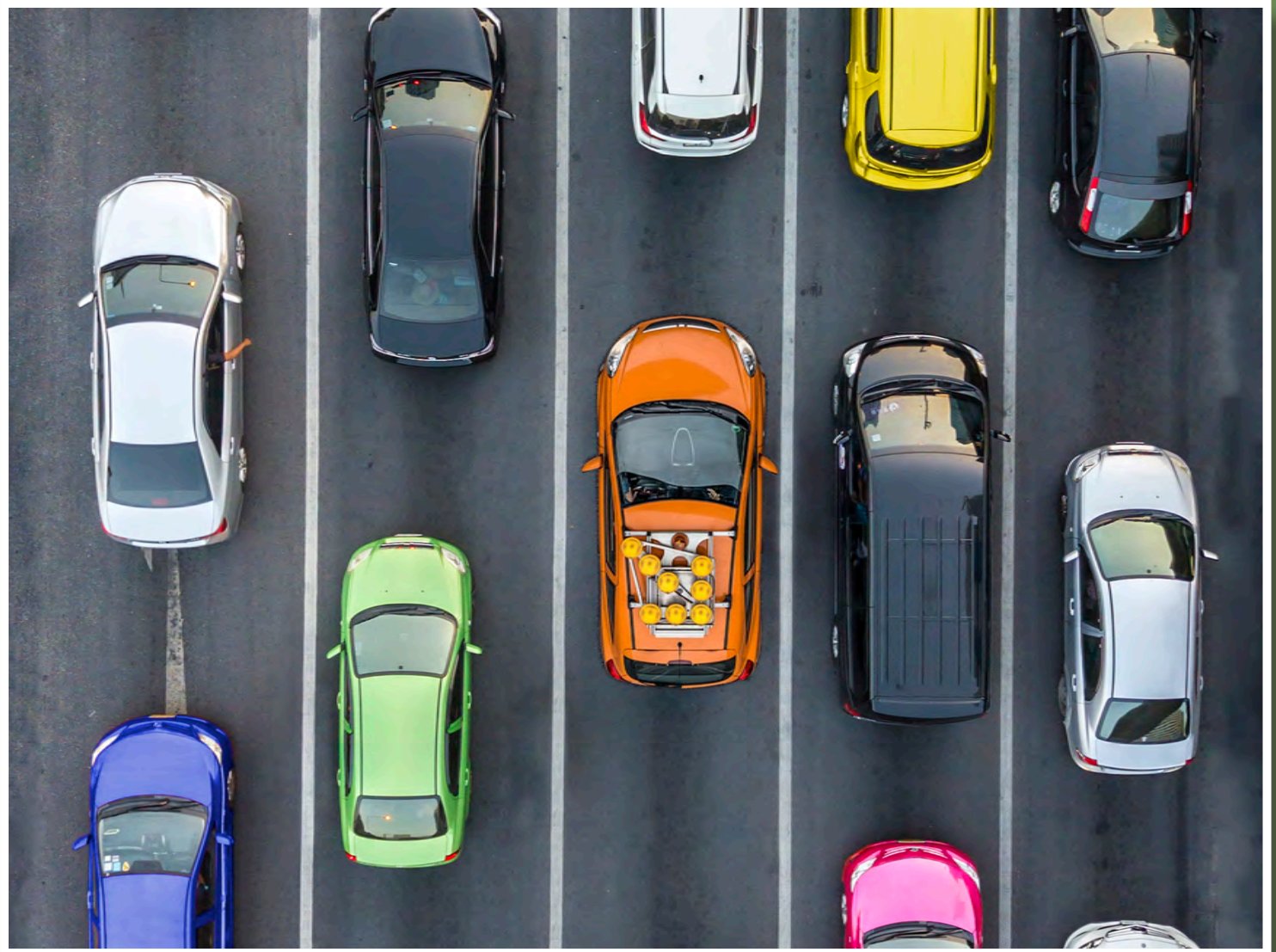


Transportation Energy Data Book Edition 39

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OAK RIDGE NATIONAL LABORATORY
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Transportation Energy Data Book

Quick Facts

Petroleum

- In 2020 the U.S. produced more than 16 million barrels of petroleum per day (mmbd), or 18.2% of the world's 88 mmbd.
- The U.S. consumed 20.5 mmbd, or 20% of the world's 100 mmbd in 2020.
- Net imports of petroleum to the U.S. in 2020 were -0.65 mmbd meaning the U.S. exported more petroleum than it imported.
- Petroleum use in U.S. transportation comprised 66% of total U.S. petroleum use in 2020.
- In 2020, U.S. transportation petroleum use was 73% of total U.S. petroleum production.
- Petroleum comprised 90% of U.S. transportation energy use in 2020.
- Cars and light trucks accounted for 62% of U.S. transportation petroleum use in 2018.
- Medium trucks (Class 3-6) accounted for 4% of U.S. transportation petroleum use in 2018.
- Heavy trucks (Class 7-8) and buses accounted for 19% of U.S. transportation petroleum use in 2018.
- Nonhighway modes accounted for the remainder of U.S. transportation petroleum use in 2018 (14%).

Energy

- Energy use in U.S. transportation accounted for about 26% of total U.S. energy use in 2020.
- Cars and light trucks accounted for 57% of U.S. transportation energy use in 2018.
- Medium trucks accounted for 5% of U.S. transportation energy use in 2018.
- Heavy trucks and buses accounted for 19% of U.S. transportation energy use in 2018.
- Nonhighway modes accounted for the remainder of U.S. transportation energy use in 2018 (19%).

Light Vehicle Characteristics

- In 2019 there were 109 million cars and 144 million light trucks in the U.S. (253 million total light vehicles).
- Light vehicles accounted for 90% of the 3.3 trillion vehicle miles driven in the U.S. in 2019.
- U.S. cars:
 - 3,402,000 cars were sold in 2020 which was 23% of new light vehicle sales.
 - In 2018 the average age of a U.S. car was 11.9 years.
 - In 2019 the average fuel economy for the U.S. car fleet (all cars on the road) was 28.3 mpg.
- U.S. light trucks:
 - 10,712,000 light trucks were sold in 2020 which was 72% of new light vehicle sales.
 - In 2018 the average age of a U.S. light truck was 11.7 years.
 - In 2019 the average fuel economy for the U.S. light truck fleet (all light trucks on the road) was 20.4 mpg which was 7.9 mpg lower than the average for cars.
- The average U.S. household vehicle travels 11,200 miles per year (2017 NHTS).

Heavy Truck Characteristics

- 13,085,000 heavy trucks were registered in the U.S. in 2019.
- Heavy trucks and buses accounted for 10% of the 3.3 trillion vehicle miles driven in 2019.
- In 2002 (the last time a survey was conducted), heavy trucks accounted for 80% of medium and heavy truck fuel use.

Energy and Transportation Science Division

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This book would not be possible without the leadership, guidance, and vision of Phil Patterson, who began this book in the 1970's. We hope to continue this report into the future with the same level of excellence. The authors and the transportation research community will be forever grateful for his efforts.

ABSTRACT

The *Transportation Energy Data Book: Edition 39* is a statistical compendium prepared and published by Oak Ridge National Laboratory (ORNL) under contract with the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Vehicle Technologies Office. Designed for use as a desk-top reference, the Data Book represents an assembly and display of statistics and information that characterize transportation activity and presents data on other factors that influence transportation energy use. The purpose of this document is to present relevant statistical data in the form of tables and graphs. The latest edition of the Data Book is available via the Internet (tedb.ornl.gov).

This edition of the Data Book has 13 chapters which focus on various aspects of the transportation industry. Chapter 1 focuses on petroleum; Chapter 2 – energy; Chapter 3 – highway vehicles; Chapter 4 – light vehicles; Chapter 5 – heavy vehicles; Chapter 6 – alternative fuel vehicles; Chapter 7 – transit and other shared mobility; Chapter 8 – fleet vehicles; Chapter 9 – household vehicles; Chapter 10 – nonhighway modes; Chapter 11 – transportation and the economy; Chapter 12 – greenhouse gas emissions; and Chapter 13 – criteria pollutant emissions. The sources used represent the latest available data. There are also two appendices which include detailed source information for some tables and measures of conversion. A glossary of terms is also included for the reader's convenience.

INTRODUCTION

In January 1976, the Transportation Energy Conservation (TEC) Division of the Energy Research and Development Administration contracted with Oak Ridge National Laboratory (ORNL) to prepare a Transportation Energy Conservation Data Book to be used by TEC staff in their evaluation of current and proposed conservation strategies. The major purposes of the Data Book were to draw together, under one cover, transportation data from diverse sources, to resolve data conflicts and inconsistencies, and to produce a comprehensive document. The first edition of the TEC Data Book was published in October 1976. With the passage of the Department of Energy (DOE) Organization Act, the work being conducted by the former Transportation Energy Conservation Division fell under the purview of the DOE's Office of Transportation Programs. This work continues today in the Vehicle Technologies Office.

Policymakers and analysts need to be well-informed about activity in the transportation sector. The organization and scope of the data book reflect the need for different kinds of information. For this reason, Edition 39 updates much of the same type of data that is found in previous editions.

In any attempt to compile a comprehensive set of statistics on transportation activity, numerous instances of inadequacies and inaccuracies in the basic data are encountered. Where such problems occur, estimates are developed by ORNL. To minimize the misuse of these statistics, an appendix (Appendix A) is included to document the estimation procedures. The attempt is to provide sufficient information for the conscientious user to evaluate the estimates and to form their own opinions as to their utility. Clearly, the accuracy of the estimates cannot exceed the accuracy of the primary data, an accuracy which in most instances is unknown. In cases where data accuracy is known or substantial errors are strongly suspected in the data, the reader is alerted. In all cases it should be recognized that the estimates are not precise.

The majority of the statistics contained in the data book are taken directly from published sources, although these data may be reformatted for presentation by ORNL. Consequently, neither ORNL nor DOE endorses the validity of these data.

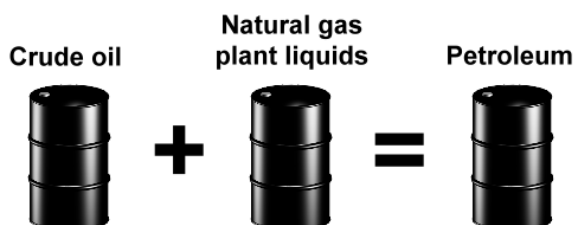
Chapter 1

Petroleum

Summary Statistics from Tables/Figures in this Chapter

| Source | | | | |
|------------|---|-------------------|-------------------|--------|
| Table 1.3 | World Petroleum Production, 2020 (million barrels per day) | | | 87.80 |
| | <i>U.S. Production (million barrels per day)</i> | | | 16.47 |
| | <i>U.S. Share</i> | | | 18.8% |
| Table 1.4 | World Petroleum Consumption, 2018 (million barrels per day) | | | 100.05 |
| | <i>U.S. Consumption (million barrels per day)</i> | | | 20.45 |
| | <i>U.S. Share</i> | | | 20.5% |
| Figure 1.4 | Average Refinery Yield, 2020 | OECD ^a | OECD ^a | |
| | | Europe | Americas | |
| | <i>Gasoline</i> | 18.1% | 41.1% | |
| | <i>Diesel oil</i> | 42.4% | 31.1% | |
| | <i>Residual fuel</i> | 9.3% | 3.0% | |
| | <i>Kerosene</i> | 5.6% | 16.4% | |
| | <i>Other (includes naphtha and LPG)</i> | 10.2% | 2.4% | |
| Table 1.12 | U.S. transportation petroleum use as a percent of U.S. petroleum production, 2020 | | | 72.7% |
| Table 1.12 | Net imports as a percentage of U.S. petroleum consumption, 2020 | | | -3.6% |
| Table 1.13 | Transportation share of U.S. petroleum consumption, 2020 | | | 66.0% |
| Table 1.17 | Highway share of transportation petroleum consumption, 2018 | | | 86.3% |
| Table 1.17 | Light vehicle share of transportation petroleum consumption, 2018 | | | 62.7% |

In this document, petroleum is defined as crude oil (including lease condensate) and natural gas plant liquids.



^a Organization for Economic Co-operation and Development.

As new technologies appear, and new areas are explored, the amount of proved reserves of crude oil and natural gas has grown. Although the reserves of natural gas in the United States were 132% higher in 2020 than in 1980, the U.S. share of world natural gas reserves is lower.

Table 1.1 (Updated April 2021)
Proved Reserves of Crude Oil and Natural Gas, 1980–2020

| Year | Crude Oil Reserves (billion barrels) | | U.S. Share of Crude Oil Reserves | Natural Gas Reserves (trillion cubic feet) | | U.S. Share of Natural Gas Reserves |
|-----------|---|---------------|---|---|---------------|--|
| | World | United States | | World | United States | |
| 1980 | 643.1 | 31.2 | 4.9% | 2,585.5 | 201.0 | 7.8% |
| 1985 | 699.2 | 30.0 | 4.3% | 3,401.6 | 197.5 | 5.8% |
| 1986 | 699.8 | 29.9 | 4.3% | 3,483.7 | 193.4 | 5.6% |
| 1987 | 699.0 | 28.3 | 4.1% | 3,641.3 | 191.6 | 5.3% |
| 1988 | 888.6 | 28.7 | 3.2% | 3,789.3 | 187.2 | 4.9% |
| 1989 | 907.1 | 28.2 | 3.1% | 3,921.9 | 168.0 | 4.3% |
| 1990 | 1,001.5 | 27.9 | 2.8% | 3,981.0 | 167.1 | 4.2% |
| 1991 | 1,000.0 | 27.6 | 2.8% | 4,215.7 | 169.3 | 4.0% |
| 1992 | 933.4 | 25.9 | 2.8% | 2,626.8 | 167.1 | 6.4% |
| 1993 | 940.3 | 25.0 | 2.7% | 2,941.6 | 165.0 | 5.6% |
| 1994 | 942.5 | 24.1 | 2.6% | 3,016.8 | 162.4 | 5.4% |
| 1995 | 944.1 | 23.6 | 2.5% | 3,004.9 | 163.8 | 5.5% |
| 1996 | 951.6 | 23.5 | 2.5% | 2,957.1 | 165.1 | 5.6% |
| 1997 | 1,019.8 | 23.3 | 2.3% | 4,947.0 | 166.5 | 3.4% |
| 1998 | 1,021.4 | 23.9 | 2.3% | 5,088.7 | 167.2 | 3.3% |
| 1999 | 1,034.1 | 22.4 | 2.2% | 5,143.1 | 164.0 | 3.2% |
| 2000 | 1,018.2 | 23.2 | 2.3% | 5,151.1 | 167.4 | 3.2% |
| 2001 | 1,029.6 | 23.5 | 2.3% | 5,290.0 | 177.4 | 3.4% |
| 2002 | 1,033.4 | 23.8 | 2.3% | 5,458.6 | 183.5 | 3.4% |
| 2003 | 1,214.7 | 24.0 | 2.0% | 5,506.3 | 186.9 | 3.4% |
| 2004 | 1,266.5 | 23.1 | 1.8% | 6,079.9 | 189.0 | 3.1% |
| 2005 | 1,278.8 | 22.6 | 1.8% | 6,046.3 | 192.5 | 3.2% |
| 2006 | 1,289.6 | 23.0 | 1.8% | 6,126.0 | 204.4 | 3.3% |
| 2007 | 1,320.3 | 22.3 | 1.7% | 6,192.3 | 211.1 | 3.4% |
| 2008 | 1,328.9 | 22.8 | 1.7% | 6,215.8 | 237.7 | 3.8% |
| 2009 | 1,336.8 | 20.6 | 1.5% | 6,265.5 | 244.7 | 3.9% |
| 2010 | 1,357.1 | 22.3 | 1.6% | 6,641.4 | 272.5 | 4.1% |
| 2011 | 1,475.4 | 25.2 | 1.7% | 6,712.5 | 304.6 | 4.5% |
| 2012 | 1,523.8 | 29.0 | 1.9% | 6,814.0 | 334.1 | 4.9% |
| 2013 | 1,644.9 | 33.4 | 2.0% | 6,850.9 | 308.0 | 4.5% |
| 2014 | 1,651.8 | 36.5 | 2.2% | 6,979.4 | 338.3 | 4.8% |
| 2015 | 1,659.3 | 39.9 | 2.4% | 6,957.4 | 368.7 | 5.3% |
| 2016 | 1,652.0 | 35.2 | 2.1% | 6,885.5 | 307.7 | 4.5% |
| 2017 | 1,647.1 | 35.2 | 2.1% | 6,929.8 | 322.2 | 4.6% |
| 2018 | 1,662.8 | 42.0 | 2.5% | 7,131.3 | 438.5 | 6.1% |
| 2019 | 1,659.2 | 47.1 | 2.8% | 7,176.9 | 474.8 | 6.6% |
| 2020 | 1,661.9 | 47.1 | 2.8% | 7,257.2 | 465.4 | 6.4% |
| | | | <i>Average annual percentage change</i> | | | |
| 1980-2020 | 2.4% | 1.0% | | 2.6% | 2.1% | |
| 2010-2020 | 2.0% | 7.8% | | 0.9% | 5.5% | |

Source:

U.S. Department of Energy, Energy Information Administration, *International Energy Statistics*, April 2021.
(Additional resources: www.eia.doe.gov)

In 2020, the Organization of Petroleum Exporting Countries (OPEC) accounted for 36.1% of world oil production. U.S. crude oil production reached an all-time high in 2019 and was still above 11 million barrels per day in 2020.

Table 1.2 (Updated April 2021)
World Crude Oil Production, 1960–2020^a
(million barrels per day)

| Year | United States | U.S. share | Total OPEC ^b | OPEC share | Total non-OPEC | World | |
|-----------|---------------|------------|---|------------|----------------|-------|--|
| 1960 | 7.04 | 33.5% | 8.70 | 41.4% | 12.29 | 20.99 | |
| 1965 | 7.80 | 25.7% | 14.35 | 47.3% | 15.98 | 30.33 | |
| 1970 | 9.64 | 21.0% | 23.30 | 50.8% | 22.59 | 45.89 | |
| 1975 | 8.37 | 17.6% | 25.45 | 53.5% | 22.12 | 47.57 | |
| 1980 | 8.60 | 14.4% | 24.95 | 41.9% | 34.61 | 59.56 | |
| 1985 | 8.97 | 16.6% | 15.08 | 27.9% | 38.89 | 53.97 | |
| 1990 | 7.36 | 12.2% | 22.24 | 36.8% | 38.26 | 60.50 | |
| 1991 | 7.42 | 12.3% | 22.18 | 36.9% | 37.95 | 60.13 | |
| 1992 | 7.17 | 11.9% | 23.46 | 39.0% | 36.64 | 60.10 | |
| 1993 | 6.85 | 11.4% | 24.21 | 40.2% | 35.97 | 60.18 | |
| 1994 | 6.66 | 10.9% | 24.61 | 40.2% | 36.56 | 61.17 | |
| 1995 | 6.56 | 10.5% | 25.22 | 40.4% | 37.21 | 62.43 | |
| 1996 | 6.46 | 10.1% | 25.68 | 40.2% | 38.13 | 63.82 | |
| 1997 | 6.45 | 9.8% | 27.01 | 41.0% | 38.79 | 65.80 | |
| 1998 | 6.25 | 9.3% | 27.98 | 41.7% | 39.06 | 67.03 | |
| 1999 | 5.88 | 8.9% | 26.87 | 40.7% | 39.10 | 65.97 | |
| 2000 | 5.82 | 8.5% | 28.57 | 41.7% | 39.96 | 68.53 | |
| 2001 | 5.80 | 8.5% | 27.69 | 40.6% | 40.44 | 68.13 | |
| 2002 | 5.74 | 8.5% | 26.08 | 38.8% | 41.21 | 67.29 | |
| 2003 | 5.65 | 8.1% | 27.45 | 39.5% | 42.01 | 69.46 | |
| 2004 | 5.44 | 7.5% | 29.84 | 41.1% | 42.75 | 72.60 | |
| 2005 | 5.18 | 7.0% | 31.26 | 42.3% | 42.61 | 73.87 | |
| 2006 | 5.09 | 6.9% | 30.95 | 42.0% | 42.68 | 73.63 | |
| 2007 | 5.07 | 6.9% | 30.64 | 41.8% | 42.68 | 73.32 | |
| 2008 | 5.00 | 6.7% | 32.05 | 43.1% | 42.26 | 74.30 | |
| 2009 | 5.36 | 7.3% | 30.31 | 41.5% | 42.80 | 73.12 | |
| 2010 | 5.48 | 7.3% | 31.11 | 41.5% | 43.77 | 74.88 | |
| 2011 | 5.67 | 7.6% | 31.08 | 41.5% | 43.83 | 74.91 | |
| 2012 | 6.52 | 8.5% | 32.32 | 42.3% | 44.10 | 76.42 | |
| 2013 | 7.49 | 9.8% | 31.23 | 40.8% | 45.24 | 76.46 | |
| 2014 | 8.79 | 11.2% | 31.25 | 39.9% | 47.10 | 78.35 | |
| 2015 | 9.45 | 11.7% | 32.50 | 40.3% | 48.21 | 80.70 | |
| 2016 | 8.85 | 11.0% | 33.53 | 41.5% | 47.25 | 80.77 | |
| 2017 | 9.37 | 11.6% | 33.41 | 41.2% | 47.65 | 81.06 | |
| 2018 | 10.96 | 13.2% | 33.34 | 40.2% | 49.55 | 82.88 | |
| 2019 | 12.25 | 14.9% | 31.31 | 38.0% | 51.00 | 82.31 | |
| 2020 | 11.31 | 14.9% | 27.48 | 36.1% | 48.64 | 76.12 | |
| | | | <i>Average annual percentage change</i> | | | | |
| 1960-2020 | 0.8% | | 1.9% | | 2.3% | 2.2% | |
| 1970-2020 | 0.3% | | 0.3% | | 1.5% | 1.0% | |
| 2010-2020 | 7.5% | | -1.2% | | 1.1% | 0.2% | |

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, March 2021. (Additional resources: www.eia.doe.gov)

^a Includes lease condensate. Excludes natural gas plant liquids.

^b See Glossary for membership.

This table shows petroleum production, which includes both crude oil and natural gas plant liquids. Because other liquids and processing gain are not included, the world total is often smaller than world petroleum consumption (Table 1.4). The United States was responsible for 18.8% of the world's petroleum production in 2020 and 14.9% of the world's crude oil production (Table 1.2).

Table 1.3 (Updated April 2021)
World Petroleum Production, 1973–2020^a
(million barrels per day)

| Year | United States | U.S. share | Total OPEC ^b | OPEC share | Total non-OPEC | Non-OPEC share | World | |
|-----------|---------------|------------|---|------------|----------------|----------------|-------|--|
| 1973 | 10.95 | 20.6% | 29.39 | 55.3% | 23.75 | 44.7% | 53.15 | |
| 1975 | 10.01 | 19.9% | 25.82 | 51.3% | 24.54 | 48.7% | 50.36 | |
| 1980 | 10.17 | 16.1% | 25.60 | 40.6% | 37.40 | 59.4% | 63.00 | |
| 1985 | 10.58 | 18.3% | 15.88 | 27.4% | 42.02 | 72.6% | 57.90 | |
| 1990 | 8.91 | 13.7% | 23.41 | 35.9% | 41.73 | 64.1% | 65.14 | |
| 1991 | 9.08 | 14.0% | 23.35 | 36.0% | 41.59 | 64.0% | 64.94 | |
| 1992 | 8.87 | 13.7% | 24.69 | 38.0% | 40.26 | 62.0% | 64.95 | |
| 1993 | 8.58 | 13.2% | 25.51 | 39.1% | 39.73 | 60.9% | 65.24 | |
| 1994 | 8.39 | 12.6% | 26.20 | 39.4% | 40.35 | 60.6% | 66.55 | |
| 1995 | 8.32 | 12.2% | 26.86 | 39.5% | 41.15 | 60.5% | 68.01 | |
| 1996 | 8.29 | 11.9% | 27.32 | 39.3% | 42.20 | 60.7% | 69.52 | |
| 1997 | 8.27 | 11.5% | 28.73 | 40.1% | 42.92 | 59.9% | 71.65 | |
| 1998 | 8.01 | 11.0% | 29.76 | 40.7% | 43.28 | 59.3% | 73.04 | |
| 1999 | 7.73 | 10.7% | 28.69 | 39.8% | 43.46 | 60.2% | 72.15 | |
| 2000 | 7.73 | 10.3% | 30.45 | 40.7% | 44.45 | 59.3% | 74.90 | |
| 2001 | 7.67 | 10.3% | 29.78 | 39.8% | 45.05 | 60.2% | 74.83 | |
| 2002 | 7.62 | 10.3% | 28.25 | 38.1% | 45.85 | 61.9% | 74.10 | |
| 2003 | 7.37 | 9.6% | 29.72 | 38.8% | 46.80 | 61.2% | 76.52 | |
| 2004 | 7.25 | 9.0% | 32.51 | 40.5% | 47.69 | 59.5% | 80.19 | |
| 2005 | 6.90 | 8.4% | 34.26 | 41.9% | 47.51 | 58.1% | 81.77 | |
| 2006 | 6.82 | 8.4% | 33.99 | 41.6% | 47.69 | 58.4% | 81.68 | |
| 2007 | 6.86 | 8.4% | 33.83 | 41.5% | 47.74 | 58.5% | 81.57 | |
| 2008 | 6.78 | 8.2% | 35.23 | 42.7% | 47.29 | 57.3% | 82.51 | |
| 2009 | 7.27 | 8.9% | 33.50 | 41.1% | 47.97 | 58.9% | 81.47 | |
| 2010 | 7.56 | 9.1% | 34.34 | 41.1% | 49.16 | 58.9% | 83.50 | |
| 2011 | 7.88 | 9.4% | 34.31 | 41.0% | 49.40 | 59.0% | 83.71 | |
| 2012 | 8.93 | 10.4% | 35.66 | 41.7% | 49.95 | 58.3% | 85.61 | |
| 2013 | 10.10 | 11.8% | 34.52 | 40.2% | 51.32 | 59.8% | 85.84 | |
| 2014 | 11.80 | 13.4% | 34.49 | 39.1% | 53.69 | 60.9% | 88.18 | |
| 2015 | 12.79 | 14.1% | 35.70 | 39.3% | 55.15 | 60.7% | 90.85 | |
| 2016 | 12.36 | 13.6% | 36.75 | 40.3% | 54.35 | 59.7% | 91.10 | |
| 2017 | 13.15 | 14.3% | 36.67 | 40.0% | 55.03 | 60.0% | 91.70 | |
| 2018 | 15.33 | 16.3% | 36.58 | 38.9% | 57.51 | 61.1% | 94.08 | |
| 2019 | 17.07 | 18.2% | 34.48 | 36.7% | 59.41 | 63.3% | 93.89 | |
| 2020 | 16.47 | 18.8% | 30.43 | 34.7% | 57.37 | 65.3% | 87.80 | |
| | | | <i>Average annual percentage change</i> | | | | | |
| 1973-2020 | 0.9% | | 0.1% | | 1.9% | | 1.1% | |
| 2010-2020 | 8.1% | | -1.2% | | 1.6% | | 0.5% | |

Source:

U.S. Department of Energy, Energy Information Administration, *International Energy Statistics* website, April 2021.
 (Additional resources: www.eia.doe.gov)

^a Includes natural gas plant liquids, crude oil and lease condensate. Does not account for all inputs or refinery processing gain.

^b Organization of Petroleum Exporting Countries. See Glossary for membership.

During the 1980s and 1990s, the United States accounted for about one-quarter of the world's petroleum consumption, but from 2000 to 2012 that share had been decreasing. In 2018 the United States accounted for only 20.5%. World petroleum consumption decreased in 2008 and 2009 but has continued to increase thereafter. Non-OECD consumption has continued to increase.

Table 1.4 (Updated April 2021)
World Petroleum Consumption, 1960–2020
(million barrels per day)

| Year | United States | U.S. share | Total OECD ^a | Total non-OECD | World |
|-----------|---------------|---|-------------------------|-------------------|-------------------|
| 1960 | 9.80 | 45.9% | 15.78 | 5.56 | 21.34 |
| 1965 | 11.51 | 37.0% | 22.81 | 8.33 | 31.14 |
| 1970 | 14.70 | 31.4% | 34.69 | 12.12 | 46.81 |
| 1975 | 16.32 | 29.0% | 39.23 | 16.97 | 56.20 |
| 1980 | 17.06 | 27.0% | 42.01 | 21.10 | 63.11 |
| 1985 | 15.73 | 26.2% | 37.78 | 22.35 | 60.13 |
| 1990 | 16.99 | 25.5% | 41.87 | 24.79 | 66.67 |
| 1991 | 16.71 | 24.9% | 42.26 | 24.73 | 66.99 |
| 1992 | 17.03 | 25.3% | 43.44 | 23.81 | 67.25 |
| 1993 | 17.24 | 25.7% | 43.93 | 23.09 | 67.02 |
| 1994 | 17.72 | 25.9% | 45.24 | 23.21 | 68.45 |
| 1995 | 17.72 | 25.4% | 45.67 | 24.20 | 69.87 |
| 1996 | 18.31 | 25.5% | 46.82 | 25.12 | 71.94 |
| 1997 | 18.62 | 25.5% | 47.56 | 25.59 | 73.15 |
| 1998 | 18.92 | 25.6% | 47.76 | 26.23 | 73.99 |
| 1999 | 19.52 | 25.8% | 48.66 | 26.98 | 75.64 |
| 2000 | 19.70 | 25.6% | 48.80 | 28.27 | 77.07 |
| 2001 | 19.65 | 25.3% | 48.84 | 28.95 | 77.79 |
| 2002 | 19.76 | 25.1% | 48.87 | 29.74 | 78.62 |
| 2003 | 20.03 | 25.0% | 49.58 | 30.66 | 80.24 |
| 2004 | 20.73 | 24.8% | 50.45 | 32.99 | 83.43 |
| 2005 | 20.80 | 24.6% | 50.79 | 33.85 | 84.65 |
| 2006 | 20.69 | 24.1% | 50.62 | 35.19 | 85.80 |
| 2007 | 20.68 | 23.7% | 50.44 | 36.76 | 87.19 |
| 2008 | 19.50 | 22.5% | 48.64 | 38.06 | 86.70 |
| 2009 | 18.77 | 21.9% | 46.61 | 39.22 | 85.83 |
| 2010 | 19.18 | 21.6% | 47.30 | 41.40 | 88.70 |
| 2011 | 18.90 | 21.1% | 46.75 | 42.64 | 89.38 |
| 2012 | 18.48 | 20.4% | 46.30 | 44.41 | 90.71 |
| 2013 | 18.97 | 20.6% | 46.33 | 45.90 | 92.24 |
| 2014 | 19.10 | 20.4% | 46.05 | 47.48 | 93.53 |
| 2015 | 19.53 | 20.5% | 46.80 | 48.46 | 95.26 |
| 2016 | 19.69 | 20.3% | 47.23 | 49.56 | 96.79 |
| 2017 | 19.95 | 20.2% | 47.82 | 51.12 | 98.94 |
| 2018 | 20.51 | 20.5% | 48.15 | 51.90 | 100.05 |
| 2019 | 20.54 | ^b | 47.34 | ^b | ^b |
| 2020 | 18.12 | ^b | 41.51 | ^b | ^b |
| | | <i>Average annual percentage change</i> | | | |
| 1960-2020 | 1.0% | -1.4% ^c | 1.6% | 3.9% ^c | 2.7% ^c |
| 1970-2020 | 0.4% | -0.9% ^c | 0.4% | 3.1% ^c | 1.6% ^c |
| 2010-2020 | -0.6% | -0.7% ^c | -1.3% | 2.9% ^c | 1.5% ^c |

Source:

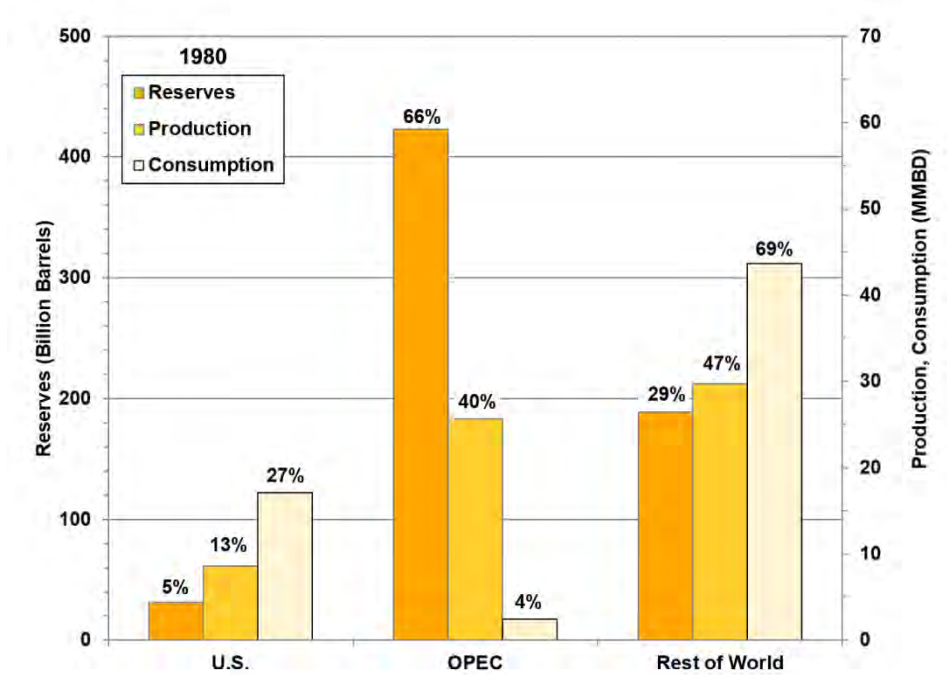
U.S. Department of Energy, Energy Information Administration, *International Energy Statistics*, April 2021.
 (Additional resources: www.eia.doe.gov)

^a Organization for Economic Cooperation and Development. See Glossary for membership.

^b Data are not available.

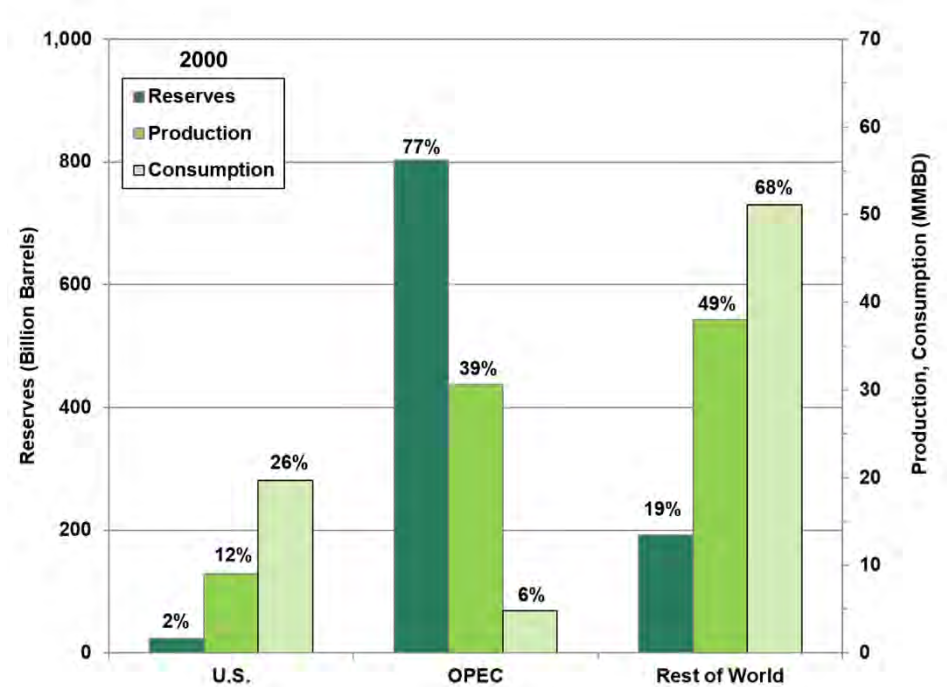
^c Average annual percentage change is through 2018.

Figure 1.1. World Oil Reserves, Production, and Consumption, 1980 (Updated August 2021)

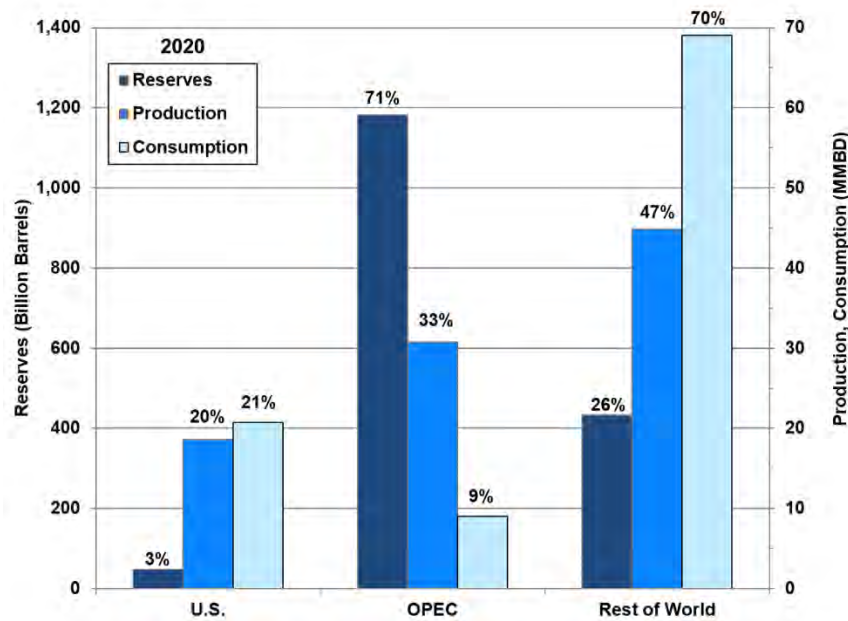


Source:
See Table 1.5.

Figure 1.2. World Oil Reserves, Production, and Consumption, 2000 (Updated August 2021)



Source:
See Table 1.5.

Figure 1.3. World Oil Reserves, Production, and Consumption, 2020 (Updated August 2021)

Source:
See Table 1.5.

Table 1.5 (Updated August 2021)
World Oil Reserves, Production, and Consumption, 1980, 2000 and 2020

| | Crude oil reserves (billion barrels) | Reserve share | Petroleum production (million barrels per day) | Production share | Petroleum consumption (million barrels per day) | Consumption share |
|---------------|---|---------------|---|------------------|--|-------------------|
| 1980 | | | | | | |
| United States | 31.2 | 5% | 8.6 | 13% | 17.1 | 27% |
| OPEC | 423.0 | 66% | 25.7 | 40% | 2.4 | 4% |
| Rest of world | 188.9 | 29% | 29.7 | 47% | 43.6 | 69% |
| 2000 | | | | | | |
| United States | 23.2 | 2% | 9.1 | 12% | 19.7 | 26% |
| OPEC | 803.2 | 79% | 30.6 | 39% | 4.8 | 6% |
| Rest of world | 191.8 | 19% | 38.0 | 49% | 51.1 | 68% |
| 2020 | | | | | | |
| United States | 47.1 | 3% | 18.6 | 20% | 20.7 | 21% |
| OPEC | 1,181.5 | 71% | 30.7 | 33% | 9.0 | 9% |
| Rest of world | 433.3 | 26% | 44.9 | 47% | 69.0 | 70% |

Note: Consumption for OPEC and Rest of World in 2020 are actually 2019 consumption, which are the latest available. Total consumption is higher than total production due to refinery gains including alcohol and liquid products produced from coal and other sources. See Glossary for OPEC countries.

Sources:

Energy Information Administration, *International Energy Statistics*, August 2020. (Additional resources: www.eia.doe.gov)

The share of petroleum imported to the United States can be calculated using total imports or net imports. Net imports, which are the preferred data, rose to over 50% of U.S. petroleum consumption for the first time in 1998, while total imports reached 50% for the first time in 1993. OPEC share of net imports has been below 50% since 1993. Due to declining total imports and rising petroleum exports, net petroleum imports were negative in 2020 for the first time in the series.

Table 1.6 (Updated April 2021)
U.S. Petroleum Imports, 1960–2020
(million barrels per day)

| Year | Net OPEC ^a imports | Net OPEC ^a share | Net imports | Net imports as a share of U.S. consumption | Total imports | |
|-----------|----------------------------------|--------------------------------|---|---|---------------|--|
| 1960 | 1.23 | 68.0% | 1.61 | 16.5% | 1.81 | |
| 1965 | 1.44 | 58.3% | 2.28 | 19.8% | 2.47 | |
| 1970 | 1.29 | 37.8% | 3.16 | 21.5% | 3.42 | |
| 1975 | 3.60 | 59.5% | 5.85 | 35.8% | 6.06 | |
| 1980 | 4.30 | 62.2% | 6.36 | 37.3% | 6.91 | |
| 1985 | 1.83 | 36.1% | 4.29 | 27.3% | 5.07 | |
| 1990 | 4.30 | 53.6% | 7.16 | 42.2% | 8.02 | |
| 1991 | 4.09 | 53.7% | 6.63 | 39.6% | 7.63 | |
| 1992 | 4.09 | 51.9% | 6.94 | 40.7% | 7.89 | |
| 1993 | 4.27 | 49.6% | 7.62 | 44.2% | 8.62 | |
| 1994 | 4.25 | 47.2% | 8.05 | 45.5% | 9.00 | |
| 1995 | 4.00 | 45.3% | 7.89 | 44.5% | 8.83 | |
| 1996 | 4.21 | 44.4% | 8.50 | 46.4% | 9.48 | |
| 1997 | 4.57 | 45.0% | 9.16 | 49.2% | 10.16 | |
| 1998 | 4.91 | 45.8% | 9.76 | 51.6% | 10.71 | |
| 1999 | 4.95 | 45.6% | 9.91 | 50.8% | 10.85 | |
| 2000 | 5.20 | 45.4% | 10.42 | 52.9% | 11.46 | |
| 2001 | 5.53 | 46.6% | 10.90 | 55.5% | 11.87 | |
| 2002 | 4.61 | 39.9% | 10.55 | 53.4% | 11.53 | |
| 2003 | 5.16 | 42.1% | 11.24 | 56.1% | 12.26 | |
| 2004 | 5.70 | 43.4% | 12.10 | 58.4% | 13.15 | |
| 2005 | 5.59 | 40.7% | 12.55 | 60.3% | 13.71 | |
| 2006 | 5.52 | 40.2% | 12.39 | 59.9% | 13.71 | |
| 2007 | 5.98 | 44.4% | 12.04 | 58.2% | 13.47 | |
| 2008 | 5.95 | 46.1% | 11.11 | 57.0% | 12.92 | |
| 2009 | 4.78 | 40.9% | 9.67 | 51.5% | 11.69 | |
| 2010 | 4.91 | 41.6% | 9.44 | 49.2% | 11.79 | |
| 2011 | 4.56 | 39.8% | 8.45 | 44.8% | 11.44 | |
| 2012 | 4.27 | 40.3% | 7.39 | 40.0% | 10.60 | |
| 2013 | 3.72 | 37.7% | 6.24 | 32.9% | 9.86 | |
| 2014 | 3.24 | 35.0% | 5.07 | 26.5% | 9.24 | |
| 2015 | 2.89 | 30.6% | 4.71 | 24.1% | 9.45 | |
| 2016 | 3.45 | 34.3% | 4.79 | 24.4% | 10.06 | |
| 2017 | 3.37 | 33.2% | 3.77 | 18.9% | 10.14 | |
| 2018 | 2.89 | 29.0% | 2.34 | 11.4% | 9.94 | |
| 2019 | 1.64 | 17.9% | 0.67 | 3.3% | 9.14 | |
| 2020 | 0.89 | 11.3% | -0.65 | -3.6% | 7.86 | |
| | | | <i>Average annual percentage change</i> | | | |
| 1960-2020 | -0.5% | | b | | 2.5% | |
| 1970-2020 | -0.8% | | b | | 1.7% | |
| 2010-2020 | -15.7% | | b | | -3.5% | |

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, March 2021, Table 3.3a. (Additional resources: www.eia.gov)

^a Organization of Petroleum Exporting Countries. See Glossary for membership.

More than half of the oil imported to the United States in 2019 was from North America. Canada and Mexico provided most of the oil, plus a small amount from the U.S. Virgin Islands (not listed separately).

Table 1.7 (Updated April 2021)
Imported Crude Oil by Country of Origin, 1960–2020
(million barrels per day)

| Year | Saudi Arabia | Venezuela | Nigeria | Other OPEC ^a countries | Canada | Mexico | Russia | Other non-OPEC countries | Total imports |
|---|--------------|--------------|--------------|-----------------------------------|--------|--------|--------------|--------------------------|---------------|
| 1960 | 0.08 | 0.91 | 0.00 | 0.24 | 0.12 | 0.02 | ^b | 0.45 | 1.81 |
| 1965 | 0.16 | 0.99 | 0.00 | 0.29 | 0.32 | 0.05 | ^b | 0.66 | 2.47 |
| 1970 | 0.03 | 0.99 | 0.00 | 0.27 | 0.77 | 0.04 | 0.00 | 1.31 | 3.42 |
| 1973 | 0.49 | 1.13 | 0.46 | 0.91 | 1.32 | 0.02 | 0.03 | 1.90 | 6.26 |
| 1975 | 0.71 | 0.70 | 0.76 | 1.42 | 0.85 | 0.07 | 0.01 | 1.52 | 6.06 |
| 1980 | 1.26 | 0.48 | 0.86 | 1.70 | 0.45 | 0.53 | 0.00 | 1.62 | 6.91 |
| 1985 | 0.17 | 0.60 | 0.29 | 0.76 | 0.77 | 0.82 | 0.01 | 1.64 | 5.07 |
| 1990 | 1.34 | 1.02 | 0.80 | 1.13 | 0.93 | 0.76 | 0.04 | 1.99 | 8.02 |
| 1995 | 1.34 | 1.48 | 0.63 | 0.55 | 1.33 | 1.07 | 0.02 | 2.41 | 8.83 |
| 1996 | 1.36 | 1.68 | 0.62 | 0.56 | 1.42 | 1.24 | 0.03 | 2.57 | 9.48 |
| 1997 | 1.41 | 1.77 | 0.70 | 0.69 | 1.56 | 1.39 | 0.01 | 2.63 | 10.16 |
| 1998 | 1.49 | 1.72 | 0.70 | 1.00 | 1.60 | 1.35 | 0.02 | 2.83 | 10.71 |
| 1999 | 1.48 | 1.49 | 0.66 | 1.33 | 1.54 | 1.32 | 0.09 | 2.95 | 10.85 |
| 2000 | 1.57 | 1.55 | 0.90 | 1.19 | 1.81 | 1.37 | 0.07 | 3.00 | 11.46 |
| 2001 | 1.66 | 1.55 | 0.89 | 1.43 | 1.83 | 1.44 | 0.09 | 2.98 | 11.87 |
| 2002 | 1.55 | 1.40 | 0.62 | 1.03 | 1.97 | 1.55 | 0.21 | 3.20 | 11.53 |
| 2003 | 1.77 | 1.38 | 0.87 | 1.14 | 2.07 | 1.62 | 0.25 | 3.15 | 12.26 |
| 2004 | 1.56 | 1.55 | 1.14 | 1.45 | 2.14 | 1.66 | 0.30 | 3.34 | 13.15 |
| 2005 | 1.54 | 1.53 | 1.17 | 1.36 | 2.18 | 1.66 | 0.41 | 3.87 | 13.71 |
| 2006 | 1.46 | 1.42 | 1.11 | 1.52 | 2.35 | 1.71 | 0.37 | 3.76 | 13.71 |
| 2007 | 1.48 | 1.36 | 1.13 | 2.00 | 2.45 | 1.53 | 0.41 | 3.09 | 13.47 |
| 2008 | 1.53 | 1.19 | 0.99 | 2.25 | 2.49 | 1.30 | 0.47 | 2.70 | 12.92 |
| 2009 | 1.00 | 1.06 | 0.81 | 1.90 | 2.48 | 1.21 | 0.56 | 2.66 | 11.69 |
| 2010 | 1.10 | 0.99 | 1.02 | 1.80 | 2.54 | 1.28 | 0.61 | 2.46 | 11.79 |
| 2011 | 1.19 | 0.95 | 0.82 | 1.59 | 2.73 | 1.21 | 0.62 | 2.32 | 11.44 |
| 2012 | 1.37 | 0.96 | 0.44 | 1.51 | 2.95 | 1.03 | 0.48 | 1.87 | 10.60 |
| 2013 | 1.33 | 0.81 | 0.28 | 1.30 | 3.14 | 0.92 | 0.46 | 1.62 | 9.86 |
| 2014 | 1.17 | 0.79 | 0.09 | 1.19 | 3.39 | 0.84 | 0.33 | 1.44 | 9.24 |
| 2015 | 1.06 | 0.83 | 0.08 | 0.93 | 3.76 | 0.76 | 0.37 | 1.66 | 9.45 |
| 2016 | 1.11 | 0.80 | 0.24 | 1.31 | 3.78 | 0.67 | 0.44 | 1.72 | 10.06 |
| 2017 | 0.96 | 0.67 | 0.33 | 1.40 | 4.05 | 0.68 | 0.39 | 1.65 | 10.14 |
| 2018 | 0.90 | 0.59 | 0.19 | 1.21 | 4.29 | 0.72 | 0.38 | 1.67 | 9.94 |
| 2019 | 0.53 | 0.09 | 0.19 | 0.82 | 4.43 | 0.65 | 0.52 | 1.90 | 9.14 |
| 2020 | 0.52 | ^b | 0.08 | 0.29 | 4.12 | 0.75 | 0.54 | 1.56 | 7.86 |
| <i>Average annual percentage change</i> | | | | | | | | | |
| 1960-2020 | 3% | ^b | ^b | 0% | 6% | 7% | ^b | 2% | 2% |
| 1970-2020 | 6% | ^b | ^b | 0% | 3% | 6% | 11% | 0% | 2% |
| 2010-2020 | -7% | ^b | -23% | -17% | 5% | -5% | -1% | -4% | -4% |

Sources:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, March 2021, Tables 3.3c and 3.3d. (Additional resources: www.eia.gov)

^a Organization of Petroleum Exporting Countries. See Glossary for membership.

^b Data are not available.

The Strategic Petroleum Reserve (SPR) began in October 1977 as a result of the 1975 Energy Policy and Conservation Act. Its purpose is to provide protection against oil supply disruptions. The U.S. consumed 18.1 million barrels per day in 2020. At that rate of consumption, the SPR supply would last 35 days if used exclusively and continuously.

Table 1.8 (Updated April 2021)
Crude Oil Supplies, 1973-2020

| Year | Strategic Petroleum Reserve | Other crude oil stocks ^a | Total crude oil stocks | U.S. petroleum consumption (million barrels per day) | Number of days the SPR would supply the U.S. ^b |
|-----------|-----------------------------|-------------------------------------|---|--|---|
| 1973 | ^c | 242.5 | 242.5 | 17.3 | ^c |
| 1980 | 107.8 | 358.2 | 466.0 | 17.1 | 6.3 |
| 1985 | 493.3 | 320.9 | 814.2 | 15.7 | 31.4 |
| 1990 | 585.7 | 322.7 | 908.4 | 17.0 | 34.5 |
| 1991 | 568.5 | 324.6 | 893.1 | 16.7 | 34.0 |
| 1992 | 574.7 | 318.1 | 892.9 | 17.0 | 33.7 |
| 1993 | 587.1 | 335.4 | 922.5 | 17.2 | 34.1 |
| 1994 | 591.7 | 337.2 | 928.9 | 17.7 | 33.4 |
| 1995 | 591.6 | 303.3 | 895.0 | 17.7 | 33.4 |
| 1996 | 565.8 | 283.9 | 849.7 | 18.3 | 30.9 |
| 1997 | 563.4 | 304.7 | 868.1 | 18.6 | 30.3 |
| 1998 | 571.4 | 323.5 | 894.9 | 18.9 | 30.2 |
| 1999 | 567.2 | 284.5 | 851.7 | 19.5 | 29.1 |
| 2000 | 540.7 | 285.5 | 826.2 | 19.7 | 27.4 |
| 2001 | 550.2 | 312.0 | 862.2 | 19.6 | 28.0 |
| 2002 | 599.1 | 277.6 | 876.7 | 19.8 | 30.3 |
| 2003 | 638.4 | 268.9 | 907.3 | 20.0 | 31.9 |
| 2004 | 675.6 | 285.7 | 961.3 | 20.7 | 32.6 |
| 2005 | 684.5 | 307.7 | 992.2 | 20.8 | 32.9 |
| 2006 | 688.6 | 295.8 | 984.4 | 20.7 | 33.3 |
| 2007 | 696.9 | 268.4 | 964.3 | 20.7 | 33.7 |
| 2008 | 701.8 | 308.2 | 1,010.1 | 19.5 | 36.0 |
| 2009 | 726.6 | 307.1 | 1,033.8 | 18.8 | 38.7 |
| 2010 | 726.5 | 312.1 | 1,038.6 | 19.2 | 37.9 |
| 2011 | 696.0 | 308.2 | 1,004.2 | 18.9 | 36.8 |
| 2012 | 695.3 | 337.8 | 1,033.1 | 18.5 | 37.6 |
| 2013 | 696.0 | 327.2 | 1,023.2 | 19.0 | 36.7 |
| 2014 | 691.0 | 360.9 | 1,051.8 | 19.1 | 36.2 |
| 2015 | 695.1 | 449.2 | 1,144.3 | 19.5 | 35.6 |
| 2016 | 695.1 | 484.6 | 1,179.7 | 19.7 | 35.3 |
| 2017 | 662.8 | 421.6 | 1,084.5 | 20.0 | 33.2 |
| 2018 | 649.1 | 442.5 | 1,091.6 | 20.5 | 31.6 |
| 2019 | 635.0 | 432.9 | 1,067.9 | 20.5 | 30.9 |
| 2020 | 638.1 | 485.3 | 1,123.3 | 18.1 | 35.2 |
| | | | <i>Average annual percentage change</i> | | |
| 1973-2020 | ^c | 1.5% | 3.3% | 0.1% | ^c |
| 2010-2020 | -1.3% | 4.5% | 0.8% | -0.6% | -0.7% |

Sources:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, March 2021, Tables 3.1 and 3.4. (Additional resources: www.eia.gov)

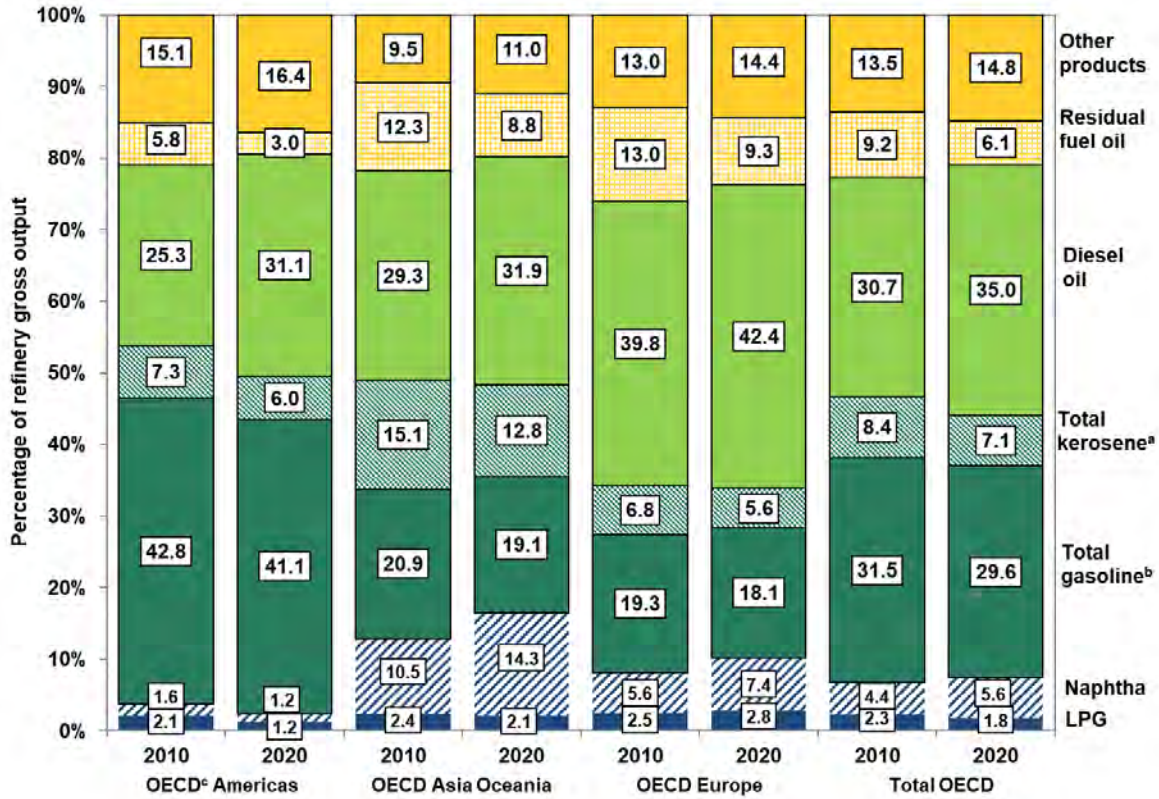
^a Other crude oil stocks include stocks held by petroleum companies, as well as stocks of Alaskan crude oil in transit.

^b Strategic Petroleum Reserves divided by U.S. consumption per day. This would only hold true if the SPR were the only oil used for that many days.

^c Not applicable.

Other parts of the world refine crude oil to produce more diesel fuel and less gasoline than the OECD Americas. The OECD Europe countries produce the lowest share of gasoline and highest share of diesel in 2020.

Figure 1.4. Refinery Gross Output by World Region, 2010 and 2020 (Updated August 2021)



Source:

International Energy Agency, *Monthly Oil Statistics*, August 2021 and *Monthly Oil Survey*, December 2011. (Additional resources: www.iea.org)

^a Includes jet kerosene and other kerosene.

^b Includes motor gasoline, jet gasoline, and aviation gasoline.

^c Organization for Economic Cooperation and Development. See Glossary for membership.

Oxygenate refinery input increased significantly in 1995, most certainly due to the Clean Air Act Amendments of 1990 which mandated the sale of reformulated gasoline in certain areas beginning in January 1995. The use of MTBE has declined over the last 15 years due to many states banning the additive. The other hydrocarbons and liquids category includes unfinished oils, motor gasoline blending components and aviation gasoline blending components.

Table 1.9 (Updated April 2021)
U.S. Refinery Input of Crude Oil and Petroleum Products, 1987–2019
 (thousand barrels)

| Year | Crude oil | Natural gas liquids | Oxygenates | | | Other hydrocarbons and liquids | Total input to refineries |
|---|-----------|---------------------|--------------|-------------------|-------------------------------|--------------------------------|---------------------------|
| | | | Fuel ethanol | MTBE ^a | Other oxygenates ^b | | |
| 1987 | 4,691,783 | 280,889 | c | c | d | 132,720 | 5,105,392 |
| 1990 | 4,894,379 | 170,589 | c | c | d | 260,108 | 5,325,076 |
| 1991 | 4,855,016 | 172,306 | c | c | d | 280,265 | 5,307,587 |
| 1992 | 4,908,603 | 171,701 | c | c | d | 272,676 | 5,352,980 |
| 1993 | 4,968,641 | 179,213 | 3,351 | 49,393 | 1,866 | 280,074 | 5,482,538 |
| 1994 | 5,061,111 | 169,868 | 3,620 | 52,937 | 1,918 | 193,808 | 5,483,262 |
| 1995 | 5,100,317 | 172,026 | 9,055 | 79,396 | 4,122 | 190,411 | 5,555,327 |
| 1996 | 5,195,265 | 164,552 | 11,156 | 79,407 | 3,570 | 214,282 | 5,668,232 |
| 1997 | 5,351,466 | 151,769 | 11,803 | 86,240 | 4,246 | 201,268 | 5,806,792 |
| 1998 | 5,434,383 | 146,921 | 11,722 | 89,362 | 4,038 | 206,135 | 5,892,561 |
| 1999 | 5,403,450 | 135,756 | 13,735 | 94,784 | 4,147 | 225,779 | 5,877,651 |
| 2000 | 5,514,395 | 138,921 | 15,268 | 90,288 | 4,005 | 201,135 | 5,964,012 |
| 2001 | 5,521,637 | 156,479 | 16,929 | 87,116 | 4,544 | 192,632 | 5,979,337 |
| 2002 | 5,455,530 | 155,429 | 26,320 | 90,291 | 2,338 | 224,567 | 5,955,475 |
| 2003 | 5,585,875 | 152,763 | 55,626 | 67,592 | 1,937 | 163,459 | 6,027,252 |
| 2004 | 5,663,861 | 154,356 | 74,095 | 47,600 | 940 | 194,203 | 6,135,055 |
| 2005 | 5,555,332 | 161,037 | 84,088 | 39,751 | 612 | 295,064 | 6,135,884 |
| 2006 | 5,563,354 | 182,924 | 117,198 | 11,580 | 57 | 322,989 | 6,198,102 |
| 2007 | 5,532,097 | 184,383 | 136,603 | 1,610 | 0 | 349,807 | 6,204,500 |
| 2008 | 5,361,287 | 177,559 | 190,084 | 480 | 0 | 548,843 | 6,277,893 |
| 2009 | 5,232,656 | 177,194 | 240,955 | 90 | 0 | 518,998 | 6,169,893 |
| 2010 | 5,374,094 | 161,479 | 285,883 | 901 | 0 | 523,015 | 6,345,372 |
| 2011 | 5,404,347 | 178,884 | 297,266 | 1,154 | 0 | 541,059 | 6,422,710 |
| 2012 | 5,489,516 | 186,270 | 304,155 | 806 | 0 | 425,946 | 6,406,693 |
| 2013 | 5,589,006 | 181,112 | 310,568 | 915 | 0 | 495,476 | 6,577,077 |
| 2014 | 5,784,637 | 186,601 | 317,171 | 719 | 1 | 490,213 | 6,779,342 |
| 2015 | 5,908,550 | 188,722 | 325,858 | 830 | 0 | 446,744 | 6,870,704 |
| 2016 | 5,924,395 | 196,281 | 334,767 | 1,062 | 0 | 483,229 | 6,939,734 |
| 2017 | 6,055,241 | 206,629 | 335,023 | d | d | 406,266 | 7,003,159 |
| 2018 | 6,193,832 | 209,708 | 336,205 | d | d | 397,744 | 7,137,489 |
| 2019 | 6,045,396 | 208,501 | 337,168 | d | d | 479,185 | 7,070,250 |
| <i>Average annual percentage change</i> | | | | | | | |
| 1987-2019 | 0.8% | -0.9% | d | d | d | 4.1% | 1.0% |
| 2009-2019 | 1.5% | 1.6% | 3.4% | d | d | -0.8% | 1.4% |

Source:

U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual 2019, Vol. 1*, August 2021, Table 16, and annual. (Additional resources: www.eia.doe.gov)

^a Methyl tertiary butyl ether (MTBE).

^b Includes methanol and other oxygenates.

^c Reported in "Other hydrocarbons and liquids" category in this year.

^d Data are not available.

When crude oil and other hydrocarbons are processed into products that are, on average, less dense than the input, a processing volume gain occurs. Due to this gain, the product yield from a barrel of crude oil is more than 100%. For the last 20 years, the processing volume gain has been about 5-7%.

Table 1.10 (Updated April 2021)
U.S. Refinery Yield of Petroleum Products from a Barrel of Crude Oil, 1978–2020
 (percentage)

| Year | Motor gasoline | Distillate fuel oil | Jet fuel | Liquefied petroleum gas | Other ^a | Total ^b |
|------|----------------|---------------------|----------|-------------------------|--------------------|--------------------|
| 1978 | 44.1 | 21.4 | 6.6 | 2.3 | 29.6 | 104.0 |
| 1980 | 44.5 | 19.7 | 7.4 | 2.4 | 30.0 | 104.0 |
| 1985 | 45.6 | 21.6 | 9.6 | 3.1 | 24.6 | 104.5 |
| 1986 | 45.7 | 21.2 | 9.8 | 3.2 | 24.8 | 104.7 |
| 1987 | 46.4 | 20.5 | 10.0 | 3.4 | 24.5 | 104.8 |
| 1988 | 46.0 | 20.8 | 10.0 | 3.6 | 24.4 | 104.8 |
| 1989 | 45.7 | 20.8 | 10.1 | 4.0 | 24.2 | 104.8 |
| 1990 | 45.6 | 20.9 | 10.7 | 3.6 | 24.1 | 104.9 |
| 1991 | 45.7 | 21.3 | 10.3 | 3.8 | 24.1 | 105.2 |
| 1992 | 46.0 | 21.2 | 9.9 | 4.3 | 24.0 | 105.4 |
| 1993 | 46.1 | 21.9 | 9.2 | 4.1 | 23.3 | 104.6 |
| 1994 | 45.5 | 22.3 | 9.8 | 4.2 | 23.2 | 105.0 |
| 1995 | 46.4 | 21.8 | 9.7 | 4.5 | 22.8 | 105.2 |
| 1996 | 45.7 | 22.7 | 10.4 | 4.5 | 22.4 | 105.7 |
| 1997 | 45.7 | 22.5 | 10.3 | 4.6 | 22.4 | 105.5 |
| 1998 | 46.2 | 22.3 | 9.9 | 4.4 | 22.9 | 105.7 |
| 1999 | 46.5 | 22.3 | 10.2 | 4.5 | 22.4 | 105.9 |
| 2000 | 46.2 | 23.1 | 10.3 | 4.5 | 22.0 | 106.1 |
| 2001 | 46.2 | 23.8 | 9.8 | 4.3 | 21.6 | 105.7 |
| 2002 | 47.3 | 23.2 | 9.8 | 4.3 | 21.5 | 106.1 |
| 2003 | 46.9 | 23.7 | 9.5 | 4.2 | 22.1 | 106.4 |
| 2004 | 46.8 | 23.9 | 9.7 | 4.0 | 22.2 | 106.6 |
| 2005 | 46.2 | 25.0 | 9.8 | 3.6 | 21.6 | 106.2 |
| 2006 | 45.8 | 25.4 | 9.3 | 3.9 | 21.7 | 106.1 |
| 2007 | 45.5 | 26.1 | 9.1 | 4.1 | 21.5 | 106.3 |
| 2008 | 44.2 | 27.8 | 9.7 | 4.1 | 20.7 | 106.5 |
| 2009 | 46.6 | 26.6 | 9.2 | 4.1 | 20.1 | 106.6 |
| 2010 | 46.3 | 27.2 | 9.2 | 4.3 | 20.1 | 107.1 |
| 2011 | 45.6 | 28.6 | 9.3 | 4.0 | 19.5 | 107.0 |
| 2012 | 45.7 | 28.7 | 9.4 | 4.0 | 19.0 | 106.8 |
| 2013 | 45.7 | 29.1 | 9.4 | 3.9 | 18.9 | 107.0 |
| 2014 | 45.7 | 29.5 | 9.4 | 4.0 | 17.9 | 106.5 |
| 2015 | 46.0 | 29.5 | 9.6 | 3.7 | 17.6 | 106.4 |
| 2016 | 47.0 | 28.4 | 9.8 | 3.8 | 17.6 | 106.6 |
| 2017 | 46.5 | 29.0 | 9.9 | 3.7 | 17.4 | 106.5 |
| 2018 | 46.1 | 29.2 | 10.3 | 3.6 | 17.2 | 106.4 |
| 2019 | 46.2 | 29.7 | 10.5 | 3.5 | 16.4 | 106.3 |
| 2020 | 46.9 | 32.0 | 6.9 | 3.7 | 16.8 | 106.3 |

Source:

U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Navigator*, April 2021.
 (Additional resources: www.eia.doe.gov)

^a Includes aviation gasoline (0.1%), kerosene (0.1%), residual fuel oil (3.1%), naphtha and other oils for petrochemical feedstock use (1.2%), other oils for petrochemical feedstock use (0.7%), special naphthas (0.2%), lubricants (1.0%), petroleum coke (5.2%) asphalt and road oil (2.2%), still gas (4.2%), and miscellaneous products (0.6%).

^b Products sum to greater than 100% due to processing gain. The processing gain for years 1978 to 1980 is assumed to be 4%.

Domestic petroleum production increased in 2009 for the first time in 20 years and reached an all-time high of 17 mmbd in 2019. Most of the petroleum imported by the United States is in the form of crude oil. Exports were at an all-time high in 2019 as well, partly due to a lift of crude oil export restrictions in December 2015.

Table 1.11 (Updated April 2021)
United States Petroleum Production, Imports, and Exports, 1950–2020
 (million barrels per day)

| | Domestic production | | | Total imports | | | Exports | | |
|---|---------------------|---------------------------|--------------------|---------------|--------------------|-------|-----------|--------------------|-------|
| | Crude oil | Natural gas plant liquids | Total ^a | Crude oil | Petroleum products | Total | Crude oil | Petroleum products | Total |
| 1950 | 5.41 | 0.50 | 5.91 | 0.49 | 0.36 | 0.85 | 0.10 | 0.21 | 0.31 |
| 1955 | 6.81 | 0.77 | 7.58 | 0.78 | 0.47 | 1.25 | 0.03 | 0.34 | 0.37 |
| 1960 | 7.04 | 0.93 | 7.96 | 1.02 | 0.80 | 1.82 | 0.01 | 0.19 | 0.20 |
| 1965 | 7.80 | 1.21 | 9.01 | 1.24 | 1.23 | 2.47 | 0.00 | 0.18 | 0.19 |
| 1970 | 9.64 | 1.66 | 11.30 | 1.32 | 2.10 | 3.42 | 0.01 | 0.25 | 0.26 |
| 1975 | 8.38 | 1.63 | 10.01 | 4.11 | 1.95 | 6.06 | 0.01 | 0.20 | 0.21 |
| 1980 | 8.60 | 1.57 | 10.17 | 5.26 | 1.65 | 6.91 | 0.29 | 0.26 | 0.54 |
| 1985 | 8.97 | 1.61 | 10.58 | 3.20 | 1.87 | 5.07 | 0.20 | 0.58 | 0.78 |
| 1990 | 7.36 | 1.56 | 8.91 | 5.89 | 2.12 | 8.02 | 0.11 | 0.75 | 0.86 |
| 1995 | 6.56 | 1.76 | 8.32 | 7.23 | 1.61 | 8.83 | 0.09 | 0.85 | 0.95 |
| 1996 | 6.46 | 1.83 | 8.29 | 7.51 | 1.97 | 9.48 | 0.11 | 0.87 | 0.98 |
| 1997 | 6.45 | 1.82 | 8.27 | 8.23 | 1.94 | 10.16 | 0.11 | 0.90 | 1.00 |
| 1998 | 6.25 | 1.76 | 8.01 | 8.71 | 2.00 | 10.71 | 0.11 | 0.83 | 0.94 |
| 1999 | 5.88 | 1.85 | 7.73 | 8.73 | 2.12 | 10.85 | 0.12 | 0.82 | 0.94 |
| 2000 | 5.82 | 1.91 | 7.73 | 9.07 | 2.39 | 11.46 | 0.05 | 0.99 | 1.04 |
| 2001 | 5.80 | 1.87 | 7.67 | 9.33 | 2.54 | 11.87 | 0.02 | 0.95 | 0.97 |
| 2002 | 5.74 | 1.88 | 7.62 | 9.14 | 2.39 | 11.53 | 0.01 | 0.97 | 0.98 |
| 2003 | 5.65 | 1.72 | 7.37 | 9.66 | 2.60 | 12.26 | 0.01 | 1.01 | 1.03 |
| 2004 | 5.44 | 1.81 | 7.25 | 10.09 | 3.06 | 13.15 | 0.03 | 1.02 | 1.05 |
| 2005 | 5.18 | 1.72 | 6.90 | 10.13 | 3.59 | 13.71 | 0.03 | 1.13 | 1.16 |
| 2006 | 5.09 | 1.74 | 6.82 | 10.12 | 3.59 | 13.71 | 0.02 | 1.29 | 1.32 |
| 2007 | 5.07 | 1.78 | 6.86 | 10.03 | 3.44 | 13.47 | 0.03 | 1.41 | 1.43 |
| 2008 | 5.00 | 1.78 | 6.78 | 9.78 | 3.13 | 12.92 | 0.03 | 1.77 | 1.80 |
| 2009 | 5.36 | 1.91 | 7.27 | 9.01 | 2.68 | 11.69 | 0.04 | 1.98 | 2.02 |
| 2010 | 5.48 | 2.07 | 7.56 | 9.21 | 2.58 | 11.79 | 0.04 | 2.31 | 2.35 |
| 2011 | 5.67 | 2.22 | 7.88 | 8.94 | 2.50 | 11.44 | 0.05 | 2.94 | 2.99 |
| 2012 | 6.52 | 2.41 | 8.93 | 8.53 | 2.07 | 10.60 | 0.07 | 3.14 | 3.20 |
| 2013 | 7.49 | 2.61 | 10.10 | 7.73 | 2.13 | 9.86 | 0.13 | 3.49 | 3.62 |
| 2014 | 8.79 | 3.01 | 11.80 | 7.34 | 1.90 | 9.24 | 0.35 | 3.82 | 4.18 |
| 2015 | 9.45 | 3.34 | 12.79 | 7.36 | 2.09 | 9.45 | 0.47 | 4.27 | 4.74 |
| 2016 | 8.85 | 3.51 | 12.36 | 7.85 | 2.20 | 10.06 | 0.59 | 4.67 | 5.26 |
| 2017 | 9.37 | 3.78 | 13.15 | 7.97 | 2.18 | 10.14 | 1.16 | 5.22 | 6.38 |
| 2018 | 10.96 | 4.37 | 15.33 | 7.77 | 2.17 | 9.94 | 2.05 | 5.55 | 7.60 |
| 2019 | 12.25 | 4.82 | 17.07 | 6.80 | 2.34 | 9.14 | 2.98 | 5.49 | 8.47 |
| <i>Average annual percentage change</i> | | | | | | | | | |
| 1950-2020 | 1.1% | 3.4% | 1.5% | 3.6% | 2.5% | 3.2% | 5.1% | 4.7% | 4.9% |
| 1970-2020 | 0.3% | 2.3% | 0.8% | 3.0% | -0.1% | 1.7% | 11.5% | 6.4% | 7.2% |
| 2010-2020 | 7.5% | 9.5% | 8.1% | -4.4% | -2.6% | -4.0% | 54.3% | 8.7% | 13.7% |

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, March 2021, Tables 3.1, 3.3b, and 3.3e. (Additional resources: www.eia.gov)

^a Total domestic production includes crude oil, natural gas plant liquids and small amounts of other liquids.

U.S. petroleum production has been mainly increasing and petroleum imports decreasing from 2009 to 2019. Despite a slight decline in petroleum production in 2020, net imports of petroleum in 2020 were negative for the first time in the series history. Transportation petroleum use as a share of domestic production went below 100% in 2018 for the first time since the 1980's.

Table 1.12 (Updated April 2021)
Petroleum Production and Transportation Petroleum Consumption in Context, 1950–2020

| | Domestic petroleum production ^a | Net petroleum imports | Transportation petroleum consumption | U.S. petroleum consumption | World petroleum consumption | Net imports as a share of U.S. consumption | U.S. petroleum consumption as a share of world consumption | Transportation petroleum use as a share of domestic production |
|-----------|--|-----------------------|---|----------------------------|-----------------------------|--|--|--|
| | (million barrels per day) | | | | | | | |
| 1950 | 5.91 | 0.55 | 3.36 | 6.46 | ^b | 8.4% | ^b | 56.8% |
| 1955 | 7.58 | 0.88 | 4.46 | 8.46 | ^b | 10.4% | ^b | 58.8% |
| 1960 | 7.99 | 1.62 | 5.15 | 9.82 | 21.34 | 16.5% | 46.0% | 64.5% |
| 1965 | 9.01 | 2.28 | 6.04 | 11.51 | 31.14 | 19.8% | 37.0% | 67.0% |
| 1970 | 11.30 | 3.16 | 7.78 | 14.70 | 46.81 | 21.5% | 31.4% | 68.9% |
| 1975 | 10.01 | 5.85 | 8.92 | 16.32 | 56.20 | 35.8% | 29.0% | 89.4% |
| 1980 | 10.17 | 6.36 | 9.55 | 17.06 | 63.11 | 37.3% | 27.0% | 93.9% |
| 1985 | 10.58 | 4.29 | 9.84 | 15.73 | 60.13 | 27.3% | 26.2% | 93.0% |
| 1990 | 8.91 | 7.16 | 10.89 | 16.99 | 66.67 | 42.2% | 25.5% | 122.1% |
| 1995 | 8.32 | 7.89 | 11.67 | 17.72 | 69.87 | 44.5% | 25.4% | 140.2% |
| 2000 | 7.73 | 10.42 | 13.01 | 19.70 | 77.07 | 52.9% | 25.6% | 168.3% |
| 2001 | 7.67 | 10.90 | 12.94 | 19.65 | 77.79 | 55.5% | 25.3% | 168.7% |
| 2002 | 7.62 | 10.55 | 13.21 | 19.76 | 78.62 | 53.4% | 25.1% | 173.2% |
| 2003 | 7.37 | 11.24 | 13.29 | 20.03 | 80.24 | 56.1% | 25.0% | 180.3% |
| 2004 | 7.25 | 12.10 | 13.72 | 20.73 | 83.43 | 58.4% | 24.8% | 189.2% |
| 2005 | 6.90 | 12.55 | 13.96 | 20.80 | 84.65 | 60.3% | 24.6% | 202.3% |
| 2006 | 6.82 | 12.39 | 14.18 | 20.69 | 85.80 | 59.9% | 24.1% | 207.7% |
| 2007 | 6.86 | 12.04 | 14.29 | 20.68 | 87.19 | 58.2% | 23.7% | 208.4% |
| 2008 | 6.78 | 11.11 | 13.62 | 19.50 | 86.70 | 57.0% | 22.5% | 200.8% |
| 2009 | 7.27 | 9.67 | 13.30 | 18.77 | 85.83 | 51.5% | 21.9% | 183.0% |
| 2010 | 7.56 | 9.44 | 13.50 | 19.18 | 88.70 | 49.2% | 21.6% | 178.6% |
| 2011 | 7.88 | 8.45 | 13.29 | 18.90 | 89.38 | 44.7% | 21.1% | 168.6% |
| 2012 | 8.93 | 7.39 | 13.01 | 18.48 | 90.71 | 40.0% | 20.4% | 145.7% |
| 2013 | 10.10 | 6.24 | 13.25 | 18.97 | 92.24 | 32.9% | 20.6% | 131.2% |
| 2014 | 11.80 | 5.07 | 13.45 | 19.10 | 93.53 | 26.5% | 20.4% | 114.0% |
| 2015 | 12.79 | 4.71 | 13.65 | 19.53 | 95.26 | 24.1% | 20.5% | 106.7% |
| 2016 | 12.36 | 4.79 | 13.89 | 19.69 | 96.79 | 24.3% | 20.3% | 112.3% |
| 2017 | 13.15 | 3.77 | 14.02 | 19.95 | 98.94 | 18.9% | 20.2% | 106.6% |
| 2018 | 15.33 | 2.34 | 14.15 | 20.51 | 100.05 | 11.4% | 20.5% | 92.3% |
| 2019 | 17.07 | 0.67 | 14.14 | 20.54 | ^b | 3.3% | ^b | 82.8% |
| 2020 | 16.47 | -0.65 | 11.96 | 18.12 | ^b | -3.6% | ^b | 72.7% |
| | | | <i>Average annual percentage change</i> | | | | | |
| 1950-2020 | 1.5% | ^b | 1.8% | 1.5% | ^b | | | |
| 1970-2020 | 0.8% | ^b | 0.9% | 0.4% | 1.6% | | | |
| 2010-2020 | 8.1% | ^b | -1.2% | -0.6% | ^b | | | |

Sources:

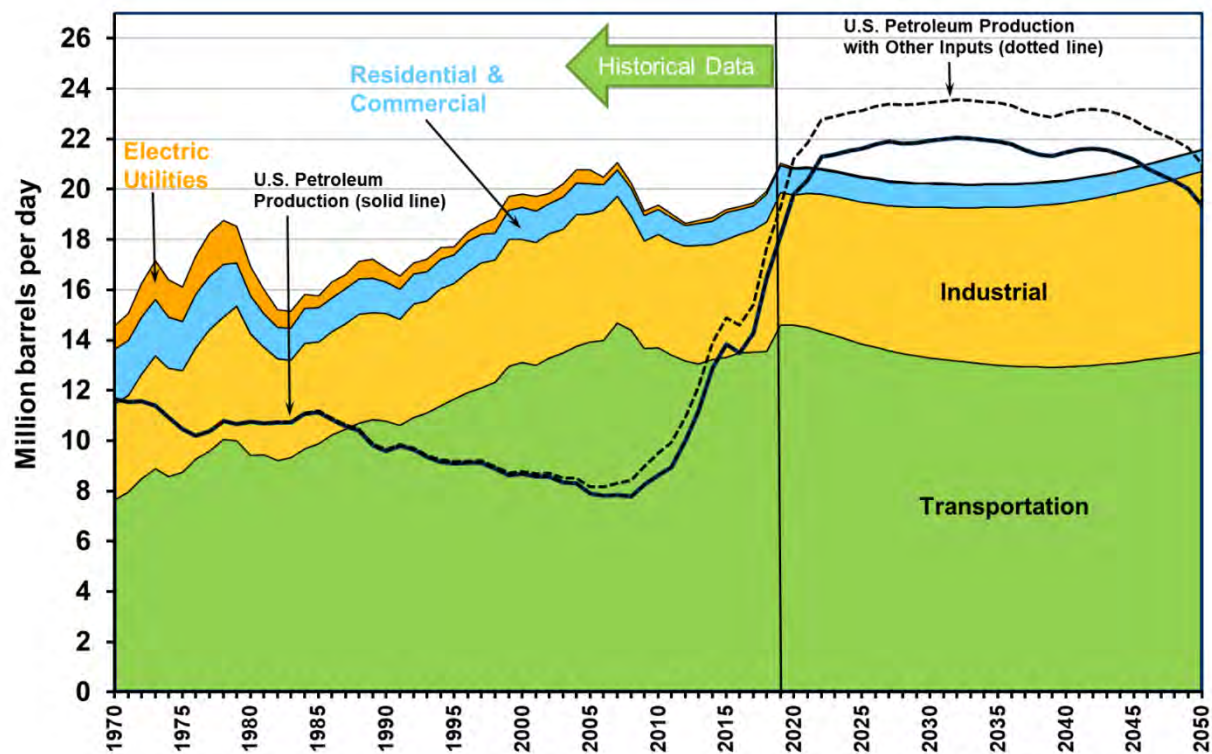
U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, March 2021, Tables 2.5, 3.1, and 11.2. (Pre-1973 data from the *Annual Energy Review*). (Additional resources: www.eia.doe.gov)

^a Total domestic production includes crude oil, natural gas plant liquids and small amounts of other liquids.

^b Data are not available.

Before 1989 the U.S. produced enough petroleum to meet the needs of the transportation sector but was still short of meeting the petroleum needs of all the sectors, including industrial, residential and commercial, and electric utilities. In 1970 the gap between what the U.S. produced and what was consumed was 3.2 million barrels per day and in 2007, the gap was 12.8 million barrels per day. By 2050, the gap is expected to be only 0.6 million barrels per day if petroleum and other inputs are included or 2.2 million barrels per day if only conventional petroleum is used.

Figure 1.5. United States Petroleum Production and Consumption – All Sectors, 1970–2050



Notes: “Total U.S. Petroleum Production” includes crude oil, natural gas plant liquids, and refinery gains. It does not include dry natural gas.

“Total U.S. Petroleum Production” is for all uses.

“Total U.S. Petroleum Production with Other Inputs” also includes non-petroleum sources such as ethanol, biomass, liquids from coal, other blending components, other hydrocarbons, and ethers which were domestically produced.

The change from historical values to projected values is between 2019 and 2020, except transportation which is between 2018 and 2019.

The sharp increase in the value for heavy trucks between 2006 and 2007 is the result of the Federal Highway Administration’s methodology change.

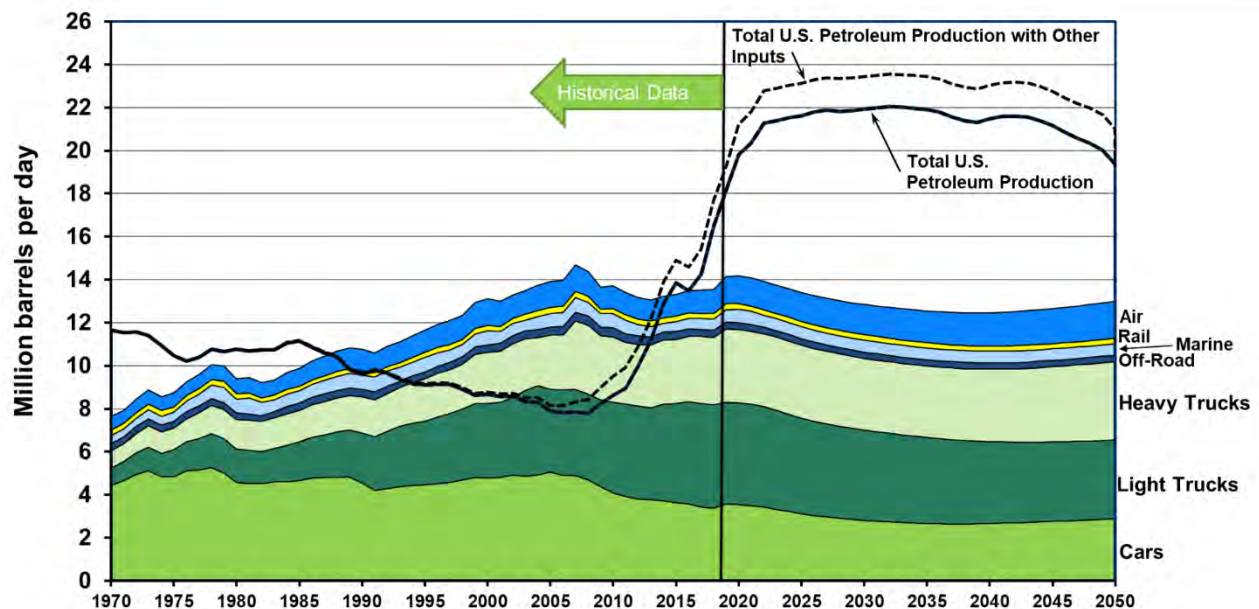
Sources:

Historical transportation petroleum use – See Tables 1.14 and 1.15. Historical petroleum use for other sectors – See Table 1.13. Historical U.S. petroleum production – Energy Information Administration, *Monthly Energy Review September 2020*, Table 3.1. Historical other inputs - Energy Information Administration, *Monthly Energy Review September 2020*, Tables 10.3 and 10.4. Forecasted petroleum use and petroleum production – Energy Information Administration, *2020 Annual Energy Outlook*, January 2020, reference case tables 7, 11, and 35.

In 1989, for the first time, petroleum consumption for transportation surpassed total U.S. petroleum production, which was declining. These contrasting trends in production and consumption created a gap that was met with foreign imports of petroleum. In 2009, however, the U.S. production of petroleum (for all uses including, but not limited to, transportation) began to increase substantially because of new hydraulic fracturing and oil extraction technology. In 2015, total production exceeded all transportation sector petroleum consumption. With other inputs included, such as ethanol, domestic production has exceeded transportation consumption since 2014. Transportation accounts for about 70% of all U.S. petroleum consumption.

The Energy Information Administration expects petroleum production to be greater than transportation consumption through 2050. Including non-petroleum sources such as ethanol, the production will exceed transportation demand by approximately 7.5 million barrels per day in 2050.

Figure 1.6. United States Petroleum Production and Transportation Consumption, 1970–2050



Notes: “Total U.S. Petroleum Production” includes crude oil, natural gas plant liquids, and refinery gains. It does not include dry natural gas.

“Total U.S. Petroleum Production” is for all uses, including but not limited to transportation.

“Total U.S. Petroleum Production with Other Inputs” also includes non-petroleum sources such as ethanol, biomass, liquids from coal, other blending components, other hydrocarbons, and ethers which were domestically produced.

The change from historical values to projected values is between 2018 and 2019.

The sharp increase in the value for heavy trucks between 2006 and 2007 is the result of the Federal Highway Administration’s methodology change.

Sources:

Historical transportation petroleum use – See Tables 1.14 and 1.15. Historical U.S. petroleum production – Energy Information Administration, *Monthly Energy Review September 2020*, Table 3.1. Historical other inputs - Energy Information Administration, *Monthly Energy Review September 2020*, Tables 10.3 and 10.4. Forecasted petroleum use and petroleum production – Energy Information Administration, *2020 Annual Energy Outlook*, January 2020, reference case tables 7, 11, and 35.

Transportation accounted for about 70% of U.S. petroleum use from 2008 to 2018, but declined to 66% in 2020, likely due to less travel during the COVID-19 pandemic. Total petroleum use in 2020 was at the lowest level since 1995.

Table 1.13 (Updated April 2021)
Consumption of Petroleum by End-Use Sector, 1950–2020
(million barrels per day)

| Year | Transportation | Percentage | Residential | Commercial | Industrial | Electric utilities | Total |
|-----------|----------------|---|-------------|------------|------------|--------------------|-------|
| 1950 | 3.36 | 52.0% | 0.66 | 0.41 | 1.82 | 0.21 | 6.46 |
| 1955 | 4.46 | 52.7% | 0.89 | 0.52 | 2.39 | 0.21 | 8.46 |
| 1960 | 5.14 | 52.4% | 1.12 | 0.59 | 2.71 | 0.24 | 9.80 |
| 1965 | 6.04 | 52.4% | 1.24 | 0.67 | 3.25 | 0.32 | 11.51 |
| 1970 | 7.78 | 52.9% | 1.42 | 0.76 | 3.81 | 0.93 | 14.70 |
| 1975 | 8.95 | 54.8% | 1.29 | 0.65 | 4.04 | 1.39 | 16.32 |
| 1980 | 9.55 | 56.0% | 0.89 | 0.63 | 4.84 | 1.15 | 17.06 |
| 1985 | 9.84 | 62.6% | 0.81 | 0.53 | 4.07 | 0.48 | 15.73 |
| 1986 | 10.19 | 62.6% | 0.80 | 0.57 | 4.09 | 0.64 | 16.28 |
| 1987 | 10.50 | 63.0% | 0.85 | 0.55 | 4.21 | 0.55 | 16.67 |
| 1988 | 10.85 | 62.8% | 0.87 | 0.54 | 4.35 | 0.68 | 17.28 |
| 1989 | 10.94 | 63.1% | 0.88 | 0.51 | 4.25 | 0.75 | 17.33 |
| 1990 | 10.89 | 64.1% | 0.74 | 0.49 | 4.30 | 0.57 | 16.99 |
| 1991 | 10.76 | 64.4% | 0.74 | 0.46 | 4.22 | 0.53 | 16.71 |
| 1992 | 10.88 | 63.9% | 0.75 | 0.44 | 4.52 | 0.43 | 17.03 |
| 1993 | 11.12 | 64.5% | 0.77 | 0.41 | 4.44 | 0.49 | 17.24 |
| 1994 | 11.42 | 64.4% | 0.76 | 0.41 | 4.67 | 0.47 | 17.72 |
| 1995 | 11.67 | 65.8% | 0.74 | 0.38 | 4.59 | 0.33 | 17.72 |
| 1996 | 11.92 | 65.1% | 0.81 | 0.40 | 4.82 | 0.36 | 18.31 |
| 1997 | 12.10 | 65.0% | 0.78 | 0.38 | 4.95 | 0.41 | 18.62 |
| 1998 | 12.42 | 65.7% | 0.72 | 0.36 | 4.84 | 0.58 | 18.92 |
| 1999 | 12.76 | 65.4% | 0.82 | 0.37 | 5.03 | 0.53 | 19.52 |
| 2000 | 13.01 | 66.0% | 0.87 | 0.41 | 4.90 | 0.51 | 19.70 |
| 2001 | 12.94 | 65.8% | 0.85 | 0.41 | 4.89 | 0.56 | 19.65 |
| 2002 | 13.21 | 66.8% | 0.82 | 0.38 | 4.93 | 0.43 | 19.76 |
| 2003 | 13.29 | 66.3% | 0.86 | 0.43 | 4.92 | 0.53 | 20.03 |
| 2004 | 13.72 | 66.2% | 0.84 | 0.42 | 5.22 | 0.53 | 20.73 |
| 2005 | 13.96 | 67.1% | 0.81 | 0.39 | 5.10 | 0.55 | 20.80 |
| 2006 | 14.18 | 68.5% | 0.69 | 0.34 | 5.19 | 0.29 | 20.69 |
| 2007 | 14.29 | 69.1% | 0.71 | 0.34 | 5.06 | 0.29 | 20.68 |
| 2008 | 13.62 | 69.9% | 0.76 | 0.35 | 4.56 | 0.21 | 19.50 |
| 2009 | 13.30 | 70.8% | 0.68 | 0.35 | 4.27 | 0.17 | 18.77 |
| 2010 | 13.50 | 70.4% | 0.66 | 0.34 | 4.51 | 0.17 | 19.18 |
| 2011 | 13.29 | 70.3% | 0.61 | 0.34 | 4.52 | 0.14 | 18.90 |
| 2012 | 13.01 | 70.4% | 0.51 | 0.30 | 4.56 | 0.10 | 18.48 |
| 2013 | 13.25 | 69.9% | 0.57 | 0.30 | 4.72 | 0.12 | 18.97 |
| 2014 | 13.45 | 70.4% | 0.61 | 0.32 | 4.58 | 0.14 | 19.10 |
| 2015 | 13.65 | 69.9% | 0.58 | 0.48 | 4.69 | 0.13 | 19.53 |
| 2016 | 13.89 | 70.5% | 0.52 | 0.47 | 4.71 | 0.11 | 19.69 |
| 2017 | 14.02 | 70.2% | 0.52 | 0.46 | 4.86 | 0.10 | 19.95 |
| 2018 | 14.15 | 69.0% | 0.61 | 0.48 | 5.15 | 0.12 | 20.51 |
| 2019 | 14.14 | 68.8% | 0.58 | 0.48 | 5.25 | 0.09 | 20.54 |
| 2020 | 11.96 | 66.0% | 0.52 | 0.42 | 5.13 | 0.08 | 18.12 |
| | | <i>Average annual percentage change</i> | | | | | |
| 1950-2020 | 1.8% | | -0.3% | 0.0% | 1.5% | -1.3% | 1.5% |
| 1970-2020 | 0.9% | | -2.0% | -1.2% | 0.6% | -4.7% | 0.4% |
| 2010-2020 | -1.2% | | -2.4% | 1.8% | 1.7% | -6.5% | -0.3% |

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, March 2021, Tables 3.7a–3.7c. (Additional resources: www.eia.doe.gov)

Transportation accounted for 80% or more of petroleum consumption in twenty-three states in 2018. Florida had the highest transportation petroleum share at 90% while Louisiana had the lowest share at 27%.

Table 1.14
Transportation Petroleum Consumption by State, 1960-2018

| State | (million barrels) | | | | | | | Share of transportation use to all petroleum use, 2018 |
|----------------------|-------------------|-------|-------|-------|-------|-------|-------|--|
| | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2018 | |
| Alabama | 31 | 46 | 61 | 70 | 83 | 87 | 88 | 86% |
| Alaska | 5 | 11 | 16 | 30 | 38 | 37 | 30 | 77% |
| Arizona | 19 | 31 | 45 | 56 | 82 | 85 | 93 | 86% |
| Arkansas | 18 | 29 | 36 | 41 | 53 | 52 | 53 | 82% |
| California | 220 | 333 | 424 | 511 | 552 | 562 | 584 | 86% |
| Colorado | 19 | 36 | 45 | 49 | 66 | 77 | 80 | 81% |
| Connecticut | 22 | 34 | 35 | 38 | 42 | 44 | 43 | 70% |
| Delaware | 8 | 9 | 10 | 12 | 13 | 12 | 14 | 66% |
| District of Columbia | 5 | 6 | 5 | 5 | 5 | 3 | 3 | 78% |
| Florida | 65 | 112 | 174 | 209 | 259 | 281 | 300 | 90% |
| Georgia | 38 | 73 | 100 | 124 | 158 | 176 | 153 | 87% |
| Hawaii | 11 | 22 | 26 | 28 | 23 | 25 | 29 | 65% |
| Idaho | 8 | 12 | 15 | 16 | 22 | 24 | 29 | 82% |
| Illinois | 91 | 141 | 149 | 141 | 176 | 177 | 184 | 75% |
| Indiana | 48 | 69 | 80 | 104 | 120 | 113 | 113 | 79% |
| Iowa | 27 | 36 | 42 | 41 | 49 | 55 | 55 | 62% |
| Kansas | 24 | 33 | 42 | 44 | 45 | 48 | 48 | 72% |
| Kentucky | 25 | 42 | 56 | 65 | 79 | 86 | 90 | 75% |
| Louisiana | 40 | 58 | 100 | 112 | 142 | 121 | 110 | 27% |
| Maine | 12 | 16 | 16 | 21 | 22 | 23 | 21 | 60% |
| Maryland | 31 | 50 | 58 | 61 | 74 | 82 | 77 | 85% |
| Massachusetts | 41 | 64 | 66 | 75 | 84 | 84 | 86 | 77% |
| Michigan | 71 | 110 | 114 | 124 | 148 | 133 | 142 | 80% |
| Minnesota | 34 | 50 | 60 | 60 | 91 | 86 | 85 | 72% |
| Mississippi | 18 | 29 | 40 | 46 | 60 | 63 | 74 | 83% |
| Missouri | 46 | 70 | 75 | 87 | 102 | 106 | 104 | 85% |
| Montana | 11 | 12 | 16 | 15 | 18 | 20 | 21 | 65% |
| Nebraska | 16 | 23 | 25 | 27 | 31 | 37 | 38 | 80% |
| Nevada | 8 | 14 | 21 | 24 | 38 | 37 | 43 | 83% |
| New Hampshire | 6 | 10 | 11 | 14 | 19 | 20 | 20 | 63% |
| New Jersey | 62 | 90 | 104 | 145 | 165 | 168 | 149 | 83% |
| New Mexico | 14 | 20 | 25 | 28 | 34 | 35 | 41 | 81% |
| New York | 142 | 195 | 184 | 167 | 174 | 192 | 204 | 78% |
| North Carolina | 43 | 67 | 82 | 99 | 130 | 133 | 141 | 84% |
| North Dakota | 8 | 10 | 13 | 12 | 13 | 16 | 21 | 60% |
| Ohio | 87 | 124 | 144 | 146 | 179 | 174 | 169 | 78% |
| Oklahoma | 27 | 41 | 53 | 58 | 74 | 79 | 79 | 77% |
| Oregon | 21 | 33 | 43 | 49 | 57 | 58 | 58 | 87% |
| Pennsylvania | 94 | 127 | 145 | 148 | 176 | 171 | 167 | 72% |
| Rhode Island | 11 | 11 | 10 | 11 | 12 | 12 | 11 | 69% |
| South Carolina | 23 | 36 | 46 | 57 | 70 | 84 | 91 | 87% |
| South Dakota | 8 | 10 | 12 | 12 | 15 | 17 | 17 | 77% |
| Tennessee | 32 | 52 | 73 | 82 | 105 | 114 | 120 | 86% |
| Texas | 137 | 207 | 306 | 371 | 456 | 497 | 636 | 40% |
| Utah | 12 | 17 | 23 | 27 | 40 | 41 | 48 | 82% |
| Vermont | 4 | 6 | 6 | 8 | 10 | 10 | 9 | 56% |
| Virginia | 51 | 79 | 87 | 106 | 125 | 135 | 134 | 86% |
| Washington | 33 | 53 | 75 | 102 | 113 | 108 | 123 | 81% |
| West Virginia | 14 | 19 | 25 | 25 | 28 | 28 | 32 | 75% |
| Wisconsin | 33 | 50 | 60 | 62 | 77 | 82 | 86 | 78% |
| Wyoming | 7 | 9 | 15 | 14 | 17 | 18 | 19 | 62% |
| Total | 1,880 | 2,839 | 3,494 | 3,974 | 4,762 | 4,927 | 5,166 | 69% |

Source:

U. S. Energy Information Administration, State Energy Data System, June 26, 2020. (Additional resources: eia.doe.gov)

Cars and light trucks use most of the petroleum in the transportation sector. Light trucks include pick-ups, minivans, sport-utility vehicles, and vans. Table 1.16 shows nonhighway petroleum consumption. See Table 2.9 for highway energy use in trillion Btu.

Table 1.15
Highway Transportation Petroleum Consumption by Mode, 1970–2018^a
(thousand barrels per day)

| Year | Cars | Light trucks | Light vehicle subtotal | Motor-cycles | Buses | Class 3-6 trucks | Class 7-8 trucks | Heavy trucks subtotal | Highway subtotal | Total transportation ^b |
|---|-------|--------------|------------------------|--------------|-------|------------------|------------------|-----------------------|------------------|-----------------------------------|
| 1970 | 4,424 | 803 | 5,227 | 4 | 62 | 140 | 598 | 738 | 6,031 | 7,301 |
| 1975 | 4,836 | 1,245 | 6,081 | 7 | 58 | 181 | 771 | 952 | 7,099 | 8,435 |
| 1980 | 4,565 | 1,552 | 6,117 | 13 | 68 | 247 | 1,055 | 1,302 | 7,500 | 9,092 |
| 1985 | 4,665 | 1,785 | 6,450 | 12 | 72 | 265 | 1,131 | 1,396 | 7,930 | 9,526 |
| 1986 | 4,773 | 1,897 | 6,670 | 12 | 76 | 271 | 1,155 | 1,426 | 8,184 | 9,882 |
| 1987 | 4,782 | 1,996 | 6,778 | 12 | 77 | 279 | 1,190 | 1,469 | 8,336 | 10,099 |
| 1988 | 4,784 | 2,130 | 6,914 | 13 | 80 | 284 | 1,211 | 1,495 | 8,503 | 10,328 |
| 1989 | 4,821 | 2,170 | 6,992 | 14 | 79 | 291 | 1,242 | 1,534 | 8,618 | 10,490 |
| 1990 | 4,538 | 2,323 | 6,861 | 12 | 78 | 304 | 1,294 | 1,597 | 8,549 | 10,414 |
| 1991 | 4,196 | 2,493 | 6,688 | 12 | 83 | 310 | 1,320 | 1,630 | 8,413 | 10,236 |
| 1992 | 4,268 | 2,670 | 6,938 | 12 | 87 | 315 | 1,345 | 1,660 | 8,698 | 10,574 |
| 1993 | 4,374 | 2,795 | 7,169 | 13 | 86 | 325 | 1,386 | 1,711 | 8,979 | 10,811 |
| 1994 | 4,428 | 2,878 | 7,305 | 13 | 86 | 343 | 1,463 | 1,806 | 9,211 | 11,082 |
| 1995 | 4,440 | 2,975 | 7,415 | 13 | 87 | 357 | 1,523 | 1,881 | 9,396 | 11,340 |
| 1996 | 4,515 | 3,089 | 7,604 | 13 | 88 | 367 | 1,564 | 1,931 | 9,636 | 11,595 |
| 1997 | 4,559 | 3,222 | 7,781 | 13 | 91 | 370 | 1,579 | 1,949 | 9,834 | 11,769 |
| 1998 | 4,677 | 3,292 | 7,969 | 13 | 93 | 382 | 1,630 | 2,012 | 10,086 | 12,004 |
| 1999 | 4,780 | 3,448 | 8,228 | 14 | 96 | 420 | 1,792 | 2,212 | 10,550 | 12,637 |
| 2000 | 4,766 | 3,453 | 8,219 | 14 | 98 | 437 | 1,861 | 2,298 | 10,630 | 12,787 |
| 2001 | 4,798 | 3,491 | 8,290 | 13 | 93 | 436 | 1,859 | 2,295 | 10,690 | 12,656 |
| 2002 | 4,923 | 3,602 | 8,525 | 12 | 91 | 456 | 1,944 | 2,401 | 11,029 | 12,938 |
| 2003 | 4,866 | 3,963 | 8,829 | 12 | 90 | 443 | 1,890 | 2,334 | 11,265 | 13,118 |
| 2004 | 4,919 | 4,137 | 9,055 | 13 | 92 | 411 | 1,752 | 2,162 | 11,323 | 13,384 |
| 2005 | 5,050 | 3,840 | 8,890 | 12 | 93 | 461 | 1,965 | 2,426 | 11,422 | 13,553 |
| 2006 | 4,893 | 3,959 | 8,852 | 14 | 94 | 470 | 2,006 | 2,476 | 11,436 | 13,596 |
| 2007 | 4,852 | 4,034 | 8,885 | 31 | 92 | 585 | 2,495 | 3,080 | 12,089 | 14,286 |
| 2008 | 4,664 | 3,992 | 8,656 ^c | 32 | 95 | 591 | 2,521 | 3,112 | 11,895 | 13,977 |
| 2009 | 4,344 | 4,033 | 8,376 | 31 | 95 | 549 | 2,341 | 2,890 | 11,392 | 13,248 |
| 2010 | 4,060 | 4,220 | 8,280 | 28 | 90 | 558 | 2,379 | 2,937 | 11,335 | 13,282 |
| 2011 | 3,891 | 4,291 | 8,182 | 28 | 92 | 525 | 2,240 | 2,766 | 11,068 | 12,988 |
| 2012 | 3,777 | 4,331 | 8,108 | 32 | 95 | 525 | 2,238 | 2,763 | 10,998 | 12,777 |
| 2013 | 3,737 | 4,276 | 8,013 | 31 | 97 | 537 | 2,288 | 2,824 | 10,965 | 12,673 |
| 2014 | 3,684 | 4,502 | 8,185 | 30 | 98 | 545 | 2,325 | 2,871 | 11,184 | 12,852 |
| 2015 | 3,602 | 4,627 | 8,229 | 29 | 100 | 542 | 2,311 | 2,853 | 11,210 | 12,955 |
| 2016 | 3,539 | 4,769 | 8,308 | 30 | 102 | 556 | 2,372 | 2,928 | 11,368 | 13,169 |
| 2017 | 3,410 | 4,816 | 8,226 | 30 | 105 | 570 | 2,429 | 2,998 | 11,359 | 13,198 |
| 2018 | 3,338 | 4,814 | 8,152 | 30 | 107 | 575 | 2,452 | 3,027 | 11,316 | 13,225 |
| <i>Average annual percentage change</i> | | | | | | | | | | |
| 1970-2018 | -0.6% | 3.8% | 0.9% | 4.3% | 1.2% | 3.0% | 3.0% | 3.0% | 1.3% | 1.2% |
| 2008-2018 | -3.3% | 1.9% | -0.6% | -0.7% | 1.2% | -0.3% | -0.3% | -0.3% | -0.5% | -0.6% |

Source:

See Appendix A, Section 2.1 Highway Energy Use.

^a Each gallon of petroleum product was assumed to equal one gallon of crude oil. The oil used to produce electricity is also estimated. See Appendix A, Section 2.4 for details.

^b Total transportation figures do not include military and off-highway energy use and may not include all possible uses of fuel for transportation (e.g., snowmobiles).

^c Due to changes in the FHWA fuel use methodology, motorcycle, bus, and heavy truck data are not comparable with data before the year 2007. Car and light truck data changed after 2008; see Appendix A, Section 7, Car/Light Truck Shares.

Although 19% of transportation energy use is for nonhighway modes, only 14% of transportation petroleum use is for nonhighway. This is because some nonhighway modes, such as pipelines and transit rail, use electricity. An estimate for the petroleum used to make electricity is included in the data. Table 1.15 shows highway petroleum consumption. See Table 2.10 for nonhighway transportation energy use in trillion Btu.

Table 1.16
Nonhighway Transportation Petroleum Consumption by Mode, 1970–2018^a
(thousand barrels per day)

| Year | Air | Water | Pipeline | Rail | Nonhighway subtotal | Total transportation ^b | |
|-----------|-------|-------|---|-------|------------------------|--------------------------------------|--|
| 1970 | 625 | 381 | 14 | 250 | 1,270 | 7,301 | |
| 1975 | 651 | 423 | 16 | 246 | 1,336 | 8,435 | |
| 1980 | 697 | 625 | 11 | 259 | 1,592 | 9,092 | |
| 1985 | 814 | 564 | 4 | 214 | 1,596 | 9,526 | |
| 1986 | 884 | 601 | 6 | 207 | 1,698 | 9,882 | |
| 1987 | 920 | 626 | 5 | 211 | 1,763 | 10,099 | |
| 1988 | 958 | 644 | 6 | 217 | 1,825 | 10,328 | |
| 1989 | 960 | 688 | 6 | 218 | 1,872 | 10,490 | |
| 1990 | 991 | 655 | 5 | 214 | 1,865 | 10,414 | |
| 1991 | 928 | 690 | 4 | 201 | 1,823 | 10,236 | |
| 1992 | 942 | 724 | 3 | 207 | 1,876 | 10,574 | |
| 1993 | 961 | 653 | 4 | 213 | 1,831 | 10,811 | |
| 1994 | 1,004 | 635 | 4 | 229 | 1,871 | 11,082 | |
| 1995 | 1,036 | 668 | 2 | 238 | 1,944 | 11,340 | |
| 1996 | 1,068 | 644 | 3 | 244 | 1,959 | 11,595 | |
| 1997 | 1,113 | 574 | 3 | 245 | 1,935 | 11,769 | |
| 1998 | 1,102 | 566 | 4 | 246 | 1,918 | 12,004 | |
| 1999 | 1,202 | 626 | 4 | 255 | 2,087 | 12,637 | |
| 2000 | 1,236 | 663 | 3 | 254 | 2,157 | 12,787 | |
| 2001 | 1,161 | 546 | 4 | 255 | 1,966 | 12,656 | |
| 2002 | 1,079 | 572 | 3 | 256 | 1,909 | 12,938 | |
| 2003 | 1,094 | 494 | 3 | 262 | 1,853 | 13,118 | |
| 2004 | 1,188 | 593 | 3 | 276 | 2,061 | 13,384 | |
| 2005 | 1,226 | 623 | 3 | 279 | 2,131 | 13,553 | |
| 2006 | 1,216 | 657 | 2 | 285 | 2,159 | 13,596 | |
| 2007 | 1,215 | 704 | 2 | 276 | 2,197 | 14,286 | |
| 2008 | 1,160 | 657 | 1 | 265 | 2,083 | 13,977 | |
| 2009 | 1,029 | 604 | 1 | 221 | 1,856 | 13,248 | |
| 2010 | 1,040 | 665 | 1 | 240 | 1,946 | 13,282 | |
| 2011 | 1,044 | 623 | 1 | 253 | 1,920 | 12,988 | |
| 2012 | 1,006 | 525 | 1 | 247 | 1,779 | 12,777 | |
| 2013 | 987 | 467 | 1 | 253 | 1,708 | 12,673 | |
| 2014 | 997 | 405 | 1 | 265 | 1,668 | 12,852 | |
| 2015 | 1,025 | 465 | 1 | 254 | 1,745 | 12,955 | |
| 2016 | 1,054 | 512 | 1 | 234 | 1,801 | 13,169 | |
| 2017 | 1,080 | 517 | 1 | 242 | 1,839 | 13,198 | |
| 2018 | 1,141 | 514 | 1 | 252 | 1,908 | 13,225 | |
| | | | <i>Average annual percentage change</i> | | | | |
| 1970-2018 | 1.3% | 0.6% | -5.8% | 0.0% | 0.9% | 1.2% | |
| 2008-2018 | -0.2% | -2.4% | -4.5% | -0.5% | -0.9% | -0.6% | |

Source:

See Appendix A, Section 2.3. Nonhighway Energy Use.

^a Each gallon of petroleum product was assumed to equal one gallon of crude oil. The oil used to produce electricity is also estimated. See Appendix A, Section 2.3 Nonhighway Energy Use for details.

^b Total transportation figures do not include military and off-highway energy use and may not include all possible uses of fuel for transportation (e.g., snowmobiles).

Highway vehicles were responsible for 86.3% of all transportation petroleum use in 2018. See Table 2.8 for transportation energy use in trillion Btu.

Table 1.17
Transportation Petroleum Use by Mode, 2017–2018^a

| | Thousand barrels per day | | Percentage of total ^b | | Percentage of total U.S. petroleum consumption ^b | |
|--------------------------------|-----------------------------|-----------------|----------------------------------|---------------|---|--------------|
| | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 |
| HIGHWAY | 11,368.1 | 11,358.6 | 86.7% | 86.3% | 57.0% | 55.5% |
| Light vehicles | 8,337.9 | 8,255.8 | 63.6% | 62.7% | 41.8% | 40.4% |
| Cars | 3,538.7 | 3,409.5 | 27.0% | 25.9% | 17.7% | 16.7% |
| Light trucks ^c | 4,768.9 | 4,816.4 | 36.4% | 36.6% | 23.9% | 23.5% |
| Motorcycles | 30.4 | 29.9 | 0.2% | 0.2% | 0.2% | 0.1% |
| Buses | 101.7 | 104.6 | 0.8% | 0.8% | 0.5% | 0.5% |
| Transit | 43.9 | 43.6 | 0.3% | 0.3% | 0.2% | 0.2% |
| Intercity | 16.6 | 17.5 | 0.1% | 0.1% | 0.1% | 0.1% |
| School | 41.2 | 43.4 | 0.3% | 0.3% | 0.2% | 0.2% |
| Medium/heavy trucks | 2,928.4 | 2,998.3 | 22.3% | 22.8% | 14.7% | 14.7% |
| Class 3-6 | 556.4 | 569.7 | 4.2% | 4.3% | 2.8% | 2.8% |
| Class 7-8 | 2,372.0 | 2,428.6 | 18.1% | 18.5% | 11.9% | 11.9% |
| NONHIGHWAY | 1,744.6 | 1,800.7 | 13.3% | 13.7% | 8.7% | 8.8% |
| Air | 1,024.9 | 1,054.1 | 7.8% | 8.0% | 5.1% | 5.2% |
| General aviation | 102.6 | 106.9 | 0.8% | 0.8% | 0.5% | 0.5% |
| Domestic air carriers | 712.9 | 741.9 | 5.4% | 5.6% | 3.6% | 3.6% |
| International air carriers | 209.4 | 205.3 | 1.6% | 1.6% | 1.0% | 1.0% |
| Water | 465.3 | 512.0 | 3.5% | 3.9% | 2.3% | 2.5% |
| Freight | 360.0 | 405.3 | 2.7% | 3.1% | 1.8% | 2.0% |
| Recreational | 105.4 | 106.7 | 0.8% | 0.8% | 0.5% | 0.5% |
| Pipeline | 0.8 | 0.7 | 0.0% | 0.0% | 0.0% | 0.0% |
| Rail | 253.6 | 233.9 | 1.9% | 1.8% | 1.3% | 1.1% |
| Freight (Class I) | 242.9 | 223.0 | 1.9% | 1.7% | 1.2% | 1.1% |
| Passenger | 10.7 | 10.9 | 0.1% | 0.1% | 0.1% | 0.1% |
| Transit | 0.2 | 0.1 | 0.0% | 0.0% | 0.0% | 0.0% |
| Commuter | 6.4 | 6.8 | 0.0% | 0.1% | 0.0% | 0.0% |
| Intercity | 4.1 | 3.9 | 0.0% | 0.0% | 0.0% | 0.0% |
| HWY & NONHWY | | | | | | |
| TOTAL^d | 13,112.7 | 13,159.3 | 100.0% | 100.0% | 65.7% | 64.3% |
| Off-Highway^e | 1,904.0 | 1,957.6 | | | | |

Source:

See Appendix A, Section 2. Energy Use Sources.

^a Each gallon of petroleum product was assumed to equal one gallon of crude oil. The oil used to produce electricity is also estimated. See Appendix A, Section 2.4 for details.

^b Percentages may not sum to totals due to rounding.

^c Two-axle, four-tire trucks.

^d Civilian consumption only. Totals may not include all possible uses of fuels for transportation (e.g., snowmobiles).

^e Includes equipment that does not travel on roads, such as equipment from agriculture, construction, and airports.

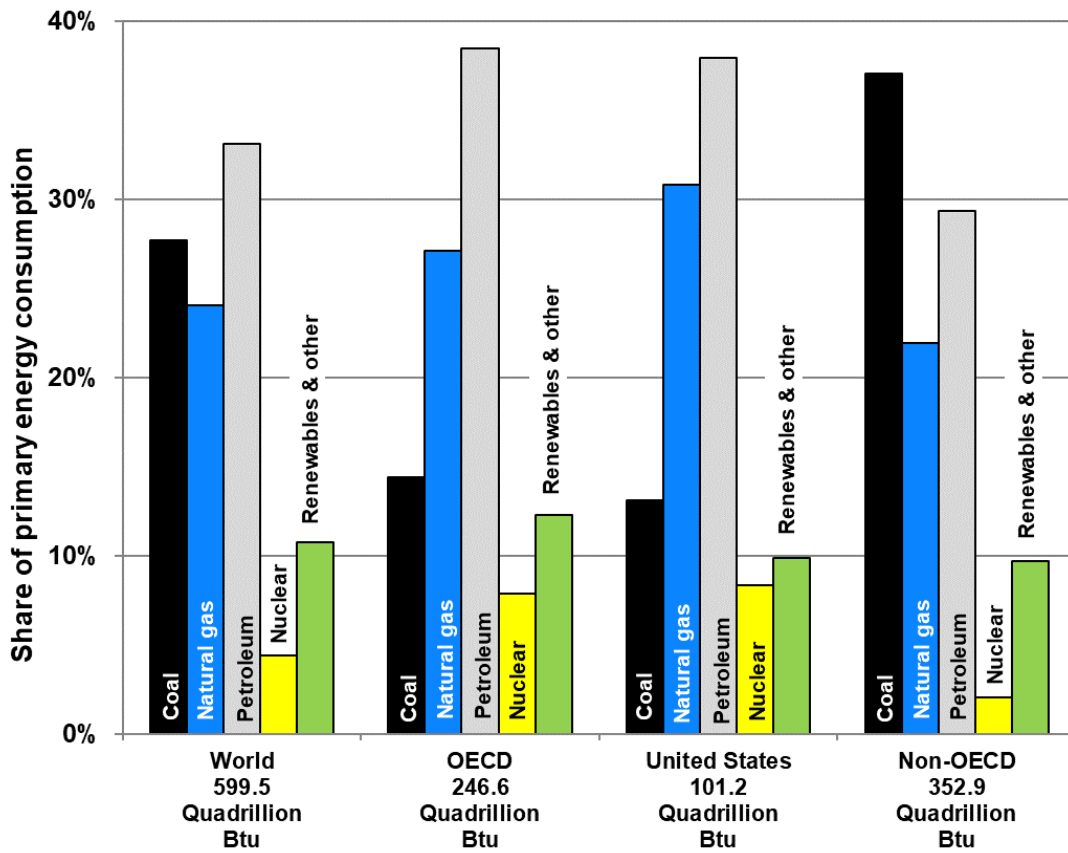
Chapter 2 Energy

Summary Statistics from Tables in this Chapter

| Source | | | |
|-----------|--|----------------|-------------------------------|
| Table 2.2 | Transportation share of U.S. energy consumption, 2020 | | 26.1% |
| Table 2.3 | Petroleum share of transportation energy consumption, 2020 | | 90.3% |
| Table 2.6 | Fuel ethanol consumption, 2020 (million gallons) | | 12,629.3 |
| | Biodiesel consumption, 2020 (million gallons) | | 1,863.8 |
| Table 2.8 | Transportation energy use by mode, 2018 | (trillion Btu) | (transportation energy share) |
| | <i>Cars</i> | 6,209 | 23.2% |
| | <i>Light trucks</i> | 8,960 | 33.4% |
| | <i>Medium/heavy trucks</i> | 6,349 | 23.7% |
| | <i>Buses</i> | 226 | 0.8% |
| | <i>Total Highway</i> | 21,801 | 81.3% |
| | <i>Air</i> | 2,358 | 8.8% |
| | <i>Water</i> | 1,120 | 4.2% |
| | <i>Pipeline</i> | 973 | 3.6% |
| | <i>Rail</i> | 560 | 2.1% |

Petroleum accounted for 33% of the world’s energy use in 2018. Although petroleum and natural gas are the dominant energy sources for OECD countries, the non-OECD countries rely on coal and petroleum. The U.S. shares of primary energy sources are similar to the OECD countries as a whole, but with a lesser reliance on renewables and a greater reliance on natural gas.

Figure 2.1. World Consumption of Primary Energy, 2018 (Updated August 2021)

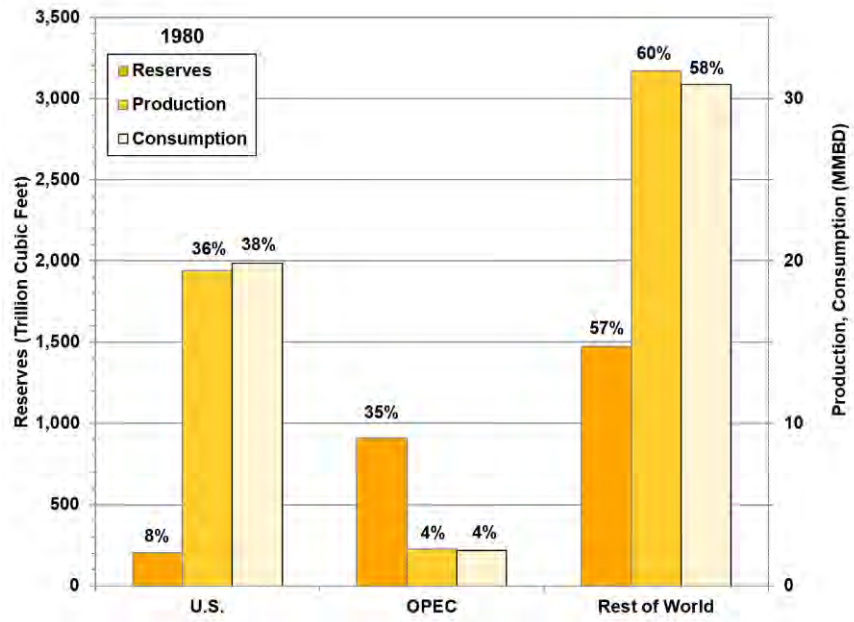


Note: The United States data are shown separately but are also included in the OECD data.

Source:

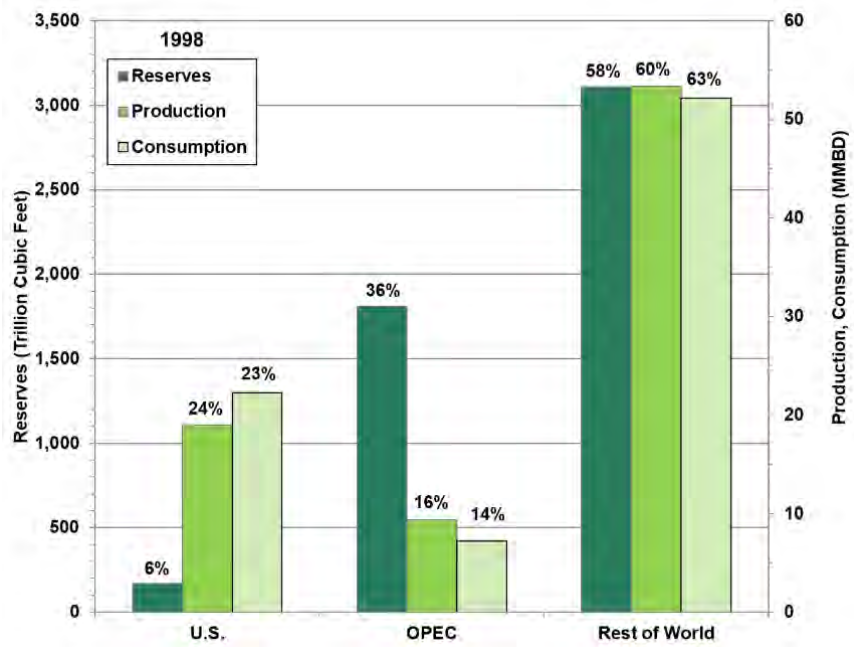
U.S. Department of Energy, Energy Information Administration, *International Energy Statistics*, August 2021. (Additional resources: www.eia.doe.gov)

Figure 2.2. World Natural Gas Reserves, Production, and Consumption, 1980

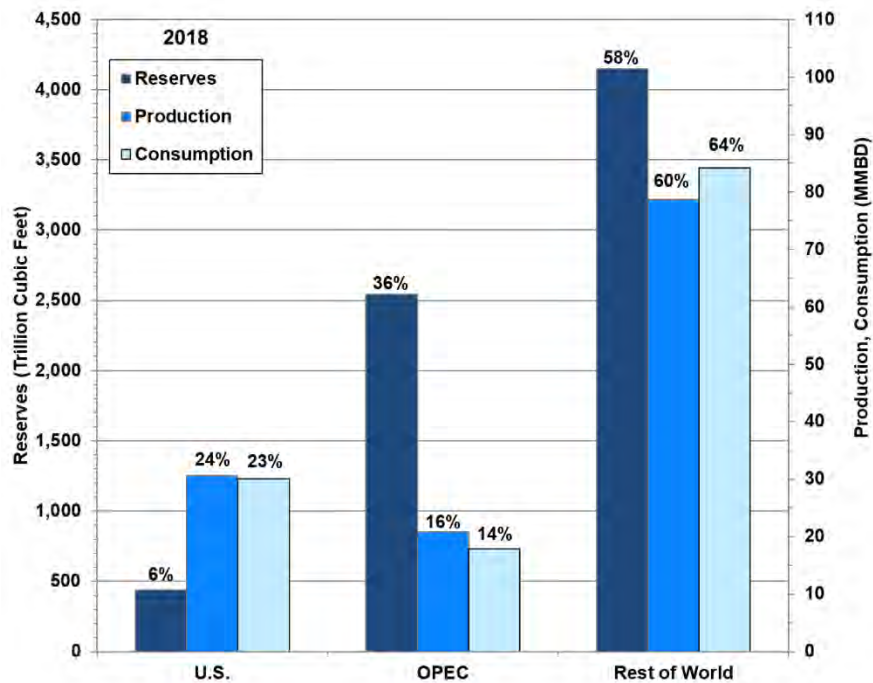


Source:
See Table 2.1.

Figure 2.3. World Natural Gas Reserves, Production, and Consumption, 1998



Source:
See Table 2.1.

Figure 2.4. World Natural Gas Reserves, Production, and Consumption, 2018

Source:
See Table 2.1.

Table 2.1
World Natural Gas Reserves, Production, and Consumption, 1980, 1998, and 2018
(trillion cubic feet)

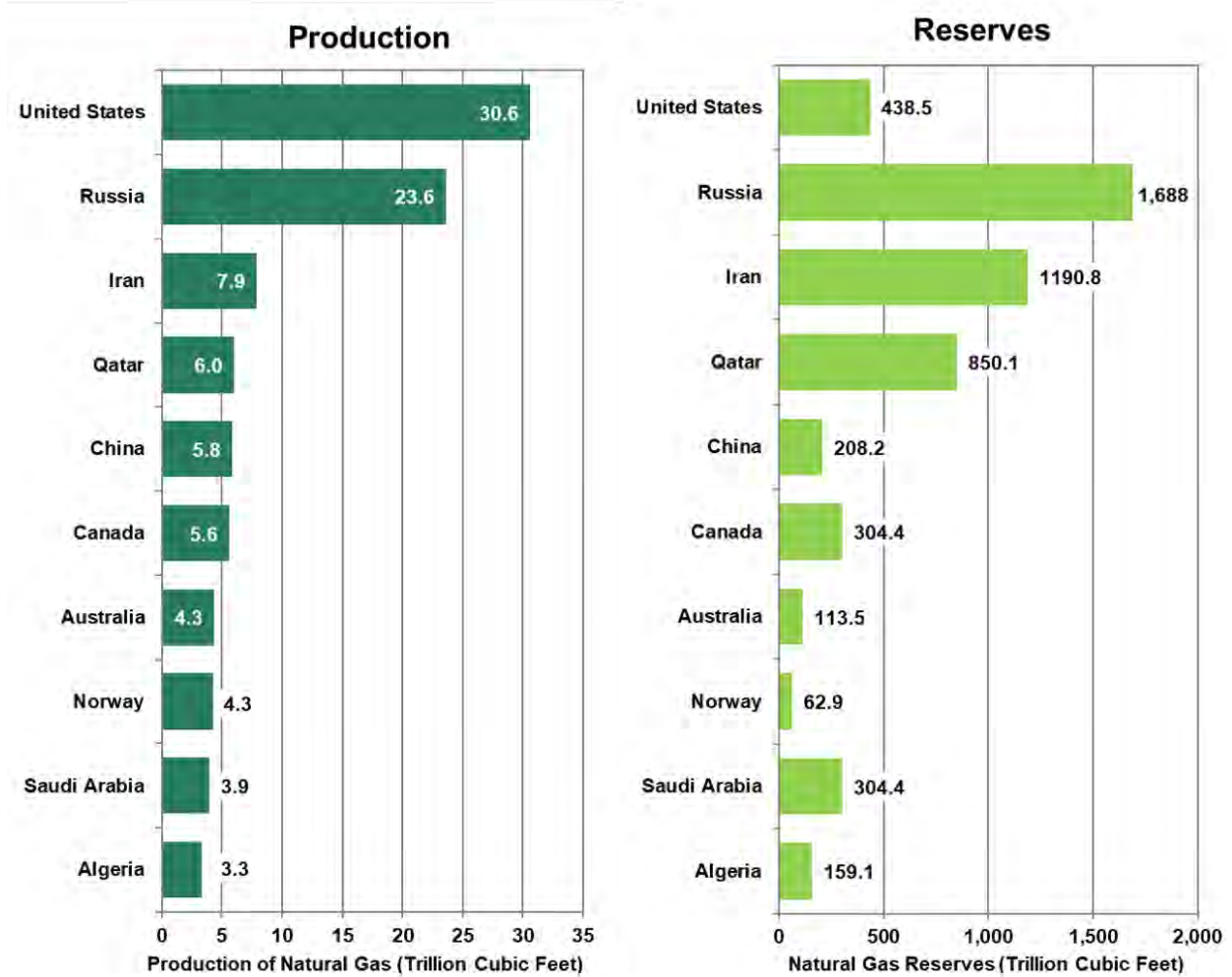
| | Natural gas reserves | Reserve share | Natural gas production | Production share | Natural gas consumption | Consumption share |
|---------------|----------------------|---------------|------------------------|------------------|-------------------------|-------------------|
| 1980 | | | | | | |
| United States | 201.0 | 8% | 19.4 | 36% | 19.9 | 38% |
| OPEC | 911.1 | 35% | 2.2 | 4% | 2.2 | 4% |
| Rest of world | 1,473.4 | 57% | 31.7 | 60% | 30.9 | 58% |
| 1998 | | | | | | |
| United States | 167.2 | 3% | 19.0 | 23% | 22.2 | 27% |
| OPEC | 1,811.4 | 36% | 9.3 | 11% | 7.2 | 9% |
| Rest of world | 3,110.0 | 61% | 53.4 | 65% | 52.2 | 64% |
| 2018 | | | | | | |
| United States | 438.5 | 6% | 30.6 | 24% | 30.1 | 23% |
| OPEC | 2,543.4 | 36% | 20.8 | 16% | 17.9 | 14% |
| Rest of world | 4,149.4 | 58% | 78.6 | 60% | 84.2 | 63% |

Note: Production data are dry gas production. OPEC and world production and consumption are 2017 data. See Glossary for OPEC countries.

Source:
Energy Information Administration, *International Energy Statistics*, September 2020. (Additional resources: www.eia.doe.gov)

In 2018, the United States and Russia were by far the top natural gas producing countries with nearly triple that of any other country. Although the United States produced more than Russia, Russia has almost four times more reserves.

Figure 2.5. Natural Gas Production and Reserves for the Top Ten Natural Gas Producing Countries, 2018



Source: Energy Information Administration, *International Energy Statistics*, September 2020. (Additional resources: www.eia.doe.gov)

Total energy use was over 100 quads in 2018 and 2019 with transportation using 28% but in 2020 transportation used only 26% of U.S. energy. The Energy Information Administration includes renewable energy in the appropriate sectors.

Table 2.2 (Updated April 2021)
U. S. Consumption of Total Energy by End-Use Sector, 1950–2020
 (quadrillion Btu)

| Year | Transportation | Percentage transportation of | | | | Total ^a |
|---|----------------|------------------------------|------------|------------|-------------|--------------------|
| | | total | Industrial | Commercial | Residential | |
| 1950 | 8.5 | 24.5% | 16.2 | 3.9 | 6.0 | 34.6 |
| 1955 | 9.6 | 23.8% | 19.5 | 3.9 | 7.3 | 40.2 |
| 1960 | 10.6 | 23.5% | 20.8 | 4.6 | 9.0 | 45.0 |
| 1965 | 12.4 | 23.0% | 25.0 | 5.8 | 10.6 | 54.0 |
| 1970 | 16.1 | 23.7% | 29.6 | 8.3 | 13.8 | 67.8 |
| 1975 | 18.2 | 25.4% | 29.4 | 9.5 | 14.8 | 71.9 |
| 1980 | 19.7 | 25.2% | 32.0 | 10.6 | 15.8 | 78.0 |
| 1985 | 20.1 | 26.3% | 28.8 | 11.5 | 16.0 | 76.3 |
| 1990 | 22.4 | 26.6% | 31.7 | 13.3 | 16.9 | 84.4 |
| 1995 | 23.8 | 26.2% | 33.9 | 14.7 | 18.5 | 90.9 |
| 1996 | 24.4 | 26.0% | 34.8 | 15.2 | 19.5 | 93.9 |
| 1997 | 24.7 | 26.2% | 35.1 | 15.7 | 19.0 | 94.5 |
| 1998 | 25.2 | 26.8% | 34.8 | 16.0 | 19.0 | 94.9 |
| 1999 | 25.9 | 26.8% | 34.7 | 16.4 | 19.6 | 96.5 |
| 2000 | 26.5 | 26.9% | 34.6 | 17.2 | 20.4 | 98.7 |
| 2001 | 26.2 | 27.3% | 32.7 | 17.1 | 20.0 | 96.1 |
| 2002 | 26.8 | 27.5% | 32.6 | 17.3 | 20.8 | 97.5 |
| 2003 | 26.9 | 27.5% | 32.5 | 17.3 | 21.1 | 97.8 |
| 2004 | 27.8 | 27.8% | 33.4 | 17.7 | 21.1 | 100.0 |
| 2005 | 28.3 | 28.2% | 32.4 | 17.9 | 21.6 | 100.1 |
| 2006 | 28.7 | 28.9% | 32.3 | 17.7 | 20.7 | 99.4 |
| 2007 | 28.8 | 28.6% | 32.3 | 18.3 | 21.5 | 100.9 |
| 2008 | 27.4 | 27.8% | 31.3 | 18.4 | 21.7 | 98.8 |
| 2009 | 26.6 | 28.3% | 28.4 | 17.9 | 21.1 | 93.9 |
| 2010 | 27.0 | 27.7% | 30.6 | 18.1 | 21.9 | 97.5 |
| 2011 | 26.6 | 27.5% | 30.9 | 18.0 | 21.4 | 96.9 |
| 2012 | 26.1 | 27.7% | 31.0 | 17.4 | 19.9 | 94.4 |
| 2013 | 26.6 | 27.4% | 31.5 | 17.9 | 21.1 | 97.1 |
| 2014 | 26.9 | 27.3% | 31.7 | 18.3 | 21.4 | 98.3 |
| 2015 | 27.2 | 28.0% | 31.4 | 18.2 | 20.6 | 97.4 |
| 2016 | 27.8 | 28.5% | 31.3 | 18.0 | 20.2 | 97.3 |
| 2017 | 28.0 | 28.7% | 31.9 | 17.9 | 19.9 | 97.7 |
| 2018 | 28.5 | 28.1% | 32.8 | 18.4 | 21.5 | 101.2 |
| 2019 | 28.5 | 28.4% | 32.8 | 18.0 | 21.0 | 100.3 |
| 2020 | 24.3 | 26.1% | 31.2 | 16.8 | 20.7 | 93.0 |
| <i>Average annual percentage change</i> | | | | | | |
| 1950-2020 | 1.5% | | 0.9% | 2.1% | 1.8% | 1.4% |
| 1970-2020 | 0.8% | | 0.1% | 1.4% | 0.8% | 0.6% |
| 2010-2020 | -1.0% | | 0.2% | -0.7% | -0.5% | -0.5% |

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, March 2021, Washington, DC, Table 2.1. (Additional resources: www.eia.doe.gov)

^a Electrical energy losses have been distributed among the sectors. Renewable energy consumption is included in the appropriate sectors.

In transportation, the alcohol fuels blended into gasoline to make gasohol (10% ethanol or less) are counted under “renewables” and are not in with petroleum. The petroleum category, however, still contains other blending agents that are not actually petroleum but are not broken out into a separate category.

Table 2.3 (Updated April 2021)
Distribution of Energy Consumption by Source and Sector, 1973 and 2020
(percentage)

| Energy source | Transportation | | Residential | | Commercial | |
|--------------------------|----------------|---------------|--------------|---------------|--------------|---------------|
| | 1973 | 2020 | 1973 | 2020 | 1973 | 2020 |
| Petroleum ^a | 95.8 | 90.3% | 18.8 | 4.2% | 16.8 | 4.4% |
| Natural gas ^b | 4.0 | 4.2% | 33.4 | 23.2% | 27.8 | 19.5% |
| Coal | 0.0 | 0.0% | 0.6 | 0.0% | 1.7 | 0.1% |
| Renewable | 0.0 | 5.2% | 2.4 | 3.8% | 0.1 | 1.7% |
| Nuclear | 0.0 | 0.0% | 0.0 | 0.0% | 0.0 | 0.0% |
| Electricity ^c | 0.2 | 0.3% | 44.8 | 68.8% | 53.6 | 74.3% |
| Total | 100.0 | 100.0% | 100.0 | 100.0% | 100.0 | 100.0% |

| Energy source | Industrial | | Electric utilities | |
|--------------------------|--------------|---------------|--------------------|---------------|
| | 1973 | 2020 | 1973 | 2020 |
| Petroleum ^a | 27.9 | 27.2% | 17.8 | 0.5% |
| Natural gas ^b | 31.8 | 33.6% | 19.0 | 33.4% |
| Coal | 12.4 | 3.0% | 44.0 | 23.1% |
| Renewable | 3.7 | 7.4% | 14.4 | 19.4% |
| Nuclear | 0.0 | 0.0% | 4.6 | 23.1% |
| Electricity ^c | 24.2 | 28.8% | 0.2 | 0.5% |
| Total | 100.0 | 100.0% | 100.0 | 100.0% |

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, March 2021, Washington, DC, Tables 2.2, 2.3, 2.4, 2.5, and 2.6. (Additional resources: www.eia.doe.gov)

^a In transportation, the petroleum category contains some blending agents which are not petroleum.

^b Includes supplemental gaseous fuels. Transportation sector includes pipeline fuel and natural gas vehicle use.

^c Includes electrical system energy losses.

Total transportation energy consumption was 24.3 quads in 2020, down from 28.5 quads the previous year. Petroleum has accounted for more than 90% of transportation energy consumption since the mid-1950's. Renewables, including ethanol and biodiesel, were 5.2% of the total in 2020.

Table 2.4 (Updated April 2021)
Distribution of Transportation Energy Consumption by Source, 1950–2020

| Year | Petroleum ^a | Natural gas ^b | Coal | Renewables | Electricity ^c | Total (trillion Btu) |
|------|------------------------|--------------------------|-------|------------|--------------------------|-------------------------|
| 1950 | 78.8% | 1.5% | 18.4% | 0.0% | 1.3% | 8,492.5 |
| 1955 | 92.1% | 2.7% | 4.4% | 0.0% | 0.8% | 9,550.2 |
| 1960 | 95.6% | 3.4% | 0.7% | 0.0% | 0.3% | 10,596.0 |
| 1965 | 95.4% | 4.2% | 0.1% | 0.0% | 0.3% | 12,432.5 |
| 1970 | 95.1% | 4.6% | 0.0% | 0.0% | 0.2% | 16,098.3 |
| 1975 | 96.5% | 3.3% | 0.0% | 0.0% | 0.2% | 18,245.1 |
| 1980 | 96.5% | 3.3% | 0.0% | 0.0% | 0.2% | 19,696.7 |
| 1985 | 96.9% | 2.6% | 0.0% | 0.2% | 0.2% | 20,088.0 |
| 1990 | 96.5% | 3.0% | 0.0% | 0.3% | 0.2% | 22,419.0 |
| 1991 | 96.6% | 2.8% | 0.0% | 0.3% | 0.2% | 22,118.0 |
| 1992 | 96.7% | 2.7% | 0.0% | 0.4% | 0.2% | 22,415.1 |
| 1993 | 96.5% | 2.8% | 0.0% | 0.4% | 0.2% | 22,670.8 |
| 1994 | 96.3% | 3.0% | 0.0% | 0.4% | 0.2% | 23,318.7 |
| 1995 | 96.3% | 3.0% | 0.0% | 0.5% | 0.2% | 23,811.9 |
| 1996 | 96.4% | 3.0% | 0.0% | 0.3% | 0.2% | 24,419.3 |
| 1997 | 96.2% | 3.2% | 0.0% | 0.4% | 0.2% | 24,722.6 |
| 1998 | 96.7% | 2.6% | 0.0% | 0.4% | 0.2% | 25,224.5 |
| 1999 | 96.7% | 2.6% | 0.0% | 0.5% | 0.2% | 25,916.0 |
| 2000 | 96.7% | 2.5% | 0.0% | 0.5% | 0.2% | 26,515.5 |
| 2001 | 96.7% | 2.5% | 0.0% | 0.5% | 0.2% | 26,242.1 |
| 2002 | 96.5% | 2.6% | 0.0% | 0.6% | 0.2% | 26,807.8 |
| 2003 | 96.5% | 2.3% | 0.0% | 0.9% | 0.3% | 26,881.0 |
| 2004 | 96.5% | 2.2% | 0.0% | 1.0% | 0.3% | 27,826.5 |
| 2005 | 96.3% | 2.2% | 0.0% | 1.2% | 0.3% | 28,260.7 |
| 2006 | 95.9% | 2.2% | 0.0% | 1.7% | 0.3% | 28,696.8 |
| 2007 | 95.3% | 2.3% | 0.0% | 2.1% | 0.3% | 28,815.1 |
| 2008 | 94.2% | 2.5% | 0.0% | 3.0% | 0.3% | 27,421.4 |
| 2009 | 93.5% | 2.7% | 0.0% | 3.5% | 0.3% | 26,592.2 |
| 2010 | 93.0% | 2.7% | 0.0% | 4.0% | 0.3% | 26,978.4 |
| 2011 | 92.6% | 2.8% | 0.0% | 4.4% | 0.3% | 26,598.6 |
| 2012 | 92.3% | 3.0% | 0.0% | 4.4% | 0.3% | 26,125.7 |
| 2013 | 91.5% | 3.3% | 0.0% | 4.8% | 0.3% | 26,611.7 |
| 2014 | 92.0% | 2.8% | 0.0% | 4.8% | 0.3% | 26,868.9 |
| 2015 | 92.1% | 2.7% | 0.0% | 4.9% | 0.3% | 27,238.0 |
| 2016 | 91.8% | 2.7% | 0.0% | 5.2% | 0.3% | 27,785.5 |
| 2017 | 91.7% | 2.9% | 0.0% | 5.1% | 0.3% | 28,014.1 |
| 2018 | 91.4% | 3.4% | 0.0% | 5.0% | 0.3% | 28,465.1 |
| 2019 | 91.2% | 3.6% | 0.0% | 4.9% | 0.3% | 28,507.4 |
| 2020 | 90.3% | 4.2% | 0.0% | 5.2% | 0.3% | 24,296.6 |

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, March 2021, Washington, DC, Table 2.5. (Additional resources: www.eia.doe.gov)

^a In transportation, the petroleum category contains some blending agents which are not petroleum.

^b Includes supplemental gaseous fuels. Transportation sector includes pipeline fuel and natural gas vehicle use.

^c Includes electrical system energy losses.

Transportation energy use was 20%-30% of all energy use for thirty states in 2018. Hawaii had the highest share of transportation use at 55%. Transportation energy use in Texas and California was over 3 quads in 2018.

Table 2.5
Transportation Energy Consumption by State, 1960-2018

| State | (trillion Btu) | | | | | | | Share of transportation use to all energy use, 2018 |
|----------------------|----------------|--------|--------|--------|--------|--------|--------|---|
| | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2018 | |
| Alabama | 176 | 268 | 350 | 398 | 473 | 478 | 492 | 25% |
| Alaska | 27 | 76 | 90 | 169 | 220 | 210 | 169 | 28% |
| Arizona | 117 | 194 | 266 | 326 | 460 | 465 | 502 | 34% |
| Arkansas | 105 | 167 | 204 | 228 | 294 | 288 | 289 | 26% |
| California | 1,224 | 1,833 | 2,364 | 2,835 | 3,018 | 3,044 | 3,170 | 40% |
| Colorado | 104 | 195 | 251 | 271 | 366 | 420 | 436 | 29% |
| Connecticut | 117 | 183 | 185 | 206 | 228 | 237 | 233 | 31% |
| Delaware | 44 | 50 | 54 | 63 | 70 | 64 | 73 | 25% |
| District of Columbia | 29 | 33 | 27 | 27 | 28 | 19 | 20 | 12% |
| Florida | 348 | 608 | 951 | 1,137 | 1,404 | 1,514 | 1,609 | 38% |
| Georgia | 209 | 401 | 550 | 682 | 860 | 951 | 817 | 28% |
| Hawaii | 62 | 125 | 147 | 155 | 125 | 136 | 160 | 55% |
| Idaho | 42 | 66 | 83 | 91 | 124 | 134 | 162 | 29% |
| Illinois | 504 | 791 | 821 | 788 | 968 | 967 | 1,014 | 25% |
| Indiana | 265 | 378 | 442 | 582 | 659 | 610 | 611 | 22% |
| Iowa | 151 | 210 | 238 | 236 | 271 | 302 | 303 | 19% |
| Kansas | 173 | 251 | 279 | 280 | 270 | 281 | 285 | 25% |
| Kentucky | 154 | 261 | 324 | 380 | 441 | 473 | 497 | 28% |
| Louisiana | 257 | 392 | 647 | 691 | 854 | 711 | 732 | 17% |
| Maine | 67 | 88 | 83 | 115 | 120 | 122 | 110 | 28% |
| Maryland | 173 | 273 | 319 | 331 | 403 | 440 | 432 | 32% |
| Massachusetts | 220 | 349 | 358 | 407 | 453 | 445 | 462 | 32% |
| Michigan | 387 | 593 | 620 | 684 | 816 | 718 | 765 | 26% |
| Minnesota | 181 | 274 | 332 | 339 | 513 | 469 | 464 | 24% |
| Mississippi | 129 | 216 | 261 | 291 | 359 | 362 | 423 | 36% |
| Missouri | 254 | 391 | 411 | 477 | 555 | 564 | 555 | 30% |
| Montana | 58 | 68 | 89 | 82 | 106 | 116 | 118 | 27% |
| Nebraska | 94 | 139 | 141 | 152 | 173 | 205 | 212 | 23% |
| Nevada | 42 | 73 | 116 | 133 | 205 | 201 | 230 | 32% |
| New Hampshire | 34 | 51 | 58 | 73 | 102 | 104 | 102 | 32% |
| New Jersey | 338 | 493 | 566 | 799 | 906 | 910 | 806 | 36% |
| New Mexico | 91 | 138 | 176 | 230 | 226 | 194 | 228 | 33% |
| New York | 802 | 1,099 | 1,027 | 929 | 971 | 1,065 | 1,135 | 29% |
| North Carolina | 232 | 364 | 444 | 537 | 703 | 702 | 740 | 28% |
| North Dakota | 42 | 54 | 72 | 65 | 81 | 101 | 139 | 21% |
| Ohio | 485 | 674 | 787 | 803 | 985 | 939 | 921 | 25% |
| Oklahoma | 151 | 241 | 308 | 340 | 426 | 457 | 484 | 28% |
| Oregon | 111 | 183 | 240 | 280 | 320 | 317 | 314 | 31% |
| Pennsylvania | 536 | 718 | 818 | 843 | 999 | 959 | 938 | 24% |
| Rhode Island | 61 | 63 | 52 | 58 | 65 | 63 | 62 | 31% |
| South Carolina | 126 | 199 | 248 | 309 | 379 | 447 | 483 | 29% |
| South Dakota | 41 | 54 | 63 | 66 | 85 | 94 | 100 | 25% |
| Tennessee | 174 | 308 | 409 | 466 | 583 | 616 | 646 | 29% |
| Texas | 798 | 1,212 | 1,802 | 2,155 | 2,563 | 2,757 | 3,541 | 25% |
| Utah | 65 | 92 | 127 | 149 | 221 | 231 | 267 | 32% |
| Vermont | 19 | 29 | 34 | 42 | 52 | 51 | 45 | 32% |
| Virginia | 290 | 446 | 482 | 584 | 683 | 725 | 717 | 30% |
| Washington | 180 | 291 | 416 | 571 | 626 | 590 | 680 | 33% |
| West Virginia | 85 | 108 | 147 | 147 | 186 | 171 | 193 | 23% |
| Wisconsin | 180 | 271 | 329 | 341 | 419 | 432 | 453 | 24% |
| Wyoming | 41 | 57 | 88 | 81 | 109 | 122 | 118 | 21% |
| Total | 10,597 | 16,094 | 19,697 | 22,424 | 26,521 | 26,992 | 28,456 | 28% |

Source:

U. S. Energy Information Administration, State Energy Data System, June 26, 2020.

Ethanol is an oxygenate blended with gasoline in amounts up to 10% to be used in conventional vehicles and is blended in higher amounts up to 85% for use in flex-fuel vehicles. The production of ethanol grew to over 16 billion gallons in 2018 but has declined each year since then. Beginning in 2010, the United States began exporting more fuel ethanol than it imports. Biodiesel is a renewable fuel typically made from vegetable oils or animal fats. It can be burned in standard diesel engines and is often blended with petroleum diesel. In 2020, about 1.9 billion gallons of biodiesel were consumed.

Table 2.6 (Updated April 2021)
Fuel Ethanol and Biodiesel Production, Net Imports, and Consumption, 1981–2020
 (million gallons)

| Year | Fuel ethanol | | | Biodiesel | | |
|-----------|--------------|-------------|----------------------------------|------------|-------------|-------------|
| | Production | Net imports | Consumption | Production | Net imports | Consumption |
| 1981 | 83.1 | a | 83.1 | a | a | a |
| 1985 | 617.1 | a | 617.1 | a | a | a |
| 1990 | 747.7 | a | 747.7 | a | a | a |
| 1991 | 866.3 | a | 866.3 | a | a | a |
| 1992 | 985.0 | a | 985.0 | a | a | a |
| 1993 | 1,154.3 | 10.2 | 1,151.0 | a | a | a |
| 1994 | 1,288.9 | 11.7 | 1,288.9 | a | a | a |
| 1995 | 1,357.7 | 16.3 | 1,382.6 | a | a | a |
| 1996 | 973.5 | 13.1 | 991.7 | a | a | a |
| 1997 | 1,288.3 | 3.6 | 1,255.8 | a | a | a |
| 1998 | 1,405.0 | 2.8 | 1,387.6 | a | a | a |
| 1999 | 1,465.0 | 3.7 | 1,442.7 | a | a | a |
| 2000 | 1,622.3 | 4.9 | 1,653.4 | a | a | a |
| 2001 | 1,765.2 | 13.2 | 1,740.7 | 8.6 | 1.7 | 10.3 |
| 2002 | 2,140.2 | 12.9 | 2,073.1 | 10.5 | 5.9 | 16.4 |
| 2003 | 2,804.4 | 12.3 | 2,826.0 | 14.2 | (0.7) | 13.5 |
| 2004 | 3,404.4 | 148.8 | 3,552.2 | 28.0 | (1.1) | 26.8 |
| 2005 | 3,904.4 | 135.8 | 4,058.6 | 90.8 | 0.0 | 90.8 |
| 2006 | 4,884.3 | 731.1 | 5,481.2 | 250.4 | 10.5 | 260.9 |
| 2007 | 6,521.0 | 439.2 | 6,885.7 | 489.8 | (136.1) | 353.7 |
| 2008 | 9,308.8 | 529.6 | 9,683.4 | 678.1 | (374.6) | 303.6 |
| 2009 | 10,937.8 | 198.2 | 11,036.6 | 515.8 | (194.9) | 321.8 |
| 2010 | 13,297.9 | (382.8) | 12,858.5 | 343.4 | (85.0) | 260.1 |
| 2011 | 13,929.1 | (1,023.3) | 12,893.3 | 967.5 | (38.1) | 886.2 |
| 2012 | 13,218.0 | (247.4) | 12,881.9 | 990.7 | (92.5) | 899.0 |
| 2013 | 13,292.7 | (242.0) | 13,215.6 | 1,359.5 | 146.0 | 1,428.8 |
| 2014 | 14,312.8 | (771.6) | 13,444.0 | 1,279.0 | 109.4 | 1,416.9 |
| 2015 | 14,807.2 | (740.5) | 13,946.7 | 1,263.3 | 246.9 | 1,494.2 |
| 2016 | 15,413.2 | (1,134.1) | 14,356.3 | 1,567.7 | 620.8 | 2,085.4 |
| 2017 | 15,936.3 | (1,313.2) | 14,485.1 | 1,595.7 | 300.1 | 1,985.3 |
| 2018 | 16,091.3 | (1,655.2) | 14,420.4 | 1,857.3 | 62.9 | 1,903.7 |
| 2019 | 15,778.5 | (1,271.6) | 14,551.7 | 1,724.5 | 56.6 | 1,812.8 |
| 2020 | 13,926.2 | (1,198.7) | 12,629.3 | 1,807.5 | 54.8 | 1,863.8 |
| | | | Average annual percentage change | | | |
| 1981-2020 | 14.0% | a | 13.7% | a | a | a |
| 2010-2020 | 0.5% | a | -0.2% | 18.1% | a | 21.8% |

Note: Net imports are total imports minus exports.

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, March 2021, Table 10.3 and Table 10.4. (Additional resources: www.eia.doe.gov)

^a Data are not available.

As data about alternative fuel use become available, an attempt is made to incorporate them into this table. Sometimes assumptions must be made in order to use the data. Please see Appendix A for a description of the methodology used to develop these data. See Table 1.17 for transportation petroleum use in thousand barrels per day.

Table 2.7
Domestic Consumption of Transportation Energy by Mode and Fuel Type, 2018^a
(trillion Btu)

| | Gasoline | Diesel fuel | Liquefied petroleum gas | Jet fuel | Residual fuel oil | Natural gas | Electricity ^b | Total ^c |
|---|-----------------|----------------|-------------------------|----------------|-------------------|--------------|--------------------------|--------------------|
| HIGHWAY | 15,366.1 | 6,324.3 | 75.3 | - | - | 25.4 | 9.8 | 21,800.9 |
| Light vehicles | 14,717.5 | 444.9 | 53.9 | - | - | - | 9.6 | 15,225.9 |
| Cars | 6,165.5 | 35.5 | | | | | 8.3 | 6,209.2 |
| Light trucks ^d | 8,495.0 | 409.5 | 53.9 | | | | 1.3 | 8,959.6 |
| Motorcycles | 57.1 | | | | | | | 57.1 |
| Buses | 10.5 | 189.6 | 0.3 | - | - | 25.4 | 0.2 | 225.9 |
| Transit | 1.7 | 61.6 | 0.3 | | | 25.4 | 0.2 | 89.2 |
| Intercity | | 39.6 | | | | | | 39.6 |
| School | 8.8 | 88.3 | | | | | | 97.1 |
| Medium/heavy trucks | 638.1 | 5,689.8 | 21.2 | - | - | - | - | 6,349.0 |
| Class 3-6 trucks | 587.0 | 796.6 | 21.0 | | | | | 1,404.6 |
| Class 7-8 trucks | 51.0 | 4,893.2 | 0.2 | | | | | 4,944.5 |
| NONHIGHWAY | 198.1 | 867.5 | - | 2,331.5 | 616.4 | 889.6 | 107.4 | 5,010.6 |
| Air | 26.7 | - | - | 2,331.5 | - | - | - | 2,358.2 |
| General aviation | 26.7 | | | 246.1 | | | | 272.8 |
| Domestic air carriers | | | | 1,640.0 | | | | 1,640.0 |
| International air carriers ^e | | | | 445.4 | | | | 445.4 |
| Water | 171.4 | 332.2 | - | - | 616.4 | - | - | 1,120.0 |
| Freight | | 291.4 | | | 616.4 | | | 907.9 |
| Recreational | 171.4 | 40.7 | | | | | | 212.1 |
| Pipeline | - | - | - | - | - | 889.6 | 83.3 | 972.9 |
| Rail | - | 535.4 | - | - | - | - | 24.1 | 559.5 |
| Freight (Class I) | | 512.8 | | | | | | 512.8 |
| Passenger | | 22.6 | | | | | 24.1 | 46.7 |
| Transit | | | | | | | 16.4 | 16.4 |
| Commuter | | 14.2 | | | | | 6.0 | 20.3 |
| Intercity ^f | | 8.3 | | | | | 1.7 | 10.0 |
| TOTAL HWY & NONHWY^c | 15,564.2 | 7,191.8 | 75.3 | 2,331.5 | 616.4 | 915.0 | 117.2 | 26,811.5 |

Source:

See Appendix A, Section 2. Energy Use Sources.

^a Civilian consumption only. Totals may not include all possible uses of fuels for transportation (e.g., snowmobiles).

^b Only end-use energy was counted for electricity. See Appendix C for this table with electricity generation and distribution losses included.

^c Totals may not sum due to rounding.

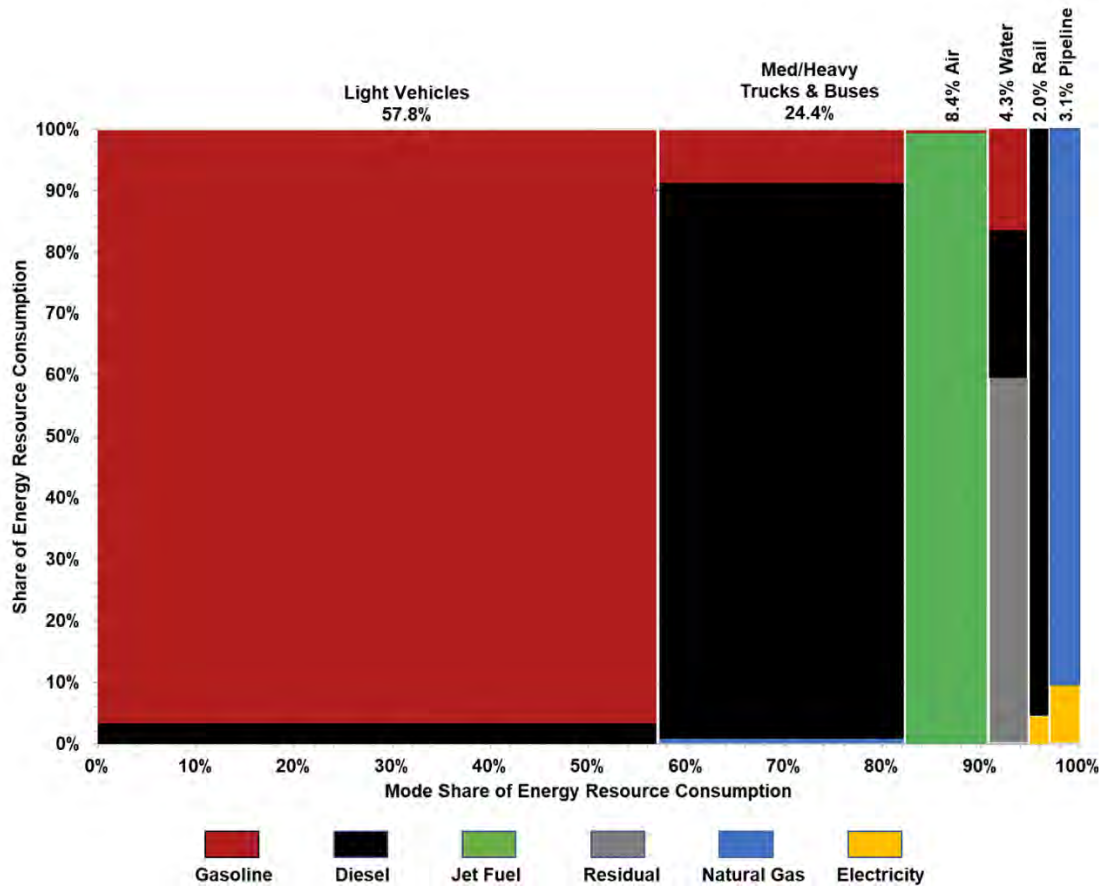
^d Two-axle, four-tire trucks.

^e One half of fuel used by domestic carriers in international operation.

^f Data for 2018 were not available. Data for 2017 are shown.

The gasoline and diesel used in highway modes accounted for the majority of transportation energy use (82.3%) and nearly all highway use in 2018.

Figure 2.6. Domestic Consumption of Transportation Energy Use by Mode and Fuel Type, 2018^a



Note: Residual fuel oil is heavier oil which can be used in vessel bunkering.

Source: See Table 2.7 or Appendix A, Section 2. Energy Use Sources.

^a Civilian consumption only. Totals may not include all possible uses of fuels for transportation (e.g., snowmobiles). Only end-use energy was counted for electricity. See Appendix C for this figure with electricity generation and distribution losses included.

Nonhighway modes were responsible for 18.7% of all transportation energy use in 2018. See Table 1.17 for transportation energy use in thousand barrels per day.

Table 2.8
Transportation Energy Use by Mode, 2017–2018^a

| | Trillion Btu | | Percentage of total based on Btus | |
|--------------------------------|-----------------|-----------------|-----------------------------------|---------------|
| | 2017 | 2018 | 2017 | 2018 |
| <u>HIGHWAY</u> | 21,868.7 | 21,800.9 | 82.2% | 81.3% |
| Light vehicles | 15,359.8 | 15,225.9 | 57.8% | 56.8% |
| Cars | 6,338.8 | 6,209.2 | 23.8% | 23.2% |
| Light trucks ^b | 8,963.7 | 8,959.6 | 33.7% | 33.4% |
| Motorcycles | 57.3 | 57.1 | 0.2% | 0.2% |
| Buses | 220.3 | 225.9 | 0.8% | 0.8% |
| Transit | 91.6 | 89.2 | 0.3% | 0.3% |
| Intercity | 37.3 | 39.6 | 0.1% | 0.1% |
| School | 91.4 | 97.1 | 0.3% | 0.4% |
| Medium/heavy trucks | 6,288.6 | 6,349.0 | 23.6% | 23.7% |
| Class 3-6 trucks | 1,391.2 | 1,404.6 | 5.2% | 5.2% |
| Class 7-8 trucks | 4,897.4 | 4,944.5 | 18.4% | 18.4% |
| <u>NONHIGHWAY</u> | 4,723.5 | 5,010.6 | 17.8% | 18.7% |
| Air | 2,230.8 | 2,358.2 | 8.4% | 8.8% |
| General aviation | 231.7 | 272.8 | 0.9% | 1.0% |
| Domestic air carriers | 1,564.3 | 1,640.0 | 5.9% | 6.1% |
| International air | 434.8 | 445.4 | 1.6% | 1.7% |
| Water | 1,130.4 | 1,120.0 | 4.3% | 4.2% |
| Freight | 920.2 | 907.9 | 3.5% | 3.4% |
| Recreational | 210.3 | 212.1 | 0.8% | 0.8% |
| Pipeline | 825.4 | 972.9 | 3.1% | 3.6% |
| Rail | 536.9 | 559.5 | 2.0% | 2.1% |
| Freight (Class I) | 490.5 | 512.8 | 1.8% | 1.9% |
| Passenger | 46.4 | 46.7 | 0.2% | 0.2% |
| Transit | 15.9 | 16.4 | 0.1% | 0.1% |
| Commuter | 20.5 | 20.3 | 0.1% | 0.1% |
| Intercity ^c | 10.0 | 10.0 | 0.0% | 0.0% |
| HWY & NONHWY TOTAL | 26,592.2 | 26,811.5 | 100.0% | 100.0% |
| Off-highway^d | 1,980.8 | 2,147.4 | | |

Source:

See Appendix A, Section 2. Energy Use Sources.

^a Civilian consumption only. Totals may not include all possible uses of fuels for transportation (e.g., snowmobiles). Only end-use energy was counted for electricity. See Appendix C for this table with electricity generation and distribution losses included.

^b Two-axle, four-tire trucks.

^c Data for 2018 were not available. Data for 2017 are shown.

^d Includes equipment that does not travel on roads, such as equipment from agriculture, construction, and airports.

Light trucks include pick-ups, minivans, sport-utility vehicles, and vans. See Table 1.15 for highway petroleum use in thousand barrels per day.

Table 2.9
Highway Transportation Energy Consumption by Mode, 1970–2018
(trillion Btu)

| Year | Cars | Light trucks | Light vehicles subtotal | Motor-cycles | Buses | Class 3-6 trucks | Class 7-8 trucks | Heavy trucks subtotal | Highway subtotal | Total transportation ^a |
|---|-------|--------------|-------------------------|--------------|-------|------------------|------------------|-----------------------|------------------|-----------------------------------|
| 1970 | 8,479 | 1,539 | 10,018 | 7 | 129 | 333 | 1,220 | 1,553 | 11,707 | 15,192 |
| 1975 | 9,298 | 2,384 | 11,682 | 14 | 124 | 430 | 1,574 | 2,003 | 13,823 | 17,204 |
| 1980 | 8,800 | 2,975 | 11,775 | 26 | 143 | 929 | 1,757 | 2,686 | 14,630 | 18,760 |
| 1985 | 8,932 | 3,413 | 12,345 | 23 | 153 | 986 | 1,897 | 2,883 | 15,404 | 19,017 |
| 1986 | 9,138 | 3,629 | 12,767 | 23 | 160 | 920 | 2,038 | 2,958 | 15,908 | 20,086 |
| 1987 | 9,157 | 3,819 | 12,976 | 24 | 164 | 858 | 2,203 | 3,061 | 16,225 | 20,578 |
| 1988 | 9,158 | 4,078 | 13,236 | 25 | 169 | 860 | 2,257 | 3,118 | 16,548 | 21,131 |
| 1989 | 9,232 | 4,156 | 13,388 | 26 | 169 | 869 | 2,330 | 3,199 | 16,782 | 21,487 |
| 1990 | 8,688 | 4,451 | 13,139 | 24 | 167 | 891 | 2,442 | 3,334 | 16,664 | 21,383 |
| 1991 | 8,029 | 4,774 | 12,803 | 23 | 177 | 895 | 2,507 | 3,402 | 16,405 | 20,985 |
| 1992 | 8,169 | 5,117 | 13,286 | 24 | 184 | 897 | 2,570 | 3,468 | 16,962 | 21,646 |
| 1993 | 8,368 | 5,356 | 13,724 | 25 | 183 | 906 | 2,671 | 3,577 | 17,509 | 22,125 |
| 1994 | 8,470 | 5,515 | 13,985 | 26 | 183 | 936 | 2,842 | 3,778 | 17,972 | 22,729 |
| 1995 | 8,489 | 5,695 | 14,184 | 25 | 184 | 954 | 2,983 | 3,937 | 18,330 | 23,263 |
| 1996 | 8,634 | 5,917 | 14,551 | 24 | 186 | 958 | 3,088 | 4,045 | 18,806 | 23,773 |
| 1997 | 8,710 | 6,169 | 14,879 | 25 | 192 | 945 | 3,141 | 4,086 | 19,182 | 24,126 |
| 1998 | 8,936 | 6,303 | 15,239 | 26 | 196 | 967 | 3,251 | 4,218 | 19,679 | 24,461 |
| 1999 | 9,134 | 6,602 | 15,736 | 26 | 203 | 1,054 | 3,584 | 4,638 | 20,603 | 25,760 |
| 2000 | 9,100 | 6,607 | 15,707 | 26 | 209 | 1,085 | 3,734 | 4,819 | 20,761 | 26,071 |
| 2001 | 9,161 | 6,678 | 15,839 | 24 | 196 | 1,074 | 3,738 | 4,813 | 20,872 | 25,741 |
| 2002 | 9,391 | 6,883 | 16,274 | 24 | 192 | 1,114 | 3,921 | 5,035 | 21,525 | 26,329 |
| 2003 | 9,255 | 7,551 | 16,806 | 24 | 190 | 1,083 | 3,812 | 4,895 | 21,915 | 26,509 |
| 2004 | 9,331 | 7,861 | 17,192 | 25 | 194 | 1,003 | 3,532 | 4,535 | 21,946 | 26,965 |
| 2005 | 9,579 | 7,296 | 16,875 | 24 | 196 | 1,126 | 3,963 | 5,088 | 22,183 | 27,373 |
| 2006 | 9,316 | 7,550 | 16,866 | 28 | 199 | 1,149 | 4,045 | 5,193 | 22,286 | 27,546 |
| 2007 | 9,221 | 7,679 | 16,900 | 59 | 195 | 1,429 | 5,031 | 6,460 | 23,615 | 29,004 |
| 2008 | 8,831 | 7,572 | 16,404 | 61 | 200 | 1,444 | 5,083 | 6,527 | 23,192 | 28,365 |
| 2009 | 8,209 | 7,635 | 15,843 | 60 | 200 | 1,341 | 4,720 | 6,061 | 22,165 | 26,878 |
| 2010 | 7,657 | 7,971 | 15,628 | 53 | 190 | 1,363 | 4,797 | 6,160 | 22,032 | 26,949 |
| 2011 | 7,336 | 8,104 | 15,440 | 53 | 195 | 1,283 | 4,517 | 5,801 | 21,489 | 26,357 |
| 2012 | 7,121 | 8,180 | 15,300 | 61 | 200 | 1,282 | 4,512 | 5,794 | 21,356 | 25,966 |
| 2013 | 7,047 | 8,077 | 15,124 | 58 | 204 | 1,310 | 4,613 | 5,924 | 21,310 | 25,868 |
| 2014 | 6,951 | 8,506 | 15,454 | 57 | 206 | 1,332 | 4,689 | 6,022 | 21,742 | 25,949 |
| 2015 | 6,716 | 8,654 | 15,370 | 56 | 210 | 1,324 | 4,660 | 5,984 | 21,619 | 26,084 |
| 2016 | 6,577 | 8,890 | 15,467 | 58 | 214 | 1,359 | 4,783 | 6,142 | 21,881 | 26,485 |
| 2017 | 6,339 | 8,963 | 15,302 | 57 | 220 | 1,391 | 4,897 | 6,289 | 21,869 | 26,592 |
| 2018 | 6,209 | 8,960 | 15,169 | 57 | 226 | 1,405 | 4,944 | 6,349 | 21,801 | 26,812 |
| <i>Average annual percentage change</i> | | | | | | | | | | |
| 1970-2018 | -0.6% | 3.7% | 0.9% | 4.5% | 1.2% | 3.0% | 3.0% | 3.0% | 1.3% | 1.2% |
| 2008-2018 | -3.5% | 1.7% | -0.8% | -0.7% | 1.3% | -0.3% | -0.3% | -0.3% | -0.6% | -0.6% |

Note: Totals may not add due to rounding.

Source:

See Appendix A, Section 2.1 Highway Energy Use.

^a Total transportation figures do not include military and off-highway energy use and may not include all possible uses of fuel for transportation (e.g., snowmobiles). Only end-use energy was counted for electricity. See Appendix C for this table with electricity generation and distribution losses included.

^b Due to changes in the FHWA fuel use methodology, motorcycle, bus, and heavy truck data are not comparable with data before the year 2007. Car and light truck data changed after 2008; see Appendix A for car/light truck shares.

About 19% of transportation energy use is for nonhighway modes. Air travel accounts for 47% of nonhighway energy use. See Table 1.16 for nonhighway petroleum use in thousand barrels per day.

Table 2.10
Nonhighway Transportation Energy Consumption by Mode, 1970–2018
(trillion Btu)

| Year | Air | Water | Pipeline | Rail | Nonhighway subtotal | Total transportation ^a |
|-----------|---|-------|----------|-------|---------------------|-----------------------------------|
| 1970 | 1,287 | 836 | 826 | 537 | 3,486 | 15,192 |
| 1975 | 1,234 | 927 | 680 | 540 | 3,381 | 17,204 |
| 1980 | 1,434 | 1,393 | 734 | 570 | 4,130 | 18,760 |
| 1985 | 1,677 | 871 | 597 | 468 | 3,613 | 19,017 |
| 1986 | 1,823 | 1,323 | 578 | 454 | 4,178 | 20,086 |
| 1987 | 1,899 | 1,378 | 613 | 464 | 4,354 | 20,578 |
| 1988 | 1,978 | 1,417 | 712 | 476 | 4,583 | 21,131 |
| 1989 | 1,981 | 1,516 | 729 | 478 | 4,705 | 21,487 |
| 1990 | 2,046 | 1,442 | 760 | 471 | 4,719 | 21,383 |
| 1991 | 1,916 | 1,523 | 699 | 442 | 4,580 | 20,985 |
| 1992 | 1,945 | 1,599 | 685 | 455 | 4,684 | 21,646 |
| 1993 | 1,986 | 1,437 | 723 | 469 | 4,615 | 22,125 |
| 1994 | 2,075 | 1,394 | 787 | 502 | 4,758 | 22,729 |
| 1995 | 2,141 | 1,468 | 803 | 523 | 4,935 | 23,263 |
| 1996 | 2,206 | 1,411 | 814 | 536 | 4,967 | 23,773 |
| 1997 | 2,300 | 1,250 | 856 | 537 | 4,943 | 24,126 |
| 1998 | 2,275 | 1,232 | 735 | 540 | 4,782 | 24,461 |
| 1999 | 2,483 | 1,370 | 745 | 560 | 5,158 | 25,760 |
| 2000 | 2,554 | 1,455 | 742 | 559 | 5,311 | 26,071 |
| 2001 | 2,397 | 1,187 | 724 | 561 | 4,870 | 25,741 |
| 2002 | 2,229 | 1,246 | 768 | 563 | 4,805 | 26,329 |
| 2003 | 2,260 | 1,071 | 689 | 575 | 4,594 | 26,509 |
| 2004 | 2,456 | 1,293 | 662 | 607 | 5,018 | 26,965 |
| 2005 | 2,532 | 1,363 | 681 | 613 | 5,190 | 27,373 |
| 2006 | 2,511 | 1,442 | 681 | 626 | 5,260 | 27,546 |
| 2007 | 2,509 | 1,550 | 720 | 610 | 5,389 | 29,004 |
| 2008 | 2,396 | 1,444 | 748 | 586 | 5,174 | 28,365 |
| 2009 | 2,127 | 1,323 | 771 | 492 | 4,714 | 26,878 |
| 2010 | 2,149 | 1,460 | 775 | 533 | 4,918 | 26,949 |
| 2011 | 2,157 | 1,362 | 790 | 560 | 4,869 | 26,357 |
| 2012 | 2,077 | 1,148 | 835 | 549 | 4,610 | 25,966 |
| 2013 | 2,037 | 1,017 | 942 | 562 | 4,558 | 25,868 |
| 2014 | 2,060 | 876 | 803 | 587 | 4,326 | 25,949 |
| 2015 | 2,118 | 1,005 | 780 | 563 | 4,465 | 26,084 |
| 2016 | 2,178 | 1,116 | 789 | 520 | 4,603 | 26,485 |
| 2017 | 2,231 | 1,130 | 825 | 537 | 4,724 | 26,592 |
| 2018 | 2,358 | 1,120 | 973 | 559 | 5,011 | 26,812 |
| | <i>Average annual percentage change</i> | | | | | |
| 1970-2018 | 1.3% | 0.6% | 0.3% | 0.1% | 0.8% | 1.3% |
| 2008-2018 | -0.2% | -2.5% | 2.7% | -0.5% | -0.3% | -0.6% |

Note: Totals may not add due to rounding.

Source:

See Appendix A, Section 2.3 Nonhighway Energy Use.

^a Total transportation figures do not include military and off-highway energy use and may not include all possible uses of fuel for transportation (e.g., snowmobiles). Only end-use energy was counted for electricity. See Appendix C for this table with electricity generation and distribution losses included.

The Environmental Protection Agency's MOVES model estimates fuel use for different types of nonroad equipment and off-highway vehicles. MOVES nonroad base data were updated in model 2014b. Most of these vehicles/equipment use diesel fuel. Recreational equipment, such as off-highway motorcycles, snowmobiles, and all-terrain vehicles, are mainly fueled by gasoline.

Table 2.11 (Updated August 2021)
Off-Highway Transportation-Related Fuel Consumption, 2019
 (trillion Btu)

| | Gasoline | Diesel | LPG | CNG | Total |
|--|--------------|----------------|--------------|--------------|----------------|
| Agricultural equipment | | | | | |
| <i>Tractors, mowers, combines, balers, and other farm equipment which has utility in its movement.</i> | 8.2 | 527.0 | 0.0 | 1.6 | 536.8 |
| Airport ground equipment | 0.3 | 10.4 | 0.2 | ^a | 10.8 |
| Construction and mining equipment | | | | | |
| <i>Pavers, rollers, drill rigs, graders, backhoes, excavators, cranes, mining equipment</i> | 21.7 | 913.7 | 2.5 | 0.0 | 938.0 |
| Industrial equipment | | | | | |
| <i>Forklifts, terminal tractors, sweeper/scrubbers</i> | 51.6 | 268.2 | 229.9 | 35.1 | 584.7 |
| Logging equipment | | | | | |
| <i>Feller/buncher/skidder</i> | 1.1 | 18.5 | ^a | ^a | 19.6 |
| Railroad maintenance equipment | 0.2 | 3.3 | 0.0 | ^a | 3.5 |
| Recreational equipment | | | | | |
| <i>Off-road motorcycles, snowmobiles, all-terrain vehicles, golf carts, specialty vehicles</i> | 103.2 | 1.8 | 0.1 | ^a | 105.2 |
| Total | 186.3 | 1,742.9 | 232.7 | 36.6 | 2,198.5 |

Source:

Environmental Protection Agency, MOVES3.0.1, www.epa.gov/moves.

^a There is no equipment listed for this fuel type.

The Federal Highway Administration (FHWA) cautions that data from 1993 on may not be directly comparable to earlier years. Some states have improved reporting procedures in recent years, and the estimation procedures were revised in 1994. The FHWA no longer publishes separate estimates of gasohol or ethanol used in gasohol.

Table 2.12 (Updated April 2021)
Highway Usage of Gasoline and Diesel, 1973–2019
(billion gallons)

| Year | Total gasoline and gasohol | Diesel ^a | Percent diesel | Total highway fuel use |
|-----------|----------------------------|---|----------------|------------------------|
| 1973 | 100.6 | 9.8 | 8.9% | 110.5 |
| 1975 | 99.4 | 9.6 | 8.8% | 109.0 |
| 1980 | 101.2 | 13.8 | 12.0% | 115.0 |
| 1985 | 103.6 | 17.8 | 14.6% | 121.3 |
| 1986 | 106.8 | 18.4 | 14.7% | 125.2 |
| 1987 | 108.7 | 19.0 | 14.9% | 127.7 |
| 1988 | 109.8 | 20.1 | 15.5% | 129.9 |
| 1989 | 110.6 | 21.2 | 16.1% | 131.9 |
| 1990 | 110.2 | 21.4 | 16.3% | 131.6 |
| 1991 | 107.9 | 20.7 | 16.1% | 128.6 |
| 1992 | 111.0 | 22.0 | 16.5% | 132.9 |
| 1993 | 113.7 | 23.5 | 17.1% | 137.2 |
| 1994 | 115.0 | 25.1 | 17.9% | 140.1 |
| 1995 | 117.1 | 26.2 | 18.3% | 143.3 |
| 1996 | 119.5 | 27.2 | 18.5% | 146.7 |
| 1997 | 120.9 | 29.4 | 19.6% | 150.3 |
| 1998 | 124.7 | 30.2 | 19.5% | 154.9 |
| 1999 | 128.7 | 31.9 | 19.9% | 160.7 |
| 2000 | 128.9 | 33.4 | 20.6% | 162.3 |
| 2001 | 129.7 | 33.4 | 20.5% | 163.1 |
| 2002 | 133.0 | 34.8 | 20.7% | 167.8 |
| 2003 | 134.1 | 35.5 | 20.9% | 169.6 |
| 2004 | 136.5 | 37.4 | 21.5% | 173.9 |
| 2005 | 135.2 | 39.1 | 22.4% | 174.3 |
| 2006 | 134.8 | 40.1 | 22.9% | 174.9 |
| 2007 | 135.4 | 40.7 | 23.1% | 176.1 |
| 2008 | 132.2 | 38.6 | 22.6% | 170.8 |
| 2009 | 132.9 | 35.3 | 21.0% | 168.1 |
| 2010 | 133.1 | 36.6 | 21.6% | 169.7 |
| 2011 | 131.5 | 37.1 | 22.0% | 168.6 |
| 2012 | 130.9 | 37.4 | 22.2% | 168.3 |
| 2013 | 131.3 | 38.4 | 22.6% | 169.7 |
| 2014 | 136.5 | 39.7 | 22.5% | 176.2 |
| 2015 | 132.2 | 40.5 | 23.5% | 172.9 |
| 2016 | 136.3 | 41.6 | 23.4% | 177.9 |
| 2017 | 135.3 | 42.7 | 24.0% | 177.9 |
| 2018 | 137.2 | 43.5 | 24.1% | 180.7 |
| 2019 | 136.1 | 43.9 | 24.4% | 180.0 |
| | | <i>Average annual percentage change</i> | | |
| 1973-2019 | 0.7% | 3.3% | | 1.1% |
| 2009-2019 | 0.2% | 2.2% | | 0.7% |

Source:

U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2019*, Washington, DC, 2021, Table MF-27 and annual. (Additional resources: www.fhwa.dot.gov)

^a Consists primarily of diesel fuel, with small quantities of other fuels, such as liquefied petroleum gas and E85.

Great care should be taken when comparing modal energy intensity data among modes. Because of the inherent differences among the transportation modes in the nature of services, routes available, and many additional factors, it is not possible to obtain truly comparable national energy intensities among modes. These values are averages, and there is a great deal of variability even within a mode.

Table 2.13
Passenger Travel and Energy Use, 2018^a

| | Number of vehicles (thousands) | Vehicle-miles (millions) | Passenger-miles (millions) | Load factor (persons/vehicle) | Energy intensities | | Energy use (trillion Btu) |
|------------------------------------|--------------------------------|--------------------------|----------------------------|-------------------------------|------------------------|--------------------------|---------------------------|
| | | | | | (Btu per vehicle-mile) | (Btu per passenger-mile) | |
| Cars | 111,242.1 | 1,419,571 | 2,186,139 | 1.5 | 4,374 | 2,840 | 6,209.2 |
| Personal trucks | 3,678.4 | 1,235,245 | 2,248,145 | 1.8 | 5,966 | 3,278 | 7,369.4 |
| Motorcycles | 8,666.2 | 20,076 | 24,091 | 1.2 | 2,843 | 2,369 | 57.1 |
| Demand response^b | 70.1 | 1,702 | 1,821 | 1.1 | 15,687 | 14,660 | 26.7 |
| Buses | ^b | ^b | ^b | ^b | ^b | ^b | 217.9 |
| Transit | 72.3 | 2,543 | 19,559 | 7.7 | 35,075 | 4,560 | 89.2 |
| Intercity ^d | ^b | ^b | ^b | ^b | ^b | ^b | 37.3 |
| School ^d | 708.8 | ^b | ^b | ^b | ^b | ^b | 91.4 |
| Air | ^b | ^b | ^b | ^b | ^b | ^b | 1,965.4 |
| Certificated route ^c | ^b | 6,092 | 722,935 | 118.7 | 277,822 | 2,341 | 1,692.6 |
| General aviation | 215.4 | ^b | ^b | ^b | ^b | ^b | 272.8 |
| Recreational boats | 12,568.5 | ^b | ^b | ^b | ^b | ^b | 212.1 |
| Rail | 20.7 | 1,475 | 38,449 | 26.1 | 31,639 | 1,214 | 46.7 |
| Intercity (Amtrak) | 0.4 | 273 | 6,363 | 23.3 | 36,708 | 1,535 | 10.0 ^f |
| Transit | 13.0 | 826 | 19,452 | 23.5 | 19,871 | 844 | 16.4 |
| Commuter | 7.2 | 377 | 12,634 | 33.6 | 53,794 | 1,603 | 20.3 |

Source:

See Appendix A, Section 3. Passenger Travel and Energy Use.

^a Only end-use energy was counted for electricity. See Appendix C for this table with electricity generation and distribution losses included.

^b Includes passenger cars, vans, and small buses operating in response to calls from passengers to the transit operator who dispatches the vehicles.

^c Data are not available.

^d Energy use is estimated.

^e Only domestic service and domestic energy use are shown on this table. These energy intensities may be inflated because all energy use is attributed to passengers—cargo energy use is not taken into account.

^f Data for 2018 were not available. Data for 2017 are shown.

Great care should be taken when comparing modal energy intensity data among modes. Because of the inherent differences among the transportation modes in the nature of services, routes available, and many additional factors, it is not possible to obtain truly comparable national energy intensities among modes. These values are averages, and there is a great deal of variability even within a mode.

Table 2.14
Energy Intensities of Highway Passenger Modes, 1970–2018

| Year | Cars | | Light trucks ^b | | Transit Buses ^c | |
|---|------------------------|--------------------------|---------------------------|--------------------------|----------------------------|--------------------------|
| | (Btu per vehicle-mile) | (Btu per passenger-mile) | (Btu per vehicle-mile) | (Btu per passenger-mile) | (Btu per vehicle-mile) | (Btu per passenger-mile) |
| 1970 | 9,250 | 4,868 | 12,479 | 6,568 | 31,796 | 2,472 |
| 1975 | 8,993 | 4,733 | 11,879 | 6,496 | 33,748 | 2,814 |
| 1980 | 7,916 | 4,279 | 10,224 | 5,548 | 36,553 | 2,813 |
| 1985 | 7,164 | 4,110 | 8,730 | 4,737 | 38,876 | 3,423 |
| 1990 | 6,169 | 3,856 | 7,746 | 4,557 | 37,374 | 3,794 |
| 1991 | 5,912 | 3,695 | 7,351 | 4,376 | 37,732 | 3,877 |
| 1992 | 5,956 | 3,723 | 7,239 | 4,361 | 40,243 | 4,310 |
| 1993 | 6,087 | 3,804 | 7,182 | 4,379 | 39,043 | 4,262 |
| 1994 | 6,024 | 3,765 | 7,212 | 4,452 | 36,932 | 4,225 |
| 1995 | 5,902 | 3,689 | 7,208 | 4,505 | 36,936 | 4,271 |
| 1996 | 5,874 | 3,683 | 7,247 | 4,473 | 37,238 | 4,315 |
| 1997 | 5,797 | 3,646 | 7,251 | 4,421 | 38,622 | 4,407 |
| 1998 | 5,767 | 3,638 | 7,260 | 4,373 | 41,062 | 4,374 |
| 1999 | 5,821 | 3,684 | 7,327 | 4,361 | 40,351 | 4,320 |
| 2000 | 5,687 | 3,611 | 7,158 | 4,211 | 41,466 | 4,506 |
| 2001 | 5,626 | 3,583 | 7,080 | 4,116 | 38,320 | 4,123 |
| 2002 | 5,662 | 3,612 | 7,125 | 4,101 | 37,340 | 4,110 |
| 2003 | 5,535 | 3,537 | 7,673 | 4,374 | 36,900 | 4,191 |
| 2004 | 5,489 | 3,513 | 7,653 | 4,320 | 37,665 | 4,342 |
| 2005 | 5,607 | 3,594 | 7,009 | 3,919 | 37,244 | 4,229 |
| 2006 | 5,511 | 3,538 | 6,974 | 3,862 | 39,397 | 4,297 |
| 2007 | 5,513 | 3,546 | 6,904 | 3,787 | 39,748 | 4,352 |
| 2008 | 5,466 | 3,520 | 6,830 | 3,712 | 39,726 | 4,328 |
| 2009 | 5,239 | 3,380 | 7,159 | 3,895 | 39,073 | 4,233 |
| 2010 | 5,117 | 3,304 | 6,919 | 3,769 | 35,858 | 4,107 |
| 2011 | 5,032 | 3,252 | 6,795 | 3,706 | 37,648 | 4,232 |
| 2012 | 4,950 | 3,201 | 6,675 | 3,645 | 37,037 | 4,023 |
| 2013 | 4,874 | 3,155 | 6,557 | 3,585 | 37,273 | 4,052 |
| 2014 | 4,797 | 3,107 | 6,631 | 3,630 | 35,237 | 3,810 |
| 2015 | 4,646 | 3,012 | 6,486 | 3,555 | 36,322 | 4,059 |
| 2016 | 4,525 | 2,936 | 6,366 | 3,494 | 36,826 | 4,283 |
| 2017 | 4,450 | 2,890 | 6,169 | 3,389 | 36,468 | 4,535 |
| 2018 | 4,374 | 2,840 | 6,166 | 3,388 | 35,075 | 4,560 |
| <i>Average annual percentage change</i> | | | | | | |
| 1970-2018 | -1.5% | -1.1% | -1.5% | -1.4% | 0.2% | 1.3% |
| 2008-2018 | -2.2% | -2.1% | -1.0% | -0.9% | -1.2% | 0.5% |

Source:

See Appendix A, Section 4. Highway Passenger Mode Energy Intensities.

^a Only end-use energy was counted for electricity. See Appendix C for this table with electricity generation and distribution losses included.

^b All two-axle, four-tire trucks.

^c Series not continuous between 1983 and 1984 because of a change in data source by the American Public Transportation Association (APTA).

Great care should be taken when comparing modal energy intensity data among modes. Because of the inherent differences between the transportation modes in the nature of services, routes available, and many additional factors, it is not possible to obtain truly comparable national energy intensities among modes.

Table 2.15
Energy Intensities of Nonhighway Passenger Modes, 1970–2018^a

| Year | Air | Intercity Amtrak (Btu per passenger-mile) | Rail | |
|-----------|---|---|---|--|
| | Certificated air carriers ^b (Btu per passenger-mile) | | Rail transit (Btu per passenger-mile) | Commuter rail (Btu per passenger-mile) |
| 1970 | 10,115 | ^c | 712 | ^c |
| 1975 | 7,625 | 3,311 | 866 | ^c |
| 1980 | 5,561 | 2,859 | 763 | ^c |
| 1985 | 5,053 | 2,237 | 927 | 1,720 |
| 1986 | 5,011 | 2,037 | 1,004 | 1,720 |
| 1987 | 4,827 | 1,989 | 1,003 | 1,628 |
| 1988 | 4,861 | 1,967 | 1,014 | 1,666 |
| 1989 | 4,844 | 2,082 | 960 | 1,622 |
| 1990 | 4,797 | 2,052 | 998 | 1,622 |
| 1991 | 4,602 | 2,011 | 1,074 | 1,601 |
| 1992 | 4,455 | 2,117 | 1,041 | 1,565 |
| 1993 | 4,490 | 2,142 | 1,113 | 1,782 |
| 1994 | 4,407 | 1,917 | 1,102 | 1,605 |
| 1995 | 4,349 | 2,071 | 1,102 | 1,580 |
| 1996 | 4,199 | 2,194 | 996 | 1,541 |
| 1997 | 4,173 | 2,289 | 943 | 1,630 |
| 1998 | 3,987 | 2,246 | 931 | 1,612 |
| 1999 | 4,108 | 2,362 | 919 | 1,670 |
| 2000 | 3,960 | 2,651 | 923 | 1,542 |
| 2001 | 3,943 | 2,690 | 925 | 1,533 |
| 2002 | 3,718 | 2,537 | 948 | 1,542 |
| 2003 | 3,614 | 2,145 | 936 | 1,542 |
| 2004 | 3,505 | 2,068 | 907 | 1,536 |
| 2005 | 3,346 | 2,025 | 919 | 1,658 |
| 2006 | 3,250 | 1,948 | 893 | 1,539 |
| 2007 | 3,153 | 1,824 | 851 | 1,543 |
| 2008 | 3,055 | 1,745 | 832 | 1,579 |
| 2009 | 2,901 | 1,773 | 830 | 1,714 |
| 2010 | 2,825 | 1,668 | 832 | 1,753 |
| 2011 | 2,772 | 1,628 | 812 | 1,681 |
| 2012 | 2,633 | 1,561 | 791 | 1,703 |
| 2013 | 2,568 | 1,608 | 793 | 1,676 |
| 2014 | 2,506 | 1,629 | 786 | 1,638 |
| 2015 | 2,477 | 1,589 | 777 | 1,661 |
| 2016 | 2,449 | 1,551 | 761 | 1,705 |
| 2017 | 2,415 | 1,524 | 788 | 1,657 |
| 2018 | 2,408 | 1,535 ^d | 844 | 1,603 |
| | | <i>Average annual percentage change^e</i> | | |
| 1970-2018 | -2.9% | -1.7% | 0.4% | -0.3% |
| 2008-2018 | -2.4% | -1.3% | 0.1% | 0.2% |

Source:

See Appendix A, Section 5. Nonhighway Passenger Mode Energy Intensities.

^a Only end-use energy was counted for electricity. See Appendix C for this table with electricity generation and distribution losses included.

^b These data differ from the data on Table 2.13 because they include half of international services. These energy intensities may be inflated because all energy use is attributed to passengers—cargo energy use is not taken into account.

^c Data are not available.

^d Energy data for 2018 were not available, thus were assumed to be the same as 2017.

^e Average annual percentage calculated to earliest year possible.

Great care should be taken when comparing modal energy intensity data among modes. Because of the inherent differences between the transportation modes in the nature of services, routes available, and many additional factors, it is not possible to obtain truly comparable national energy intensities among modes.

Table 2.16
Energy Intensities of Freight Modes, 1970–2018

| Year | Heavy single-unit and combination trucks (Btu per vehicle-mile) | Class I freight railroad | | Waterborne commerce on taxable waterways (Btu per ton-mile) |
|---|---|----------------------------|--------------------|---|
| | | (Btu per freight car-mile) | (Btu per ton-mile) | |
| 1970 | 24,960 | 17,669 | 691 | a |
| 1975 | 24,631 | 18,739 | 687 | a |
| 1980 | 24,758 | 18,742 | 597 | a |
| 1985 | 23,343 | 17,500 | 497 | a |
| 1986 | 23,352 | 17,265 | 486 | a |
| 1987 | 22,923 | 16,790 | 456 | a |
| 1988 | 22,596 | 16,758 | 443 | a |
| 1989 | 22,411 | 16,894 | 437 | a |
| 1990 | 22,795 | 16,619 | 420 | a |
| 1991 | 22,749 | 15,835 | 391 | a |
| 1992 | 22,609 | 16,043 | 393 | a |
| 1993 | 22,373 | 16,056 | 389 | a |
| 1994 | 22,193 | 16,340 | 388 | a |
| 1995 | 22,097 | 15,992 | 372 | a |
| 1996 | 22,109 | 15,747 | 368 | a |
| 1997 | 21,340 | 15,784 | 370 | 266 |
| 1998 | 21,516 | 15,372 | 365 | 256 |
| 1999 | 22,884 | 15,363 | 363 | 266 |
| 2000 | 23,449 | 14,917 | 352 | 270 |
| 2001 | 23,024 | 15,108 | 346 | 253 |
| 2002 | 23,462 | 15,003 | 345 | 253 |
| 2003 | 22,461 | 15,016 | 344 | 251 |
| 2004 | 20,540 | 15,274 | 341 | 241 |
| 2005 | 22,866 | 15,152 | 337 | 241 |
| 2006 | 23,340 ^b | 14,990 | 330 | 235 |
| 2007 | 28,452 | 14,846 | 320 | 225 |
| 2008 | 28,695 | 14,573 | 305 | 252 |
| 2009 | 21,024 | 13,907 | 291 | 225 |
| 2010 | 21,499 | 13,733 | 289 | 217 |
| 2011 | 21,677 | 14,043 | 298 | 211 |
| 2012 | 21,524 | 13,800 | 294 | 211 |
| 2013 | 21,540 | 14,607 | 296 | 233 |
| 2014 | 21,573 | 14,533 | 292 | 214 |
| 2015 | 21,382 | 14,405 | 297 | a |
| 2016 | 21,335 | 14,557 | 299 | a |
| 2017 | 21,132 | 14,400 | 293 | a |
| 2018 | 20,826 | 14,644 | 296 | a |
| <i>Average annual percentage change</i> | | | | |
| 1970-2018 | -0.4% | -0.4% | -1.7% | a |
| 2008-2018 | -3.2% | 0.0% | -0.3% | a |

Source:

See Appendix A, Section 6. Freight Mode Energy Intensities.

^a Data are not available.

^b Due to changes in the FHWA fuel use methodology, truck data are not comparable with data before the year 2007.

Chapter 3

All Highway Vehicles and Characteristics

Summary Statistics from Tables in this Chapter

| Source | | |
|-------------|---|-----------|
| Table 3.2 | U.S. share of world car registrations, 2019 | 11.8% |
| Table 3.3 | U.S. share of world truck & bus registrations, 2019 | 40.7% |
| Table 3.4 | Number of U.S. cars, 2018 (thousands) | 111,242 |
| Table 3.4 | Number of U.S. trucks, 2018 (thousands) | 152,702 |
| Table 3.9 | Vehicle miles traveled, 2019 (million miles) | 3,261,772 |
| | <i>Cars</i> | 42.1% |
| | <i>Two-axle, four-tire trucks</i> | 47.5% |
| | <i>Combination trucks</i> | 5.4% |
| | <i>Other single-unit trucks</i> | 3.8% |
| | <i>Motorcycles</i> | 0.6% |
| | <i>Buses</i> | 0.6% |
| Table 3.133 | Average age of vehicles, 2018 | |
| | <i>Cars (years)</i> | 11.9 |
| | <i>Light trucks (years)</i> | 11.7 |
| | <i>All light vehicles (years)</i> | 11.8 |

The top countries producing the world's cars and trucks have changed over the last 18 years. In 2020, China was the largest producer of cars and trucks. In 2000, Japan produced the most cars and the United States produced the most trucks (includes light trucks). Car production in 2020 was less than in 2000 likely due to two reasons -- sport utility vehicles becoming more popular than automobiles in some countries and the 2020 pandemic.

Table 3.1 (Updated August 2021)
World Production of Cars and Trucks, 2000 and 2020
 (thousands)

| Cars | 2000 | 2020 | Percent change 2000-2020 |
|---------------------|---------------|---------------|-----------------------------|
| China | 605 | 10,149 | 1578% |
| Japan | 8,363 | 6,960 | -17% |
| Germany | 5,132 | 3,515 | -31% |
| U.S. | 5,542 | 1,924 | -65% |
| Spain | 2,366 | 1,801 | -24% |
| India | 605 | 1,707 | 182% |
| Brazil | 1,362 | 1,609 | 18% |
| Russia | 969 | 1,257 | 30% |
| Czech Republic | 428 | 1,153 | 169% |
| South Korea | 1,881 | 1,148 | -39% |
| Slovakia | 123 | 970 | 689% |
| Mexico | 1,130 | 951 | -16% |
| France | 2,880 | 920 | -68% |
| UK | 1,641 | 890 | -46% |
| Turkey | 297 | 855 | 187% |
| All Other Countries | 7,903 | 5,170 | -35% |
| Total World | 41,229 | 40,979 | -1% |

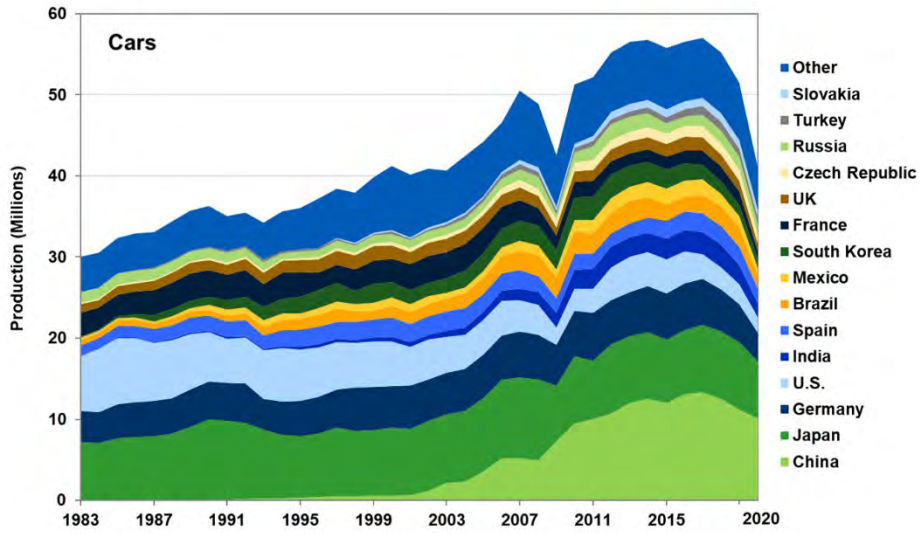
| Trucks ^a | 2000 | 2020 | Percent change 2000-2020 |
|---------------------|---------------|---------------|-----------------------------|
| China | 1,464 | 15,076 | 929% |
| U.S. | 7,263 | 6,897 | -5% |
| South Korea | 512.99 | 2,359 | 360% |
| Mexico | 792.401 | 2,208 | 179% |
| India | 283.403 | 1,687 | 495% |
| Japan | 1,781 | 1,108 | -38% |
| Canada | 1,411 | 1,048 | -26% |
| Thailand | 315 | 889 | 182% |
| All Other Countries | 3,893 | 4,129 | 6% |
| Total World | 17,717 | 35,400 | 100% |

Source:

Ward's Communications, www.wardsauto.com.

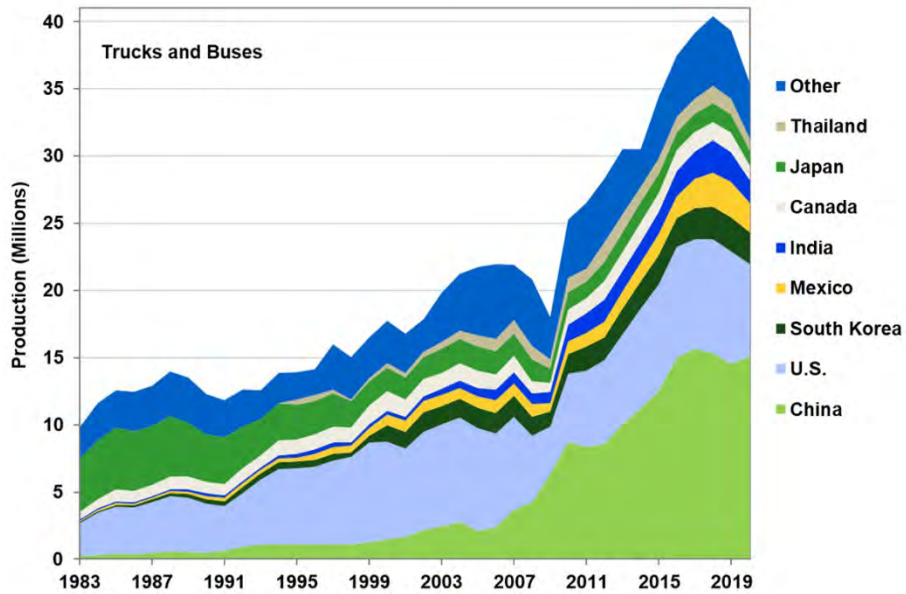
^a Includes light trucks, heavy trucks, and buses.

Figure 3.1. World Car Production, 1983–2020^a (Updated August 2021)



Source:
See Table 3.1.

Figure 3.2. World Truck and Bus Production, 1983–2020^a (Updated August 2021)



Source:
See Table 3.1.

^a The sharp decrease in 2009 coincides with the recession. Note that the scales of the two figures differ.

Use caution comparing historical data because of disconnects in data series and definitional differences among countries. The United States uses light trucks (SUVs, minivans, pickups) for personal travel which are not counted as cars in this table. China's light trucks were not counted in this table until 2014, when a reclassification of vehicle types added them as cars. The U.S. share of world cars continued to be below 12%. The growth in the World total comes mainly from developing countries, like China, Indonesia, India, and South Korea.

Table 3.2 (Updated August 2021)
Car Registrations for Selected Countries, 1960–2019
(thousands)

| Country | 1960 | 1970 | 1980 | 1990 | 2000 | 2005 | 2010 | 2015 | 2019 | Average annual percentage change 1990-2019 |
|--------------------------|--------|---------|---------|---------|---------|---------|---------|---------|-----------|--|
| Argentina | 474 | 1,482 | 3,112 | 4,284 | 5,060 | 5,340 | 7,605 | 10,403 | 11,067 | 3.3% |
| Brazil | a | a | a | 12,127 | 15,393 | 18,370 | 25,541 | 35,471 | 37,720 | 4.0% |
| Canada ^b | 4,104 | 6,602 | 10,256 | 12,622 | 16,832 | 18,124 | 20,121 | 22,068 | 23,600 | 2.2% |
| China ^c | a | a | 351 | 1,897 | 3,750 | 8,900 | 34,430 | 146,800 | 212,395 | 17.7% |
| France | 4,950 | 11,860 | 18,440 | 23,550 | 28,060 | 30,100 | 31,300 | 32,000 | 32,125 | 1.1% |
| Germany ^d | 4,856 | 14,376 | 23,236 | 35,512 | 43,772 | 46,090 | 42,302 | 45,071 | 47,716 | 1.0% |
| India | a | a | a | 2,300 | 5,150 | 7,654 | 13,300 | 26,065 | 34,504 | 9.8% |
| Indonesia | a | a | a | 1,200 | a | 3,850 | 8,891 | 13,846 | 17,238 | 9.6% |
| Japan | 457 | 8,779 | 23,660 | 34,924 | 52,437 | 57,091 | 58,347 | 60,987 | 62,140 | 2.0% |
| Malaysia | a | a | a | 1,811 | 4,213 | 6,402 | 9,115 | 11,279 | 16,382 | 7.9% |
| Pakistan | a | a | a | 738 | 375 | 411 | 1,726 | 2,807 | 3,355 | 5.4% |
| Russia | a | a | a | a | 20,353 | 25,285 | 34,350 | 41,000 | 52,956 | 5.2% |
| South Korea | a | a | a | 2,075 | 8,084 | 11,122 | 13,632 | 16,562 | 19,129 | 8.0% |
| United Kingdom | 5,650 | 11,802 | 15,438 | 22,528 | 27,185 | 30,652 | 31,258 | 33,542 | 35,732 | 1.6% |
| United States | 61,671 | 89,244 | 121,601 | 143,550 | 127,721 | 132,909 | 129,053 | 122,322 | 121,231 | -0.6% |
| U.S. percentage of world | 62.7% | 46.1% | 38.0% | 32.3% | 23.3% | 21.5% | 17.8% | 13.1% | 11.8% | |
| World total | 98,305 | 193,479 | 320,390 | 444,900 | 548,558 | 617,914 | 723,567 | 931,260 | 1,083,528 | 3.1% |

Source:

Ward's Communications, www.wardsauto.com.

^a Data are not available.

^b Data from 2000 and later are not comparable to prior data. Canada reclassified autos and trucks prior to 2000.

^c Light trucks were reclassified into the car category in 2014.

^d Data for 1990 and prior include West Germany only. Kraftwagen are included with automobiles.

^e Data for earliest year available.

Use caution comparing historical data because of disconnects in data series and definitional differences among countries. The United States totals include SUVs, minivans, and light trucks, many of which are used for personal travel. Thus, countries that only use trucks for freight movement will not be comparable to the United States. China's light trucks were included in this table until a reclassification in 2014.

Table 3.3 (Updated August 2021)
Truck and Bus Registrations for Selected Countries, 1960–2019
 (thousands)

| Country | 1960 | 1970 | 1980 | 1990 | 2000 | 2005 | 2010 | 2015 | 2019 | Average annual percentage change 1990-2019 |
|--------------------------|--------|--------|--------|---------|---------|---------|---------|---------|---------|--|
| Argentina | 392 | 788 | 1,217 | 1,501 | 1,554 | 1,730 | 2,511 | 3,305 | 3,576 | 3.0% |
| Brazil | a | a | a | 936 | 3,917 | 4,653 | 6,524 | 7,272 | 7,759 | 7.6% |
| Canada ^b | 1,056 | 1,481 | 2,955 | 3,931 | 739 | 786 | 933 | 1,147 | 1,221 | -4.0% |
| China ^c | a | a | 1,480 | 4,314 | 9,650 | 21,750 | 43,590 | 25,200 | 41,485 | 8.1% |
| France | 1,650 | 1,850 | 2,550 | 4,910 | 5,733 | 6,198 | 6,444 | 6,652 | 8,127 | 1.8% |
| Germany ^d | 786 | 1,228 | 1,617 | 2,764 | 3,534 | 3,133 | 2,960 | 3,356 | 3,890 | 1.2% |
| India | a | a | a | 2,050 | 2,390 | 4,145 | 9,500 | 18,447 | 26,827 | 9.3% |
| Indonesia | a | a | a | 1,391 | 2,373 | 2,950 | 6,938 | 9,238 | 10,549 | 7.2% |
| Japan | 896 | 8,803 | 14,197 | 22,773 | 20,211 | 16,734 | 15,512 | 14,503 | 14,529 | -1.5% |
| Malaysia | a | a | a | 616 | 1,030 | 1,323 | 1,138 | 1,335 | 1,676 | 3.5% |
| Pakistan | a | a | a | 172 | 385 | 414 | 538 | 678 | 779 | 5.3% |
| Russia | a | a | a | 7,200 | 5,041 | 5,705 | 6,304 | 8,000 | 8,968 | 0.8% |
| South Korea | a | a | a | 1,320 | 3,956 | 4,275 | 4,310 | 4,428 | 4,505 | 4.3% |
| United Kingdom | 1,534 | 1,769 | 1,920 | 3,774 | 3,361 | 3,943 | 4,220 | 4,677 | 5,277 | 1.2% |
| United States | 12,186 | 19,175 | 34,195 | 45,106 | 85,579 | 104,788 | 119,179 | 141,872 | 165,653 | 4.6% |
| U.S. percentage of world | 42.6% | 36.2% | 37.7% | 32.7% | 42.1% | 42.6% | 38.5% | 42.7% | 40.7% | |
| World total | 28,583 | 52,899 | 90,592 | 138,082 | 203,272 | 245,798 | 309,395 | 332,434 | 406,770 | 3.8% |

Source:

Ward's Communications, www.wardsauto.com.

^a Data are not available.

^b Data from 2000 and later are not comparable to prior data. Canada reclassified autos and trucks prior to 2000.

^c Light trucks were reclassified into the car category in 2014.

^d Data for 1990 and prior include West Germany only. Kraftwagen are included with automobiles.

VEHICLES IN USE

Both the Federal Highway Administration (FHWA) and IHS Automotive report figures on the car and truck population each year. The two estimates, however, differ by as much as 11.2% (1981). The differences can be attributed to several factors:

- The FHWA data include all vehicles which have been registered at any time throughout the calendar year. Therefore, the data include vehicles which were retired during the year and may double count vehicles which have been registered in different states or the same states to different owners. IHS Automotive data include only those vehicles which are registered on July 1 of the given year and would not include vehicles registered after that date.
- The classification of mini-vans, station wagons on truck chassis, and utility vehicles as cars or trucks causes important differences in the two estimates. IHS Automotive data included passenger vans in the car count until 1980; since 1980 all vans have been counted as trucks.
- Starting in 1993, the FHWA reclassified some minivans and sport utility vehicles into the truck category which were previously included with cars. This change produced a dramatic change in the individual percentage differences of cars and trucks. The difference in total vehicles has been less than 5% each year since 1990 and does not appear to be significantly affected by the FHWA reclassifications. Beginning with 2009, the FHWA discontinued the car/2-axle, 4-tire truck designations on Table VM-1. The data since 2009 come from Tables MV-1 and MV-9.
- The FHWA data include all non-military Federal vehicles, while IHS Automotive data include only those Federal vehicles which are registered within a state. Federal vehicles are not required to have State registrations, and, according to the General Services Administration, most Federal vehicles are not registered.
- In 2012 both IHS Automotive and FHWA changed their methodologies for the car/light truck split which created a significant decrease in the number of cars reported and a corresponding increase in the number of light trucks.

In the early 1980's, researchers had to make a conscious choice of which data series to use, since they differed by as much as 11%. In 2005 the two sources differed by less than 1%. Both sources changed their methodologies for the car/light truck split causing significant decreases to the number of cars in 2012.

Table 3.4
U.S. Cars and Trucks in Use, 1970–2018
(thousands)

| Year | Cars | | | Trucks | | | Total | | |
|------|---------|----------------|-----------------------|---------|----------------|-----------------------|---------|----------------|-----------------------|
| | FHWA | IHS Automotive | Percentage difference | FHWA | IHS Automotive | Percentage difference | FHWA | IHS Automotive | Percentage difference |
| 1970 | 89,243 | 80,448 | 10.9% | 18,797 | 17,688 | 6.3% | 108,040 | 98,136 | 10.1% |
| 1975 | 106,706 | 95,241 | 12.0% | 25,781 | 24,813 | 3.9% | 132,487 | 120,054 | 10.4% |
| 1980 | 121,601 | 104,564 | 16.3% | 33,667 | 35,268 | -4.5% | 155,267 | 139,832 | 11.0% |
| 1985 | 127,885 | 114,662 | 11.5% | 43,210 | 42,387 | 1.9% | 171,095 | 157,049 | 8.9% |
| 1986 | 130,004 | 117,268 | 10.9% | 45,103 | 44,826 | 0.6% | 175,106 | 162,094 | 8.0% |
| 1987 | 131,482 | 119,849 | 9.7% | 46,826 | 47,344 | -1.1% | 178,308 | 167,193 | 6.6% |
| 1988 | 133,836 | 121,519 | 10.1% | 49,941 | 50,221 | -0.6% | 183,777 | 171,740 | 7.0% |
| 1989 | 134,559 | 122,758 | 9.6% | 52,172 | 53,202 | -1.9% | 186,731 | 175,960 | 6.1% |
| 1990 | 133,700 | 123,276 | 8.5% | 54,470 | 56,023 | -2.8% | 188,171 | 179,299 | 4.9% |
| 1991 | 128,300 | 123,268 | 4.1% | 59,206 | 58,179 | 1.8% | 187,505 | 181,447 | 3.3% |
| 1992 | 126,581 | 120,347 | 5.2% | 63,136 | 61,172 | 3.2% | 189,717 | 181,519 | 4.5% |
| 1993 | 127,327 | 121,055 | 5.2% | 66,082 | 65,260 | 1.3% | 193,409 | 186,315 | 3.8% |
| 1994 | 127,883 | 121,997 | 4.8% | 69,491 | 66,717 | 4.2% | 197,375 | 188,714 | 4.6% |
| 1995 | 128,387 | 123,242 | 4.2% | 72,458 | 70,199 | 3.2% | 200,845 | 193,441 | 3.8% |
| 1996 | 129,728 | 124,613 | 4.1% | 75,940 | 73,681 | 3.1% | 205,669 | 198,294 | 3.7% |
| 1997 | 129,749 | 124,673 | 4.1% | 77,307 | 76,398 | 1.2% | 207,056 | 201,071 | 3.0% |
| 1998 | 131,839 | 125,966 | 4.7% | 79,062 | 79,077 | 0.0% | 210,901 | 205,043 | 2.9% |
| 1999 | 132,432 | 126,869 | 4.4% | 83,148 | 82,640 | 0.6% | 215,580 | 209,509 | 2.9% |
| 2000 | 133,621 | 127,721 | 4.6% | 87,108 | 85,579 | 1.8% | 220,729 | 213,300 | 3.5% |
| 2001 | 137,633 | 128,714 | 6.9% | 92,045 | 87,969 | 4.6% | 229,678 | 216,683 | 6.0% |
| 2002 | 135,921 | 129,907 | 4.6% | 92,939 | 91,120 | 2.0% | 228,860 | 221,027 | 3.5% |
| 2003 | 135,670 | 131,072 | 3.5% | 94,944 | 94,810 | 0.1% | 230,614 | 225,882 | 2.1% |
| 2004 | 136,431 | 132,469 | 3.0% | 100,016 | 99,698 | 0.3% | 236,447 | 232,167 | 1.8% |
| 2005 | 136,568 | 132,909 | 2.8% | 103,819 | 105,475 | -1.6% | 240,387 | 238,384 | 0.8% |
| 2006 | 135,400 | 135,047 | 0.3% | 107,944 | 109,596 | -1.5% | 243,344 | 244,643 | -0.5% |
| 2007 | 135,933 | 135,222 | 0.5% | 110,498 | 113,479 | -2.6% | 246,431 | 248,701 | -0.9% |
| 2008 | 137,080 | 135,882 | 0.9% | 110,242 | 113,931 | -3.2% | 247,322 | 249,813 | -1.0% |
| 2009 | 134,880 | 132,500 | 1.8% | 110,561 | 116,472 | -5.1% | 245,441 | 248,972 | -1.4% |
| 2010 | 130,892 | 129,053 | 1.4% | 110,322 | 119,179 | -7.4% | 241,214 | 248,232 | -2.8% |
| 2011 | 125,657 | 127,577 | -1.5% | 118,483 | 121,355 | -2.4% | 244,140 | 248,932 | -1.9% |
| 2012 | 111,290 | 120,902 | -8.0% | 133,130 | 130,595 | 1.9% | 244,420 | 251,497 | -2.8% |
| 2013 | 113,676 | 120,214 | -5.4% | 132,931 | 132,501 | 0.3% | 246,607 | 252,715 | -2.4% |
| 2014 | 113,899 | 120,984 | -5.9% | 137,531 | 137,043 | 0.4% | 251,430 | 258,027 | -2.6% |
| 2015 | 112,864 | 122,322 | -7.7% | 141,256 | 141,872 | -0.4% | 254,120 | 264,194 | -3.8% |
| 2016 | 112,961 | 123,553 | -8.6% | 146,182 | 147,014 | -0.6% | 259,144 | 270,566 | -4.2% |
| 2017 | 111,177 | 124,141 | -10.4% | 149,301 | 151,838 | -1.7% | 260,478 | 275,979 | -5.6% |
| 2018 | 111,242 | 122,828 | -9.4% | 152,702 | 158,671 | -3.8% | 263,944 | 281,499 | -6.2% |

Source:

FHWA - U.S. Department of Transportation, Federal Highway Administration, 1970-2008, *Highway Statistics 2008* and earlier, Washington, DC, 2009, Table VM-1 and annual. 2009-2018 data from Tables MV-1 and MV-9, *Highway Statistics 2018*. (Additional resources: www.fhwa.dot.gov)

IHS Automotive - IHS Automotive, Detroit, Michigan. Used with permission. FURTHER REPRODUCTION PROHIBITED. (Additional resources: <https://www.ihs.com/industry/automotive.html>)

Light trucks comprise more than half of all vehicle registrations in 44 states. The District of Columbia has the smallest share of light trucks.

Table 3.5 (Updated April 2021)
Motor Vehicle Registrations by State and Vehicle Type, 2019
(thousands)

| State | Cars | Motorcycles | Light Trucks ^a | Medium & Heavy Trucks ^b | Buses | All Motor Vehicles |
|----------------------------|----------------|--------------|---------------------------|------------------------------------|------------|--------------------|
| Alabama | 2,109 | 108 | 2,812 | 253 | 6 | 5,288 |
| Alaska | 179 | 28 | 529 | 51 | 9 | 795 |
| Arizona | 2,406 | 160 | 3,163 | 245 | 8 | 5,983 |
| Arkansas | 887 | 170 | 1,645 | 188 | 12 | 2,902 |
| California | 14,895 | 808 | 13,777 | 1,667 | 101 | 31,247 |
| Colorado | 1,741 | 186 | 3,226 | 246 | 13 | 5,412 |
| Connecticut | 1,261 | 86 | 1,433 | 88 | 12 | 2,879 |
| Delaware | 423 | 28 | 532 | 29 | 4 | 1,017 |
| Dist. of Columbia | 204 | 4 | 118 | 19 | 5 | 350 |
| Florida | 7,841 | 591 | 8,676 | 666 | 59 | 17,834 |
| Georgia | 3,500 | 204 | 4,422 | 432 | 37 | 8,595 |
| Hawaii | 499 | 40 | 692 | 38 | 3 | 1,272 |
| Idaho | 602 | 67 | 1,155 | 126 | 4 | 1,955 |
| Illinois | 4,323 | 315 | 5,386 | 634 | 35 | 10,692 |
| Indiana | 2,186 | 252 | 3,217 | 547 | 21 | 6,223 |
| Iowa | 1,222 | 193 | 2,070 | 292 | 9 | 3,786 |
| Kansas | 947 | 92 | 1,421 | 216 | 7 | 2,682 |
| Kentucky | 1,669 | 112 | 2,355 | 236 | 11 | 4,383 |
| Louisiana | 1,350 | 41 | 2,172 | 210 | 29 | 3,803 |
| Maine | 374 | 52 | 622 | 78 | 5 | 1,130 |
| Maryland | 1,869 | 113 | 2,033 | 166 | 23 | 4,204 |
| Massachusetts ^c | 2,089 | 163 | 2,642 | 154 | 14 | 5,061 |
| Michigan | 2,831 | 253 | 4,957 | 390 | 9 | 8,440 |
| Minnesota | 1,837 | 235 | 2,996 | 338 | 20 | 5,426 |
| Mississippi | 806 | 32 | 1,071 | 151 | 7 | 2,067 |
| Missouri | 2,053 | 136 | 2,982 | 336 | 27 | 5,534 |
| Montana | 439 | 339 | 1,002 | 116 | 5 | 1,901 |
| Nebraska ^c | 662 | 54 | 995 | 244 | 14 | 1,968 |
| Nevada | 1,060 | 75 | 1,330 | 77 | 4 | 2,547 |
| New Hampshire | 489 | 79 | 732 | 60 | 3 | 1,363 |
| New Jersey | 2,639 | 148 | 2,940 | 279 | 26 | 6,033 |
| New Mexico | 642 | 60 | 1,012 | 106 | 6 | 1,825 |
| New York | 4,444 | 385 | 6,080 | 398 | 82 | 11,389 |
| North Carolina | 3,435 | 188 | 4,416 | 457 | 32 | 8,527 |
| North Dakota | 229 | 39 | 495 | 138 | 4 | 904 |
| Ohio | 4,423 | 407 | 5,470 | 559 | 42 | 10,901 |
| Oklahoma ^c | 1,255 | 129 | 2,067 | 252 | 3 | 3,707 |
| Oregon | 1,425 | 135 | 2,138 | 204 | 18 | 3,919 |
| Pennsylvania | 4,268 | 367 | 5,488 | 622 | 56 | 10,800 |
| Rhode Island | 397 | 24 | 416 | 30 | 2 | 869 |
| South Carolina | 1,801 | 117 | 2,303 | 278 | 18 | 4,516 |
| South Dakota | 343 | 124 | 689 | 123 | 3 | 1,281 |
| Tennessee | 2,185 | 185 | 3,230 | 188 | 30 | 5,818 |
| Texas | 8,314 | 351 | 13,116 | 1,156 | 70 | 23,007 |
| Utah | 922 | 106 | 1,283 | 113 | 7 | 2,430 |
| Vermont | 207 | 30 | 342 | 40 | 1 | 620 |
| Virginia | 3,187 | 194 | 3,943 | 289 | 35 | 7,648 |
| Washington | 2,944 | 232 | 3,812 | 364 | 25 | 7,377 |
| West Virginia ^c | 537 | 47 | 991 | 91 | 3 | 1,668 |
| Wisconsin | 2,004 | 284 | 3,034 | 330 | 15 | 5,666 |
| Wyoming | 196 | 29 | 554 | 61 | 4 | 844 |
| Total | 108,548 | 8,596 | 143,983 | 14,369 | 995 | 276,491 |

Source:

U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2019*, Washington, DC, 2021, Tables MV-1 and MV-9. (Additional resources: www.fhwa.dot.gov)

^a Includes pickups, vans, sport-utility vehicles and other light trucks.

^b Includes medium and heavy trucks over 10,000 lb. gross vehicle weight rating.

^c Estimated by FHWA based on State reported data or data from secondary sources.

Table 3.6 (Updated April 2021)
New Retail Vehicle Sales, 1970–2020
 (thousands)

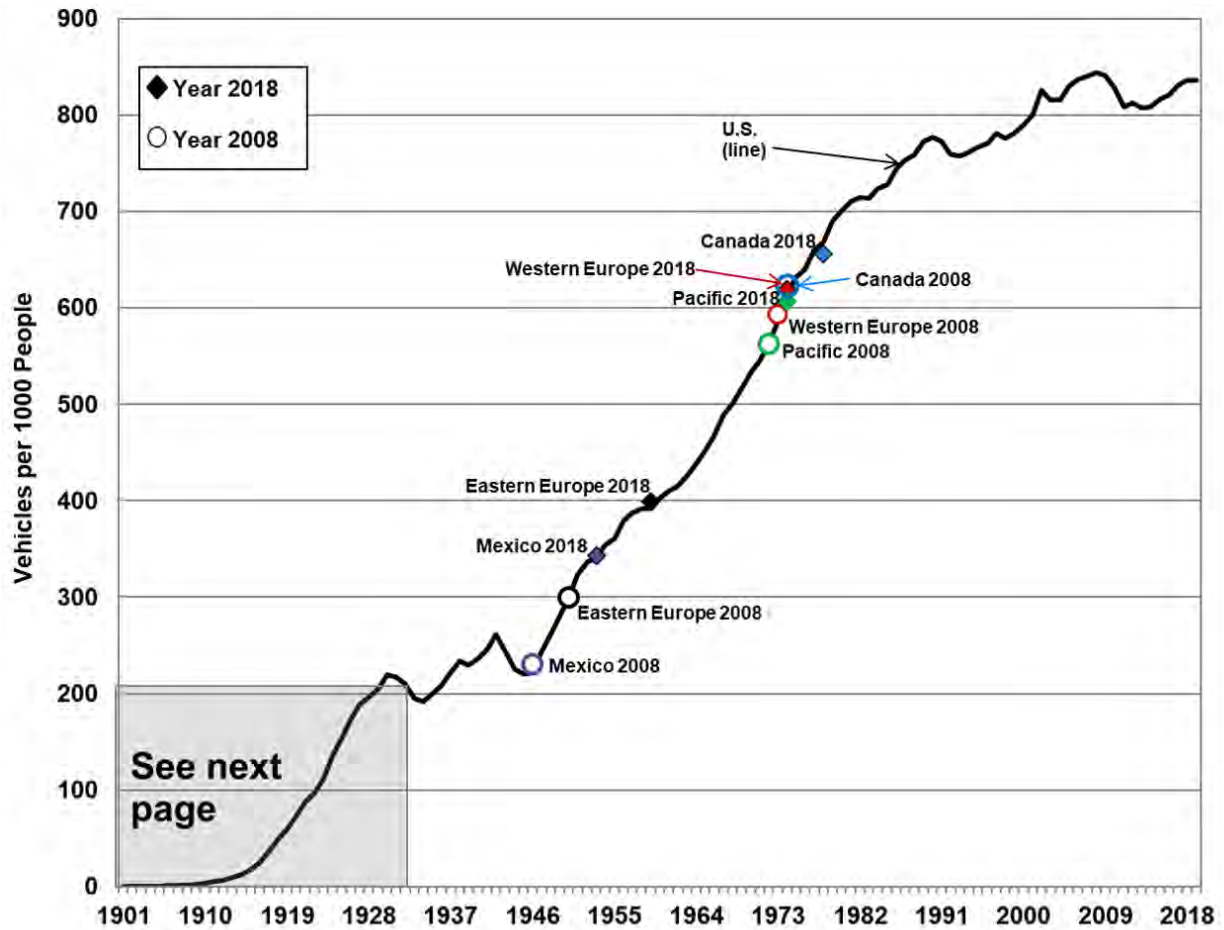
| Calendar Year | Cars | Light Trucks ^a | Subtotal Light Vehicles | Heavy Trucks | Total Vehicle Sales |
|---------------|--------|---|-------------------------|--------------|---------------------|
| 1970 | 8,321 | 1,457 | 9,778 | 334 | 10,112 |
| 1975 | 8,486 | 2,053 | 10,539 | 298 | 10,837 |
| 1980 | 8,949 | 1,960 | 10,909 | 271 | 11,180 |
| 1981 | 8,488 | 1,746 | 10,234 | 226 | 10,460 |
| 1982 | 7,956 | 2,063 | 10,019 | 184 | 10,203 |
| 1983 | 9,148 | 2,521 | 11,669 | 189 | 11,858 |
| 1984 | 10,324 | 3,255 | 13,579 | 282 | 13,861 |
| 1985 | 10,979 | 3,688 | 14,667 | 295 | 14,962 |
| 1986 | 11,404 | 4,594 | 15,998 | 277 | 16,275 |
| 1987 | 10,187 | 4,610 | 14,797 | 302 | 15,099 |
| 1988 | 10,544 | 4,800 | 15,344 | 348 | 15,692 |
| 1989 | 9,776 | 4,610 | 14,386 | 330 | 14,716 |
| 1990 | 9,301 | 4,548 | 13,849 | 297 | 14,146 |
| 1991 | 8,185 | 4,122 | 12,307 | 242 | 12,549 |
| 1992 | 8,213 | 4,629 | 12,842 | 276 | 13,118 |
| 1993 | 8,518 | 5,351 | 13,869 | 330 | 14,199 |
| 1994 | 8,991 | 6,033 | 15,024 | 387 | 15,411 |
| 1995 | 8,620 | 6,053 | 14,673 | 428 | 15,101 |
| 1996 | 8,479 | 6,519 | 14,998 | 411 | 15,409 |
| 1997 | 8,217 | 6,797 | 15,014 | 430 | 15,444 |
| 1998 | 8,085 | 7,299 | 15,384 | 526 | 15,910 |
| 1999 | 8,638 | 8,073 | 16,711 | 641 | 17,352 |
| 2000 | 8,778 | 8,386 | 17,164 | 579 | 17,743 |
| 2001 | 8,352 | 8,598 | 16,950 | 452 | 17,402 |
| 2002 | 8,042 | 8,633 | 16,675 | 402 | 17,077 |
| 2003 | 7,556 | 8,938 | 16,494 | 420 | 16,914 |
| 2004 | 7,483 | 9,254 | 16,737 | 538 | 17,275 |
| 2005 | 7,660 | 9,114 | 16,774 | 664 | 17,438 |
| 2006 | 7,762 | 8,574 | 16,336 | 694 | 17,030 |
| 2007 | 7,562 | 8,305 | 15,867 | 537 | 16,404 |
| 2008 | 6,769 | 6,246 | 13,015 | 432 | 13,447 |
| 2009 | 5,402 | 4,834 | 10,236 | 312 | 10,548 |
| 2010 | 5,636 | 5,758 | 11,394 | 378 | 11,772 |
| 2011 | 6,093 | 6,449 | 12,542 | 500 | 13,042 |
| 2012 | 7,245 | 6,975 | 14,220 | 569 | 14,789 |
| 2013 | 7,586 | 7,693 | 15,279 | 606 | 15,884 |
| 2014 | 7,708 | 8,484 | 16,192 | 671 | 16,862 |
| 2015 | 7,529 | 9,578 | 17,107 | 732 | 17,839 |
| 2016 | 6,883 | 10,296 | 17,179 | 697 | 17,876 |
| 2017 | 6,089 | 10,738 | 16,827 | 732 | 17,559 |
| 2018 | 5,310 | 11,609 | 16,919 | 789 | 17,708 |
| 2019 | 4,720 | 11,911 | 16,630 | 854 | 17,485 |
| 2020 | 3,402 | 10,712 | 14,114 | 758 | 14,872 |
| | | <i>Average annual percentage change</i> | | | |
| 1970-2020 | -1.8% | 4.1% | 0.7% | 1.7% | 0.8% |
| 2010-2020 | -4.9% | 6.4% | 2.2% | 7.2% | 2.4% |

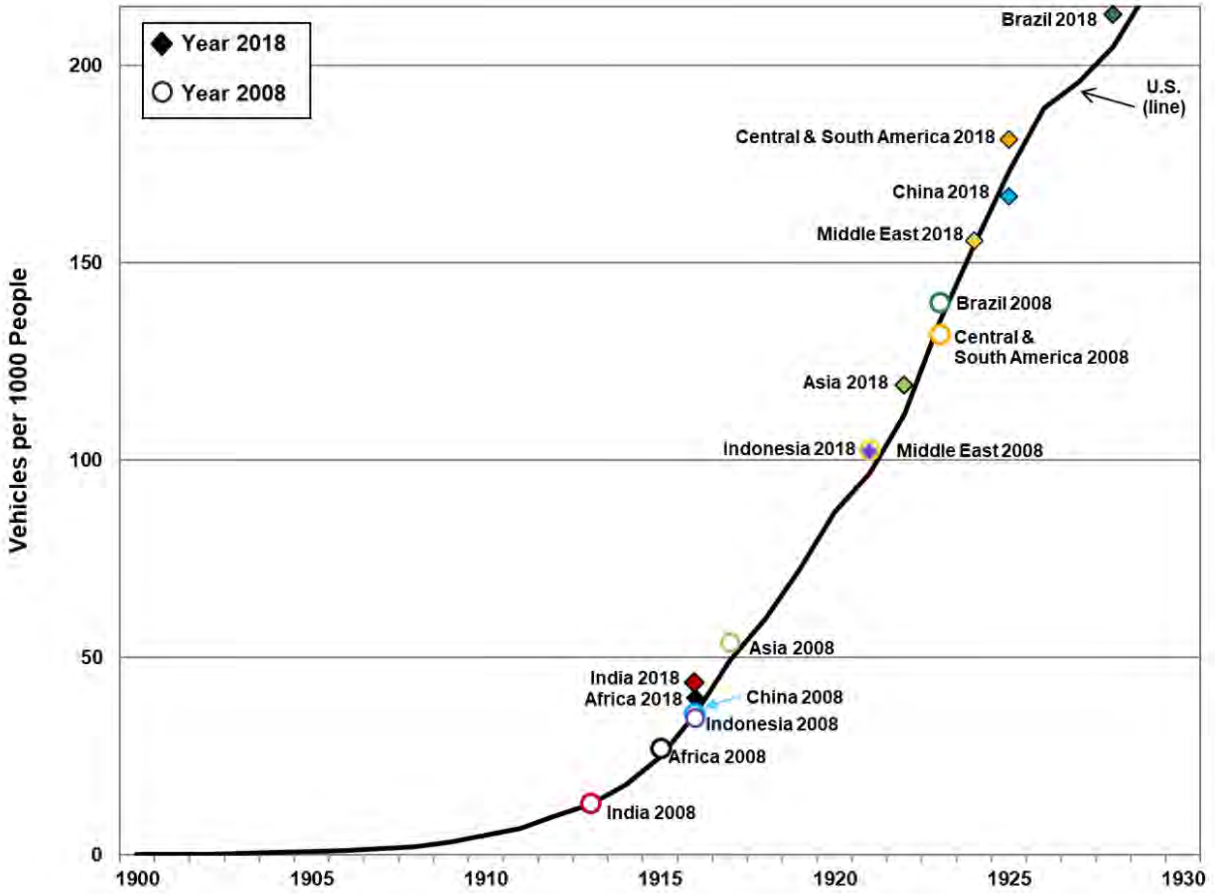
Source:Ward's Communications, www.wardsauto.com.

^a Includes light trucks of 10,000 lb. gross vehicle weight and less.

The graphs below show the number of motor vehicles per thousand people for various countries. The data for the United States are displayed in the line which goes from 1900 to 2018. The points labeled on that line show data for the other countries/regions around the world and how their vehicles per thousand people compare to the United States at two different points in time, 2008 and 2018. For example, the graph shows that in 2008, Eastern Europe's vehicles per thousand people was about where the United States was in 1949, but by 2018 it is about where the United States was in 1958. The lower part of the graph (1900-1930) is shown enlarged on the facing page.

Figure 3.3. Vehicles per Thousand People: U.S. (Over Time) Compared to Other Countries (in 2008 and 2018)





Source:
See Tables 3.7 and 3.8.

Though some countries are listed separately in this table, those countries are also included in the regional total. For instance, China is listed separately, but is also included in the Asia, Far East region.

Table 3.7
Vehicles per Thousand People in Selected Countries/Regions, 2008 and 2018

| Country/Region | Vehicles per 1,000 people | |
|-------------------------|---------------------------|-------|
| | 2008 | 2018 |
| Africa | 27.2 | 39.8 |
| Asia, Far East | 53.8 | 118.8 |
| Asia, Middle East | 102.7 | 155.7 |
| Brazil | 140.0 | 212.8 |
| Canada | 623.0 | 656.1 |
| Central & South America | 131.9 | 181.3 |
| China | 35.7 | 167.0 |
| Europe, East | 300.0 | 399.0 |
| Europe, West | 593.2 | 619.5 |
| India | 13.2 | 43.6 |
| Indonesia | 34.7 | 102.2 |
| Mexico | 230.2 | 343.0 |
| Pacific | 563.1 | 607.2 |
| United States | 838.5 | 836.3 |

Sources:

2018 population – U.S. Census Bureau, Population Division, International Data Base (IDB) World, September 2020.

(Additional resources: www.census.gov/population/international)

2018 vehicles – United States: See Table 3.6. All other countries: Ward's Communications, www.wardsauto.com.

2008 data – Oak Ridge National Laboratory, *Transportation Energy Data Book: Edition 29*, ORNL-6985, 2010.

The number of vehicles per thousand people in the United States has grown tremendously since 1900. After a peak in 2007 at 844.5, the number declined but began rising in 2012. By 2018 there were 836.3 vehicles per thousand people in the United States.

Table 3.8
Vehicles per Thousand People in the United States, 1900–2018

| Year | U.S. vehicles per 1,000 people | Year | U.S. vehicles per 1,000 people | Year | U.S. vehicles per 1,000 people | Year | U.S. vehicles per 1,000 people | Year | U.S. vehicles per 1,000 people |
|------|---|------|---|------|---|------|---|------|---|
| 1900 | 0.1 | 1924 | 154.4 | 1948 | 280.2 | 1972 | 585.6 | 1996 | 781.2 |
| 1901 | 0.2 | 1925 | 173.3 | 1949 | 299.6 | 1973 | 615.2 | 1997 | 776.0 |
| 1902 | 0.3 | 1926 | 189.1 | 1950 | 323.7 | 1974 | 632.3 | 1998 | 781.2 |
| 1903 | 0.4 | 1927 | 195.8 | 1951 | 337.1 | 1975 | 640.1 | 1999 | 790.1 |
| 1904 | 0.7 | 1928 | 204.9 | 1952 | 340.6 | 1976 | 659.5 | 2000 | 800.3 |
| 1905 | 0.9 | 1929 | 219.3 | 1953 | 353.7 | 1977 | 669.0 | 2001 | 825.8 |
| 1906 | 1.3 | 1930 | 217.3 | 1954 | 361.4 | 1978 | 690.2 | 2002 | 815.7 |
| 1907 | 1.7 | 1931 | 210.4 | 1955 | 379.8 | 1979 | 700.4 | 2003 | 816.1 |
| 1908 | 2.2 | 1932 | 195.4 | 1956 | 387.6 | 1980 | 710.7 | 2004 | 829.9 |
| 1909 | 3.5 | 1933 | 192.4 | 1957 | 392.1 | 1981 | 715.2 | 2005 | 837.3 |
| 1910 | 5.1 | 1934 | 199.9 | 1958 | 392.2 | 1982 | 714.0 | 2006 | 840.7 |
| 1911 | 6.8 | 1935 | 208.6 | 1959 | 402.8 | 1983 | 724.3 | 2007 | 844.5 |
| 1912 | 9.9 | 1936 | 222.6 | 1960 | 410.4 | 1984 | 728.2 | 2008 | 841.6 |
| 1913 | 12.9 | 1937 | 233.3 | 1961 | 415.1 | 1985 | 744.5 | 2009 | 828.7 |
| 1914 | 17.8 | 1938 | 229.7 | 1962 | 426.1 | 1986 | 753.3 | 2010 | 808.4 |
| 1915 | 24.8 | 1939 | 236.9 | 1963 | 438.8 | 1987 | 758.6 | 2011 | 812.5 |
| 1916 | 35.5 | 1940 | 245.6 | 1964 | 451.6 | 1988 | 772.9 | 2012 | 807.8 |
| 1917 | 49.6 | 1941 | 261.6 | 1965 | 466.9 | 1989 | 777.0 | 2013 | 809.1 |
| 1918 | 59.7 | 1942 | 244.7 | 1966 | 489.3 | 1990 | 773.4 | 2014 | 817.1 |
| 1919 | 72.5 | 1943 | 225.9 | 1967 | 500.7 | 1991 | 760.2 | 2015 | 821.1 |
| 1920 | 86.8 | 1944 | 220.2 | 1968 | 516.5 | 1992 | 758.0 | 2016 | 831.2 |
| 1921 | 96.7 | 1945 | 221.8 | 1969 | 533.4 | 1993 | 761.9 | 2017 | 836.6 |
| 1922 | 111.5 | 1946 | 243.1 | 1970 | 545.4 | 1994 | 766.9 | 2018 | 836.3 |
| 1923 | 134.9 | 1947 | 262.6 | 1971 | 562.5 | 1995 | 771.0 | | |

Sources:

Population – U.S. Census Bureau, Population Division, International Data Base (IDB) World, September 2020.

(Additional resources: www.census.gov/programs-surveys/international-programs.html)

Vehicles – U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2018*, Washington, DC, 2020.

Total vehicle-miles traveled increased each year from 2011 to 2019. The trend of using two-axle, four-tire trucks, such as pickups, vans, and sport-utility vehicles, for personal travel is evident in these data; two-axle, four-tire trucks account for 36% more travel in 2019 than in 1970, and cars account for 40% less travel between those two time periods.

Table 3.9 (Updated April 2021)
Shares of Highway Vehicle-Miles Traveled by Vehicle Type, 1970–2019

| Year | Cars | Motorcycles | Two-axle, four-tire trucks | Other single-unit trucks | Combination trucks | Buses | Total vehicle-miles traveled (million miles) |
|-----------|---|-------------|----------------------------------|--------------------------------|-----------------------|-------|---|
| 1970 | 82.6% | 0.3% | 11.1% | 2.4% | 3.2% | 0.4% | 1,109,724 |
| 1975 | 77.9% | 0.4% | 15.1% | 2.6% | 3.5% | 0.5% | 1,327,664 |
| 1980 | 72.8% | 0.7% | 19.0% | 2.6% | 4.5% | 0.4% | 1,527,295 |
| 1985 | 70.2% | 0.5% | 22.0% | 2.6% | 4.4% | 0.3% | 1,774,826 |
| 1986 | 69.2% | 0.5% | 23.1% | 2.5% | 4.4% | 0.3% | 1,834,872 |
| 1987 | 68.5% | 0.5% | 23.8% | 2.5% | 4.5% | 0.3% | 1,921,204 |
| 1988 | 67.6% | 0.5% | 24.8% | 2.4% | 4.4% | 0.3% | 2,025,962 |
| 1989 | 66.8% | 0.5% | 25.6% | 2.4% | 4.4% | 0.3% | 2,096,487 |
| 1990 | 65.7% | 0.4% | 26.8% | 2.4% | 4.4% | 0.3% | 2,144,362 |
| 1991 | 62.5% | 0.4% | 29.9% | 2.4% | 4.4% | 0.3% | 2,172,050 |
| 1992 | 61.0% | 0.4% | 31.5% | 2.4% | 4.4% | 0.3% | 2,247,151 |
| 1993 | 59.9% | 0.4% | 32.5% | 2.5% | 4.5% | 0.3% | 2,296,378 |
| 1994 | 59.6% | 0.4% | 32.4% | 2.6% | 4.6% | 0.3% | 2,357,588 |
| 1995 | 59.4% | 0.4% | 32.6% | 2.6% | 4.8% | 0.3% | 2,422,696 |
| 1996 | 59.1% | 0.4% | 32.8% | 2.6% | 4.8% | 0.3% | 2,485,848 |
| 1997 | 58.7% | 0.4% | 33.2% | 2.6% | 4.9% | 0.3% | 2,561,695 |
| 1998 | 58.9% | 0.4% | 33.0% | 2.6% | 4.9% | 0.3% | 2,631,522 |
| 1999 | 58.3% | 0.4% | 33.5% | 2.6% | 4.9% | 0.3% | 2,691,056 |
| 2000 | 58.3% | 0.4% | 33.6% | 2.6% | 4.9% | 0.3% | 2,746,925 |
| 2001 | 58.2% | 0.3% | 33.7% | 2.6% | 4.9% | 0.3% | 2,797,287 |
| 2002 | 58.1% | 0.3% | 33.8% | 2.7% | 4.9% | 0.2% | 2,855,508 |
| 2003 | 57.8% | 0.3% | 34.0% | 2.7% | 4.8% | 0.2% | 2,890,412 |
| 2004 | 57.3% | 0.3% | 34.6% | 2.7% | 4.8% | 0.2% | 2,964,788 |
| 2005 | 57.1% | 0.3% | 34.8% | 2.6% | 4.8% | 0.2% | 2,989,430 |
| 2006 | 56.1% | 0.4% | 35.9% | 2.7% | 4.7% | 0.2% | 3,014,369 ^a |
| 2007 | 55.2% | 0.4% | 36.7% | 2.7% | 4.8% | 0.2% | 3,032,399 |
| 2008 | 54.3% | 0.5% | 37.3% | 2.8% | 4.8% | 0.2% | 2,973,509 |
| 2009 | 53.0% | 0.7% | 36.1% | 4.1% | 5.7% | 0.5% | 2,956,764 |
| 2010 | 50.4% | 0.6% | 38.8% | 3.7% | 5.9% | 0.5% | 2,967,266 |
| 2011 | 49.4% | 0.6% | 40.4% | 3.5% | 5.6% | 0.5% | 2,950,402 |
| 2012 | 48.4% | 0.7% | 41.3% | 3.6% | 5.5% | 0.5% | 2,969,433 |
| 2013 | 48.4% | 0.7% | 41.2% | 3.6% | 5.6% | 0.5% | 2,988,280 |
| 2014 | 47.5% | 0.7% | 42.1% | 3.6% | 5.6% | 0.5% | 3,025,656 |
| 2015 | 46.7% | 0.6% | 43.1% | 3.5% | 5.5% | 0.5% | 3,095,373 |
| 2016 | 45.8% | 0.6% | 44.0% | 3.6% | 5.5% | 0.5% | 3,174,408 |
| 2017 | 44.3% | 0.6% | 45.2% | 3.6% | 5.6% | 0.5% | 3,212,347 |
| 2018 | 43.8% | 0.6% | 45.6% | 3.7% | 5.7% | 0.6% | 3,240,326 |
| 2019 | 42.1% | 0.6% | 47.5% | 3.8% | 5.4% | 0.6% | 3,261,772 |
| | <i>Average annual percentage change</i> | | | | | | |
| 1970–2019 | | | | | | | 2.2% |
| 2009–2019 | | | | | | | 1.0% |

Source:

U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2019*, Washington, DC, 2021, Table VM-1 and annual. (Additional resources: www.fhwa.dot.gov). 2009-2019 cars and 2-axle 4-tire trucks – see Section 7 in Appendix A.

^a Due to FHWA methodology changes, data from 2007-on are not comparable with previous data.

The majority of vehicle miles of travel (VMT) in each state is on streets and roads. Interstate travel accounted for 35% of VMT in the United States in 2019.

Table 3.10 (Updated April 2021)
Vehicle Miles of Travel by State, 2019
(million vehicle miles)

| State | Rural Interstate ^a | Rural streets and roads ^b | Urban Interstate ^a | Urban Streets and Roads ^b | Total |
|-------------------|-------------------------------|--------------------------------------|-------------------------------|--------------------------------------|-----------|
| Alabama | 6,644 | 22,367 | 9,945 | 32,778 | 71,735 |
| Alaska | 851 | 1,739 | 790 | 2,501 | 5,881 |
| Arizona | 7,257 | 9,433 | 16,681 | 36,910 | 70,281 |
| Arkansas | 4,617 | 13,328 | 6,668 | 12,486 | 37,099 |
| California | 23,161 | 33,319 | 136,460 | 147,895 | 340,836 |
| Colorado | 5,217 | 10,999 | 15,684 | 22,733 | 54,634 |
| Connecticut | 805 | 2,383 | 14,173 | 14,239 | 31,601 |
| Delaware | 375 | 2,152 | 2,258 | 5,460 | 10,245 |
| Dist. of Columbia | 0 | 0 | 898 | 2,859 | 3,756 |
| Florida | 13,492 | 24,039 | 48,048 | 140,935 | 226,514 |
| Georgia | 8,114 | 23,696 | 29,396 | 71,922 | 133,128 |
| Hawaii | 0 | 1,877 | 2,568 | 6,580 | 11,024 |
| Idaho | 3,208 | 6,901 | 1,927 | 6,021 | 18,058 |
| Illinois | 9,567 | 15,809 | 25,707 | 56,442 | 107,525 |
| Indiana | 9,046 | 21,060 | 12,597 | 40,016 | 82,719 |
| Iowa | 5,216 | 14,740 | 3,225 | 10,356 | 33,537 |
| Kansas | 5,091 | 10,139 | 6,153 | 10,459 | 31,843 |
| Kentucky | 9,991 | 16,607 | 7,611 | 15,202 | 49,410 |
| Louisiana | 7,048 | 12,751 | 10,804 | 20,758 | 51,360 |
| Maine | 2,196 | 8,056 | 1,418 | 3,202 | 14,871 |
| Maryland | 2,722 | 7,990 | 22,798 | 26,705 | 60,216 |
| Massachusetts | 959 | 2,093 | 23,954 | 37,883 | 64,890 |
| Michigan | 8,610 | 22,672 | 24,211 | 46,680 | 102,174 |
| Minnesota | 4,195 | 20,633 | 13,572 | 22,332 | 60,731 |
| Mississippi | 4,829 | 19,166 | 4,918 | 12,177 | 41,091 |
| Missouri | 12,350 | 22,160 | 20,023 | 24,636 | 79,168 |
| Montana | 2,642 | 6,299 | 633 | 3,318 | 12,892 |
| Nebraska | 3,979 | 7,684 | 2,904 | 6,674 | 21,242 |
| Nevada | 2,328 | 3,311 | 6,570 | 16,585 | 28,794 |
| New Hampshire | 1,254 | 4,301 | 3,465 | 4,809 | 13,828 |
| New Jersey | 1,723 | 3,244 | 28,926 | 44,312 | 78,205 |
| New Mexico | 4,698 | 11,725 | 3,033 | 8,316 | 27,772 |
| New York | 6,992 | 18,495 | 38,879 | 59,620 | 123,986 |
| North Carolina | 9,619 | 32,000 | 26,662 | 54,194 | 122,475 |
| North Dakota | 1,624 | 5,252 | 535 | 2,415 | 9,826 |
| Ohio | 11,002 | 24,020 | 32,027 | 47,644 | 114,694 |
| Oklahoma | 5,443 | 16,577 | 8,628 | 14,000 | 44,648 |
| Oregon | 4,087 | 9,521 | 7,208 | 14,992 | 35,808 |
| Pennsylvania | 13,055 | 21,450 | 24,383 | 43,976 | 102,864 |
| Rhode Island | 357 | 562 | 2,806 | 3,857 | 7,581 |
| South Carolina | 8,902 | 17,113 | 8,937 | 22,987 | 57,939 |
| South Dakota | 2,614 | 4,319 | 900 | 2,088 | 9,922 |
| Tennessee | 8,805 | 17,379 | 18,569 | 38,139 | 82,892 |
| Texas | 21,201 | 57,424 | 86,625 | 122,977 | 288,227 |
| Utah | 3,600 | 5,288 | 8,931 | 15,091 | 32,911 |
| Vermont | 1,269 | 3,953 | 610 | 1,514 | 7,346 |
| Virginia | 10,142 | 19,250 | 22,312 | 33,729 | 85,432 |
| Washington | 6,893 | 10,604 | 18,545 | 26,488 | 62,530 |
| West Virginia | 2,379 | 7,231 | 3,664 | 5,803 | 19,077 |
| Wisconsin | 7,459 | 25,927 | 11,818 | 21,144 | 66,348 |
| Wyoming | 2,738 | 4,452 | 572 | 2,446 | 10,208 |
| U.S. Total | 300,364 | 683,488 | 830,630 | 1,447,289 | 3,261,772 |

Source:

U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2019*, Washington, DC, 2021, Table VM-2. (Additional resources: www.fhwa.dot.gov)

^a Includes Interstates, freeways, and expressways.

^b Includes other principal arterial, minor arterial, major collector, minor collector and local streets and roads.

In 1970 only 2.9% of the car population was 15 years old or older; by 2013 that number rose to nearly 20%.

Table 3.11
Cars in Operation by Age, 1970, 2000, and 2013

| Age (years) | 1970 | | | 2000 | | | 2013 | | |
|----------------------|----------------------|-------------------------|------------------------------------|----------------------|-------------------------|------------------------------------|----------------------|-------------------------|------------------------------------|
| | Vehicles (thousands) | Percentage ^a | Cumulative percentage ^a | Vehicles (thousands) | Percentage ^a | Cumulative percentage ^a | Vehicles (thousands) | Percentage ^a | Cumulative percentage ^a |
| Under 1 ^b | 6,288 | 7.8% | 7.8% | 6,665 | 5.2% | 5.2% | 9,287 | 7.1% | 7.1% |
| 1 | 9,299 | 11.6% | 19.4% | 8,177 | 6.4% | 11.6% | 7,700 | 5.9% | 13.1% |
| 2 | 8,816 | 11.0% | 30.3% | 7,655 | 6.0% | 17.6% | 5,957 | 4.6% | 17.6% |
| 3 | 7,878 | 9.8% | 40.1% | 7,906 | 6.2% | 23.8% | 6,159 | 4.7% | 22.4% |
| 4 | 8,538 | 10.6% | 50.8% | 7,413 | 5.8% | 29.6% | 5,484 | 4.2% | 26.6% |
| 5 | 8,506 | 10.6% | 61.3% | 8,675 | 6.8% | 36.4% | 7,226 | 5.6% | 32.1% |
| 6 | 7,116 | 8.8% | 70.2% | 7,628 | 6.0% | 42.4% | 7,896 | 6.1% | 38.2% |
| 7 | 6,268 | 7.8% | 78.0% | 7,650 | 6.0% | 48.4% | 7,706 | 5.9% | 44.1% |
| 8 | 5,058 | 6.3% | 84.3% | 7,021 | 5.5% | 53.9% | 7,843 | 6.0% | 50.2% |
| 9 | 3,267 | 4.1% | 88.3% | 7,109 | 5.6% | 59.4% | 6,924 | 5.3% | 55.5% |
| 10 | 2,776 | 3.5% | 91.8% | 7,071 | 5.5% | 65.0% | 7,237 | 5.6% | 61.1% |
| 11 | 1,692 | 2.1% | 93.9% | 7,338 | 5.7% | 70.7% | 7,167 | 5.5% | 66.6% |
| 12 | 799 | 1.0% | 94.9% | 6,876 | 5.4% | 76.1% | 6,660 | 5.1% | 71.7% |
| 13 | 996 | 1.2% | 96.1% | 6,084 | 4.8% | 80.9% | 6,889 | 5.3% | 77.0% |
| 14 | 794 | 1.0% | 97.1% | 5,334 | 4.2% | 85.0% | 5,487 | 4.2% | 81.2% |
| 15 and older | 2,336 | 2.9% | 100.0% | 19,119 | 15.0% | 100.0% | 24,457 | 18.8% | 100.0% |
| Subtotal | 80,427 | 100.0% | | 127,721 | 100.0% | | 130,078 | 100.0% | |
| Age not given | 22 | | | 0 | | | 0 | | |
| Total | 80,449 | | | 121,721 | | | 130,078 | | |

Source:

IHS Automotive, Detroit, MI. Used with permission. **FURTHER REPRODUCTION PROHIBITED.**

^a Percentages may not sum to totals due to rounding.

^b Includes cars which were sold prior to July 1, 1970, and similarly, sold prior to July 1, 2000. For 2013, cars sold prior to December 31, 2013 were included.

The number of trucks in the United States has grown significantly since 1970, some of it due to the use of light trucks (pickups, vans, sport utility vehicles) as personal passenger vehicles. Those light trucks, as well as medium and heavy trucks, are included in the data. In 1970 about 15% of trucks were age 15 or older; by 2013, that increased to 20.8%.

Table 3.12
Trucks in Operation by Age, 1970, 2000, and 2013

| Age (years) | 1970 | | | 2000 | | | 2013 | | |
|----------------------|----------------------|-------------------------|------------------------------------|----------------------|-------------------------|------------------------------------|----------------------|-------------------------|------------------------------------|
| | Vehicles (thousands) | Percentage ^a | Cumulative percentage ^a | Vehicles (thousands) | Percentage ^a | Cumulative percentage ^a | Vehicles (thousands) | Percentage ^a | Cumulative percentage ^a |
| Under 1 ^b | 1,262 | 7.1% | 7.1% | 6,439 | 7.5% | 7.5% | 8,097 | 6.5% | 6.5% |
| 1 | 1,881 | 10.6% | 17.8% | 7,726 | 9.0% | 16.6% | 6,391 | 5.1% | 11.6% |
| 2 | 1,536 | 8.7% | 26.5% | 6,630 | 7.7% | 24.3% | 6,417 | 5.2% | 16.8% |
| 3 | 1,428 | 8.1% | 34.6% | 6,313 | 7.4% | 31.7% | 4,972 | 4.0% | 20.8% |
| 4 | 1,483 | 8.4% | 43.0% | 5,300 | 6.2% | 37.9% | 3,991 | 3.2% | 24.0% |
| 5 | 1,339 | 7.6% | 50.5% | 5,818 | 6.8% | 44.7% | 6,927 | 5.6% | 29.5% |
| 6 | 1,154 | 6.5% | 57.1% | 5,206 | 6.1% | 50.8% | 7,587 | 6.1% | 35.6% |
| 7 | 975 | 5.5% | 62.6% | 4,335 | 5.1% | 55.8% | 7,580 | 6.1% | 41.7% |
| 8 | 826 | 4.7% | 67.3% | 3,547 | 4.1% | 60.0% | 7,585 | 6.1% | 47.8% |
| 9 | 621 | 3.5% | 70.8% | 3,411 | 4.0% | 63.9% | 7,978 | 6.4% | 54.2% |
| 10 | 658 | 3.7% | 74.5% | 3,258 | 3.8% | 67.8% | 7,201 | 5.8% | 60.0% |
| 11 | 583 | 3.3% | 77.8% | 3,665 | 4.3% | 72.0% | 6,850 | 5.5% | 65.5% |
| 12 | 383 | 2.2% | 80.0% | 3,421 | 4.0% | 76.0% | 6,163 | 4.9% | 70.4% |
| 13 | 417 | 2.4% | 82.3% | 2,860 | 3.3% | 79.4% | 5,673 | 4.6% | 75.0% |
| 14 | 414 | 2.3% | 84.7% | 2,812 | 3.3% | 82.7% | 5,217 | 4.2% | 79.2% |
| 15 and older | 2,710 | 15.3% | 100.0% | 14,838 | 17.3% | 100.0% | 25,917 | 20.8% | 100.0% |
| Subtotal | 17,670 | 100.0% | | 85,579 | 100.0% | | 124,545 | 100.0% | |
| Age note given | 15 | | | 0 | | | 0 | | |
| Total | 17,685 | | | 85,579 | | | 124,545 | | |

Source:

IHS Automotive, Detroit, MI. Used with permission. **FURTHER REPRODUCTION PROHIBITED.**

^a Percentages may not sum to totals due to rounding.

^b Includes trucks which were sold prior to July 1, 1970, and similarly, sold prior to July 1, 2000. For 2013, trucks sold prior to December 31, 2013 were included.

The average age of cars and light trucks has grown to a record level in 2019—11.9 years. Light trucks, which include pickups, vans, and sport utility vehicles, had a lower average age than cars in 2018.

Table 3.13
U.S. Average Vehicle Age, 1970–2019

| Calendar Year | Passenger cars | Light trucks | All light vehicles |
|---------------|----------------|--------------|--------------------|
| 1970 | 5.6 | 7.3 | ^a |
| 1975 | 6.0 | 6.9 | ^a |
| 1980 | 6.6 | 7.1 | ^a |
| 1985 | 7.6 | 8.1 | ^a |
| 1990 | 7.8 | 8.0 | ^a |
| 1991 | 7.9 | 8.1 | ^a |
| 1992 | 8.1 | 8.4 | ^a |
| 1993 | 8.3 | 8.6 | ^a |
| 1994 | 8.4 | 8.4 | ^a |
| 1995 | 8.4 | 8.3 | 8.4 |
| 1996 | 8.5 | 8.3 | 8.5 |
| 1997 | 8.7 | 8.5 | 8.6 |
| 1998 | 8.9 | 8.5 | 8.8 |
| 1999 | 9.1 | 8.5 | 8.8 |
| 2000 | 9.1 | 8.4 | 8.9 |
| 2001 | 9.3 | 8.4 | 8.9 ^b |
| 2002 | 9.8 | 9.4 | 9.6 |
| 2003 | 9.9 | 9.0 | 9.7 |
| 2004 | 10.0 | 9.5 | 9.8 |
| 2005 | 10.1 | 9.5 | 9.8 |
| 2006 | 10.2 | 9.5 | 9.9 |
| 2007 | 10.3 | 9.6 | 10.0 |
| 2008 | 10.4 | 9.8 | 10.1 |
| 2009 | 10.5 | 10.1 | 10.3 |
| 2010 | 10.8 | 10.5 | 10.6 |
| 2011 | 11.1 | 10.8 | 10.9 |
| 2012 | 11.3 | 11.1 | 11.2 |
| 2013 | 11.4 | 11.3 | 11.4 |
| 2014 | 11.4 | 11.4 | 11.4 |
| 2015 | 11.5 | 11.5 | 11.5 |
| 2016 | 11.6 | 11.6 | 11.6 |
| 2017 | ^a | ^a | ^a |
| 2018 | 11.9 | 11.7 | 11.8 |
| 2019 | ^a | ^a | 11.9 |

Source:

IHS Automotive, Detroit, MI. Used with permission. **FURTHER REPRODUCTION PROHIBITED.** (Additional resources: <https://www.ihs.com/industry/automotive.html>)

^a Data are not available.

^b In 2013, IHS Automotive published a data series showing vehicle age from 2002-2013. These data did not match the previous data published in earlier releases and, therefore, are not comparable.

The Environmental Protection Agency estimated the annual vehicle miles of travel for cars and light trucks up to 30 years old for the mid-term evaluation of the Light Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards. The “Total” row represents the number of miles a car or light truck would travel if it is in operation for 30 years. Typical lifetime miles from a 2006 study by the National Highway Traffic Safety Administration (NHTSA) are shown below the total.

Table 3.14
Annual Mileage for Cars and Light Trucks by Vehicle Age

| Vehicle age (years) | Estimated annual vehicle miles of travel for cars | Estimated annual vehicle miles of travel for light trucks |
|--|---|---|
| 0 | 13,843 | 15,962 |
| 1 | 13,580 | 15,670 |
| 2 | 13,296 | 15,320 |
| 3 | 12,992 | 15,098 |
| 4 | 12,672 | 14,528 |
| 5 | 12,337 | 14,081 |
| 6 | 11,989 | 13,548 |
| 7 | 11,630 | 13,112 |
| 8 | 11,262 | 12,544 |
| 9 | 10,887 | 12,078 |
| 10 | 10,509 | 11,595 |
| 11 | 10,129 | 11,131 |
| 12 | 9,748 | 10,641 |
| 13 | 9,370 | 10,153 |
| 14 | 8,997 | 9,691 |
| 15 | 8,629 | 9,239 |
| 16 | 8,270 | 8,797 |
| 17 | 7,922 | 8,383 |
| 18 | 7,586 | 8,009 |
| 19 | 7,265 | 7,666 |
| 20 | 6,962 | 7,358 |
| 21 | 6,679 | 7,089 |
| 22 | 6,416 | 6,862 |
| 23 | 6,177 | 6,684 |
| 24 | 5,963 | 6,556 |
| 25 | 5,778 | 6,481 |
| 26 | 5,623 | 6,466 |
| 27 | 5,499 | 6,466 |
| 28 | 5,410 | 6,466 |
| 29 | 5,358 | 6,466 |
| 30 | 5,358 | 6,466 |
| Total | 278,134 | 310,610 |
| NHTSA 2006 study – typical lifetime miles | 152,137 | 179,954 |

Sources:

- U.S. Environmental Protection Agency, *Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025*, EPA-420-D-16-900, July 2016. (Additional resources: <https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas-ghg#TAR>)
- U.S. Department of Transportation, National Highway Traffic Safety Administration, *Vehicle Survivability and Travel Mileage Schedules*, January 2006.

The Environmental Protection Agency estimated the survival rates for cars and light trucks for the mid-term evaluation of the Light Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards.

Table 3.15
Survival Rates for Cars and Light Trucks by Vehicle Age

| Vehicle age (years) | Estimated survival rate for cars | Estimated survival rate for light trucks |
|------------------------|--|--|
| 0 | 1.000 | 1.000 |
| 1 | 0.997 | 0.991 |
| 2 | 0.994 | 0.982 |
| 3 | 0.991 | 0.973 |
| 4 | 0.984 | 0.960 |
| 5 | 0.974 | 0.941 |
| 6 | 0.961 | 0.919 |
| 7 | 0.942 | 0.891 |
| 8 | 0.920 | 0.859 |
| 9 | 0.893 | 0.823 |
| 10 | 0.862 | 0.784 |
| 11 | 0.826 | 0.741 |
| 12 | 0.788 | 0.697 |
| 13 | 0.718 | 0.651 |
| 14 | 0.613 | 0.605 |
| 15 | 0.510 | 0.553 |
| 16 | 0.415 | 0.502 |
| 17 | 0.332 | 0.453 |
| 18 | 0.261 | 0.407 |
| 19 | 0.203 | 0.364 |
| 20 | 0.157 | 0.324 |
| 21 | 0.120 | 0.288 |
| 22 | 0.092 | 0.255 |
| 23 | 0.070 | 0.225 |
| 24 | 0.053 | 0.198 |
| 25 | 0.040 | 0.174 |
| 26 | 0.030 | 0.153 |
| 27 | 0.023 | 0.133 |
| 28 | 0.013 | 0.117 |
| 29 | 0.010 | 0.102 |
| 30 | 0.007 | 0.089 |
| 31 | 0.002 | 0.027 |

Source:

U.S. Environmental Protection Agency, *Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025*, EPA-420-D-16-900, July 2016. (Additional resources: <https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas-ghg#TAR>)

Using current registration data and a scrappage model by Greenspan and Cohen [1996 paper: www.federalreserve.gov/pubs/feds/1996/199640/199640pap.pdf], ORNL calculated heavy truck (trucks over 26,000 lb gross vehicle weight) scrappage rates. The expected median lifetime for a 1990 model year heavy truck is 29 years. These data are fitted model values which assume constant economic conditions.

Table 3.16
Heavy Truck^a Scrappage and Survival Rates
1970, 1980, and 1990 Model Years

| Vehicle age ^b (years) | 1970 model year | | 1980 model year | | 1990 model year | |
|-------------------------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|
| | Survival rate ^c | Scrappage rate ^d | Survival rate ^c | Scrappage rate ^d | Survival rate ^c | Scrappage rate ^d |
| 4 | 98.8 | 1.2 | 98.5 | 1.5 | 99.4 | 0.6 |
| 5 | 97.2 | 1.6 | 96.7 | 1.9 | 98.6 | 0.8 |
| 6 | 95.3 | 1.9 | 94.5 | 2.3 | 97.6 | 1.0 |
| 7 | 93.2 | 2.3 | 92.0 | 2.7 | 96.5 | 1.2 |
| 8 | 90.7 | 2.6 | 89.1 | 3.1 | 95.2 | 1.3 |
| 9 | 88.1 | 3.0 | 86.0 | 3.5 | 93.8 | 1.5 |
| 10 | 85.2 | 3.3 | 82.7 | 3.9 | 92.2 | 1.7 |
| 11 | 82.1 | 3.6 | 79.1 | 4.3 | 90.5 | 1.9 |
| 12 | 78.8 | 4.0 | 75.4 | 4.7 | 88.6 | 2.0 |
| 13 | 75.4 | 4.3 | 71.6 | 5.1 | 86.7 | 2.2 |
| 14 | 71.9 | 4.7 | 67.7 | 5.5 | 84.6 | 2.4 |
| 15 | 68.3 | 5.0 | 63.7 | 5.9 | 82.4 | 2.6 |
| 16 | 64.6 | 5.3 | 59.7 | 6.3 | 80.2 | 2.7 |
| 17 | 61.0 | 5.7 | 55.7 | 6.7 | 77.9 | 2.9 |
| 18 | 57.3 | 6.0 | 51.8 | 7.1 | 75.5 | 3.1 |
| 19 | 53.7 | 6.3 | 47.9 | 7.4 | 73.0 | 3.3 |
| 20 | 50.1 | 6.7 | 44.2 | 7.8 | 70.5 | 3.4 |
| 21 | 46.6 | 7.0 | 40.6 | 8.2 | 68.0 | 3.6 |
| 22 | 43.2 | 7.3 | 37.1 | 8.6 | 65.4 | 3.8 |
| 23 | 39.9 | 7.6 | 33.7 | 9.0 | 62.8 | 3.9 |
| 24 | 36.7 | 8.0 | 30.6 | 9.4 | 60.3 | 4.1 |
| 25 | 33.7 | 8.3 | 27.6 | 9.7 | 57.7 | 4.3 |
| 26 | 30.8 | 8.6 | 24.8 | 10.1 | 55.1 | 4.5 |
| 27 | 28.0 | 8.9 | 22.2 | 10.5 | 52.6 | 4.6 |
| 28 | 25.4 | 9.3 | 19.8 | 10.9 | 50.0 | 4.8 |
| 29 | 23.0 | 9.6 | 17.6 | 11.2 | 47.6 | 5.0 |
| 30 | 20.7 | 9.9 | 15.5 | 11.6 | 45.1 | 5.1 |
| Median lifetime | 20.0 years | | 18.5 years | | 28.0 years | |

Source:

Schmoyer, Richard L., unpublished study on scrappage rates, Oak Ridge National Laboratory, Oak Ridge, TN, 2001.

^a Heavy trucks are trucks over 26,000 lb gross vehicle weight.

^b It was assumed that scrappage for vehicles less than 4 years old is 0.

^c The percentage of heavy trucks which will be in use at the end of the year.

^d The percentage of heavy trucks which will be retired from use during the year.

Chapter 4

Light Vehicles and Characteristics

Summary Statistics from Tables in this Chapter

| Source | | |
|------------|--|---------|
| Table 4.1 | Cars, 2019 | |
| | <i>Registrations (thousands)</i> | 108,548 |
| | <i>Vehicle miles (billion miles)</i> | 1,374.3 |
| | <i>Fleet average fuel economy (miles per gallon)</i> | 28.3 |
| Table 4.2 | Two-axle, four-tire trucks, 2019 | |
| | <i>Registrations (thousands)</i> | 143,983 |
| | <i>Vehicle miles (billion miles)</i> | 1,549.7 |
| | <i>Fleet average fuel economy (miles per gallon)</i> | 20.4 |
| Table 4.7 | Light truck share of total light vehicle sales | |
| | <i>1970 calendar year</i> | 14.8% |
| | <i>2020 calendar year</i> | 75.9% |
| Table 4.9 | Cars, 2019 model year | |
| | <i>Production (thousands)</i> | 5,279 |
| | <i>New car fuel economy (miles per gallon)</i> | 30.9 |
| Table 4.9 | Car SUVs, 2019 model year | |
| | <i>Production (thousands)</i> | 1,891 |
| | <i>New car SUV fuel economy (miles per gallon)</i> | 27.5 |
| Table 4.11 | Truck SUVs, 2019 model year | |
| | <i>Production (thousands)</i> | 5,893 |
| | <i>New truck SUV fuel economy (miles per gallon)</i> | 23.5 |
| Table 4.11 | Pickups, 2019 model year | |
| | <i>Production (thousands)</i> | 2,521 |
| | <i>New pickup fuel economy (miles per gallon)</i> | 19.0 |
| Table 4.11 | Vans, 2019 model year | |
| | <i>Production (thousands)</i> | 555 |
| | <i>New van fuel economy (miles per gallon)</i> | 22.4 |
| Table 4.34 | Average fuel economy loss from 50 to 70 mph | 24.5% |

The definition of light truck can change from table to table in this document due to differing definitions among federal government regulations and public nomenclature. See page 4-2 for additional information.

Definition of Light Truck

Often for regulatory purposes, agencies within the federal government have differing definitions for the term “light truck.” Private data collectors, such as Ward’s Communications or IHS Automotive/Polk, have their own definitions as well. The paragraphs below are intended as a guide to the different definitions which are used in this document.

The data in Table 4.2 are from the Federal Highway Administration (FHWA). From 1970 to 2008 the FHWA defined light trucks as two-axle, four-tire trucks, including pickups, vans, SUVs, and other two-axle, four-tire trucks under 10,000 lb gross vehicle weight rating (GVWR). In 2009, the FHWA changed methodologies and no longer publishes vehicle miles, fuel use, and fuel economy of light trucks separately from cars. They continue to publish vehicle registrations for pickups, vans, SUVs and other two-axle, four tire trucks under 10,000 lb. The methodology used by Oak Ridge National Laboratory (ORNL) to continue the data series on Table 4.2 after 2008 is based on the FHWA data for all light vehicles, thus uses the same definition of light trucks. See Section 7.2 in Appendix A for the methodology of light truck data on Table 4.2 after 2008. Data on energy use in Tables 2.7 through 2.9 also use the FHWA definition of light truck.

Tables 3.6, 4.4, and 4.7 are light truck sales based on Ward’s Communications data. Ward’s definition of light trucks includes pickups, vans, SUVs, and specialty purpose vehicles up to 14,000 lb GVWR. However, in most cases, data are available by individual GVWR and ORNL summarized only light trucks that were 10,000 lb GVWR or less and did not include the heavier trucks. Thus, the definition on these tables is nearly identical to the FHWA definition.

The Environmental Protection Agency (EPA) and the U. S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), issued joint rulemaking to establish Corporate Average Fuel Economy (CAFE) standards and greenhouse gas emissions standards beginning with model year 2012. The rulemaking established new definitions of cars and light trucks. Before the rule, CAFE standards applied to cars and light trucks (pickups, vans, SUVs, and other trucks) less than 8,500 lb GVWR. After the rule, some two-wheel drive SUVs are considered cars instead of light trucks, and personal passenger vehicles (vans and SUVs) up to 10,000 lb GVWR are considered light trucks. Thus, data are now categorized as cars, car SUVs, truck SUVs, pickups and vans. Table 4.10 gives a listing of which SUVs are considered car SUVs for model year 2016. The EPA revised their data series back to 1975, so the definitions are consistent historically. Data on tables 4.9 through 4.19 are based on EPA data and thus use this definition of cars and light trucks. The CAFE data on Table 4.27 apply to cars only through 2011 and cars plus car SUVs after that. The CAFE data on Table 4.28 are for trucks up to 8,500 lb GVWR through 2011 and after that are for truck SUVs and vans up to 10,000 lb GVWR, and pickup trucks up to 8,500 lb GVWR.

Because of these different definitions, caution is advised when comparing light truck data from different sources.

The data in this table from 1985–on DO NOT include minivans, pickups, or sport utility vehicles. Much of the data for 2009–on were estimated; the FHWA no longer publishes travel and fuel data for cars. A methodology change for the number of cars registered affected the series in 2012.

Table 4.1 (Updated April 2021)
Summary Statistics for Cars, 1970–2019

| Year | Registrations ^a (thousands) | Vehicle travel (billion miles) | Average annual miles per vehicle | Fuel use (million gallons) | Average fuel economy ^b per vehicle (miles per gallon) |
|---|---|-----------------------------------|-------------------------------------|-------------------------------|--|
| 1970 | 89,244 | 916.7 | 10,272 | 67,820 | 13.5 |
| 1975 | 106,706 | 1,034.0 | 9,690 | 74,140 | 13.9 |
| 1980 | 121,601 | 1,111.6 | 9,141 | 69,981 | 15.9 |
| 1985 ^c | 127,885 | 1,246.8 | 9,749 | 71,518 | 17.4 |
| 1990 | 133,700 | 1,408.3 | 10,533 | 69,568 | 20.2 |
| 1991 | 128,300 | 1,358.2 | 10,586 | 64,318 | 21.1 |
| 1992 | 126,581 | 1,371.6 | 10,836 | 65,436 | 21.0 |
| 1993 | 127,327 | 1,374.7 | 10,797 | 67,047 | 20.5 |
| 1994 | 127,883 | 1,406.1 | 10,995 | 67,874 | 20.7 |
| 1995 | 128,387 | 1,438.3 | 11,203 | 68,072 | 21.1 |
| 1996 | 129,728 | 1,469.9 | 11,330 | 69,221 | 21.2 |
| 1997 | 129,749 | 1,502.6 | 11,580 | 69,892 | 21.5 |
| 1998 | 131,839 | 1,549.6 | 11,754 | 71,695 | 21.6 |
| 1999 | 132,432 | 1,569.1 | 11,848 | 73,283 | 21.4 |
| 2000 | 133,621 | 1,600.3 | 11,976 | 73,065 | 21.9 |
| 2001 | 137,633 | 1,628.3 | 11,831 | 73,559 | 22.1 |
| 2002 | 135,921 | 1,658.5 | 12,202 | 75,471 | 22.0 |
| 2003 | 135,670 | 1,672.1 | 12,325 | 74,590 | 22.4 |
| 2004 | 136,431 | 1,699.9 | 12,460 | 75,402 | 22.5 |
| 2005 | 136,568 | 1,708.4 | 12,510 | 77,418 | 22.1 |
| 2006 | 135,400 | 1,690.5 | 12,485 | 75,009 | 22.5 |
| 2007 | 135,933 | 1,672.5 | 12,304 | 74,377 | 22.5 |
| 2008 | 137,080 | 1,615.9 | 11,788 | 71,497 | 22.6 ^d |
| 2009 | 134,880 | 1,566.8 | 11,616 | 66,587 | 23.5 |
| 2010 | 130,892 | 1,496.4 | 11,432 | 62,245 | 24.0 |
| 2011 | 125,657 | 1,457.8 | 11,601 | 59,646 | 24.4 |
| 2012 | 111,290 | 1,438.6 | 12,928 | 57,899 | 24.9 |
| 2013 | 113,676 | 1,446.0 | 12,720 | 57,290 | 25.2 |
| 2014 | 113,899 | 1,436.6 | 12,613 | 56,470 | 25.4 |
| 2015 | 112,864 | 1,445.4 | 12,807 | 55,212 | 26.2 |
| 2016 | 112,961 | 1,453.4 | 12,866 | 54,248 | 26.8 |
| 2017 | 111,177 | 1,424.3 | 12,811 | 52,268 | 27.3 |
| 2018 | 111,242 | 1,419.6 | 12,761 | 51,174 | 27.7 |
| 2019 | 108,548 | 1,374.3 | 12,661 | 48,579 | 28.3 |
| <i>Average annual percentage change</i> | | | | | |
| 1970-2019 | 0.4% | 0.8% | 0.4% | -0.7% | 1.5% |
| 2009-2019 | -2.1% | -1.3% | 0.9% | -3.1% | 1.9% |

Source:

1970-2008: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2009*, Washington, DC, 2011, Table VM-1 and annual. 2009-on: See Section 7.1 in Appendix A. (Additional resources: www.fhwa.dot.gov)

^a This number differs from IHS Automotive’s estimates of “number of cars in use.” See Table 3.4.

^b Average fuel economy for all cars.

^c Beginning in this year the data were revised to exclude minivans, pickups and sport utility vehicles which may have been previously included.

^d Due to FHWA methodology changes, data from 2009-on are not comparable with previous data.

Much of the data for 2009-on were estimated; the FHWA no longer publishes travel and fuel use data for two-axle, four-tire trucks. A methodology change for the number of registrations affected the data series in 2012.

Table 4.2 (Updated April 2021)
Summary Statistics for Two-Axle, Four-Tire Trucks, 1970–2019

| Year | Registrations (thousands) | Vehicle travel (billion miles) | Average annual miles per vehicle | Fuel use (million gallons) | Average fuel economy ^a per vehicle (miles per gallon) |
|---|------------------------------|-----------------------------------|-------------------------------------|-------------------------------|--|
| 1970 | 14,211 | 123.3 | 8,675 | 12,313 | 10.0 |
| 1975 | 20,418 | 200.7 | 9,830 | 19,081 | 10.5 |
| 1980 | 27,876 | 290.9 | 10,437 | 23,796 | 12.2 |
| 1985 ^b | 37,214 | 391.0 | 10,506 | 27,363 | 14.3 |
| 1990 | 48,275 | 574.6 | 11,902 | 35,611 | 16.1 |
| 1991 | 53,033 | 649.4 | 12,245 | 38,217 | 17.0 |
| 1992 | 57,091 | 706.9 | 12,381 | 40,929 | 17.3 |
| 1993 | 59,994 | 745.8 | 12,430 | 42,851 | 17.4 |
| 1994 | 62,904 | 764.6 | 12,156 | 44,112 | 17.3 |
| 1995 | 65,738 | 790.0 | 12,018 | 45,605 | 17.3 |
| 1996 | 69,134 | 816.5 | 11,811 | 47,354 | 17.2 |
| 1997 | 70,224 | 850.7 | 12,115 | 49,389 | 17.2 |
| 1998 | 71,330 | 868.3 | 12,173 | 50,462 | 17.2 |
| 1999 | 75,356 | 901.0 | 11,957 | 52,859 | 17.0 |
| 2000 | 79,085 | 923.1 | 11,672 | 52,939 | 17.4 |
| 2001 | 84,188 | 943.2 | 11,204 | 53,522 | 17.6 |
| 2002 | 85,011 | 966.0 | 11,364 | 55,220 | 17.5 |
| 2003 | 87,187 | 984.1 | 11,287 | 60,758 | 16.2 |
| 2004 | 91,845 | 1,027.2 | 11,184 | 63,417 | 16.2 |
| 2005 | 95,337 | 1,041.1 | 10,920 | 58,869 | 17.7 |
| 2006 | 99,125 | 1,082.5 | 10,920 | 60,685 | 17.8 |
| 2007 | 101,470 | 1,112.3 | 10,962 | 61,836 | 18.0 |
| 2008 | 101,235 | 1,108.6 | 10,951 | 61,199 | 18.1 |
| 2009 | 100,154 | 1,066.5 | 10,649 | 61,824 | 17.3 |
| 2010 | 102,702 | 1,152.1 | 11,218 | 64,687 | 17.8 |
| 2011 | 105,571 | 1,192.7 | 11,298 | 65,786 | 18.1 |
| 2012 | 120,847 | 1,225.5 | 10,142 | 66,395 | 18.5 |
| 2013 | 120,523 | 1,231.8 | 10,220 | 65,555 | 18.8 |
| 2014 | 124,681 | 1,274.0 | 10,218 | 69,012 | 18.5 |
| 2015 | 128,553 | 1,334.3 | 10,448 | 70,933 | 18.8 |
| 2016 | 132,716 | 1,396.4 | 10,521 | 73,107 | 19.1 |
| 2017 | 137,749 | 1,453.1 | 10,549 | 73,835 | 19.7 |
| 2018 | 138,357 | 1,477.5 | 10,679 | 73,802 | 20.0 |
| 2019 | 143,983 | 1,549.7 | 10,763 | 75,856 | 20.4 |
| <i>Average annual percentage change</i> | | | | | |
| 1970-2019 | 4.8% | 5.3% | 0.4% | 3.8% | 1.5% |
| 2009-2019 | 3.7% | 3.8% | 0.1% | 2.1% | 1.7% |

Source:

1970-2008: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2009*, Washington, DC, 2011, Table MV-9. Previous years Table VM-1. 2009-on: See Section 7.2 in Appendix A. (Additional resources: www.fhwa.dot.gov)

^a Average fuel economy for all two-axle, four-tire trucks.

^b Beginning in this year the data were revised to include all vans (including mini-vans), pickups and sport utility vehicles.

^c Due to FHWA methodology changes, data from 2009-on are not comparable with previous data.

These data are the combination of the car and two-axle, four-tire truck data from Tables 4.1 and 4.2 thus the data may not match exactly with the FHWA VM-1 table's light-duty vehicle data. The methodology change after 2008 affects these data as well.

Table 4.3 (Updated April 2021)
Summary Statistics for Light Vehicles, 1970–2019

| Year | Registrations (thousands) | Vehicle travel (billion miles) | Average annual miles per vehicle | Fuel use (million gallons) | Average fuel economy ^a per vehicle (miles per gallon) |
|---|------------------------------|-----------------------------------|-------------------------------------|-------------------------------|--|
| 1970 | 103,455 | 1,040 | 10,053 | 80,133 | 13.0 |
| 1975 | 127,124 | 1,235 | 9,712 | 93,221 | 13.2 |
| 1980 | 149,477 | 1,403 | 9,383 | 93,777 | 15.0 |
| 1985 ^b | 165,099 | 1,638 | 9,920 | 98,881 | 16.6 |
| 1986 | 169,386 | 1,694 | 10,001 | 102,248 | 16.6 |
| 1987 | 172,589 | 1,773 | 10,272 | 103,906 | 17.1 |
| 1988 | 177,641 | 1,872 | 10,541 | 105,998 | 17.7 |
| 1989 | 180,504 | 1,938 | 10,735 | 107,184 | 18.1 |
| 1990 | 181,975 | 1,983 | 10,896 | 105,179 | 18.9 |
| 1991 | 181,333 | 2,008 | 11,071 | 102,535 | 19.6 |
| 1992 | 183,672 | 2,078 | 11,316 | 106,365 | 19.5 |
| 1993 | 187,321 | 2,120 | 11,320 | 109,898 | 19.3 |
| 1994 | 190,787 | 2,171 | 11,378 | 111,986 | 19.4 |
| 1995 | 194,125 | 2,228 | 11,479 | 113,677 | 19.6 |
| 1996 | 198,862 | 2,286 | 11,497 | 116,575 | 19.6 |
| 1997 | 199,973 | 2,353 | 11,768 | 119,281 | 19.7 |
| 1998 | 203,169 | 2,418 | 11,901 | 122,157 | 19.8 |
| 1999 | 207,788 | 2,470 | 11,888 | 126,142 | 19.6 |
| 2000 | 212,706 | 2,523 | 11,863 | 126,004 | 20.0 |
| 2001 | 221,821 | 2,572 | 11,593 | 127,081 | 20.2 |
| 2002 | 220,932 | 2,625 | 11,879 | 130,691 | 20.1 |
| 2003 | 222,857 | 2,656 | 11,919 | 135,348 | 19.6 |
| 2004 | 228,276 | 2,727 | 11,946 | 138,819 | 19.6 |
| 2005 | 231,905 | 2,749 | 11,856 | 136,287 | 20.2 |
| 2006 | 234,525 | 2,773 | 11,824 | 135,694 | 20.4 |
| 2007 | 237,403 | 2,785 | 11,730 | 136,213 | 20.4 |
| 2008 | 238,315 | 2,724 | 11,432 | 132,696 | 20.5 ^c |
| 2009 | 235,034 | 2,633 | 11,204 | 128,411 | 20.5 |
| 2010 | 233,594 | 2,648 | 11,338 | 126,932 | 20.9 |
| 2011 | 231,228 | 2,650 | 11,463 | 125,432 | 21.1 |
| 2012 | 232,137 | 2,664 | 11,476 | 124,294 | 21.4 |
| 2013 | 234,199 | 2,678 | 11,434 | 122,845 | 21.8 |
| 2014 | 238,580 | 2,711 | 11,361 | 125,482 | 21.6 |
| 2015 | 241,417 | 2,780 | 11,514 | 122,940 | 22.6 |
| 2016 | 245,677 | 2,850 | 11,599 | 127,355 | 22.4 |
| 2017 | 248,926 | 2,877 | 11,559 | 126,103 | 22.8 |
| 2018 | 249,599 | 2,897 | 11,607 | 124,976 | 23.2 |
| 2019 | 252,530 | 2,924 | 11,579 | 124,436 | 23.5 |
| <i>Average annual percentage change</i> | | | | | |
| 1970-2019 | 1.8% | 2.1% | 0.3% | 0.9% | 1.2% |
| 2009-2019 | 0.7% | 1.1% | 0.3% | -0.3% | 1.4% |

Sources:

Tables 4.1 and 4.2.

^a Average fuel economy for all light vehicles.

^b Beginning in this year the data were revised to include all vans (including mini-vans), pickups and sport utility vehicles.

^c Due to FHWA methodology changes, data from 2009-on are not comparable with previous data.

Because data on class 2b trucks are scarce, the U.S. DOE funded a study to investigate available sources of data. In the final report, four methodologies are described to estimate the sales of class 2b trucks. The 1999 data are the latest available for fuel use and vehicle miles of travel of class 2b trucks.

Table 4.4
Summary Statistics on Class 1, Class 2a, and Class 2b Light Trucks

| Class (truck weight) | CY 1999 truck sales (millions) | 2000 truck population (millions) | Percent diesel trucks in population | Average age (years) | Estimated annual miles ^a (billions) | Estimated fuel use (billion ^a gallons) | Estimated fuel economy (miles per gallon) |
|-------------------------------|--------------------------------------|---|--|---------------------------|---|--|---|
| Class 1 (0-6,000 lbs) | 5.7 | 49.7 | 0.3% | 7.3 | 672.7 | 37.4 | 18.0 |
| Class 2a (6,001 – 8,500 lbs) | 1.8 | 19.2 | 2.5% | 7.4 | 251.9 | 18.0 | 14.0 |
| Class 2b (8,501 – 10,000 lbs) | 0.5 | 5.8 | 24.0% | 8.6 | 76.7 | 5.5 | 13.9 |

Note: CY - calendar year.

Source:

Davis, S.C. and L.F. Truett, *Investigation of Class 2b Trucks (Vehicles of 8,500 to 10,000 lbs GVWR)*, ORNL/TM-2002/49, March 2002, Table 16.

Table 4.5
Example of Class 2b Vehicle Models, 2017

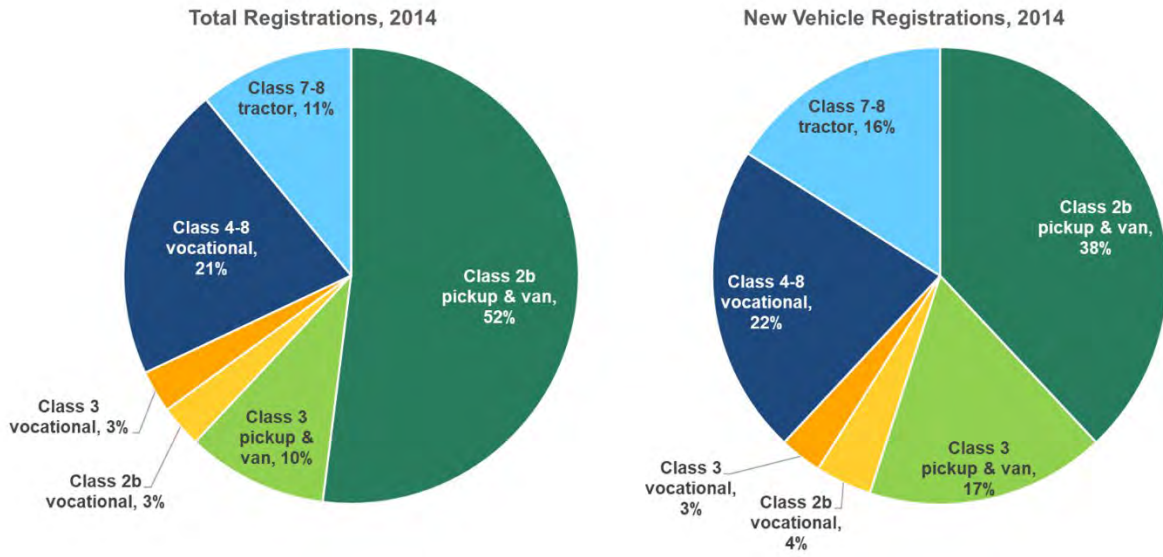
| Manufacturer | Model | Type |
|---------------|--------------------------------------|---------------------------|
| Chevrolet | Silverado 2500HD | Pickup |
| Chevrolet | Express 2500, 3500 | Van |
| FCA | Dodge Ram 2500 | Pickup |
| FCA | Dodge Ram ProMaster 1500 | Van |
| Ford | E-Series 350 | Van |
| Ford | F-250, F-350 | Pickup |
| Ford | F-250, F-350 CC | Chassis Cab |
| Ford | Transit 150, 250, 350, 350HD | Van |
| Ford | Transit CC / CA 150, 250, 350, 350HD | Chassis Cab / Cutaway Van |
| GMC | Savana 2500 | Van |
| GMC | Sierra 2500 | Pickup |
| GMC | Yukon 2500 | SUV |
| Mercedes-Benz | Sprinter | Van |

Source:

Birky, Alicia, et al., *Electrification Beyond Light-Duty: Class 2b-3 Commercial Vehicles*, ORNL/TM-2017/744, December 2017.

^a Estimates derived using 2000 population data and 1997 usage data. See source for details.

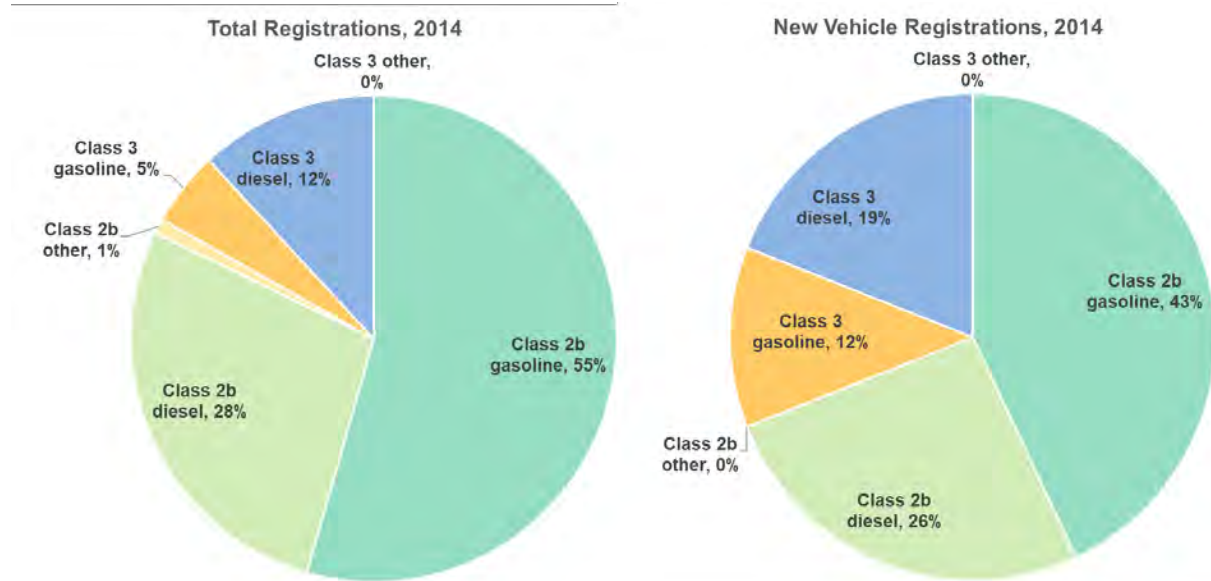
Figure 4.1. Truck Registrations by Class and Type, 2014



Source:

Birky, Alicia, et al., *Electrification Beyond Light Duty: Class 2b-3 Commercial Vehicles*, ORNL/TM-2017/744, December 2017.

Figure 4.2. Class 2b and 3 Registrations by Fuel Type, 2014



Source:

Birky, Alicia, et al., *Electrification Beyond Light Duty: Class 2b-3 Commercial Vehicles*, ORNL/TM-2017/744, December 2017.

Car sales in 2020 were at the lowest point in this series. Consumer preference towards sport utility vehicles is likely the reason for the decline. In 1980, Chrysler/FCA, Ford and General Motors held 73.8% of the market; by 2020, that dropped to 17%.

Table 4.6 (Updated April 2021)
New Retail Car Sales in the United States, 1970–2020

| Calendar year | Domestic ^a | Import ^b (thousands) | Total ^c | Percentage imports | Percentage | |
|---|-----------------------|------------------------------------|--------------------|--------------------|--------------------------------|-------------------|
| | | | | | FCA/Ford/GM sales ^d | Percentage diesel |
| 1970 | 7,112 | 1,209 | 8,321 | 14.5% | ^d | 0.07% |
| 1975 | 6,945 | 1,541 | 8,486 | 18.2% | ^d | 0.32% |
| 1980 | 6,580 | 2,369 | 8,949 | 26.5% | 73.8% | 4.32% |
| 1985 | 8,205 | 2,775 | 10,979 | 25.3% | 72.9% | 0.83% |
| 1990 | 6,917 | 2,384 | 9,301 | 25.6% | 65.7% | 0.08% |
| 1995 | 7,114 | 1,506 | 8,620 | 17.5% | 65.3% | 0.03% |
| 1996 | 7,206 | 1,272 | 8,479 | 15.0% | 64.1% | 0.09% |
| 1997 | 6,862 | 1,355 | 8,217 | 16.5% | 62.2% | 0.09% |
| 1998 | 6,705 | 1,380 | 8,085 | 17.1% | 59.7% | 0.14% |
| 1999 | 6,919 | 1,719 | 8,638 | 19.9% | 58.3% | 0.16% |
| 2000 | 6,762 | 2,016 | 8,778 | 23.0% | 55.0% | 0.26% |
| 2001 | 6,254 | 2,098 | 8,352 | 25.1% | 51.4% | 0.18% |
| 2002 | 5,817 | 2,226 | 8,042 | 27.7% | 48.4% | 0.39% |
| 2003 | 5,473 | 2,083 | 7,556 | 27.6% | 47.1% | 0.52% |
| 2004 | 5,333 | 2,149 | 7,483 | 28.7% | 44.9% | 0.40% |
| 2005 | 5,473 | 2,187 | 7,660 | 28.5% | 43.1% | 0.63% |
| 2006 | 5,417 | 2,345 | 7,762 | 30.2% | 40.5% | 0.82% |
| 2007 | 5,197 | 2,365 | 7,562 | 31.3% | 36.9% | 0.11% |
| 2008 | 4,491 | 2,278 | 6,769 | 33.7% | 34.2% | 0.11% |
| 2009 | 3,558 | 1,843 | 5,402 | 34.1% | 31.3% | 2.93% |
| 2010 | 3,791 | 1,844 | 5,636 | 32.7% | 31.7% | 2.69% |
| 2011 | 4,146 | 1,947 | 6,093 | 32.0% | 33.3% | 1.47% |
| 2012 | 5,120 | 2,125 | 7,245 | 29.3% | 31.6% | 2.69% |
| 2013 | 5,433 | 2,153 | 7,586 | 28.4% | 32.4% | 2.45% |
| 2014 | 5,610 | 2,098 | 7,708 | 27.2% | 31.2% | 2.41% |
| 2015 | 5,595 | 1,922 | 7,517 | 25.6% | 29.7% | 1.14% |
| 2016 | 5,146 | 1,727 | 6,873 | 25.1% | 27.9% | 0.12% |
| 2017 | 4,593 | 1,488 | 6,081 | 24.5% | 25.8% | 0.09% |
| 2018 | 4,087 | 1,217 | 5,304 | 22.9% | 23.8% | 0.08% |
| 2019 | 3,544 | 1,171 | 4,715 | 24.8% | 20.0% | 0.02% |
| 2020 | 2,560 | 842 | 3,402 | 24.8% | 17.3% | 0.00% |
| <i>Average annual percentage change</i> | | | | | | |
| 1970-2020 | -2.0% | -0.7% | -1.8% | | | |
| 2010-2020 | -3.9% | -7.5% | -4.9% | | | |

Source:

Domestic and import data - 1970–97: American Automobile Manufacturers Association, *Motor Vehicle Facts and Figures 1998*, Detroit, MI, 1998, p. 15, and annual. 1997 data from *Economic Indicators, 4th Quarter 1997*. 1998–2019: Ward’s Communication, www.wardsauto.com.

^a Any vehicle built in North America regardless of manufacturer.

^b Any vehicle built outside of North America regardless of manufacturer. Does not include import tourist deliveries.

^c Sums may not add to totals due to rounding.

^d Data are not available.

Light trucks, which include pick-ups, minivans, sport-utility vehicles, and other trucks less than 10,000 pounds gross vehicle weight (GVW), have grown more popular and by 2020 accounted for 75.9% of all light vehicle sales. Imports accounted for only 22.9% of 2020 light truck sales.

Table 4.7 (Updated April 2021)
New Retail Sales of Trucks 10,000 Pounds GVW and Less in the United States, 1970–2020

| Calendar year | Light truck sales ^a (thousands) | Percentages | | | | Light trucks of all light vehicle sales ^e | Light trucks of total truck sales |
|---|---|---------------------|--------------------------------|---------------------|-------|--|-----------------------------------|
| | | Import ^b | FCA/Ford/GM sales ^c | Diesel ^d | | | |
| 1970 | 1,457 | 4.5% | Not available | ^f | 14.8% | 77.8% | |
| 1975 | 2,053 | 10.0% | Not available | ^f | 20.9% | 78.6% | |
| 1980 | 1,960 | 24.4% | Not available | 4.0% | 17.5% | 78.1% | |
| 1985 | 3,688 | 22.6% | 78.2% | 4.0% | 25.1% | 77.7% | |
| 1990 | 4,548 | 13.5% | 80.9% | 2.3% | 32.8% | 93.8% | |
| 1991 | 4,122 | 13.1% | 79.4% | 3.2% | 33.5% | 94.4% | |
| 1992 | 4,629 | 8.8% | 83.1% | 2.5% | 36.0% | 94.4% | |
| 1993 | 5,351 | 7.1% | 83.4% | 2.3% | 38.6% | 94.2% | |
| 1994 | 6,033 | 6.8% | 82.9% | 2.5% | 40.2% | 94.0% | |
| 1995 | 6,053 | 6.6% | 83.4% | 3.8% | 41.3% | 93.2% | |
| 1996 | 6,519 | 6.7% | 83.8% | 3.1% | 43.5% | 93.4% | |
| 1997 | 6,797 | 8.5% | 81.9% | 2.7% | 45.3% | 93.4% | |
| 1998 | 7,299 | 9.0% | 80.5% | 2.6% | 47.4% | 92.6% | |
| 1999 | 8,073 | 9.6% | 78.0% | 2.9% | 48.3% | 92.0% | |
| 2000 | 8,386 | 10.2% | 76.1% | 3.4% | 48.9% | 92.8% | |
| 2001 | 8,598 | 11.4% | 75.3% | 2.9% | 50.7% | 94.3% | |
| 2002 | 8,633 | 12.4% | 74.7% | 2.7% | 51.8% | 94.9% | |
| 2003 | 8,938 | 13.7% | 72.4% | 2.9% | 54.2% | 95.0% | |
| 2004 | 9,254 | 13.5% | 70.1% | 2.8% | 55.3% | 94.3% | |
| 2005 | 9,114 | 13.3% | 68.2% | 2.7% | 54.3% | 93.1% | |
| 2006 | 8,574 | 15.7% | 63.9% | 2.8% | 52.5% | 92.3% | |
| 2007 | 8,305 | 16.7% | 61.9% | 3.2% | 52.3% | 93.3% | |
| 2008 | 6,246 | 17.6% | 61.2% | 3.4% | 48.0% | 92.9% | |
| 2009 | 4,834 | 18.3% | 57.8% | 4.2% | 47.2% | 93.0% | |
| 2010 | 5,758 | 15.6% | 57.6% | 4.9% | 50.5% | 93.8% | |
| 2011 | 6,449 | 15.2% | 59.4% | 5.4% | 51.4% | 92.7% | |
| 2012 | 6,975 | 15.2% | 57.7% | 5.5% | 49.0% | 92.6% | |
| 2013 | 7,693 | 16.1% | 57.3% | 5.3% | 50.3% | 92.7% | |
| 2014 | 8,484 | 16.0% | 57.6% | 5.4% | 52.4% | 92.7% | |
| 2015 | 9,578 | 18.6% | 57.0% | 5.5% | 56.0% | 92.7% | |
| 2016 | 10,296 | 20.9% | 55.6% | 5.4% | 60.0% | 93.7% | |
| 2017 | 10,738 | 22.4% | 54.2% | 4.4% | 63.8% | 93.6% | |
| 2018 | 11,609 | 23.7% | 53.1% | 4.2% | 68.6% | 93.6% | |
| 2019 | 11,911 | 22.0% | 52.8% | 3.3% | 71.6% | 93.3% | |
| 2020 | 10,712 | 22.9% | 51.7% | 4.1% | 75.9% | 93.3% | |
| <i>Average annual percentage change</i> | | | | | | | |
| 1970-2020 | 4.1% | | | | | | |
| 2010-2020 | 7.5% | | | | | | |

Source:

Ward's Communications, www.wardsauto.com.

^a Includes all trucks of 10,000 pounds gross vehicle weight and less sold in the United States.

^b Excluding transplants.

^c Includes Ford, General Motors, and Fiat-Chrysler (and predecessor entities).

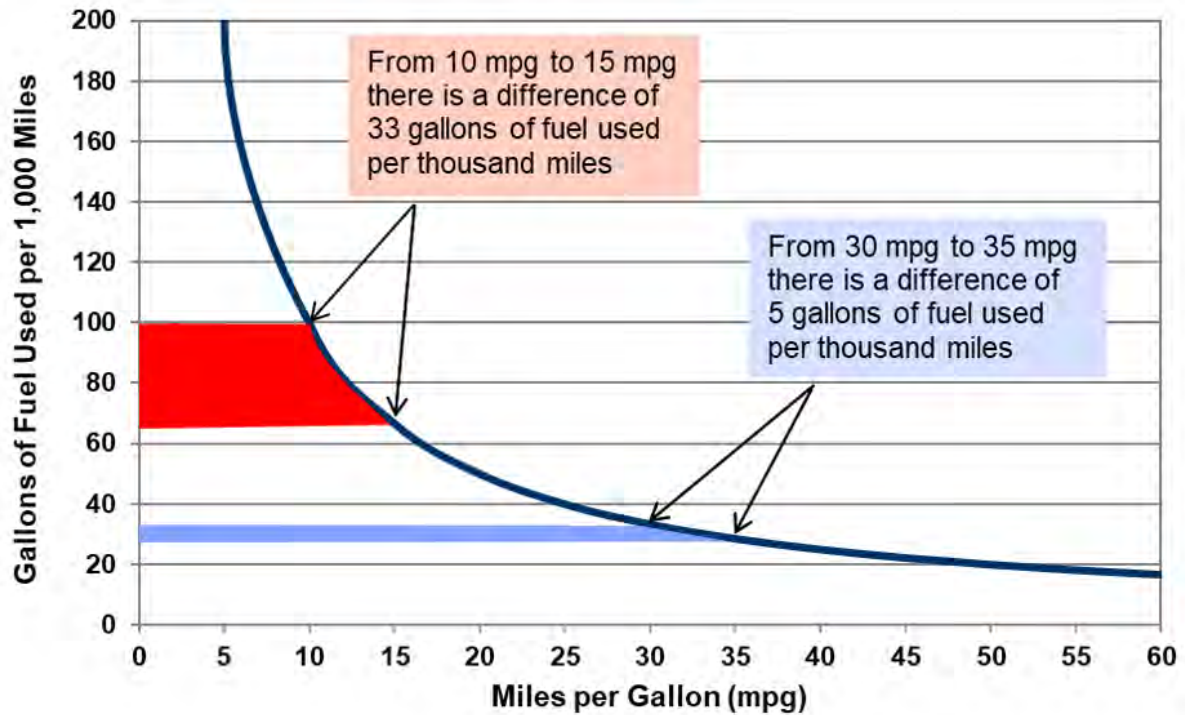
^d Based on model year factory installations from 1970-2016. Based on retail sales thereafter.

^e Includes cars and light trucks up to 10,000 lb gross vehicle weight.

^f Indicates less than 1 percent.

The relationship between gallons used over a given distance and miles per gallon (mpg) is not linear. Thus, an increase in fuel economy by 5 mpg does not translate to a constant fuel savings amount. Replacing a low-mpg car or truck with one that has just slightly better fuel economy will save more fuel than replacing a high-mpg car or truck with a more efficient vehicle. For example, replacing a truck that gets 10 mpg for a new one that gets 15 mpg will save 33 gallons of fuel for every 1,000 miles driven. In contrast, replacing a 30-mpg car with a new car that gets 35 mpg will save 5 gallons of fuel for every 1,000 miles driven.

Figure 4.3. Fuel Use versus Fuel Economy



Note: Each category on the horizontal axis shows a five-mile per gallon improvement in fuel economy.

Source:

U.S. Department of Energy fuel economy data www.fueleconomy.gov.

The fuel economy values that manufacturers must use to comply with the Corporate Average Fuel Economy (CAFE) standards are not the same as fuel economy values on new vehicle window stickers. Nor are they the same as the real-world estimates published in Tables 4.9, 4.11, and 4.12. The number of test cycles used and the weighting of city and highway mileage differs with these three fuel economy metrics. The example of a 2020 Toyota Prius Eco shows a combined fuel economy of 81 miles per gallon (mpg) for CAFE purposes, 56 mpg for the window sticker, and 55 mpg as the best real-world estimate. The fuel economy difference is not constant among vehicle models.

Table 4.8 (Updated April 2021)
Fuel Economy Comparison Among CAFE, Window Sticker, and Real-World Estimates
for the 2020 Toyota Prius Eco

| Fuel economy metric | Purpose | City/highway weighting | Test basis | Fuel economy value (miles per gallon) | | |
|------------------------------|---|------------------------|------------|---------------------------------------|-----|-------------------|
| | | | | City | Hwy | Combined City/Hwy |
| CAFE unadjusted 2-cycle test | Basis for manufacturer compliance with CAFE standards | 55%/45% | 2-cycle | 84 | 78 | 81 |
| New vehicle window sticker | Consumer information to compare individual vehicles | 55%/45% | 5-cycle | 58 | 53 | 56 |
| Estimated real-world | Best estimate of real-world performance | 43%/57% | 5-cycle | 58 | 53 | 55 |

Notes: CAFE estimates and standards are shown in Tables 4.27 and 4.28. Test cycles are shown in Figures 4.8-4.12.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: www.epa.gov/fuel-economy-trends)

The production-weighted fuel economy of cars increased dramatically from 1975 (13.5 mpg) to 1985 (23.0 mpg) but rose only 0.5 mpg from 1985 to 2005. Since 2005, fuel economy rose 8.5 mpg—from 23.5 mpg in 2005 to 32.0 mpg in 2020. The fuel economy values have been adjusted to provide the best estimate of real-world performance.

Table 4.9 (Updated April 2021)
Production, Production Shares, and Production-Weighted Fuel Economies of New Domestic and Import Cars, Model Years 1975-2020^a

| Model year | Car | | | Car SUV | | |
|-------------------|------------------------|-----------------------------------|--------------------|------------------------|-----------------------------------|--------------------|
| | Production (thousands) | Production share (%) ^b | Fuel economy (mpg) | Production (thousands) | Production share (%) ^b | Fuel economy (mpg) |
| 1975 | 8,237 | 99.9% | 13.5 | 10 | 0.1% | 11.1 |
| 1980 | 9,443 | 100.0% | 20.0 | 0 | 0.0% | 14.6 |
| 1990 | 8,810 | 99.3% | 23.3 | 65 | 0.7% | 18.8 |
| 1991 | 8,524 | 97.4% | 23.4 | 224 | 2.6% | 18.2 |
| 1992 | 8,108 | 97.1% | 23.1 | 243 | 2.9% | 17.8 |
| 1993 | 8,456 | 94.7% | 23.5 | 473 | 5.3% | 17.0 |
| 1994 | 8,415 | 96.2% | 23.3 | 332 | 3.8% | 18.0 |
| 1995 | 9,396 | 97.7% | 23.4 | 220 | 2.3% | 17.8 |
| 1996 | 7,890 | 96.5% | 23.3 | 287 | 3.5% | 18.4 |
| 1997 | 8,334 | 95.8% | 23.4 | 361 | 4.2% | 19.2 |
| 1998 | 7,971 | 94.6% | 23.4 | 454 | 5.4% | 18.2 |
| 1999 | 8,376 | 94.5% | 23.0 | 488 | 5.5% | 18.5 |
| 2000 | 9,125 | 93.7% | 22.9 | 617 | 6.3% | 17.9 |
| 2001 | 8,405 | 91.9% | 23.0 | 743 | 8.1% | 18.8 |
| 2002 | 8,301 | 93.2% | 23.1 | 603 | 6.8% | 19.3 |
| 2003 | 7,921 | 93.2% | 23.3 | 575 | 6.8% | 19.9 |
| 2004 | 7,537 | 92.2% | 23.1 | 639 | 7.8% | 20.0 |
| 2005 | 8,027 | 90.8% | 23.5 | 813 | 9.2% | 20.2 |
| 2006 | 7,993 | 91.4% | 23.3 | 751 | 8.6% | 20.5 |
| 2007 | 8,082 | 89.8% | 24.1 | 919 | 10.2% | 20.6 |
| 2008 | 7,319 | 88.8% | 24.3 | 924 | 11.2% | 21.2 |
| 2009 | 5,636 | 90.3% | 25.3 | 608 | 9.7% | 22.0 |
| 2010 | 6,061 | 86.9% | 26.2 | 915 | 13.1% | 23.0 |
| 2011 | 5,743 | 82.6% | 25.8 | 1,207 | 17.4% | 23.5 |
| 2012 | 7,393 | 85.4% | 27.6 | 1,265 | 14.6% | 23.3 |
| 2013 | 8,226 | 84.5% | 28.4 | 1,514 | 15.5% | 24.3 |
| 2014 | 7,639 | 83.0% | 28.4 | 1,566 | 17.0% | 24.4 |
| 2015 | 7,899 | 82.3% | 29.0 | 1,701 | 17.7% | 25.1 |
| 2016 | 7,131 | 79.2% | 29.2 | 1,870 | 20.8% | 26.2 |
| 2017 | 6,979 | 78.1% | 30.2 | 1,961 | 21.9% | 26.2 |
| 2018 | 5,962 | 76.5% | 30.8 | 1,831 | 23.5% | 27.3 |
| 2019 | 5,279 | 73.6% | 30.9 | 1,891 | 26.4% | 27.5 |
| 2020 ^c | ^d | 77.8% | 32.0 | ^d | 22.2% | 29.5 |

Note: See Table 4.12 for all cars (car + car SUV). See Table 4.10 for car SUV listing.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: www.epa.gov/fuel-economy-trends)

^a The fuel economy data on this table are adjusted to provide the best estimate of real world performance. See Appendix C of the source document for details on adjustment methodology. These data are typically 20-25% lower than Corporate Average Fuel Economy data.

^b Production share is based on total of cars plus car SUVs. Percentages may not sum to totals due to rounding.

^c Data for 2020 are preliminary.

^d Data are not available.

A vehicle classification was created to match the Corporate Average Fuel Economy (CAFE) methodology. Under CAFE, two-wheel and all-wheel drive sport utility vehicles that are under 6,000 lb gross vehicle weight and have off road capabilities will be held to the same standards as cars. The Environmental Protection Agency has labeled these vehicles as “car SUVs.”

Table 4.10 (Updated April 2021)
Definition of Car Sport Utility Vehicles in Model Year 2020

| | |
|-----------------------|---------------------------------|
| Acura RDX FWD | Jeep Renegade 4x2 |
| Alfa Romeo Stelvio | Kia Sportage FWD |
| Audi A6 Allroad | Lamborghini Urus |
| Audi Q3 quattro | Lexus NX 300 |
| Buick Envision FWD | Lexus NX 300 AWD F SPORT |
| Chevrolet Equinox FWD | Lexus RX 350 |
| Ford Ecosport FWD | Lexus RX 350L |
| Ford Edge FWD | Lexus RX 350L AWD |
| Ford Escape FWD | Maserati Levante GTS |
| Ford Escape FWD HEV | Mazda CX-30 2WD |
| Ford Escape FWD PHEV | Mazda CX-5 2WD |
| GMC Terrain FWD | Mercedes GLA 250 |
| Honda CR-V FWD | Mercedes GLB 250 |
| Hyundai Kona AWD | Mercedes GLC 300 |
| Hyundai Kona Electric | Mitsubishi Eclipse Cross 2WD |
| Hyundai Kona FWD | Mitsubishi Eclipse Cross ES 2WD |
| Hyundai Nexo | Mitsubishi Outlander Sport 2WD |
| Hyundai Nexo Blue | Nissan Rogue FWD |
| Hyundai Tucson AWD | Tesla Model X |
| Hyundai Tucson FWD | Tesla Model Y |
| Infiniti QX50 | Toyota RAV4 |
| Jaguar I-Pace | Volvo XC60 FWD |
| Jeep Cherokee FWD | VW Tiguan |
| Jeep Compass 4x2 | |

Note: 2WD = Two-wheel drive. AWD = All-wheel drive. FWD = Front-wheel drive.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021.
(Additional resources: www.epa.gov/fuel-economy-trends)

Production of sport utility vehicles (SUVs) has grown substantially since 1975. The production-weighted fuel economy of truck SUVs was 23.9 mpg in 2020. Estimates show 71.5% of all light trucks produced in 2020 were truck SUVs.

Table 4.11 (Updated April 2021)
Production, Production Shares, and Production-Weighted Fuel Economies of New Domestic and Import Light Trucks, Model Years 1975-2020^a

| Model Year | Pickup | | | Van | | | Truck SUV | | |
|-------------------|------------------------|------------------------|--------------------|------------------------|------------------------|--------------------|------------------------|------------------------|--------------------|
| | Production (Thousands) | Share (%) ^b | Fuel Economy (mpg) | Production (Thousands) | Share (%) ^b | Fuel Economy (mpg) | Production (Thousands) | Share (%) ^b | Fuel Economy (mpg) |
| 1975 | 1,343 | 67.9% | 11.9 | 457 | 23.1% | 11.1 | 177 | 9.0% | 11.0 |
| 1980 | 1,437 | 77.1% | 16.5 | 242 | 13.0% | 14.1 | 184 | 9.9% | 13.2 |
| 1985 | 2,078 | 58.0% | 18.2 | 855 | 23.9% | 16.5 | 648 | 18.1% | 16.5 |
| 1990 | 1,835 | 49.1% | 17.4 | 1,262 | 33.7% | 17.8 | 643 | 17.2% | 16.4 |
| 1991 | 1,920 | 50.2% | 18.2 | 1,034 | 27.0% | 17.9 | 871 | 22.8% | 16.7 |
| 1992 | 1,840 | 48.1% | 17.5 | 1,221 | 31.9% | 17.9 | 761 | 19.9% | 16.2 |
| 1993 | 2,002 | 46.8% | 17.6 | 1,441 | 33.7% | 18.2 | 838 | 19.6% | 16.3 |
| 1994 | 2,669 | 49.6% | 17.4 | 1,418 | 26.4% | 17.8 | 1,291 | 24.0% | 16.0 |
| 1995 | 2,271 | 41.1% | 16.9 | 1,662 | 30.1% | 18.1 | 1,596 | 28.9% | 16.0 |
| 1996 | 1,955 | 39.4% | 17.1 | 1,409 | 28.4% | 18.3 | 1,603 | 32.3% | 16.2 |
| 1997 | 2,408 | 41.8% | 16.8 | 1,265 | 22.0% | 18.2 | 2,089 | 36.3% | 16.1 |
| 1998 | 2,415 | 40.0% | 17.0 | 1,489 | 24.7% | 18.7 | 2,127 | 35.3% | 16.2 |
| 1999 | 2,544 | 40.1% | 16.3 | 1,463 | 23.0% | 18.3 | 2,342 | 36.9% | 16.1 |
| 2000 | 2,612 | 38.2% | 16.7 | 1,691 | 24.8% | 18.6 | 2,526 | 37.0% | 16.0 |
| 2001 | 2,519 | 39.0% | 16.0 | 1,232 | 19.1% | 18.0 | 2,707 | 41.9% | 16.4 |
| 2002 | 2,380 | 33.0% | 15.8 | 1,243 | 17.2% | 18.7 | 3,588 | 49.8% | 16.3 |
| 2003 | 2,474 | 34.0% | 16.1 | 1,232 | 16.9% | 19.0 | 3,571 | 49.1% | 16.4 |
| 2004 | 2,505 | 33.3% | 15.7 | 953 | 12.7% | 19.2 | 4,075 | 54.1% | 16.5 |
| 2005 | 2,300 | 32.6% | 15.8 | 1,481 | 21.0% | 19.3 | 3,272 | 46.4% | 16.7 |
| 2006 | 2,188 | 34.4% | 16.1 | 1,166 | 18.3% | 19.5 | 3,006 | 47.3% | 17.2 |
| 2007 | 2,113 | 33.7% | 16.2 | 847 | 13.5% | 19.5 | 3,314 | 52.8% | 17.7 |
| 2008 | 1,794 | 31.7% | 16.5 | 790 | 14.0% | 19.8 | 3,072 | 54.3% | 18.2 |
| 2009 | 989 | 32.2% | 16.9 | 368 | 12.0% | 20.1 | 1,714 | 55.8% | 19.3 |
| 2010 | 1,276 | 30.8% | 16.9 | 559 | 13.5% | 20.1 | 2,305 | 55.7% | 19.7 |
| 2011 | 1,479 | 29.2% | 17.2 | 521 | 10.3% | 20.9 | 3,069 | 60.5% | 19.8 |
| 2012 | 1,357 | 28.3% | 17.2 | 662 | 13.8% | 21.3 | 2,771 | 57.9% | 20.0 |
| 2013 | 1,577 | 28.9% | 17.5 | 571 | 10.5% | 21.1 | 3,310 | 60.6% | 20.8 |
| 2014 | 1,929 | 30.6% | 18.0 | 672 | 10.6% | 21.3 | 3,706 | 58.8% | 21.6 |
| 2015 | 1,786 | 25.0% | 18.8 | 655 | 9.2% | 21.8 | 4,697 | 65.8% | 21.9 |
| 2016 | 1,907 | 26.2% | 18.9 | 630 | 8.7% | 21.7 | 4,741 | 65.1% | 22.2 |
| 2017 | 2,054 | 25.5% | 18.9 | 617 | 7.7% | 22.2 | 5,391 | 66.9% | 22.3 |
| 2018 | 2,259 | 26.7% | 19.1 | 508 | 6.0% | 22.8 | 5,692 | 67.3% | 23.1 |
| 2019 | 2,521 | 28.1% | 19.0 | 555 | 6.2% | 22.4 | 5,893 | 65.7% | 23.5 |
| 2020 ^c | ^d | 24.0% | 19.5 | ^d | 4.6% | 23.0 | ^d | 71.5% | 23.9 |

Note: Data include pickups, vans, and truck SUV less than 8,500 lb. Beginning with 2011, truck SUV and passenger vans up to 10,000 lb were also included. See Table 4.12 for all light trucks (pickup + van + truck SUV).

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

^a The fuel economy data on this table are adjusted to provide the best estimate of real world performance. See Appendix C of the source document for details on adjustment methodology. These data are typically 20-25% lower than Corporate Average Fuel Economy data.

^b Production share is based on the total of pickups, plus vans and truck SUVs. Percentages may not sum to totals due to rounding.

^c Data for 2020 are preliminary.

^d Data are not available.

The average fuel economy of cars more than doubled from 1975 to 2020 while the average fuel economy of light trucks grew by 94% in that same time period. This was not steady annual growth, but growth in the 1970's and early 1980's followed by a long period with little improvement. Growth resumed around 2008-2009.

Table 4.12 (Updated April 2021)
**Production and Production-Weighted Fuel Economies of New Domestic and Import Cars,
 Light Trucks and Light Vehicles, Model Years 1975-2020^a**

| Model Year | All Cars ^b | | All Light Trucks | | All Light Vehicles | |
|-------------------|---------------------------|-----------------------|---------------------------|-----------------------|---------------------------|-----------------------|
| | Production (Thousands) | Fuel Economy (mpg) | Production (Thousands) | Fuel Economy (mpg) | Production (Thousands) | Fuel Economy (mpg) |
| 1975 | 8,247 | 13.5 | 1,977 | 11.6 | 10,224 | 13.1 |
| 1980 | 9,444 | 20.0 | 1,863 | 15.8 | 11,307 | 19.2 |
| 1985 | 10,879 | 23.0 | 3,581 | 17.5 | 14,460 | 21.3 |
| 1990 | 8,875 | 23.3 | 3,740 | 17.4 | 12,615 | 21.2 |
| 1995 | 9,616 | 23.3 | 5,529 | 17.0 | 15,145 | 20.5 |
| 1996 | 8,177 | 23.1 | 4,967 | 17.2 | 13,144 | 20.4 |
| 1997 | 8,695 | 23.2 | 5,762 | 16.8 | 14,457 | 20.2 |
| 1998 | 8,425 | 23.0 | 6,030 | 17.1 | 14,455 | 20.1 |
| 1999 | 8,865 | 22.7 | 6,350 | 16.6 | 15,215 | 19.7 |
| 2000 | 9,742 | 22.5 | 6,829 | 16.8 | 16,571 | 19.8 |
| 2001 | 9,148 | 22.6 | 6,458 | 16.5 | 15,606 | 19.6 |
| 2002 | 8,904 | 22.8 | 7,211 | 16.5 | 16,115 | 19.5 |
| 2003 | 8,496 | 23.0 | 7,277 | 16.7 | 15,773 | 19.6 |
| 2004 | 8,176 | 22.9 | 7,533 | 16.5 | 15,709 | 19.3 |
| 2005 | 8,839 | 23.1 | 7,053 | 16.9 | 15,892 | 19.9 |
| 2006 | 8,744 | 23.0 | 6,360 | 17.2 | 15,104 | 20.1 |
| 2007 | 9,001 | 23.7 | 6,275 | 17.4 | 15,276 | 20.6 |
| 2008 | 8,243 | 23.9 | 5,656 | 17.8 | 13,898 | 21.0 |
| 2009 | 6,244 | 25.0 | 3,071 | 18.5 | 9,316 | 22.4 |
| 2010 | 6,976 | 25.7 | 4,141 | 18.8 | 11,116 | 22.6 |
| 2011 | 6,949 | 25.4 | 5,069 | 19.1 | 12,018 | 22.3 |
| 2012 | 8,659 | 26.9 | 4,790 | 19.3 | 13,449 | 23.6 |
| 2013 | 9,740 | 27.7 | 5,458 | 19.8 | 15,198 | 24.2 |
| 2014 | 9,205 | 27.6 | 6,307 | 20.3 | 15,512 | 24.1 |
| 2015 | 9,601 | 28.2 | 7,138 | 21.1 | 16,739 | 24.6 |
| 2016 | 9,001 | 28.5 | 7,277 | 21.2 | 16,278 | 24.7 |
| 2017 | 8,954 | 29.2 | 8,061 | 21.3 | 17,016 | 24.9 |
| 2018 | 7,800 | 29.9 | 8,459 | 21.9 | 16,259 | 25.1 |
| 2019 | 7,171 | 29.9 | 8,969 | 22.0 | 16,139 | 24.9 |
| 2020 ^c | ^d | 31.4 | ^d | 22.6 | ^d | 25.7 |

Note: Data include pickups, vans, and truck SUV less than 8,500 lb. Beginning with 2011, truck SUVs and passenger vans up to 10,000 lb were also included.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021.
 (Additional resources: www.epa.gov/fuel-economy-trends)

^a The fuel economy data on this table are adjusted to provide the best estimate of real world performance. See Appendix C of the source document for details on adjustment methodology. These data are typically 20-25% lower than Corporate Average Fuel Economy data.

^b All Cars include both car and car SUV categories.

^c Data for 2020 are preliminary.

^d Data are not available, but 42.8% of all light vehicles were cars (car + car SUV) and 57.2% were light trucks (pickups, vans, and truck SUV) in 2020.

Back in 1975 only 19.3% of new light vehicles produced were light trucks. Because of the boom in production of minivans, sport utility vehicles, and pick-up trucks, that number rose to over 40% in 1998. Since 2018 more than half of light vehicles produced were light trucks. The car SUV category was 9.5% of production in 2020 and the truck SUVs were 40.8%.

Table 4.13 (Updated April 2021)
Light Vehicle Production Shares^a, Model Years 1975–2020

| Model Year | Light Vehicle Production Shares | | | | | Total Light Vehicles Produced (thousands) | Production Share | |
|-------------------|---------------------------------|---------|--------|-------|-----------|---|-------------------|--------------|
| | Car | Car SUV | Pickup | Van | Truck SUV | | Cars ^b | Light Trucks |
| 1975 | 80.6% | 0.1% | 13.1% | 4.5% | 1.7% | 10,224 | 80.7% | 19.3% |
| 1980 | 83.5% | 0.0% | 12.7% | 2.1% | 1.6% | 11,306 | 83.5% | 16.5% |
| 1985 | 74.6% | 0.6% | 14.4% | 5.9% | 4.5% | 14,460 | 75.2% | 24.8% |
| 1990 | 69.8% | 0.5% | 14.5% | 10.0% | 5.1% | 12,615 | 70.4% | 29.6% |
| 1991 | 67.8% | 1.8% | 15.3% | 8.2% | 6.9% | 12,573 | 69.6% | 30.4% |
| 1992 | 66.6% | 2.0% | 15.1% | 10.0% | 6.2% | 12,172 | 68.6% | 31.4% |
| 1993 | 64.0% | 3.6% | 15.2% | 10.9% | 6.3% | 13,211 | 67.6% | 32.4% |
| 1994 | 59.6% | 2.3% | 18.9% | 10.0% | 9.1% | 14,125 | 61.9% | 38.1% |
| 1995 | 62.0% | 1.5% | 15.0% | 11.0% | 10.5% | 15,145 | 63.5% | 36.5% |
| 1996 | 60.0% | 2.2% | 14.9% | 10.7% | 12.2% | 13,144 | 62.2% | 37.8% |
| 1997 | 57.6% | 2.5% | 16.7% | 8.8% | 14.5% | 14,458 | 60.1% | 39.9% |
| 1998 | 55.1% | 3.1% | 16.7% | 10.3% | 14.7% | 14,456 | 58.3% | 41.7% |
| 1999 | 55.1% | 3.2% | 16.7% | 9.6% | 15.4% | 15,215 | 58.3% | 41.7% |
| 2000 | 55.1% | 3.7% | 15.8% | 10.2% | 15.2% | 16,571 | 58.8% | 41.2% |
| 2001 | 53.9% | 4.8% | 16.1% | 7.9% | 17.3% | 15,605 | 58.6% | 41.4% |
| 2002 | 51.5% | 3.7% | 14.8% | 7.7% | 22.3% | 16,115 | 55.3% | 44.7% |
| 2003 | 50.2% | 3.6% | 15.7% | 7.8% | 22.6% | 15,773 | 53.9% | 46.1% |
| 2004 | 48.0% | 4.1% | 15.9% | 6.1% | 25.9% | 15,709 | 52.0% | 48.0% |
| 2005 | 50.5% | 5.1% | 14.5% | 9.3% | 20.6% | 15,892 | 55.6% | 44.4% |
| 2006 | 52.9% | 5.0% | 14.5% | 7.7% | 19.9% | 15,104 | 57.9% | 42.1% |
| 2007 | 52.9% | 6.0% | 13.8% | 5.5% | 21.7% | 15,276 | 58.9% | 41.1% |
| 2008 | 52.7% | 6.6% | 12.9% | 5.7% | 22.1% | 13,898 | 59.3% | 40.7% |
| 2009 | 60.5% | 6.5% | 10.6% | 4.0% | 18.4% | 9,316 | 67.0% | 33.0% |
| 2010 | 54.5% | 8.2% | 11.5% | 5.0% | 20.7% | 11,116 | 62.8% | 37.3% |
| 2011 | 47.8% | 10.0% | 12.3% | 4.3% | 25.5% | 12,018 | 57.8% | 42.2% |
| 2012 | 55.0% | 9.4% | 10.1% | 4.9% | 20.6% | 13,449 | 64.4% | 35.6% |
| 2013 | 54.1% | 10.0% | 10.4% | 3.8% | 21.8% | 15,198 | 64.1% | 35.9% |
| 2014 | 49.2% | 10.1% | 12.4% | 4.3% | 23.9% | 15,512 | 59.3% | 40.7% |
| 2015 | 47.2% | 10.2% | 10.7% | 3.9% | 28.1% | 16,739 | 57.4% | 42.6% |
| 2016 | 43.8% | 11.5% | 11.7% | 3.9% | 29.1% | 16,278 | 55.3% | 44.7% |
| 2017 | 41.0% | 11.6% | 12.1% | 3.6% | 31.7% | 17,016 | 52.6% | 47.4% |
| 2018 | 36.7% | 11.3% | 13.9% | 3.1% | 35.0% | 16,259 | 48.0% | 52.0% |
| 2019 | 32.7% | 11.7% | 15.6% | 3.4% | 36.5% | 16,139 | 44.4% | 55.6% |
| 2020 ^c | 33.3% | 9.5% | 13.7% | 2.6% | 40.8% | ^d | 42.8% | 57.2% |

Note: Light truck data include pickups, vans, and truck SUVs less than 8,500 lb. Beginning with 2011, SUV and passenger vans up to 10,000 lb were also included.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

^a Percentages may not sum to totals due to rounding.

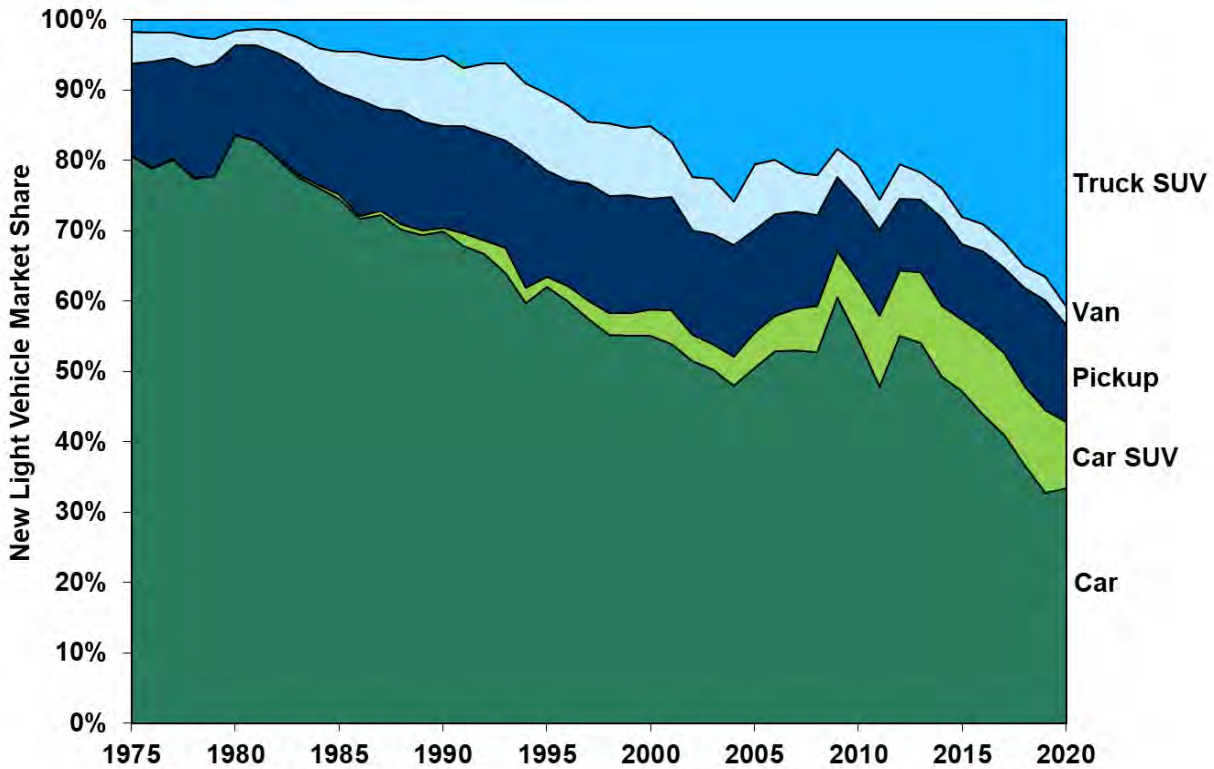
^b Cars include both car and car SUV categories.

^c Data for 2020 are preliminary.

^d Data are not available.

The effects of the Japanese earthquake/tsunami in 2011 are apparent in the large decline in car production for that year. Light trucks were gaining market share from the early 1980s until 2004, mainly due to increases in the market share of sport utility vehicles (SUVs) and pickup trucks. Car SUVs are two-wheel drive SUVs that are counted as cars in the Corporate Average Fuel Economy Standards for model years 2011-on. A listing of the makes/models of car SUVs is in Table 4.10.

Figure 4.4. Light Vehicle Production Shares, Model Years 1975–2020 (Updated April 2021)



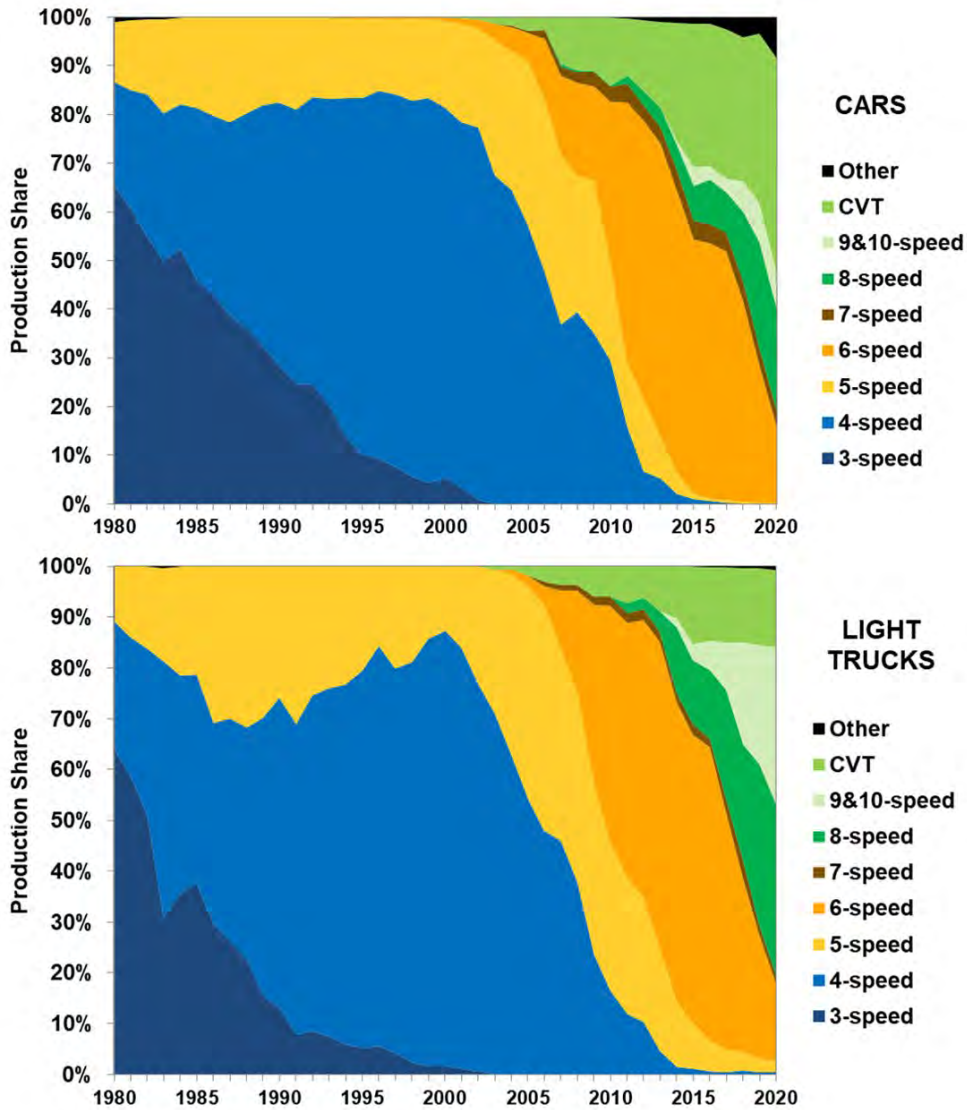
Note: Data for 2020 are preliminary.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: www.epa.gov/fuel-economy-trends)

The number of transmission speeds in new light-duty vehicles has been growing over the last few decades. By 2020, 91% of cars and 97% of light trucks were at least six speeds. The share of light truck transmissions in the 9 & 10-speed category grew to 31% in 2020. Continuously variable transmissions (CVTs) were 44% of car production and 15% of light truck production. A greater number of gears improves fuel economy and performance by more closely matching the wheel speed to the optimum engine speed.

Figure 4.5. Car and Light Truck Production by Transmission Speed, Model Years 1980-2020
(Updated April 2021)



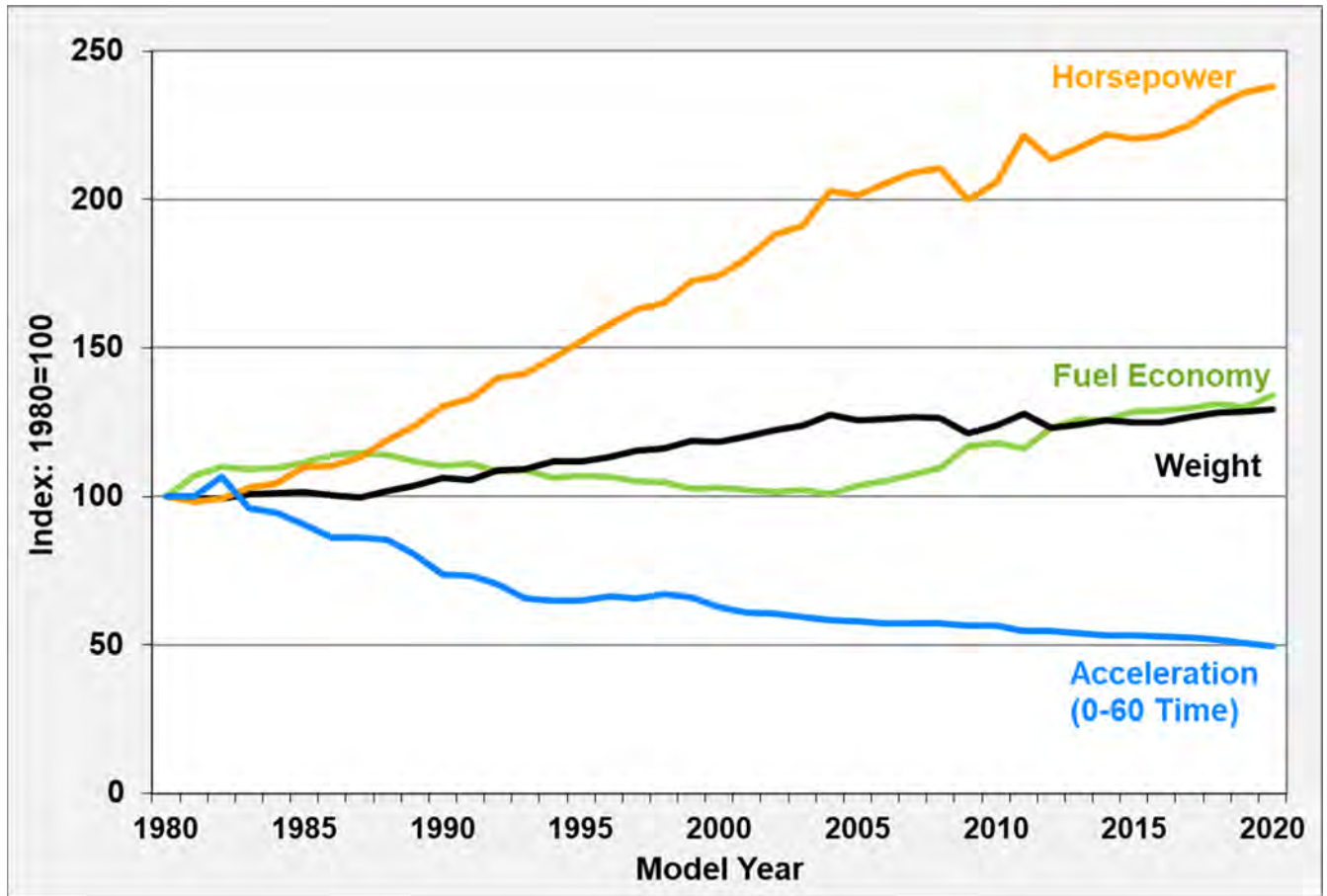
Note: Data are production-weighted averages for each model year. Data for model year 2020 are preliminary. CVT data include both hybrid and non-hybrid. The "Other" category includes electric vehicles and plug-in hybrid-electric vehicles. Data include light trucks less than 8,500 lb Beginning with 2011, SUVs and passenger vans up to 10,000 lb were also included.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

Increased performance typically comes as a trade-off with fuel economy. But light vehicle manufacturers have been able to employ advanced technologies to improve both performance and fuel economy. Despite a 138% increase in horsepower and 50% improvement in acceleration from model year 1980 to 2020, the fuel economy of vehicles improved 34%. In the 1990s and early 2000s, fuel economy decreased while vehicle weight increased. Fuel economy has improved nearly every year since 2004.

Figure 4.6. Horsepower, Fuel Economy, Weight, and 0-60 Time for New Light Vehicles, Model Years 1980-2020 (Updated April 2021)



Note: Data are production-weighted averages for each model year. Data for model year 2020 are preliminary. CVT data include both hybrid and non-hybrid. Data include light trucks less than 8,500 lb Beginning with 2011, SUVs and passenger vans up to 10,000 lb were also included.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

Manufacturers have introduced new technologies that have played a significant role in improving the fuel economy of passenger cars. Turbocharging has enabled manufacturers to downsize engines without sacrificing performance while gasoline direct injection has improved combustion efficiency in the engine. Cylinder deactivation is another strategy for reducing engine displacement that shuts down cylinders under light load conditions. Stop-start reduces unnecessary idling by automatically shutting down the engine when the vehicle is stopped and restarting the engine only when needed. Continuously variable transmissions improve efficiency by maintaining optimum engine speed as the vehicle speed varies. Penetration of direct injection has grown rapidly and was installed on 50.1% of all new cars in model year (MY) 2020. Turbochargers were installed on 33.7% of new cars produced in MY 2020.

Table 4.14 (Updated April 2021)
Car Technology Penetration, 1996-2020

| Model year | Turbo | Continuously variable transmission (non-hybrid) | Continuously variable transmission (hybrid) | Gasoline direct injection | Cylinder deactivation | Stop-start (non-hybrid) | Stop-start (hybrid) |
|-------------------|-------|---|---|---------------------------|-----------------------|-------------------------|---------------------|
| 1996 | 0.3% | 0.0% | a | a | a | a | a |
| 1997 | 0.7% | 0.1% | a | a | a | a | a |
| 1998 | 1.4% | 0.1% | a | a | a | a | a |
| 1999 | 2.5% | 0.0% | a | a | a | a | a |
| 2000 | 2.2% | 0.0% | a | a | a | a | 0.1% |
| 2001 | 3.3% | 0.0% | 0.2% | a | a | a | 0.2% |
| 2002 | 3.9% | 0.1% | 0.3% | a | a | a | 0.3% |
| 2003 | 2.0% | 1.0% | 0.5% | a | a | a | 0.6% |
| 2004 | 3.6% | 0.9% | 0.8% | a | a | a | 0.9% |
| 2005 | 2.4% | 1.1% | 1.7% | a | 1.0% | a | 1.9% |
| 2006 | 3.2% | 1.2% | 1.5% | a | 2.0% | a | 1.5% |
| 2007 | 3.6% | 6.7% | 3.0% | 0.3% | 0.9% | a | 3.2% |
| 2008 | 4.5% | 7.7% | 3.2% | 3.1% | 2.0% | a | 3.3% |
| 2009 | 4.0% | 8.3% | 2.8% | 4.2% | 1.8% | a | 2.9% |
| 2010 | 4.1% | 8.4% | 5.5% | 9.2% | 2.1% | a | 5.6% |
| 2011 | 8.2% | 8.8% | 3.1% | 18.4% | 1.3% | a | 3.4% |
| 2012 | 9.7% | 11.0% | 4.0% | 27.4% | 1.7% | 1.3% | 4.6% |
| 2013 | 15.1% | 13.7% | 4.3% | 37.3% | 1.9% | 3.5% | 5.3% |
| 2014 | 18.1% | 21.3% | 3.7% | 42.7% | 2.2% | 10.7% | 4.1% |
| 2015 | 18.1% | 26.3% | 3.6% | 44.0% | 2.2% | 12.7% | 4.0% |
| 2016 | 23.6% | 27.2% | 2.4% | 49.5% | 2.1% | 12.1% | 2.7% |
| 2017 | 28.9% | 29.1% | 2.7% | 52.4% | 3.0% | 15.7% | 3.4% |
| 2018 | 36.4% | 28.2% | 2.4% | 52.5% | 3.3% | 21.8% | 2.9% |
| 2019 | 35.2% | 32.1% | 3.2% | 53.1% | 3.6% | 25.2% | 4.4% |
| 2020 ^b | 33.7% | 40.9% | 3.9% | 50.1% | 4.3% | 23.1% | 5.0% |

Note: Based on production. Car category includes car SUV. See Table 4.10 for car SUV listing.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-006, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

^a The Environmental Protection Agency did not record market penetration for this technology in this year.

^b Data for 2020 are preliminary.

Manufacturers have introduced a number of engine and transmission technologies to improve the fuel efficiency and performance of light trucks. Gasoline direct injection has seen rapid market penetration from about 1% of all new light trucks produced in model year (MY) 2008 to about 60% by MY 2020. Cylinder deactivation, turbocharging, and stop-start have all seen increased penetration with each of these technologies reaching more than 20% of production for light trucks in MY 2020. The penetration of continuously variable transmissions (CVT) is lower for light trucks than for cars because CVTs are not generally well suited to the high horsepower and high torque requirements of pickup trucks and large SUVs that provide greater load hauling and towing capability.

Table 4.15 (Updated April 2021)
Light Truck Technology Penetration, 2002-2020

| Model year | Turbo | Continuously variable transmission (non-hybrid) | Continuously variable transmission (hybrid) | Gasoline direct injection | Cylinder deactivation | Stop-start (non-hybrid) | Stop-start (hybrid) |
|-------------------|--------------|---|---|---------------------------|-----------------------|-------------------------|---------------------|
| 2002 | ^a | 0.0% | ^a | ^a | ^a | ^a | |
| 2003 | 0.2% | 0.6% | ^a | ^a | ^a | ^a | |
| 2004 | 0.8% | 0.6% | ^a | ^a | ^a | ^a | 0.0% |
| 2005 | 0.7% | 1.7% | 0.1% | ^a | 0.5% | ^a | 0.1% |
| 2006 | 0.6% | 1.6% | 1.5% | ^a | 5.9% | ^a | 1.5% |
| 2007 | 1.0% | 2.9% | 0.7% | ^a | 16.4% | ^a | 0.8% |
| 2008 | 1.0% | 2.3% | 1.3% | 1.1% | 13.5% | ^a | 1.3% |
| 2009 | 1.7% | 5.1% | 0.9% | 4.2% | 18.3% | ^a | 0.9% |
| 2010 | 1.8% | 5.1% | 0.8% | 6.8% | 13.8% | ^a | 0.9% |
| 2011 | 4.9% | 6.9% | 0.4% | 11.3% | 20.6% | ^a | 0.4% |
| 2012 | 6.1% | 5.9% | 0.3% | 13.5% | 19.6% | 0.3% | 0.4% |
| 2013 | 11.7% | 8.4% | 0.4% | 18.4% | 18.0% | 1.1% | 0.4% |
| 2014 | 9.9% | 9.8% | 0.3% | 29.7% | 22.9% | 2.8% | 0.4% |
| 2015 | 12.6% | 15.0% | 0.3% | 39.0% | 21.7% | 5.9% | 0.3% |
| 2016 | 15.3% | 13.6% | 0.8% | 46.1% | 20.7% | 11.2% | 0.8% |
| 2017 | 17.3% | 13.8% | 1.0% | 46.7% | 21.8% | 20.0% | 1.1% |
| 2018 | 24.1% | 13.7% | 1.1% | 48.1% | 20.9% | 37.1% | 1.8% |
| 2019 | 25.8% | 13.8% | 1.4% | 52.8% | 24.0% | 46.3% | 3.2% |
| 2020 ^b | 36.5% | 13.0% | 2.4% | 59.3% | 20.9% | 56.6% | 7.7% |

Note: Based on production. Data include pickups, vans, and truck SUV less than 8,500 lb. Beginning with 2011, truck SUVs and passenger vans up to 10,000 lb were also included.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

^a The Environmental Protection Agency did not record market penetration for this technology in this year.

^b Data for 2020 are preliminary.

The production-weighted average engine displacement of cars in 1975 was 4.72 liters but had declined to 2.23 liters by 2020. Car SUVs also experienced a decline in engine displacement. For a list of car SUVs, see Table 4.10

Table 4.16 (Updated April 2021)
Production-Weighted Engine Size of New Domestic and Import Cars,
Model Years 1975-2020
(liters^a)

| Model Year | Car | Car SUV |
|---|-------|---------|
| 1975 | 4.73 | 4.29 |
| 1980 | 3.08 | 4.59 |
| 1985 | 2.90 | 2.80 |
| 1986 | 2.74 | 2.78 |
| 1987 | 2.65 | 2.93 |
| 1988 | 2.63 | 3.26 |
| 1989 | 2.67 | 3.70 |
| 1990 | 2.67 | 3.42 |
| 1991 | 2.66 | 3.52 |
| 1992 | 2.78 | 3.44 |
| 1993 | 2.73 | 3.91 |
| 1994 | 2.75 | 3.42 |
| 1995 | 2.74 | 3.51 |
| 1996 | 2.71 | 3.52 |
| 1997 | 2.68 | 3.11 |
| 1998 | 2.68 | 3.58 |
| 1999 | 2.72 | 3.45 |
| 2000 | 2.71 | 3.47 |
| 2001 | 2.70 | 3.17 |
| 2002 | 2.71 | 3.00 |
| 2003 | 2.71 | 2.97 |
| 2004 | 2.76 | 3.13 |
| 2005 | 2.72 | 3.05 |
| 2006 | 2.82 | 3.01 |
| 2007 | 2.71 | 3.04 |
| 2008 | 2.70 | 2.93 |
| 2009 | 2.54 | 2.87 |
| 2010 | 2.56 | 2.81 |
| 2011 | 2.61 | 2.72 |
| 2012 | 2.42 | 2.74 |
| 2013 | 2.37 | 2.63 |
| 2014 | 2.40 | 2.52 |
| 2015 | 2.37 | 2.51 |
| 2016 | 2.32 | 2.33 |
| 2017 | 2.27 | 2.26 |
| 2018 | 2.26 | 2.09 |
| 2019 | 2.27 | 2.06 |
| 2020 ^b | 2.23 | 2.04 |
| <i>Annual average percentage change</i> | | |
| 1975-2020 | -1.7% | -1.6% |
| 2010-2020 | -1.4% | -3.2% |

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

^a 1 liter = 61.02 cubic inches.

^b Data for 2020 are preliminary.

The production-weighted engine size of truck sport utility vehicles (SUVs) declined an average of 2.4% per year from 2010 to 2020, while the engine size of pickups decreased by only 0.9%.

Table 4.17 (Updated April 2021)
Production-Weighted Engine Size of New Domestic and Import Light Trucks,
Model Years 1975-2020
(liters^a)

| Model Year | Pickup | Van | Truck SUV |
|-------------------|---|-------|-----------|
| 1975 | 5.02 | 5.20 | 5.44 |
| 1980 | 3.86 | 4.72 | 4.83 |
| 1985 | 3.63 | 3.87 | 3.63 |
| 1990 | 4.04 | 3.69 | 3.85 |
| 1991 | 3.80 | 3.60 | 3.82 |
| 1992 | 4.01 | 3.64 | 3.85 |
| 1993 | 4.00 | 3.57 | 4.00 |
| 1994 | 4.06 | 3.70 | 4.01 |
| 1995 | 4.20 | 3.79 | 4.01 |
| 1996 | 4.12 | 3.61 | 4.24 |
| 1997 | 4.33 | 3.61 | 4.19 |
| 1998 | 4.13 | 3.56 | 4.14 |
| 1999 | 4.38 | 3.65 | 4.14 |
| 2000 | 4.18 | 3.55 | 4.15 |
| 2001 | 4.41 | 3.75 | 3.92 |
| 2002 | 4.45 | 3.57 | 4.01 |
| 2003 | 4.33 | 3.59 | 4.05 |
| 2004 | 4.61 | 3.58 | 4.13 |
| 2005 | 4.65 | 3.53 | 4.00 |
| 2006 | 4.55 | 3.54 | 3.87 |
| 2007 | 4.69 | 3.59 | 3.94 |
| 2008 | 4.69 | 3.60 | 3.76 |
| 2009 | 4.70 | 3.53 | 3.46 |
| 2010 | 4.80 | 3.51 | 3.48 |
| 2011 | 4.63 | 3.47 | 3.56 |
| 2012 | 4.69 | 3.44 | 3.52 |
| 2013 | 4.62 | 3.43 | 3.36 |
| 2014 | 4.80 | 3.49 | 3.21 |
| 2015 | 4.54 | 3.32 | 3.24 |
| 2016 | 4.36 | 3.37 | 3.13 |
| 2017 | 4.48 | 3.37 | 3.11 |
| 2018 | 4.37 | 3.36 | 2.95 |
| 2019 | 4.38 | 3.34 | 2.93 |
| 2020 ^b | 4.36 | 3.24 | 2.73 |
| | <i>Annual average percentage change</i> | | |
| 1975-2020 | -0.3% | -1.0% | -1.5% |
| 2010-2020 | -0.9% | -0.8% | -2.4% |

Note: Data include pickups, vans, and truck SUV less than 8,500 lb Beginning with 2011, truck SUVs and passenger vans up to 10,000 lb were also included.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

^a 1 liter = 61.02 cubic inches.

^b Data for 2020 are preliminary.

The production-weighted loaded vehicle weight of cars declined by 500 lb from 1975 to 2020, while car SUVs declined by 186 lb.

Table 4.18 (Updated April 2021)
Production-Weighted Loaded Vehicle Weight^a of New Domestic and Import Cars,
Model Years 1975–2020
(pounds)

| Model Year | Car | Car SUV |
|---|-------|---------|
| 1975 | 4,058 | 4,000 |
| 1980 | 3,101 | 4,000 |
| 1985 | 3,093 | 3,469 |
| 1986 | 3,041 | 3,479 |
| 1987 | 3,031 | 3,492 |
| 1988 | 3,047 | 3,495 |
| 1989 | 3,099 | 3,497 |
| 1990 | 3,176 | 3,518 |
| 1991 | 3,154 | 3,733 |
| 1992 | 3,240 | 3,713 |
| 1993 | 3,207 | 3,848 |
| 1994 | 3,250 | 3,735 |
| 1995 | 3,263 | 3,763 |
| 1996 | 3,282 | 3,710 |
| 1997 | 3,274 | 3,549 |
| 1998 | 3,306 | 3,824 |
| 1999 | 3,365 | 3,831 |
| 2000 | 3,369 | 3,870 |
| 2001 | 3,380 | 3,765 |
| 2002 | 3,391 | 3,747 |
| 2003 | 3,417 | 3,716 |
| 2004 | 3,462 | 3,854 |
| 2005 | 3,463 | 3,848 |
| 2006 | 3,534 | 3,876 |
| 2007 | 3,507 | 3,935 |
| 2008 | 3,527 | 3,902 |
| 2009 | 3,464 | 3,846 |
| 2010 | 3,474 | 3,949 |
| 2011 | 3,559 | 3,890 |
| 2012 | 3,452 | 3,915 |
| 2013 | 3,465 | 3,966 |
| 2014 | 3,497 | 3,865 |
| 2015 | 3,489 | 3,868 |
| 2016 | 3,468 | 3,782 |
| 2017 | 3,471 | 3,860 |
| 2018 | 3,535 | 3,739 |
| 2019 | 3,512 | 3,714 |
| 2020 ^b | 3,558 | 3,814 |
| <i>Annual average percentage change</i> | | |
| 1975-2020 | -0.3% | -0.2% |
| 2010-2020 | 0.2% | -0.3% |

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

^a Loaded vehicle weight is equal to the vehicle's curb weight plus 300 pounds.

^b Data for 2020 are preliminary.

The production-weighted loaded vehicle weight of pickups, vans, and truck SUVs increased from 1975 to 2019. Pickups gained 1,180 lb while vans gained 449 lb and truck SUVs gained 183 lb.

Table 4.19 (Updated April 2021)
Production-Weighted Loaded Vehicle Weight^a of New Domestic and Import Light Trucks,
Model Years 1975–2020
(pounds)

| Model Year | Pickup | Van | Truck SUV |
|---|--------|-------|-----------|
| 1975 | 4,012 | 4,196 | 4,214 |
| 1980 | 3,740 | 4,353 | 4,237 |
| 1985 | 3,642 | 3,975 | 4,092 |
| 1990 | 3,928 | 4,095 | 4,098 |
| 1991 | 3,779 | 4,133 | 4,157 |
| 1992 | 3,976 | 4,151 | 4,204 |
| 1993 | 3,996 | 4,105 | 4,331 |
| 1994 | 4,056 | 4,156 | 4,331 |
| 1995 | 4,182 | 4,110 | 4,323 |
| 1996 | 4,190 | 4,195 | 4,386 |
| 1997 | 4,415 | 4,240 | 4,463 |
| 1998 | 4,282 | 4,183 | 4,450 |
| 1999 | 4,486 | 4,306 | 4,518 |
| 2000 | 4,340 | 4,276 | 4,602 |
| 2001 | 4,551 | 4,518 | 4,546 |
| 2002 | 4,690 | 4,394 | 4,636 |
| 2003 | 4,642 | 4,393 | 4,754 |
| 2004 | 4,939 | 4,487 | 4,756 |
| 2005 | 4,988 | 4,430 | 4,756 |
| 2006 | 4,968 | 4,475 | 4,715 |
| 2007 | 5,144 | 4,479 | 4,797 |
| 2008 | 5,161 | 4,527 | 4,727 |
| 2009 | 5,176 | 4,572 | 4,548 |
| 2010 | 5,309 | 4,533 | 4,555 |
| 2011 | 5,268 | 4,502 | 4,665 |
| 2012 | 5,335 | 4,442 | 4,640 |
| 2013 | 5,429 | 4,543 | 4,584 |
| 2014 | 5,485 | 4,489 | 4,483 |
| 2015 | 5,165 | 4,416 | 4,533 |
| 2016 | 5,150 | 4,459 | 4,482 |
| 2017 | 5,217 | 4,503 | 4,510 |
| 2018 | 5,233 | 4,524 | 4,426 |
| 2019 | 5,085 | 4,497 | 4,444 |
| 2020 ^b | 5,192 | 4,645 | 4,397 |
| <i>Annual average percentage change</i> | | | |
| 1975-2019 | 0.5% | 0.2% | 0.1% |
| 2009-2019 | -0.2% | 0.0% | -0.7% |

Note: Data include pickups, vans, and truck SUV less than 8,500 lb. Beginning with 2011, truck SUVs and passenger vans up to 10,000 lb were also included.

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: <https://www.epa.gov/fuel-economy-trends>)

^a Loaded vehicle weight is equal to the vehicle's curb weight plus 300 pounds.

^b Data for 2020 are preliminary.

The average light vehicle in 2017 contained more than 2,000 pounds of steel, most of it conventional steel. High and medium strength steel, however, were more than 19% of the vehicle. The use of aluminum grew from 1995 to 2017, while the use of iron castings declined.

Table 4.20
Average Material Consumption for a Domestic Light Vehicle,^a
Model Years 1995, 2000, and 2017

| Material | 1995 | | 2000 | | 2017 | |
|---------------------------------|--------------|---------------|--------------|---------------|--------------|---------------|
| | Pounds | Percentage | Pounds | Percentage | Pounds | Percentage |
| Regular steel | 1,630 | 44.1% | 1,655 | 42.4% | 1,222 | 30.9% |
| High and medium strength steel | 324 | 8.8% | 408 | 10.5% | 765 | 19.3% |
| Stainless steel | 51 | 1.4% | 62 | 1.6% | 72 | 1.8% |
| Other steels | 46 | 1.2% | 26 | 0.7% | 31 | 0.8% |
| Iron castings | 466 | 12.6% | 432 | 11.1% | 243 | 6.1% |
| Aluminum | 231 | 6.3% | 268 | 6.9% | 416 | 10.5% |
| Magnesium castings | 4 | 0.1% | 8 | 0.2% | 8 | 0.2% |
| Copper and brass | 50 | 1.4% | 52 | 1.3% | 69 | 1.8% |
| Lead | 33 | 0.9% | 36 | 0.9% | 37 | 0.9% |
| Zinc castings | 19 | 0.5% | 13 | 0.3% | 9 | 0.2% |
| Powder metal parts | 29 | 0.8% | 36 | 0.9% | 44 | 1.1% |
| Other metals | 4 | 0.1% | 4 | 0.1% | 5 | 0.1% |
| Plastics and plastic composites | 240 | 6.5% | 286 | 7.3% | 342 | 8.6% |
| Rubber | 149 | 4.0% | 166 | 4.3% | 206 | 5.2% |
| Coatings | 23 | 0.6% | 25 | 0.6% | 29 | 0.7% |
| Textiles | 42 | 1.1% | 44 | 1.1% | 46 | 1.2% |
| Fluids and lubricants | 192 | 5.2% | 207 | 5.3% | 222 | 5.6% |
| Glass | 97 | 2.6% | 103 | 2.6% | 95 | 2.4% |
| Other materials | 64 | 1.7% | 71 | 1.8% | 92 | 2.6% |
| Total | 3,694 | 100.0% | 3,902 | 100.0% | 3,953 | 100.0% |

Source:

Ward's Communications, www.wardsauto.com. (Original source: American Chemistry Council)

^a Data are for vehicles built in North America. Percentages may not sum to totals due to rounding.

In the automotive industry, a Tier 1 supplier is a company that sells directly to the original equipment manufacturer (OEM). Globally, Robert Bosch GmbH is the top automotive supplier. Of the top 20 global Tier 1 suppliers, Magna International has the highest share of sales in North America (48%).

Table 4.21 (Updated August 2021)
List of Top Twenty Tier 1 Global Suppliers, 2020

| Rank | Company | Headquarters location | Market share | | | | Total |
|------|---------------------------------|-----------------------|---------------|--------------|--------------|---------------|--------------|
| | | | North America | Europe | Asia | Rest of World | |
| 1 | Robert Bosch GmbH | Germany | 15% | 45% | 39% | 1% | 100% |
| 2 | Denso Corp. | Japan | 21% | 10% | 68% | 1% | 100% |
| 3 | ZF Friedrichshafen AG | Germany | 26% | 46% | 25% | 3% | 100% |
| 4 | Magna International, Inc. | Canada | 48% | 44% | 6% | 1% | 99% |
| 5 | Aisin Seiki | Japan | 16% | 10% | 72% | 2% | 100% |
| 6 | Continental AG | Germany | 25% | 48% | 24% | 3% | 100% |
| 7 | Hyundai Mobis | Korea | 16% | 13% | 68% | 4% | 101% |
| 8 | Faurecia | France | 25% | 47% | 24% | 4% | 100% |
| 9 | Lear Corp. | United States | 39% | 37% | 21% | 3% | 100% |
| 10 | Valeo SA | France | 19% | 46% | 33% | 2% | 100% |
| 11 | Yazaki Corp. | Japan | 32% | 17% | 51% | 0% | 100% |
| 12 | Sumitomo Electric Industries | Japan | 23% | ^a | ^a | ^a | ^a |
| 13 | BASF | Germany | 25% | 34% | 39% | 2% | 100% |
| 14 | Adient | United States | 31% | 26% | 36% | 7% | 100% |
| 15 | Tenneco Inc. | United States | 35% | 35% | 25% | 5% | 100% |
| 16 | Panasonic Automotive Systems Co | Japan | 39% | 6% | 53% | 2% | 100% |
| 17 | Yanfeng | China | 17% | 13% | 70% | 0% | 100% |
| 18 | Marelli | Japan | 24% | 38% | 35% | 3% | 100% |
| 19 | Apitiv | Ireland | 35% | 34% | 22% | 9% | 100% |
| 20 | JTEKT Corp. | Japan | 19% | 12% | 69% | 0% | 100% |

Source:

Crain Communications, Automotive News Supplement, "Top 100 Global Suppliers," June 2021. (Additional resources: www.autonews.com)

^a Data are not available.

There are 22 U.S.-based companies in the top 100 automotive global suppliers. Ten of these companies had at least half of their sales in North America in 2020.

Table 4.22 (Updated August 2021)
U.S.-Based Tier 1 Suppliers in the Global Top 100, 2020

| Rank | Company | Percent North American sales | Products |
|------|-----------------------------------|------------------------------|---|
| 9 | Lear Corp. | 39.0% | Seating & electrical systems (E-Systems) |
| 14 | Adient | 31.0% | Automotive seats |
| 15 | Tenneco, Inc. | 35.0% | A leading designer, manufacturer & marketer of clean air, powertrain & ride performance products |
| 23 | BorgWarner, Inc. | 31.0% | Electric drive modules, electric motors, turbochargers, high-voltage heaters, transfer cases & inverters |
| 28 | Flex-N-Gate Corp. | 81.0% | Interior & exterior plastics, metal bumpers, towing devices, structural metal assemblies, forward & signal lighting, prototyping & sequencing |
| 33 | Dana Holding Corp. | 51.0% | Drive systems, electrodynamics, gaskets, thermal-management products, motion systems & digital solutions (analytics) |
| 47 | American Axle & Mfg Holdings, Inc | 75.0% | Driveline (including EV) & metal forming components |
| 48 | Joyson Safety Systems | 27.0% | Steering wheels, seat belts, airbags & integrated safety solutions |
| 62 | Nexteer Automotive | 63.0% | Electric power steering, hydraulic power steering, steering columns & intermediate shafts, driveline systems, ADAS & AD enabling technologies |
| 64 | Piston Group | 91.0% | Batteries, cooling modules, brake corners, grilles, shocks, instrument panels, seat trim & parts, sun visors, shades, injection molding, brazed evaporator heater cores, HVAC units. |
| 67 | Visteon Corp. | 24.0% | Digital instrument clusters, displays, Android-based infotainment systems, domain controllers, advanced driver-assistance systems (ADAS) & battery management systems |
| 69 | Novelis Inc. | 51.0% | Flat-rolled aluminum sheet for vehicle structures, body panels, heat exchangers, heat shields & other automotive applications |
| 70 | Flex | 43.0% | Scalable compute, autonomous sensing, domain control, gateway modules, infotainment, power converters/inverters, media hubs, wireless charging, lighting, overhead consoles, cabin monitoring & actuators |
| 76 | Cooper Standard Automotive | 50.0% | Sealing, fuel & brake delivery & fluid transfer systems |
| 80 | Clarios | 29.0% | Battery technologies that support virtually every type of passenger, commercial & recreational vehicle (conventional to fully electric) |

(Continued)

Table 4.22 (Continued)
U.S.-Based Tier 1 Suppliers in the Global Top 100, 2020

| Rank | Company | Percent North American Sales | Products |
|------|-------------------------|------------------------------------|--|
| 83 | Arconic Inc. | 85.0% | Aluminum sheet for closure panels, hoods & trunks, bumper systems & crash management systems; extrusions for drive shafts |
| 86 | Gentex Corp. | 39.0% | Interior & exterior auto-dimming mirrors & full display mirrors; HomeLink, SmartBeam, aerospace windows & fire protection products |
| 90 | Bridgewater Interiors | 100.0% | Automotive seating systems |
| 95 | Varroc Lighting Systems | 22.0% | Exterior lighting (front & rear) & electronics |
| 98 | Inteva Products | 40.0% | Closure systems, interior systems, motors & electronic systems |
| 99 | Gentherm Inc. | 41.0% | Solutions for automotive passenger climate comfort & convenience, battery thermal management & cell connecting systems |
| 100 | Henniges Automotive | 62.0% | Automotive sealing systems & anti-vibration components |

Note: Rank based on total global OEM automotive parts sales in 2020.

Source:

Crain Communications, Automotive News Supplement, "Top 100 Global Suppliers," June 2021. (Additional resources: www.autonews.com)

The number of franchised dealerships which sell new light vehicles (cars and light trucks) has declined 46% since 1970. The average number of light vehicle sales per dealer in 2020 dropped to 849, which was the lowest since 2012.

Table 4.23 (Updated April 2021)
New Light Vehicle Dealerships and Sales, 1970–2020

| Calendar year | Number of franchised new light vehicle dealerships ^a | New light vehicle sales ^b (thousands) | Light vehicle sales per dealer |
|---------------|---|--|--------------------------------|
| 1970 | 30,800 | 9,778 | 320 |
| 1975 | 29,600 | 10,539 | 361 |
| 1980 | 27,900 | 10,909 | 391 |
| 1985 | 24,725 | 14,667 | 593 |
| 1986 | 24,825 | 15,998 | 644 |
| 1987 | 25,150 | 14,797 | 589 |
| 1988 | 25,025 | 15,344 | 613 |
| 1989 | 25,000 | 14,386 | 576 |
| 1990 | 24,825 | 13,849 | 558 |
| 1991 | 24,200 | 12,307 | 509 |
| 1992 | 23,500 | 12,842 | 546 |
| 1993 | 22,950 | 13,869 | 604 |
| 1994 | 22,850 | 15,024 | 657 |
| 1995 | 22,800 | 14,673 | 644 |
| 1996 | 22,750 | 14,998 | 659 |
| 1997 | 22,700 | 15,014 | 661 |
| 1998 | 22,600 | 15,384 | 681 |
| 1999 | 22,400 | 16,711 | 746 |
| 2000 | 22,250 | 17,164 | 771 |
| 2001 | 22,150 | 16,950 | 765 |
| 2002 | 21,800 | 16,675 | 765 |
| 2003 | 21,725 | 16,494 | 759 |
| 2004 | 21,650 | 16,737 | 773 |
| 2005 | 21,640 | 16,774 | 775 |
| 2006 | 21,495 | 16,336 | 760 |
| 2007 | 21,200 | 15,867 | 748 |
| 2008 | 20,770 | 13,015 | 627 |
| 2009 | 20,010 | 10,236 | 512 |
| 2010 | 18,460 | 11,394 | 617 |
| 2011 | 17,700 | 12,542 | 709 |
| 2012 | 17,540 | 14,220 | 811 |
| 2013 | 17,665 | 15,279 | 865 |
| 2014 | 16,396 | 16,192 | 988 |
| 2015 | 16,545 | 17,107 | 1,033 |
| 2016 | 16,708 | 17,179 | 1,028 |
| 2017 | 16,802 | 16,827 | 1,001 |
| 2018 | 16,753 | 16,919 | 1,010 |
| 2019 | 16,741 | 16,630 | 993 |
| 2020 | 16,623 | 14,114 | 849 |
| | <i>Average annual percentage change</i> | | |
| 1970-2020 | -1.2% | 0.7% | 2.0% |
| 2010-2020 | -1.0% | 2.2% | 3.2% |

Source:

Number of dealers - National Automobile Dealers Association website, www.nada.org. (Additional resources: www.nada.org). Light vehicle sales - See tables 4.5 and 4.6.

^a As of the beginning of the year.

^b Includes cars and trucks up to 10,000 lb gross vehicle weight.

Table 4.24
Conventional Refueling Stations, 1972–2020

| Year | Number of stations | Vehicles in operation (thousands) | Stations per thousand vehicles | Thousand vehicles per station |
|------|--------------------|--------------------------------------|-----------------------------------|----------------------------------|
| 1972 | 287,000 | 106,212 | 2.70 | 0.37 |
| 1975 | 242,000 | 120,054 | 2.02 | 0.50 |
| 1976 | 230,000 | 124,378 | 1.85 | 0.54 |
| 1977 | 220,000 | 128,126 | 1.72 | 0.58 |
| 1978 | 210,000 | 133,522 | 1.57 | 0.64 |
| 1979 | 203,000 | 137,260 | 1.48 | 0.68 |
| 1980 | 196,000 | 139,832 | 1.40 | 0.71 |
| 1981 | 191,000 | 141,908 | 1.35 | 0.74 |
| 1982 | 186,000 | 143,854 | 1.29 | 0.77 |
| 1983 | 182,000 | 147,104 | 1.24 | 0.81 |
| 1984 | 180,000 | 152,162 | 1.18 | 0.85 |
| 1985 | 178,000 | 157,049 | 1.13 | 0.88 |
| 1986 | 177,000 | 162,094 | 1.09 | 0.92 |
| 1987 | 176,000 | 167,193 | 1.05 | 0.95 |
| 1988 | 176,000 | 171,740 | 1.02 | 0.98 |
| 1989 | 175,000 | 175,960 | 0.99 | 1.01 |
| 1990 | 174,000 | 179,299 | 0.97 | 1.03 |
| 1991 | 172,000 | 181,447 | 0.95 | 1.05 |
| 1992 | 169,000 | 181,519 | 0.93 | 1.07 |
| 1993 | 167,000 | 186,315 | 0.90 | 1.12 |
| 1994 | 165,000 | 188,714 | 0.87 | 1.14 |
| 1995 | 164,000 | 193,441 | 0.85 | 1.18 |
| 1996 | 163,000 | 198,294 | 0.82 | 1.22 |
| 1997 | 162,000 | 201,071 | 0.81 | 1.24 |
| 1998 | 147,000 | 205,043 | 0.72 | 1.39 |
| 1999 | 141,000 | 209,509 | 0.67 | 1.49 |
| 2000 | 139,000 | 213,300 | 0.65 | 1.53 |
| 2001 | 137,000 | 216,683 | 0.63 | 1.58 |
| 2002 | 135,000 | 221,027 | 0.61 | 1.64 |
| 2003 | 137,000 | 225,882 | 0.61 | 1.65 |
| 2004 | 140,000 | 232,167 | 0.60 | 1.66 |
| 2005 | 144,000 | 238,384 | 0.60 | 1.66 |
| 2006 | 148,000 | 244,643 | 0.60 | 1.65 |
| 2007 | 150,000 | 248,701 | 0.60 | 1.66 |
| 2008 | 151,000 | 249,813 | 0.60 | 1.65 |
| 2009 | 148,000 | 248,972 | 0.59 | 1.68 |
| 2010 | 147,000 | 248,232 | 0.59 | 1.69 |
| 2011 | 147,000 | 248,932 | 0.59 | 1.69 |
| 2012 | 146,000 | 251,497 | 0.58 | 1.72 |
| 2013 | 145,000 | 252,715 | 0.57 | 1.74 |
| 2014 | 145,000 | 258,027 | 0.56 | 1.78 |
| 2015 | 145,000 | 264,194 | 0.55 | 1.82 |
| 2016 | 144,000 | 270,566 | 0.53 | 1.88 |
| 2017 | 143,000 | 275,979 | 0.52 | 1.93 |
| 2018 | 143,000 | 281,499 | 0.51 | 1.97 |
| 2019 | 142,000 | a | a | a |
| 2020 | 142,000 | a | a | a |

Notes: Includes all outlets open to the public and selling gasoline. Lundberg survey dates were 1972, 1982, 2002, 2006, 2008, 2013, 2015, 2017, 2019 and 2020. Other years were estimated by Lundberg Survey, Inc.

Sources:

Conventional refueling stations: Lundberg Survey, Inc. Used with permission.
Conventional vehicles: IHS Automotive, Detroit, MI. Used with permission.

^a Data are not available.

In April 2020, the National Highway Traffic Safety Administration and the Environmental Protection Agency issued joint rulemaking to regulate fuel economy and greenhouse gas emissions for model years (MY) 2021-2026 cars and light trucks.

Table 4.25
Fuel Economy and Carbon Dioxide Emissions Standards, Model Years 2017–2026

| Model year | Cars | Light trucks | Combined cars and light trucks |
|---|------|--------------|--------------------------------|
| Average required fuel economy (miles per gallon) | | | |
| 2017 | 39.0 | 29.4 | 34.0 |
| 2018 | 40.4 | 30.0 | 34.9 |
| 2019 | 41.9 | 30.5 | 35.8 |
| 2020 | 43.6 | 31.1 | 36.9 |
| 2021 | 44.2 | 31.6 | 36.9 |
| 2022 | 44.9 | 32.1 | 36.9 |
| 2023 | 45.6 | 32.6 | 36.9 |
| 2024 | 46.3 | 33.1 | 37.0 |
| 2025 | 47.0 | 33.6 | 37.0 |
| 2026 | 47.7 | 34.1 | 37.0 |
| Average projected emissions compliance levels (grams per mile) | | | |
| 2017 | 220 | 306 | 254 |
| 2018 | 209 | 293 | 244 |
| 2019 | 197 | 281 | 236 |
| 2020 | 187 | 268 | 227 |
| 2021 | 178 | 257 | 241 |
| 2022 | 175 | 253 | 241 |
| 2023 | 171 | 250 | 241 |
| 2024 | 168 | 248 | 241 |
| 2025 | 167 | 245 | 240 |
| 2026 | 165 | 240 | 240 |

Note: The presented rates of increase in stringency for NHTSA CAFE standards are lower than the Environmental Protection Agency (EPA) rates of increase in stringency for greenhouse gas (GHG) standards. One major difference is that NHTSA's standards, unlike EPA's, do not reflect the inclusion of air conditioning system refrigerant and leakage improvements, but EPA's standards would allow consideration of such improvements which reduce GHGs but generally do not affect fuel economy. The agencies expect, however, that a portion of these improvements will be made through reductions in air conditioning leakage, which would not contribute to fuel economy.

Source:

Federal Register, Vol. 85, No. 84, April 30, 2020. (Additional resources: www.nhtsa.gov/fuel-economy)

The target levels for the fuel economy and carbon dioxide emission standards for vehicles manufactured in model years 2012-on are assigned based on a vehicle's "footprint." Each footprint has a different target. The vehicle footprint is calculated as:

$$\text{footprint} = \text{track width} \times \text{wheelbase},$$

where

track width = lateral distance between the centerlines of the base tires at ground, and
wheelbase = longitudinal distance between the front and rear wheel centerlines.

Table 4.26 (Updated April 2021)
Vehicle Footprint by Vehicle Type, Model Years 2008-2020

| Model Year | Car | Car SUV | All Cars | Pickup | Van | Truck SUV | All Light Trucks | All Light Vehicles |
|-------------------|------|---------|----------|--------|------|-----------|------------------|--------------------|
| 2008 | 45.2 | 46.2 | 45.3 | 63.0 | 54.1 | 48.7 | 54.0 | 48.9 |
| 2009 | 44.9 | 46.1 | 45.0 | 62.6 | 54.5 | 48.6 | 53.8 | 47.9 |
| 2010 | 45.2 | 46.9 | 45.4 | 63.5 | 54.2 | 48.3 | 53.8 | 48.5 |
| 2011 | 45.8 | 46.9 | 46.0 | 63.9 | 55.4 | 49.7 | 54.4 | 49.5 |
| 2012 | 45.4 | 46.8 | 45.7 | 64.3 | 54.8 | 49.7 | 54.5 | 48.8 |
| 2013 | 45.7 | 47.1 | 45.9 | 65.3 | 54.8 | 49.7 | 54.7 | 49.1 |
| 2014 | 46.0 | 46.5 | 46.1 | 66.2 | 55.1 | 49.2 | 55.0 | 49.7 |
| 2015 | 46.0 | 46.4 | 46.1 | 65.3 | 54.6 | 49.4 | 53.9 | 49.4 |
| 2016 | 46.2 | 46.1 | 46.1 | 64.5 | 55.2 | 49.1 | 53.7 | 49.5 |
| 2017 | 46.1 | 46.5 | 46.2 | 64.8 | 55.7 | 49.4 | 53.8 | 49.8 |
| 2018 | 46.7 | 46.0 | 46.5 | 65.5 | 55.5 | 49.2 | 53.9 | 50.4 |
| 2019 | 46.5 | 46.4 | 46.5 | 65.1 | 55.1 | 49.5 | 54.2 | 50.8 |
| 2020 ^a | 46.7 | 46.9 | 46.8 | 64.4 | 55.3 | 49.1 | 53.1 | 50.4 |

Source:

U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. (Additional resources: www.epa.gov/fuel-economy-trends)

^a Data for 2020 are preliminary.

The Corporate Average Fuel Economy standards were first established by the U.S. Energy Policy and Conservation Act of 1975 (PL94-163). These standards must be met at the manufacturer level. Legislation passed in December 2007 changed the CAFE standard methodology beginning in the 2011 model year (MY). Some two-wheel drive sport utility vehicles are classified as cars under the final standards for MY 2011 on.

Table 4.27
Car Corporate Average Fuel Economy (CAFE) Standards versus
Sales-Weighted Fuel Economy Estimates, 1978–2017^a
(miles per gallon)

| Model year ^b | Cars | | | | CAFE estimates |
|-------------------------|-------------------|--------|-----------------------------|--------|--------------------------------|
| | CAFE standards | | CAFE estimates ^c | | Cars and light trucks combined |
| | Domestic | Import | Domestic | Import | |
| 1978 | 18.0 | 18.0 | 18.7 | 27.3 | 19.9 |
| 1980 | 20.0 | 20.0 | 22.6 | 29.6 | 23.1 |
| 1985 | 27.5 | 27.5 | 26.3 | 31.5 | 25.4 |
| 1990 | 27.5 | 27.5 | 26.9 | 29.9 | 25.4 |
| 1991 | 27.5 | 27.5 | 27.3 | 30.1 | 25.6 |
| 1992 | 27.5 | 27.5 | 27.0 | 29.2 | 25.1 |
| 1993 | 27.5 | 27.5 | 27.8 | 29.6 | 25.2 |
| 1994 | 27.5 | 27.5 | 27.5 | 29.6 | 24.7 |
| 1995 | 27.5 | 27.5 | 27.7 | 30.3 | 24.9 |
| 1996 | 27.5 | 27.5 | 28.1 | 29.6 | 24.9 |
| 1997 | 27.5 | 27.5 | 27.8 | 30.1 | 24.6 |
| 1998 | 27.5 | 27.5 | 28.6 | 29.2 | 24.7 |
| 1999 | 27.5 | 27.5 | 28.0 | 29.0 | 24.5 |
| 2000 | 27.5 | 27.5 | 28.7 | 28.3 | 24.8 |
| 2001 | 27.5 | 27.5 | 28.7 | 29.0 | 24.5 |
| 2002 | 27.5 | 27.5 | 29.1 | 28.8 | 24.7 |
| 2003 | 27.5 | 27.5 | 29.1 | 29.9 | 25.1 |
| 2004 | 27.5 | 27.5 | 29.9 | 28.7 | 24.6 |
| 2005 | 27.5 | 27.5 | 30.5 | 29.9 | 25.4 |
| 2006 | 27.5 | 27.5 | 30.3 | 29.7 | 25.8 |
| 2007 | 27.5 | 27.5 | 30.6 | 32.2 | 26.6 |
| 2008 | 27.5 ^d | 27.5 | 31.2 | 31.8 | 27.1 |
| 2009 | 27.5 ^d | 27.5 | 32.1 | 33.8 | 29.0 |
| 2010 | 27.5 ^d | 27.5 | 33.1 | 35.2 | 29.3 |
| 2011 | 30.0 | 30.4 | 32.7 | 33.7 | 29.0 |
| 2012 | 32.7 | 33.4 | 34.8 | 36.0 | 30.8 |
| 2013 | 33.2 | 33.9 | 36.1 | 36.8 | 31.6 |
| 2014 | 34.0 | 34.6 | 36.3 | 36.9 | 31.7 |
| 2015 | 35.2 | 35.8 | 37.2 | 37.3 | 32.2 |
| 2016 | 36.5 | 37.4 | 37.3 | 38.1 | 32.3 |
| 2017 | 38.5 | 39.6 | 39.2 | 39.7 | 33.4 |

Source:

U.S. Department of Transportation, NHTSA, "Summary of Fuel Economy Performance," Washington, DC, December 2014 and CAFE Public Information Center Reports, September 2020. (Additional resources: www.nhtsa.gov)

^a Only vehicles with at least 75 percent domestic content can be counted in the average domestic fuel economy for a manufacturer.

^b Model year as determined by the manufacturer on a vehicle by vehicle basis.

^c All CAFE calculations are sales-weighted.

^d Unreformed standards, which were an option from 2008-2010. See Table 4.25 for reformed standards.

The Corporate Average Fuel Economy standards for light trucks are lower than the car standards. Light trucks include pickups, minivans, sport utility vehicles and vans. Legislation passed in December 2007 changed the CAFE standard methodology beginning in the 2011 model year (MY). Some two-wheel drive sport utility vehicles are classified as cars under the final standards for MY 2011 on.

Table 4.28
Light Truck Corporate Average Fuel Economy (CAFE) Standards versus
Sales-Weighted Fuel Economy Estimates, 1978–2017^a
(miles per gallon)

| Model year ^c | CAFE standards ^e | Light trucks ^b | | | CAFE estimates Cars and light trucks combined |
|-------------------------|-----------------------------|-----------------------------|---------------------|-----------------------|---|
| | | CAFE estimates ^d | | | |
| | | Domestic ^f | Import ^f | Combined ^f | |
| 1978 | | | | | 19.9 |
| 1980 | | 16.8 | 24.3 | 18.5 | 23.1 |
| 1985 | 19.5 | 19.6 | 26.5 | 20.7 | 25.4 |
| 1990 | 20.0 | 20.3 | 23.0 | 20.8 | 25.4 |
| 1991 | 20.2 | 20.9 | 23.0 | 21.3 | 25.6 |
| 1992 | 20.2 | 20.5 | 22.7 | 20.8 | 25.1 |
| 1993 | 20.4 | 20.7 | 22.8 | 21.0 | 25.2 |
| 1994 | 20.5 | 20.5 | 22.1 | 20.8 | 24.7 |
| 1995 | 20.6 | 20.3 | 21.5 | 20.5 | 24.9 |
| 1996 | 20.7 | 20.5 | 22.2 | 20.8 | 24.9 |
| 1997 | 20.7 | 20.1 | 22.1 | 20.6 | 24.6 |
| 1998 | 20.7 | 20.5 | 23.0 | 21.0 | 24.7 |
| 1999 | 20.7 | 20.4 | 22.5 | 20.9 | 24.5 |
| 2000 | 20.7 | 21.1 | 19.7 | 21.3 | 24.8 |
| 2001 | 20.7 | 20.6 | 21.8 | 20.9 | 24.5 |
| 2002 | 20.7 | 20.6 | 21.9 | 21.4 | 24.7 |
| 2003 | 20.7 | 21.8 | 22.4 | 21.8 | 25.1 |
| 2004 | 20.7 | 20.7 | 22.3 | 21.5 | 24.6 |
| 2005 | 21.0 | ^f | ^f | 22.1 | 25.4 |
| 2006 | 21.6 | ^f | ^f | 22.5 | 25.8 |
| 2007 | 22.2 | ^f | ^f | 23.1 | 26.6 |
| 2008 | 22.4 ^g | ^f | ^f | 23.6 | 27.1 |
| 2009 | 23.0 ^g | ^f | ^f | 24.8 | 29.0 |
| 2010 | 23.4 ^g | ^f | ^f | 25.2 | 29.3 |
| 2011 | 24.3 | ^f | ^f | 24.7 | 29.0 |
| 2012 | 25.3 | ^f | ^f | 25.0 | 30.8 |
| 2013 | 25.9 | ^f | ^f | 25.7 | 31.6 |
| 2014 | 26.3 | ^f | ^f | 26.5 | 31.7 |
| 2015 | 27.6 | ^f | ^f | 27.3 | 32.2 |
| 2016 | 28.8 | ^f | ^f | 27.4 | 32.3 |
| 2017 | 29.4 | ^f | ^f | 28.6 | 33.4 |

Source:

U.S. Department of Transportation, NHTSA, "Summary of Fuel Economy Performance," Washington, DC, December 2014 and CAFE Public Information Center Reports, September 2020. (Additional resources: www.nhtsa.gov)

^a Only vehicles with at least 75% domestic content can be counted in the average domestic fuel economy for a manufacturer.

^b Represents two- and four-wheel drive trucks combined. Gross vehicle weight of 0-6,000 pounds for model year 1978-1979 and 0-8,500 pounds for subsequent years.

^c Model year as determined by the manufacturer on a vehicle by vehicle basis.

^d All CAFE calculations are sales-weighted.

^e Standards were set for two-wheel drive and four-wheel drive light trucks, but no combined standard was set in this year.

^f Data are not available.

^g Unreformed standards, which were an option from 2008-2010. See Table 4.25 for reformed standards.

Manufacturers of cars and light trucks whose vehicles do not meet the CAFE standards are fined. Data from the National Highway Traffic Safety Administration show the CAFE fine in the year in which the money was collected, which may not be the same year in which it was assessed. A manufacturer can also use CAFE credits to offset fines. Fines for recent model years have not been collected.

Table 4.29
Corporate Average Fuel Economy (CAFE) Fines Collected, as of February 2020^a

| Model year | Current dollars | 2017 constant dollars ^b |
|------------|-----------------|------------------------------------|
| 1982 | \$120,000 | \$304,812 |
| 1983 | \$57,970 | \$142,667 |
| 1984 | \$5,958,020 | \$14,056,110 |
| 1985 | \$15,564,540 | \$35,457,064 |
| 1986 | \$29,871,815 | \$66,808,205 |
| 1987 | \$31,260,530 | \$67,452,299 |
| 1988 | \$44,519,450 | \$92,245,204 |
| 1989 | \$47,380,515 | \$93,660,579 |
| 1990 | \$48,308,615 | \$90,599,906 |
| 1991 | \$42,243,030 | \$76,025,048 |
| 1992 | \$38,286,565 | \$66,890,968 |
| 1993 | \$28,688,380 | \$48,665,022 |
| 1994 | \$31,498,570 | \$52,098,040 |
| 1995 | \$40,787,498 | \$65,602,569 |
| 1996 | \$19,301,930 | \$30,154,806 |
| 1997 | \$36,211,850 | \$55,303,730 |
| 1998 | \$21,739,774 | \$32,692,351 |
| 1999 | \$27,516,451 | \$40,485,188 |
| 2000 | \$51,067,038 | \$72,691,942 |
| 2001 | \$35,507,412 | \$49,144,984 |
| 2002 | \$20,041,533 | \$27,307,284 |
| 2003 | \$15,225,419 | \$20,282,906 |
| 2004 | \$33,637,439 | \$43,648,539 |
| 2005 | \$27,486,696 | \$34,498,407 |
| 2006 | \$38,584,106 | \$46,913,373 |
| 2007 | \$37,385,941 | \$44,197,711 |
| 2008 | \$12,922,256 | \$14,711,840 |
| 2009 | \$9,148,425 | \$10,452,565 |
| 2010 | \$23,803,412 | \$26,757,770 |
| 2011 | \$40,013,270 | \$43,603,167 |
| 2012 | \$14,962,382 | \$15,974,193 |
| 2013 | \$21,319,155 | \$22,432,257 |
| 2014 | \$2,289,788 | \$2,370,880 |
| 2015 | \$0 | \$0 |
| 2016 | \$77,268,703 | \$78,914,800 |
| 2017 | \$79,376,644 | \$79,376,644 |

Source:

U.S. Department of Transportation, National Highway Traffic Safety Administration, Summary of Civil Penalties, February 2020. (Additional resources: www.nhtsa.gov)

^a These are fines which are actually collected. Fines which are assessed in certain year may not have been collected in that year.

^b Adjusted using the Consumer Price Inflation Index.

Consumers must pay the Gas Guzzler Tax when purchasing a car that has an Environmental Protection Agency (EPA) fuel economy rating (combined city and highway) less than that stipulated in the table below. The Gas Guzzler Tax doubled in 1991 after remaining constant from 1986 to 1990. The tax has not changed since 1991. This tax does not apply to light trucks such as pickups, minivans, sport utility vehicles, and vans.

Table 4.30
The Gas Guzzler Tax on New Cars
(dollars per vehicle)

| Vehicle fuel economy (mpg) | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986-90 | 1991 - on |
|----------------------------|------|------|-------|-------|-------|-------|---------|-----------|
| Over 22.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22.0-22.5 | 0 | 0 | 0 | 0 | 0 | 0 | 500 | 1,000 |
| 21.5-22.0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 | 1,000 |
| 21.0-21.5 | 0 | 0 | 0 | 0 | 0 | 0 | 650 | 1,300 |
| 20.5-21.0 | 0 | 0 | 0 | 0 | 0 | 500 | 650 | 1,300 |
| 20.0-20.5 | 0 | 0 | 0 | 0 | 0 | 500 | 850 | 1,700 |
| 19.5-20.0 | 0 | 0 | 0 | 0 | 0 | 600 | 850 | 1,700 |
| 19.0-19.5 | 0 | 0 | 0 | 0 | 450 | 600 | 1,050 | 2,100 |
| 18.5-19.0 | 0 | 0 | 0 | 350 | 450 | 800 | 1,050 | 2,100 |
| 18.0-18.5 | 0 | 0 | 200 | 350 | 600 | 800 | 1,300 | 2,600 |
| 17.5-18.0 | 0 | 0 | 200 | 500 | 600 | 1,000 | 1,300 | 2,600 |
| 17.0-17.5 | 0 | 0 | 350 | 500 | 750 | 1,000 | 1,500 | 3,000 |
| 16.5-17.0 | 0 | 200 | 350 | 650 | 750 | 1,200 | 1,500 | 3,000 |
| 16.0-16.5 | 0 | 200 | 450 | 650 | 950 | 1,200 | 1,850 | 3,700 |
| 15.5-16.0 | 0 | 350 | 450 | 800 | 950 | 1,500 | 1,850 | 3,700 |
| 15.0-15.5 | 0 | 350 | 600 | 800 | 1,150 | 1,500 | 2,250 | 4,500 |
| 14.5-15.0 | 200 | 450 | 600 | 1,000 | 1,150 | 1,800 | 2,250 | 4,500 |
| 14.0-14.5 | 200 | 450 | 750 | 1,000 | 1,450 | 1,800 | 2,700 | 5,400 |
| 13.5-14.0 | 300 | 550 | 750 | 1,250 | 1,450 | 2,200 | 2,700 | 5,400 |
| 13.0-13.5 | 300 | 550 | 950 | 1,250 | 1,750 | 2,200 | 3,200 | 6,400 |
| 12.5-13.0 | 550 | 650 | 950 | 1,550 | 1,750 | 2,650 | 3,200 | 6,400 |
| Under 12.5 | 550 | 650 | 1,200 | 1,550 | 2,150 | 2,650 | 3,850 | 7,700 |

Source:

Internal Revenue Service, Form 6197, (Rev. 10-05), "Gas Guzzler Tax." (Additional resources: www.irs.ustreas.gov)

Consumers who purchased these 2021 model year vehicles paid the Gas Guzzler tax. The tax is based on unadjusted combined city/highway fuel economy. Adjusted combined fuel economy is on the window sticker.

Table 4.31 (Updated April 2021)
List of Model Year 2021 Cars with Gas Guzzler Taxes^a

| Manufacturer | Model(s) | Size class | Unadjusted combined city/highway fuel economy | Adjusted combined city/highway fuel economy |
|----------------------|----------------------------|------------------|---|---|
| Aston Martin Lagonda | DBS | Minicompact Cars | 22 | 17 |
| Audi | R8 | Two Seaters | 19 | 16 |
| Audi | R8 2WD | Two Seaters | 20 | 17 |
| Audi | R8 Spyder | Two Seaters | 19 | 16 |
| Audi | R8 Spyder 2WD | Two Seaters | 20 | 17 |
| Audi | S8 | Large Cars | 21 | 16 |
| Bentley | Continental GT | Subcompact Cars | 19 | 15 |
| Bentley | Continental GT Convertible | Minicompact Cars | 19 | 15 |
| Bentley | Flying Spur | Midsize Cars | 22 | 17 |
| Bentley | Flying Spur | Midsize Cars | 19 | 15 |
| BMW | M5 | Midsize Cars | 22 | 17 |
| BMW | M5 Competition | Midsize Cars | 22 | 17 |
| BMW | M760i xDrive | Large Cars | 20 | 16 |
| BMW | M8 Competition Convertible | Subcompact Cars | 22 | 17 |
| BMW | M8 Competition Gran Coupe | Midsize Cars | 22 | 17 |
| BMW | M8 Gran Coupe | Midsize Cars | 22 | 17 |
| Bugatti | Chiron | Two Seaters | 13 | 11 |
| Bugatti | Chiron Pur Sport | Two Seaters | 12 | 10 |
| Chevrolet | Camero | Subcompact Cars | 19 | 16 |
| Chevrolet | Camero | Subcompact Cars | 20 | 16 |
| Dodge | Challenger | Midsize Cars | 22 | 17 |
| Dodge | Challenger SRT | Midsize Cars | 20 | 16 |
| Dodge | Challenger SRT | Midsize Cars | 20 | 16 |
| Dodge | Challenger SRT Widebody | Midsize Cars | 19 | 15 |
| Dodge | Challenger SRT Widebody | Midsize Cars | 20 | 16 |
| Dodge | Challenger Widebody | Midsize Cars | 22 | 17 |
| Dodge | Charger SRT Widebody | Large Cars | 19 | 15 |
| Ferrari | 812 GTS | Two Seaters | 17 | 13 |
| Ferrari | 812 Superfast | Two Seaters | 17 | 13 |
| Ferrari | F8 Spider | Two Seaters | 20 | 16 |
| Ferrari | F8 Tributo | Two Seaters | 21 | 16 |
| Ford | Ford GT | Two Seaters | 18 | 14 |
| Ford | Mustang Mach 1 | Subcompact Cars | 22 | 17 |
| Ford | Shelby GT500 Mustang | Subcompact Cars | 18 | 14 |
| Lamborghini | Aventador Coupe | Two Seaters | 13 | 10 |
| Lamborghini | Aventador Roadster | Two Seaters | 13 | 10 |
| Lamborghini | Huracan | Two Seaters | 19 | 15 |
| Lamborghini | Huracan Spyder | Two Seaters | 19 | 15 |
| Lamborghini | Huracan Spyder 2WD | Two Seaters | 19 | 15 |
| Maserati | GHIBLI TROFEO | Midsize Cars | 20 | 16 |
| Maserati | Quattroporte Trofeo | Large Cars | 20 | 16 |
| Mercedes-Benz | AMG GT (coupe) | Two Seaters | 22 | 17 |
| Mercedes-Benz | AMG GT (roadster) | Two Seaters | 21 | 17 |
| Mercedes-Benz | AMG GT Black Series | Two Seaters | 22 | 17 |
| Mercedes-Benz | AMG GT C (coupe) | Two Seaters | 21 | 17 |
| Mercedes-Benz | AMG GT C (roadster) | Two Seaters | 22 | 17 |
| Mercedes-Benz | AMG GT R (coupe) | Two Seaters | 21 | 16 |
| Porsche | 911 Turbo | Minicompact Cars | 22 | 17 |
| Porsche | 911 Turbo Cabriolet | Minicompact Cars | 22 | 17 |
| Porsche | 911 Turbo S Cabriolet | Minicompact Cars | 22 | 17 |

Table 4.31 (Updated April 2021) (Continued)
List of Model Year 2021 Cars with Gas Guzzler Taxes^a

| Make | Model(s) | Size class | Unadjusted combined city/highway fuel economy | Adjusted combined city/highway fuel economy |
|-------------|----------------------|------------------------|---|---|
| Rolls-Royce | Cullinan | Midsize Station Wagons | 18 | 14 |
| Rolls-Royce | Cullinan Black Badge | Midsize Station Wagons | 18 | 14 |
| Rolls-Royce | Dawn | Compact Cars | 18 | 14 |
| Rolls-Royce | Dawn Black Badge | Compact Cars | 18 | 14 |
| Rolls-Royce | Ghost | Large Cars | 18 | 14 |
| Rolls-Royce | Ghost EWB | Large Cars | 18 | 14 |
| Rolls-Royce | Phantom | Large Cars | 18 | 14 |
| Rolls-Royce | Phantom EWB | Large Cars | 18 | 14 |
| Rolls-Royce | Wraith Black Badge | Midsize Cars | 18 | 14 |
| Rolls-Royce | Wraith | Midsize Cars | 18 | 14 |

Source:

U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy Guide database, www.fueleconomy.gov

^a Tax is based on unadjusted combined fuel economy; adjusted combined fuel economy is used on window stickers.

The IRS collected \$42 million from those buying model year 2018 cars with combined city/highway fuel economy less than 22.5 miles per gallon. This tax does not apply to light trucks such as pickups, minivans, sport utility vehicles, and vans. It is worthy to note that total revenue from fines paid by consumers to purchase gas-guzzling vehicles greatly exceeds the overall fines paid by manufacturers whose vehicles fail to meet CAFE standards (see Table 4.279).

Table 4.32
Tax Receipts from the Sale of Gas Guzzlers, 1980–2018
(thousands)

| Model year | Current dollars | 2018 constant dollars ^a |
|------------|-----------------|---------------------------------------|
| 1980 | 740 | 2,255 |
| 1981 | 780 | 2,155 |
| 1982 | 1,720 | 4,476 |
| 1983 | 4,020 | 10,135 |
| 1984 | 8,820 | 21,316 |
| 1985 | 39,790 | 92,858 |
| 1986 | 147,660 | 338,307 |
| 1987 | 145,900 | 322,505 |
| 1988 | 116,780 | 247,881 |
| 1989 | 109,640 | 222,027 |
| 1990 | 103,200 | 198,273 |
| 1991 | 118,400 | 218,290 |
| 1992 | 144,200 | 258,087 |
| 1993 | 111,600 | 193,935 |
| 1994 | 64,100 | 108,610 |
| 1995 | 73,500 | 121,105 |
| 1996 | 52,600 | 84,182 |
| 1997 | 48,200 | 75,410 |
| 1998 | 47,700 | 73,483 |
| 1999 | 68,300 | 102,945 |
| 2000 | 70,800 | 103,243 |
| 2001 | 78,200 | 110,878 |
| 2002 | 79,700 | 111,246 |
| 2003 | 126,700 | 172,909 |
| 2004 | 140,800 | 187,167 |
| 2005 | 163,800 | 210,606 |
| 2006 | 201,700 | 251,232 |
| 2007 | 178,700 | 216,419 |
| 2008 | 172,400 | 201,069 |
| 2009 | 99,300 | 116,227 |
| 2010 | 85,200 | 98,114 |
| 2011 | 68,900 | 76,915 |
| 2012 | 73,500 | 80,387 |
| 2013 | 61,300 | 66,076 |
| 2014 | 48,200 | 51,126 |
| 2015 | 58,700 | 62,190 |
| 2016 | 72,500 | 75,853 |
| 2017 | 36,700 | 37,596 |
| 2018 | 42,000 | 42,000 |

Source:

Ward's Communications, Detroit, MI, 2020. Original data source: Internal Revenue Service. (Additional resources: www.epa.gov/fueleconomy/guzzler)

^a Adjusted using the Consumer Price Inflation Index.

Autonomie is a system simulation tool for vehicle energy consumption and performance analysis. It is used to evaluate the energy consumption and cost of multiple advanced powertrain technologies. Autonomie was used to develop data on the relationship between steady-state vehicle speed and fuel economy.

Table 4.33
Fuel Economy by Speed, Autonomie Model Results, Model Year 2016

| Speed (mph) | Gasoline conventional | | | Diesel conventional | | | Hybrid vehicle |
|-------------|--------------------------|-----------|-----------|---------------------|-----------|-----------|----------------|
| | Midsize car | Small SUV | Large SUV | Midsize car | Small SUV | Large SUV | Midsize Car |
| | (miles per gallon) | | | | | | |
| 45 | 43 | 37 | 35 | 57 | 48 | 48 | 55 |
| 55 | 45 | 36 | 31 | 55 | 45 | 40 | 46 |
| 65 | 38 | 30 | 29 | 45 | 36 | 35 | 38 |
| 75 | 32 | 26 | 25 | 37 | 30 | 29 | 33 |
| | <i>Fuel economy loss</i> | | | | | | |
| 55 - 65 mph | 15% | 16% | 7% | 18% | 19% | 13% | 18% |
| 65 - 75 mph | 15% | 16% | 15% | 18% | 18% | 17% | 12% |
| 55 - 75 mph | 28% | 29% | 21% | 33% | 34% | 27% | 28% |

Source:

Argonne National Laboratory, Autonomie model, August 2016, www.autonomie.net. (Additional resources: www.anl.gov/energy/transportation)

The latest study of vehicle fuel economy by speed indicated higher fuel economy around 40 miles per hour, as did the 1973 and 1984 studies. Engineers at Oak Ridge National Laboratory believe that the lowest speed in the vehicle's highest gear is where the best fuel economy is typically obtained. That speed will be different for individual vehicles.

Table 4.34
Fuel Economy by Speed, 1973, 1984, 1997, and 2012 Studies
(miles per gallon)

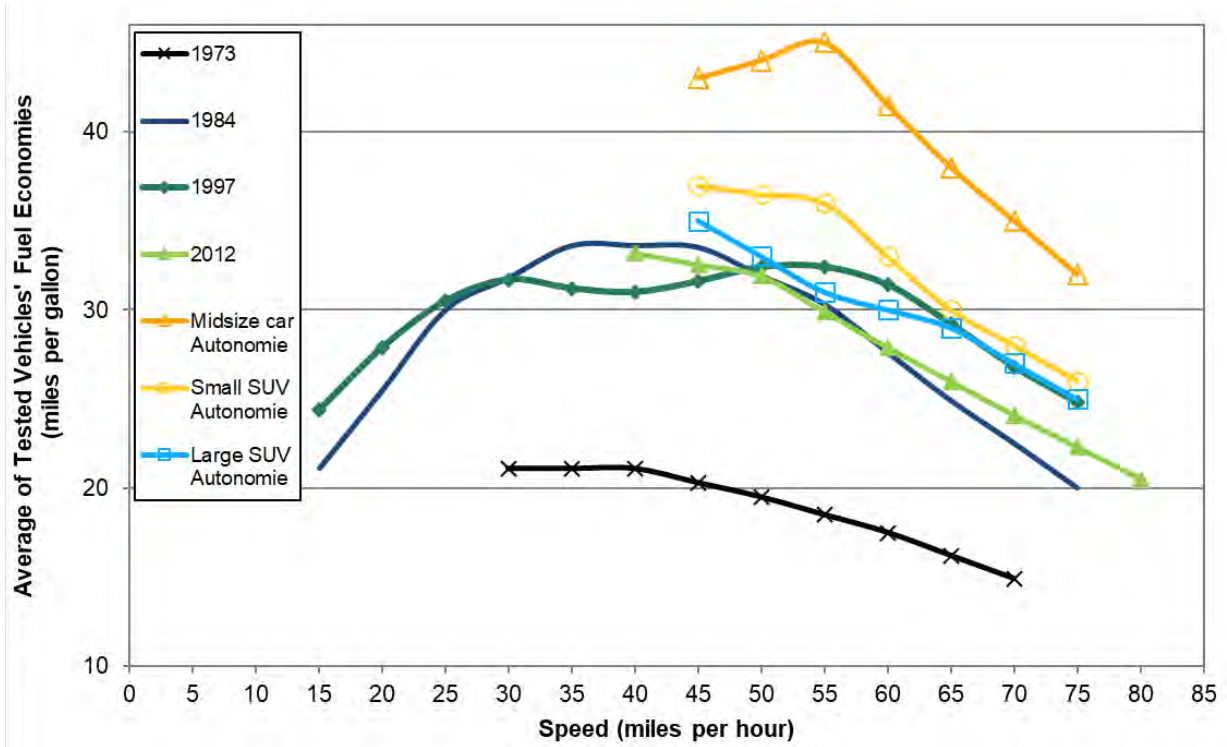
| Speed (miles per hour) | 1973 ^a (13 vehicles) | 1984 ^b (15 vehicles) | 1997 ^c (9 vehicles) | 2012 ^d (74 vehicles) |
|---------------------------|------------------------------------|------------------------------------|-----------------------------------|------------------------------------|
| 15 | e | 21.1 | 24.4 | e |
| 20 | e | 25.5 | 27.9 | e |
| 25 | e | 30.0 | 30.5 | e |
| 30 | 21.1 | 31.8 | 31.7 | e |
| 35 | 21.1 | 33.6 | 31.2 | e |
| 40 | 21.1 | 33.6 | 31.0 | 33.2 |
| 45 | 20.3 | 33.5 | 31.6 | e |
| 50 | 19.5 | 31.9 | 32.4 | 31.9 |
| 55 | 18.5 | 30.3 | 32.4 | e |
| 60 | 17.5 | 27.6 | 31.4 | 27.9 |
| 65 | 16.2 | 24.9 | 29.2 | e |
| 70 | 14.9 | 22.5 | 26.8 | 24.1 |
| 75 | e | 20.0 | 24.8 | e |
| 80 | e | e | e | 20.5 |
| <i>Fuel economy loss</i> | | | | |
| 50–60 mph | 10.3% | 13.5% | 3.1% | 12.5% |
| 60–70 mph | 14.9% | 18.5% | 14.6% | 13.6% |
| 50–70 mph | 23.6% | 29.5% | 17.3% | 24.5% |

Sources:

- 1973- U.S. Department of Transportation, Federal Highway Administration, Office of Highway Planning, *The Effect of Speed on Automobile Gasoline Consumption Rates*, Washington, DC, October 1973.
- 1984 - U.S. Department of Transportation, Federal Highway Administration, *Fuel Consumption and Emission Values for Traffic Models*, Washington, DC, May 1985.
- 1997 - West, B.H., R.N. McGill, J.W. Hodgson, S.S. Sluder, and D.E. Smith, *Development and Verification of Light-Duty Modal Emissions and Fuel Consumption Values for Traffic Models*, FHWA-RD-99-068, U.S. Department of Transportation, Federal Highway Administration, Washington, DC, March 1999.
- 2012 - U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy Guide website: www.fueleconomy.gov. The Green Car Congress, "ORNL researchers quantify the effect of increasing highway speed on fuel economy." February 8, 2013.

- ^a Model years 1970 and earlier cars.
- ^b Model years 1981–84 cars and light trucks.
- ^c Model years 1988–97 cars and light trucks.
- ^d Model years 2003-2012 cars and light trucks.
- ^e Data are not available.

Figure 4.7. Fuel Economy by Speed, 1973, 1984, 1997, and 2012 Studies and Autonomie Model 2016 Results



Sources:
See Tables 4.33 and 4.34.

This table shows the driving cycles for the new methodology that the Environmental Protection Agency (EPA) used to determine fuel economy ratings for new vehicles beginning in model year 2008. In addition to the Urban Driving Cycle and the Highway Driving cycle, the EPA will also use three additional tests to adjust fuel economy ratings to account for higher speeds, air conditioner use, and colder temperatures. Though the EPA uses a complex combination of these five cycles to determine the fuel economy that will be posted on a new vehicle window sticker, the manufacturer's Corporate Average Fuel Economy is still calculated using only the city and highway driving cycles. To know more about new vehicle fuel economy ratings, visit www.fueleconomy.gov.

Table 4.35
Driving Cycle Attributes

| | Test schedule | | | | |
|-----------------------------|---|-------------------------------------|--|-------------------------------------|--|
| | City | Highway | High speed | Air conditioner (AC) | Cold temp |
| Trip type | Low speeds in stop-and-go urban traffic | Free-flow traffic at highway speeds | Higher speeds; harder acceleration & braking | AC use under hot ambient conditions | City test w/colder outside temperature |
| Top speed | 56 mph | 60 mph | 80 mph | 54.8 mph | 56 mph |
| Average speed | 21 mph | 48 mph | 48 mph | 21 mph | 21 mph |
| Max. acceleration | 3.3 mph/sec | 3.2 mph/sec | 8.46 mph/sec | 5.1 mph/sec | 3.3 mph/sec |
| Simulated distance | 11 mi. | 10.3 mi. | 8 mi. | 3.6 mi. | 11 mi. |
| Time | 31.2 min. | 12.6 min. | 9.9 min. | 9.9 min. | 31.2 min. |
| Stops | 23 | None | 4 | 5 | 23 |
| Idling time | 18% of time | None | 7% of time | 19% of time | 18% of time |
| Engine startup ^a | Cold | Warm | Warm | Warm | Cold |
| Lab temperature | 68-86° F | 68-86° F | 68-86° F | 95° F | 20° F |
| Vehicle air conditioning | Off | Off | Off | On | Off |

Source:

U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy website, www.fueleconomy.gov.

^a A vehicle's engine doesn't reach maximum fuel efficiency until it is warm.

These driving cycles simulate the performance of an engine while driving in the city and on the highway. Once the city cycle is completed, the engine is stopped, and then started again for the 8.5-minute hot start cycle. Three additional cycles also influence new vehicle fuel economy ratings beginning with the 2008 model year.

Figure 4.8. City Driving Cycle

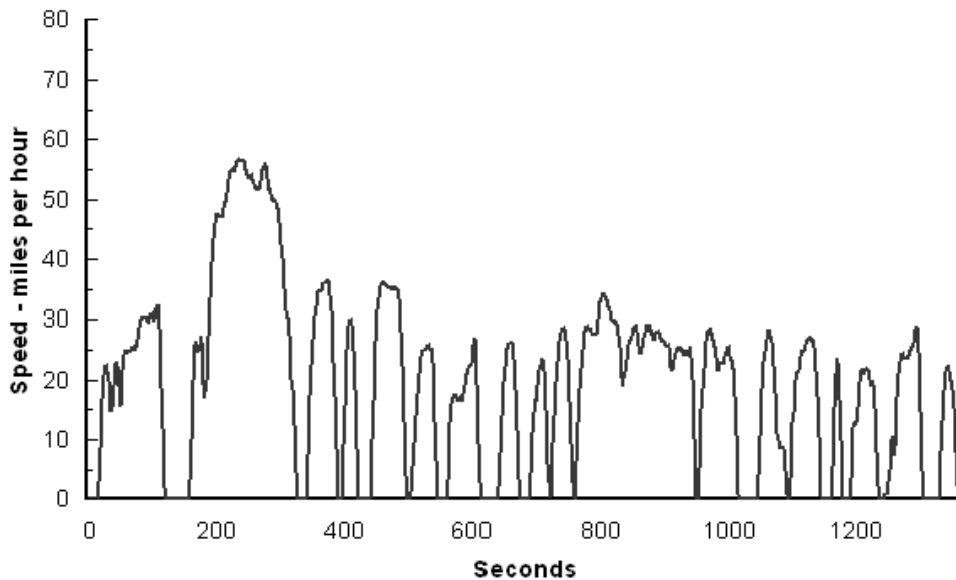
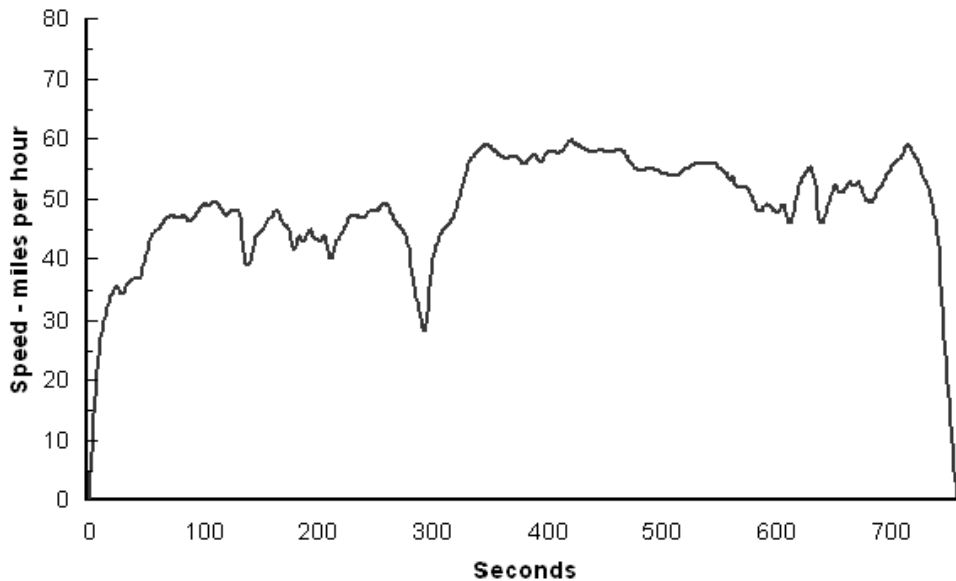


Figure 4.9. Highway Driving Cycle

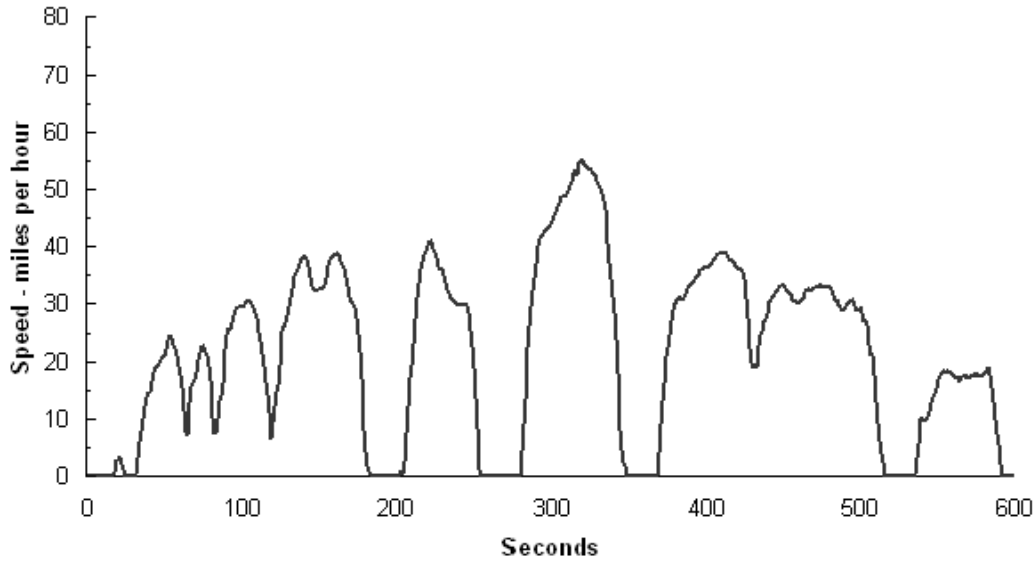


Source:

Code of Federal Regulations, 40CFR, "Subpart B - Fuel Economy Regulations for 1978 and Later Model Year Automobiles - Test Procedures," July 1, 1988 edition, p. 676.

Beginning with the 2008 model year, these cycles influence the new vehicle fuel economy ratings.

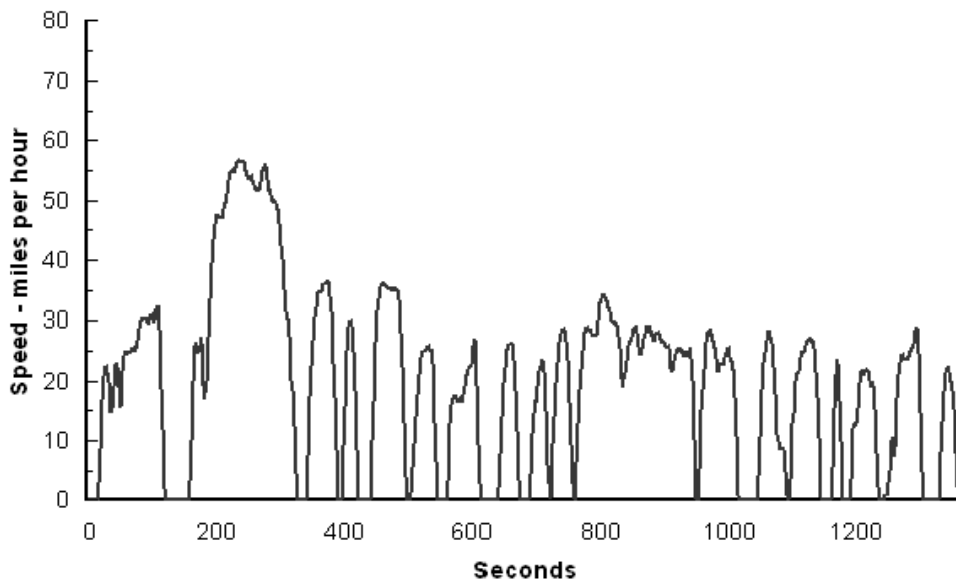
Figure 4.10. Air Conditioning (SC03) Driving Cycle



Source:

U.S. Department of Energy and Environmental Protection Agency, Fuel Economy website, www.fueleconomy.gov.

Figure 4.11. Cold Temperature (Cold FTP) Driving Cycle^a



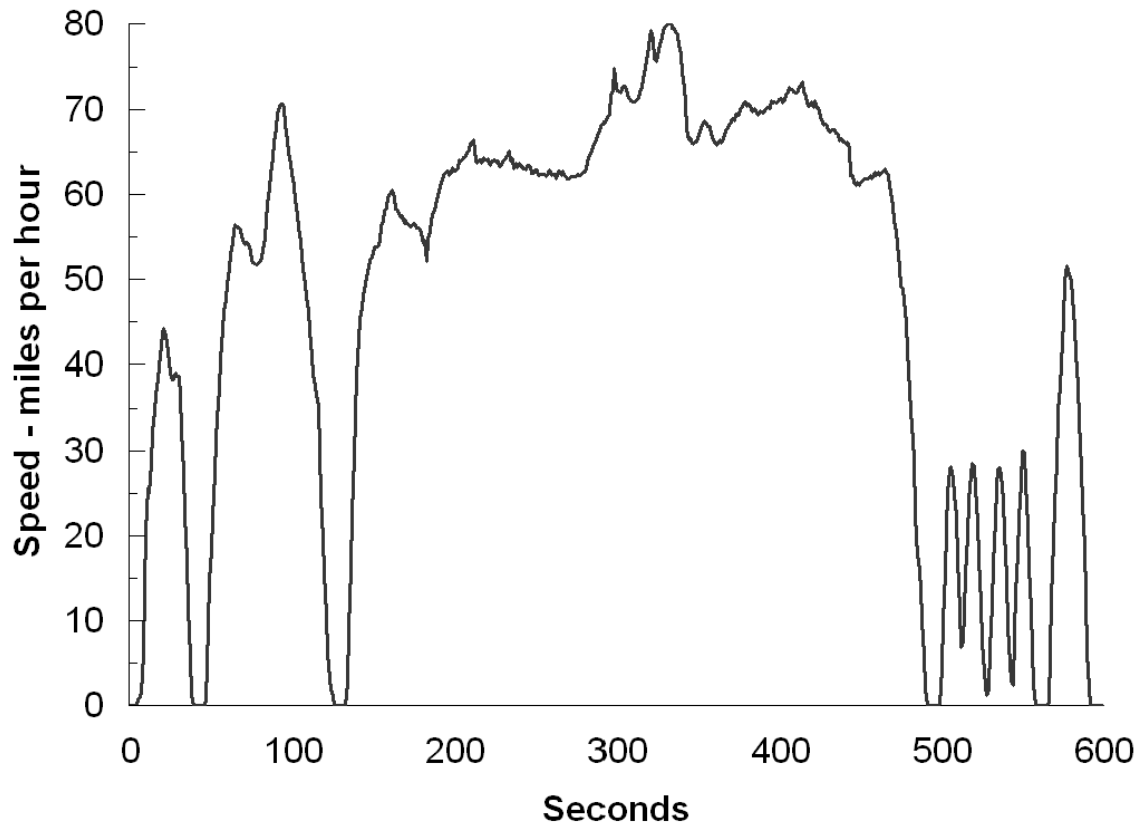
Source:

U.S. Department of Energy and Environmental Protection Agency, Fuel Economy website, www.fueleconomy.gov.

^a Cold FTP uses the same speeds as the city driving cycle. Tests the effects of colder outside temperatures on cold-start driving in stop-and-go traffic.

Beginning with the 2008 model year, this cycle influences the new vehicle fuel economy ratings. The US06 driving cycle was originally developed as a supplement to the Federal Test Procedure. It is a short-duration cycle (600 seconds) which represents hard-acceleration driving.

Figure 4.12. High-Speed (US06) Driving Cycle



Source:

U.S. Department of Energy and Environmental Protection Agency, Fuel Economy website, www.fueleconomy.gov.

Two other test cycles are sometimes used by researchers and engineers to test new vehicles (although these do not affect the fuel economy ratings). The New York Test Cycle was developed in the 1970's in order to simulate driving in downtown congested areas. The Representative Number Five Test Cycle was developed in the 1990's to better represent actual on-road driving by combining modern city and freeway driving.

Figure 4.13. New York City Driving Cycle

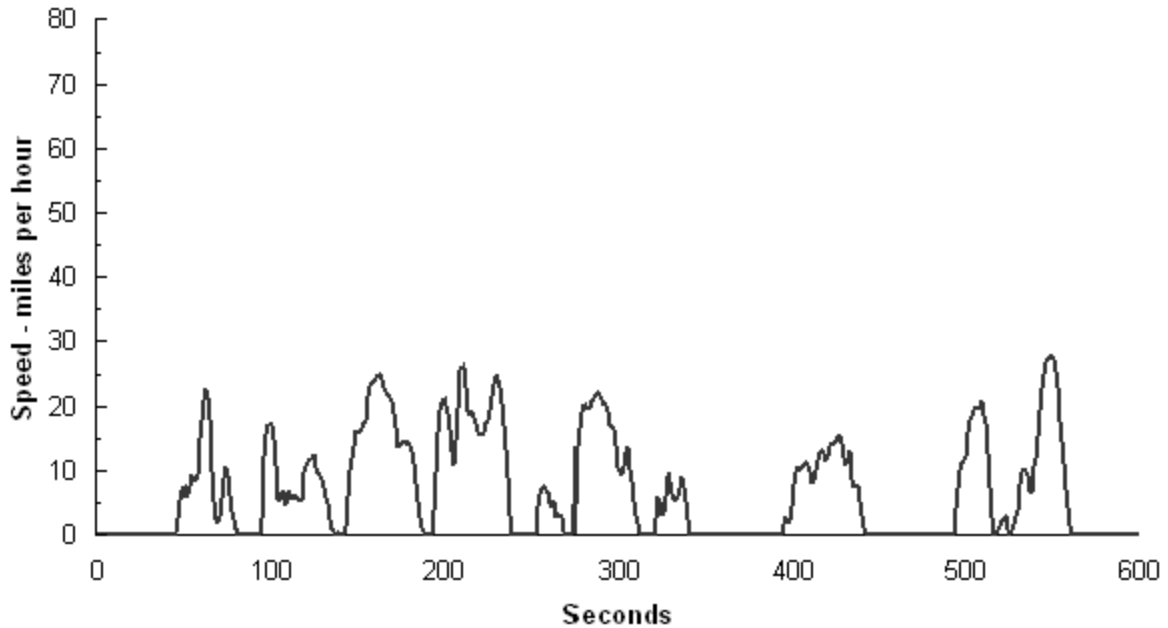
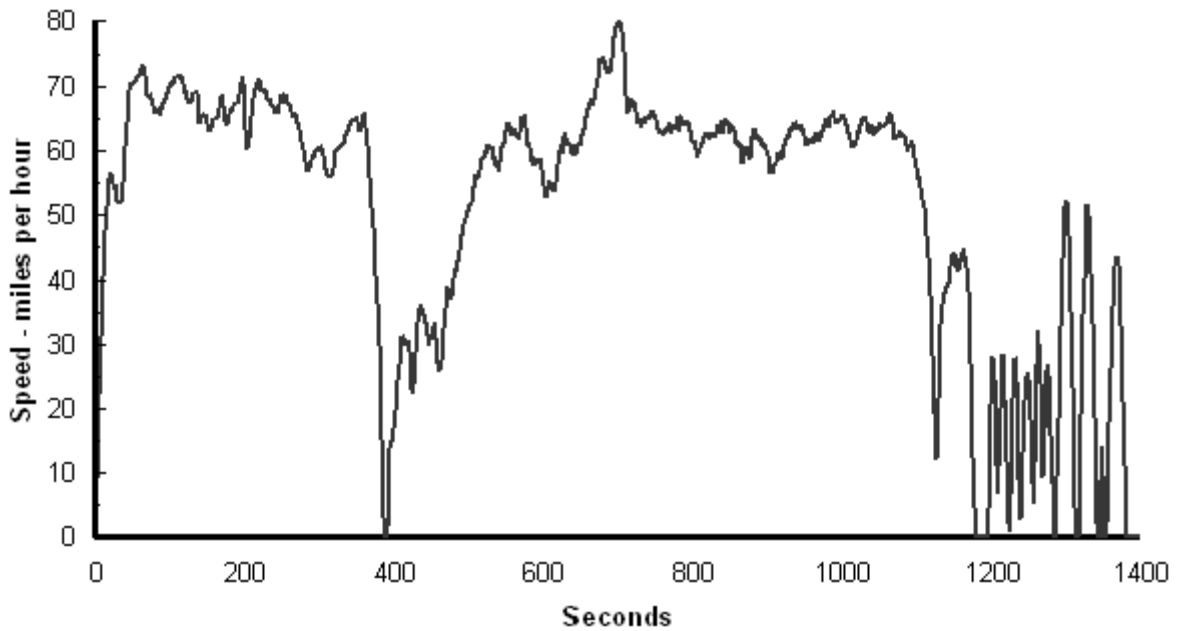


Figure 4.14. Representative Number Five Driving Cycle



Source:

Data obtained from Michael Wang, Argonne National Laboratory, Argonne, IL, 1997.

Testing cycles to determine vehicle fuel economy and emissions vary by country. The United States currently uses five different drive cycles to determine vehicle fuel economy. In Europe, the NEDC cycle is being replaced by the WLTC, but the NEDC continues to be used in China. The ARTEMIS cycles are not used in vehicle certification but are used to represent real world driving in Europe.

Table 4.36
Comparison of U.S., European, and Japanese Driving Cycles Attributes

| Cycle | Time (seconds) | Distance (miles) | Average Speed (mph) | Maximum Speed (mph) | Maximum Acceleration (mph/s) |
|---------------------------------------|-------------------|---------------------|---------------------------|---------------------------|------------------------------------|
| United States | | | | | |
| City | 1,872 | 11.0 | 21.2 | 56.0 | 3.3 |
| Highway | 765 | 10.3 | 48.3 | 60.0 | 3.2 |
| High-Speed | 594 | 8.0 | 48.4 | 80.0 | 8.5 |
| Air Conditioner Use | 594 | 3.6 | 21.2 | 54.8 | 5.1 |
| Cold Temperatures | 1,872 | 11.0 | 21.2 | 56.0 | 3.3 |
| World Light Vehicle Test Cycle (WLTC) | | | | | |
| Low | 589 | 1.9 | 11.7 | 35.1 | 3.6 |
| Medium | 433 | 3.0 | 24.5 | 47.6 | 3.6 |
| High | 455 | 4.4 | 35.1 | 60.5 | 3.7 |
| Extra High | 323 | 5.1 | 57.0 | 81.6 | 2.3 |
| Total WLTC | 1,800 | 14.5 | 28.9 | 81.6 | 3.7 |
| Japan | | | | | |
| JC08 | 1,204 | 5.1 | 15.2 | 50.7 | 3.8 |
| New European Driving Cycle (NEDC) | | | | | |
| Urban Driving Cycle (UDC) | 780 | 2.5 | 11.8 | 31.1 | 2.3 |
| Extra Urban Driving Cycle (EUDC) | 400 | 4.3 | 38.9 | 74.6 | 1.9 |
| Total NEDC | 1,180 | 6.8 | 20.9 | 74.6 | 2.3 |
| ARTEMIS | | | | | |
| Urban | 993 | 3.0 | 11.0 | 35.9 | 6.4 |
| Rural Road | 1,082 | 10.7 | 35.7 | 69.3 | 5.3 |
| Motorway | 1,068 | 17.9 | 60.1 | 81.9 | 4.3 |
| Total ARTEMIS | 3,143 | 31.6 | 36.2 | 81.9 | 6.4 |

Source:

United States - U.S. Department of Energy, Fuel Economy Guide website,
www.fueleconomy.gov/feg/fe_test_schedules.shtml

All other - Compiled from public sources by Aymeric Rousseau, Argonne National Laboratory, September 2016.

Testing cycles to determine vehicle fuel economy and emissions vary by country and therefore it is difficult to make a direct comparison. Simulation results show up to a 28% difference in the test cycles for each vehicle type. Note that the differences in these cycle results also vary with each individual vehicle tested.

Table 4.37
Example of Differing Results Using the U.S., European, and Japanese Driving Cycles

| Vehicle type | Miles per gallon | | | Percentage difference from | |
|-----------------------|--|-----------------------------------|------------------|----------------------------|--------------|
| | U.S. Corporate Average Fuel Economy (CAFE) cycle | New European Driving Cycle (NEDC) | Japan JC08 cycle | CAFE to NEDC | CAFE to JC08 |
| Small car | 34.8 | 32.4 | 27.6 | -7% | -21% |
| Large car | 26.6 | 24.7 | 21.5 | -7% | -19% |
| Minivan | 23.9 | 20.5 | 17.2 | -14% | -28% |
| Sport-utility vehicle | 20.2 | 17.6 | 14.6 | -13% | -28% |
| Pickup | 18.8 | 15.9 | 13.5 | -15% | -28% |

Note: Simulation results for identical gasoline vehicles (i.e., results for the same small car on each of the three cycles).

Source:

The International Council on Clean Transportation, *Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update*, July 2009.

Chapter 5

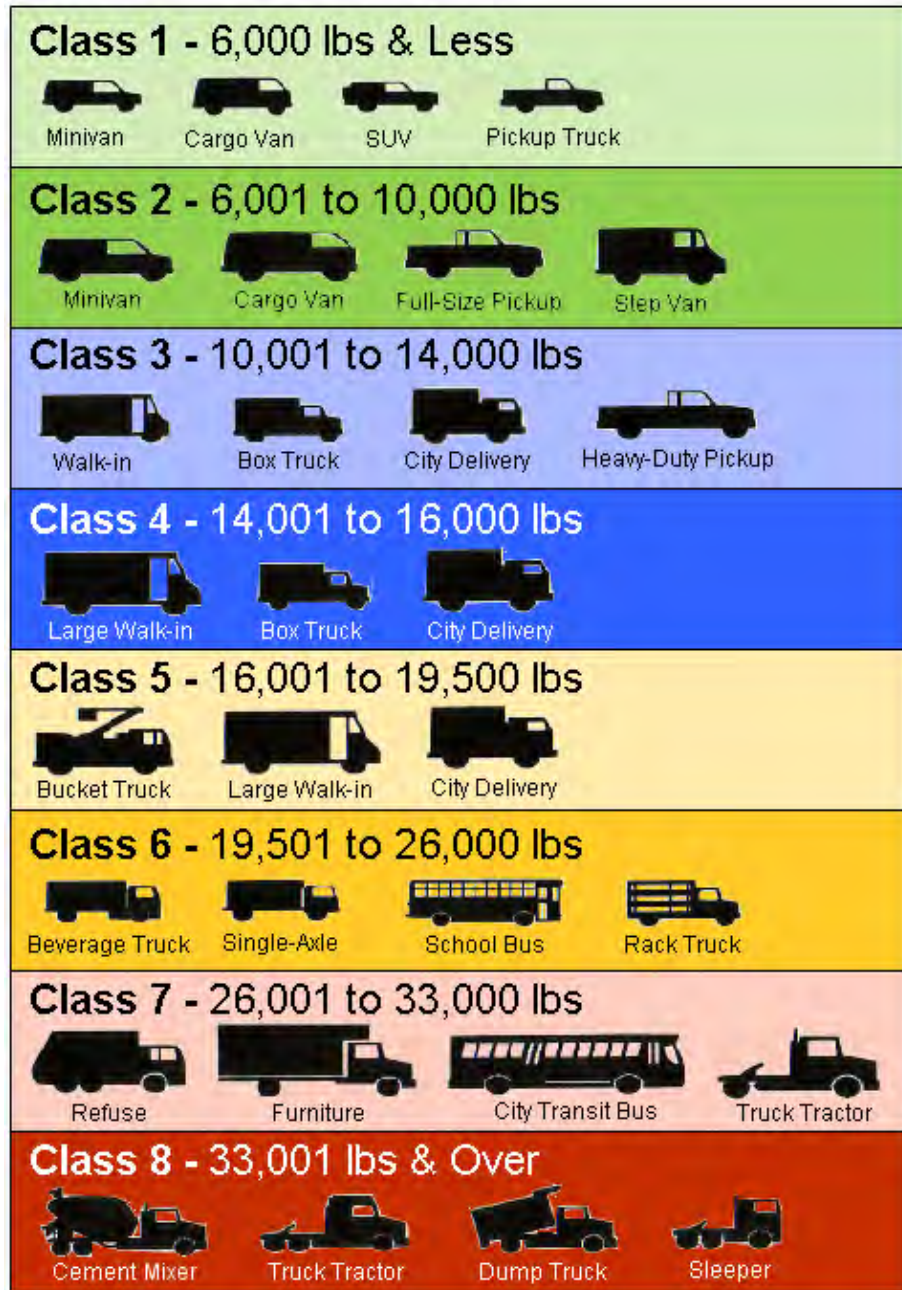
Heavy Vehicles and Characteristics

Summary Statistics from Tables in this Chapter

| Source | | |
|------------|---|----------------|
| Table 5.1 | Class 3-8 single-unit trucks, 2019 | |
| | <i>Registration (thousands)</i> | <i>10,160</i> |
| | <i>Vehicle miles (millions)</i> | <i>124,746</i> |
| | <i>Fuel economy (miles per gallon)</i> | <i>7.5</i> |
| Table 5.2 | Class 7-8 combination trucks, 2019 | |
| | <i>Registration (thousands)</i> | <i>2,925</i> |
| | <i>Vehicle miles (millions)</i> | <i>175,305</i> |
| | <i>Fuel economy (miles per gallon)</i> | <i>6.0</i> |
| Table 5.15 | Freight Shipments, 2017 Commodity Flow Survey | |
| Table 5.15 | <i>Value (billion dollars)</i> | <i>14,518</i> |
| Table 5.16 | <i>Tons (millions)</i> | <i>12,469</i> |
| Table 5.17 | <i>Ton-miles (billions)</i> | <i>3,117</i> |

There are eight truck classes, categorized by the gross vehicle weight rating that the vehicle is assigned when it is manufactured. The pictures below show examples of some of the different body types that would be included in each class. Many of the body types can be in more than one category, depending on the vehicle's attributes. Examples of this include pickups, box trucks, buses, and truck tractors.

Figure 5.1. Examples of Body Types in Each Truck Class



Source:

Oak Ridge National Laboratory, National Transportation Research Center, Oak Ridge, TN. Gross vehicle weight category definitions from 49CFR565.6 (2000).

Class 3-8 single-unit trucks include trucks over 10,000 lb gross vehicle weight with the cab/engine and cargo space together as one unit. Most of these trucks would be used for business or for individuals with heavy hauling or towing needs. Very heavy single-units, such as concrete mixers and dump trucks, are also in this category. The data series was changed by the FHWA back to 2007.

Table 5.1 (Updated April 2021)
Summary Statistics for Class 3-8 Single-Unit Trucks, 1970–2019

| Year | Registrations (thousands) | Vehicle travel (million miles) | Average annual miles per vehicle | Fuel use (million gallons) | Average fuel economy per vehicle (miles per gallon) |
|---|------------------------------|-----------------------------------|-------------------------------------|-------------------------------|---|
| 1970 | 3,681 | 27,081 | 7,357 | 3,968 | 6.8 |
| 1975 | 4,232 | 34,606 | 8,177 | 5,420 | 6.4 |
| 1980 | 4,374 | 39,813 | 9,102 | 6,923 | 5.8 |
| 1985 | 4,593 | 45,441 | 9,894 | 7,399 | 6.1 |
| 1986 | 4,313 | 45,637 | 10,581 | 7,386 | 6.2 |
| 1987 | 4,188 | 48,022 | 11,467 | 7,523 | 6.4 |
| 1988 | 4,470 | 49,434 | 11,059 | 7,701 | 6.4 |
| 1989 | 4,519 | 50,870 | 11,257 | 7,779 | 6.5 |
| 1990 | 4,487 | 51,901 | 11,567 | 8,357 | 6.2 |
| 1991 | 4,481 | 52,898 | 11,805 | 8,172 | 6.5 |
| 1992 | 4,370 | 53,874 | 12,328 | 8,237 | 6.5 |
| 1993 | 4,408 | 56,772 | 12,879 | 8,488 | 6.7 |
| 1994 | 4,906 | 61,284 | 12,492 | 9,032 | 6.8 |
| 1995 | 5,024 | 62,705 | 12,481 | 9,216 | 6.8 |
| 1996 | 5,266 | 64,072 | 12,167 | 9,409 | 6.8 |
| 1997 | 5,293 | 66,893 | 12,638 | 9,576 | 7.0 |
| 1998 | 5,414 | 67,894 | 12,540 | 9,741 | 7.0 |
| 1999 | 5,763 | 70,304 | 12,199 | 9,372 | 7.5 |
| 2000 | 5,926 | 70,500 | 11,897 | 9,563 | 7.4 |
| 2001 | 5,704 | 72,448 | 12,701 | 9,667 | 7.5 |
| 2002 | 5,651 | 75,866 | 13,425 | 10,321 | 7.4 |
| 2003 | 5,849 | 77,757 | 13,294 | 8,881 | 8.8 |
| 2004 | 6,161 | 78,441 | 12,732 | 8,959 | 8.8 |
| 2005 | 6,395 | 78,496 | 12,275 | 9,501 | 8.3 |
| 2006 | 6,649 | 80,344 | 12,084 | 9,852 | 8.2 ^a |
| 2007 | 8,117 | 119,979 | 14,781 | 16,314 | 7.3 |
| 2008 | 8,228 | 126,855 | 15,417 | 17,144 | 7.4 |
| 2009 | 8,356 | 120,207 | 14,386 | 16,253 | 7.4 |
| 2010 | 8,217 | 110,738 | 13,477 | 15,097 | 7.3 |
| 2011 | 7,819 | 103,803 | 13,276 | 14,214 | 7.3 |
| 2012 | 8,190 | 105,605 | 12,894 | 14,376 | 7.3 |
| 2013 | 8,126 | 106,582 | 13,116 | 14,502 | 7.3 |
| 2014 | 8,329 | 109,301 | 13,123 | 14,894 | 7.3 |
| 2015 | 8,456 | 109,597 | 12,961 | 14,850 | 7.4 |
| 2016 | 8,747 | 113,338 | 12,958 | 15,338 | 7.4 |
| 2017 | 9,337 | 116,102 | 12,435 | 15,600 | 7.4 |
| 2018 | 10,328 | 120,699 | 11,687 | 16,080 | 7.5 |
| 2019 | 10,160 | 124,746 | 12,278 | 16,657 | 7.5 |
| <i>Average annual percentage change</i> | | | | | |
| 1970-2019 | 2.1% | 3.2% | 1.1% | 3.0% | 0.2% |
| 2009-2019 | 2.0% | 0.4% | -1.6% | 0.2% | 0.1% |

Source:

U. S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2019*, Washington, DC, 2021, Table VM-1 and annual. (Additional resources: www.fhwa.dot.gov)

^a Due to FHWA methodology changes, data from 2007-on are not comparable with previous data.

Class 7-8 combination trucks include all trucks designed to be used in combination with one or more trailers with a gross vehicle weight rating over 26,000 lb. The average vehicle travel of these trucks (on a per truck basis) far surpasses the travel of other trucks due to long-haul freight movement. The data series was changed by the FHWA back to 2007.

Table 5.2 (Updated April 2021)
Summary Statistics for Class 7-8 Combination Trucks, 1970–2019

| Year | Registrations (thousands) | Vehicle travel ^a (million miles) | Average annual miles per vehicle | Fuel use (million gallons) | Average fuel economy per vehicle (miles per gallon) |
|---|------------------------------|--|-------------------------------------|-------------------------------|---|
| 1970 | 905 | 35,134 | 38,822 | 7,348 | 4.8 |
| 1975 | 1,131 | 46,724 | 41,312 | 9,177 | 5.1 |
| 1980 | 1,417 | 68,678 | 48,467 | 13,037 | 5.3 |
| 1985 | 1,403 | 78,063 | 55,640 | 14,005 | 5.6 |
| 1986 | 1,408 | 81,038 | 57,555 | 14,475 | 5.6 |
| 1987 | 1,530 | 85,495 | 55,879 | 14,990 | 5.7 |
| 1988 | 1,667 | 88,551 | 53,120 | 15,224 | 5.8 |
| 1989 | 1,707 | 91,879 | 53,825 | 15,733 | 5.8 |
| 1990 | 1,709 | 94,341 | 55,202 | 16,133 | 5.8 |
| 1991 | 1,691 | 96,645 | 57,153 | 16,809 | 5.7 |
| 1992 | 1,675 | 99,510 | 59,409 | 17,216 | 5.8 |
| 1993 | 1,680 | 103,116 | 61,379 | 17,748 | 5.8 |
| 1994 | 1,681 | 108,932 | 64,802 | 18,653 | 5.8 |
| 1995 | 1,696 | 115,451 | 68,073 | 19,777 | 5.8 |
| 1996 | 1,747 | 118,899 | 68,059 | 20,192 | 5.9 |
| 1997 | 1,790 | 124,584 | 69,600 | 20,302 | 6.1 |
| 1998 | 1,831 | 128,159 | 69,994 | 21,100 | 6.1 |
| 1999 | 2,029 | 132,384 | 65,246 | 24,537 | 5.4 |
| 2000 | 2,097 | 135,020 | 64,387 | 25,666 | 5.3 |
| 2001 | 2,154 | 136,584 | 63,409 | 25,512 | 5.4 |
| 2002 | 2,277 | 138,737 | 60,930 | 26,480 | 5.2 |
| 2003 | 1,908 | 140,160 | 73,459 | 23,815 | 5.9 |
| 2004 | 2,010 | 142,370 | 70,831 | 24,191 | 5.9 |
| 2005 | 2,087 | 144,028 | 69,012 | 27,689 | 5.2 |
| 2006 | 2,170 | 142,169 | 65,516 | 28,107 | 5.1 ^b |
| 2007 | 2,635 | 184,199 | 69,905 | 30,904 | 6.0 |
| 2008 | 2,585 | 183,826 | 71,113 | 30,561 | 6.0 |
| 2009 | 2,617 | 168,100 | 64,234 | 28,050 | 6.0 |
| 2010 | 2,553 | 175,789 | 68,856 | 29,927 | 5.9 |
| 2011 | 2,452 | 163,791 | 66,809 | 28,181 | 5.8 |
| 2012 | 2,469 | 163,602 | 66,262 | 27,975 | 5.8 |
| 2013 | 2,471 | 168,436 | 68,155 | 28,795 | 5.8 |
| 2014 | 2,577 | 169,830 | 65,897 | 29,118 | 5.8 |
| 2015 | 2,747 | 170,246 | 61,978 | 28,886 | 5.9 |
| 2016 | 2,752 | 174,557 | 63,428 | 29,555 | 5.9 |
| 2017 | 2,892 | 181,490 | 62,751 | 30,364 | 6.0 |
| 2018 | 2,906 | 184,165 | 63,374 | 30,325 | 6.1 |
| 2019 | 2,925 | 175,305 | 59,929 | 28,987 | 6.0 |
| <i>Average annual percentage change</i> | | | | | |
| 1970-2019 | 2.4% | 3.3% | 0.9% | 2.8% | 0.5% |
| 2009-2019 | 1.1% | 0.4% | -0.7% | 0.3% | 0.0% |

Source:

U. S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2019*, Washington, DC, 2021, Table VM-1 and annual. (Additional resources: www.fhwa.dot.gov)

^a The Federal Highway Administration changed the combination truck travel methodology in 1993.

^b Due to FHWA methodology changes, data from 2007-on are not comparable with previous data.

Truck sales declined from 2019 to 2020. Trucks under 10,000 lb continue to dominate truck sales.

Table 5.3 (Updated April 2021)
New Retail Truck Sales by Gross Vehicle Weight, 1970–2020^a
 (thousands)

| Calendar year | Class 1 6,000 lb or less | Class 2 6,001– 10,000 lb | Class 3 10,001– 14,000 lb | Class 4 14,001– 16,000 lb | Class 5 16,001– 19,500 lb | Class 6 19,501– 26,000 lb | Class 7 26,001– 33,000 lb | Class 8 33,001 lb and over | Total |
|---|--------------------------------|--------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|--------|
| Domestic sales (import data are not available) | | | | | | | | | |
| 1970 ^b | 1,049 | 408 | 6 | 12 | 58 | 133 | 36 | 89 | 1,791 |
| 1975 | 1,101 | 952 | 23 | 1 | 9 | 159 | 23 | 83 | 2,351 |
| 1980 | 985 | 975 | 4 | ^c | 2 | 90 | 58 | 117 | 2,231 |
| 1981 | 896 | 850 | 1 | ^c | 2 | 72 | 51 | 100 | 1,972 |
| 1982 | 1,102 | 961 | 1 | ^c | 1 | 44 | 62 | 76 | 2,248 |
| 1983 | 1,314 | 1,207 | ^c | ^c | 1 | 47 | 59 | 82 | 2,710 |
| 1984 | 2,031 | 1,224 | 6 | ^c | 5 | 55 | 78 | 138 | 3,538 |
| 1985 | 2,408 | 1,280 | 11 | ^c | 5 | 48 | 97 | 134 | 3,983 |
| Domestic and import sales | | | | | | | | | |
| 1986 | 3,380 | 1,214 | 12 | ^c | 6 | 45 | 101 | 113 | 4,870 |
| 1990 | 3,451 | 1,097 | 21 | 27 | 5 | 38 | 85 | 121 | 4,846 |
| 1991 | 3,246 | 876 | 21 | 24 | 3 | 22 | 73 | 99 | 4,365 |
| 1992 | 3,608 | 1,021 | 26 | 26 | 4 | 28 | 73 | 119 | 4,903 |
| 1993 | 4,119 | 1,232 | 27 | 33 | 4 | 27 | 81 | 158 | 5,681 |
| 1994 | 4,527 | 1,506 | 35 | 44 | 4 | 20 | 98 | 186 | 6,421 |
| 1995 | 4,422 | 1,631 | 40 | 53 | 4 | 23 | 107 | 201 | 6,481 |
| 1996 | 4,829 | 1,690 | 52 | 59 | 7 | 19 | 104 | 170 | 6,930 |
| 1997 | 5,085 | 1,712 | 53 | 57 | 9 | 18 | 114 | 179 | 7,226 |
| 1998 | 5,263 | 2,036 | 102 | 43 | 25 | 32 | 115 | 209 | 7,826 |
| 1999 | 5,707 | 2,366 | 122 | 49 | 30 | 48 | 130 | 262 | 8,716 |
| 2000 | 5,965 | 2,421 | 117 | 47 | 29 | 51 | 123 | 212 | 8,965 |
| 2001 | 6,073 | 2,525 | 102 | 52 | 24 | 42 | 92 | 140 | 9,050 |
| 2002 | 6,068 | 2,565 | 80 | 38 | 24 | 45 | 69 | 146 | 9,035 |
| 2003 | 6,267 | 2,671 | 91 | 40 | 29 | 51 | 67 | 142 | 9,357 |
| 2004 | 6,458 | 2,796 | 107 | 47 | 36 | 70 | 75 | 203 | 9,793 |
| 2005 | 6,586 | 2,528 | 167 | 49 | 46 | 60 | 89 | 253 | 9,777 |
| 2006 | 6,136 | 2,438 | 150 | 50 | 49 | 70 | 91 | 284 | 9,268 |
| 2007 | 5,682 | 2,623 | 166 | 51 | 45 | 54 | 70 | 151 | 8,842 |
| 2008 | 4,358 | 1,888 | 135 | 36 | 40 | 39 | 49 | 133 | 6,680 |
| 2009 | 3,528 | 1,306 | 112 | 20 | 24 | 22 | 39 | 95 | 5,145 |
| 2010 | 4,245 | 1,513 | 161 | 12 | 31 | 29 | 38 | 107 | 6,137 |
| 2011 | 4,714 | 1,735 | 195 | 10 | 42 | 41 | 41 | 171 | 6,951 |
| 2012 | 5,164 | 1,811 | 223 | 9 | 55 | 40 | 47 | 195 | 7,544 |
| 2013 | 5,615 | 2,077 | 254 | 12 | 60 | 47 | 48 | 185 | 8,298 |
| 2014 | 6,209 | 2,275 | 264 | 13 | 67 | 52 | 54 | 220 | 9,154 |
| 2015 | 7,161 | 2,417 | 283 | 14 | 72 | 55 | 59 | 249 | 10,310 |
| 2016 | 7,724 | 2,572 | 296 | 14 | 72 | 62 | 60 | 193 | 10,993 |
| 2017 | 8,102 | 2,637 | 317 | 19 | 79 | 63 | 62 | 192 | 11,470 |
| 2018 | 8,881 | 2,728 | 301 | 21 | 81 | 72 | 64 | 251 | 12,398 |
| 2019 | 9,091 | 2,819 | 327 | 22 | 85 | 78 | 66 | 276 | 12,765 |
| 2020 | 8,189 | 2,523 | 349 | 22 | 93 | 52 | 51 | 192 | 11,470 |
| <i>Average annual percentage change</i> | | | | | | | | | |
| 1970-2020 | 4.2% | 3.7% | 8.5% | 1.2% | 1.0% | -1.9% | 0.7% | 1.5% | 3.8% |
| 1986-2020 | 2.6% | 2.2% | 10.4% | 7.2% ^d | 8.4% | 0.4% | -2.0% | 1.6% | 2.6% |
| 2009-2020 | 6.8% | 5.2% | 8.0% | 6.1% | 11.6% | 6.1% | 2.9% | 6.0% | 6.5% |

Source:

Ward's Communications, www.wardsauto.com. (Additional resources: www.wardsauto.com)

^a Sales include domestic-sponsored imports.

^b Data for 1970 is based on new truck registrations.

^c Data are not available.

^d 1987-2019.

Based on factory sales, the share of diesel medium/heavy trucks sold has declined from 1995 to 2019 for truck gross vehicle weight rating (GVWR) classes 4, 5, and 7. Class 6 diesel sales share increased in that period and class 8 continued to be 100% diesel. The result for all class 4 through 8 trucks combined was a decline from 87% diesel share in 1995 to 82% in 2019.

Table 5.4
Diesel Share of Medium and Heavy Truck Sales by Gross Vehicle Weight, 1995–2019^a

| Calendar year | Class 4 14,001– 16,000 lb | Class 5 16,001– 19,500 lb | Class 6 19,501– 26,000 lb | Class 7 26,001– 33,000 lb | Class 8 33,001 lb and over | Total (Class 4 - Class 8) |
|---------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|---------------------------------|
| 1995 | 68% | 87% | 70% | 74% | 100% | 87% |
| 1996 | 66% | 92% | 69% | 68% | 100% | 85% |
| 1997 | 61% | 90% | 82% | 70% | 100% | 85% |
| 1998 | 72% | 91% | 88% | 72% | 100% | 88% |
| 1999 | 62% | 86% | 90% | 74% | 100% | 88% |
| 2000 | 62% | 93% | 54% | 68% | 100% | 83% |
| 2001 | 91% | 90% | 70% | 59% | 100% | 84% |
| 2002 | 68% | 93% | 66% | 54% | 100% | 82% |
| 2003 | 74% | 92% | 77% | 47% | 100% | 83% |
| 2004 | 71% | 92% | 76% | 54% | 100% | 85% |
| 2005 | 74% | 92% | 73% | 56% | 100% | 87% |
| 2006 | 76% | 92% | 75% | 59% | 100% | 88% |
| 2007 | 78% | 92% | 52% | 50% | 100% | 81% |
| 2008 | 81% | 92% | 58% | 50% | 100% | 84% |
| 2009 | 87% | 91% | 56% | 36% | 100% | 80% |
| 2010 | 94% | 93% | 92% | 39% | 100% | 87% |
| 2011 | 82% | 80% | 95% | 49% | 100% | 91% |
| 2012 | 14% | 79% | 95% | 49% | 100% | 89% |
| 2013 | 39% | 80% | 96% | 46% | 100% | 88% |
| 2014 | 32% | 80% | 91% | 45% | 100% | 88% |
| 2015 | 24% | 80% | 98% | 48% | 100% | 89% |
| 2016 | 21% | 54% | 89% | 45% | 100% | 78% |
| 2017 | 16% | 52% | 87% | 45% | 100% | 75% |
| 2018 | 18% | 53% | 87% | 50% | 100% | 80% |
| 2019 | 27% | 58% | 90% | 45% | 100% | 82% |

Source:

Ward's Communications, www.wardsauto.com. (Additional resources: www.wardsauto.com)

^a Estimates based on available factory sales. May not represent the entire industry.

The Vehicle Inventory and Use Survey (VIUS) was discontinued, thus the 2002 VIUS data remain the latest available.

Vehicle Inventory and Use Survey

The Vehicle Inventory and Use Survey (VIUS), which was formerly the Truck Inventory and Use Survey (TIUS), provides data on the physical and operational characteristics of the Nation's truck population. It is based on a probability sample of private and commercial trucks registered (or licensed) in each state. In 1997, the survey was changed to the Vehicle Inventory and Use Survey due to future possibilities of including additional vehicle types. The 2002 VIUS, however, only includes trucks. Internet site: www.census.gov/econ/overview/se0501.html

Since 1987, the survey has included minivans, vans, station wagons on truck chassis, and sport utility vehicles in addition to the bigger trucks. The 1977 and 1982 surveys did not include those vehicle types. The estimated number of trucks that were within the scope of the 2002 VIUS and registered in the United States as of July 1, 2002 was 85.2 million. These trucks were estimated to have been driven a total of 1,115 billion miles during 2002, an increase of 6.8% from 1997. The average annual miles traveled per truck was estimated at 13,100 miles.

A new VIUS is planned for 2022 to collect data on 2021 truck activity and characteristics. Internet site: www.bts.gov/vius.

Table 5.5
Truck Statistics by Gross Vehicle Weight Class, 2002

| Manufacturer's gross vehicle weight class | Number of trucks | Percentage of trucks | Average annual miles per truck | Harmonic mean fuel economy | Percentage of fuel use |
|---|-------------------|----------------------|--------------------------------|----------------------------|------------------------|
| 1) 6,000 lb and less | 51,941,389 | 61.0% | 11,882 | 17.6 | 42.7% |
| 2) 6,001 – 10,000 lb | 28,041,234 | 32.9% | 12,684 | 14.3 | 30.5% |
| 3) 10,001 – 14,000 lb | 691,342 | 0.8% | 14,094 | 10.5 | 1.1% |
| 4) 14,001 – 16,000 lb | 290,980 | 0.3% | 15,441 | 8.5 | 0.5% |
| 5) 16,001 – 19,500 lb | 166,472 | 0.2% | 11,645 | 7.9 | 0.3% |
| 6) 19,501 – 26,000 lb | 1,709,574 | 2.0% | 12,671 | 7.0 | 3.2% |
| 7) 26,001 – 33,000 lb | 179,790 | 0.2% | 30,708 | 6.4 | 0.9% |
| 8) 33,001 lb and up | 2,153,996 | 2.5% | 45,739 | 5.7 | 20.7% |
| Total | 85,174,777 | 100.0% | 13,088 | 13.5 | 100.0% |
| Light truck subtotal (1–2) | 79,982,623 | 93.9% | 12,163 | 16.2 | 73.2% |
| Medium truck subtotal (3–6) | 2,858,368 | 3.4% | 13,237 | 8.0 | 5.2% |
| Heavy truck subtotal (7–8) | 2,333,786 | 2.7% | 44,581 | 5.8 | 21.6% |

Source:

U.S. Department of Commerce, Bureau of the Census, *2002 Vehicle Inventory and Use Survey*, Microdata File on CD, 2005. (Additional resources: www.census.gov/svsd/www.tiusview.html)

Table 5.6
Truck Harmonic Mean Fuel Economy by Size Class, 1992, 1997, and 2002
(miles per gallon)

| Manufacturer's gross vehicle weight class | 1992 TIUS | 1997 VIUS | 2002 VIUS |
|---|--------------|--------------|--------------|
| 1) 6,000 lb and less | 17.2 | 17.1 | 17.6 |
| 2) 6,001–10,000 lb | 13.0 | 13.6 | 14.3 |
| 3) 10,000–14,000 lb | 8.8 | 9.4 | 10.5 |
| 4) 14,001–16,000 lb | 8.8 | 9.3 | 8.5 |
| 5) 16,001–19,500 lb | 7.4 | 8.7 | 7.9 |
| 6) 19,501–26,000 lb | 6.9 | 7.3 | 7.0 |
| 7) 26,001–33,000 lb | 6.5 | 6.4 | 6.4 |
| 8) 33,001 lb and over | 5.5 | 5.7 | 5.7 |
| Light truck subtotal (1–2) | 15.7 | 15.8 | 16.2 |
| Medium truck subtotal (3–6) | 7.3 | 8.6 | 8.0 |
| Large truck subtotal (7–8) | 5.6 | 6.1 | 5.8 |

Note: Based on average fuel economy as reported by respondent.

Sources:

Estimates are based on data provided on the following public use files: U.S. Department of Commerce, Bureau of the Census, Census of Transportation, Washington, DC, *1992 Truck Inventory and Use Survey*, 1995; *1997 Vehicle Inventory and Use Survey*, 2000, and *2002 Vehicle Inventory and Use Survey*, 2005. (Additional resources: www.census.gov/svsd/www.tiusview.html)

As expected, most light trucks travel within 50 miles of their home base and refuel at public stations. About sixty percent of heavy trucks travel over 50 miles from their home base and 36% of them refuel at central company-owned refueling stations.

Table 5.7
Truck Statistics by Size, 2002

| | Manufacturer's gross vehicle weight class | | | Total |
|--------------------------|---|----------------------------------|------------------------|---------------|
| | Light (< 10,000 lb) | Medium (10,001– 26,000 lb) | Heavy (> 26,000 lb) | |
| | Typical trip miles or range of operation ^a | | | |
| Under 50 miles | 69.2% | 61.5% | 40.7% | 68.2% |
| 51–100 miles | 8.5% | 11.7% | 13.5% | 8.7% |
| 101–200 miles | 2.4% | 3.2% | 6.7% | 2.5% |
| 201–500 miles | 1.1% | 1.8% | 7.6% | 1.3% |
| 501 miles or more | 1.4% | 2.2% | 10.4% | 1.7% |
| Off-road | 1.1% | 3.5% | 3.2% | 1.2% |
| Vehicle not in use | 2.2% | 4.4% | 3.2% | 2.3% |
| Not reported | 14.1% | 11.7% | 14.7% | 14.1% |
| Total^b | 100.0% | 100.0% | 100.0% | 100.0% |
| | Primary refueling facility | | | |
| Gas station | 96.9% | 62.4% | 28.4% | 93.9% |
| Truck stop | 0.7% | 7.7% | 31.9% | 1.8% |
| Own facility | 2.0% | 27.3% | 36.2% | 3.7% |
| Other nonpublic facility | 0.3% | 2.6% | 3.5% | 0.5% |
| Other | 0.0% | 0.0% | 0.0% | 0.0% |
| Total^b | 100.0% | 100.0% | 100.0% | 100.0% |

Source:

U.S. Department of Commerce, Bureau of the Census, *2002 Vehicle Inventory and Use Survey*, Microdata. File on CD, 2005. (Additional resources: www.census.gov/svsd/www/tiusview.html)

^a The respondent was asked to choose the category which best described the trips made by the vehicle.

^b Percentages may not sum to totals due to rounding.

More medium truck owners listed construction as the truck's major use than any other major use category. Construction was the second highest major use for light trucks and heavy trucks.

Table 5.8
Percentage of Trucks by Size Ranked by Major Use, 2002

| Rank | Light (< 10,000 lb average weight) | Medium (10,001 – 26,000 lb average weight) | Heavy (> 26,000 lb average weight) |
|------|---|--|---|
| 1 | Personal 81.5% | Construction 18.4% | For hire 30.1% |
| 2 | Construction 4.6% | Agriculture 16.2% | Construction 15.9% |
| 3 | Other services^a 2.5% | For hire 9.6% | Agriculture 12.2% |
| 4 | Not in use 2.2% | Retail 7.1% | Retail 5.4% |
| 5 | Agriculture 1.9% | Not in use 6.4% | Not in use 5.1% |
| 6 | Retail 1.5% | Leasing 6.2% | Waste management 5.0% |
| 7 | Unknown 1.3% | Wholesale 5.5% | Manufacturing 4.9% |
| 8 | Leasing 0.7% | Waste management 5.4% | Wholesale 4.8% |
| 9 | Manufacturing 0.7% | Utilities 5.0% | Leasing 4.6% |
| 10 | Utilities 0.6% | Personal 4.8% | Unknown 3.2% |
| 11 | Waste management 0.6% | Unknown 4.4% | Personal 2.5% |
| 12 | Wholesale 0.6% | Manufacturing 3.3% | Mining 2.4% |
| 13 | Information services 0.4% | Other services^a 3.2% | Other services^a 1.3% |
| 14 | For hire 0.4% | Food services 1.6% | Utilities 1.1% |
| 15 | Food services 0.3% | Information services 1.3% | Food services 1.1% |
| 16 | Arts 0.2% | Mining 1.1% | Arts 0.3% |
| 17 | Mining 0.1% | Arts 0.5% | Information services 0.1% |

Source:

U.S. Department of Commerce, Bureau of the Census, *2002 Vehicle Inventory and Use Survey*, Micro data File on CD, 2005. (Additional resources: www.census.gov/svsd/www/tiusview.html)

^a Business and personal services.

Nearly half of trucks in fleets of 11-20 and 21-50 vehicles use company-owned facilities. Most trucks in smaller fleets use public gas stations for fueling.

Table 5.9
Percentage of Trucks by Fleet Size and Primary Fueling Facility, 2002

| Truck fleet size | Primary refueling facility | | | | Total ^a |
|------------------------------|----------------------------|-------------|--------------|------------------|--------------------|
| | Gas station | Truck stop | Own facility | Other's facility | |
| 1-5 | 73.8% | 6.1% | 18.2% | 1.9% | 100.0% |
| 6-10 | 55.3% | 5.7% | 35.5% | 3.4% | 100.0% |
| 11-20 | 41.1% | 5.1% | 48.9% | 4.9% | 100.0% |
| 21-50 | 42.9% | 3.7% | 49.8% | 3.6% | 100.0% |
| 51 or more | 48.3% | 6.3% | 44.4% | 1.0% | 100.0% |
| Fleets of 6 or more vehicles | 47.6% | 5.2% | 43.9% | 3.4% | 100.0% |
| No fleet | 96.4% | 1.6% | 1.7% | 0.3% | 100.0% |

Source:

U.S. Department of Commerce, Bureau of the Census, *2002 Vehicle Inventory and Use Survey*, Microdata File on CD, 2005. (Additional resources: www.census.gov/svsd/www/tiusview.html)

^a Percentages may not sum to totals due to rounding.

Most trucks are fueled at gas stations, but for-hire or warehousing trucks are more often fueled at truck stops. Mining trucks and vehicle leasing or rental trucks fuel at the companies' own facility more than 30% of the time.

Table 5.10
Share of Trucks by Major Use and Primary Fueling Facility, 2002

| Major use | Gas station | Truck stop | Own facility | Others facility | Other | All ^a |
|---|--------------|-------------|--------------|-----------------|-------------|------------------|
| Personal | 98.6% | 0.6% | 0.7% | 0.1% | 0.1% | 100.0% |
| Other services | 96.0% | 1.4% | 1.6% | 0.9% | 0.1% | 100.0% |
| Information services | 92.3% | 0.4% | 7.2% | 0.1% | 0.0% | 100.0% |
| Retail trade | 86.6% | 3.5% | 8.6% | 1.2% | 0.0% | 100.0% |
| Construction | 84.7% | 3.3% | 9.8% | 2.2% | 0.0% | 100.0% |
| Accommodation or food services | 82.4% | 7.5% | 8.8% | 1.3% | 0.0% | 100.0% |
| Manufacturing | 81.5% | 5.1% | 11.9% | 1.5% | 0.0% | 100.0% |
| Arts, entertainment, recreation services | 81.1% | 4.3% | 14.2% | 0.3% | 0.0% | 100.0% |
| Waste mgmt, landscaping, admin/support services | 78.2% | 3.0% | 17.1% | 1.6% | 0.0% | 100.0% |
| Wholesale trade | 76.2% | 6.6% | 12.0% | 5.1% | 0.0% | 100.0% |
| Utilities | 72.6% | 1.8% | 24.3% | 1.3% | 0.0% | 100.0% |
| Agriculture, forestry, fishing, hunting | 62.7% | 6.7% | 29.4% | 1.0% | 0.1% | 100.0% |
| Vehicle leasing or rental | 60.2% | 1.3% | 31.8% | 6.8% | 0.0% | 100.0% |
| Mining | 48.7% | 8.5% | 34.3% | 8.5% | 0.0% | 100.0% |
| For-hire or warehousing | 33.3% | 38.7% | 25.8% | 2.3% | 0.0% | 100.0% |
| Overall | 93.9% | 1.8% | 3.7% | 0.5% | 0.0% | 100.0% |

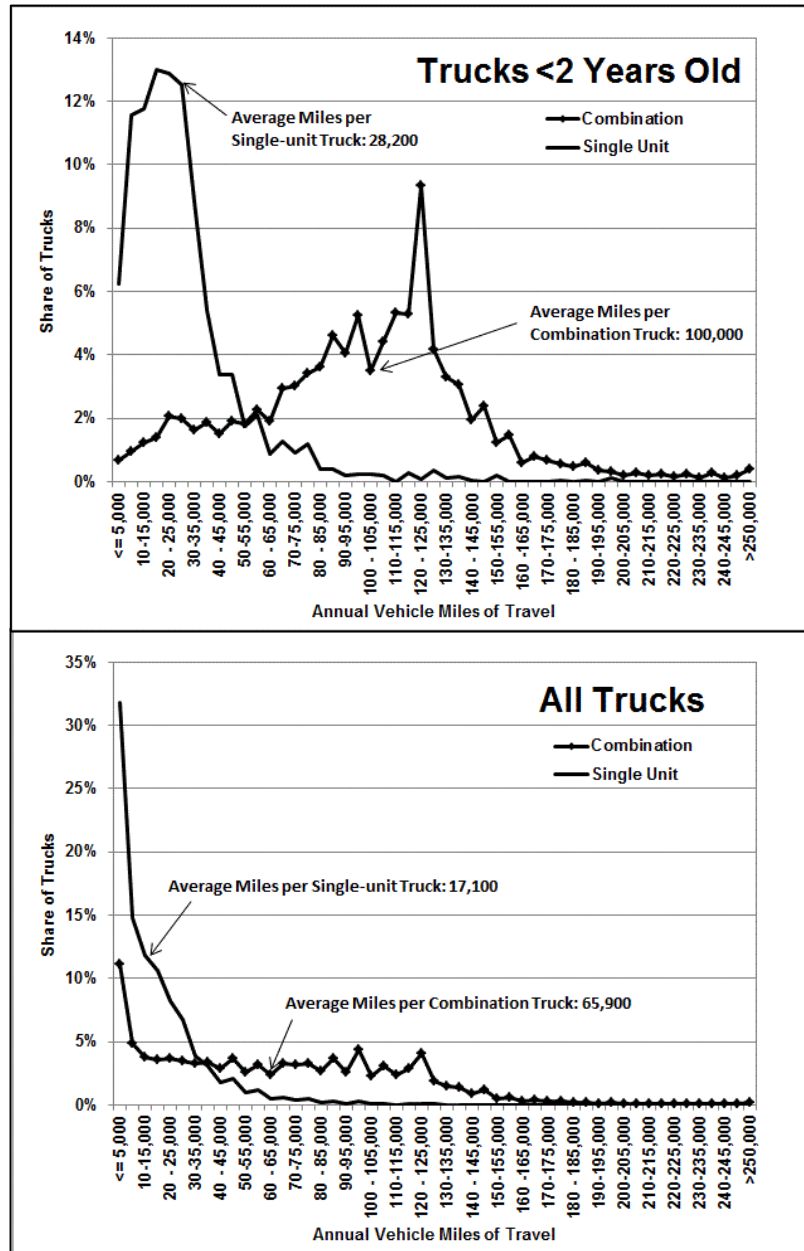
Source:

U.S. Department of Commerce, Bureau of the Census, *2002 Vehicle Inventory and Use Survey*, Microdata File on CD, 2005. (Additional resources: www.census.gov/svsd/www/tiusview.html)

^a Percentages may not sum to totals due to rounding.

The figure below shows the distribution of annual travel the two types of Class 7 and 8 vehicles—combination units (separate tractor and trailer) and single units (tractor and trailer on a single chassis). This information is for all trucks and trucks two years old or less. Combination trucks, dominated by box-type trailers, display the greatest amount of annual travel of all heavy vehicle types, as is evidenced both by the range of annual use. Most of the single-unit trucks in the survey travel 40,000 miles per year or less.

Figure 5.2. Distribution of Trucks over 26,000 lb by Vehicle-Miles Traveled, 2002



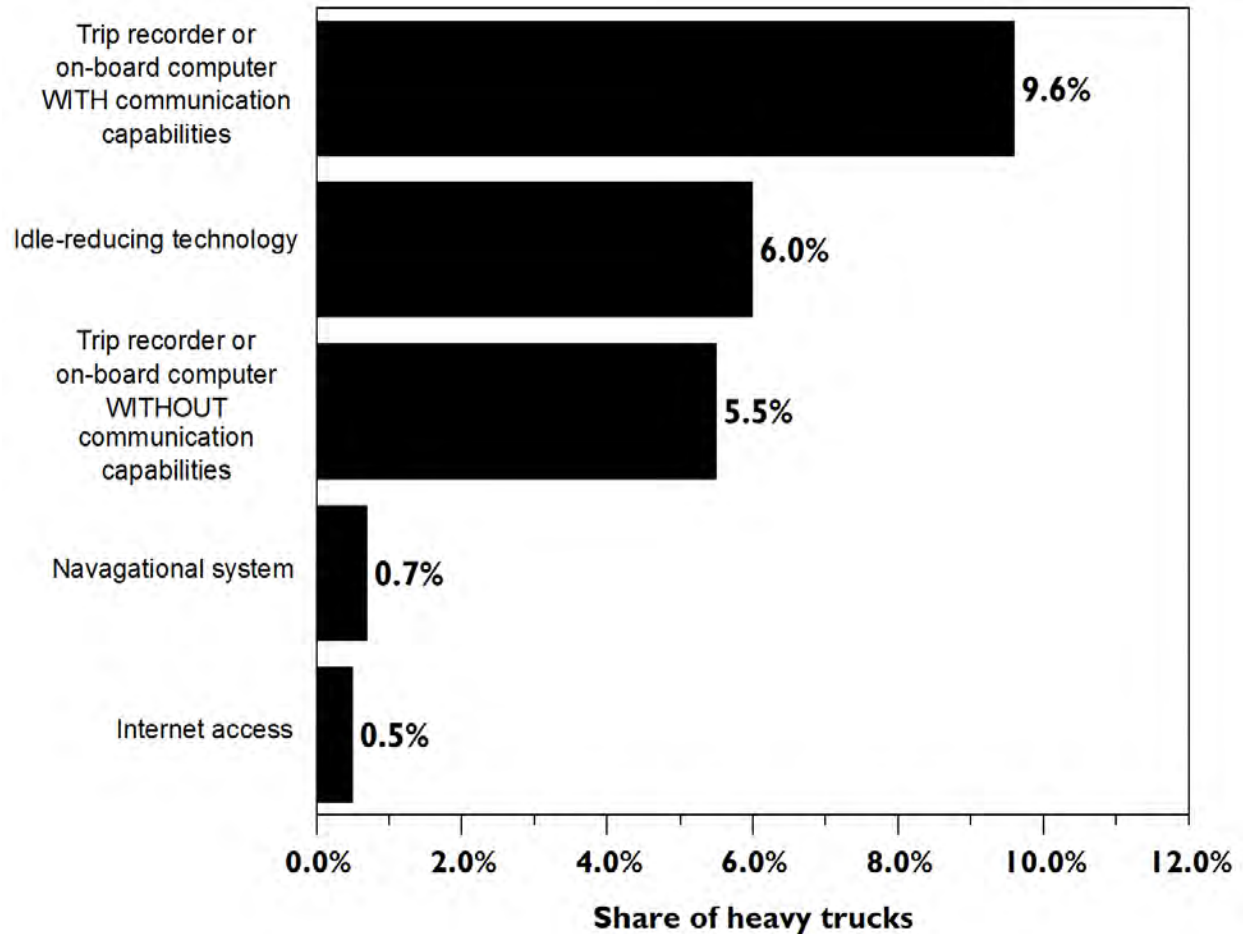
Note: Heavy trucks (class 7 & 8) are greater than 26,000 pounds gross vehicle weight based on the manufacturer’s rating.

Source:

U.S. Department of Commerce, Bureau of the Census, *2002 Vehicle Inventory and Use Survey*, Microdata File on CD, 2005. (Additional resources: www.census.gov/svsd/www/tiusview.html)

The latest *Vehicle Inventory and Use Survey* asked truck owners if the truck had certain features as permanent equipment on the truck. Some of the features asked about were onboard computers, idle-reduction devices, navigational systems, and Internet access. Of the 2.3 million heavy trucks (class 7 & 8) in the United States, nearly 10% were equipped with onboard computers that had communication capabilities and another 5% had onboard computers without communication capabilities. Six percent of heavy trucks were equipped with idle-reducing technology. Navigational systems and Internet access were available in less than one percent of heavy trucks.

Figure 5.3. Share of Heavy Trucks with Selected Electronic Features, 2002



Note: Heavy trucks (class 7 & 8) are greater than 26,000 pounds gross vehicle weight based on the manufacturer's rating.

Source:

U.S. Department of Commerce, Bureau of the Census, *2002 Vehicle Inventory and User Survey*, Microdata File on CD, 2005.

Fuel Economy Study for Class 8 Trucks

As part of a study sponsored by the U.S. Department of Energy (DOE) Vehicle Technologies Office (VTO), the Oak Ridge National Laboratory (ORNL) in conjunction with several industry partners has collected data and information related to heavy-truck operation in real-world highway environments. The primary objective of the project was to collect real-world performance and spatial data for long-haul operations of Class 8 tractor-trailers from a fleet engaged in normal freight operations. Six model-year 2005 Class 8 trucks from the selected fleet, which operates within a large area of the country extending from the east coast to Mountain Time Zone and from Canada to the US-Mexican border, were instrumented and 60 channels of data were collected for over a year at a rate of 5 Hz (or 5 readings per second). Those channels included information such as instantaneous fuel rate, engine speed, gear ratio, vehicle speed, and other information read from the vehicle's databus; weather information (wind speed, precipitation, air temperature, etc.) gathered from an on-board weather station; spatial information (latitude, longitude, altitude) acquired from a GPS (Global Positioning System) device; and instantaneous tractor and trailer weight obtained from devices mounted on the six participating tractors and ten trailers. Three of the six instrumented tractors and five of the ten instrumented trailers were mounted with New Generation Single Wide-Based Tires and the others with regular dual tires. Over the duration of this phase of the project (just over a year) the six tractors traveled nearly 700,000 miles.

To find out more about this project, contact Oscar Franzese, franzeseo@ornl.gov, 865-946-1304. The final report on this project is available on-line at: cta.ornl.gov/cta/Publications/Reports/ORNL_TM_2008-122.pdf.

The type of terrain a truck is traveling on can cause significant differences in fuel efficiency. This study (see page 5–15 for project description) shows fuel economy on severe upslopes is less than half that on flat terrain. On severe downslopes, the fuel economy was two times higher than on flat terrain.

Table 5.11
Effect of Terrain on Class 8 Truck Fuel Economy

| Type of terrain | Share of data records | Average fuel efficiency (mpg) | | | |
|-----------------------------|-----------------------|-------------------------------|--------------------------|-----------------------------------|--|
| | | All trucks | Tractors with dual tires | Tractors with single (wide) tires | Difference between dual and single tires (percent) |
| Severe upslope (>4%) | 0.7% | 2.90 | 2.86 | 2.94 | 2.91% |
| Mild upslope (1% to 4%) | 13.2% | 4.35 | 4.25 | 4.44 | 4.35% |
| Flat terrain (1% to 1%) | 72.4% | 7.33 | 7.08 | 7.58 | 7.13% |
| Mild downslope (-4% to -1%) | 12.6% | 15.11 | 14.64 | 15.57 | 6.36% |
| Severe downslope (<-4%) | 1.1% | 23.5 | 21.82 | 25.3 | 15.97% |

Source:

Capps, Gary, Oscar Franzese, Bill Knee, M.B. Lascrain, and Pedro Otaduy. *Class-8 Heavy Truck Duty Cycle Project Final Report*, ORNL/TM-2008/122, Oak Ridge National Laboratory, Oak Ridge, TN, December 2008. (Additional resources: cta.ornl.gov/cta/Publications/Reports/ORNL_TM_2008-122.pdf)

This table presents a distribution of distance traveled, fuel consumed, and fuel economy by speed and by type of tires for the vehicles participating in the project (see page 5-15 for project description). The speed bins are divided into 5-mile intervals, going from 0+ mph (i.e., speed > 0.00 mph) to 85 mph, while the four main columns of the table are organized by the type of tires that were mounted on the tractor and trailers. The first row of the table contains information about fuel consumed while the vehicle was idling (i.e., the vehicle was static with the engine on) with the following rows presenting information about the distance traveled, fuel consumed, and fuel economy for each one of the speed intervals. The next-to-the-last row shows the totals for both traveled distances and fuel consumed as well as the overall fuel economy for each tire-combination category. The latter are then used to compute the percentage difference in terms of fuel economy from dual tire tractors and trailers, which is the most common tire setup for large trucks at the present time.

Table 5.12
Fuel Economy for Class 8 Trucks as a Function of Speed
and Tractor-Trailer Tire Combination

| Speed (mph) | Dual tire tractor – dual tire trailer | | | Dual tire tractor – single (wide) tire trailer | | | Single (wide) tire tractor – dual tire trailer | | | Single (wide) tire tractor – single (wide) tire trailer | | |
|--|---------------------------------------|------------------|------------------|--|------------------|------------------|--|------------------|------------------|---|------------------|------------------|
| | Distance traveled (miles) | Fuel cons. (gal) | Fuel econ. (MPG) | Distance traveled (miles) | Fuel cons. (gal) | Fuel econ. (MPG) | Distance traveled (miles) | Fuel cons. (gal) | Fuel econ. (MPG) | Distance traveled (miles) | Fuel cons. (gal) | Fuel econ. (MPG) |
| Idling | N/A | 1,858.5 | N/A | N/A | 967.9 | N/A | N/A | 1,676.4 | N/A | N/A | 706.0 | N/A |
| 0+ to 5 | 281 | 101.8 | 2.76 | 148 | 50.4 | 2.93 | 368.0 | 124.2 | 3.0 | 156 | 52.8 | 2.96 |
| 5+ to 10 | 674 | 198.8 | 3.39 | 368 | 103.2 | 3.56 | 808.0 | 245.4 | 3.3 | 331 | 98.8 | 3.35 |
| 10+ to 15 | 723 | 192.0 | 3.77 | 396 | 98.3 | 4.03 | 848.0 | 216.5 | 3.9 | 343 | 87.0 | 3.95 |
| 15+ to 20 | 744 | 199.1 | 3.73 | 404 | 100.9 | 4.00 | 882.0 | 221.6 | 4.0 | 361 | 90.5 | 3.98 |
| 20+ to 25 | 938 | 228.4 | 4.11 | 489 | 113.6 | 4.31 | 1,111.0 | 244.2 | 4.6 | 462 | 101.1 | 4.57 |
| 25+ to 30 | 1,178 | 266.9 | 4.41 | 609 | 131.5 | 4.63 | 1,420.0 | 286.9 | 5.0 | 580 | 117.6 | 4.93 |
| 30+ to 35 | 1,481 | 336.8 | 4.40 | 753 | 154.2 | 4.88 | 1,774.0 | 341.1 | 5.2 | 708 | 141.1 | 5.02 |
| 35+ to 40 | 1,917 | 403.5 | 4.75 | 1,000 | 193.6 | 5.17 | 2,284.0 | 433.6 | 5.3 | 941 | 184.3 | 5.10 |
| 40+ to 45 | 2,955 | 584.1 | 5.06 | 1,543 | 285.9 | 5.40 | 3,380.0 | 603.6 | 5.6 | 1,350 | 254.4 | 5.31 |
| 45+ to 50 | 4,935 | 907.9 | 5.43 | 2,573 | 447.7 | 5.75 | 5,410.0 | 872.8 | 6.2 | 2,177 | 360.4 | 6.04 |
| 50+ to 55 | 9,397 | 1,629.8 | 5.77 | 4,962 | 811.5 | 6.11 | 10,046.0 | 1,622.7 | 6.2 | 3,877 | 625.5 | 6.20 |
| 55+ to 60 | 20,656 | 3,297.2 | 6.26 | 11,707 | 1,721.9 | 6.80 | 22,373.0 | 3,257.8 | 6.9 | 8,710 | 1,246.9 | 6.99 |
| 60+ to 65 | 38,964 | 5,879.6 | 6.63 | 21,472 | 2,980.8 | 7.20 | 34,517.0 | 4,840.0 | 7.1 | 14,944 | 2,049.4 | 7.29 |
| NOT ADJUSTED FOR TERRAIN: See note below. | | | | | | | | | | | | |
| 65+ to 70 | 58,304 | 8,313.2 | 7.01 | 27,931 | 3,652.2 | 7.65 | 65,063.0 | 9,256.4 | 7.0 | 27,144 | 3,880.1 | 7.00 |
| 70+ to 75 | 56,378 | 7,483.2 | 7.53 | 21,751 | 2,745.5 | 7.92 | 66,882.0 | 8,435.6 | 7.9 | 32,887 | 4,056.1 | 8.11 |
| 75+ to 85 | 7,849 | 808.2 | 9.71 | 3,610 | 403.2 | 8.95 | 11,513.0 | 911.1 | 12.6 | 6,817 | 512.2 | 13.31 |
| Total ^a | 207,374 | 30,831.0 | 6.73 | 99,714 | 13,994.0 | 7.13 | 228,680.0 | 31,913.0 | 7.2 | 101,790 | 13,858.0 | 7.35 |
| Percent increase in fuel economy from dual tire trac/trailer | | | 0.00% | | | 5.93% | | | 6.53% | | | 9.20% |

Note: These data were not adjusted to account for the effects of terrain. The increase in fuel economy for speeds above 70 mph is likely due to the vehicle achieving high speeds while traveling down slope. Therefore, this increase in fuel economy is not expected to be characteristic of all travel at these higher speeds.

Source:

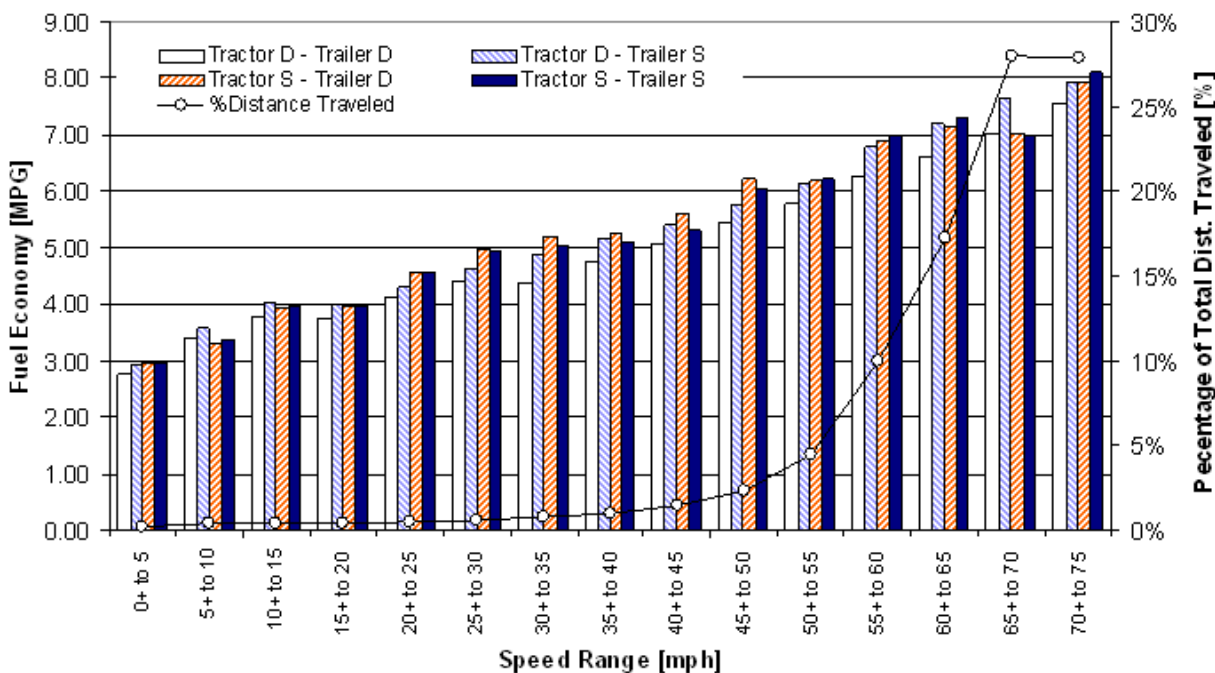
Capps, Gary, Oscar Franzese, Bill Knee, M.B. Lascrain, and Pedro Otaduy. *Class-8 Heavy Truck Duty Cycle Project Final Report*, ORNL/TM-2008/122, Oak Ridge National Laboratory, Oak Ridge, TN, December 2008. (Additional resources: cta.ornl.gov/cta/Publications/Reports/ORNL_TM_2008-122.pdf)

^a Total fuel consumed does not include fuel consumed while idling.

The fuel economy information presented in Table 5.12 is on the upper limits of today's large-truck fleets and is mostly a result of driver training and the extensive vehicle maintenance (including constant tire pressure) to which the fleet company participating in this project adheres. Nevertheless, the results of this extensive test indicate that there are substantial gains in terms of fuel economy for large trucks when single (wide) tires are used in combination with dual tires or alone (best case). Figure 5.4 shows the information from Table 5.12 in a graphical form (bars) and also displays for each speed bin the percentage of the total distance that is traveled at that speed (line). It is possible to observe that above 80% of the distance traveled by long-haul Class 8 trucks is done at speeds above 55 mph. Therefore, any gains in fuel economies at these speeds derived from a given tire combination would have a very large impact on the overall fuel economy of these types of trucks. Figure 5.4 shows that, except for the D-S combination within the 65+ to 70 mph, the combinations with all single (wide) tires perform better and, therefore, obtain the largest overall fuel economy.

Figure 5.4. Class 8 Truck Fuel Economy as a Function of Speed and Tractor-Trailer Tire Combination and Percentage of Total Distance Traveled as a Function of Speed

NOT ADJUSTED FOR TERRAIN: See note below.



Note: D = Dual tire. S = Single (wide) tire.

These data were not adjusted to account for the effects of terrain. The increase in fuel economy for speeds above 70 mph is likely due to the vehicle achieving high speeds while traveling down slope. Therefore, this increase in fuel economy is not expected to be characteristic of all travel at these higher speeds.

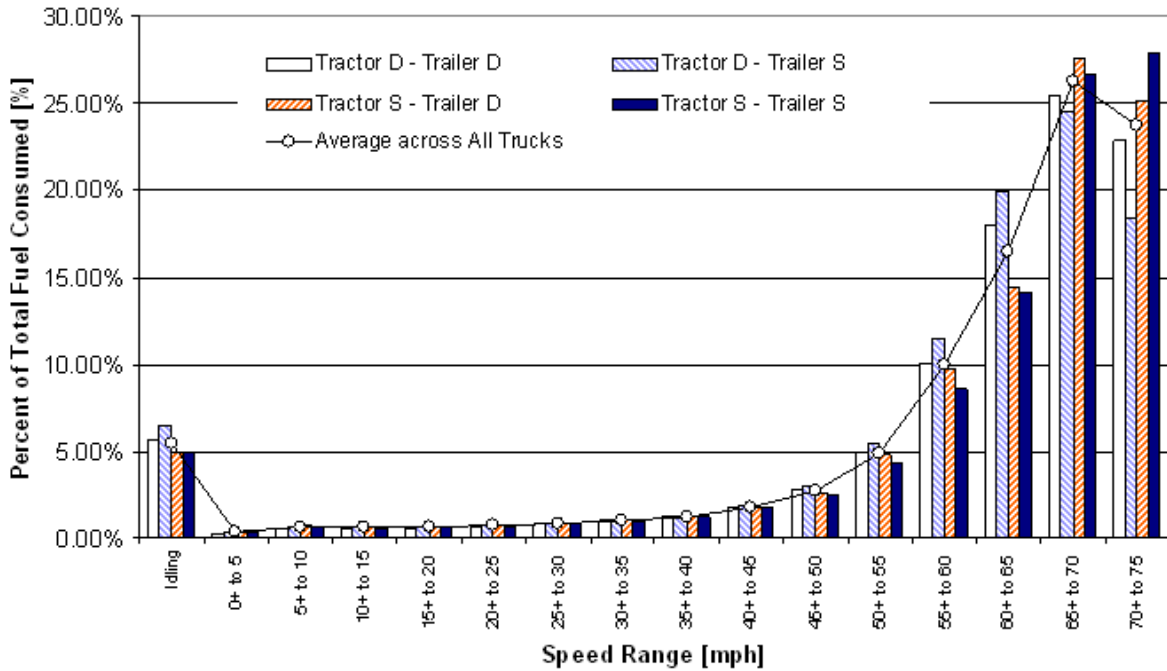
Source:

Capps, Gary, Oscar Franzese, Bill Knee, M.B. Lascrain, and Pedro Otaduy. *Class-8 Heavy Truck Duty Cycle Project Final Report*, ORNL/TM-2008/122, Oak Ridge National Laboratory, Oak Ridge, TN, December 2008. (Additional resources: cta.ornl.gov/cta/Publications/Reports/ORNL_TM_2008-122.pdf)

This graph presents for each one of the four tire-combination categories the percent of total fuel that is consumed when traveling at different speeds (bars) as well as the average percent of fuel consumed for each speed bin (line). As opposed to Table 5.12, the total fuel consumed on this graph includes the fuel consumed while idling.

Figure 5.5. Class 8 Truck Percent of Total Fuel Consumed as a Function of Speed and Tractor-Trailer Tire Combination

NOT ADJUSTED FOR TERRAIN: See note below



Note: D = Dual tire. S = Single (wide) tire.

These data were not adjusted to account for the effects of terrain. The increase in fuel economy for speeds above 70 mph is likely due to the vehicle achieving high speeds while traveling down slope. Therefore, this increase in fuel economy is not expected to be characteristic of all travel at these higher speeds.

Source:

Capps, Gary, Oscar Franzese, Bill Knee, M.B. Lascurain, and Pedro Otaduy. *Class-8 Heavy Truck Duty Cycle Project Final Report*, ORNL/TM-2008/122, Oak Ridge National Laboratory, Oak Ridge, TN, December 2008. (Additional resources: cta.ornl.gov/cta/Publications/Reports/ORNL_TM_2008-122.pdf)

A typical class 8 truck tractor weighs about 17,000 lb. The powertrain is nearly a quarter of the weight (24%) while the truck body structure is 19%.

Table 5.13
Class 8 Truck Weight by Component

| | Pounds | Share of total |
|---------------------------|---------------|----------------|
| Wheels and tires | 1,700 | 10% |
| Chassis/frame | 2,040 | 12% |
| Drivetrain and suspension | 2,890 | 17% |
| Misc. accessories/systems | 3,060 | 18% |
| Truck body structure | 3,230 | 19% |
| Powertrain | 4,080 | 24% |
| Total | 17,000 | 100% |

Notes:

- Powertrain includes engine and cooling system, transmission and accessories.
- Truck body structure includes cab-in-white, sleeper unit, hood and fairings, interior and glass.
- Miscellaneous accessories/systems include batteries, fuel system, and exhaust hardware.
- Drivetrain and suspension include drive axles, steer axle, and suspension system.
- Chassis/frame includes frame rails and crossmembers, fifth wheel and brackets. Wheels and tires include a set of 10 aluminum wheels, plus tires.

Source:

National Academy of Sciences, *Technologies and Approaches to Reducing the Fuel Consumption of Medium and Heavy-Duty Vehicles*, 2010, p. 117.

The gross weight of a vehicle (GVW) is the weight of the empty vehicle plus the weight of the maximum payload that the vehicle was designed to carry. In cars and small light trucks, the difference between the empty weight of the vehicle and the GVW is not significantly different (1,000 to 1,500 lb). The largest trucks and tractor-trailers, however, have a payload capacity share of 200%, which means they can carry 200% of their empty weight. The medium-sized trucks (truck classes 3-6) have payload capacity shares between 50% and 100%.

Table 5.14
Gross Vehicle Weight versus Empty Vehicle Weight

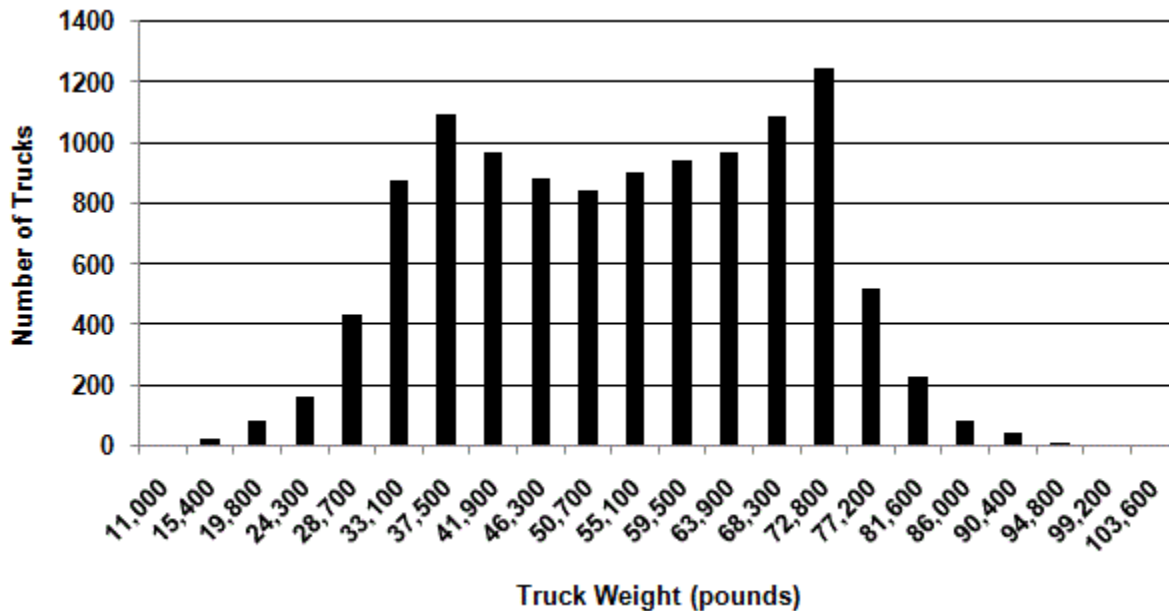
| Vehicle description | Truck class | Gross vehicle weight range (pounds) | Empty vehicle weight range (pounds) | Maximum payload capacity (pounds) | Payload capacity share (percent of empty weight) |
|---|-------------|-------------------------------------|-------------------------------------|-----------------------------------|--|
| Cars | | 3,200-6,000 | 2,400-5,000 | 1,000 | 20% |
| Minivans, small SUVs, small pick-ups | 1 | 4,000-2,400 | 3,200-4,500 | 1,500 | 33% |
| Large SUVs, standard pick-ups | 2a | 6,001-8,500 | 4,500-6,000 | 2,500 | 40% |
| Large SUVs, standard pick-ups | 2b | 8,501-10,000 | 5,000-6,300 | 3,700 | 60% |
| Utility van, multi-purpose, mini-bus, step van | 3 | 10,001-14,000 | 7,650-8,750 | 5,250 | 60% |
| City delivery, parcel delivery, large walk-in, bucket, landscaping | 4 | 14,001-16,000 | 7,650-8,750 | 7,250 | 80% |
| City delivery, parcel delivery, large walk-in, bucket | 5 | 16,001-19,500 | 9,500-10,000 | 8,700 | 80% |
| City delivery, school bus, large walk-in, bucket | 6 | 19,501-26,000 | 11,500-14,500 | 11,500 | 80% |
| City bus, furniture, refrigerated, refuse, fuel tanker, dump, tow, concrete, fire engine, tractor-trailer | 7 | 26,001-33,000 | 11,500-14,500 | 18,500 | 125% |
| Refuse, concrete, furniture, city bus, tow, fire engine (straight trucks) | 8a | 33,001-80,000 | 20,000-26,000 | 54,000 | 200% |
| Tractor-trailer: van, refrigerated, bulk tanker, flat bed (combination trucks) | 8b | 33,001-80,000 | 20,000-26,000 | 54,000 | 200% |

Source:

National Academy of Sciences, *Technologies and Approaches to Reducing the Fuel Consumption of Medium and Heavy-Duty Vehicles*, 2010, pp. 18 and 116.

According to weigh-in-motion data collected by fifteen states, the majority of 5-axle tractor-trailers on the road weigh between 33,000 and 73,000 lb. Eleven percent of the tractor-trailers had weight recorded around 72,800 lb and 10% around 68,300 lb. Another 10% of tractor-trailers were on the lighter end of the scale – around 37,500 lb. These data show that only a small percent of trucks on the road are near the maximum roadway gross vehicle weight of 80,000 lb. Thus, most trucks are filling the trailer space to capacity (cubing-out) before they reach the maximum weight limit (weighing-out).

Figure 5.6. Distribution of Class 8 Trucks by On-Road Vehicle Weight, 2008^a



Note: Data are from these 15 States: California, Connecticut, Florida, Georgia, Hawaii, Iowa, Minnesota, Missouri, Montana, North Carolina, Oregon, Pennsylvania, South Dakota, Texas, and Washington.

Source:

National Academy of Sciences, *Technologies and Approaches to Reducing the Fuel Consumption of Medium and Heavy-Duty Vehicles*, 2010, p. 118. Original source: Federal Highway Administration, Vehicle Travel Information System, 2008.

^a Study reported data on 5-axle tractor-trailers which are class 8 trucks. Single-unit class 8 trucks were not considered in the study.

Commodity Flow Survey

The Commodity Flow Survey (CFS) is designed to provide data on the flow of goods and materials by mode of transport. The survey was first conducted in various years from 1963 to 1977, and was again conducted in 1993, 1997, 2002, 2007, 2012, and 2017 with improvements in methodology, sample size, and scope. Final data for the 2017 survey was released in July 2020. It is a shipper-based survey which covers business establishments from these industries:

- Mining
- Manufacturing
- Wholesale trade
- Select Retail and Services

Industries not covered by CFS include transportation, construction, most retail and services industries, farms, fisheries, foreign establishments, and most government-owned establishments. Before 1993 data were collected only on the principal mode of travel, but after that time all modes of a shipment were captured in the data.

The CFS is a joint effort of the Bureau of Transportation Statistics and the U.S. Census Bureau. Additional information on the survey can be found at:

- www.bts.gov/cfs
- www.census.gov/programs-surveys/cfs.html

Industries covered by the 2017 Commodity Flow Survey (CFS) shipped goods worth over \$14 trillion. Compared to the 1993 CFS, the value of shipments is up 1.2% per year. By value, multiple mode shipments increased 3.5% per year from 1993 to 2017.

Table 5.15
Value of Goods Shipped in the United States: Comparison of the 1993, 1997, 2002, 2007, 2012, and 2017 Commodity Flow Surveys^a

| | 1993 (billion 2017 dollars) | 1997 (billion 2017 dollars) | 2002 (billion 2017 dollars) | 2007 (billion 2017 dollars) | 2012 (billion 2017 dollars) | 2017 (billion dollars) | Average annual percent change (1993- 2017) |
|--------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|------------------------------|---|
| All modes | 10,790.0 | 10,605.0 | 11,441.5 | 13,813.9 | 14,788.8 | 14,517.8 | 1.2% |
| Single modes | 9,120.0 | 8,735.1 | 9,605.0 | 11,277.1 | 12,705.1 | 11,738.0 | 1.1% |
| Truck ^b | 8,127.2 | 7,607.9 | 8,495.4 | 9,854.6 | 10,817.4 | 10,398.9 | 1.0% |
| For-hire truck | 4,844.9 | 4,431.1 | 5,119.1 | 5,858.6 | 6,944.5 | 6,968.2 | 1.5% |
| Private truck | 3,240.7 | 3,110.2 | 3,331.8 | 3,995.9 | 3,872.9 | 3,430.7 | 0.2% |
| Rail | 456.6 | 488.1 | 423.6 | 516.0 | 505.1 | 254.2 | -2.4% |
| Water | 113.8 | 115.8 | 121.7 | 135.8 | 322.0 | 243.9 | 3.2% |
| Inland water | 75.2 | 82.3 | 78.3 | 107.6 | 233.7 | 117.3 | 1.9% |
| Great Lakes | ^c | 2.3 | 1.2 | ^c | 0.4 | 0.6 | ^c |
| Deep sea | 36.5 | 31.2 | 42.3 | 27.2 | 64.0 | 120.7 | 5.1% |
| Multiple waterways | ^c | ^d | ^d | ^d | 23.8 | 5.3 | ^c |
| Air (includes truck and air) | 256.7 | 349.9 | 361.0 | 298.3 | 481.1 | 496.6 | 2.8% |
| Pipeline ^e | 165.9 | 173.4 | 203.3 | 472.4 | 579.6 | 344.4 | 3.1% |
| Multiple modes | 1,222.9 | 1,444.6 | 1,470.4 | 2,206.9 | 2,082.7 | 2,777.7 | 3.5% |
| Parcel, U.S.P.S. or courier | 1,039.5 | 1,307.2 | 1,345.8 | 1,846.5 | 1,802.4 | 2,117.1 | 3.0% |
| Truck and rail | 153.3 | 115.6 | 95.2 | 221.3 | 240.0 | 348.0 | 3.5% |
| Truck and water | 17.3 | 12.6 | 19.5 | 69.1 | 31.0 | 251.4 | 11.8% |
| Rail and water | 6.8 | 2.7 | 4.5 | 16.4 | 8.5 | 43.6 | 8.0% |
| Other multiple modes | 6.0 | 6.5 | 5.2 | 53.6 | 0.7 | 17.5 | 4.6% |
| Other and unknown modes | 447.1 | 425.4 | 366.0 | 330.0 | 1.1 | 2.1 | -20.0% |

Source:

U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Bureau of the Census, *1993, 1997, 2002, 2007, 2012, and 2017 Commodity Flow Surveys*, Table 1a. (Additional resources: <https://www.bts.gov/topics/commodity-flow-survey-data-and-reports>)

^a Detail may not add to total because of rounding.

^b "Truck" as a single mode includes shipments which went by private truck only, for-hire truck only, or a combination of private truck and for-hire truck.

^c Denotes data do not meet publication standards because of high sampling variability or poor response quality.

^d Data are not available.

^e CFS data for pipeline exclude most shipments of crude oil.

Industries covered by the 2017 Commodity Flow Survey (CFS) shipped over 12 billion tons of goods nationwide. About 71% of the freight tonnage was shipped by truck.

Table 5.16
Tons of Freight in the United States: Comparison of the 1993, 1997, 2002, 2007, 2012, and 2017 Commodity Flow Surveys^a

| | 1993 (millions) | 1997 (millions) | 2002 (millions) | 2007 (millions) | 2012 (millions) | 2017 (millions) | Average annual percent change (1993- 2017) |
|--------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---|
| All modes | 9,688.50 | 11,089.7 | 11,667.9 | 12,543.4 | 11,299.4 | 12,468.9 | 1.1% |
| Single modes | 8,922.30 | 10,436.5 | 11,086.7 | 11,698.1 | 10,905.5 | 11,604.8 | 1.1% |
| Truck ^b | 6,385.90 | 7,700.7 | 7,842.8 | 8,778.7 | 8,060.2 | 8,843.3 | 1.4% |
| For-hire truck | 2,808.30 | 3,402.6 | 3,657.3 | 4,075.1 | 4,298.7 | 5,232.0 | 2.6% |
| Private truck | 3,543.50 | 4,137.3 | 4,149.7 | 4,703.6 | 3,761.3 | 3,611.3 | 0.1% |
| Rail | 1,544.10 | 1,549.8 | 1,873.9 | 1,861.3 | 1,628.5 | 1,251.2 | -0.9% |
| Water | 505.4 | 563.4 | 681.2 | 403.6 | 576.0 | 804.4 | 2.0% |
| Inland water | 362.5 | 414.8 | 458.6 | 343.3 | 424.5 | 471.9 | 1.1% |
| Great Lakes | 33 | 38.4 | 38.0 | 17.8 | 31.4 | 41.9 | 1.0% |
| Deep sea | 109.9 | 110.2 | 184.6 | 42.5 | 73.0 | 268.6 | 3.8% |
| Multiple waterways | ^c | ^c | ^c | ^c | 47.1 | 22.0 | ^c |
| Air (includes truck and air) | 3.1 | 4.5 | 3.8 | 3.6 | 4.8 | 8.0 | 4.0% |
| Pipeline ^d | 483.6 | 618.2 | 685.0 | 650.9 | 636.0 | 697.8 | 1.5% |
| Multiple modes | 225.7 | 216.7 | 216.7 | 573.7 | 357.0 | 770.5 | 5.2% |
| Parcel, U.S.P.S. or courier | 18.9 | 23.7 | 25.5 | 33.9 | 28.5 | 38.0 | 3.0% |
| Truck and rail | 40.6 | 54.2 | 43.0 | 225.6 | 213.8 | 471.4 | 10.8% |
| Truck and water | 68 | 33.2 | 23.3 | 145.5 | 56.7 | 109.9 | 2.0% |
| Rail and water | 79.2 | 79.3 | 105.1 | 54.9 | 55.6 | 143.0 | 2.5% |
| Other multiple modes | 18.9 | 26.2 | 19.8 | 113.8 | 2.5 | 8.2 | -3.4% |
| Other and unknown modes | 540.5 | 436.5 | 364.6 | 271.6 | 36.8 | 93.6 | -7.0% |

Source:

U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Bureau of the Census, *1993, 1997, 2002, 2007, 2012, and 2017 Commodity Flow Survey*, Table 1a. (Additional resources: <https://www.bts.gov/topics/commodity-flow-survey-data-and-reports>)

^a Detail may not add to total because of rounding.

^b "Truck" as a single mode includes shipments which went by private truck only, for-hire truck only, or a combination of private truck and for-hire truck.

^c Data are not available.

^d CFS data for pipeline exclude most shipments of crude oil.

Industries covered by the 2017 Commodity Flow Survey (CFS) accounted for 3.1 trillion ton-miles on the nation's highways, railways, waterways, pipelines, and aviation system. Ton-miles increased an average of 1.1% per year from 1993 to 2017.

Table 5.17
Ton-Miles of Freight in the United States: Comparison of the 1993, 1997, 2002, 2007, 2012, and 2017 Commodity Flow Surveys^a

| | 1993 (billions) | 1997 (billions) | 2002 (billions) | 2007 (billions) | 2012 (billions) | 2017 (billions) | Average annual percent change (1993- 2017) |
|--------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---|
| All modes | 2,420.90 | 2,661.4 | 3,137.9 | 3,344.7 | 2,969.5 | 3,116.9 | 1.1% |
| Single modes | 2,136.90 | 2,383.5 | 2,867.9 | 2,894.3 | 2,697.4 | 2,479.6 | 0.6% |
| Truck ^b | 869.5 | 1,023.5 | 1,255.9 | 1,342.1 | 1,247.7 | 1,327.1 | 1.8% |
| For-hire truck | 629 | 741.1 | 959.6 | 1,055.6 | 1,050.9 | 1,162.2 | 2.6% |
| Private truck | 235.9 | 268.6 | 291.1 | 286.5 | 196.8 | 164.9 | -1.5% |
| Rail | 942.6 | 1,022.5 | 1,261.6 | 1,344.0 | 1,211.5 | 824.8 | -0.6% |
| Water | 272 | 261.7 | 282.7 | 157.3 | 192.9 | 259.6 | -0.2% |
| Inland water | 164.4 | 189.3 | 211.5 | 117.5 | 118.7 | 177.5 | 0.3% |
| Great Lakes | 12.4 | 13.4 | 13.8 | ^{6.9} | 11.0 | 15.6 | 1.0% |
| Deep sea | 95.2 | 59.0 | 57.4 | 33.0 | 22.1 | 50.9 | -2.6% |
| Multiple waterways | ^c | ^c | ^c | ^c | 41.0 | 15.6 | ^c |
| Air (includes truck and air) | 4 | 6.2 | 5.8 | 4.5 | 5.8 | 9.8 | 3.8% |
| Pipeline ^d | ^c | ^e | ^c | ^e | ^e | ^c | ^c |
| Multiple modes | 191.5 | 204.5 | 225.7 | 416.6 | 271.8 | 637.2 | 5.1% |
| Parcel, U.S.P.S. or courier | 13.2 | 18.0 | 19.0 | 28.0 | 22.7 | 29.8 | 3.5% |
| Truck and rail | 37.7 | 55.6 | 45.5 | 196.8 | 169.5 | 443.2 | 10.8% |
| Truck and water | 40.6 | 34.8 | 32.4 | 98.4 | 48.6 | 51.9 | 1.0% |
| Rail and water | 70.2 | 77.6 | 115.0 | 47.1 | 29.2 | 102.7 | 1.6% |
| Other multiple modes | ^c | 18.6 | 13.8 | 46.4 | 1.9 | 9.6 | ^c |
| Other and unknown modes | 92.6 | 73.4 | 44.2 | 33.8 | 0.3 | 0.1 | -24.0% |

Source:

U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Bureau of the Census, *1993, 1997, 2002, 2007, 2012, and 2017 Commodity Flow Surveys*, Table 1a. (Additional resources: <https://www.bts.gov/topics/commodity-flow-survey-data-and-reports>)

^a Detail may not add to total because of rounding.

^b "Truck" as a single mode includes shipments which went by private truck only, for-hire truck only, or a combination of private truck and for-hire truck.

^c Data are not available.

^d CFS data for pipeline exclude most shipments of crude oil.

^e Denotes data do not meet publication standards because of high sampling variability or poor response quality.

Industries covered by the 2017 Commodity Flow Survey (CFS) had an average shipment length of 679 miles, a 60% increase from the 1993 survey. For single mode shipments, air had the highest shipment length in 2017; for multiple modes, truck and rail had the highest length.

Table 5.18
Average Miles per Shipment in the United States: Comparison of the 1993, 1997, 2002, 2007, 2012, and 2017 Commodity Flow Surveys^a

| | 1993 (miles) | 1997 (miles) | 2002 (miles) | 2007 (miles) | 2012 (miles) | 2017 (miles) | Average annual percent change (1997-2017) |
|--------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---|
| All modes | 424 | 472 | 546 | 619 | 630 | 679 | 2.0% |
| Single modes | 197 | 184 | 240 | 234 | 262 | 243 | 0.9% |
| Truck ^b | 144 | 144 | 173 | 206 | 227 | 206 | 1.5% |
| For-hire truck | 472 | 485 | 523 | 599 | 508 | 369 | -1.0% |
| Private truck | 52 | 53 | 64 | 57 | 58 | 45 | -0.6% |
| Rail | 766 | 769 | 807 | 728 | 805 | 579 | -1.2% |
| Water | ^c | 482 | 568 | 520 | 908 | 259 | ^c |
| Inland water | ^c | 177 | 450 | 144 | 275 | 188 | ^c |
| Great Lakes | 534 | 204 | 339 | 657 | 347 | 304 | -2.3% |
| Deep sea | 1,861 | 1,024 | 664 | 923 | 1,157 | 359 | -6.6% |
| Multiple waterways | ^c | ^c | ^c | ^c | 1,034 | 525 | ^c |
| Air (includes truck and air) | 1,415 | 1,380 | 1,919 | 1,304 | 1,295 | 1,403 | 0.0% |
| Pipeline ^d | ^c | ^e | ^e | ^e | ^e | ^e | ^c |
| Multiple modes | 736 | 813 | 895 | 975 | 922 | 953 | 1.1% |
| Parcel, U.S.P.S. or courier | 734 | 813 | 894 | 975 | 922 | 953 | 1.1% |
| Truck and rail | 1,403 | 1,347 | 1,413 | 1,007 | 988 | 1,177 | -0.7% |
| Truck and water | 1,417 | 1,265 | 1,950 | 1,429 | 1,562 | 784 | -2.4% |
| Rail and water | 627 | 1,092 | 957 | 1,928 | 1,073 | 1,075 | 2.3% |
| Other multiple modes | 1,082 | ^e | ^e | 1,182.0 | ^e | 1,425.0 | 1.2% |
| Other and unknown modes | 229 | 122 | 130 | 116 | 2 | 1 | -20.3% |

Source:

U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Bureau of the Census, *1993, 1997, 2002, 2007, 2012, and 2017 Commodity Flow Surveys*, Table 1a. (Additional resources: www.census.gov/programs-surveys/cfs.html)

^a Detail may not add to total because of rounding.

^b "Truck" as a single mode includes shipments which went by private truck only, for-hire truck only, or a combination of private truck and for-hire truck.

^c Data are not available.

^d CFS data for pipeline exclude most shipments of crude oil.

^e Denotes data do not meet publication standards because of high sampling variability or poor response quality.

Freight Analysis Framework

The Freight Analysis Framework is a combination of sources drawn together to create a comprehensive picture of freight movement in the U.S. in terms of tonnage, value, and ton-miles. Data are available by origin, destination, commodity type, distance band, and mode. FAF origin and destination data include state level or major metropolitan area. The sources of data for FAF are the Commodity Flow Survey, international trade data from the Census Bureau, and other data sources from agriculture, extraction, utility, construction, service, and other sectors.

Historically, FAF data are available for 1997, 2002, 2007, 2012, with estimated data for 2013-2018, and forecasted data from 2020-2045. A new version, FAF5, will be released in 2021 since the 2017 Commodity Flow Survey data were finalized in late 2020.

For additional information on FAF, see the website: faf.ornl.gov/fafweb.

For shipments of 100 miles or less, trucks moved 7.5 billion tons of freight in 2018. Trucks moved more tons than other modes for all shipments less than 1,000 miles while rail moved more tons in shipments from 1,000-2,000 miles in length. More than 18 billion tons of freight were shipped in 2018.

Table 5.19
Tons of Freight Moved in the United States by Mode and Distance Band, 2018
(thousand tons)

| Mode | Distance Band ^a (miles) | | | | | | | | Total |
|-------------------------|------------------------------------|------------------|------------------|------------------|----------------|------------------|------------------|----------------|-------------------|
| | Below 100 | 100 - 249 | 250 - 499 | 500 - 749 | 750 - 999 | 1,000 - 1,499 | 1,500 - 2,000 | Over 2,000 | |
| Truck | 7,547,034 | 1,938,958 | 1,382,656 | 471,600 | 208,938 | 204,947 | 89,384 | 76,644 | 11,920,161 |
| Rail | 248,774 | 178,853 | 257,704 | 241,153 | 197,526 | 391,104 | 190,039 | 76,447 | 1,781,599 |
| Water | 371,926 | 124,936 | 150,171 | 43,223 | 39,839 | 54,992 | 20,365 | 32,453 | 837,905 |
| Air (include truck-air) | 33 | 110 | 1,753 | 886 | 588 | 659 | 568 | 1,175 | 5,772 |
| Pipeline | 983,057 | 726,167 | 1,094,492 | 307,404 | 121,052 | 109,975 | 3,354 | 209 | 3,345,711 |
| Multiple modes & mail | 39,928 | 118,820 | 99,677 | 56,293 | 40,155 | 63,687 | 27,000 | 58,212 | 503,773 |
| No domestic mode | 182,396 | 103 | 0 | 0 | 0 | 0 | 0 | 0 | 182,499 |
| Other and unknown | 28,617 | 9,355 | 307 | 48 | 103 | 124 | 46 | 35 | 38,636 |
| Total | 9,401,764 | 3,097,303 | 2,986,761 | 1,120,608 | 608,201 | 825,488 | 330,756 | 245,175 | 18,616,056 |

Note: Includes total flows moved between domestic origins and destinations and includes both domestic and foreign shipments. Mode of transportation is the mode used from zone of entry to the domestic destination, domestic origin to domestic destination, and domestic origin to zone of exit.

Source:

U.S. Department of Transportation, Freight Analysis Framework Version 4.5.1.

^a Freight shipments categorized by origin to destination Great Circle Distance, which is commonly called “as-the-crow-flies.”

Table 5.20
Top Ten Commodities Moved in the United States by Weight, Ton-miles, and Value, 2018

| Weight | |
|--------------------------------------|-------------------|
| Commodity | Billion Tons |
| Coal-not elsewhere classified | 2.50 |
| Gravel | 2.10 |
| Gasoline | 1.24 |
| Cereal grains | 1.22 |
| Crude petroleum | 1.16 |
| Non-metallic mineral products | 1.11 |
| Fuel oils | 0.99 |
| Coal | 0.84 |
| Natural sands | 0.83 |
| Other foodstuffs | 0.68 |
| Ton-Miles | |
| Commodity | Billion Ton-miles |
| Coal-not elsewhere classified | 758.5 |
| Coal | 563.2 |
| Crude petroleum | 533.0 |
| Cereal grains | 312.8 |
| Other foodstuffs | 261.9 |
| Other agricultural products | 188.7 |
| Non-metallic mineral products | 175.3 |
| Gasoline | 169.5 |
| Basic chemicals | 158.0 |
| Gravel | 146.2 |
| Value | |
| Commodity | Trillion dollars |
| Electronics | 1.65 |
| Motorized vehicles | 1.59 |
| Mixed freight | 1.48 |
| Gasoline | 1.13 |
| Machinery | 1.05 |
| Coal-not elsewhere classified | 0.86 |
| Pharmaceuticals | 0.85 |
| Fuel oils | 0.83 |
| Miscellaneous manufacturing products | 0.76 |
| Crude petroleum | 0.72 |

Note: Commodities are based on Standard Classification of Transported Goods (SCTG) codes. See the Census Bureau web site for commodity details: bhs.econ.census.gov/bhsphpext/brdsearch/scs_code.html.

Source:

U.S. Department of Transportation, Freight Analysis Framework Version 4.5.1. (Additional information: faf.ornl.gov)

The Freight Analysis Framework compiles data from a variety of sources to create a comprehensive picture of freight movement in the United States.

Table 5.21
U.S. Freight Ton-Miles by State, 2018
(million ton-miles)

| State | Within the given state | Outbound from the given state | Inbound to the given state |
|----------------------|------------------------|-------------------------------|----------------------------|
| Alabama | 15,296.2 | 76,900.4 | 82,542.3 |
| Alaska | 12,164.5 | 90,948.9 | 5,329.6 |
| Arizona | 10,467.1 | 30,917.0 | 58,460.2 |
| Arkansas | 11,566.6 | 46,243.0 | 52,384.9 |
| California | 120,177.2 | 228,830.9 | 386,860.0 |
| Colorado | 14,224.8 | 71,743.8 | 62,849.4 |
| Connecticut | 2,027.8 | 23,645.5 | 18,575.6 |
| Delaware | 603.8 | 4,887.0 | 16,970.8 |
| District of Columbia | 10.5 | 1,363.9 | 762.5 |
| Florida | 58,371.1 | 59,097.3 | 121,180.0 |
| Georgia | 16,988.7 | 77,710.3 | 114,734.5 |
| Hawaii | 1,281.8 | 5,566.5 | 10,578.3 |
| Idaho | 5,461.0 | 41,877.9 | 20,223.8 |
| Illinois | 28,859.7 | 187,645.6 | 246,414.4 |
| Indiana | 14,303.9 | 86,135.9 | 118,948.0 |
| Iowa | 10,372.0 | 118,939.0 | 76,112.8 |
| Kansas | 13,632.4 | 91,564.4 | 71,668.5 |
| Kentucky | 11,289.9 | 92,089.2 | 88,904.7 |
| Louisiana | 52,236.5 | 181,661.5 | 235,952.8 |
| Maine | 1,704.3 | 12,759.4 | 7,910.0 |
| Maryland | 3,980.1 | 20,098.2 | 38,511.4 |
| Massachusetts | 3,049.7 | 19,536.6 | 30,068.5 |
| Michigan | 19,460.5 | 101,238.1 | 158,312.1 |
| Minnesota | 18,890.0 | 153,727.0 | 137,208.0 |
| Mississippi | 12,170.8 | 59,885.3 | 70,135.5 |
| Missouri | 9,756.8 | 63,987.1 | 110,631.9 |
| Montana | 7,735.7 | 82,163.7 | 22,249.4 |
| Nebraska | 7,491.8 | 106,399.4 | 60,397.5 |
| Nevada | 2,168.8 | 16,572.9 | 25,490.3 |
| New Hampshire | 716.5 | 4,872.4 | 8,638.6 |
| New Jersey | 5,276.6 | 60,862.1 | 85,109.0 |
| New Mexico | 7,027.7 | 45,408.6 | 22,015.5 |
| New York | 17,480.6 | 64,085.1 | 87,250.5 |
| North Carolina | 12,667.7 | 52,803.9 | 81,760.9 |
| North Dakota | 10,721.3 | 227,555.7 | 39,126.5 |
| Ohio | 22,549.9 | 109,557.3 | 159,639.0 |
| Oklahoma | 19,874.6 | 96,799.5 | 77,383.6 |
| Oregon | 6,936.1 | 42,452.7 | 56,521.1 |
| Pennsylvania | 45,571.6 | 110,601.0 | 122,045.1 |
| Rhode Island | 254.9 | 3,725.7 | 3,554.0 |
| South Carolina | 4,954.4 | 38,770.3 | 61,242.2 |
| South Dakota | 4,814.7 | 37,006.4 | 16,674.6 |
| Tennessee | 8,173.7 | 65,054.5 | 78,915.9 |
| Texas | 298,078.8 | 386,177.1 | 488,870.7 |
| Utah | 5,251.0 | 40,315.0 | 35,784.4 |
| Vermont | 710.3 | 4,253.0 | 3,795.1 |
| Virginia | 12,112.8 | 38,986.9 | 76,583.1 |
| Washington | 22,893.6 | 74,095.3 | 118,478.3 |
| West Virginia | 3,470.8 | 75,954.4 | 32,781.2 |
| Wisconsin | 17,603.5 | 65,371.9 | 87,927.3 |
| Wyoming | 21,982.8 | 416,957.6 | 21,337.9 |

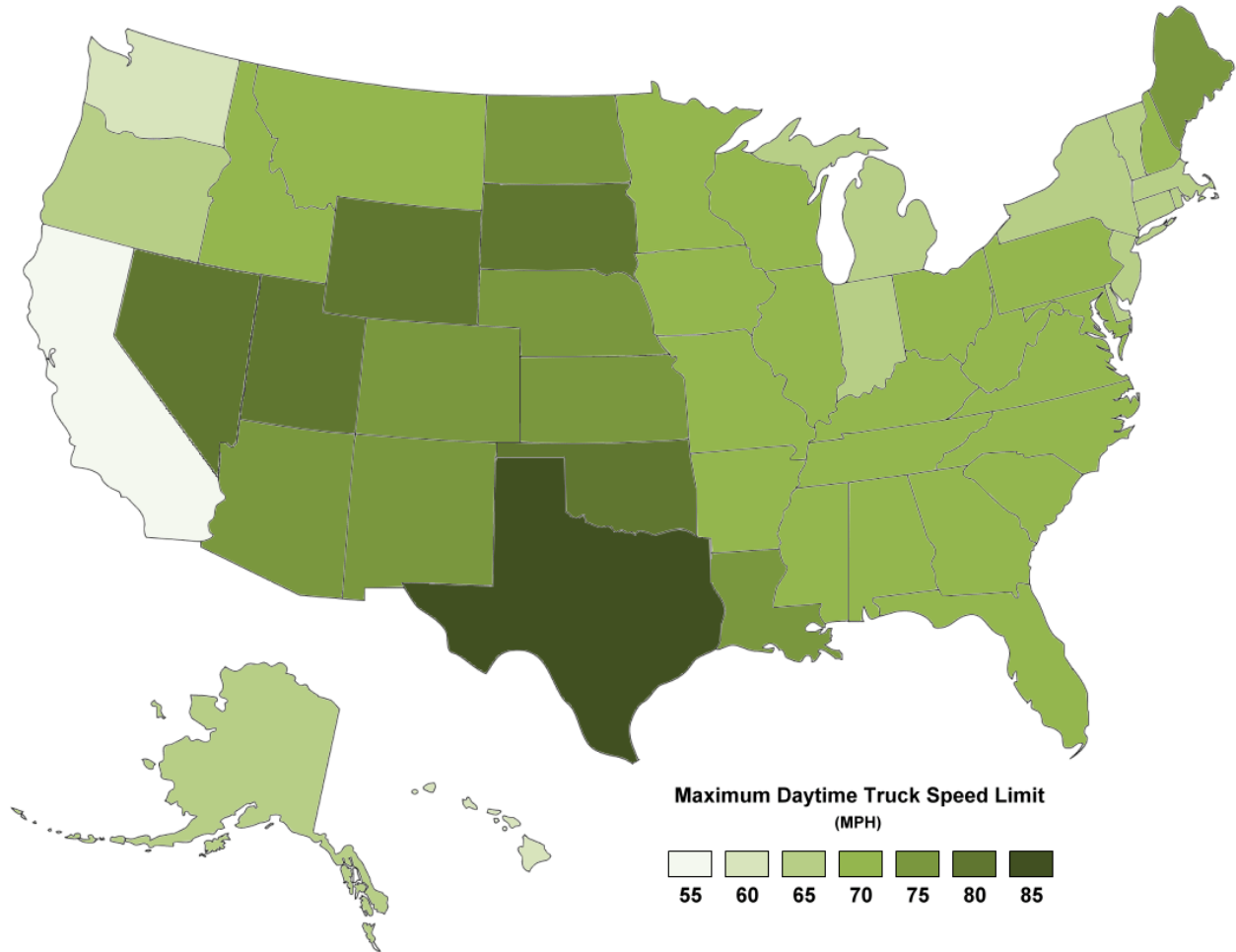
Note: Includes total flows moved between domestic origins and destinations and includes both domestic and foreign shipments.

Source:

U.S. Department of Transportation, Freight Analysis Framework Version 4.5.1.

Ranging from a speed limit of 55 miles per hour (mph) to 85 mph, the maximum speed limit for trucks varies from state to state and sometimes from year to year. Currently, California has the most conservative maximum speed limit for trucks – 55 mph. At the other end of the spectrum, Texas has some roads where the truck speed limit is 85 mph. Because of the varying limits, there is not one common highway speed at which trucks travel. Manufacturers design the vehicle to perform well over the entire range of speeds.

Figure 5.7. Maximum Daytime Truck Speed Limits by State, 2021 (Updated August 2021)

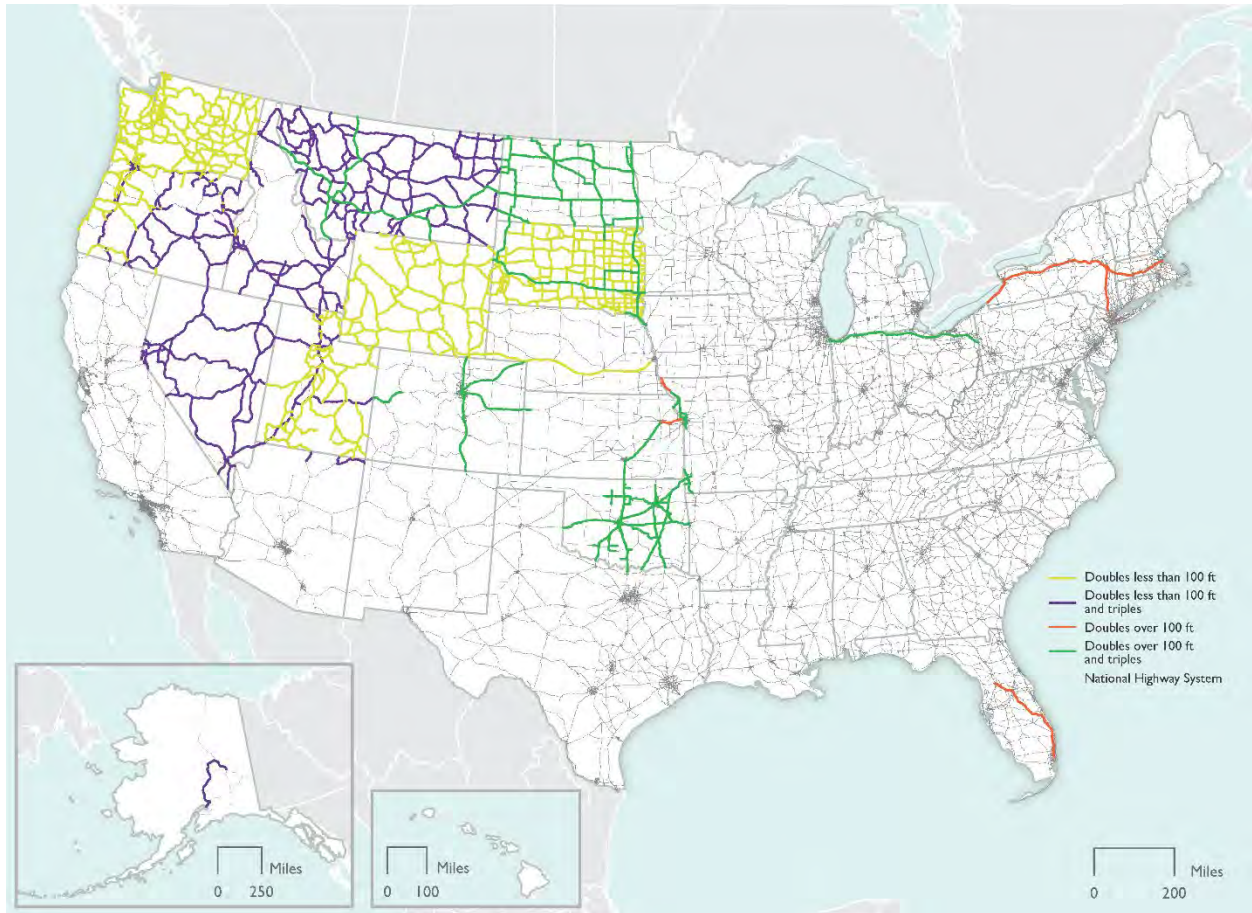


Source:

Insurance Institute for Highway Safety, Highway Loss Data Institute, “Speed Limits,” August 2021.
 (Additional resources: www.iihs.org/iihs/topics/speed/speed-limit-laws)

Although all states allow the conventional combinations consisting of a 28-foot semi-trailer and a 28-foot trailer, only 14 states and six state turnpike authorities allow longer combination vehicles (LCVs) on at least some parts of their road networks. LCVs are tractors pulling a semi-trailer and trailer, with at least one of them – the semi-trailer, the trailer, or both – longer than 28 feet. The routes that these LCVs can travel have not changed since 1991.

Figure 5.8. Routes Where Longer Combination Vehicles Are Permitted, 2017



Note: Empty triples are allowed on I-80 in Nebraska.

Source:

U.S. Department of Transportation, Bureau of Transportation Statistics, *Freight Facts and Figures* digital version, July 2020. (Additional resources: www.bts.gov/product/freight-facts-and-figures).

Chapter 6

Alternative Fuel and Advanced Technology Vehicles and Characteristics

Summary Statistics from Tables in this Chapter

| Source | | |
|------------|--|-----------|
| Table 6.1 | Alternative fuel vehicles made available, 2018 | 1,076,884 |
| | <i>E85</i> | 813,774 |
| | <i>LPG</i> | 2,468 |
| | <i>CNG</i> | 4,451 |
| | <i>Electric</i> | 253,678 |
| | <i>LNG</i> | 0 |
| | <i>Hydrogen</i> | 2,513 |
| Table 6.12 | Number of alternative fuel refuel sites, 2020 | 105,173 |
| | <i>Electric outlets</i> | 95,809 |
| | <i>LPG</i> | 3,062 |
| | <i>CNG</i> | 1,563 |
| | <i>Biodiesel (B20)</i> | 722 |
| | <i>Hydrogen</i> | 63 |

Fuel type abbreviations are used throughout this chapter.

B20 = 20% biodiesel, 80% petroleum diesel

CNG = compressed natural gas

E85 = 85% ethanol, 15% gasoline

E95 = 95% ethanol, 5% gasoline

H₂ = hydrogen

LNG = liquefied natural gas

LPG = liquefied petroleum gas

Alternative Fuels

The Energy Policy Act of 1992 defines alternative fuels and allows the U.S. Department of Energy (DOE) to add to the list of alternative fuels if the fuel is substantially nonpetroleum, yields substantial energy security benefits, and offers substantial environmental benefits. DOE currently recognizes the following as alternative fuels:

- methanol, ethanol, and other alcohols,
- blends of 85% or more of alcohol with gasoline,
- natural gas and liquid fuels domestically produced from natural gas,
- liquefied petroleum gas (propane),
- coal-derived liquid fuels,
- hydrogen,
- electricity,
- biodiesel (B100),
- fuels (other than alcohol) derived from biological materials,
- P-series.

Alternative Fuels Data Center

DOE established the Alternative Fuels Data Center (AFDC) in 1991 to support its work aimed at fulfilling the Alternative Motor Fuels Act directives. Since then, the AFDC has expanded its focus to include all advanced transportation fuels, vehicles, and technologies. The AFDC is operated and managed by the National Renewable Energy Laboratory (NREL) in Golden, Colorado.

The purposes of the AFDC are:

- to gather and analyze information on the fuel consumption, emissions, operation, and durability of alternative fuel vehicles, and
- to provide unbiased, accurate information on alternative fuels and alternative fuel vehicles to government agencies, private industry, research institutions, and other interested organizations.

Much of the AFDC data can be obtained through their website: afdc.energy.gov. Several tables and graphs in this chapter contain statistics which were generated by the AFDC. Below are some links to specific areas of the AFDC website.

Alternative & Advanced Fuels – afdc.energy.gov

Alternative Fueling Station Locator – afdc.energy.gov/stations/#/find/nearest

Alternative & Advanced Vehicles – afdc.energy.gov/fuels

State & Federal Incentives & Laws – afdc.energy.gov/laws

Data Analysis & Trends – afdc.energy.gov/data

Tools – afdc.energy.gov/tools

The Energy Information Administration (EIA) is no longer publishing estimates of the number of alternative vehicles in use in the United States. EIA does publish the number of alternative fuel vehicles “made available” each year, beginning in 2004. The alternative fuel vehicles “made available” are estimates from vehicle manufacturer production and companies performing vehicle conversions. The data are more of a proxy for alternative fuel vehicle sales than for vehicle population, but EIA cautions that the data are not actual sales data.

Table 6.1
Estimates of Alternative Fuel Highway Vehicles Made Available, 2004-2018

| Year | CNG | Electric ^a | E85 | Hydrogen | LNG | LPG |
|---|-------|-----------------------|-----------|----------|---------|-------|
| 2004 | 7,752 | 2,200 | 674,678 | 31 | 136 | 2,150 |
| 2005 | 3,304 | 2,281 | 743,948 | 74 | 68 | 700 |
| 2006 | 3,128 | 2,715 | 1,011,399 | 40 | 92 | 473 |
| 2007 | 2,487 | 3,152 | 1,115,069 | 63 | 26 | 356 |
| 2008 | 4,440 | 2,802 | 1,175,345 | 63 | 384 | 695 |
| 2009 | 3,770 | 2,255 | 805,777 | 26 | 126 | 861 |
| 2010 | 4,973 | 2,229 | 1,484,945 | 64 | 231 | 747 |
| 2011 | 5,674 | 25,382 | 2,116,273 | 107 | 137 | 1,054 |
| 2012 | 7,672 | 46,624 | 2,446,966 | 56 | 101 | 1,134 |
| 2013 | 9,454 | 130,323 | 2,665,470 | 10 | 344 | 2,700 |
| 2014 | 6,662 | 92,594 | 2,433,113 | 3 | 535 | 1,708 |
| 2015 | 8,744 | 118,560 | 1,881,500 | 2 | 7 | 2,248 |
| 2016 | 7,840 | 162,951 | 1,272,091 | 29 | 10 | 1,932 |
| 2017 | 5,939 | 258,689 | 1,150,097 | 2,842 | 0 | 2,837 |
| 2018 | 4,451 | 253,678 | 813,774 | 2,513 | 0 | 2,468 |
| <i>Average annual percentage change</i> | | | | | | |
| 2004-2018 | -3.9% | 40.4% | 1.3% | 36.9% | -100.0% | 1.0% |
| 2008-2018 | 0.0% | 56.9% | -3.6% | 44.6% | -100.0% | 13.5% |

Note: “Made available” refers to the supply of warranted alternative fuel vehicles by manufacturers and aftermarket conversion companies. These do not represent sales.

Source:

U. S. Department of Energy, Energy Information Administration website, “Alternative Fuel Vehicle Data,” www.eia.gov/renewable/afv, September 2019. (Additional resources: www.eia.gov)

^a Includes plug-in hybrid-electric vehicles and all-electric vehicles.

Hybrid vehicle sales began in 1999 and plug-in electric vehicle sales began in 2010. Hybrids captured 3.2% of the light vehicle market in 2013 and again in 2020. All-electric vehicles accounted for 1.7% of the light vehicle market in 2020.

Table 6.2 (Updated April 2021)
Hybrid and Plug-In Vehicle Sales, 1999-2020

| Calendar year | Hybrid vehicle sales (thousands) | Plug-in hybrid vehicle sales (thousands) | All-electric vehicle sales ^a (thousands) | All light vehicle sales ^a (thousands) | Hybrid share of all light vehicles | Plug-in hybrid share of all light vehicles | All-electric share of all light vehicles |
|---|----------------------------------|--|---|--|------------------------------------|--|--|
| 1999 | 0.0 | 0.0 | 0.0 | 16,711 | 0.0% | 0.0% | 0.0% |
| 2000 | 9.4 | 0.0 | 0.0 | 17,164 | 0.1% | 0.0% | 0.0% |
| 2001 | 20.3 | 0.0 | 0.0 | 16,950 | 0.1% | 0.0% | 0.0% |
| 2002 | 36.0 | 0.0 | 0.0 | 16,675 | 0.2% | 0.0% | 0.0% |
| 2003 | 47.6 | 0.0 | 0.0 | 16,494 | 0.3% | 0.0% | 0.0% |
| 2004 | 84.2 | 0.0 | 0.0 | 16,737 | 0.5% | 0.0% | 0.0% |
| 2005 | 205.9 | 0.0 | 0.0 | 16,774 | 1.2% | 0.0% | 0.0% |
| 2006 | 251.9 | 0.0 | 0.0 | 16,336 | 1.5% | 0.0% | 0.0% |
| 2007 | 351.1 | 0.0 | 0.0 | 15,867 | 2.2% | 0.0% | 0.0% |
| 2008 | 315.8 | 0.0 | 0.0 | 13,015 | 2.4% | 0.0% | 0.0% |
| 2009 | 290.3 | 0.0 | 0.0 | 10,236 | 2.8% | 0.0% | 0.0% |
| 2010 | 274.6 | 0.3 | 0.0 | 11,394 | 2.4% | 0.0% | 0.0% |
| 2011 | 266.5 | 7.7 | 10.1 | 12,542 | 2.1% | 0.1% | 0.1% |
| 2012 | 434.6 | 38.6 | 14.6 | 14,220 | 3.1% | 0.3% | 0.1% |
| 2013 | 495.5 | 49.0 | 48.1 | 15,279 | 3.2% | 0.3% | 0.3% |
| 2014 | 452.2 | 55.4 | 63.5 | 16,192 | 2.8% | 0.3% | 0.4% |
| 2015 | 384.4 | 43.0 | 71.1 | 17,107 | 2.2% | 0.3% | 0.4% |
| 2016 | 346.9 | 72.9 | 86.7 | 17,179 | 2.0% | 0.4% | 0.5% |
| 2017 | 362.9 | 91.2 | 104.5 | 16,827 | 2.2% | 0.5% | 0.6% |
| 2018 | 338.1 | 123.9 | 207.1 | 16,919 | 2.0% | 0.7% | 1.2% |
| 2019 | 380.8 | 85.8 | 233.8 | 16,630 | 2.3% | 0.5% | 1.4% |
| 2020 | 454.9 | 66.2 | 240.1 | 14,114 | 3.2% | 0.5% | 1.7% |
| <i>Average annual percentage change</i> | | | | | | | |
| 2000-2020 | 21.4% | ^c | ^c | -1.0% | | | |
| 2011-2020 | 6.0% | 27.0% | 42.2% | 1.3% | | | |

Note: Plug-in vehicle sales include only those vehicles certified for highway use. Small electric carts and neighborhood electric vehicles are excluded.

Sources:

Hybrid and Electric Vehicle Sales – Compiled by the Transportation Research Center at Argonne National Laboratory, 2021. (Additional resources: www.anl.gov/energy-systems/project/light-duty-electric-drive-vehicles-monthly-sales-updates)

All Light Vehicle Sales – Table 3.11.

^a Includes plug-in hybrid-electric vehicles and all-electric vehicles.

^b Includes cars and trucks up to 10,000 lb gross vehicle weight.

^c Data are not available.

Trolleybus, heavy rail, and light rail use nearly all alternative fuels. However, the 54.5% of buses using alternative fuels replace a lot of traditional fuel use.

Table 6.3
Transit Vehicle Alternative Fuel Shares by Mode, 1992-2019

| Year | Bus ^a | Trolleybus | Vanpool | Demand response | Commuter rail self-propelled ^b | Commuter rail locomotive ^b | Heavy rail ^c | Light rail ^d |
|------|------------------|------------|---------|-----------------|---|---------------------------------------|-------------------------|-------------------------|
| 1992 | 2.0% | e | e | e | e | e | e | e |
| 1993 | 4.1% | e | e | 5.8% | e | e | e | e |
| 1994 | 6.5% | e | e | 7.5% | e | e | e | e |
| 1995 | 6.3% | e | e | 11.2% | e | e | e | e |
| 1996 | 6.4% | 100.0% | e | 14.0% | e | e | 99.9% | 100.0% |
| 1997 | 5.6% | 100.0% | e | 13.8% | e | e | 100.0% | 100.0% |
| 1998 | 6.5% | 100.0% | e | 13.2% | e | e | 100.0% | 100.0% |
| 1999 | 7.5% | 100.0% | e | 11.4% | e | e | 100.0% | 100.0% |
| 2000 | 7.9% | 100.0% | e | 8.5% | e | e | 100.0% | 100.0% |
| 2001 | 9.8% | 100.0% | e | 5.8% | e | e | 100.0% | 100.0% |
| 2002 | 11.8% | 100.0% | e | 5.1% | e | e | 100.0% | 100.0% |
| 2003 | 13.0% | 100.0% | e | 5.1% | e | e | 100.0% | 100.0% |
| 2004 | 13.3% | 100.0% | e | 5.1% | e | e | 100.0% | 98.9% |
| 2005 | 16.0% | 100.0% | e | 4.9% | e | e | 100.0% | 100.0% |
| 2006 | 20.8% | 100.0% | e | 6.4% | 99.3% | 11.0% | 100.0% | 98.0% |
| 2007 | 22.4% | 100.0% | e | 5.3% | 99.5% | 10.2% | 100.0% | 98.4% |
| 2008 | 31.6% | 100.0% | e | 10.9% | 99.1% | 3.6% | 100.0% | 99.2% |
| 2009 | 30.4% | 100.0% | e | 10.5% | 99.5% | 10.0% | 100.0% | 98.2% |
| 2010 | 33.5% | 100.0% | e | 8.0% | 99.5% | 11.3% | 100.0% | 98.3% |
| 2011 | 36.6% | 100.0% | e | 7.7% | 99.8% | 11.6% | 100.0% | 98.4% |
| 2013 | 40.4% | 100.0% | e | 8.3% | 99.2% | 16.6% | 100.0% | 98.4% |
| 2014 | 41.4% | 100.0% | 17.0% | 16.4% | 95.0% | 4.1% | 100.0% | 100.0% |
| 2015 | 46.9% | 100.0% | 27.4% | 17.0% | 98.0% | 3.2% | 100.0% | 100.0% |
| 2016 | 49.1% | 100.0% | 29.3% | 15.9% | 98.2% | 1.7% | 100.0% | 100.0% |
| 2017 | 54.3% | 100.0% | 32.1% | 19.5% | 67.9% | 4.4% | 100.0% | 100.0% |
| 2018 | 53.8% | 100.0% | 30.3% | 14.4% | 98.9% | 2.5% | 100.0% | 100.0% |
| 2019 | 54.5% | 100.0% | 0.4% | 17.0% | 98.9% | 2.5% | 100.0% | 100.0% |

Source:

American Public Transportation Association, *2020 Public Transportation Fact Book*, Washington, DC, March 2020, Appendix A. (Additional resources: www.apta.com)

^a Includes bus rapid transit and commuter bus vehicles.

^b Electric car or diesel-propelled railway for urban passenger train service between a central city and adjacent suburbs.

^c An electric railway with the capacity for a heavy volume of traffic.

^d An electric railway with a light volume traffic capacity with power drawn from an overhead electric line.

^e Data are not available.

Table 6.4 (Updated August 2021)
E85 Flex-Fuel Vehicles Available by Manufacturer, Model Year 2021

| Model | EPA Size Class | Range E85 (Miles) |
|------------------------------------|-----------------------------|-------------------|
| Chevrolet Silverado 2WD | Standard Pick-up Trucks 2WD | 288/340 |
| Chevrolet Silverado 4WD | Standard Pick-up Trucks 4WD | 288/340 |
| Ford Explorer FFV AWD | Standard SUV 4WD | 283 |
| Ford F150 Pickup 2WD FFV | Standard Pick-up Trucks 2WD | 382/432 |
| Ford F150 Pickup 2WD FFV | Standard Pick-up Trucks 2WD | 335/378 |
| Ford F150 Pickup 4WD FFV | Standard Pick-up Trucks 4WD | 358/405 |
| Ford F150 Pickup 4WD FFV | Standard Pick-up Trucks 4WD | 311/351 |
| Ford Transit Connect Van FFV | Special Purpose Vehicle 2WD | 300 |
| Ford Transit Connect Wagon LWB FFV | Special Purpose Vehicle 2WD | 300 |
| Ford Transit T150 Wagon 2WD FFV | Vans, Passenger Type | 296 |
| Ford Transit T150 Wagon 4WD FFV | Vans, Passenger Type | 296 |
| GMC Sierra 2WD | Standard Pick-up Trucks 2WD | 288/340 |
| GMC Sierra 4WD | Standard Pick-up Trucks 4WD | 288/340 |

Note: Vehicles with two ranges listed have two fuel tank size options.

Source:

U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy Website, Power Search www.fueleconomy.gov/feg/powerSearch.jsp. Data accessed: July 29, 2021.

Table 6.5 (Updated August 2021)
B20, CNG, and LPG Vehicles Available by Manufacturer, Model Year 2021

| Model | Fuel ^a | EPA Size Class | Range (Miles) |
|---|-------------------|-----------------------------|---------------|
| Cadillac Escalade 2WD | B20 | Standard SUV 2WD | ^a |
| Cadillac Escalade 4WD | B20 | Standard SUV 4WD | ^a |
| Chevrolet Colorado 2WD | B20 | Small Pick-up Trucks 2WD | 483 |
| Chevrolet Colorado 4WD | B20 | Small Pick-up Trucks 4WD | 462 |
| Chevrolet Colorado ZR2 4WD | B20 | Small Pick-up Trucks 4WD | 399 |
| Chevrolet Silverado 2WD | B20 | Standard Pick-up Trucks 2WD | 648 |
| Chevrolet Silverado 4WD | B20 | Standard Pick-up Trucks 4WD | 576 |
| Chevrolet Suburban 2WD | B20 | Standard SUV 2WD | 644 |
| Chevrolet Suburban 4WD | B20 | Standard SUV 4WD | 616 |
| Chevrolet Tahoe 2WD | B20 | Standard SUV 2WD | 672 |
| Chevrolet Tahoe 4WD | B20 | Standard SUV 4WD | 616 |
| Ford F150 Pickup 4WD | B20 | Standard Pick-up Trucks 4WD | 529/598 |
| GMC Canyon 2WD | B20 | Small Pick-up Trucks 2WD | 483 |
| GMC Canyon 4WD | B20 | Small Pick-up Trucks 4WD | 462 |
| GMC Sierra 2WD | B20 | Standard Pick-up Trucks 2WD | 624 |
| GMC Sierra 4WD | B20 | Standard Pick-up Trucks 4WD | 576 |
| GMC Sierra 4WD AT4 | B20 | Standard Pick-up Trucks 4WD | 576 |
| GMC Yukon 2WD | B20 | Standard SUV 2WD | 598 |
| GMC Yukon 4WD | B20 | Standard SUV 4WD | 572 |
| GMC Yukon XL 2WD | B20 | Standard SUV 2WD | 713 |
| GMC Yukon XL 4WD | B20 | Standard SUV 4WD | 682 |
| Jeep Gladiator EcoDiesel 4x4 | B20 | Standard Pick-up Trucks 4WD | ^a |
| Jeep Gladiator Rubicon EcoDiesel 4x4 | B20 | Standard Pick-up Trucks 4WD | ^a |
| Jeep Wrangler 4dr EcoDiesel 4x4 | B20 | Small SUV 4WD | 458 |
| Jeep Wrangler Rubic 4dr EcoDiesel 4x4 | B20 | Small SUV 4WD | 421 |
| Land Rover Range Rover | B20 | Standard SUV 4WD | 545 |
| Land Rover Range Rover Sport | B20 | Standard SUV 4WD | 545 |
| RAM 1500 4X2 | B20 | Standard Pick-up Trucks 2WD | 598/676 |
| RAM 1500 4X4 | B20 | Standard Pick-up Trucks 4WD | 552/624 |
| RAM 1500 HFE 4X2 | B20 | Standard Pick-up Trucks 2WD | ^a |
| No light vehicles fueled with CNG are available in this model year. | | | |
| No light vehicles fueled with LPG are available in this model year. | | | |

Note: Vehicles with two ranges listed have two fuel tank size options.

Source:

U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy Website, Power Search www.fueleconomy.gov/feg/powerSearch.jsp. Data accessed July 29, 2021.

^a All diesel vehicles are capable of using B20.

Table 6.6 (Updated August 2021)
Hybrid-Electric Vehicles Available by Manufacturer, Model Year 2021

| Model | EPA Size Class | Range (Miles) |
|--|-----------------------------|---------------|
| Acura NSX | Two Seaters | a |
| Audi A4 allroad quattro | Small Station Wagons | 398 |
| Audi A4 quattro | Compact Cars | 428 |
| Audi A4 S line quattro | Compact Cars | 413 |
| Audi A5 Cabriolet quattro | Subcompact Cars | a |
| Audi A5 quattro | Subcompact Cars | a |
| Audi A5 Sportback quattro | Midsize Cars | a |
| Audi A5 Sportback S line quattro | Midsize Cars | a |
| Audi A6 Allroad | Midsize Station Wagons | a |
| Audi A6 quattro 2L | Midsize Cars | 502 |
| Audi A6 quattro 3L | Midsize Cars | a |
| Audi A7 quattro | Midsize Cars | 463 |
| Audi A8 3L | Large Cars | a |
| Audi A8 4L | Large Cars | 391 |
| Audi Q5 | Small SUV 4WD | 462 |
| Audi Q5 Sportback | Small SUV 4WD | a |
| Audi Q7 | Standard SUV 4WD | 450 |
| Audi Q8 | Standard SUV 4WD | 450 |
| Audi RS 6 Avant | Midsize Station Wagons | a |
| Audi RS 7 | Midsize Cars | a |
| Audi RS Q8 | Standard SUV 4WD | a |
| Audi S6 | Midsize Cars | a |
| Audi S7 | Midsize Cars | a |
| Audi S8 | Large Cars | a |
| BMW 540i | Midsize Cars | a |
| BMW 540i xDrive | Midsize Cars | 468 |
| BMW M340i | Compact Cars | a |
| BMW M340i xDrive | Compact Cars | a |
| BMW M440i Convertible | Subcompact Cars | a |
| BMW M440i xDrive Coupe | Subcompact Cars | 390 |
| BMW X5 sDrive40i | Standard SUV 2WD | 504 |
| BMW X5 xDrive40i | Standard SUV 4WD | 504 |
| BMW X6 sDrive40i | Standard SUV 2WD | 504 |
| BMW X6 xDrive40i | Standard SUV 4WD | 504 |
| BMW X7 xDrive40i | Standard SUV 4WD | 460 |
| Ford Escape AWD HEV | Small SUV 4WD | a |
| Ford Escape FWD HEV | Small SUV 2WD | a |
| Ford Explorer HEV AWD | Standard SUV 4WD | 465 |
| Ford Explorer HEV RWD | Standard SUV 2WD | 502 |
| Ford F150 Pickup 2WD HEV | Standard Pick-up Trucks 2WD | 765 |
| Ford F150 Pickup 4WD HEV | Standard Pick-up Trucks 4WD | 734 |
| Honda Accord | Large Cars | 614 |
| Honda Accord Sport/Touring | Large Cars | 550 |
| Honda CR-V AWD | Small SUV 4WD | 406 |
| Honda Insight | Midsize Cars | 551 |
| Honda Insight Touring | Compact Cars | 509 |
| Hyundai Motor Company Elantra Hybrid | Midsize Cars | 550 |
| Hyundai Motor Company Elantra Hybrid Blue | Midsize Cars | 594 |
| Hyundai Motor Company Ioniq | Large Cars | a |
| Hyundai Motor Company Ioniq Blue | Large Cars | a |
| Hyundai Motor Company Santa Fe Hybrid | Small SUV 4WD | a |
| Hyundai Motor Company Santa Fe Hybrid Blue | Small SUV 4WD | a |
| Hyundai Motor Company Sonata Hybrid | Large Cars | 620 |
| Hyundai Motor Company Sonata Hybrid Blue | Large Cars | 686 |
| Jaguar E-PACE MHEV | Small SUV 4WD | a |
| Jaguar F-PACE P340 MHEV | Small SUV 4WD | a |
| Jaguar F-PACE P400 MHEV | Small SUV 4WD | a |

Table 6.6 (continued) (Updated August 2021)
Hybrid-Electric Vehicles Available by Manufacturer, Model Year 2021

| Model | EPA Size Class | Range (Miles) |
|--|-----------------------------|---------------|
| Jeep Wrangler 2dr 4X4 | Small SUV 4WD | 368 |
| Jeep Wrangler 4dr 4X4 | Small SUV 4WD | 452 |
| Kia Motors Corporation Niro | Small Station Wagons | a |
| Kia Motors Corporation Niro FE | Small Station Wagons | a |
| Kia Motors Corporation Niro Touring | Small Station Wagons | a |
| Kia Motors Corporation Sorento Hybrid | Small SUV 2WD | a |
| Land Rover Defender 110 MHEV | Standard SUV 4WD | a |
| Land Rover Defender 90 MHEV | Standard SUV 4WD | a |
| Land Rover Discovery MHEV | Standard SUV 4WD | a |
| Land Rover Range Rover MHEV | Standard SUV 4WD | 550 |
| Land Rover Range Rover Sport MHEV | Standard SUV 4WD | 580 |
| Land Rover Range Rover Velar P340 MHEV | Small SUV 4WD | a |
| Land Rover Range Rover Velar P400 MHEV | Small SUV 4WD | a |
| Lexus ES 300h | Midsize Cars | 581 |
| Lexus LC 500h | Subcompact Cars | 644 |
| Lexus LS 500h | Midsize Cars | a |
| Lexus LS 500h AWD | Midsize Cars | a |
| Lexus NX 300h AWD | Small SUV 4WD | 459 |
| Lexus RX 450h AWD | Standard SUV 4WD | 516 |
| Lexus RX 450h L AWD | Standard SUV 4WD | 499 |
| Lexus UX 250h | Compact Cars | 445 |
| Lexus UX 250h AWD | Compact Cars | 413 |
| Mercedes-Benz AMG CLS53 4MATIC+ | Compact Cars | 547 |
| Mercedes-Benz AMG E53 4MATIC+ | Midsize Cars | a |
| Mercedes-Benz AMG E53 4MATIC+ (Convertible) | Subcompact Cars | 485 |
| Mercedes-Benz AMG E53 4MATIC+ (Coupe) | Subcompact Cars | 418 |
| Mercedes-Benz AMG GLE 53 4MATIC+ | Standard SUV 4WD | 428 |
| Mercedes-Benz AMG GLE 53 4MATIC+ (coupe) | Standard SUV 4WD | 450 |
| Mercedes-Benz AMG GLE 63 S 4MATIC+ | Standard SUV 4WD | 360 |
| Mercedes-Benz AMG GLE 63 S 4MATIC+ (coupe) | Standard SUV 4WD | 382 |
| Mercedes-Benz AMG GLS 63 4MATIC+ | Standard SUV 4WD | 381 |
| Mercedes-Benz AMG GT 43 4MATIC+ | Compact Cars | a |
| Mercedes-Benz AMG GT 53 4MATIC+ | Compact Cars | a |
| Mercedes-Benz CLS 450 | Compact Cars | a |
| Mercedes-Benz CLS 450 4MATIC | Compact Cars | a |
| Mercedes-Benz E 450 (convertible) | Subcompact Cars | 435 |
| Mercedes-Benz E 450 (coupe) | Subcompact Cars | 452 |
| Mercedes-Benz E 450 4MATIC | Midsize Cars | 549 |
| Mercedes-Benz E 450 4MATIC (convertible) | Subcompact Cars | 435 |
| Mercedes-Benz E 450 4MATIC (coupe) | Subcompact Cars | 435 |
| Mercedes-Benz E 450 4MATIC All-Terrain (wagon) | Midsize Station Wagons | 506 |
| Mercedes-Benz GLE 450 4MATIC | Standard SUV 4WD | 518 |
| Mercedes-Benz GLE 580 4MATIC | Standard SUV 4WD | 428 |
| Mercedes-Benz GLS 450 4MATIC | Standard SUV 4WD | 500 |
| Mercedes-Benz GLS 580 4MATIC | Standard SUV 4WD | 428 |
| Mercedes-Benz GLS 600 4MATIC Maybach | Standard SUV 4WD | 381 |
| Mercedes-Benz S 500 4MATIC | Large Cars | a |
| Mercedes-Benz S 580 4MATIC | Large Cars | a |
| Mercedes-Benz S 580 4MATIC Maybach | Large Cars | a |
| RAM 1500 3.6L 4X2 | Standard Pick-up Trucks 2WD | 506/572 |
| RAM 1500 5.7L 4X2 | Standard Pick-up Trucks 2WD | 437/494 |
| RAM 1500 HFE 4X2 | Standard Pick-up Trucks 2WD | a |
| RAM 3.6L 1500 4X4 | Standard Pick-up Trucks 4WD | 483/546 |
| RAM 5.7L 1500 4X4 | Standard Pick-up Trucks 4WD | 437/494 |
| Toyota Avalon Hybrid | Midsize Cars | 568 |
| Toyota Avalon Hybrid XLE | Midsize Cars | 581 |
| Toyota Camry Hybrid LE | Midsize Cars | 686 |
| Toyota Camry Hybrid SE/XLE/XSE | Midsize Cars | 607 |
| Toyota Corolla Hybrid | Compact Cars | 593 |
| Toyota Highlander Hybrid | Small SUV 2WD | 616 |

Table 6.6 (continued) (Updated August 2021)
Hybrid-Electric Vehicles Available by Manufacturer, Model Year 2021

| | | |
|---------------------------------------|--------------------------------------|-----|
| Toyota Highlander Hybrid AWD | Standard SUV 4WD | 598 |
| Toyota Highlander Hybrid AWD LTD/PLAT | Standard SUV 4WD | 598 |
| Toyota Prius | Midsize Cars | 588 |
| Toyota Prius AWD | Midsize Cars | 519 |
| Toyota Prius Eco | Midsize Cars | 633 |
| Toyota RAV4 Hybrid AWD | Small SUV 4WD | 580 |
| TOYOTA Sienna AWD | Special Purpose Vehicle, minivan 2WD | 648 |
| TOYOTA Sienna AWD | Special Purpose Vehicle, minivan 4WD | 630 |
| Toyota Venza AWD | Small SUV 4WD | 566 |

Note: Vehicles with two ranges listed have two fuel tank size options.

Source:

U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy Website, Power Search www.fueleconomy.gov/feg/powerSearch.jsp. Data accessed July 29, 2021.

^aData are not available.

Table 6.7 (Updated August 2021)
Plug-in Hybrid Vehicles Available by Manufacturer, Model Year 2021

| Model | EPA Size Class | Range (Miles) |
|--|----------------------|---------------------|
| Audi A7 quattro (PHEV) | Midsize Cars | Elec 24 / Total 416 |
| Audi A8L (PHEV) | Large Cars | Elec 18 / Total 397 |
| Audi Q5 (PHEV) | Small SUV 4WD | Elec 19 / Total 378 |
| Bentley Bentayga (PHEV) | Standard SUV 4WD | Elec 18 / Total 372 |
| BMW 330e (PHEV) | Compact Cars | Elec 23 / Total 302 |
| BMW 330e xDrive (PHEV) | Compact Cars | Elec 20 / Total 271 |
| BMW 530e (PHEV) | Compact Cars | Elec 21 / Total 323 |
| BMW 530e xDrive (PHEV) | Compact Cars | Elec 19 / Total 302 |
| BMW 745e xDrive (PHEV) | Large Cars | Elec 17 / Total 270 |
| BMW I3 with Range Extender (PHEV) | Subcompact Cars | Elec 126 / Total 72 |
| BMW I3s with Range Extender (PHEV) | Subcompact Cars | Elec 126 / Total 72 |
| BMW Mini Cooper SE Countryman ALL4 (PHEV) | Midsize Cars | Elec 18 / Total 280 |
| BMW X3 xDrive30e (PHEV) | Small SUV 4WD | Elec 18 / Total 318 |
| BMW X5 xDrive45e (PHEV) | Standard SUV 4WD | Elec 31 / Total 373 |
| Chrysler Pacifica Hybrid (PHEV) | Minivan 2WD | Elec 32 / Total 487 |
| Ferrari SF90 Stradale Coupe (PHEV) | Two Seaters | Elec 9 / Total 320 |
| Ford Escape FWD PHEV | Small SUV 2WD | Elec 37 / Total 487 |
| Jeep Wrangler 4dr 4xe (PHEV) | Small SUV 4WD | Elec 22 / Total 346 |
| Karma GS-6 PHEV (21-inch wheels) | Subcompact Cars | Elec 61 / Total 266 |
| Karma GS-6 PHEV (22-inch wheels) | Subcompact Cars | Elec 54 / Total 224 |
| Karma Revero GT PHEV (21-inch wheels) | Subcompact Cars | Elec 61 / Total 266 |
| Karma Revero GT PHEV (22-inch wheels) | Subcompact Cars | Elec 54 / Total 224 |
| Kia Niro Plug-in Hybrid | Small Station Wagons | Elec 26 / Total 530 |
| Land Rover Range Rover (PHEV) | Standard SUV 4WD | Elec 19 / Total 461 |
| Land Rover Range Rover Sport (PHEV) | Standard SUV 4WD | Elec 19 / Total 461 |
| Lincoln Aviator AWD (PHEV) | Standard SUV 4WD | Elec 21 / Total 443 |
| Lincoln Corsair AWD (PHEV) | Small SUV 4WD | Elec 28 / Total 400 |
| Mitsubishi Outlander PHEV | Small SUV 4WD | Elec 24 / Total 292 |
| Polestar Automotive Polestar-1 (PHEV) | Minicompact Cars | Elec 52 / Total 417 |
| Porsche Cayenne e-Hybrid (PHEV) | Standard SUV 4WD | Elec 17 / Total 414 |
| Porsche Cayenne e-Hybrid Coupe (PHEV) | Standard SUV 4WD | Elec 17 / Total 414 |
| Porsche Cayenne Turbo S e-Hybrid (PHEV) | Standard SUV 4WD | Elec 15 / Total 359 |
| Porsche Cayenne Turbo S e-Hybrid Coupe (PHEV) | Standard SUV 4WD | Elec 15 / Total 359 |
| Porsche Panamera 4 E-Hybrid (PHEV) | Large Cars | Elec 19 / Total 463 |
| Porsche Panamera 4 E-Hybrid Executive (PHEV) | Large Cars | Elec 19 / Total 463 |
| Porsche Panamera 4S E-Hybrid (PHEV) | Large Cars | Elec 19 / Total 461 |
| Porsche Panamera 4S E-Hybrid Executive (PHEV) | Large Cars | Elec 19 / Total 461 |
| Porsche Panamera 4S E-Hybrid Sport Turismo (PHEV) | Large Cars | Elec 19 / Total 461 |
| Porsche Panamera Turbo S E-Hybrid (PHEV) | Large Cars | Elec 17 / Total 413 |
| Porsche Panamera Turbo S E-Hybrid Executive (PHEV) | Large Cars | Elec 17 / Total 413 |
| Porsche Panamera Turbo S E-Hybrid Sport Turismo (PHEV) | Large Cars | Elec 17 / Total 413 |
| Subaru Crosstrek Hybrid AWD (PHEV) | Small SUV 4WD | Elec 17 / Total 464 |
| Toyota Prius Prime (PHEV) | Midsize Cars | Elec 25 / Total 618 |
| Toyota RAV4 Prime AWD (PHEV) | Small SUV 4WD | Elec 42 / Total 558 |
| Volvo S60 AWD (PHEV) | Compact Cars | Elec 22 / Total 485 |
| Volvo S90 AWD (PHEV) | Midsize Cars | Elec 21 / Total 473 |
| Volvo V60 AWD (PHEV) | Small Station Wagons | Elec 22 / Total 485 |
| Volvo XC60 AWD (PHEV) | Small SUV 4WD | Elec 19 / Total 502 |
| Volvo XC90 AWD (PHEV) | Standard SUV 4WD | Elec 18 / Total 505 |

Note: For Range, the term "Elec" refers to the charge depleting portion of operation where electricity is exclusively or primarily used.

Source:

U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy Website, Power Search www.fueleconomy.gov/feg/powerSearch.jsp. Data accessed July 29, 2021.

Table 6.8 (Updated August 2021)
All-Electric and Fuel Cell Vehicles Available by Manufacturer, Model Year 2021

| Model | Drive Type | EPA Size Class | Range (Miles) |
|--|------------|----------------------|---------------|
| Audi e-tron | EV | Standard SUV 4WD | 222 |
| Audi e-tron Sportback | EV | Standard SUV 4WD | 218 |
| BMW I3 BEV (120 Ah battery) | EV | Subcompact Cars | 153 |
| BMW I3s BEV (120 Ah battery) | EV | Subcompact Cars | 153 |
| Chevy Bolt (BEV) | EV | Small Station Wagons | 259 |
| Ford Mustang Mach-E AWD | EV | Small Station Wagons | 211 |
| Ford Mustang Mach-E AWD Extended | EV | Small Station Wagons | 270 |
| Ford Mustang Mach-E California Route 1 (RWD) | EV | Small Station Wagons | 305 |
| Ford Mustang Mach-E RWD | EV | Small Station Wagons | 230 |
| Ford Mustang Mach-E RWD Extended | EV | Small Station Wagons | 300 |
| Hyundai Ioniq Electric | EV | Midsize Cars | 170 |
| Hyundai Kona Electric | EV | Small SUV 2WD | 258 |
| Jaguar I-Pace EV400 | EV | Small SUV 4WD | 234 |
| Kandi K27 | EV | Compact Cars | 59 |
| Kia Niro Electric | EV | Small Station Wagons | 239 |
| Mini Cooper SE Hardtop 2 Door | EV | Subcompact Cars | 110 |
| Nissan Leaf (40 kW-hr battery pack) | EV | Midsize Cars | 149 |
| Nissan Leaf (62 kW-hr battery pack) | EV | Midsize Cars | 226 |
| Nissan Leaf SV/SL (62 kW-hr battery pack) | EV | Midsize Cars | 215 |
| Porsche Taycan Performance Battery | EV | Compact Cars | 200 |
| Porsche Taycan Performance Battery Plus | EV | Compact Cars | 225 |
| Porsche Taycan 4S Performance Battery | EV | Large Cars | 199 |
| Porsche Taycan 4S Performance Battery Plus | EV | Large Cars | 227 |
| Porsche Taycan Turbo | EV | Large Cars | 212 |
| Porsche Taycan Turbo S | EV | Large Cars | 201 |
| Tesla Model 3 Long Range AWD | EV | Midsize Cars | 353 |
| Tesla Model 3 Performance AWD | EV | Midsize Cars | 315 |
| Tesla Model 3 Standard Range Plus RWD | EV | Midsize Cars | 263 |
| Tesla Model S Long Range | EV | Large Cars | 405 |
| Tesla Model S Performance (19" Wheels) | EV | Large Cars | 387 |
| Tesla Model S Performance (21" Wheels) | EV | Large Cars | 334 |
| Tesla Model S Plaid (21" Wheels) | EV | Large Cars | 348 |
| Tesla Model X Long Range Plus | EV | Standard SUV 4WD | 371 |
| Tesla Model X Performance (20" Wheels) | EV | Standard SUV 4WD | 341 |
| Tesla Model X Performance (22" Wheels) | EV | Standard SUV 4WD | 300 |
| Tesla Model Y Long Range AWD | EV | Small SUV 4WD | 326 |
| Tesla Model Y Performance AWD | EV | Small SUV 4WD | 303 |
| Tesla Model Y Standard Range Plus RWD | EV | Small SUV 2WD | 244 |
| Volkswagen ID.4 1st | EV | Small SUV 2WD | 250 |
| Volkswagen ID.4 Pro | EV | Small SUV 2WD | 260 |
| Volkswagen ID.4 Pro S | EV | Small SUV 2WD | 250 |
| Volvo Polestar 2 | EV | Midsize Cars | 233 |
| Volvo XC40 AWD BEV | EV | Small SUV 4WD | 208 |
| Honda Clarity | FCEV | Midsize Cars | 360 |
| Hyundai Nexo | FCEV | Small SUV 2WD | 354 |
| Hyundai Nexo Blue | FCEV | Small SUV 2WD | 380 |
| Toyota Mirai Limited | FCEV | Compact Cars | 357 |
| Toyota Mirai XLE | FCEV | Compact Cars | 402 |

Note: EV = electric vehicle; FCEV = hydrogen fuel cell vehicle.

Source:

U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy Website, Power Search www.fueleconomy.gov/feg/powerSearch.jsp. Data accessed July 29, 2021.

In 1991 there were only two alternative fuel vehicle (AFV) models on the market which were fueled by M85. In 2020 there were 130 different models of AFV on the market, with 64% of those being electric vehicles which include plug-in hybrid-electric vehicles. Another 19% of the models available in 2020 were fueled by E85.

Table 6.9 (Updated August 2021)
Number of Alternative Fuel Light Vehicle Models Available, 1991–2020
(number of models available)

| Model year | Propane ^a | CNG ^a | Ethanol (E85) | Methanol (M85) | Electric vehicle ^b | Hydrogen | Total |
|------------|---|------------------|---------------|----------------|-------------------------------|----------|-------|
| 1991 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| 1992 | 0 | 2 | 1 | 2 | 0 | 0 | 5 |
| 1993 | 0 | 2 | 1 | 4 | 0 | 0 | 7 |
| 1994 | 0 | 2 | 1 | 2 | 0 | 0 | 5 |
| 1995 | 0 | 10 | 0 | 2 | 1 | 0 | 13 |
| 1996 | 0 | 10 | 1 | 1 | 0 | 0 | 12 |
| 1997 | 3 | 9 | 1 | 1 | 3 | 0 | 17 |
| 1998 | 3 | 12 | 2 | 0 | 8 | 0 | 25 |
| 1999 | 5 | 16 | 6 | 0 | 16 | 0 | 43 |
| 2000 | 2 | 15 | 8 | 0 | 12 | 0 | 37 |
| 2001 | 5 | 16 | 11 | 0 | 10 | 0 | 42 |
| 2002 | 5 | 18 | 16 | 0 | 6 | 0 | 45 |
| 2003 | 1 | 16 | 22 | 0 | 5 | 0 | 44 |
| 2004 | 1 | 16 | 19 | 0 | 1 | 0 | 37 |
| 2005 | 0 | 5 | 24 | 0 | 0 | 0 | 29 |
| 2006 | 0 | 5 | 22 | 0 | 0 | 0 | 27 |
| 2007 | 0 | 1 | 31 | 0 | 0 | 0 | 32 |
| 2008 | 1 | 1 | 31 | 0 | 1 | 0 | 34 |
| 2009 | 1 | 1 | 36 | 0 | 1 | 0 | 39 |
| 2010 | 0 | 1 | 34 | 0 | 1 | 0 | 36 |
| 2011 | 0 | 1 | 72 | 0 | 2 | 0 | 75 |
| 2012 | 1 | 6 | 62 | 0 | 6 | 1 | 76 |
| 2013 | 6 | 11 | 84 | 0 | 15 | 1 | 117 |
| 2014 | 14 | 19 | 90 | 0 | 16 | 2 | 141 |
| 2015 | 10 | 17 | 84 | 0 | 27 | 3 | 141 |
| 2016 | 5 | 12 | 66 | 0 | 29 | 3 | 115 |
| 2017 | 8 | 9 | 45 | 0 | 51 | 2 | 115 |
| 2018 | 7 | 9 | 53 | 0 | 57 | 2 | 128 |
| 2019 | 7 | 7 | 40 | 0 | 72 | 4 | 130 |
| 2020 | 8 | 10 | 25 | 0 | 83 | 4 | 130 |
| | <i>Average annual percentage change</i> | | | | | | |
| 1991-2019 | c | c | c | -100.0% | c | c | 15.5% |
| 2009-2019 | c | 25.9% | -3.0% | c | 55.56% | c | 13.7% |

Note: Model count differs from data on Tables 6.4-6.7 because heavier vehicles, such as Ford F-250 or RAM 2500 are included.

Source:

U.S. Department of Energy, Alternative Fuels Data Center website, “Light-Duty AFV, HEV, and Diesel Model Offerings, By Fuel Type,” www.afdc.energy.gov/data/10303, August 2021. (Additional resources: www.afdc.energy.gov)

^a Dedicated and bi-fuel vehicles.

^b Electric vehicles include plug-in hybrid-electric vehicles but do not include neighborhood electric vehicles, low-speed electric vehicles, or two-wheeled electric vehicles.

^c Average annual percentage change cannot be calculated from zero.

Table 6.10 (Updated August 2021)
Hybrid-Electric Medium/Heavy Trucks and Buses Available by Manufacturer, 2021

| Manufacturer - Model | Drive type | Truck type |
|--|------------------------|---------------------------|
| Ford E350, E450 Cutaway | Hybrid Electric | Vocational/Cab Chassis |
| Ford E350, E450 Stripped Chassis | Hybrid Electric | Vocational/Cab Chassis |
| Ford F-59 Stripped Chassis | Hybrid Electric | Vocational/Cab Chassis |
| Ford Super Duty Chassis Cab F350, F450, F550 | Hybrid Electric | Vocational/Cab Chassis |
| Ford Super Duty F250, F350, F450 | Hybrid Electric | Pickup |
| Ford Transit 250/350 Cargo Van | Hybrid Electric | Van |
| Ford Transit 250/350 Passenger Van | Hybrid Electric | Passenger Van/Shuttle Bus |
| Ford Transit CC-CA 250, 350 | Hybrid Electric | Vocational/Cab Chassis |
| Ford F-59 Stripped Chassis | Hybrid E85 Electric | Vocational/Cab Chassis |
| ENC AXESS 35' | Hybrid Diesel Electric | Transit Bus |
| ENC AXESS 40' | Hybrid Diesel Electric | Transit Bus |
| ENC E-Z RIDER II 30' | Hybrid Diesel Electric | Transit Bus |
| ENC E-Z RIDER II 32' | Hybrid Diesel Electric | Transit Bus |
| ENC E-Z RIDER II 35' | Hybrid Diesel Electric | Transit Bus |
| Gillig BRT, BRT Plus, Commuter | Hybrid Diesel Electric | Transit Bus |
| Gillig Low Floor, Low Floor Plus | Hybrid Diesel Electric | Transit Bus |
| Gillig Trolley | Hybrid Diesel Electric | Transit Bus |
| Global M4 Hybrid | Hybrid Diesel Electric | Street Sweeper |
| Hino 195h, 195hDC Hybrid Cab-Over | Hybrid Diesel Electric | Vocational/Cab Chassis |
| Hometown Trolley Streetcar | Hybrid Diesel Electric | Passenger Van/Shuttle Bus |
| MCI D4000 Hybrid Commuter Coach | Hybrid Diesel Electric | Transit Bus |
| MCI D4500 Hybrid Commuter Coach | Hybrid Diesel Electric | Transit Bus |
| New Flyer Xcelsior 40' | Hybrid Diesel Electric | Transit Bus |
| New Flyer Xcelsior 60' | Hybrid Diesel Electric | Transit Bus |
| Nova Bus LFS Artic HEV | Hybrid Diesel Electric | Transit Bus |
| Nova Bus LFS HEV | Hybrid Diesel Electric | Transit Bus |
| US Hybrid HySweep sweeper | Hybrid Diesel Electric | Street Sweeper |

Source:

U.S. Department of Energy, Alternative Fuels Data Center website, www.afdc.energy.gov/vehicles/search, August 2021. (Additional resources: www.afdc.energy.gov)

Table 6.11 (Updated August 2021)
Electric-Drive Medium/Heavy Trucks and Buses Available by Manufacturer, 2021

| Manufacturer - Model | Drive type | Truck type |
|---|-------------------------|---------------------------|
| Ford Super Duty F250, F350, F450 | Plug-in Hybrid Electric | Pickup |
| US Hybrid H2Truck | Plug-in Hybrid Electric | Tractor |
| US Hybrid H2Cargo | Plug-in Hybrid Electric | Step Van |
| US Hybrid H2Ride 30 | Plug-in Hybrid Electric | Passenger Van/Shuttle Bus |
| US Hybrid H2Ride 32 | Plug-in Hybrid Electric | Passenger Van/Shuttle Bus |
| Blue Bird All American RE Electric | Electric | School Bus |
| Blue Bird All American RE Electric Activity | Electric | Passenger Van/Shuttle Bus |
| Blue Bird Micro Bird Activity G5 Electric | Electric | Passenger Van/Shuttle Bus |
| Blue Bird Micro Bird G5 Electric | Electric | School Bus |
| Blue Bird Vision Electric | Electric | School Bus |
| Blue Bird Vision Electric Activity | Electric | Passenger Van/Shuttle Bus |
| BYD 23' Electric Motor Coach | Electric | Passenger Van/Shuttle Bus |
| BYD 30' Electric transit | Electric | Transit Bus |
| BYD 35' Double Decker Electric Bus | Electric | Transit Bus |
| BYD 35' Electric Motor Coach | Electric | Passenger Van/Shuttle Bus |
| BYD 35' Electric Transit | Electric | Transit Bus |
| BYD 40' Electric Motor Coach | Electric | Passenger Van/Shuttle Bus |
| BYD 40' Electric Transit | Electric | Transit Bus |
| BYD 45' Double Decker Electric Bus | Electric | Transit Bus |
| BYD 45' Electric Motor Coach | Electric | Passenger Van/Shuttle Bus |
| BYD 60' Electric Transit | Electric | Transit Bus |
| BYD 6F | Electric | Vocational/Cab Chassis |
| BYD 6R | Electric | Refuse |
| BYD 8R | Electric | Refuse |
| BYD 8TT Day Cab | Electric | Tractor |
| BYD 8Y Terminal Tractor | Electric | Tractor |
| Chanje V8100 Panel Van | Electric | Van |
| COBUS Industries e.COBUS 2700 | Electric | Transit Bus |
| COBUS Industries e.COBUS 2700S | Electric | Transit Bus |
| COBUS Industries e.COBUS 3000 | Electric | Transit Bus |
| Collins Bus Type A School Bus (DE516) | Electric | School Bus |
| Collins Bus Type A School Bus (DE516WF) | Electric | School Bus |
| Ford E-450 Box Truck | Electric | Vocational/Cab Chassis |
| Ford E450 Cutaway | Electric | Vocational/Cab Chassis |
| Ford E-450 School Bus | Electric | School Bus |
| Ford E-450 Shuttle | Electric | Passenger Van/Shuttle Bus |
| Ford E-450 Step Van | Electric | Step Van |
| Ford E450 Stripped Chassis | Electric | Vocational/Cab Chassis |
| Ford E-450 Work Truck | Electric | Vocational/Cab Chassis |
| Ford F-550 Bus | Electric | Passenger Van/Shuttle Bus |
| Ford F-59 School Bus | Electric | School Bus |
| Ford F-59 Shuttle Bus | Electric | Passenger Van/Shuttle Bus |
| Ford F-59 Step Van | Electric | Step Van |
| Ford F-59 Stripped Chassis | Electric | Vocational/Cab Chassis |
| Ford F-650 Box Truck | Electric | Vocational/Cab Chassis |
| Ford Transit 250/350 Cargo Van | Electric | Van |
| Ford Transit 250/350 Passenger Van | Electric | Passenger Van/Shuttle Bus |
| Ford Transit CC-CA 250, 350 | Electric | Vocational/Cab Chassis |
| Gillig Low Floor Plus | Electric | Transit Bus |
| Global M3 SUPERCHARGED | Electric | Street Sweeper |

Table 6.11 (Continued) (Updated August 2021)
Electric-Drive Medium/Heavy Trucks and Buses Available by Manufacturer, 2021

| | | |
|------------------------------------|--------------------|----------------------------|
| Global M4 SUPERCHARGED | Electric | Street Sweeper |
| GreenPower Motor Co AV Star | Electric | Passenger Van/Shuttle Bus |
| GreenPower Motor Co BEAST | Electric | School Bus |
| GreenPower Motor Co EV250 | Electric | Transit Bus |
| GreenPower Motor Co EV350 | Electric | Transit Bus |
| GreenPower Motor Co EV550 | Electric | Transit Bus |
| GreenPower Motor Co EV Star | Electric | Passenger Van/Shuttle Bus |
| GreenPower Motor Co EV Star+ | Electric | Passenger Van/Shuttle Bus |
| GreenPower Motor Co EV Star Cargo | Electric | Van |
| GreenPower Motor Co EV Star Cargo+ | Electric | Van/Vocational/Cab Chassis |
| GreenPower Motor Co EV Star CC | Electric | Vocational/Cab Chassis |
| Hometown Trolley Commuter | Electric | Passenger Van/Shuttle Bus |
| Hometown Trolley Mainstreet | Electric | Transit Bus |
| Hometown Trolley Streetcar | Electric | Transit Bus |
| Hometown Trolley Urban | Electric | Transit Bus |
| Hometown Trolley View | Electric | Transit Bus |
| Hometown Trolley Villager | Electric | Passenger Van/Shuttle Bus |
| Kalmar Ottawa T2E | Electric | Tractor |
| Lion Electric LION6 | Electric | Vocational/Cab Chassis |
| Lion Electric LION8 | Electric | Vocational/Cab Chassis |
| Lion Electric LION8 | Electric | Refuse |
| Lion Electric LION8T | Electric | Tractor |
| Lion Electric LIONA | Electric | School Bus |
| Lion Electric LIONC | Electric | School Bus |
| Lion Electric LIOND | Electric | School Bus |
| Lion Electric LIONM | Electric | Passenger Van/Shuttle Bus |
| Mack LR | Electric | Refuse |
| MCI D45 CRT LE CHARGE | Electric | Transit Bus |
| MCI J4500e CHARGE | Electric | Transit Bus |
| Mercedes-Benz eSprinter | Electric | Van |
| New Flyer Xcelsior CHARGE 35' | Electric | Transit Bus |
| New Flyer Xcelsior CHARGE 40' | Electric | Transit Bus |
| New Flyer Xcelsior CHARGE 60' | Electric | Transit Bus |
| Nova Bus LFSe | Electric | Transit Bus |
| Nova Bus LFSe+ | Electric | Transit Bus |
| Orange EV T Series terminal | Electric | Tractor |
| Peterbilt 220EV | Electric | Vocational/Cab Chassis |
| Peterbilt 520EV | Electric | Refuse |
| Peterbilt 579EV | Electric | Tractor |
| Proterra ZX5 35-Foot Bus | Electric | Transit Bus |
| Proterra ZX5+ 35-Foot Bus | Electric | Transit Bus |
| Proterra ZX5 40-Foot Bus | Electric | Transit Bus |
| Proterra ZX5+ 40-Foot Bus | Electric | Transit Bus |
| Proterra ZX5MAX 40-Foot Bus | Electric | Transit Bus |
| Starcraft Allstar 22 | Electric | Passenger Van/Shuttle Bus |
| Starcraft E-Quest | Electric | School Bus |
| Starcraft E-Quest XL | Electric | School Bus |
| Thomas Built Saf-T-Liner C2 Jouley | Electric | School Bus |
| Turtle Top Ford - Terra Transit | Electric | Passenger Van/Shuttle Bus |
| US Hybrid eCargo | Electric | Step Van |
| US Hybrid eTruck drayage | Electric | Tractor |
| Van Hool CX45E | Electric | Transit Bus |
| Volvo VNR Electric | Electric | Tractor |
| Workhorse C-Series | Electric | Step Van |
| ENC AXESS-FC 35' | Hydrogen Fuel Cell | Transit Bus |

Table 6.11 (Continued) (Updated August 2021)
Electric-Drive Medium/Heavy Trucks and Buses Available by Manufacturer, 2021

| | | |
|----------------------------------|--------------------|---------------------------|
| ENC AXESS-FC 40' | Hydrogen Fuel Cell | Transit Bus |
| New Flyer Xcelsior CHARGE H2 40' | Hydrogen Fuel Cell | Transit Bus |
| New Flyer Xcelsior CHARGE H2 60' | Hydrogen Fuel Cell | Transit Bus |
| US Hybrid H2Truck | Hydrogen Fuel Cell | Tractor |
| US Hybrid H2Cargo | Hydrogen Fuel Cell | Step Van |
| US Hybrid H2Ride 30 | Hydrogen Fuel Cell | Passenger Van/Shuttle Bus |
| US Hybrid H2Ride 32 | Hydrogen Fuel Cell | Passenger Van/Shuttle Bus |

Source:

U.S. Department of Energy, Alternative Fuels Data Center website, www.afdc.energy.gov/vehicles/search, August 2021. (Additional resources: www.afdc.energy.gov)

This list includes public and private refuel sites; therefore, not all of these sites are available to the public.

Table 6.12 (Updated August 2021)
Number of Alternative Refuel Sites by State and Fuel Type, 2021

| State | B20 sites | CNG sites | E85 sites | Electric stations | Electric charging outlets | Hydrogen sites | LNG sites | LPG sites | Totals by State ^a |
|-----------------------|------------|--------------|--------------|-------------------|---------------------------|----------------|------------|--------------|------------------------------|
| Alabama | 10 | 31 | 33 | 257 | 627 | 0 | 2 | 70 | 773 |
| Alaska | 0 | 1 | 0 | 39 | 69 | 0 | 0 | 3 | 73 |
| Arizona | 75 | 29 | 19 | 791 | 2,006 | 1 | 7 | 78 | 2,215 |
| Arkansas | 17 | 15 | 66 | 144 | 425 | 0 | 0 | 35 | 558 |
| California | 22 | 326 | 251 | 13,891 | 39,091 | 52 | 41 | 261 | 40,044 |
| Colorado | 6 | 33 | 87 | 1486 | 3,682 | 1 | 0 | 52 | 3,861 |
| Connecticut | 1 | 17 | 3 | 518 | 1,373 | 1 | 0 | 20 | 1,415 |
| Delaware | 0 | 2 | 1 | 114 | 277 | 1 | 0 | 9 | 290 |
| Dist. of Columbia | 7 | 2 | 4 | 278 | 781 | 0 | 0 | 0 | 794 |
| Florida | 7 | 57 | 110 | 2,480 | 6,368 | 0 | 3 | 139 | 6,684 |
| Georgia | 4 | 50 | 65 | 1555 | 3,842 | 0 | 4 | 87 | 4,052 |
| Hawaii | 8 | 0 | 1 | 388 | 824 | 2 | 0 | 1 | 836 |
| Idaho | 0 | 11 | 5 | 136 | 340 | 0 | 0 | 24 | 380 |
| Illinois | 20 | 40 | 298 | 997 | 2,552 | 0 | 2 | 94 | 3,006 |
| Indiana | 7 | 32 | 238 | 342 | 897 | 0 | 1 | 53 | 1,228 |
| Iowa | 12 | 11 | 333 | 252 | 528 | 0 | 0 | 33 | 917 |
| Kansas | 7 | 21 | 60 | 480 | 985 | 0 | 1 | 37 | 1,111 |
| Kentucky | 3 | 9 | 71 | 177 | 409 | 0 | 1 | 22 | 515 |
| Louisiana | 2 | 22 | 22 | 158 | 383 | 0 | 1 | 50 | 480 |
| Maine | 1 | 2 | 0 | 274 | 577 | 0 | 0 | 8 | 588 |
| Maryland | 27 | 15 | 45 | 1171 | 3,142 | 0 | 0 | 28 | 3,257 |
| Massachusetts | 8 | 13 | 7 | 1902 | 4,287 | 2 | 1 | 30 | 4,348 |
| Michigan | 10 | 24 | 246 | 781 | 1,700 | 2 | 0 | 87 | 2,069 |
| Minnesota | 157 | 22 | 445 | 562 | 1,297 | 0 | 0 | 48 | 1,969 |
| Mississippi | 1 | 7 | 4 | 110 | 427 | 0 | 2 | 73 | 514 |
| Missouri | 2 | 20 | 120 | 1012 | 2,116 | 0 | 1 | 64 | 2,323 |
| Montana | 0 | 1 | 2 | 70 | 200 | 0 | 0 | 27 | 230 |
| Nebraska | 3 | 9 | 88 | 160 | 341 | 0 | 1 | 27 | 469 |
| Nevada | 1 | 6 | 11 | 427 | 1280 | 0 | 0 | 23 | 1321 |
| New Hampshire | 2 | 4 | 0 | 152 | 322 | 0 | 0 | 18 | 346 |
| New Jersey | 5 | 28 | 7 | 710 | 1,891 | 0 | 0 | 13 | 1,944 |
| New Mexico | 2 | 11 | 18 | 173 | 425 | 0 | 1 | 55 | 512 |
| New York | 26 | 55 | 83 | 2,774 | 7,018 | 1 | 0 | 45 | 7,228 |
| North Carolina | 109 | 39 | 99 | 1029 | 2,537 | 0 | 1 | 80 | 2,865 |
| North Dakota | 1 | 1 | 46 | 55 | 122 | 0 | 0 | 19 | 189 |
| Ohio | 10 | 52 | 209 | 847 | 1,948 | 2 | 4 | 73 | 2,298 |
| Oklahoma | 1 | 116 | 74 | 294 | 1045 | 0 | 0 | 122 | 1358 |
| Oregon | 37 | 16 | 4 | 948 | 2,360 | 0 | 2 | 44 | 2,463 |
| Pennsylvania | 5 | 90 | 146 | 1071 | 2,494 | 0 | 3 | 86 | 2,824 |
| Rhode Island | 3 | 3 | 0 | 227 | 576 | 0 | 0 | 5 | 587 |
| South Carolina | 33 | 11 | 47 | 371 | 790 | 0 | 1 | 49 | 931 |
| South Dakota | 0 | 0 | 81 | 50 | 137 | 0 | 0 | 22 | 240 |
| Tennessee | 8 | 20 | 91 | 674 | 1,582 | 0 | 4 | 66 | 1,771 |
| Texas | 18 | 108 | 269 | 2,190 | 5,145 | 0 | 15 | 382 | 5,937 |
| Utah | 1 | 46 | 1 | 847 | 1,777 | 0 | 0 | 42 | 1,867 |
| Vermont | 2 | 3 | 0 | 309 | 837 | 0 | 0 | 1 | 843 |
| Virginia | 4 | 24 | 66 | 1017 | 2,947 | 1 | 1 | 84 | 3,127 |
| Washington | 33 | 25 | 14 | 1,711 | 4,208 | 1 | 1 | 83 | 4,365 |
| West Virginia | 0 | 2 | 38 | 105 | 283 | 0 | 0 | 14 | 337 |
| Wisconsin | 4 | 42 | 259 | 469 | 910 | 0 | 1 | 63 | 1,279 |
| Wyoming | 0 | 8 | 9 | 65 | 178 | 0 | 0 | 20 | 215 |
| Totals by Fuel | 722 | 1,532 | 4,196 | 47,040 | 120,358 | 67 | 102 | 2,869 | 129,846 |

Source:

U.S. Department of Energy, Alternative Fuels Data Center website,
www.afdc.energy.gov/afdc/fuels/stations_counts.html, August 2021. (Additional resources: www.afdc.energy.gov)

^a Totals by State is the total number of fuel types available at stations. Stations are counted once for each type of fuel available. For electric, the number of charging outlets was used.

There were just over 3,000 propane stations in the United States in 1992 making up 89% of all alternative refueling stations. Electric vehicle stations, which after 2010 are counted by the number of plugs rather than by the geographic location, have the largest number of stations in 2020.

Table 6.13
Number of Alternative Refuel Stations, 1992–2020
(number of stations)

| Year | Propane | CNG | LNG | Biodiesel ^a | Ethanol (E85) | Methanol (M85) | Electric vehicle ^b | Hydrogen | Total |
|-----------|---|-------|-------|------------------------|---------------|----------------|-------------------------------|----------|---------|
| 1992 | 3,297 | 349 | c | 0 | 2 | 43 | c | c | 3,691 |
| 1993 | 3,297 | 497 | c | 0 | 7 | 50 | c | c | 3,851 |
| 1994 | 3,299 | 1,042 | c | 0 | 32 | 82 | c | c | 4,455 |
| 1995 | 3,299 | 1,065 | c | 0 | 37 | 88 | 188 | c | 4,677 |
| 1996 | 4,252 | 1,419 | 72 | 0 | 68 | 95 | 194 | c | 6,100 |
| 1997 | 4,255 | 1,426 | 71 | 0 | 71 | 106 | 310 | c | 6,239 |
| 1998 | 5,318 | 1,268 | 66 | 0 | 40 | 91 | 486 | c | 7,269 |
| 1999 | 4,153 | 1,267 | 46 | 0 | 49 | 51 | 490 | c | 6,056 |
| 2000 | 3,268 | 1,217 | 44 | 2 | 113 | 3 | 558 | c | 5,205 |
| 2001 | 3,403 | 1,232 | 44 | 16 | 154 | 0 | 693 | c | 5,542 |
| 2002 | 3,431 | 1,166 | 36 | 79 | 149 | 0 | 873 | 7 | 5,741 |
| 2003 | 3,966 | 1,035 | 62 | 142 | 188 | 0 | 830 | 7 | 6,230 |
| 2004 | 3,689 | 917 | 58 | 176 | 200 | 0 | 671 | 9 | 5,720 |
| 2005 | 2,995 | 787 | 40 | 304 | 436 | 0 | 588 | 14 | 5,164 |
| 2006 | 2,619 | 732 | 37 | 459 | 762 | 0 | 465 | 17 | 5,091 |
| 2007 | 2,371 | 721 | 35 | 742 | 1,208 | 0 | 442 | 32 | 5,551 |
| 2008 | 2,175 | 778 | 38 | 645 | 1,644 | 0 | 430 | 46 | 5,756 |
| 2009 | 2,468 | 772 | 36 | 679 | 1,928 | 0 | 465 | 63 | 6,411 |
| 2010 | 2,647 | 841 | 39 | 644 | 2,142 | 0 | 541 | 58 | 6,912 |
| 2011 | 2,597 | 910 | 45 | 627 | 2,442 | 0 | 3,394 | 56 | 10,071 |
| 2012 | 2,654 | 1,107 | 59 | 675 | 2,553 | 0 | 13,392 | 58 | 20,498 |
| 2013 | 2,956 | 1,263 | 81 | 757 | 2,639 | 0 | 19,410 | 53 | 27,159 |
| 2014 | 2,931 | 1,495 | 103 | 783 | 2,840 | 0 | 25,602 | 51 | 33,805 |
| 2015 | 3,594 | 1,563 | 111 | 721 | 2,990 | 0 | 30,945 | 39 | 39,963 |
| 2016 | 3,665 | 1,725 | 140 | 697 | 3,091 | 0 | 42,029 | 54 | 51,398 |
| 2017 | 3,541 | 1,697 | 131 | 702 | 3,322 | 0 | 50,627 | 64 | 60,053 |
| 2018 | 3,341 | 1,659 | 137 | 681 | 3,617 | 0 | 61,067 | 60 | 70,562 |
| 2019 | 3,178 | 1,591 | 119 | 613 | 3,777 | 0 | 78,301 | 61 | 87,640 |
| 2020 | 3,062 | 1,563 | 114 | 722 | 3,840 | 0 | 95,809 | 63 | 105,173 |
| | <i>Average annual percentage change</i> | | | | | | | | |
| 1992-2020 | -0.3% | 5.5% | c | c | 31.0% | -100.0% | c | c | 12.7% |
| 2010-2020 | 1.5% | 6.4% | 11.3% | 1.1% | 6.0% | c | d | 0.8% | 31.3% |

Source:

U.S. Department of Energy, Alternative Fuels Data Center website, “U.S. Alternative Fueling Stations by Fuel Type,” www.afdc.energy.gov/data/10332. (Additional resources: www.afdc.energy.gov)

^a Stations selling biodiesel blends less than B20 are included in the station count for years 2005-2007 only.

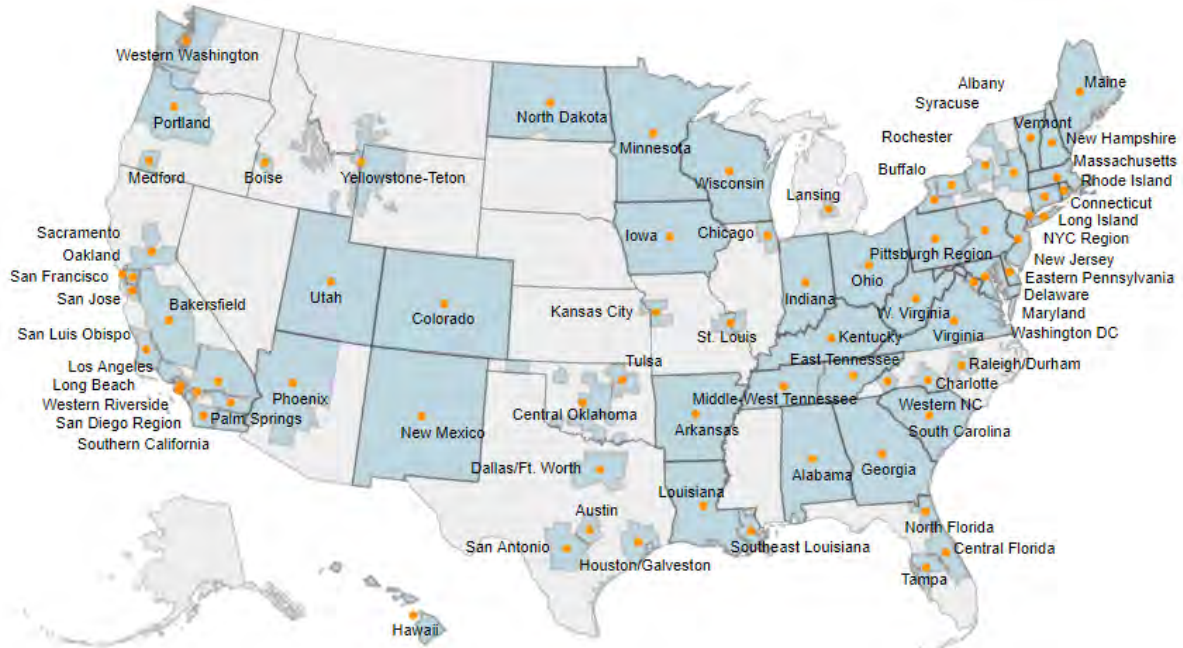
^b Starting in 2011, electric stations are counted by the plug rather than by the geographical location. This is different from the other fuels, which count only the geographical location regardless of how many dispensers or nozzles are on site.

^c Data are not available.

^d Because data are not comparable from 2009 to 2020, an average annual percentage change is not provided.

Clean Cities is a locally-based government/industry partnership, coordinated by the U.S. Department of Energy to expand the use of alternatives to gasoline and diesel fuel. By combining the decision-making with voluntary action by partners, the "grass-roots" approach of Clean Cities departs from traditional "top-down" Federal programs.

Figure 6.1. Clean Cities Coalitions (Updated August 2021)



Source:
U.S. Department of Energy, Clean Cities website, "Clean Cities Coalition Locations,"
cleancities.energy.gov/coalitions/locations, August 2021. (Additional resources: cleancities.energy.gov)

The 2017 California Vehicle Survey

Data on vehicles operating in California are necessary for the California Energy Commission to forecast future state transportation needs. The California Vehicle Survey was begun two decades ago to meet those needs and has been conducted periodically since that time. The survey uses a multi-method sampling approach with samples stratified by the six regions defined across California (San Francisco, Sacramento, Central Valley, Los Angeles, San Diego, and the Rest of California). The survey includes both residential and commercial light vehicle owners, as well as an add-on survey for those who own or lease plug-in electric vehicles (PEV). The PEV owner survey asks questions related to vehicle refueling, charging, use, and incentives. Data from the California Vehicle Survey are shown in Tables 6.14-6.16 and Figures 6.2 and 6.3. Additional information on this survey can be found at: www.energy.ca.gov/data-reports/surveys/california-vehicle-survey.

In the 2017 California Vehicle Survey, plug-in hybrid electric vehicle owners were more likely to report charging daily than owners of all-electric vehicles. This is true in both residential and commercial settings though daily charging is most common for vehicles used commercially.

Table 6.14
Vehicle Charging Frequency Regardless of Location, 2017 California Vehicle Survey

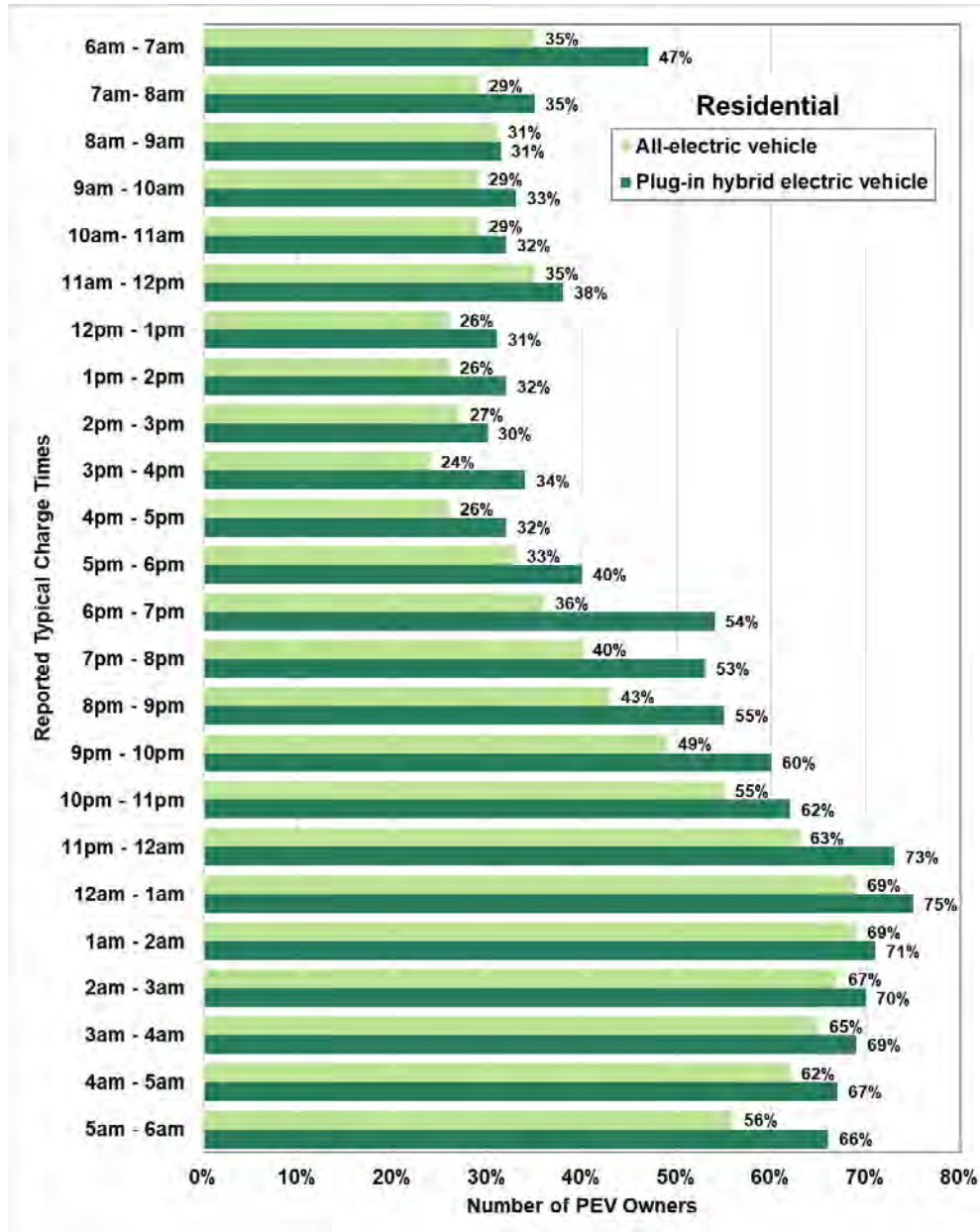
| Charging frequency | Plug-in hybrid electric vehicle owners | | All-electric vehicle owners | | Total | |
|-----------------------------------|--|---------|-----------------------------|---------|-------|---------|
| | Count | Percent | Count | Percent | Count | Percent |
| Residential Vehicle Owners | | | | | | |
| Daily | 94 | 60% | 71 | 45% | 165 | 52% |
| 5 or 6 times a week | 25 | 16% | 34 | 21% | 59 | 19% |
| 3 or 4 times a week | 22 | 14% | 30 | 19% | 52 | 17% |
| 1 or 2 times a week | 7 | 5% | 19 | 12% | 26 | 8% |
| Less than once a week | 6 | 4% | 5 | 3% | 11 | 3% |
| Never | 2 | 1% | 0 | 0% | 2 | 1% |
| Total | 156 | 100% | 159 | 100% | 315 | 100% |
| Commercial Vehicle Owners | | | | | | |
| Daily | 90 | 66% | 92 | 62% | 182 | 64% |
| 5 or 6 times a week | 23 | 17% | 20 | 14% | 43 | 15% |
| 3 or 4 times a week | 13 | 10% | 25 | 17% | 38 | 13% |
| 1 or 2 times a week | 6 | 4% | 11 | 7% | 17 | 6% |
| Less than once a week | 3 | 2% | 0 | 0% | 3 | 1% |
| Never | 1 | 1% | 0 | 0% | 1 | 0% |
| Total | 136 | 100% | 148 | 100% | 284 | 100% |

Source:

California Energy Commission, *2015-2017 California Vehicle Survey*, May 2018, CEC-200-2018-006. (Additional information: www.energy.ca.gov/data-reports/surveys/california-vehicle-survey)

Most California residential plug-in vehicle charging occurs between evening and the early morning hours. Some utilities offer lower rates for off-peak electricity usage which usually begins in the evening. Plug-in vehicle owners in those areas can schedule their charging to take advantage of lower rates.

Figure 6.2. Typical Daily Charging Times for Residential Plug-in Electric Vehicles, 2017 California Vehicle Survey



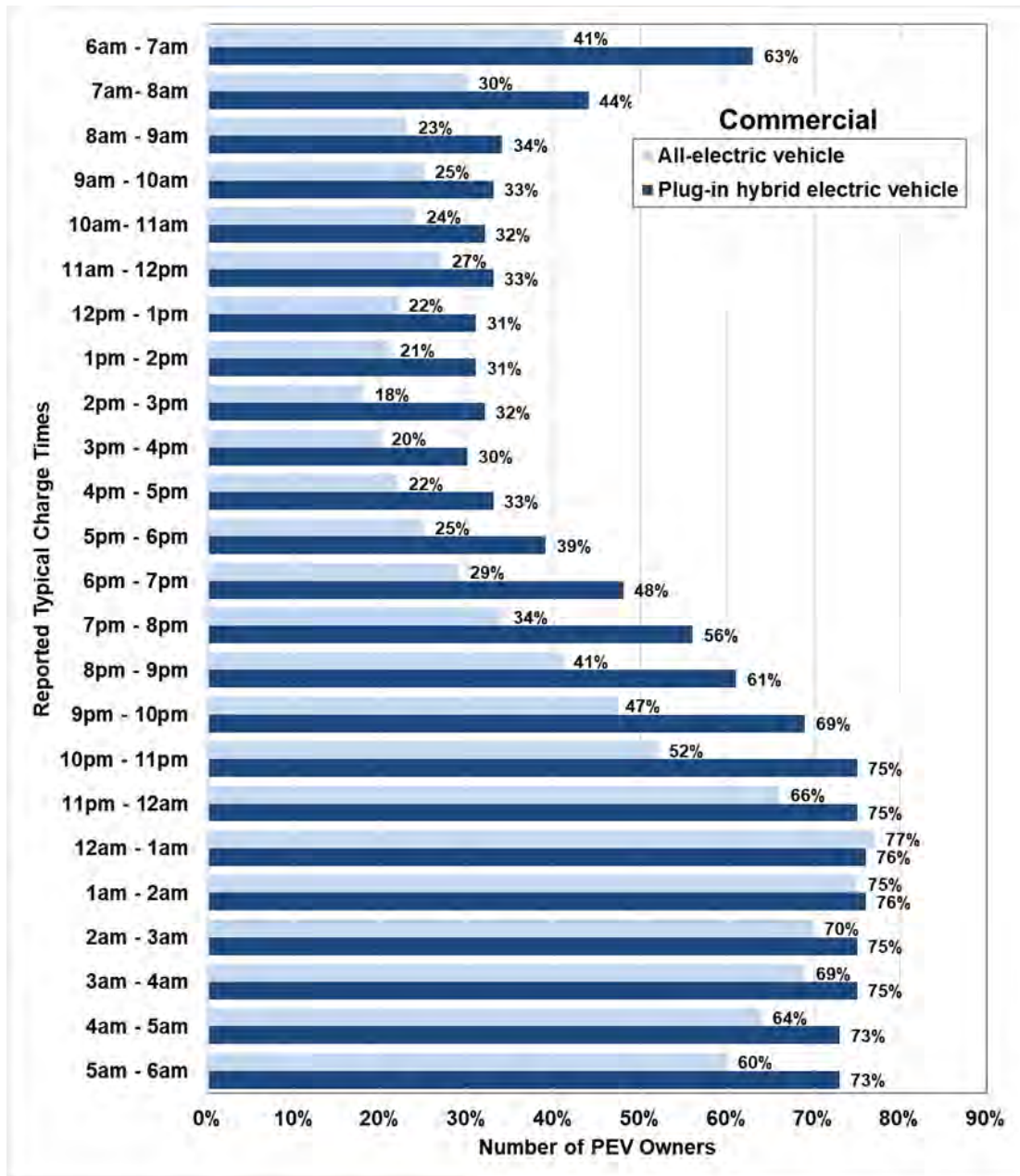
Note: Electric vehicles include both all-electric and plug-in hybrid electric vehicles. N=315.

Source:

California Energy Commission, *2015-2017 California Vehicle Survey*, May 2018, CEC-200-2018-006.
 (Additional information: www.energy.ca.gov/data-reports/surveys/california-vehicle-survey)

California commercial plug-in vehicle patterns are very similar to residential charging patterns with most charging occurring from evening to the early morning hours. For most times of the day, plug-in hybrid vehicles were reported to be charging more often than all-electric vehicles.

Figure 6.3. Typical Daily Charging Times for Commercial Plug-in Electric Vehicles, 2017 California Vehicle Survey



Note: Electric vehicles include both all-electric and plug-in hybrid electric vehicles. N=315.

Source:

California Energy Commission, *2015-2017 California Vehicle Survey*, May 2018, CEC-200-2018-006. (Additional information: www.energy.ca.gov/data-reports/surveys/california-vehicle-survey)

The 2017 California Vehicle Survey revealed that state rebates and federal tax incentives were the two most important factors cited by owners in making it possible to buy or lease a plug-in vehicle.

Table 6.15
Ranking of Important Factors for Buying or Leasing an Electric Vehicle,
2017 California Vehicle Survey

| How important were each of the following factors in making it possible for you to buy or lease your electric vehicle? | Share of PEV owners answering "extremely important" or "very important" |
|---|---|
| The California state vehicle rebate (up to \$2,500) | 65% |
| The federal tax incentives (up to \$7,500) | 63% |
| HOV lane access | 42% |
| Having free charging locations available | 38% |
| Manufacturer or dealer incentives (e.g. low interest rate, cash back) | 38% |
| Special electricity rates for charging | 33% |
| Attractive lease terms | 32% |
| Parking incentives (employer, business, or government) | 16% |
| The availability of carshare/car rental as part of purchase | 10% |

Source:

2017 California Vehicle Survey, Transportation Secure Data Center, National Renewable Energy Laboratory.
Accessed September 5, 2019: www.nrel.gov/tsdc-california-vehicle-survey-2017.html

The 2017 California Vehicle Survey showed that the two most important reasons behind the decision to purchase a plug-in vehicle were reducing environmental impacts and saving money on fuel costs. Of those two reasons, all-electric vehicle owners were more likely to cite reducing environmental impacts while plug-in hybrid owners were more likely to cite saving money on fuel.

Table 6.16
Factors that were the Most Important Reasons for Deciding to Purchase an All-electric or Plug-in Hybrid Electric Vehicle, 2017 California Vehicle Survey

| Which of the following factors were the most important reasons why you decided to purchase an electric vehicle? (Select up to five) | Share of California all-electric vehicle owners | Share of California plug-in hybrid electric vehicle owners |
|---|---|--|
| Reducing environmental impacts | 74% | 59% |
| Saving money on fuel costs | 47% | 62% |
| Politics of fossil fuels | 38% | 30% |
| Saving money overall | 38% | 26% |
| Vehicle performance | 32% | 18% |
| Carpool or High Occupancy Vehicle (HOV) lane access | 31% | 39% |
| Convenience of charging at home or work | 31% | 25% |
| A desire for the newest technology | 31% | 24% |
| Free charging at work or away from home | 23% | 6% |
| Vehicle styling, finish and comfort | 18% | 19% |
| Good lease terms & options | 17% | 19% |
| Special/low EV electricity rate at home | 15% | 21% |
| Manufacturer or dealer cash back | 8% | 17% |
| Brand name | 6% | 16% |
| Free or privileged parking space | 4% | 4% |
| Better finance/interest rate | 3% | 5% |
| Insurance discount | 2% | 3% |
| Other | 9% | 10% |

Note: Respondents were able to select up to five important reasons.

Source:

2017 California Vehicle Survey, Transportation Secure Data Center, National Renewable Energy Laboratory.
Accessed September 5, 2019: www.nrel.gov/tsdc-california-vehicle-survey-2017.html

Table 6.17
Properties of Conventional and Alternative Liquid Fuels

| Property | Liquid Fuels | | | |
|---|-----------------------------------|-----------------------------------|-------------------------------------|--|
| | Gasoline | Low-sulfur diesel | Methanol | Ethanol (E100) |
| Standard chemical formula ^a | C ₄ to C ₁₂ | C ₈ to C ₂₅ | CH ₃ OH | CH ₃ CH ₂ OH |
| Physical state | Liquid | Liquid | Liquid | Liquid |
| Molecular weight | 100–105 | ~200 | 32.04 | 46.07 |
| Composition (weight %) | | | | |
| Carbon | 85–88 | 87 | 37.5 | 52.2 |
| Hydrogen | 12–15 | 13 | 12.6 | 13.1 |
| Oxygen | 0 | 0 | 49.9 | 34.7 |
| Main fuel source(s) | Crude oil | Crude oil | Natural gas, coal, or woody biomass | Corn, grains, or agricultural waste |
| Gasoline gallon equivalent (GGE) (Fuel unit measured/GGE) | 1.0 (E0 gasoline) | 0.889 (Diesel gal/GGE) | 2.04 Methanol gal/GGE) | 1.20-1.37 (E85 ^b gal/GGE) 1.03 (E10 gal/GGE) |
| Specific gravity (60° F/ 60° F) | 0.72–0.78 | 0.85 | 0.796 | 0.794 |
| Density (lb./gal @ 60° F) | 6.0–6.5 | 7.079 | 6.63 | 6.61 |
| Boiling temperature (F°) | 80–437 | 356–644 | 149 | 172 |
| Freezing point (F°) | -40 | -40–30 | -143.5 | -173.2 |
| Autoignition temperature (F°) | 495 | ~600 | 897 | 793 |
| Reid vapor pressure (psi) | 8–15 | <0.2 | 4.6 | 2.3 |

Source:

U.S. Department of Energy, Alternative Fuels Data Center website, “Fuel Properties Comparison,” www.afdc.energy.gov/fuels/fuel_comparison_chart.pdf, July 2015, and communication with George Mitchell, National Renewable Energy Laboratory, July 2015.

^a Standard Chemical Formulas represent idealized fuels. Some table values are expressed in ranges to represent typical fuel variations that are encountered in the field.

^b 1 gallon of E85 has 73% to 83% of the energy of one gallon of gasoline (variation due to ethanol content in E85).

Table 6.18
Properties of Conventional and Alternative Gaseous Fuels

| Property | Gaseous Fuels | | |
|---|-------------------------------|--|---|
| | Propane (LPG) | CNG | Hydrogen |
| Standard chemical formula ^a | C ₃ H ₈ | CH ₄ | H ₂ |
| Physical state | Pressurized liquid | Compressed gas | Compressed gas or liquid |
| Molecular weight | 44.1 | 16.04 | 2.02 |
| Composition (weight %) | | | |
| Carbon | 82 | 75 | 0 |
| Hydrogen | 18 | 25 | 100 |
| Oxygen | n/a | n/a | 0 |
| Main fuel source(s) | Underground reserves | Underground reserves and renewable Bio-gas | Natural gas, methanol, electrolysis, and other energy sources |
| Gasoline gallon equivalent (GGE) (Fuel unit measured/GGE) | 1.34-1.38 (LPG gal/GGE) | 5.56-5.71 (lb. mass/GGE) ^b | 0.991-1.017 (kg mass/GGE) |
| Diesel gallon equivalent (DGE) (Fuel unit measured/DGE) | 1.54 (LPG gal/DGE) | 6.38 (lb. mass/DGE) | n/a |
| Specific Gravity (60° F/60° F) | 1.55 | 0.60 | 0.069 |
| Density (lb./cu ft @ 60° F) | 0.124 | 0.0458 | 0.0056 |
| Freezing point (°F) | -305.8 | -296 | -435 |
| Boiling Point (°F) | -44 | -260 | -423 |
| Autoignition temperature (°F) | 850-950 | 1,004 | 1,050-1,080 |
| Reid vapor pressure (psi) | 208 | n/a | n/a |

Note: n/a = not applicable.

Source:

U.S. Department of Energy, Alternative Fuels Data Center website, "Fuel Properties Comparison," www.afdc.energy.gov/fuels/fuel_comparison_chart.pdf, July 2015, and communication with George Mitchell, National Renewable Energy Laboratory, July 2015.

^a Standard Chemical Formulas represent idealized fuels.

^b CNG: 1 Gasoline Gallon Equivalent = 5.66 lb. (as referenced by NIST Special Publication 854; Report of the 78th NCWM (1993); p. 326; NG data derived from field sampling of pipeline natural gas by IGT/GRI).

Chapter 7

Transit and Other Shared Mobility

Summary Statistics from Tables in this Chapter

| Source | | |
|-----------|---|----------------|
| | Passenger-miles | (millions) |
| Table 7.1 | <i>Transit buses and trolleybuses, 2018</i> | 19,559 |
| Table 7.2 | <i>Demand response vehicles, 2018</i> | 1,821 |
| Table 7.3 | <i>Commuter rail, 2018</i> | 12,634 |
| Table 7.4 | <i>Transit rail, 2018</i> | 19,452 |
| | Energy use | (trillion Btu) |
| Table 7.1 | <i>Transit buses and trolleybuses, 2018</i> | 89.2 |
| Table 7.2 | <i>Demand response vehicles, 2018</i> | 26.7 |
| Table 7.3 | <i>Commuter rail, 2018</i> | 20.3 |
| Table 7.4 | <i>Transit rail, 2018</i> | 16.4 |
| Table 7.5 | Number of countries in which Uber operates, 2018 | 63 |
| Table 7.5 | Average Uber trips per day, 2018 | 14 million |
| Table 7.5 | Cumulative number of Uber worldwide trips from 2010-2018 | 10 billion |
| Table 7.7 | Share of Lyft riders who do not own or lease a personal vehicle, 2020 | 35% |
| Table 7.8 | Carshare members, 2018 | (millions) |
| | <i>Asia</i> | 22.7 |
| | <i>Europe</i> | 6.8 |
| | <i>North America</i> | 2.1 |
| | <i>Oceania</i> | 0.2 |
| | <i>South America</i> | 0.1 |

In 2007, the data changed substantially due to improved estimation methodologies. Unfortunately, those data are no longer comparable to the rest of the historical series.

Table 7.1
Summary Statistics on Transit Buses and Trolleybuses, 1994–2018

| Year | Number of active buses | Vehicle-miles (millions) | Passenger-miles (millions) | Btu/passenger-mile | Energy use (trillion Btu) |
|---|------------------------|--------------------------|----------------------------|--------------------|---------------------------|
| 1994 | 68,766 | 2,176 | 19,019 | 4,225 | 80.4 |
| 1995 | 67,802 | 2,198 | 19,005 | 4,271 | 81.2 |
| 1996 | 72,353 | 2,234 | 19,280 | 4,315 | 83.2 |
| 1997 | 73,425 | 2,259 | 19,793 | 4,407 | 87.2 |
| 1998 | 72,788 | 2,188 | 20,542 | 4,374 | 89.9 |
| 1999 | 74,885 | 2,290 | 21,391 | 4,320 | 92.4 |
| 2000 | 75,665 | 2,329 | 21,433 | 4,506 | 96.6 |
| 2001 | 76,675 | 2,389 | 22,209 | 4,123 | 91.6 |
| 2002 | 76,806 | 2,425 | 22,029 | 4,110 | 90.5 |
| 2003 | 78,000 | 2,435 | 21,438 | 4,191 | 89.8 |
| 2004 | 81,630 | 2,484 | 21,550 | 4,342 | 93.6 |
| 2005 | 82,642 | 2,498 | 21,998 | 4,229 | 93.0 |
| 2006 | 83,689 | 2,507 | 22,985 | 4,297 | 93.0 ^a |
| 2007 | 65,808 | 2,314 | 21,132 | 4,352 | 92.0 |
| 2008 | 67,096 | 2,388 | 21,918 | 4,328 | 94.9 |
| 2009 | 65,363 | 2,345 | 21,645 | 4,233 | 91.6 |
| 2010 | 66,810 | 2,425 | 21,172 | 4,107 | 86.9 |
| 2011 | 69,654 | 2,425 | 21,574 | 4,232 | 91.3 |
| 2012 | 70,757 | 2,417 | 21,251 | 4,023 | 89.5 |
| 2013 | 71,699 | 2,425 | 22,306 | 4,052 | 90.4 |
| 2014 | 71,603 | 2,445 | 22,614 | 3,810 | 86.2 |
| 2015 | 72,686 | 2,439 | 21,822 | 4,059 | 88.6 |
| 2016 | 72,557 | 2,495 | 21,452 | 4,283 | 91.9 |
| 2017 | 72,877 | 2,513 | 20,209 | 4,535 | 91.6 |
| 2018 | 72,314 | 2,543 | 19,559 | 4,560 | 89.2 |
| <i>Average annual percentage change</i> | | | | | |
| 1994-2018 | 0.2% | 0.7% | 0.1% | 0.3% | 0.4% |
| 2008-2018 | 0.8% | 0.6% | -1.1% | 0.5% | -0.6% |

Source:

American Public Transportation Association, *2020 Public Transportation Fact Book*, Washington, DC, March 2020, Appendix A. (Additional resources: www.apta.com)

^a Data are not continuous between 2006 and 2007 due to changes in estimation methodology. See source document for details.

Demand response vehicles (also called paratransit or dial-a-ride) are widely used by transit agencies. The vehicles do not operate over a fixed route or on a fixed schedule. The vehicle may be dispatched to pick up several passengers at different pick-up points before taking them to their respective destinations and may even be interrupted en route to these destinations to pick up other passengers. Demand response service is provided primarily by vans. In 2007, the data changed substantially due to improved estimation methodologies. Unfortunately, those data are no longer comparable to the rest of the historical series.

Table 7.2
Summary Statistics on Demand Response Vehicles, 1994–2018

| Year | Number of agencies | Number of active vehicles | Vehicle-miles (millions) | Average annual miles per vehicle | Passenger-miles (millions) | Average load factor ^a | Energy use (trillion Btu) |
|---|--------------------|---------------------------|--------------------------|----------------------------------|----------------------------|----------------------------------|---------------------------|
| 1994 | 5,214 | 28,729 | 464 | 16,140 | 577 | ^b | 9.5 |
| 1995 | 5,214 | 29,352 | 507 | 17,256 | 607 | 1.41 | 9.2 |
| 1996 | 5,214 | 30,804 | 548 | 17,800 | 656 | 1.21 | 9.9 |
| 1997 | 5,214 | 32,509 | 585 | 18,004 | 754 | 1.36 | 9.8 |
| 1998 | 5,214 | 29,646 | 671 | 22,630 | 735 | 1.21 | 10.4 |
| 1999 | 5,252 | 31,884 | 718 | 22,532 | 813 | 1.34 | 10.6 |
| 2000 | 5,252 | 33,080 | 759 | 22,941 | 839 | 1.30 | 10.8 |
| 2001 | 5,251 | 34,661 | 789 | 22,772 | 855 | 1.28 | 11.3 |
| 2002 | 5,251 | 34,699 | 803 | 23,130 | 853 | 1.24 | 11.6 |
| 2003 | 5,346 | 35,954 | 864 | 24,031 | 930 | 1.27 | 12.9 |
| 2004 | 5,960 | 37,078 | 890 | 23,990 | 962 | 1.25 | 13.3 |
| 2005 | 5,960 | 41,958 | 978 | 23,316 | 1,058 | 1.25 | 14.8 |
| 2006 | 5,960 | 43,509 | 1,013 | 23,283 | 1,078 | 1.24 | 15.5 ^c |
| 2007 | 7,300 | 64,865 | 1,471 | 22,684 | 1,502 | 1.18 | 24.7 |
| 2008 | 7,200 | 65,799 | 1,495 | 22,724 | 1,412 | 1.09 | 24.7 |
| 2009 | 6,700 | 68,957 | 1,529 | 22,176 | 1,477 | 1.12 | 23.1 |
| 2010 | 6,741 | 68,621 | 1,694 | 24,680 | 1,494 | 1.03 | 22.8 |
| 2011 | 6,600 | 65,336 | 1,612 | 24,669 | 1,580 | 1.13 | 24.1 |
| 2012 | 6,511 | 68,632 | 1,618 | 23,576 | 1,756 | 1.24 | 24.8 |
| 2013 | 6,270 | 68,559 | 1,565 | 22,829 | 2,171 | 1.59 | 26.4 |
| 2014 | 6,370 | 71,359 | 1,595 | 22,353 | 2,267 | 1.65 | 32.0 |
| 2015 | 6,340 | 71,299 | 1,617 | 22,679 | 2,056 | 1.48 | 26.0 |
| 2016 | 6,532 | 68,059 | 1,692 | 24,855 | 1,976 | 1.35 | 25.8 |
| 2017 | 6,426 | 69,316 | 1,705 | 24,594 | 2,031 | 1.38 | 26.6 |
| 2018 | 6,343 | 70,093 | 1,702 | 24,281 | 1,821 | 1.24 | 26.7 |
| <i>Average annual percentage change</i> | | | | | | | |
| 1994-2018 | 0.8% | 3.8% | 5.6% | 1.7% | 4.9% | -0.6% | 4.4% |
| 2008-2018 | -1.3% | 0.6% | 1.3% | 0.7% | 2.6% | 1.3% | 0.8% |

Note: See Glossary for a detailed definition of demand response.

Source:

American Public Transportation Association, *2020 Public Transportation Fact Book*, Washington, DC, March 2020.
(Additional resources: www.apta.com)

^a Load factor for revenue service.

^b Data are not available.

^c Data are not continuous between 2006 and 2007 due to changes in estimation methodology. See source document for details.

Commuter rail, which is also known as regional rail or suburban rail, is long-haul rail passenger service operating between metropolitan and suburban areas, whether within or across state lines. Commuter rail lines usually have reduced fares for multiple rides and commutation tickets for regular, recurring riders.

Table 7.3
Summary Statistics for Commuter Rail Operations, 1984–2018

| Year | Number of passenger vehicles | Vehicle-miles (millions) | Passenger trips (millions) | Passenger-miles (millions) | Average trip length (miles) | Energy intensity (Btu/passenger-mile) ^a | Energy use (trillion Btu) ^a | |
|-----------|------------------------------|--------------------------|---|----------------------------|-----------------------------|--|--|--|
| 1984 | 4,075 | 167.9 | 267 | 6,207 | 23.2 | 1,798 | 11.2 | |
| 1985 | 4,035 | 182.7 | 275 | 6,534 | 23.8 | 1,720 | 11.2 | |
| 1990 | 4,982 | 212.7 | 328 | 7,082 | 21.6 | 1,622 | 11.5 | |
| 1991 | 5,126 | 214.9 | 318 | 7,344 | 23.1 | 1,601 | 11.8 | |
| 1992 | 5,164 | 218.8 | 314 | 7,320 | 23.3 | 1,565 | 11.5 | |
| 1993 | 4,982 | 223.9 | 322 | 6,940 | 21.6 | 1,782 | 12.4 | |
| 1994 | 5,126 | 230.8 | 339 | 7,996 | 23.6 | 1,605 | 12.8 | |
| 1995 | 5,164 | 237.7 | 344 | 8,244 | 24.0 | 1,580 | 13.0 | |
| 1996 | 5,240 | 241.9 | 352 | 8,351 | 23.7 | 1,541 | 12.9 | |
| 1997 | 5,426 | 250.7 | 357 | 8,038 | 22.5 | 1,630 | 13.1 | |
| 1998 | 5,536 | 259.5 | 381 | 8,704 | 22.8 | 1,612 | 14.0 | |
| 1999 | 5,550 | 265.9 | 396 | 8,766 | 22.1 | 1,670 | 14.6 | |
| 2000 | 5,498 | 270.9 | 413 | 9,402 | 22.8 | 1,542 | 14.5 | |
| 2001 | 5,572 | 277.3 | 419 | 9,548 | 22.8 | 1,533 | 14.6 | |
| 2002 | 5,724 | 283.7 | 414 | 9,504 | 22.9 | 1,542 | 14.7 | |
| 2003 | 5,959 | 286.0 | 410 | 9,559 | 23.3 | 1,542 | 14.7 | |
| 2004 | 6,228 | 294.7 | 414 | 9,719 | 23.5 | 1,536 | 14.9 | |
| 2005 | 6,392 | 303.4 | 423 | 9,473 | 22.4 | 1,658 | 15.7 | |
| 2006 | 6,403 | 314.7 | 441 | 10,361 | 23.5 | 1,539 | 15.9 | |
| 2007 | 6,391 | 325.7 | 459 | 11,153 | 24.3 | 1,543 | 17.2 | |
| 2008 | 6,617 | 310.2 | 472 | 11,049 | 23.4 | 1,579 | 17.4 | |
| 2009 | 6,941 | 343.5 | 468 | 11,232 | 24.0 | 1,714 | 19.2 | |
| 2010 | 6,927 | 345.3 | 464 | 10,874 | 23.4 | 1,753 | 19.1 | |
| 2011 | 7,193 | 345.2 | 466 | 11,427 | 24.5 | 1,681 | 19.2 | |
| 2012 | 7,059 | 346.4 | 471 | 11,181 | 23.7 | 1,703 | 19.0 | |
| 2013 | 7,310 | 359.1 | 480 | 11,862 | 24.7 | 1,676 | 19.9 | |
| 2014 | 7,337 | 370.8 | 490 | 11,718 | 23.9 | 1,638 | 19.2 | |
| 2015 | 7,216 | 373.7 | 495 | 11,813 | 23.9 | 1,661 | 19.6 | |
| 2016 | 7,350 | 376.0 | 504 | 11,899 | 23.6 | 1,705 | 20.3 | |
| 2017 | 7,290 | 378.2 | 503 | 12,384 | 24.6 | 1,657 | 20.5 | |
| 2018 | 7,184 | 376.6 | 505 | 12,634 | 25.0 | 1,603 | 20.3 | |
| | | | <i>Average annual percentage change</i> | | | | | |
| 1984-2018 | 1.7% | 2.4% | 1.9% | 2.1% | 0.2% | -0.3% | 1.8% | |
| 2008-2018 | 0.8% | 1.1% | 0.7% | 1.3% | 0.7% | 0.2% | 1.5% | |

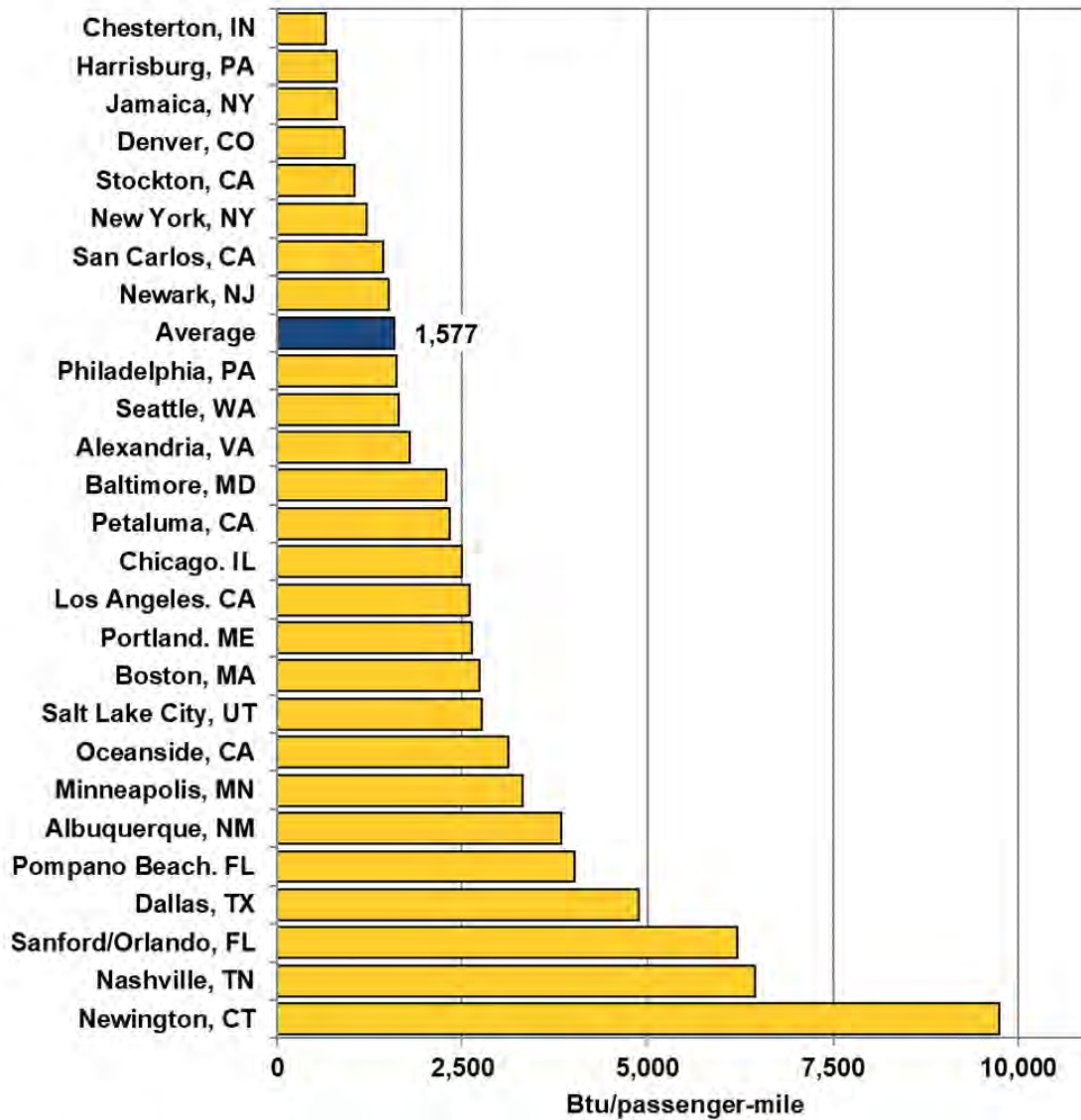
Source:

American Public Transportation Association, *2020 Public Transportation Fact Book*, Washington, DC, March 2020, Appendix A. (Additional resources: www.apta.com)

^a Only end-use energy was counted for electricity. Before Edition 36, primary energy use (which included generation and distribution losses) was shown in this table.

The energy intensity of commuter rail systems, measured in Btu per passenger-mile, varies greatly. The average of all commuter rail systems in 2018 was 1,577 Btu/passenger-mile. Most of these 26 systems used diesel power, but nine systems used both diesel and electricity: Chesterton, IN; Harrisburg, PA; Jamaica, NY; Denver, CO; New York, NY; Newark, NJ; Philadelphia, PA; Chicago, IL; and Baltimore, MD.

Figure 7.1. Energy Intensity of Commuter Rail Systems^a, 2018



Note: Does not include systems classified as hybrid rail, which is a subset of commuter rail operating exclusively on freight railroad right-of-way.

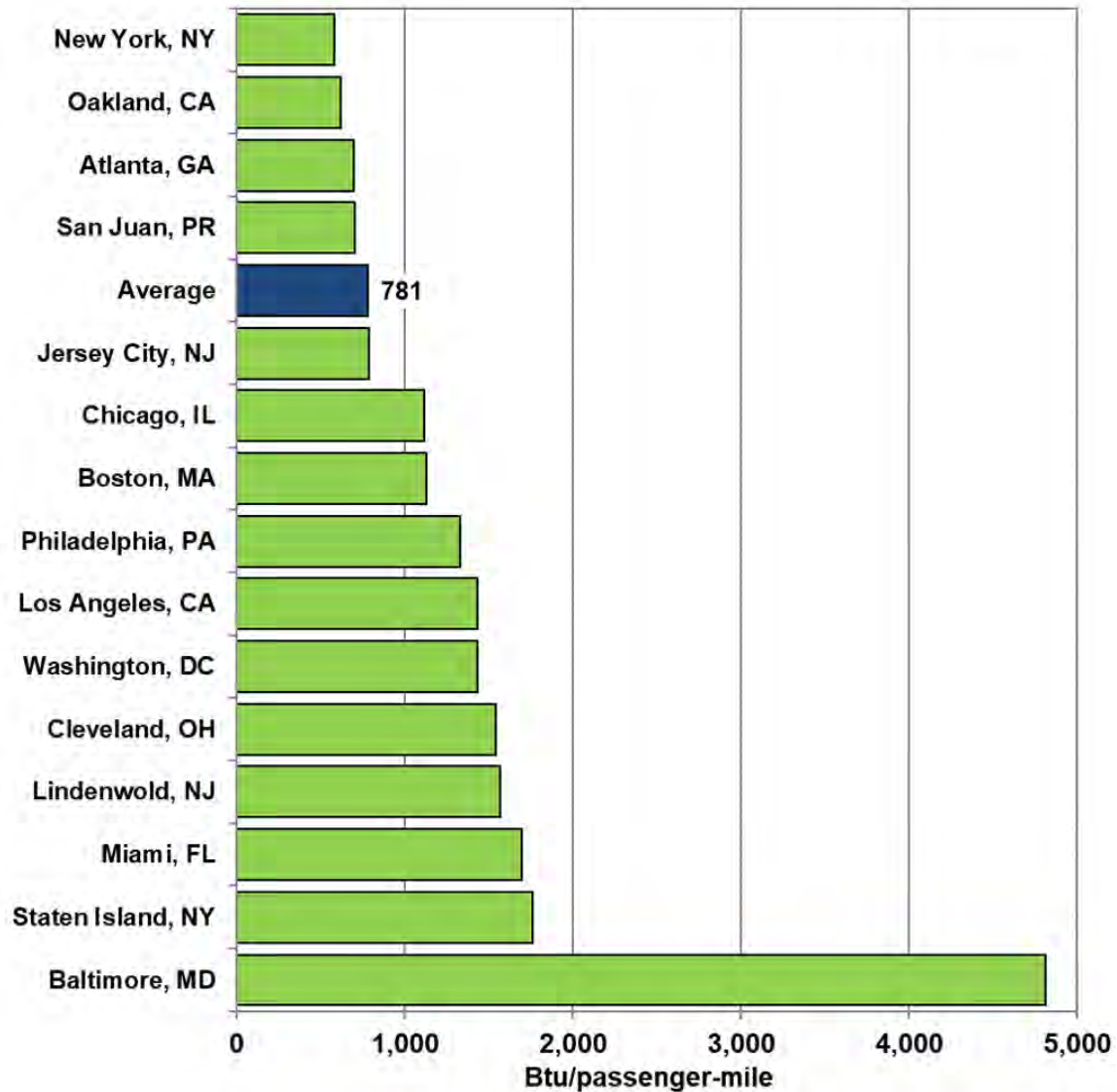
Source:

U.S. Department of Transportation, *2018 National Transit Database*, December 2019. (Additional resources: www.transit.dot.gov/ntd)

^a Electric railcar or diesel-propelled railway for urban passenger train service between a central city and adjacent suburbs. Only end-use energy was counted for electricity. Before Edition 36, primary energy use (which included generation and distribution losses) was shown in this figure.

The energy intensity of heavy rail systems, measured in Btu per passenger-mile, varies greatly. The average of all heavy rail systems in 2018 was 781 Btu/passenger-mile.

Figure 7.2. Energy Intensity of Heavy Rail Systems^a, 2018



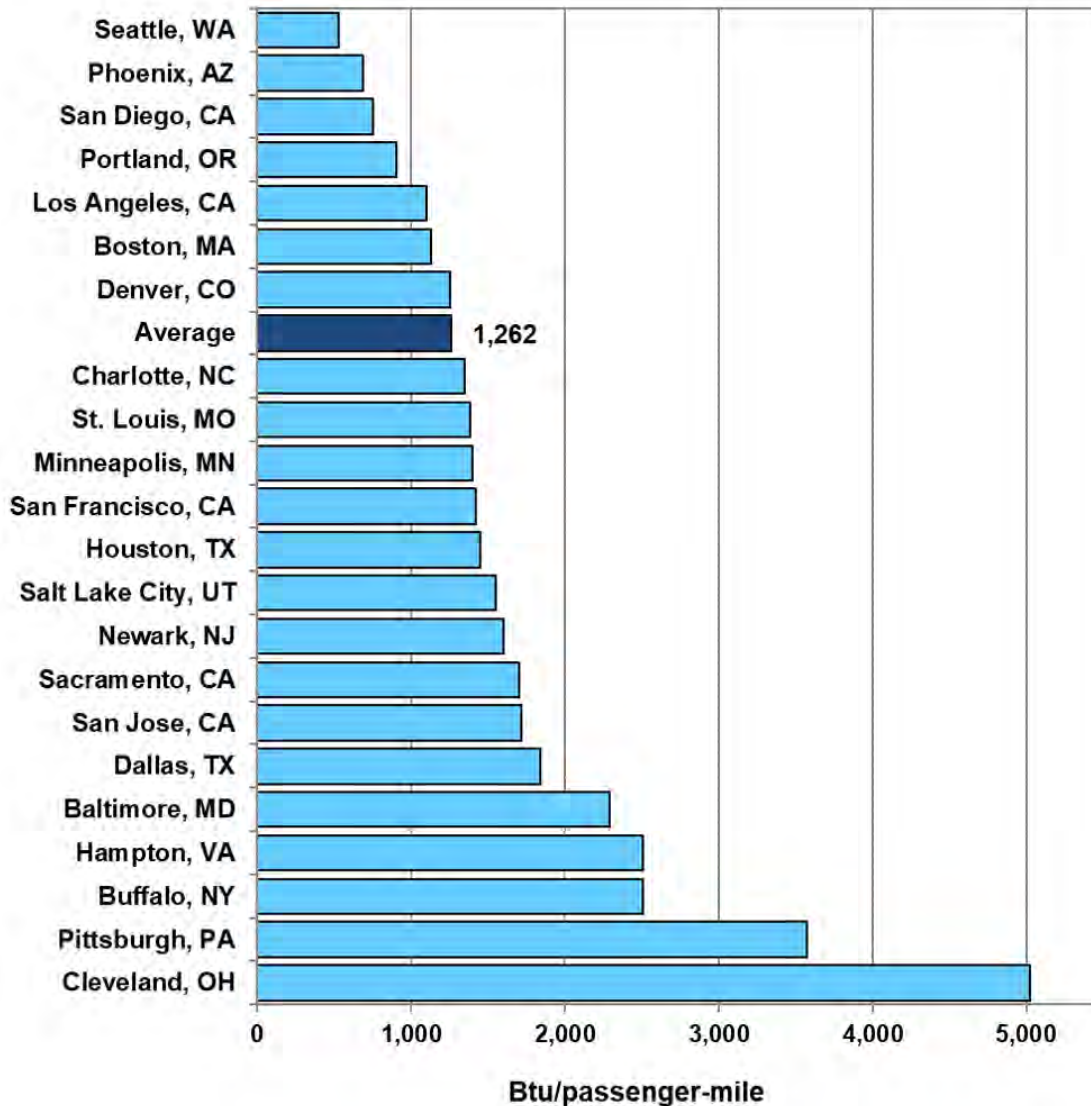
Source:

U.S. Department of Transportation, *2018 National Transit Database*, December 2019. (Additional resources: www.transit.dot.gov/ntd)

^a An electric railway with the capacity for a heavy volume of traffic. Only end-use energy was counted for electricity. Before Edition 36, primary energy use (which included generation and distribution losses) was shown in this figure.

The energy intensity of light rail systems, measured in Btu per passenger-mile, varies greatly. The average of all light rail systems in 2018 was 1,262 Btu/passenger-mile.

Figure 7.3. Energy Intensity of Light Rail Transit Systems^a, 2018



Source:

U.S. Department of Transportation, *2018 National Transit Database*, December 2019. (Additional resources: www.transit.dot.gov/ntd)

^a An electric railway with a light volume traffic capacity with power drawn from an overhead electric line. Only end-use energy was counted for electricity. Before Edition 36, primary energy use (which included generation and distribution losses) was shown in this figure.

This table on transit rail operations includes data on light rail and heavy rail systems. Light rail vehicles are usually single vehicles driven electrically with power drawn from overhead wires. Heavy rail is characterized by high speed and rapid acceleration of rail cars operating on a separate right-of-way.

Table 7.4
Summary Statistics for Rail Transit Operations, 1970–2018^a

| Year | Number of passenger vehicles | Vehicle-miles (millions) | Passenger trips (millions) ^b | Passenger-miles (millions) ^c | Average trip length (miles) ^d | Energy intensity (Btu/passenger-mile) ^e | Energy use (trillion Btu) ^e |
|---|------------------------------|--------------------------|---|---|--|--|--|
| 1970 | 10,548 | 440.8 | 2,116 | 12,273 | ^f | 712 | 8.7 |
| 1975 | 10,617 | 446.9 | 1,797 | 10,423 | ^f | 866 | 9.0 |
| 1980 | 10,654 | 402.2 | 2,241 | 10,939 | 4.9 | 763 | 8.3 |
| 1985 | 11,109 | 467.8 | 2,422 | 10,777 | 4.4 | 927 | 10.0 |
| 1990 | 11,332 | 560.9 | 2,521 | 12,046 | 4.8 | 998 | 12.0 |
| 1995 | 11,156 | 571.8 | 2,284 | 11,419 | 5.0 | 1,102 | 12.6 |
| 1996 | 11,341 | 580.7 | 2,418 | 12,487 | 5.2 | 996 | 12.4 |
| 1997 | 11,471 | 598.9 | 2,692 | 13,091 | 4.9 | 943 | 12.3 |
| 1998 | 11,521 | 609.5 | 2,669 | 13,412 | 5.0 | 931 | 12.5 |
| 1999 | 11,603 | 626.4 | 2,813 | 14,108 | 5.0 | 919 | 13.0 |
| 2000 | 12,168 | 648.0 | 2,952 | 15,200 | 5.1 | 923 | 14.0 |
| 2001 | 12,084 | 662.4 | 3,064 | 15,615 | 5.1 | 925 | 14.4 |
| 2002 | 12,479 | 681.9 | 3,025 | 15,095 | 5.0 | 948 | 14.3 |
| 2003 | 12,236 | 694.2 | 3,005 | 15,082 | 5.0 | 936 | 14.1 |
| 2004 | 12,480 | 709.7 | 3,098 | 15,930 | 5.1 | 907 | 14.5 |
| 2005 | 12,755 | 715.4 | 3,189 | 16,118 | 5.1 | 919 | 14.8 |
| 2006 | 12,853 | 726.4 | 3,334 | 16,587 | 5.0 | 893 | 14.8 |
| 2007 | 13,032 | 741.2 | 3,879 | 18,070 | 4.7 | 851 | 15.4 |
| 2008 | 13,346 | 762.8 | 4,001 | 18,941 | 4.7 | 832 | 15.8 |
| 2009 | 13,529 | 775.3 | 3,955 | 19,004 | 4.8 | 830 | 15.8 |
| 2010 | 13,614 | 759.6 | 4,007 | 18,580 | 4.6 | 832 | 15.5 |
| 2011 | 13,328 | 744.1 | 4,083 | 19,520 | 4.8 | 812 | 15.8 |
| 2012 | 12,455 | 749.5 | 4,192 | 19,835 | 4.7 | 791 | 15.7 |
| 2013 | 12,434 | 774.3 | 4,275 | 20,381 | 4.8 | 793 | 16.2 |
| 2014 | 12,608 | 780.9 | 4,411 | 20,829 | 4.7 | 786 | 16.4 |
| 2015 | 12,820 | 803.2 | 4,339 | 20,710 | 4.8 | 777 | 16.1 |
| 2016 | 12,912 | 810.2 | 4,346 | 20,922 | 4.8 | 761 | 15.9 |
| 2017 | 12,848 | 823.6 | 4,314 | 20,169 | 4.7 | 788 | 15.9 |
| 2018 | 13,046 | 826.3 | 4,211 | 19,452 | 4.6 | 844 | 16.4 |
| <i>Average annual percentage change</i> | | | | | | | |
| 1970-2018 | 0.4% | 1.3% | 1.4% | 1.0% | -0.6% ^g | 0.4% | 1.3% |
| 2008-2018 | -0.2% | 0.8% | 0.5% | 0.3% | -0.2% | 0.1% | 0.4% |

Sources:

American Public Transportation Association, *2020 Public Transportation Fact Book*, Washington, DC, March 2020, Appendix A. (Additional resources: www.apta.com)

Energy use – See Appendix A for Rail Transit Energy Use.

^a Heavy rail and light rail. Series not continuous between 1983 and 1984 because of a change in data source by the American Public Transit Association (APTA). Beginning in 1984, data provided by APTA are taken from mandatory reports filed with the Urban Mass Transit Administration (UMTA). Data for prior years were provided on a voluntary basis by APTA members and expanded statistically.

^b 1970–79 data represents total passenger rides; after 1979, data represents unlinked passenger trips.

^c Estimated for years 1970–76 based on an average trip length of 5.8 miles.

^d Calculated as the ratio of passenger-miles to passenger trips.

^e Only end-use energy was counted for electricity. Before Edition 36, primary energy use (which included generation and distribution losses) was shown in this table. Large system-to-system variations exist for energy intensities.

^f Data are not available.

^g Average annual percentage change is calculated for years 1977–2018.

Uber is the United States' largest transportation network company (TNC), which allows customers to hail a ride on demand via a phone app. The ride fare and tip are paid via credit card stored in the app and feedback is encouraged after each ride. Through the end of 2018, the Uber app has facilitated 10 billion trips worldwide.

Table 7.5
Uber Ride Hailing Statistics as of December 2018

| | |
|---|--------------|
| First Uber trip taken | July 5, 2010 |
| Countries in which Uber operates, 2018 | 63 countries |
| Cumulative number of worldwide trips from 2010-2015 | 1 billion |
| Cumulative number of worldwide trips from 2010-2018 | 10 billion |
| Trips completed per day, December 2018 | 14 million |
| Monthly active platform customers, 2018 | 91 million |
| Number of drivers, 2018 | 3.9 million |
| Number of company employees, 2018 | 22,000 |

Source:

Uber, Uber Newsroom, www.nber.org/papers/w22843.pdf, accessed September 9, 2019.

In December 2014, the Benenson Survey Group (BSG) conducted a web survey of Uber's driver-partners in 20 market areas that represented 85 percent of all of Uber's U.S. driver-partners. Jonathan V. Hall, an Uber employee, and Alan B. Krueger, an Uber consultant, compared the BSG Survey results to the 2012-2013 American Community Survey data from the U.S. Census Bureau, resulting in a Working Paper for the National Bureau of Economic Research.

Table 7.6
Characteristics of Uber's Driver-Partners, Taxi Drivers and All Workers

| | Uber's Driver-Partners (2014 BSG Survey) | Taxi Drivers and Chauffeurs (2012-13 ACS) | All workers (2012-13 ACS) |
|----------------------------|---|--|------------------------------|
| Age 18-29 | 19% | 9% | 22% |
| 30-39 | 30% | 20% | 23% |
| 40-49 | 26% | 27% | 23% |
| 50-64 | 22% | 37% | 27% |
| 65+ | 3% | 8% | 5% |
| Male | 86% | 92% | 53% |
| Female | 14% | 8% | 47% |
| Less than HS | 3% | 16% | 9% |
| High School | 9% | 36% | 21% |
| Some College / Associate's | 40% | 29% | 28% |
| College Degree | 37% | 15% | 25% |
| Postgraduate Degree | 11% | 4% | 16% |
| White Non-Hispanic | 40% | 26% | 56% |
| Black Non-Hispanic | 20% | 32% | 15% |
| Asian Non-Hispanic | 17% | 18% | 8% |
| Other Non-Hispanic | 6% | 2% | 2% |
| Hispanic | 18% | 22% | 20% |
| Married | 50% | 59% | 53% |
| Have Children at Home | 46% | 45% | 42% |
| Currently Attending School | 7% | 5% | 10% |
| Veteran | 7% | 5% | 5% |
| Number of Observations | 601 | 2,080 | 648,494 |

Notes: ACS data pertain to the same 20 markets as the BSG survey and are for 2012 and 2013. The 20 markets were: Atlanta, Austin, Baltimore, Boston, Chicago, Dallas, Denver, Houston, Los Angeles, Miami, Minneapolis, New Jersey, New York City, Orange County, Philadelphia, Phoenix, San Diego, San Francisco, Seattle, and Washington, DC.

Source:

National Bureau of Economic Research, *An Analysis of The Labor Market for Uber's Driver-Partners in the United States*, NBER Working Paper No. 22843, November 2016.

Lyft is the second-largest transportation network company (TNC) in the United States. As with Uber, a mobile app is used to hail a ride on demand. In 2020, 35% of Lyft riders did not own or lease a personal vehicle.

Table 7.7
Lyft Ride Hailing Statistics, 2020

| Areas served by Lyft, 2020 | All U.S. States, District of Columbia, and Toronto, Canada |
|---|--|
| Share of drivers that are veterans, 2020 | 9% |
| Share of drivers that are female, 2020 | 23% |
| Share of drivers that are in a minority group, 2020 | 66% |
| Share of drivers that are over the age of 50, 2020 | 23% |
| Share of drivers that drive fewer than 20 hours per week, 2020 | 90% |
| Share of Lyft riders who do not own or lease a personal vehicle, 2020 | 35% |
| Share of Lyft riders that are students, 2020 | 16% |
| Share of Lyft riders that are in a minority group, 2020 | 37% |
| Share of U.S. population in a minority group, 2020 | 39% |
| Median annual household income of Lyft riders, 2020 | \$69,900 |
| U.S. median annual household income, 2018 | \$61,900 |
| Share of Lyft trips that start or end in a low-income area, 2020 | 40% |

Source:

Lyft, Economic Impact Report 2020, National and Toronto, www.lyftimpact.com/stats/national, website accessed September 24, 2020.

Carshare programs provide one alternative to car ownership. Typically, a carshare program has membership requirements and hourly rates for use of a common fleet of vehicles located throughout an area. The carshare operator typically provides insurance, gasoline, parking, and maintenance.

Table 7.8
Carshare Members and Vehicles by World Region, 2006–2018

| | 2006 | 2008 | 2010 | 2012 | 2014 | 2016 | 2018 |
|----------------------|---------|---------|---------|---------|-----------|-----------|------------|
| Asia | | | | | | | |
| Members | 15,700 | 12,546 | 81,817 | 160,500 | 955,880 | 8,722,138 | 22,707,000 |
| Vehicles | 608 | 810 | 4,315 | 6,155 | 20,344 | 67,329 | 108,097 |
| Member-Vehicle Ratio | 25.8 | 15.5 | 19.0 | 26.1 | 47.0 | 129.5 | 210.1 |
| Europe | | | | | | | |
| Members | 212,124 | 334,168 | 552,868 | 691,943 | 2,206,884 | 4,371,151 | 6,761,688 |
| Vehicles | 7,491 | 10,833 | 16,779 | 20,464 | 57,947 | 57,857 | 60,622 |
| Member-Vehicle Ratio | 28.3 | 30.8 | 32.9 | 33.8 | 38.1 | 75.6 | 111.5 |
| North America | | | | | | | |
| Members | 117,656 | 318,898 | 516,100 | 908,584 | 1,625,652 | 1,837,854 | 2,110,111 |
| Vehicles | 3,337 | 7,505 | 10,420 | 15,795 | 24,210 | 26,691 | 23,376 |
| Member-Vehicle Ratio | 35.3 | 42.5 | 49.5 | 57.5 | 67.1 | 68.9 | 90.3 |
| Oceania | | | | | | | |
| Members | 1,130 | 5,210 | 12,750 | 25,500 | 50,700 | 96,600 | 201,000 |
| Vehicles | 65 | 255 | 440 | 1,080 | 1,524 | 5,040 | 5,500 |
| Member-Vehicle Ratio | 17.4 | 20.4 | 29.0 | 23.6 | 33.3 | 19.2 | 36.5 |
| South America | | | | | | | |
| Members | 0 | 0 | 110 | 1,500 | 3,500 | 7,350 | 16,892 |
| Vehicles | 0 | 0 | 13 | 60 | 100 | 120 | 363 |
| Member-Vehicle Ratio | 0 | 0 | 8.5 | 25 | 35 | 61.3 | 46.5 |

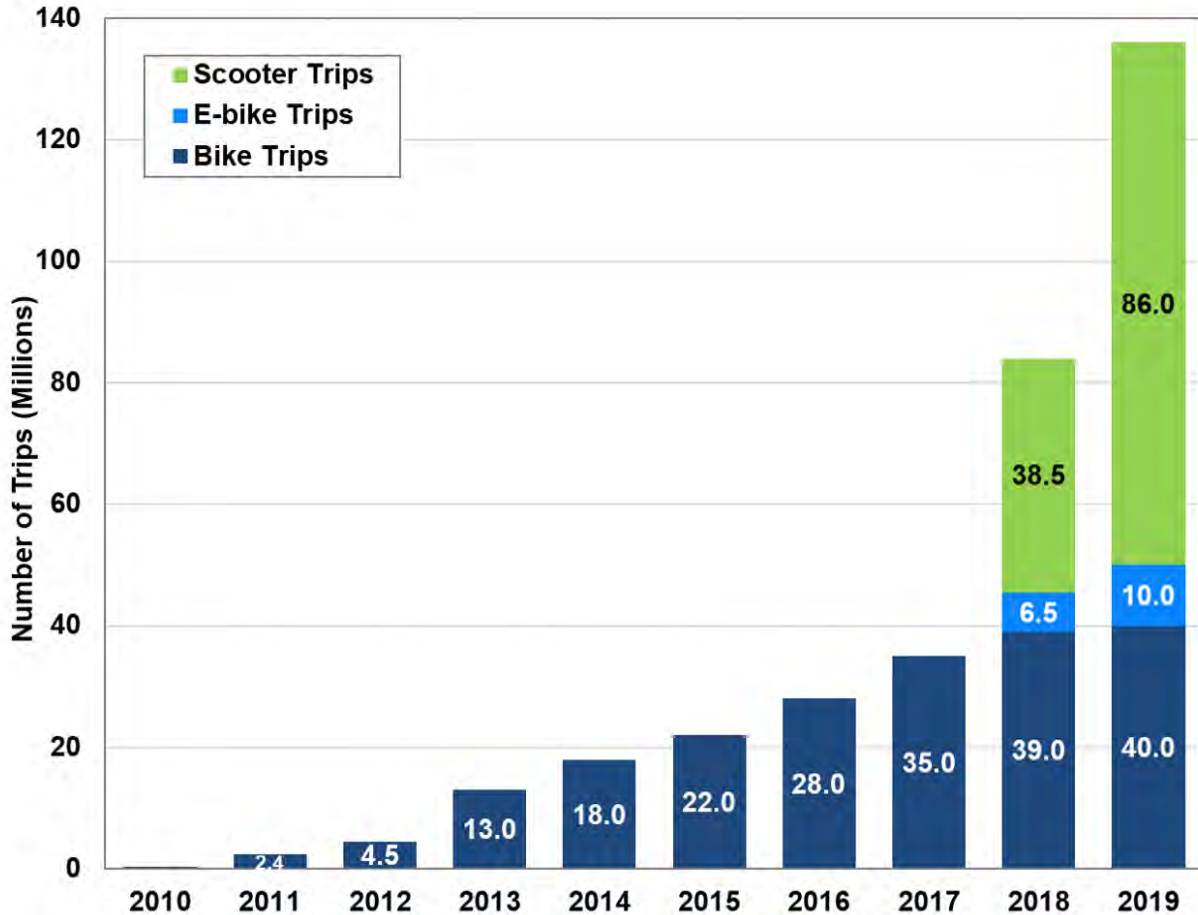
Note: Data are as of October of each year listed.

Source:

Transportation Sustainability Research Center, University of California, Berkeley, *Innovative Mobility: Carsharing Outlook*, Spring 2020. (Additional information: <https://tsrc.berkeley.edu/research/shared-mobility>)

Micromobility sharing services (bikes and scooters) have expanded rapidly in cities across the United States. The number of shared bike trips in the 100 largest U.S. cities has been estimated by the National Association of City Transportation Officials (NACTO). The number of bike trips increased from 321 thousand in 2010 to 40 million in 2019, with another 10 million electronic e-bike trips in addition. Shared scooter trips were added to the NACTO study in 2018. There were 86 million scooter trips in 2019 representing 63% of the 136 million shared micromobility trips taken.

Figure 7.4. Shared Micromobility Trips, 2010–2019

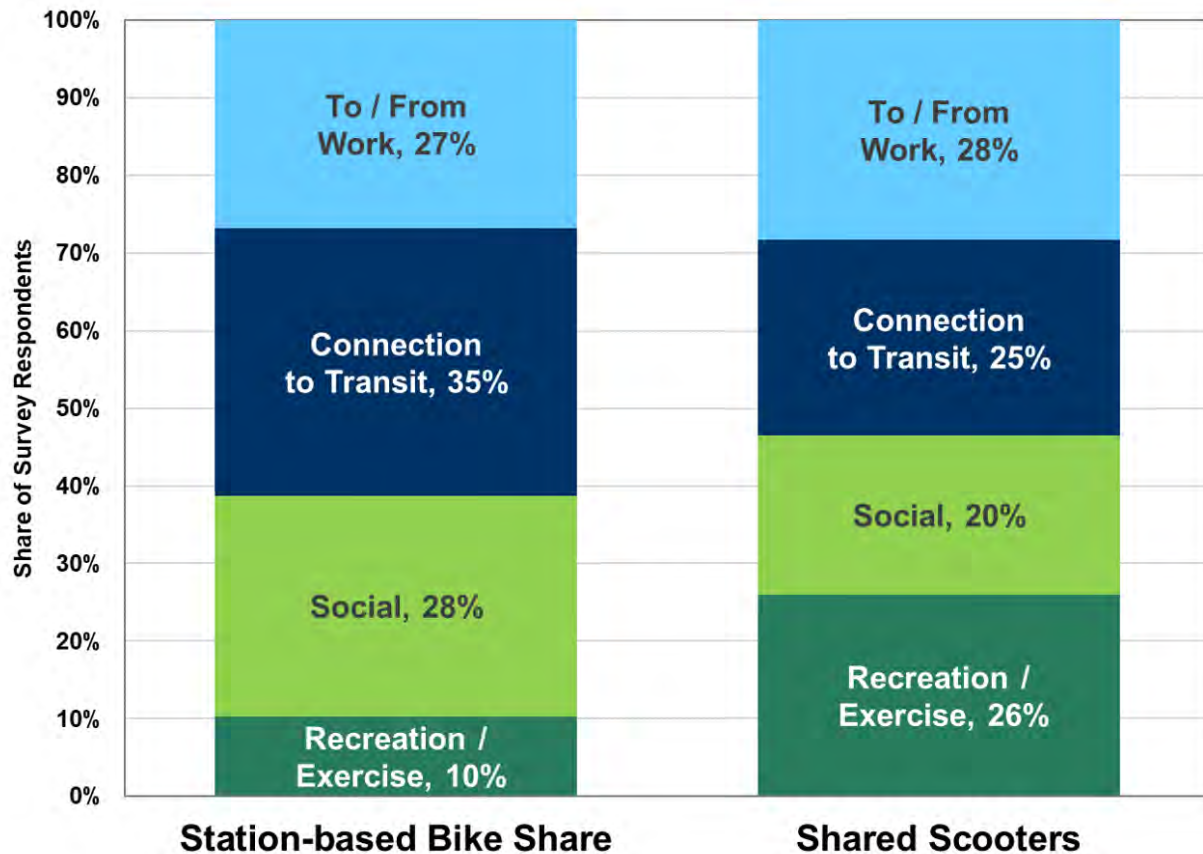


Notes: Includes systems with over 150 bikes or scooters and only includes data reported by 105 large cities. Does not include private or closed campus systems like those operating on university campuses. For more detail, see the full report.

Source: National Association of City Transportation Officials (NACTO), *Shared Micromobility in the U.S.: 2019, 2020*. (Additional information: nacto.org/shared-micromobility-2019)

The most common reasons cited for bike sharing trips were connecting to transit, social trips, and commuting to and from work. A higher percent of shared scooter trips was attributed to recreation/exercise. Connection to transit and social purposes were a greater percent of shared bike trips.

Figure 7.5. Reasons for Using Shared Bikes and Scooters, 2018



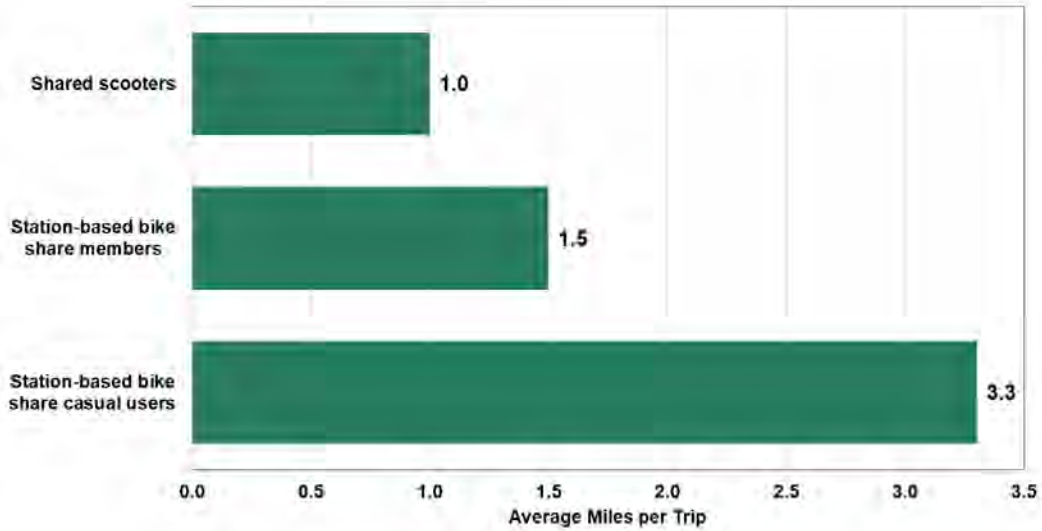
Notes: Data were not released for 2019. Data for scooters come from Denver, Portland, and Baltimore. Data for bike share come from Washington, DC, New York City, and Chicago. The social and recreation/exercise categories were only available from Washington, DC.

Source:

National Association of City Transportation Officials (NACTO), *Shared Micromobility in the U.S.: 2018*, April 2019. (Additional information: nacto.org/2019/04/17/84-million-trips-on-shared-bikes-and-scooters)

For shared bikes and scooters, casual users of station-based bikes travel the farthest and for the longest duration.

Figure 7.6. Average Miles per Trip for Shared Bikes and Scooters, 2019

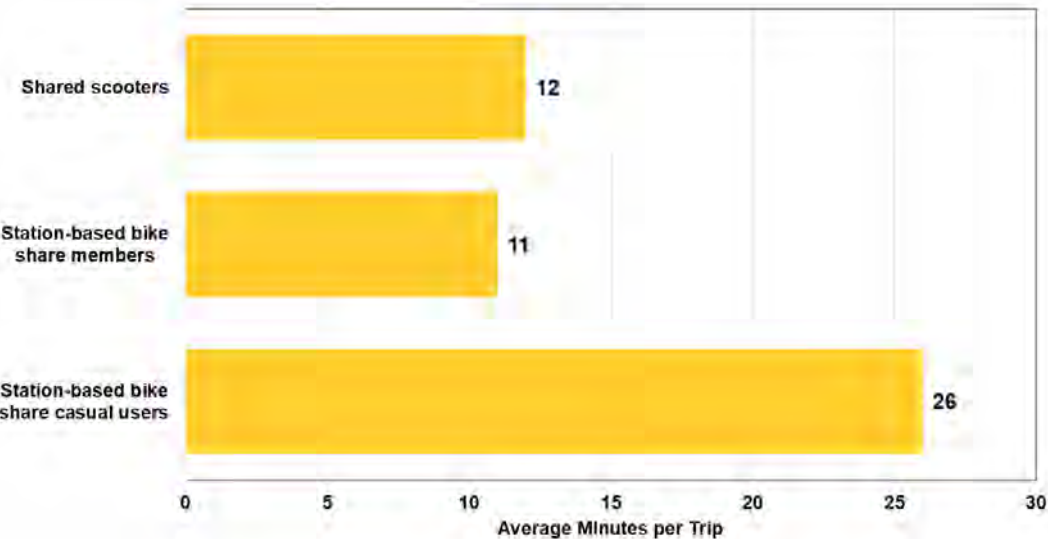


Note: Based on data from Washington, D.C., Boston, MA, Chicago, IL, San Francisco, CA, and New York, NY.

Source:

National Association of City Transportation Officials (NACTO), *Shared Micromobility in the U.S.: 2019, 2020*.
 (Additional information: nacto.org/shared-micromobility-2019)

Figure 7.7. Average Minutes per Trip for Shared Bikes and Scooters, 2019



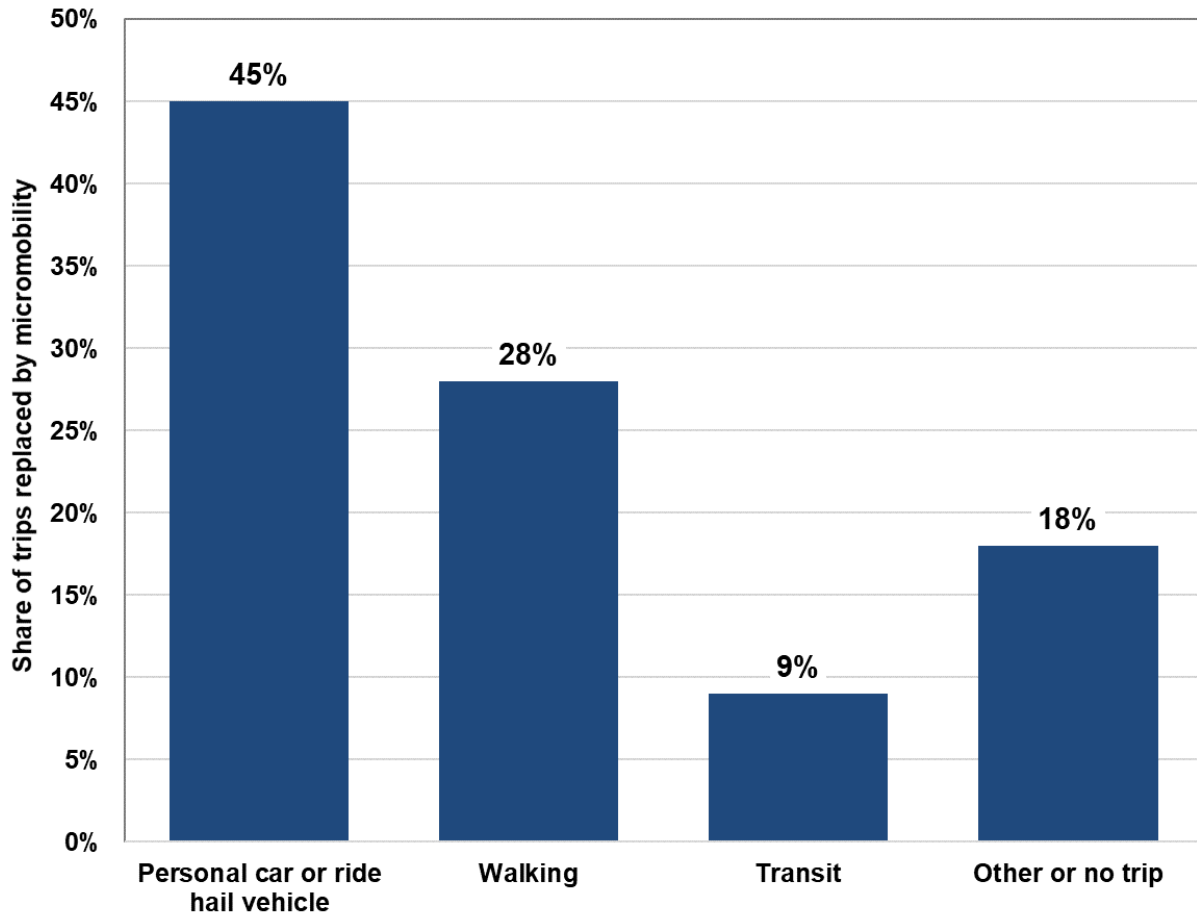
Note: Based on data from Washington, D.C., Boston, MA, Chicago, IL, San Francisco, CA, and New York, NY.

Source:

National Association of City Transportation Officials (NACTO), *Shared Micromobility in the U.S.: 2019, 2020*.
 (Additional information: nacto.org/shared-micromobility-2019)

Micromobility users in seven different cities were asked what mode they would have used to complete their trip if a dockless bike or scooter had not been available. Just under half (45%) said they would have used a personal car or ride hail vehicle and another 9% said they would have used transit.

Figure 7.8. Share of Trips Replaced by Dockless Bikes and Scooters by Mode, 2019



Note: Includes data from surveys in Santa Monica, CA, Alexandria, VA, Bloomington, IN, Brookline, MA, Hoboken, NJ, Oakland, CA, and San Francisco, CA.

Source:

National Association of City Transportation Officials (NACTO), Shared Micromobility in the U.S.: 2019, 2020. (Additional information: nacto.org/shared-micromobility-2019)

Chapter 8

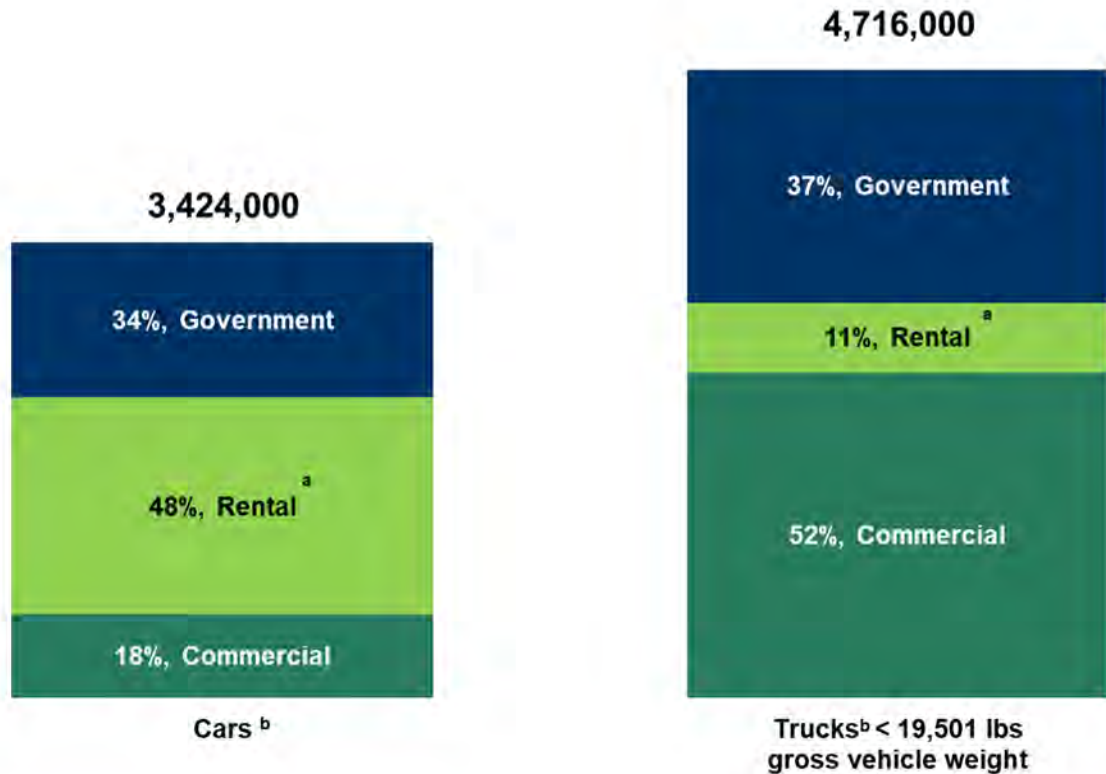
Fleet Vehicles and Characteristics

Summary Statistics from Tables in this Chapter

| Source | | |
|------------|---|-----------|
| Figure 8.1 | Fleet cars, 2020 | 3,424,000 |
| Figure 8.1 | Fleet trucks \leq 19,500 lbs. GVW, 2020 | 4,716,000 |
| Table 8.3 | Average annual miles per commercial fleet vehicle, 2020 | |
| | <i>SUVs</i> | 20,124 |
| | <i>Intermediate cars</i> | 20,940 |
| | <i>Pickup trucks</i> | 22,056 |
| Figure 8.2 | Average annual miles per Federal Government fleet vehicle, 2019 | |
| | <i>Sedans</i> | 8,981 |
| | <i>SUVs</i> | 8,854 |
| | <i>Passenger vans</i> | 8,519 |
| | <i>Buses</i> | 8,031 |
| | <i>Light trucks</i> | 6,256 |
| | <i>Medium trucks</i> | 5,466 |
| | <i>Heavy trucks</i> | 5,157 |
| | <i>Ambulances</i> | 3,785 |
| Table 8.4 | Federal government vehicles, FY 2019 | 645,047 |
| | <i>Light trucks (<8,500 lbs. GVW)</i> | 271,652 |
| | <i>Cars and other passenger vehicles</i> | 224,227 |
| | <i>Medium trucks (8,500–26,000 lbs. GVW)</i> | 101,999 |
| | <i>Heavy trucks (>26,000 lbs. GVW)</i> | 38,837 |
| | <i>Buses and ambulances</i> | 8,332 |

Vehicles in fleets of 15 or more are counted as fleet vehicles, as well as vehicles in fleets where five or more vehicles are purchased annually. There are more trucks in fleets than cars in 2020.

Figure 8.1. Fleet Vehicles in Service as of January 1, 2020 (Updated April 2021)



Source:

Bobit Publishing Company, Automotive Fleet Research Department, *Automotive Fleet Factbook 2020*, Redondo Beach, CA, 2021.

^a Rental category includes vans and sports utility vehicles under cars, not trucks.

^b Fleets of 15 or more in operation or 5 or more fleet vehicles purchased annually. Taxi and police fleet data are not available.

Data for fleet vehicles (cars and trucks less than 19,501 pounds) show that rental fleets are the largest share of cars and commercial fleets are the largest share of trucks. Government fleets are the second largest share for both cars and trucks.

Table 8.1 (Updated April 2021)
Fleet Vehicles in Service, 2006-2020
 (thousands of vehicles)

| Year | Commercial | Rental ^a | Government | Police & Taxi ^b | Total |
|----------------------------------|------------|---------------------|------------|----------------------------|---------|
| Cars ^c | | | | | |
| 2006 | 896.9 | 1,623.0 | 1,195.9 | 555.2 | 4,271.0 |
| 2007 | 911.8 | 1,650.0 | 1,215.8 | 564.5 | 4,342.0 |
| 2008 | 879.1 | 1,465.1 | 1,255.8 | 586.0 | 4,186.0 |
| 2009 | 791.0 | 1,289.0 | 1,299.0 | 607.0 | 3,986.0 |
| 2010 | 741.2 | 1,175.0 | 1,352.0 | 575.7 | 3,843.8 |
| 2011 | 803.9 | 1,553.2 | 1,330.0 | 578.6 | 4,265.7 |
| 2012 | 834.7 | 1,745.0 | 1,240.0 | 556.6 | 4,376.3 |
| 2013 | 727.7 | 1,850.0 | 1,290.0 | 570.6 | 4,438.3 |
| 2014 | 688.5 | 1,920.0 | 1,245.2 | 582.4 | 4,443.2 |
| 2015 | 659.2 | 2,040.0 | 1,325.0 | 595.8 | 4,620.0 |
| 2016 | 685.0 | 2,156.0 | 1,340.0 | 575.8 | 4,756.8 |
| 2017 | 628.2 | 1,930.0 | 1,278.0 | ^d | 3,836.2 |
| 2018 | 613.4 | 1,820.0 | 1,236.0 | ^d | 3,669.4 |
| 2019 | 635.0 | 1,780.0 | 1,217.0 | ^d | 3,632.0 |
| 2020 | 626.0 | 1,630.0 | 1,168.0 | ^d | 3,424.0 |
| Trucks ^c <19,501 lbs. | | | | | |
| 2006 | 2,362.4 | 499.7 | 1,635.5 | 45.4 | 4,543.0 |
| 2007 | 2,383.2 | 560.8 | 1,682.3 | 46.7 | 4,673.0 |
| 2008 | 2,318.5 | 500.1 | 1,682.0 | 45.5 | 4,546.0 |
| 2009 | 2,224.0 | 381.0 | 1,701.0 | 59.0 | 4,365.0 |
| 2010 | 1,999.5 | 380.0 | 1,751.0 | 55.4 | 4,185.8 |
| 2011 | 2,136.3 | 391.0 | 1,684.0 | 58.4 | 4,269.7 |
| 2012 | 2,236.8 | 417.0 | 1,512.0 | 62.0 | 4,227.8 |
| 2013 | 2,186.9 | 465.0 | 1,560.0 | 66.5 | 4,278.4 |
| 2014 | 2,136.4 | 480.0 | 1,631.5 | 74.9 | 4,322.8 |
| 2015 | 2,231.8 | 535.0 | 1,727.4 | 77.4 | 4,571.6 |
| 2016 | 2,340.0 | 582.0 | 1,810.0 | 77.4 | 4,809.0 |
| 2017 | 2,377.7 | 542.0 | 1,807.0 | ^d | 4,726.7 |
| 2018 | 2,564.2 | 496.0 | 1,898.0 | ^d | 4,958.2 |
| 2019 | 2,587.0 | 475.0 | 1,778.0 | ^d | 4,840.0 |
| 2020 | 2,445.0 | 525.0 | 1,746.0 | ^d | 4,716.0 |

Source:

Bobit Publishing Company, Automotive Fleet Research Department, *Automotive Fleet Factbook 2020*, and annual, Redondo Beach, CA, 2021. (Additional resources: www.fleet-central.com)

^a Rental category includes vans and sports utility vehicles under cars, not trucks.

^b Taxi category includes vans.

^c Fleets of 15 or more in operation or 5 or more fleet vehicles purchased annually.

^d Data are not available.

In commercial fleets, pickup trucks stayed in service the longest in 2020—an average of 62 months in 2020. Commercial fleet vehicles averaged just under 20,500 miles in 2020, a decline from the two previous years.

Table 8.2 (Updated April 2021)
Average Length of Time Commercial Fleet Vehicles Are in Service, 2018-2020

| Vehicle type | Average months in service | | |
|------------------------|---------------------------|------|------|
| | 2018 | 2019 | 2020 |
| Compact cars | 38 | 41 | 47 |
| Intermediate cars | 33 | 39 | 42 |
| Pickup trucks | 48 | 51 | 62 |
| Minivans | 46 | 40 | 48 |
| Sport utility vehicles | 33 | 35 | 39 |
| Full-size vans | 53 | 63 | 58 |

Note: Based on data collected from four leading Fleet Management companies.

Source:

Bobit Publishing Company, *Automotive Fleet*, Redondo Beach, CA, December 2018, January 2020, and November 2020. (Additional resources: www.automotive-fleet.com)

Table 8.3 (Updated April 2021)
Average Annual Vehicle-Miles of Travel for Commercial Fleet Vehicles, 2018-2020

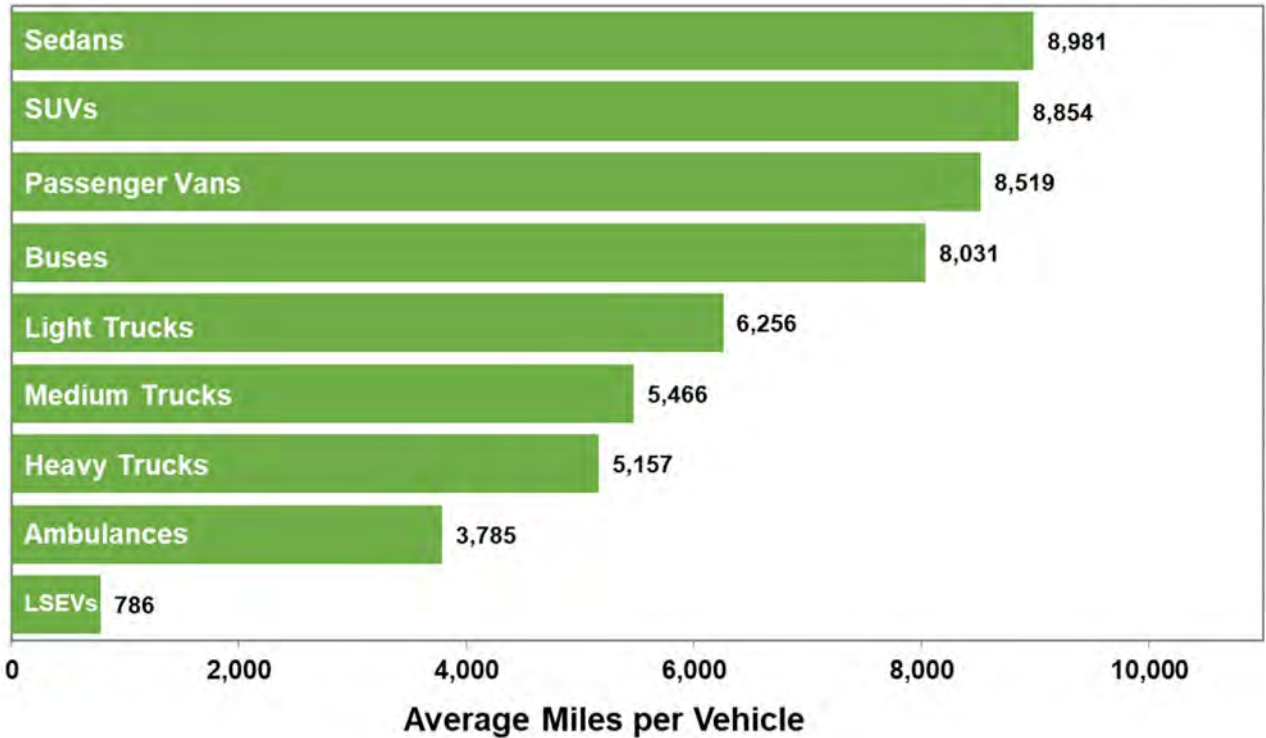
| Vehicle type | Average annual miles of travel | | |
|------------------------|--------------------------------|--------|--------|
| | 2018 | 2019 | 2020 |
| Compact cars | 21,168 | 20,832 | 22,644 |
| Intermediate cars | 23,412 | 20,688 | 20,940 |
| Pickup trucks | 23,340 | 25,680 | 22,056 |
| Minivans | 23,940 | 23,244 | 18,636 |
| Sport utility vehicles | 22,800 | 21,396 | 20,124 |
| Full-size vans | 21,888 | 23,520 | 18,684 |

Source:

Bobit Publishing Company, *Automotive Fleet*, Redondo Beach, CA, December 2018, January 2020, and November 2020. (Additional resources: www.automotive-fleet.com)

These data, which apply to domestic Federal fleet vehicles, indicate that sedans have the highest average annual miles per vehicle, followed closely by sport utility vehicles (SUVs).

Figure 8.2. Average Miles per Domestic Federal Vehicle by Vehicle Type, 2019
(Updated April 2021)



Note: Light trucks = less than 8,500 pounds gross vehicle weight (GVW).
 Medium trucks = 8,501-23,999 pounds GVW.
 Heavy trucks = 24,000 pounds GVW or more.
 LSEVs = low-speed electric vehicles.

Source:

U.S. General Services Administration, Federal Vehicle Policy Division, *FY 2019 Federal Fleet Report*, Washington, DC, 2020, Table 4-2. (Additional resources: www.gsa.gov)

The Federal Government vehicle inventory includes 21% more light trucks than passenger vehicles.

Table 8.4 (Updated April 2021)
Federal Government Vehicle Inventory, FY 2001-2019

| Vehicle Type | 2001 | 2005 | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Passenger vehicles | | | | | | | | |
| Low-speed electric vehicle | 0 | 0 | 3,029 | 3,686 | 3,257 | 2,369 | 2,931 | 2,790 |
| Subcompact | 5,462 | 2,401 | 6,797 | 27,356 | 28,309 | 27,566 | 25,977 | 25,752 |
| Compact | 60,938 | 58,284 | 46,489 | 38,766 | 38,155 | 38,043 | 38,674 | 38,138 |
| Midsized | 36,921 | 36,656 | 48,242 | 24,775 | 24,442 | 24,558 | 22,656 | 23,158 |
| Large | 11,107 | 15,966 | 10,063 | 7,150 | 6,216 | 3,516 | 2,929 | 2,642 |
| Limousines | 116 | 191 | 412 | 83 | 85 | 52 | 3 | 3 |
| Light duty passenger vans | 56,563 | 42,109 | 41,676 | 37,448 | 36,620 | 32,379 | 31,734 | 31,779 |
| Medium duty passenger vans | 727 | 13,252 | 15,218 | 14,617 | 15,963 | 15,364 | 15,266 | 15,860 |
| Light duty SUVs | 40,842 | 50,445 | 66,316 | 73,203 | 75,614 | 75,850 | 75,117 | 78,517 |
| Medium duty SUVs | 0 | 6,096 | 11,117 | 8,235 | 8,170 | 6,284 | 5,780 | 5,588 |
| Total passenger vehicles | 212,676 | 225,400 | 249,359 | 235,319 | 236,831 | 225,981 | 221,067 | 224,227 |
| Trucks and other vehicles | | | | | | | | |
| Light trucks 4x2 | 227,937 | 243,477 | 241,011 | 232,914 | 233,189 | 223,558 | 221,874 | 216,308 |
| Light trucks 4x4 | 29,975 | 35,417 | 40,105 | 49,079 | 53,143 | 50,092 | 53,430 | 55,344 |
| Medium trucks | 88,993 | 83,747 | 89,253 | 79,421 | 94,111 | 99,079 | 102,661 | 101,999 |
| Heavy trucks | 27,988 | 35,230 | 32,760 | 34,049 | 34,939 | 33,585 | 36,827 | 38,837 |
| Ambulances | 1,819 | 1,580 | 1,480 | 1,349 | 1,339 | 1,385 | 903 | 847 |
| Buses | 6,726 | 7,837 | 8,186 | 8,173 | 8,085 | 7,238 | 7,783 | 7,485 |
| Total trucks and other vehicles | 383,438 | 407,288 | 412,795 | 404,985 | 424,806 | 414,937 | 423,478 | 420,820 |
| GRAND TOTAL ALL VEHICLES | 596,114 | 632,688 | 662,154 | 640,304 | 661,637 | 640,918 | 644,545 | 645,047 |

Note: Light trucks = less than 8,500 pounds gross vehicle weight rating (GVWR).

Medium trucks = 8,501-23,999 pounds GVWR.

Heavy trucks = 24,000 pounds GVWR or more.

Source:

U.S. General Services Administration, Federal Supply Service, *FY 2019 Federal Fleet Report*, Washington, DC, 2020, Tables 2-5T and 2-6T. (Additional resources: www.gsa.gov)

Table 8.5 (Updated April 2021)
Federal Fleet Vehicle Acquisitions
by Fuel Type, FY 2002–2019

| Fuel type | 2002 | 2005 | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
|----------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Gasoline | 44,850 | 41,247 | 26,547 | 17,080 | 30,311 | 23,312 | 26,309 | 21,445 |
| Gasoline hybrid | ^a | 222 | 4,853 | 2,500 | 3,147 | 4,475 | 4,814 | 3,207 |
| Gasoline LGHG ^b | 0 | 0 | 0 | 0 | 38 | 945 | 1672 | 1128 |
| Gasoline plug-in hybrid | 0 | 0 | 0 | 263 | 86 | 191 | 302 | 212 |
| Diesel | 8,107 | 6,049 | 4,136 | 6,215 | 6,136 | 5,626 | 5,970 | 7,339 |
| Diesel hybrid | ^c | 1 | 27 | 7 | 11 | 10 | 23 | 8 |
| Diesel LGHG ^b | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| CNG | 1,267 | 188 | 60 | 241 | 67 | 12 | 11 | 14 |
| E-85 | 8,054 | 16,892 | 26,789 | 24,651 | 27,243 | 24,110 | 15,252 | 17,306 |
| Electric | 7 | 13 | 1,376 | 231 | 180 | 303 | 194 | 167 |
| LNG | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LPG | 59 | 1 | 2 | 6 | 9 | 2 | 1 | 1 |
| M-85 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hydrogen | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| Grand total | 62,372 | 64,613 | 63,794 | 51,194 | 67,228 | 58,986 | 54,549 | 50,830 |

Source:

U.S. General Services Administration, Federal Vehicle Policy Division, *FY 2019 Federal Fleet Report*, Washington, DC, 2020, Table 5-4. (Additional resources: www.gsa.gov)

Table 8.6 (Updated April 2021)
Fuel Consumed by Federal Government Fleets, FY 2000–2019
(thousand gasoline equivalent gallons)

| | 2000 | 2005 | 2009 | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
|-------------------------------|----------------|----------------|----------------|----------------|----------|----------|----------|----------|----------|
| Gasoline | 284,480 | 300,261 | 301,437 | 322,023 | 310,416 | 315,043 | 305,978 | 307,561 | 312,172 |
| Diesel | 70,181 | 53,363 | 76,456 | 75,329 | 66,736 | 69,990 | 72,351 | 57,593 | 62,291 |
| CNG | 865 | 1,245 | 499 | 504 | 400 | 397 | 357 | 280 | 117 |
| Electricity | 1 | 6 | 4 | 36 | 197 | 86 | 64 | 31 | 39 |
| Biodiesel (B20) | 569 | 8,052 | 7,393 | 8,258 | 4,722 | 4,404 | 4,206 | 2,256 | 1,946 |
| Biodiesel (B100) ^d | 0 | 0 | 5 | 0 | 11 | 0 | 155 | 115 | 48 |
| Methanol/M-85 | 14 | 0 | 0 | 0 | 0 | 19 | 190 | 201 | 200 |
| LPG | 34 | 231 | 208 | 195 | 0 | 0 | 0 | 0 | 0 |
| Ethanol/E-85 | 347 | 3,060 | 7,923 | 8,201 | 150 | 231 | 239 | 236 | 256 |
| LNG | 0 | 102 | 35 | 0 | 13,512 | 11,942 | 10,431 | 10,446 | 9,323 |
| Hydrogen | 0 | 0 | 0 | 1 | 7 | 4 | 0 | 0 | 0 |
| Total | 356,491 | 366,320 | 393,961 | 414,548 | 0 | 0 | 0 | 0 | 0 |

Source:

U.S. General Services Administration, Federal Vehicle Policy Division, *FY 2019 Federal Fleet Report*, Washington, DC, 2020, Table 5-1. (Additional resources: www.gsa.gov)

^a Combined with gasoline.

^b Low greenhouse gas emissions.

^c Combined with diesel.

^d B100 cannot be separated from B20 from 2000–2007.

The U.S. Postal Service owned 44.2% of all federal light trucks.

Table 8.7 (Updated April 2021)
Federal Government Vehicles by Agency, FY 2019

| Department or agency | Cars | Light trucks | Medium trucks | Heavy trucks | Total |
|---|---------------|----------------|----------------|---------------|----------------|
| CIVILIAN | | | | | |
| American Battle Monuments Commission | 22 | 26 | 2 | 0 | 50 |
| Consumer Product Safety Commission | 55 | 30 | 0 | 0 | 85 |
| Court Services and Offender Supervision Agency | 54 | 21 | 0 | 0 | 75 |
| Department of Agriculture | 4,602 | 21,683 | 8,524 | 2,352 | 37,161 |
| Department of Commerce | 259 | 1,215 | 412 | 59 | 1,945 |
| Department of Education | 43 | 39 | 0 | 0 | 82 |
| Department of Energy | 750 | 7,420 | 3,818 | 2,278 | 14,266 |
| Department of Health and Human Services | 1,993 | 2,340 | 267 | 77 | 4,677 |
| Department of Homeland Security | 9,368 | 35,753 | 3,861 | 1,828 | 50,810 |
| Department of Housing and Urban Development | 238 | 70 | 0 | 0 | 308 |
| Department of Justice | 16,266 | 28,501 | 954 | 1,490 | 47,211 |
| Department of Labor | 974 | 2,130 | 252 | 536 | 3,892 |
| Department of State | 1,612 | 10,404 | 769 | 782 | 13,567 |
| Department of the Interior | 2,107 | 15,976 | 9,223 | 3,388 | 30,694 |
| Department of the Treasury | 1,465 | 1,425 | 11 | 10 | 2,911 |
| Department of Transportation | 1,171 | 3,532 | 966 | 135 | 5,804 |
| Department of Veterans Affairs | 7,866 | 10,640 | 1,395 | 1,975 | 21,876 |
| Environmental Protection Agency | 210 | 576 | 114 | 33 | 933 |
| Equal Employment Opportunity Commission | 67 | 12 | 0 | 0 | 79 |
| Federal Communications Commission | 0 | 56 | 0 | 0 | 56 |
| Federal Housing Finance Agency | 1 | 3 | 0 | 0 | 4 |
| Federal Maritime Commission | 6 | 0 | 0 | 0 | 6 |
| Federal Trade Commission | 1 | 2 | 1 | 0 | 4 |
| General Services Administration | 521 | 412 | 17 | 2 | 952 |
| Government Printing Office | 0 | 0 | 0 | 0 | 0 |
| Library of Congress | 4 | 4 | 1 | 6 | 15 |
| National Aeronautics and Space Administration | 334 | 1,312 | 461 | 387 | 2,494 |
| National Archives & Records Administration | 1 | 36 | 10 | 7 | 54 |
| National Gallery of Art | 0 | 6 | 2 | 3 | 11 |
| National Labor Relations Board | 13 | 1 | 0 | 0 | 14 |
| National Science Foundation | 22 | 240 | 181 | 68 | 511 |
| National Transportation Safety Board | 0 | 2 | 0 | 0 | 2 |
| Nuclear Regulatory Commission | 5 | 20 | 0 | 2 | 27 |
| Office of Personnel Management | 26 | 15 | 0 | 0 | 41 |
| Peace Corps | 17 | 578 | 0 | 12 | 607 |
| Pretrial Services Agency for the Dist of Columbia | 2 | 1 | 0 | 0 | 3 |
| Small Business Administration | 82 | 78 | 1 | 0 | 161 |
| Smithsonian Institution | 16 | 324 | 78 | 44 | 462 |
| Social Security Administration | 220 | 181 | 5 | 27 | 433 |
| Tennessee Valley Authority | 279 | 1,168 | 941 | 143 | 2,531 |
| US Agency for Global Media | 0 | 99 | 17 | 20 | 136 |
| US Agency for International Development | 69 | 475 | 19 | 20 | 583 |
| US International Trade Commission | 0 | 2 | 0 | 0 | 2 |
| TOTAL CIVILIAN AGENCIES | 50,741 | 146,808 | 32,302 | 15,684 | 245,535 |
| MILITARY | | | | | |
| Corps of Engineers, Civil Works | 554 | 4,066 | 1,800 | 649 | 7,069 |
| Defense Agencies | 1,823 | 2,333 | 525 | 670 | 5,351 |
| Department of Air Force | 4,372 | 22,186 | 13,207 | 8,919 | 48,684 |
| Department of Army | 15,021 | 27,104 | 12,340 | 7,226 | 61,691 |
| Department of Navy | 6,997 | 17,727 | 7,913 | 3,787 | 36,424 |
| United States Marine Corps | 3,255 | 4,888 | 1,901 | 1,791 | 11,835 |
| TOTAL MILITARY AGENCIES | 32,022 | 78,304 | 37,686 | 23,042 | 171,054 |
| U. S. POSTAL SERVICE | 6,930 | 178,284 | 32,858 | 7,596 | 225,668 |
| TOTAL ALL FLEETS | 89,693 | 403,396 | 102,846 | 46,322 | 642,257 |

Note: Light trucks include SUVs, vans, and pickups less than 8,500 lb gross vehicle weight (GVW). Medium trucks are 8,501-23,999 lb GVW and include ambulances. Heavy trucks are 24,000 lb GVW or more and include buses. Does not include low-speed vehicles.

Source:

U.S. General Services Administration, Federal Supply Service, *FY 2019 Federal Fleet Report*, Washington, DC, 2020, Table 2-1. (Additional resources: www.gsa.gov)

Chapter 9

Household Vehicles and Characteristics

Summary Statistics from Tables/Figures in this Chapter

| Source | | |
|------------|---|---------------|
| Table 9.2 | Vehicles per capita, 2019 | 0.874 |
| | Vehicles per licensed driver, 2019 | 1.225 |
| | Vehicles per household, 2019 | 2.231 |
| Table 9.4 | Share of households owning 3 or more vehicles | |
| | <i>1960</i> | 2.5% |
| | <i>1970</i> | 5.5% |
| | <i>1980</i> | 17.5% |
| | <i>1990</i> | 17.3% |
| | <i>2000</i> | 18.3% |
| | <i>2010</i> | 19.5% |
| | <i>2019</i> | 21.4% |
| Figure 9.1 | Average occupancy rates by vehicle type, 2017 | |
| | <i>Van</i> | 2.44 |
| | <i>Sport Utility Vehicle</i> | 1.83 |
| | <i>Car</i> | 1.54 |
| | <i>Pickup</i> | 1.49 |
| Table 9.9 | Average annual miles per household vehicle, 2017 | 11,200 |
| Table 9.19 | Share of workers who car pooled, 2019 | 9.0% |
| Table 9.20 | Long-distance trips in the United States, 2001 (latest available data) | |
| | <i>Person-trips</i> | 2,554 million |
| | <i>Person-miles</i> | 1,138 billion |

The number of vehicles in the United States is growing faster than the population. The growth in vehicle-miles has slowed to 1% per year from 2009-2019. See Table 9.2 for vehicles per capita and vehicle-miles per capita.

Table 9.1 (Updated April 2021)
Population and Vehicle Profile, 1950–2019

| Year | Resident population ^a (thousands) | Total households (thousands) | Number of vehicles in operation (thousands) | Total vehicle-miles (millions) | Number of licensed drivers (thousands) | Number of civilian employed persons (thousands) |
|---|---|---------------------------------|--|-----------------------------------|---|--|
| 1950 | 151,868 | 43,554 | 43,501 | 458,246 | 62,194 | 58,920 |
| 1955 | 165,069 | 47,874 | 56,540 | 605,646 | 74,686 | 62,171 |
| 1960 | 179,979 | 52,799 | 67,906 | 718,762 | 87,253 | 65,778 |
| 1965 | 193,526 | 57,436 | 82,066 | 887,812 | 98,502 | 71,088 |
| 1970 | 205,052 | 63,401 | 98,136 | 1,109,724 | 111,543 | 78,628 |
| 1975 | 215,973 | 71,120 | 120,054 | 1,327,664 | 129,791 | 85,846 |
| 1980 | 227,226 | 80,776 | 139,831 | 1,527,295 | 145,295 | 99,303 |
| 1985 | 238,466 | 86,789 | 157,048 | 1,774,826 | 156,868 | 107,150 |
| 1990 | 250,132 | 93,347 | 179,299 | 2,144,362 | 167,015 | 118,793 |
| 1995 | 266,557 | 98,990 | 193,441 | 2,422,696 | 176,628 | 124,900 |
| 1996 | 269,667 | 99,627 | 198,294 | 2,485,848 | 179,539 | 126,708 |
| 1997 | 272,912 | 101,018 | 201,071 | 2,561,695 | 182,709 | 129,558 |
| 1998 | 276,115 | 102,528 | 205,043 | 2,631,522 | 184,980 | 131,463 |
| 1999 | 279,295 | 103,874 | 209,509 | 2,691,056 | 187,170 | 133,488 |
| 2000 | 282,385 | 104,705 | 213,300 | 2,746,925 | 190,625 | 136,891 |
| 2001 | 285,309 | 108,209 | 216,683 | 2,797,287 | 191,276 | 136,933 |
| 2002 | 288,105 | 109,297 | 221,027 | 2,855,508 | 194,296 | 136,485 |
| 2003 | 290,820 | 111,278 | 225,882 | 2,890,450 | 196,166 | 137,736 |
| 2004 | 293,463 | 112,000 | 232,167 | 2,964,788 | 198,889 | 139,252 |
| 2005 | 296,186 | 113,343 | 238,384 | 2,989,430 | 200,549 | 141,730 |
| 2006 | 298,996 | 114,384 | 244,643 | 3,014,371 | 202,810 | 144,427 |
| 2007 | 302,004 | 116,011 | 248,701 | 3,031,124 | 205,742 | 146,047 |
| 2008 | 304,798 | 116,783 | 249,813 | 2,976,528 | 208,321 | 145,362 |
| 2009 | 307,439 | 117,181 | 248,972 | 2,956,764 | 209,618 | 139,877 |
| 2010 | 309,322 | 117,538 | 248,231 | 2,967,266 | 210,115 | 139,064 |
| 2011 | 311,557 | 118,682 | 248,932 | 2,950,402 | 211,875 | 139,869 |
| 2012 | 313,831 | 121,084 | 251,497 | 2,969,433 | 211,815 | 142,469 |
| 2013 | 315,994 | 122,459 | 252,715 | 2,988,280 | 212,160 | 143,929 |
| 2014 | 318,301 | 123,229 | 258,027 | 3,025,656 | 214,092 | 146,305 |
| 2015 | 320,635 | 124,587 | 264,194 | 3,095,373 | 218,084 | 148,834 |
| 2016 | 322,941 | 125,819 | 270,566 | 3,174,408 | 221,712 | 151,436 |
| 2017 | 324,986 | 126,224 | 275,979 | 3,212,347 | 225,346 | 153,337 |
| 2018 | 326,688 | 127,586 | 281,499 | 3,240,327 | 227,558 | 155,761 |
| 2019 | 328,240 | 128,579 | 286,884 | 3,261,772 | 228,680 | 157,538 |
| <i>Average annual percentage change</i> | | | | | | |
| 1950-2019 | 1.1% | 1.6% | 2.8% | 2.9% | 1.9% | 1.4% |
| 2009-2019 | 0.7% | 0.9% | 1.4% | 1.0% | 0.9% | 1.2% |

Sources:

Resident population and civilian employed persons – U.S. Department of Commerce, Bureau of the Census, Online Data Retrieval, Washington, DC, 2020. (Additional resources: www.census.gov)

Vehicles in operation – IHS Automotive. Used with permission. FURTHER REPRODUCTION PROHIBITED. (Additional resources: <https://www.ihs.com/industry/automotive.html>)

Licensed drivers and vehicle-miles – U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2019*, Tables DL-20 and VM-1, and annual. (Additional resources: www.fhwa.dot.gov)

^a Estimates as of July 1. Includes Armed Forces in the United States.

In 2019, vehicles per capita reached a new high of 0.874. Vehicle-miles per capita were over 10,000 miles from 2004 to 2007 but were 9,937 miles in 2019. There were 1.821 vehicles for every employed civilian in the United States in 2019.

Table 9.2 (Updated April 2021)
Vehicles and Vehicle-Miles per Capita, 1950–2019^a

| Year | Vehicles per capita | Vehicles per household | Vehicles per licensed driver | Vehicles per civilian employed persons | Vehicle-miles per capita | Vehicle-miles per licensed driver |
|---|---------------------|------------------------|------------------------------|--|--------------------------|-----------------------------------|
| 1950 | 0.286 | 0.999 | 0.699 | 0.738 | 3,017 | 7,368 |
| 1955 | 0.343 | 1.181 | 0.757 | 0.909 | 3,669 | 8,109 |
| 1960 | 0.377 | 1.286 | 0.778 | 1.032 | 3,994 | 8,238 |
| 1965 | 0.424 | 1.429 | 0.833 | 1.154 | 4,588 | 9,013 |
| 1970 | 0.479 | 1.548 | 0.880 | 1.247 | 5,412 | 9,949 |
| 1975 | 0.556 | 1.688 | 0.925 | 1.398 | 6,147 | 10,229 |
| 1980 | 0.614 | 1.731 | 0.962 | 1.408 | 6,707 | 10,512 |
| 1985 | 0.659 | 1.810 | 1.001 | 1.466 | 7,443 | 11,314 |
| 1990 | 0.717 | 1.921 | 1.074 | 1.509 | 8,573 | 12,839 |
| 1995 | 0.726 | 1.954 | 1.095 | 1.549 | 9,089 | 13,716 |
| 1996 | 0.735 | 1.990 | 1.104 | 1.565 | 9,218 | 13,846 |
| 1997 | 0.737 | 1.990 | 1.100 | 1.552 | 9,387 | 14,021 |
| 1998 | 0.743 | 2.000 | 1.108 | 1.560 | 9,531 | 14,226 |
| 1999 | 0.750 | 2.017 | 1.119 | 1.569 | 9,635 | 14,378 |
| 2000 | 0.755 | 2.037 | 1.119 | 1.558 | 9,728 | 14,410 |
| 2001 | 0.759 | 2.002 | 1.133 | 1.582 | 9,804 | 14,624 |
| 2002 | 0.767 | 2.022 | 1.138 | 1.619 | 9,911 | 14,697 |
| 2003 | 0.777 | 2.030 | 1.151 | 1.640 | 9,939 | 14,735 |
| 2004 | 0.791 | 2.073 | 1.167 | 1.667 | 10,103 | 14,907 |
| 2005 | 0.805 | 2.103 | 1.189 | 1.682 | 10,093 | 14,906 |
| 2006 | 0.818 | 2.139 | 1.206 | 1.694 | 10,082 | 14,863 |
| 2007 | 0.824 | 2.144 | 1.209 | 1.703 | 10,037 | 14,733 |
| 2008 | 0.820 | 2.139 | 1.199 | 1.719 | 9,766 | 14,288 |
| 2009 | 0.810 | 2.125 | 1.188 | 1.780 | 9,617 | 14,105 |
| 2010 | 0.803 | 2.112 | 1.181 | 1.785 | 9,593 | 14,122 |
| 2011 | 0.799 | 2.097 | 1.175 | 1.780 | 9,470 | 13,925 |
| 2012 | 0.801 | 2.077 | 1.187 | 1.765 | 9,462 | 14,019 |
| 2013 | 0.800 | 2.064 | 1.191 | 1.756 | 9,457 | 14,085 |
| 2014 | 0.811 | 2.094 | 1.205 | 1.764 | 9,506 | 14,133 |
| 2015 | 0.824 | 2.100 | 1.211 | 1.775 | 9,654 | 14,193 |
| 2016 | 0.838 | 2.133 | 1.220 | 1.787 | 9,830 | 14,318 |
| 2017 | 0.849 | 2.186 | 1.225 | 1.800 | 9,885 | 14,255 |
| 2018 | 0.862 | 2.206 | 1.237 | 1.807 | 9,919 | 14,240 |
| 2019 | 0.874 | 2.231 | 1.255 | 1.821 | 9,937 | 14,263 |
| <i>Average annual percentage change</i> | | | | | | |
| 1950-2019 | 1.6% | 1.2% | 0.9% | 1.3% | 1.7% | 1.0% |
| 2009-2019 | 0.8% | 0.5% | 0.5% | 0.2% | 0.3% | 0.1% |

Sources:

Resident population and civilian employed persons – U.S. Department of Commerce, Bureau of the Census, Online Data Retrieval, Washington, DC, 2021. (Additional resources: www.census.gov)

Vehicles in operation – IHS Automotive. Used with permission. FURTHER REPRODUCTION PROHIBITED. (Additional resources: <https://www.ihs.com/industry/automotive.html>)

Vehicle-miles – U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2019*, Table VM-1 and annual. (Additional resources: www.fhwa.dot.gov)

^a Includes all vehicles (light and heavy).

In 1985 there was about one licensed driver for every vehicle in the United States. Since that time, there are more vehicles than licensed drivers. The average number of licensed drivers per household in 2019 was 1.779.

Table 9.3 (Updated April 2021)
Licensed Driver Statistics, 1950–2019^a

| Year | Licensed drivers per capita | Licensed drivers per capita 16 years old and up | Licensed drivers per household | Licensed drivers per vehicle | Licensed drivers per civilian employed persons |
|---|-----------------------------|---|--------------------------------|------------------------------|--|
| 1950 | 0.410 | ^b | 1.428 | 1.430 | 1.056 |
| 1955 | 0.452 | ^b | 1.560 | 1.321 | 1.201 |
| 1960 | 0.485 | ^b | 1.653 | 1.285 | 1.326 |
| 1965 | 0.509 | ^b | 1.715 | 1.200 | 1.386 |
| 1970 | 0.544 | ^b | 1.759 | 1.137 | 1.418 |
| 1975 | 0.601 | ^b | 1.825 | 1.081 | 1.512 |
| 1980 | 0.638 | ^b | 1.799 | 1.039 | 1.463 |
| 1985 | 0.658 | ^b | 1.807 | 0.999 | 1.464 |
| 1990 | 0.668 | 0.861 | 1.789 | 0.931 | 1.406 |
| 1991 | 0.667 | 0.870 | 1.792 | 0.931 | 1.436 |
| 1992 | 0.674 | 0.885 | 1.810 | 0.954 | 1.461 |
| 1993 | 0.665 | 0.877 | 1.796 | 0.929 | 1.440 |
| 1994 | 0.666 | 0.880 | 1.806 | 0.929 | 1.425 |
| 1995 | 0.663 | 0.878 | 1.784 | 0.913 | 1.414 |
| 1996 | 0.666 | 0.881 | 1.802 | 0.905 | 1.417 |
| 1997 | 0.669 | 0.888 | 1.809 | 0.909 | 1.410 |
| 1998 | 0.670 | 0.888 | 1.804 | 0.902 | 1.407 |
| 1999 | 0.670 | 0.890 | 1.802 | 0.893 | 1.402 |
| 2000 | 0.675 | 0.886 | 1.821 | 0.894 | 1.393 |
| 2001 | 0.670 | 0.868 | 1.768 | 0.883 | 1.397 |
| 2002 | 0.674 | 0.869 | 1.778 | 0.879 | 1.424 |
| 2003 | 0.675 | 0.868 | 1.763 | 0.868 | 1.424 |
| 2004 | 0.678 | 0.870 | 1.776 | 0.857 | 1.428 |
| 2005 | 0.677 | 0.867 | 1.769 | 0.841 | 1.415 |
| 2006 | 0.678 | 0.866 | 1.773 | 0.829 | 1.404 |
| 2007 | 0.681 | 0.870 | 1.773 | 0.827 | 1.409 |
| 2008 | 0.683 | 0.873 | 1.784 | 0.834 | 1.433 |
| 2009 | 0.682 | 0.870 | 1.789 | 0.842 | 1.499 |
| 2010 | 0.679 | 0.862 | 1.788 | 0.846 | 1.511 |
| 2011 | 0.680 | 0.860 | 1.785 | 0.851 | 1.515 |
| 2012 | 0.675 | 0.852 | 1.749 | 0.842 | 1.487 |
| 2013 | 0.671 | 0.846 | 1.732 | 0.840 | 1.474 |
| 2014 | 0.673 | 0.846 | 1.737 | 0.830 | 1.463 |
| 2015 | 0.680 | 0.854 | 1.750 | 0.825 | 1.465 |
| 2016 | 0.687 | 0.860 | 1.762 | 0.819 | 1.464 |
| 2017 | 0.693 | 0.867 | 1.785 | 0.817 | 1.470 |
| 2018 | 0.697 | 0.869 | 1.784 | 0.808 | 1.461 |
| 2019 | 0.697 | 0.868 | 1.779 | 0.797 | 1.452 |
| <i>Average annual percentage change</i> | | | | | |
| 1950-2019 | 0.8% | ^b | 0.3% | -0.8% | 0.5% |
| 2009-2019 | 0.2% | 0.0% | -0.1% | -0.5% | -0.3% |

Sources:

Resident population, population 16 years and older, and civilian employed persons – U.S. Department of Commerce, Bureau of the Census, Online Data Retrieval, Washington, DC, 2021. (Additional resources: www.census.gov)
Vehicles in operation – IHS Automotive. Used with permission. FURTHER REPRODUCTION PROHIBITED. (Additional resources: <https://www.ihs.com/industry/automotive.html>)

^a Includes all vehicles (light and heavy).

^b Data are not available.

Household vehicle ownership shows a dramatic increase from 1960 to 1990. In 1960, nearly 79% of households owned less than two vehicles; by 1990, it declined to 45%. Census data prior to 1990 indicated that the majority of households owned one vehicle; in 1990 that changed to two vehicles. Since 2000, less than 10% of households had no vehicles. The share of households with three or more vehicles peaked in 2018. The American Community Survey now collects these data on an annual basis, thus annual data are available after 2010.

Table 9.4 (Updated April 2021)
Household Vehicle Ownership, 1960–2019
 (percentage)

| | No vehicles | One vehicle | Two vehicles | Three or more vehicles |
|------|----------------|----------------|-----------------|------------------------------|
| 1960 | 21.5% | 56.9% | 19.0% | 2.5% |
| 1970 | 17.5% | 47.7% | 29.3% | 5.5% |
| 1980 | 12.9% | 35.5% | 34.0% | 17.5% |
| 1990 | 11.5% | 33.7% | 37.4% | 17.3% |
| 2000 | 9.4% | 33.8% | 38.6% | 18.3% |
| 2010 | 9.1% | 33.8% | 37.6% | 19.5% |
| 2011 | 9.3% | 34.1% | 37.5% | 19.1% |
| 2012 | 9.2% | 34.1% | 37.3% | 19.3% |
| 2013 | 9.1% | 33.9% | 37.3% | 19.7% |
| 2014 | 9.1% | 33.7% | 37.3% | 19.9% |
| 2015 | 8.9% | 33.5% | 37.2% | 20.3% |
| 2016 | 8.7% | 33.2% | 37.1% | 21.0% |
| 2017 | 8.6% | 32.7% | 37.3% | 21.5% |
| 2018 | 8.5% | 32.5% | 37.1% | 21.9% |
| 2019 | 8.6% | 32.7% | 37.2% | 21.4% |

Source:

U. S. Department of Transportation, Volpe National Transportation Systems Center, *Journey-to-Work Trends in the United States and its Major Metropolitan Area, 1960–1990*, Cambridge, MA, 1994, p. 2-2.

2000 data – U.S. Bureau of the Census, American Fact Finder, factfinder.census.gov, Table QT-04, August 2001.
 (Additional resources: www.census.gov)

2010-2019 data – U.S. Bureau of the Census, American Community Survey, 1-year estimates, Table CP04, 2020.

2017 National Household Travel Survey Daily Trip Data

The U. S. Department of Transportation (DOT) collected data on daily trips in 1969, 1977, 1983, 1990 and 1995 via the Nationwide Personal Transportation Survey (NPTS). For 2001, the DOT combined the collection of long trip and daily trip data into one survey – the 2001 National Household Travel Survey (NHTS). The long trip data were not included in the 2009 or 2017 NHTS.

The NHTS is the nation’s inventory of daily travel. The survey includes demographic characteristics of households, people, vehicles, and detailed information on daily travel for all purposes by all modes. NHTS survey data are collected from a sample of U.S. households and expanded to provide national estimates of trips and miles by travel mode, trip purpose, and a host of household attributes.

The NHTS was designed to continue the NPTS series, but as with all data surveys, caution should be used when comparing statistics from one survey to another due to changes in terminology, survey procedures, and target population. The NHTS surveys collected data on trips of children under 5 years of age, while the previous NPTS did not. Improved methodologies first used in the collection of trip information in the 1995 NPTS make it difficult to compare these data with past NPTS survey data. Thus, the 1990 NPTS trip data have been adjusted to make it comparable with the later surveys.

In the 2017 survey, households were able to respond online as well as by phone. The online survey included a mapping feature that allowed more accurate trip distances to be collected. These derived trip distances appear to be about 10% shorter than self-reported trips.

A vehicle trip in the NHTS is defined as a one-way trip by a single privately-operated vehicle regardless of the number of persons in the vehicle. A person trip is defined as a movement in the public space between two identifiable points. Two household members traveling together in one car would be counted as two person trips and one vehicle trip. Trips made in other highway vehicles, such as buses, streetcars, taxis (including Uber/Lyft), and school buses are collected in the NHTS, but these are shown as person trips by those modes because there is no way to trace movement of those vehicles throughout the day.

Table 9.5
Demographic Statistics from the 1969, 1977, 1983, 1990, 1995 NPTS and 2001, 2009, 2017 NHTS

| | 1969 | 1977 | 1983 | 1990 | 1995 | 2001 | 2009 | 2017 | Percent change 1969–2017 |
|-------------------------------------|------|------|------|------|------|------|------|------|-----------------------------|
| Persons per household | 3.16 | 2.83 | 2.69 | 2.56 | 2.63 | 2.58 | 2.50 | 2.55 | -19% |
| Vehicles per household | 1.16 | 1.59 | 1.68 | 1.77 | 1.78 | 1.89 | 1.87 | 1.87 | 61% |
| Workers per household | 1.21 | 1.23 | 1.21 | 1.27 | 1.33 | 1.35 | 1.34 | 1.33 | 10% |
| Licensed drivers per household | 1.65 | 1.69 | 1.72 | 1.75 | 1.78 | 1.77 | 1.88 | 1.89 | 14% |
| Vehicles per worker | 0.96 | 1.29 | 1.39 | 1.40 | 1.34 | 1.39 | 1.40 | 1.41 | 47% |
| Vehicles per licensed driver | 0.70 | 0.94 | 0.98 | 1.01 | 1.00 | 1.06 | 1.00 | 0.99 | 42% |
| Average vehicle trip length (miles) | 8.89 | 8.34 | 7.90 | 8.98 | 9.06 | 9.87 | 9.72 | 9.55 | 7% |

Note: Average vehicle trip length for 1990 and 1995 is calculated using only those records with trip mileage information present. The 1969 survey does not include pickups and other light trucks as household vehicles. Data on vehicles per household and licensed drivers per household will not match Table 9.2 and 8.3 because they come from a different source.

Sources:

U.S. Department of Transportation, Federal Highway Administration, *1990 Nationwide Personal Transportation Survey: Summary of Travel Trends*, FHWA-PL-92-027, Washington, DC, March 1992, Table 2. Data for 1995, 2001, 2009, and 2017 were generated from the 2017 National Household Travel Survey website nhts.ornl.gov. (Additional resources: www.fhwa.dot.gov)

Due to methodology improvements in collecting trip information, the 2001 and 1995 data should be compared only to the 1990 adjusted data. The original 1990 data are comparable to all previous surveys; however, comparisons should always be made with caution because of differing survey methodologies.

Table 9.6
Average Annual Vehicle-Miles, Vehicle Trips, and Trip Length per Household
1969, 1977, 1983, 1990, 1995 NPTS and 2001, 2009, 2017 NHTS

| | Journey-to-work ^a | All trips |
|---|------------------------------|-----------|
| <i>Average annual vehicle-miles per household</i> | | |
| 1969 | 4,183 | 12,423 |
| 1977 | 3,815 | 12,036 |
| 1983 | 3,538 | 11,739 |
| 1990 original | 4,853 | 15,100 |
| 1990 adjusted | 4,853 | 18,161 |
| 1995 | 6,492 | 20,895 |
| 2001 | 5,724 | 21,171 |
| 2009 | 5,513 | 19,850 |
| 2017 | 5,379 | 20,629 |
| <i>Average annual vehicle trips per household</i> | | |
| 1969 | 445 | 1,396 |
| 1977 | 423 | 1,442 |
| 1983 | 414 | 1,486 |
| 1990 original | 448 | 1,702 |
| 1990 adjusted | 448 | 2,077 |
| 1995 | 553 | 2,321 |
| 2001 | 479 | 2,171 |
| 2009 | 457 | 2,068 |
| 2017 | 450 | 1,865 |
| <i>Average vehicle trip length (miles)</i> | | |
| 1969 | 9.4 | 8.9 |
| 1977 | 9.0 | 8.4 |
| 1983 | 8.5 | 7.9 |
| 1990 original | 11.0 | 9.0 |
| 1990 adjusted | 11.0 | 8.9 |
| 1995 | 11.8 | 9.1 |
| 2001 | 12.2 | 9.9 |
| 2009 | 12.2 | 9.7 |
| 2017 | 12.0 | 9.6 |

Note: A vehicle trip is defined as one start and end movement from location to location in a single privately-operated vehicle regardless of the number of persons in the vehicle. The 2017 survey featured some online trip mapping which collected more accurate trip distances. The derived distances appear to be about 10% shorter than self-reported trips.

Sources:

U.S. Department of Transportation, Federal Highway Administration, *1990 Nationwide Personal Transportation Survey: Summary of Travel Trends*, FHWA-PL-92-027, Washington, DC, March 1992, Table 7. 1990 adjusted data – Oak Ridge National Laboratory, Oak Ridge, TN, August 1998. 1995 NPTS, 2001, 2009, 2017 NHTS data were generated from the 2017 National Household Travel Survey website nhts.ornl.gov. (Additional resources: www.fhwa.dot.gov, nhts.ornl.gov)

^a It is believed that the methodology changes in the 1995 NPTS did not affect journey-to-work trips; therefore, no adjustment is necessary.

The number of drivers in a household makes a difference in vehicle miles of travel (vmt), as does the presence of children in the household. Households with children have 64% more vmt than households without children in 2017. Rural households have more vehicles, on average, than urban households.

Table 9.7
Average Number of Vehicles and Vehicle Travel per Household,
1990 NPTS and 2001, 2009, and 2017 NHTS

| Number of licensed drivers | Average number of vehicles per household | | | | Average vehicle-miles traveled per household ^a | | | |
|-------------------------------|--|------------|------------|------------|---|---------------|---------------|---------------|
| | 1990 | 2001 | 2009 | 2017 | 1990 | 2001 | 2009 | 2017 |
| 1 | 1.5 | 1.2 | 1.1 | 1.2 | 15,200 | 9,700 | 8,800 | 11,700 |
| 2 | 2.1 | 2.2 | 2.2 | 2.2 | 22,900 | 25,800 | 23,500 | 24,500 |
| 3 | 2.9 | 3.0 | 3.0 | 3.1 | 29,400 | 37,900 | 37,700 | 35,900 |
| 4 or more | 3.8 | 3.8 | 3.9 | 4.1 | 40,500 | 47,200 | 55,200 | 48,400 |
| Household size | | | | | | | | |
| 1 person | 1.2 | 1.0 | 1.0 | 1.0 | 11,400 | 7,500 | 7,100 | 9,300 |
| 2 persons | 1.9 | 2.0 | 2.0 | 2.0 | 19,300 | 21,200 | 17,500 | 20,100 |
| 3 persons | 2.2 | 2.3 | 2.3 | 2.3 | 23,700 | 28,400 | 27,900 | 26,800 |
| 4 persons | 2.4 | 2.4 | 2.4 | 2.5 | 25,300 | 28,600 | 33,200 | 30,000 |
| 5 persons | 2.4 | 2.4 | 2.4 | 2.6 | 24,900 | 33,200 | 33,700 | 32,500 |
| 6 or more persons | 2.7 | 2.5 | 2.4 | 2.7 | 29,200 | 33,800 | 33,600 | 34,400 |
| Household urban status | | | | | | | | |
| Urban | 1.9 | 1.8 | 1.7 | 1.8 | 19,000 | 19,300 | 17,600 | 19,200 |
| Rural | 2.1 | 2.3 | 2.4 | 2.5 | 22,200 | 28,400 | 27,700 | 27,100 |
| Household composition | | | | | | | | |
| With children | 2.2 | 2.2 | 2.2 | 2.2 | 24,100 | 28,300 | 30,400 | 27,800 |
| Without children | 1.8 | 1.7 | 1.7 | 1.7 | 17,600 | 16,700 | 14,400 | 17,100 |
| All households | 1.8 | 1.9 | 1.9 | 1.9 | 18,300 | 21,200 | 19,900 | 20,600 |

Note: The 2017 survey featured some online trip mapping which collected more accurate trip distances. The derived distances appear to be about 10% shorter than self-reported trips.

Source:

Generated from the U.S. Department of Transportation, Federal Highway Administration, Nationwide Personal Transportation Survey Public Use Files, Washington, DC, 2000 and the 2017 National Household Travel Survey website nhts.ornl.gov. (Additional resources: nhts.ornl.gov)

^a Average vehicle-miles traveled per household is the total movement in miles of all privately operated vehicles, regardless of the number of people in the vehicle, divided by the total number of households in the survey.

In 2017, 24% of vehicle trips were traveling to and from work. Another 20% of trips were for shopping which is down slightly from 2001. Shopping is done close to home, as the average trip length for shopping was only seven miles.

Table 9.8
Trip Statistics^a by Trip Purpose, 2001 and 2017 NHTS

| Trip purpose | Share of trips | | Share of vehicle-miles traveled | | Trip length (miles) | | Trip length (minutes) | |
|--------------------------------|----------------|--------|---------------------------------|--------|---------------------|------|-----------------------|------|
| | 2001 | 2017 | 2001 | 2017 | 2001 | 2017 | 2001 | 2017 |
| To/from work | 22.1% | 24.1% | 27.0% | 30.2% | 12.1 | 12.0 | 22.3 | 25.0 |
| Work-related business | 4.1% | 2.0% | 8.4% | 3.2% | 20.3 | 15.2 | 30.9 | 28.1 |
| Shopping | 21.1% | 19.9% | 14.5% | 14.7% | 6.7 | 7.0 | 14.4 | 16.1 |
| Other family/personal business | 24.7% | 20.9% | 18.7% | 14.3% | 7.5 | 6.6 | 15.2 | 16.1 |
| School/church | 4.9% | 5.2% | 3.7% | 5.4% | 7.5 | 9.9 | 15.8 | 20.2 |
| Medical/dental | 2.2% | 2.4% | 2.2% | 2.4% | 9.9 | 9.5 | 20.7 | 23.1 |
| Visit friends/relatives | 6.3% | 5.7% | 9.4% | 8.8% | 14.9 | 14.6 | 24.4 | 26.8 |
| Other social/recreational | 13.7% | 15.8% | 13.2% | 14.6% | 9.6 | 8.8 | 18.2 | 19.4 |
| Other | 0.5% | 3.8% | 1.0% | 6.4% | 18.1 | 16.0 | 31.4 | 31.1 |
| All | 100.0% | 100.0% | 100.0% | 100.0% | 9.9 | 9.6 | 18.7 | 20.6 |

Note: The "All" category for average trip length and duration includes records for which trip purpose was not identified. The 2017 survey featured some online trip mapping which collected more accurate trip distances. The derived distances appear to be about 10% shorter than self-reported trips.

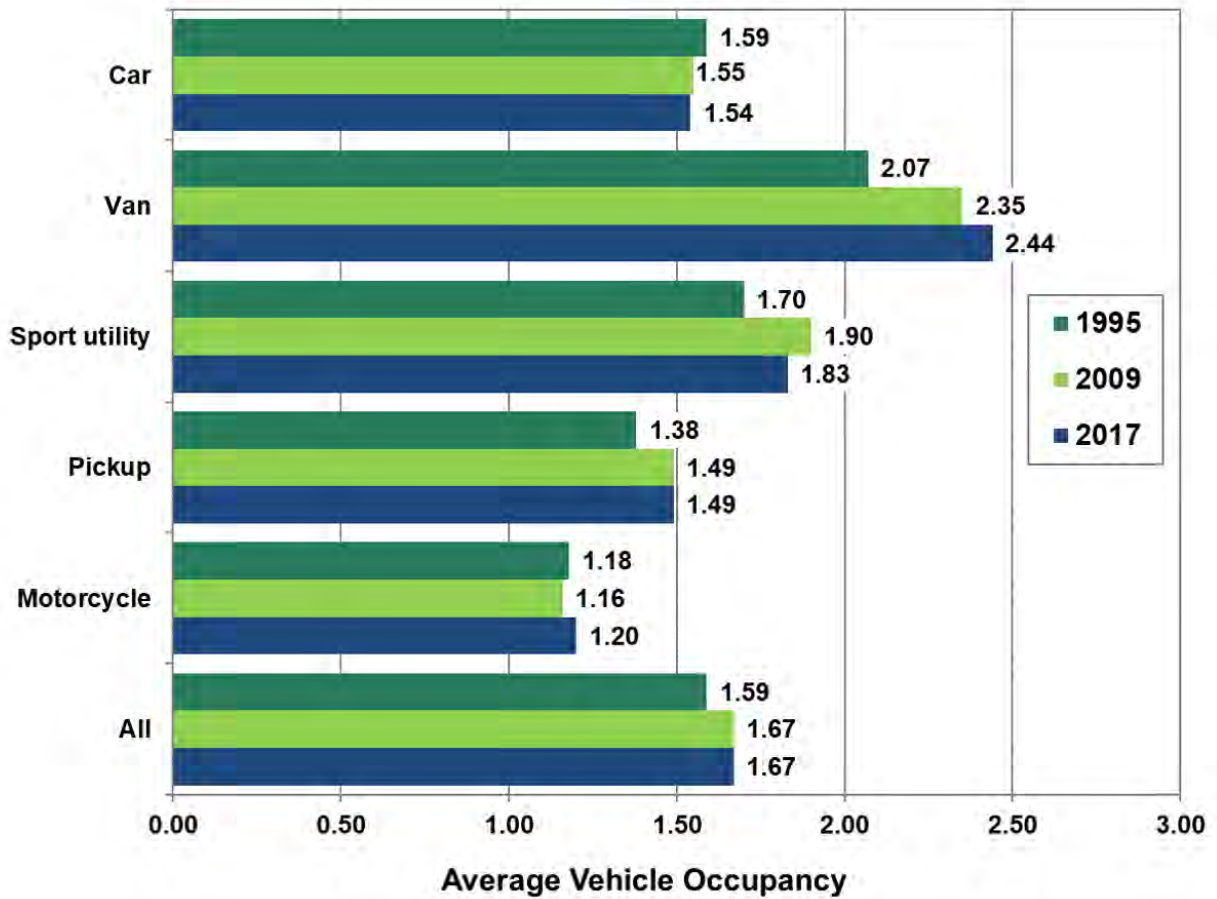
Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

^a Percentages may not sum to totals due to rounding.

Overall, household vehicle occupancy remained the same in 2017 as in 2009. Sport utility vehicle occupancy declined from 1.90 to 1.83 from 2009 to 2017, while pickup truck occupancy stayed the same. Car occupancy was nearly the same in those years as well.

Figure 9.1. Average Household Vehicle Occupancy by Vehicle Type, 1995 NPTS and 2009, 2017 NHTS



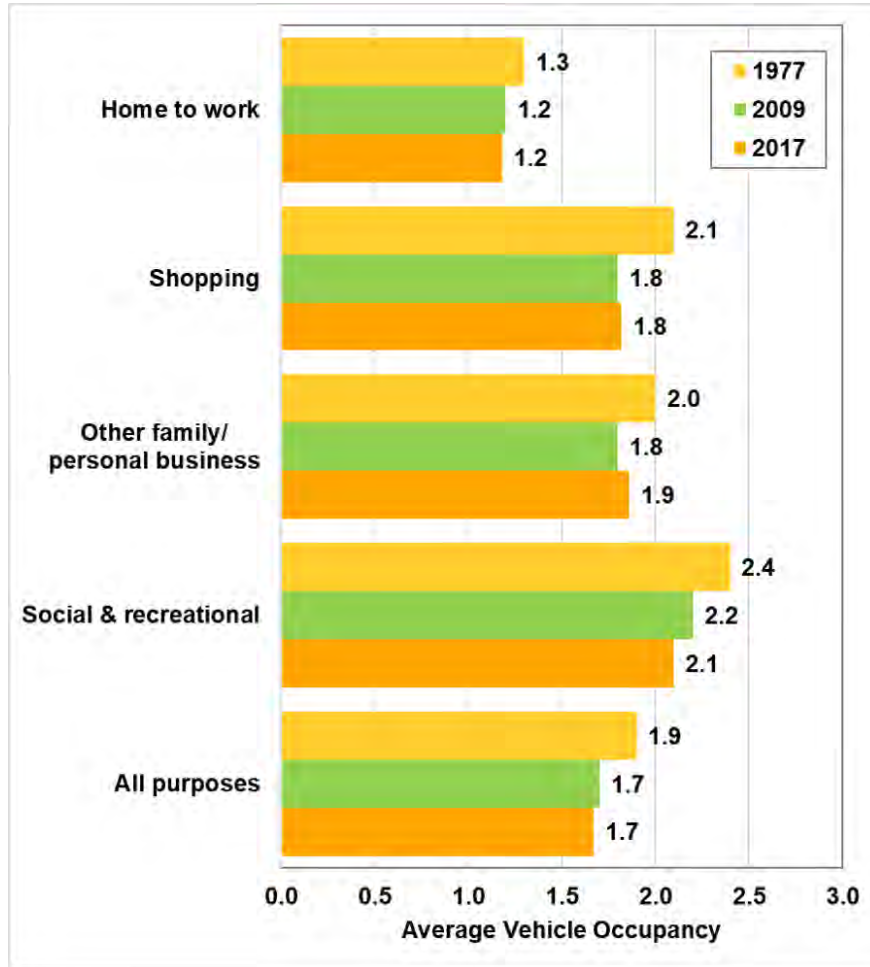
Note: Average vehicle occupancy is mileage-weighted and only includes privately operated household vehicles.

Sources:

Generated from the U. S. Department of Transportation, Federal Highway Administration, Nationwide Personal Transportation Survey Public Use Files, Washington, DC, 2000 and the 2017 National Household Travel Survey website nhts.ornl.gov. (Additional resources: nhts.ornl.gov)

The average vehicle occupancy, calculated as person-miles per vehicle-mile, is highest for social and recreational purposes. The highest vehicle occupancy levels for all purposes were in 1977. The increase in number of vehicles per household and the decrease in average household size could have contributed to the decline since then.

Figure 9.2. Average Household Vehicle Occupancy by Trip Purpose, 1977 NPTS and 2009, 2017 NHTS



Note: Average vehicle occupancy is mileage-weighted and only includes privately operated household vehicles. The “All purposes” category includes other purposes not shown above, such as trips to school, church, doctor, dentist, and work-related business.

Sources:

U.S. Department of Transportation, Federal Highway Administration, *1990 Nationwide Personal Transportation Survey: Summary of Travel Trends*, FHWA-PL-92027, Washington, DC, March 1992, Figure 6. Data from 2009 and 2017 NHTS were generated from the 2017 National Household Travel Survey website nhts.ornl.gov. (Additional resources: www.fhwa.dot.gov, nhts.ornl.gov)

The 1990 household survey reports the highest average annual miles per vehicle and the 2017 survey reports the lowest. These data show that younger vehicles are typically driven more miles than older vehicles.

Table 9.9
Average Annual Miles per Household Vehicle by Vehicle Age,
1983, 1990, 1995 NPTS and 2001, 2009, 2017 NHTS

| Vehicle age (years) | 1983 self-reported | 1990 self-reported | 1995 self-reported | 2001 self-reported | 2009 self-reported | 2017 self-reported |
|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Under 1 | 8,200 | 19,600 | 15,900 | 15,500 | 13,200 | 13,000 |
| 1 | 15,200 | 16,800 | 16,800 | 14,300 | 14,600 | 14,000 |
| 2 | 16,800 | 16,600 | 15,500 | 14,000 | 13,900 | 14,200 |
| 3 | 14,500 | 14,700 | 14,400 | 13,100 | 12,700 | 12,400 |
| 4 | 13,000 | 13,600 | 14,100 | 12,500 | 12,600 | 12,900 |
| 5 | 12,100 | 12,900 | 13,500 | 12,000 | 12,800 | 13,100 |
| 6 | 11,300 | 13,200 | 13,200 | 11,800 | 12,100 | 12,400 |
| 7 | 10,000 | 12,400 | 12,800 | 11,600 | 11,900 | 12,300 |
| 8 | 9,800 | 12,600 | 12,200 | 10,900 | 11,500 | 11,400 |
| 9 | 9,000 | 11,500 | 12,200 | 10,800 | 11,300 | 12,000 |
| 10 and older | 7,300 | 9,200 | 8,900 | 7,400 | 9,300 | 9,400 |
| All household vehicles | 10,400 | 12,500 | 12,200 | 11,100 | 11,300 | 11,200 |

Note: Data include all household vehicles and have been rounded to the nearest hundred. The 2017 survey featured some online trip mapping which collected more accurate trip distances. The derived distances appear to be about 10% shorter than self-reported trips.

Sources:

Nationwide Personal Transportation Study—1983: D. Klinger and J. Richard Kuzmyak, COMSIS Corporation, *Personal Travel in the United States, Volume 1: 1983–84 Nationwide Personal Travel Study*, prepared for the U.S. Department of Transportation, Washington, DC, August 1986, Table 4-22, p. 4-21. 1990: Generated from the *1990 Nationwide Personal Transportation Study Public Use Tape*, March 1992. 1995, 2001, 2009, and 2017: Generated from the 2017 National Household Travel Survey website nhts.ornl.gov. (Additional resources: nhts.ornl.gov)

Historically, the data from the Nationwide Personal Transportation Survey (NPTS) are based on estimates reported by survey respondents. For the 1995 NPTS and the 2001 National Household Travel Survey (NHTS), odometer data were also collected. The 1995 data indicate that respondents overestimate the number of miles they drive in a year, but the 2001 data do not show that same trend.

Table 9.10
Self-Reported vs. Odometer Average Annual Miles, 1995 NPTS and 2001 NHTS

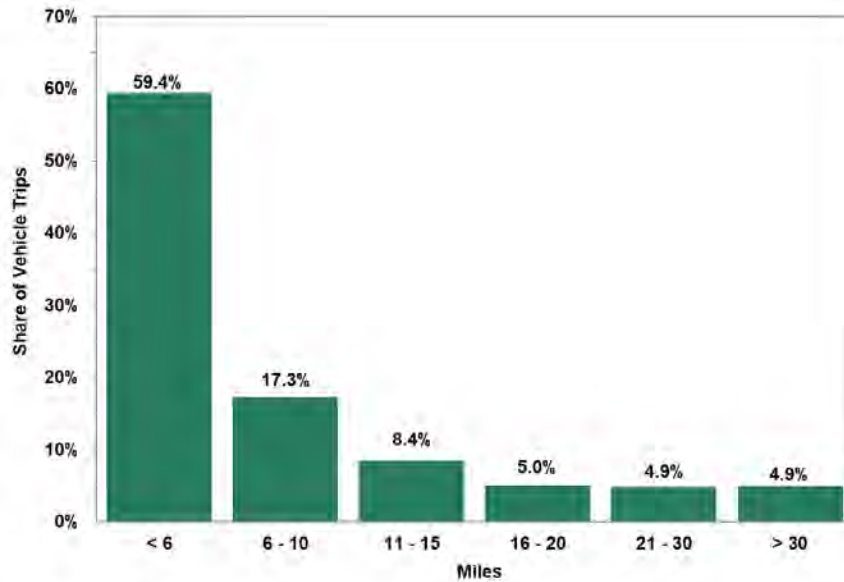
| Vehicle age (years) | 1995 self-reported | 1995 odometer | 2001 self-reported | 2001 odometer |
|---------------------------|-----------------------|------------------|-----------------------|------------------|
| Under 1 | 15,900 | 15,600 | 15,500 | 14,500 |
| 1 | 16,800 | 14,500 | 14,300 | 14,200 |
| 2 | 15,500 | 14,800 | 14,000 | 13,700 |
| 3 | 14,400 | 13,800 | 13,100 | 14,100 |
| 4 | 14,100 | 12,900 | 12,500 | 13,400 |
| 5 | 13,500 | 12,700 | 12,000 | 12,900 |
| 6 | 13,200 | 12,400 | 11,800 | 12,400 |
| 7 | 12,800 | 11,600 | 11,600 | 12,100 |
| 8 | 12,200 | 11,300 | 10,900 | 11,300 |
| 9 | 12,200 | 11,200 | 10,800 | 10,500 |
| 10 and older | 8,900 | 9,000 | 7,400 | 8,100 |
| All household vehicles | 12,200 | 11,800 | 11,000 | 11,800 |

Note: The 2009 NHTS did not collect similar data. Survey methodology on odometer reading data differs from 1995 to 2001 data.

Source:

Generated from the 2009 National Household Travel Survey website nhts.ornl.gov and 2001 NHTS public use file.

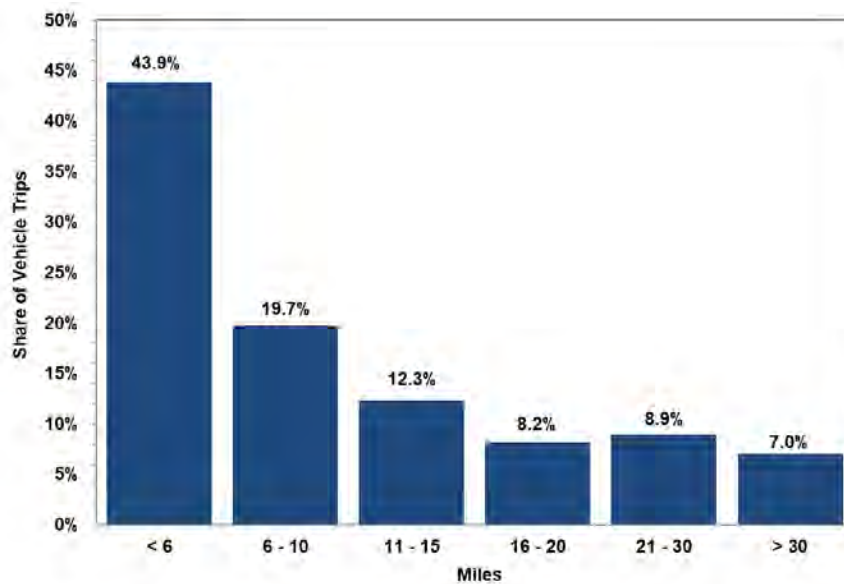
Figure 9.3. Share of Vehicle Trips by Trip Distance, 2017 NHTS



Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

Figure 9.4. Share of Vehicle Trips to Work by Trip Distance, 2017 NHTS



Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

Fifteen percent of new vehicles (1-year-old and under) travel over 20,000 miles per year. Seventy-five percent of the vehicles over 20 years old travel less than 4,000 miles in a year.

Table 9.11
Share of Vehicles by Annual Miles of Travel and Vehicle Age, 2017 NHTS

| Annual vehicle miles of travel | Vehicle age (years) | | | | | | |
|--------------------------------|---------------------|------|------|-------|-------|---------|------|
| | 1 and under | 2 | 3 | 4 | 5 | 6 | 7 |
| < 1,000 miles | 2% | 2% | 2% | 3% | 3% | 3% | 3% |
| 1 - 2,000 miles | 2% | 2% | 3% | 3% | 2% | 3% | 3% |
| 2 - 4,000 miles | 7% | 8% | 7% | 6% | 7% | 7% | 7% |
| 4 - 6,000 miles | 9% | 11% | 11% | 8% | 8% | 9% | 10% |
| 6 - 8,000 miles | 10% | 10% | 11% | 10% | 11% | 11% | 11% |
| 8 - 10,000 miles | 11% | 13% | 12% | 12% | 13% | 12% | 13% |
| 10 - 12,000 miles | 11% | 11% | 12% | 11% | 12% | 12% | 12% |
| 12 - 15,000 miles | 14% | 13% | 15% | 15% | 13% | 15% | 14% |
| 15 - 20,000 miles | 15% | 15% | 14% | 17% | 16% | 13% | 14% |
| 20 - 30,000 miles | 13% | 10% | 11% | 11% | 12% | 11% | 9% |
| >30,000 miles | 6% | 5% | 3% | 4% | 4% | 4% | 4% |
| All | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| | Vehicle age (years) | | | | | | |
| | 8 | 9 | 10 | 11-15 | 16-20 | Over 20 | |
| < 1,000 miles | 5% | 4% | 4% | 6% | 9% | 16% | |
| 1 - 2,000 miles | 3% | 3% | 4% | 5% | 8% | 10% | |
| 2 - 4,000 miles | 9% | 9% | 8% | 12% | 15% | 17% | |
| 4 - 6,000 miles | 10% | 12% | 11% | 13% | 16% | 16% | |
| 6 - 8,000 miles | 13% | 12% | 12% | 13% | 13% | 11% | |
| 8 - 10,000 miles | 12% | 11% | 12% | 12% | 10% | 8% | |
| 10 - 12,000 miles | 10% | 11% | 10% | 10% | 8% | 6% | |
| 12 - 15,000 miles | 13% | 13% | 13% | 11% | 7% | 5% | |
| 15 - 20,000 miles | 12% | 13% | 12% | 10% | 7% | 5% | |
| 20 - 30,000 miles | 9% | 9% | 10% | 6% | 5% | 4% | |
| >30,000 miles | 3% | 4% | 3% | 3% | 2% | 1% | |
| All | 100% | 100% | 100% | 100% | 100% | 100% | |

Source:

Generated from the 2017 National Household Travel Survey website [nhts.ornl.gov](https://www.nhts.gov). (Additional resources: [nhts.ornl.gov](https://www.nhts.gov))

The average driver made 2.7 trips per day with an average of 9.6 miles for each trip in 2017.

Table 9.12
Household Vehicle Trips, 1990, 1995 NPTS and 2001, 2009, 2017 NHTS

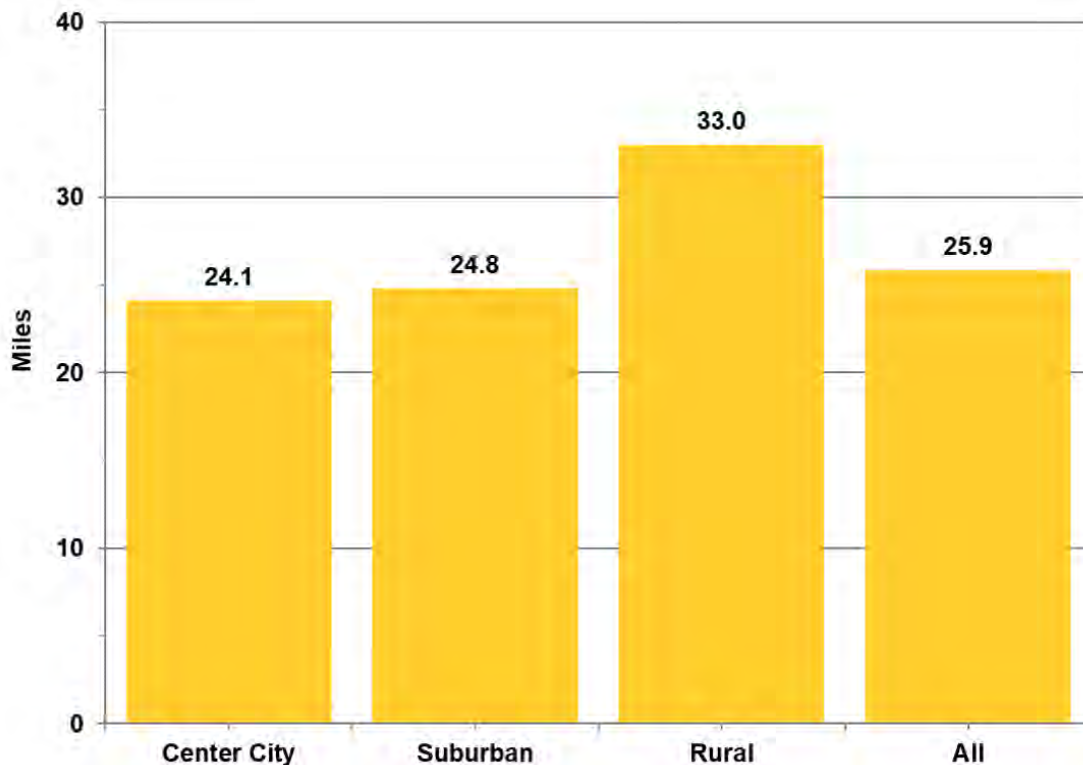
| | Number of daily vehicle trips (per driver) | Average vehicle trip length (miles) | Daily vehicle miles of travel (per driver) |
|------|--|-------------------------------------|--|
| 1990 | 3.3 | 8.9 | 28.5 |
| 1995 | 3.6 | 9.1 | 32.1 |
| 2001 | 3.4 | 9.9 | 32.7 |
| 2009 | 3.0 | 9.7 | 29.0 |
| 2017 | 2.7 | 9.6 | 25.9 |

Note: The 2017 survey featured some online trip mapping which collected more accurate trip distances. The derived distances appear to be about 10% shorter than self-reported trips.

Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

Figure 9.5. Average Daily Miles Driven (per Driver), 2017 NHTS



Note: Center city = urban area; suburban = urban cluster and area surrounded by urban areas; rural = not in urban area.

Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

Table 9.13
Daily Vehicle Miles of Travel (per Vehicle) by Number of Vehicles
in the Household, 2001, 2009, and 2017 NHTS

| Number of household vehicles | Daily miles per vehicle | | |
|------------------------------|-------------------------|------|------|
| | 2001 | 2009 | 2017 |
| 1 | 25.6 | 29.1 | 30.9 |
| 2 | 27.5 | 32.7 | 32.2 |
| 3 | 24.2 | 31.3 | 30.6 |
| 4 | 23.0 | 30.2 | 28.3 |
| 5 | 21.1 | 27.6 | 27.4 |
| More than 5 | 18.4 | 27.2 | 24.7 |
| All | 25.2 | 31.1 | 30.5 |

Note: The 2017 survey featured some online trip mapping which collected more accurate trip distances. The derived distances appear to be about 10% shorter than self-reported trips.

Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

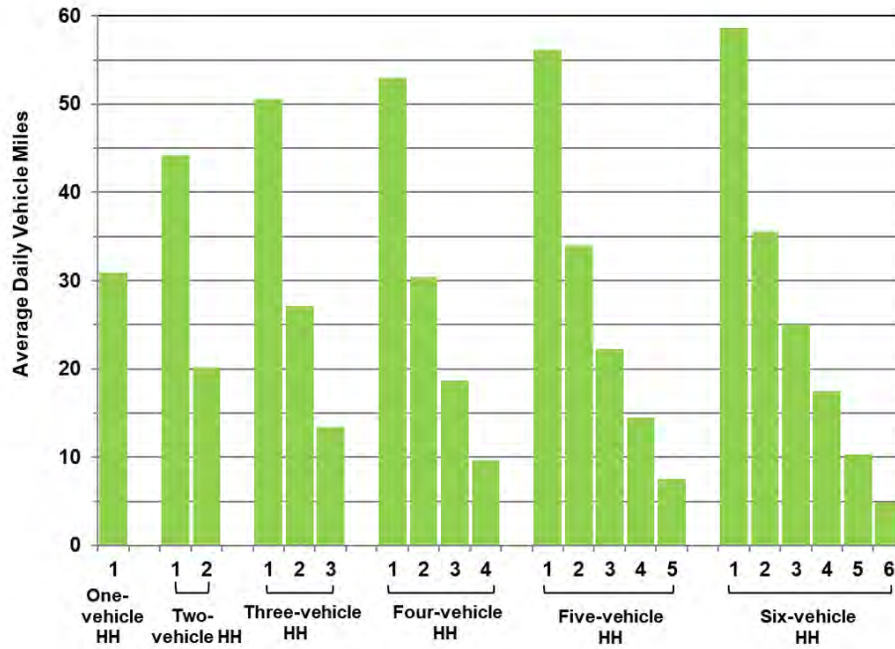
Table 9.14
Daily and Annual Vehicle Miles of Travel and Average Age for
Each Vehicle in a Household, 2017 NHTS

| Vehicle number | Average daily miles | Average annual miles | Average age (years) |
|-------------------------|---------------------|----------------------|---------------------|
| One-vehicle household | | | |
| 1 | 31.0 | 11,300 | 9.3 |
| Two-vehicle household | | | |
| 1 | 44.1 | 16,100 | 8.2 |
| 2 | 20.3 | 7,400 | 9.8 |
| Three-vehicle household | | | |
| 1 | 50.7 | 18,500 | 9.0 |
| 2 | 27.1 | 9,900 | 10.3 |
| 3 | 13.4 | 4,900 | 13.1 |
| Four-vehicle household | | | |
| 1 | 52.9 | 19,300 | 9.6 |
| 2 | 30.4 | 11,100 | 11.0 |
| 3 | 18.6 | 6,800 | 12.4 |
| 4 | 9.6 | 3,500 | 14.9 |
| Five-vehicle household | | | |
| 1 | 56.2 | 20,500 | 9.9 |
| 2 | 34.0 | 12,400 | 11.6 |
| 3 | 22.2 | 8,100 | 13.3 |
| 4 | 14.5 | 5,300 | 14.2 |
| 5 | 7.7 | 2,800 | 15.9 |
| Six-vehicle household | | | |
| 1 | 58.6 | 21,400 | 10.6 |
| 2 | 35.6 | 13,000 | 12.0 |
| 3 | 24.9 | 9,100 | 13.4 |
| 4 | 17.5 | 6,400 | 15.7 |
| 5 | 10.4 | 3,800 | 16.9 |
| 6 | 4.9 | 1,800 | 18.0 |

Source:

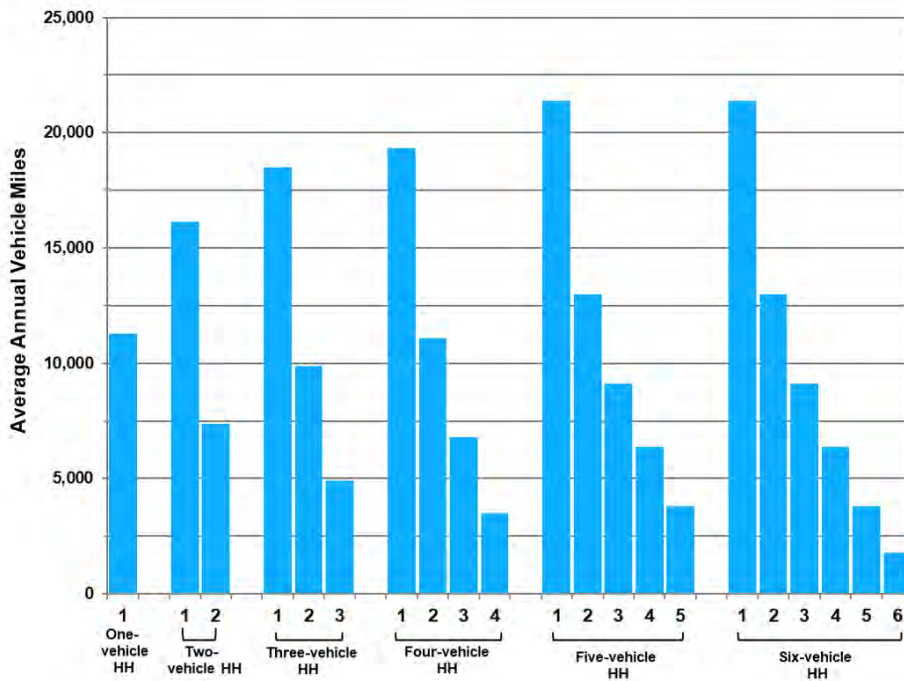
Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

Figure 9.6. Daily Vehicle Miles of Travel for Each Vehicle in a Household, 2017 NHTS



Source:
Generated from the 2017 National Household Travel Survey website [nhts.ornl.gov](https://www.nhts.gov).

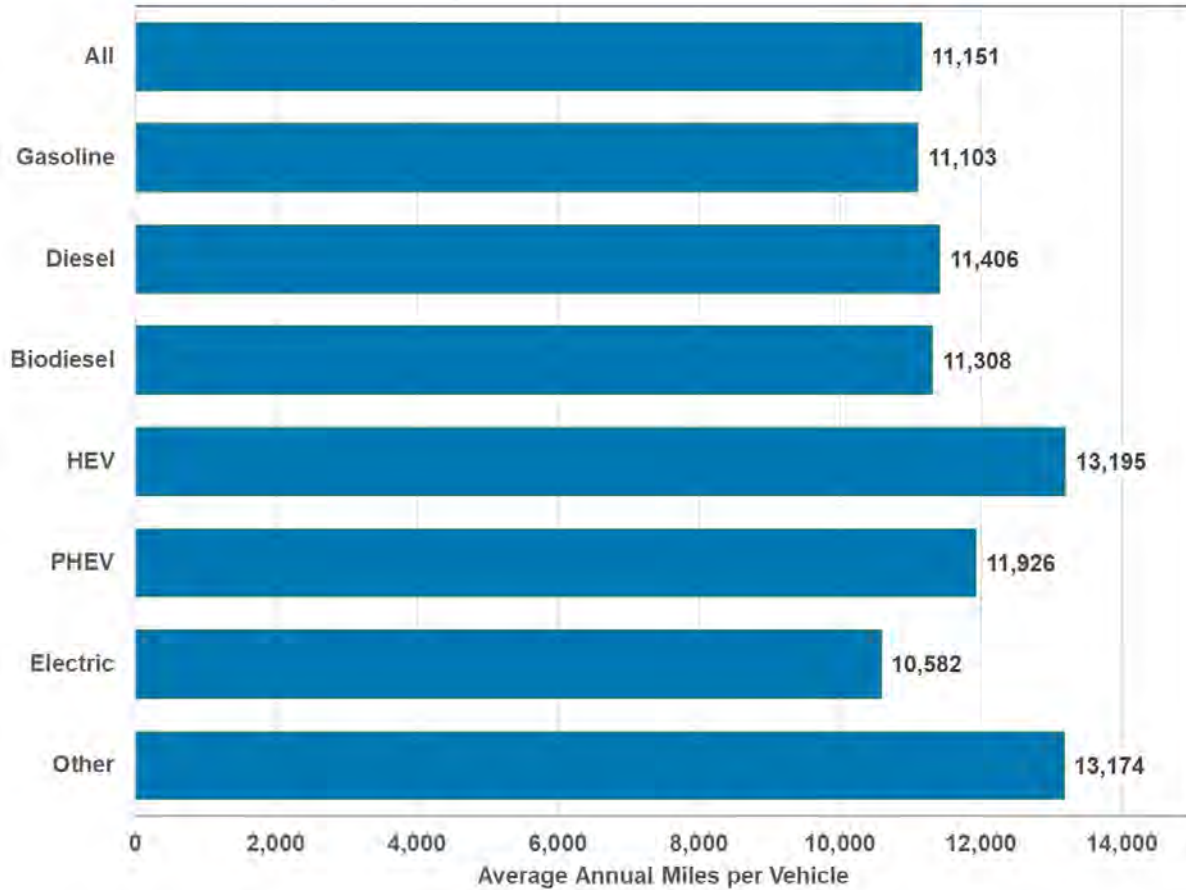
Figure 9.7. Annual Vehicle Miles of Travel for Each Vehicle in a Household, 2017 NHTS



Source:
Generated from the 2017 National Household Travel Survey website [nhts.ornl.gov](https://www.nhts.gov).

Household vehicles fueled with gasoline were driven an average of 11,103 miles in 2017, while electric vehicles were driven an average of 10,582.

Figure 9.8. Annual Vehicle Miles of Travel by Fuel Type, 2017 NHTS



Note: HEV = hybrid-electric vehicle. PHEV = plug-in hybrid vehicle. Includes household vehicles only.

Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

Table 9.15
Characteristics of U.S. Daily per Vehicle Driving by Housing Density, 2017 NHTS

| Housing units per square mile ^a | Share of vehicles in density type | Hours per vehicle per day | Average vehicle speed (miles/hour) | Miles per vehicle per day |
|--|-----------------------------------|---------------------------|------------------------------------|---------------------------|
| 0–99 | 21.5% | 0.79 | 34.1 | 26.8 |
| 100–499 | 19.7% | 0.87 | 31.0 | 27.1 |
| 500–999 | 14.1% | 0.90 | 29.1 | 26.0 |
| 1,000–1,999 | 19.8% | 0.96 | 26.1 | 25.0 |
| 2,000–3,999 | 16.3% | 1.05 | 24.0 | 25.3 |
| 4,000–9,999 | 6.3% | 1.14 | 22.2 | 25.2 |
| 10,000–24,999 | 1.8% | 1.31 | 16.7 | 21.8 |
| 25,000–999,999 | 0.6% | 1.14 | 16.9 | 19.2 |
| All | 100.0% | 0.93 | 27.9 | 25.9 |

Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

Table 9.16
Housing Unit Characteristics, 2017

| | Share of occupied housing units | Percent with garage or carport |
|---|---------------------------------|--------------------------------|
| Housing unit age | | |
| New construction (< 2 years) | 0.7% | 74.0% |
| New construction (2-5 years) | 4.2% | 71.8% |
| Older construction (6+ years) | 95.1% | 65.3% |
| Housing unit structure | | |
| Single-unit dwelling | 70.6% | 80.3% |
| Multi-unit dwelling | 23.9% | 29.0% |
| Manufactured/mobile homes | 5.5% | 37.2% |
| Other | 0.1% | 20.0% |
| Housing unit geographic location (Census Region) | | |
| Northeast | 18.0% | 52.1% |
| Midwest | 22.0% | 74.5% |
| South | 37.5% | 59.2% |
| West | 22.5% | 78.6% |
| Housing unit tenure | | |
| Owner | 63.8% | 80.6% |
| Renter | 36.2% | 39.2% |
| All occupied units | 121,200,000 units | 65.6% |

Note: The American Housing Survey is updated every two years.

Source:

U.S. Bureau of the Census, *2017 American Housing Survey*, Table Creator, accessed September 23, 2018. (Additional information: www.census.gov/programs-surveys/ahs)

^a Housing units per square mile in the census block group of the household's home location.

Trips to and from work by 21 different modes averaged 11.45 miles and 26.58 minutes in 2017. Sixty-two percent of workers traveled less than 30 minutes to work in 2019.

Table 9.17
Average Length and Duration of Trips To and From Work by Mode, 2017 NHTS

| Mode | Trip Length (miles) | Trip Duration (minutes) |
|--|---------------------|-------------------------|
| Walk | 1.19 | 15.26 |
| Bicycle | 2.72 | 21.79 |
| Car | 12.21 | 25.47 |
| SUV | 10.76 | 23.79 |
| Van | 10.73 | 23.33 |
| Pickup truck | 12.60 | 25.97 |
| Golf cart / Segway | 0.39 | 5.00 |
| Motorcycle / Moped | 10.12 | 22.53 |
| RV (motor home, ATV, snowmobile) | 5.37 | 16.19 |
| School bus | 5.78 | 36.03 |
| Public or commuter bus | 10.35 | 56.97 |
| Paratransit / Dial-a-ride | 8.63 | 41.51 |
| Private / Charter / Tour / Shuttle bus | 19.32 | 50.94 |
| City-to-city bus (Greyhound, Megabus) | 58.97 | 117.86 |
| Amtrak / Commuter rail | 25.57 | 78.13 |
| Subway / elevated / light rail / streetcar | 9.90 | 53.41 |
| Taxi / limo (including Uber / Lyft) | 5.91 | 22.54 |
| Rental car (including Zipcar / Car2Go) | 15.68 | 26.22 |
| Airplane | 718.69 | 134.83 |
| Boat / ferry / water taxi | 11.64 | 55.34 |
| Something else | 37.79 | 52.99 |
| All | 11.45 | 26.58 |

Note: A trip is defined as a movement in the public space between two identifiable points.

Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

Table 9.18 (Updated April 2021)
Workers by Commute Time, 1990, 2000, 2010, and 2019

| Commute time (one-way) | 1990 | 2000 | 2010 | 2019 |
|-------------------------------|-------|-------|-------|-------|
| Less than 15 minutes | 32.5% | 29.4% | 28.6% | 25.5% |
| 15–29 minutes | 37.0% | 36.1% | 36.2% | 36.0% |
| 30–39 minutes | 15.2% | 15.8% | 16.1% | 16.8% |
| 40–59 minutes | 9.2% | 10.7% | 11.1% | 12.3% |
| 60 minutes or more | 6.1% | 8.0% | 8.0% | 9.3% |
| Average travel time (minutes) | 22.4 | 25.5 | 25.2 | 26.9 |

Sources:

1990-2000 – U.S. Bureau of the Census, *Journey to Work: 2000*, Tables 1 and 2, 1990-2000, March 2004.

2010-2019 – U.S. Bureau of the Census, *2015-2019 American Community Survey, 5-Year Estimates*, Tables S0802 and B08303. (Additional www.census.gov, data.census.gov/cedsci)

According to the U.S. Census data, the share of workers who car pooled has dropped from 19.7% in 1980 to 9.0% in 2019. The share of workers using public transportation declined from 6.2% to 5.0% in the same time period. Those driving alone and those working at home increased. The average travel time increased by 5.2 minutes from 1980 to 2019. The American Community Survey (ACS) now collects journey-to-work data on an annual basis. It shows the average commute time as 26.9 minutes in 2019.

Table 9.19 (Updated April 2021)
Means of Transportation to Work, 1980, 1990, 2000, and 2019

| Means of transportation | 1980 Census | | 1990 Census | | 2000 Census | | 2019 ACS | |
|---|-------------------------------|----------|-------------------------------|--------|-------------------------------|--------|-------------------------------|--------|
| | Number of workers (thousands) | Share | Number of workers (thousands) | Share | Number of workers (thousands) | Share | Number of workers (thousands) | Share |
| Private vehicle | 81,258 | 84.1% | 99,593 | 86.5% | 112,737 | 87.9% | 130,348 | 85.3% |
| <i>Drove alone</i> | 62,193 | 64.4% | 84,215 | 73.2% | 97,102 | 75.7% | 116,585 | 76.3% |
| <i>Car pooled</i> | 19,065 | 19.7% | 15,378 | 13.4% | 15,635 | 12.2% | 13,764 | 9.0% |
| Public transportation | 6,008 | 6.2% | 5,889 | 5.1% | 5,868 | 4.6% | 7,641 | 5.0% |
| <i>Bus or trolley bus^a</i> | 3,925 | 4.1% | 3,445 | 3.0% | 3,207 | 2.5% | 3,664 | 2.4% |
| <i>Streetcar or trolley car^a</i> | <i>b</i> | <i>b</i> | 78 | 0.1% | 73 | 0.1% | 120 | 0.1% |
| <i>Subway or elevated</i> | 1,529 | 1.6% | 1,755 | 1.5% | 1,886 | 1.5% | 2,890 | 1.9% |
| <i>Railroad</i> | 554 | 0.6% | 574 | 0.5% | 658 | 0.5% | 120 | 0.1% |
| <i>Ferryboat</i> | <i>b</i> | <i>b</i> | 37 | 0.0% | 44 | 0.0% | 64 | 0.0% |
| Taxicab | 167 | 0.2% | 179 | 0.2% | 200 | 0.2% | 286 | 0.2% |
| Motorcycle | 419 | 0.4% | 237 | 0.2% | 142 | 0.1% | 238 | 0.2% |
| Bicycle | 468 | 0.5% | 467 | 0.4% | 488 | 0.4% | 838 | 0.5% |
| Walked only | 5,413 | 5.6% | 4,489 | 3.9% | 3,759 | 2.9% | 4,074 | 2.7% |
| Other means | 703 | 0.7% | 809 | 0.7% | 901 | 0.7% | 1,412 | 0.9% |
| Worked at home | 2,180 | 2.3% | 3,406 | 3.0% | 4,184 | 3.3% | 7,899 | 5.2% |
| Total workers | 96,616 | 100.0% | 115,069 | 100.0% | 128,279 | 100.0% | 152,736 | 100.0% |
| Average travel time (minutes) | 21.7 | | 22.4 | | 25.5 | | 26.9 | |

Sources:

1980-1990 data – Provided by the Journey-to-Work and Migration Statistics Branch, Population Division, U.S. Bureau of the Census.

2000 data – U.S. Bureau of the Census, *Journey to Work: 2000*, Tables 1 and 2, 1990-2000, March 2004 (www.census.gov/population/www/socdemo/journey.html).

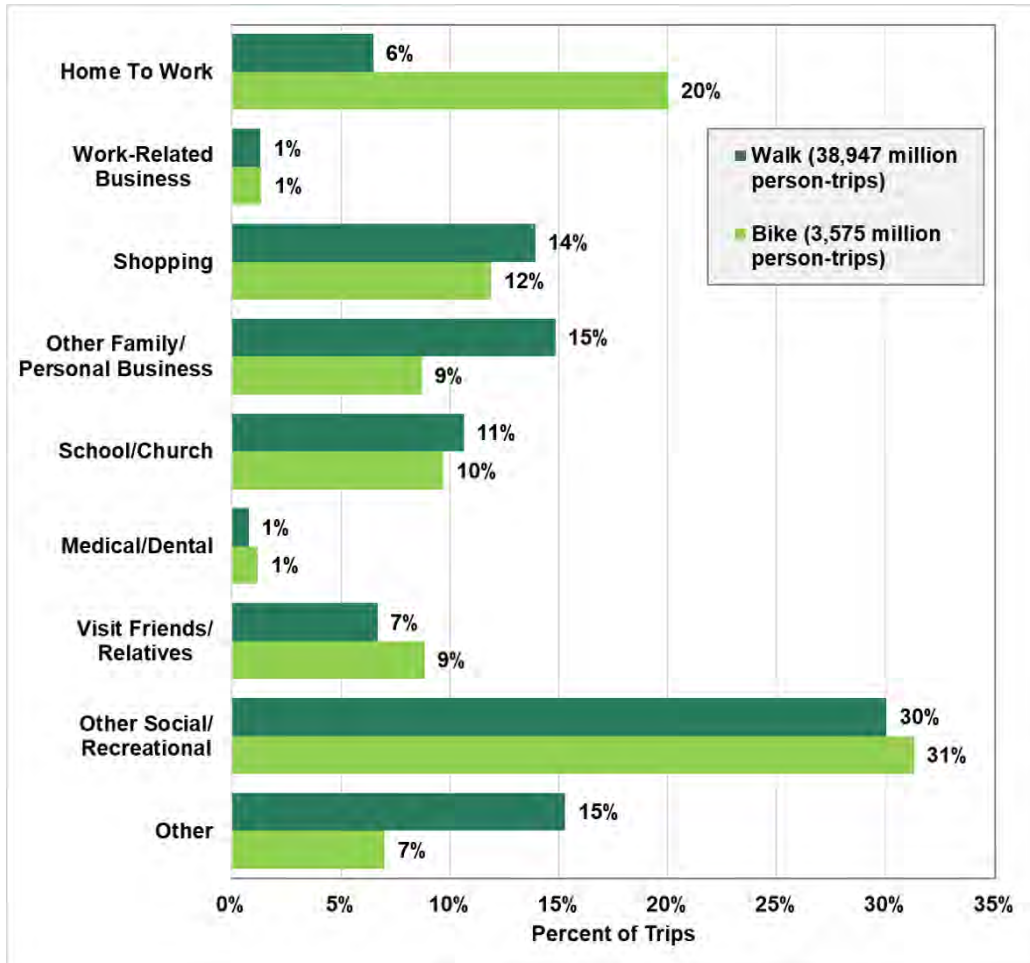
2019 data – U.S. Bureau of the Census, *2015-2019 American Community Survey Five-Year Estimates*, "Explore Census Data," Beta version. (www.census.gov/data.census.gov/cedsci)

^a This category was "Bus or streetcar" in 1980.

^b Data are not available.

In 2017, 6% of walk trips and 20% of bike trips were to/from work. Thirty-one percent of all bike trips were for social/recreational purposes. Fourteen percent of walk trips were shopping trips.

Figure 9.9. Walk and Bike Trips by Trip Purpose, 2017 NHTS



Note: Percentages may not sum to totals due to rounding.

Source:

Generated from the 2017 National Household Travel Survey website nhts.ornl.gov.

After 2001, only data on daily trips were collected in the NHTS. The 2001 data are still the latest available on long-distance trips.

Long Distance Trips – 2001 National Household Travel Survey

The 2001 National Household Travel Survey (NHTS) collected data on long-distance trips as well as everyday travel. The everyday travel data is a continuation of the Nationwide Personal Transportation Survey (NPTS), while the long-distance travel data is a continuation of the American Travel Survey (ATS) which was collected in 1977 and 1985. The survey collected trip-related data such as mode of transportation, duration, distance and purpose of trip. It also gathered demographic, geographic, and economic data for analysis purposes.

A long-distance trip is defined as a trip of 50 miles or more, one-way. Long-trip data from the 2001 NHTS were released in the summer of 2004. For additional information about the 2001 NHTS data, go to the following website: nhts.ornl.gov.

Table 9.20
Long-Distance Trip^a Characteristics, 2001 NHTS

| Trip characteristic | Person trips | | Person miles | |
|---------------------------------------|--------------|--------------|---------------|--------------|
| | (thousands) | (percent) | (thousands) | (percent) |
| Total | 2,554,068 | 100.0 | 1,138,322,697 | 100.0 |
| Principal means of transportation: | | | | |
| Personal use vehicles | 2,310,376 | 90.5 | 735,882,255 | 64.7 |
| Airplane | 165,039 | 6.5 | 367,888,741 | 32.3 |
| Commercial airplane | 158,880 | 6.2 | 361,717,015 | 31.8 |
| Bus ^b | 52,962 | 2.1 | 23,747,433 | 2.1 |
| Intercity bus | 3,456 | 0.1 | 1,765,696 | 0.2 |
| Charter, tour, or school bus | 45,952 | 1.8 | 21,019,942 | 1.9 |
| Train | 20,672 | 0.8 | 9,266,373 | 0.8 |
| Round trip distance: | | | | |
| 100 to 300 miles | 1,688,358 | 66.1 | 284,586,370 | 25.0 |
| 300 to 499 miles | 373,550 | 14.6 | 143,571,597 | 12.6 |
| 500 to 999 miles | 261,802 | 10.3 | 180,669,482 | 15.9 |
| 1,000 to 1,999 miles | 125,665 | 4.9 | 178,629,838 | 15.7 |
| 2,000 miles or more | 104,694 | 4.1 | 350,865,409 | 30.8 |
| Mean (miles) | 446 | ^c | ^c | ^c |
| Median (miles) | 206 | ^c | ^c | ^c |
| Calendar quarter: | | | | |
| 1st quarter | 566,502 | 22.2 | 246,556,190 | 21.7 |
| 2nd quarter | 653,310 | 25.6 | 298,154,812 | 26.2 |
| 3rd quarter | 734,878 | 28.8 | 341,021,290 | 30.0 |
| 4th quarter | 599,378 | 23.5 | 252,590,405 | 22.2 |
| Main purpose of trip: | | | | |
| Commuting | 329,395 | 12.9 | 65,877,968 | 5.8 |
| Other business | 405,866 | 15.9 | 242,353,212 | 21.3 |
| Personal/leisure | 1,406,411 | 55.1 | 667,471,358 | 58.7 |
| Personal business | 322,645 | 12.6 | 130,020,982 | 11.4 |
| Other | 88,230 | 3.5 | 32,031,679 | 2.8 |
| Nights away from home: | | | | |
| None | 1,454,847 | 57.0 | 304,469,524 | 26.8 |
| 1 to 3 nights | 808,281 | 31.7 | 414,219,147 | 36.4 |
| 4 to 7 nights | 214,464 | 8.4 | 269,265,597 | 23.7 |
| 8 or more nights | 76,475 | 3.0 | 150,368,429 | 13.2 |
| Destination: | | | | |
| Within Census division | 2,077,810 | 81.4 | 549,651,116 | 48.3 |
| Across Census division, within Census | 196,890 | 7.7 | 134,930,113 | 11.9 |
| Across Census region | 279,367 | 10.9 | 453,741,468 | 39.9 |

Note: Long-distance trips were not included in the 2009 or 2017 NHTS.

Source:

U.S. Bureau of Transportation Statistics and the U.S. Federal Highway Administration, *2001 National Household Transportation Survey*. (Additional resources: nhts.ornl.gov)

^a A long-distance trip is defined as a trip of 50 miles or more, one-way.

^b Includes other types of buses.

^c Not applicable.

Chapter 10 Nonhighway Modes

Summary Statistics from Tables in this Chapter

| Source | | |
|-------------|---|-----------------|
| | Passenger-miles | (millions) |
| Table 10.2 | <i>Domestic and international air carrier, 2020</i> | 665,534 |
| Table 10.10 | <i>Amtrak, 2019</i> | 64793 |
| | Freight ton-miles | (millions) |
| Table 10.5 | <i>Domestic waterborne commerce, 2019</i> | 456,000 |
| Table 10.8 | <i>Class I railroad, 2019</i> | 1,614,498 |
| | Passenger energy use | (trillion Btu) |
| Table 10.2 | <i>Domestic and international air carrier, 2020</i> | 1,549.9 |
| Table 10.3 | <i>General aviation, 2019</i> | 227.1 |
| Table 10.6 | <i>Recreational boats, 2019</i> | 213.1 |
| Table 10.10 | <i>Amtrak, 2019</i> | 9.8 |
| | Freight energy use | (trillion Btus) |
| Table 10.8 | <i>Class I railroad, 2019</i> | 480.4 |

Nonhighway transportation modes accounted for 18.7% of total transportation energy use in 2018.

Table 10.1
Nonhighway Energy Use Shares, 1970–2018

| Year | Share of transportation energy use | | | | | Nonhighway total | Transportation total (trillion Btu) ^a |
|------|------------------------------------|-------|----------|------|--|------------------|--|
| | Air | Water | Pipeline | Rail | | | |
| 1970 | 8.5% | 5.5% | 5.4% | 3.5% | | 22.9% | 15,192 |
| 1975 | 7.2% | 5.4% | 4.0% | 3.1% | | 19.7% | 17,204 |
| 1976 | 7.0% | 5.9% | 3.5% | 3.1% | | 19.6% | 18,266 |
| 1977 | 7.1% | 6.2% | 3.3% | 3.0% | | 19.7% | 18,951 |
| 1978 | 7.1% | 6.9% | 3.1% | 2.9% | | 20.1% | 19,922 |
| 1979 | 7.6% | 5.9% | 3.6% | 3.0% | | 20.2% | 19,473 |
| 1980 | 7.6% | 7.4% | 3.9% | 3.0% | | 22.0% | 18,760 |
| 1981 | 7.8% | 6.8% | 4.0% | 2.9% | | 21.6% | 18,558 |
| 1982 | 8.0% | 5.9% | 3.8% | 2.5% | | 20.3% | 18,055 |
| 1983 | 7.9% | 5.4% | 3.2% | 2.5% | | 19.0% | 18,188 |
| 1984 | 8.6% | 5.1% | 3.3% | 2.7% | | 19.7% | 18,773 |
| 1985 | 8.8% | 4.6% | 3.1% | 2.5% | | 19.0% | 19,017 |
| 1986 | 9.1% | 6.6% | 2.9% | 2.3% | | 20.8% | 20,086 |
| 1987 | 9.2% | 6.7% | 3.0% | 2.3% | | 21.2% | 20,578 |
| 1988 | 9.4% | 6.7% | 3.4% | 2.3% | | 21.7% | 21,131 |
| 1989 | 9.2% | 7.1% | 3.4% | 2.2% | | 21.9% | 21,487 |
| 1990 | 9.6% | 6.7% | 3.6% | 2.2% | | 22.1% | 21,383 |
| 1991 | 9.1% | 7.3% | 3.3% | 2.1% | | 21.8% | 20,985 |
| 1992 | 9.0% | 7.4% | 3.2% | 2.1% | | 21.6% | 21,646 |
| 1993 | 9.0% | 6.5% | 3.3% | 2.1% | | 20.9% | 22,125 |
| 1994 | 9.1% | 6.1% | 3.5% | 2.2% | | 20.9% | 22,729 |
| 1995 | 9.2% | 6.3% | 3.5% | 2.2% | | 21.2% | 23,263 |
| 1996 | 9.3% | 5.9% | 3.4% | 2.3% | | 20.9% | 23,773 |
| 1997 | 9.5% | 5.2% | 3.5% | 2.2% | | 20.5% | 24,126 |
| 1998 | 9.3% | 5.0% | 3.0% | 2.2% | | 19.5% | 24,461 |
| 1999 | 9.6% | 5.3% | 2.9% | 2.2% | | 20.0% | 25,760 |
| 2000 | 9.8% | 5.6% | 2.8% | 2.1% | | 20.4% | 26,071 |
| 2001 | 9.3% | 4.6% | 2.8% | 2.2% | | 18.9% | 25,741 |
| 2002 | 8.5% | 4.7% | 2.9% | 2.1% | | 18.3% | 26,329 |
| 2003 | 8.5% | 4.0% | 2.6% | 2.2% | | 17.3% | 26,509 |
| 2004 | 9.1% | 4.8% | 2.5% | 2.3% | | 18.6% | 26,965 |
| 2005 | 9.3% | 5.0% | 2.5% | 2.2% | | 19.0% | 27,373 |
| 2006 | 9.1% | 5.2% | 2.5% | 2.3% | | 19.1% | 27,546 |
| 2007 | 8.7% | 5.3% | 2.5% | 2.1% | | 18.6% | 29,004 |
| 2008 | 8.4% | 5.1% | 2.6% | 2.1% | | 18.2% | 28,365 |
| 2009 | 7.9% | 4.9% | 2.9% | 1.8% | | 17.5% | 26,878 |
| 2010 | 8.0% | 5.4% | 2.9% | 2.0% | | 18.2% | 26,949 |
| 2011 | 8.2% | 5.2% | 3.0% | 2.1% | | 18.5% | 26,357 |
| 2012 | 8.0% | 4.4% | 3.2% | 2.1% | | 17.8% | 25,966 |
| 2013 | 7.9% | 3.9% | 3.6% | 2.2% | | 17.6% | 25,868 |
| 2014 | 7.9% | 3.4% | 3.1% | 2.3% | | 16.7% | 25,949 |
| 2015 | 8.1% | 3.9% | 3.0% | 2.2% | | 17.1% | 26,084 |
| 2016 | 8.2% | 4.2% | 3.0% | 2.0% | | 17.4% | 26,485 |
| 2017 | 8.4% | 4.3% | 3.1% | 2.0% | | 17.8% | 26,592 |
| 2018 | 8.8% | 4.2% | 3.6% | 2.1% | | 18.7% | 26,812 |

Source:

See Appendix A, Section 2.3. Nonhighway Energy Use.

^a Only end-use energy was counted for electricity. Before Edition 36, primary energy use (which included generation and distribution losses) was shown in this table. See Appendix C for this table with electricity generation and distribution losses included.

These data include ALL international and domestic certificated route air carrier statistics; therefore, the data are different than those in Chapter 2. The effects of the pandemic are evident in the 2020 data. Revenue passenger-miles declined by 64% from 2019 to 2020.

Table 10.2 (Updated August 2021)
Summary Statistics for U.S. Domestic and International Certificated
Route Air Carriers (Combined Totals), 1970–2020^a

| Year | Revenue aircraft-miles (millions) | Revenue passenger-miles (millions) | Available seat-miles (millions) | Available seats per aircraft ^b | Passenger load factor (percentage) ^c | Revenue cargo ton-miles (millions) | Energy use (trillion Btu) ^d |
|-----------|-----------------------------------|------------------------------------|---|---|---|------------------------------------|--|
| 1970 | 2,542 | 148,137 | 264,904 | 104 | 55.9% | 3,755 | 1,363.4 |
| 1975 | 2,241 | 173,324 | 315,823 | 141 | 54.9% | 5,062 | 1,283.4 |
| 1980 | 2,924 | 267,722 | 448,479 | 153 | 59.7% | 7,885 | 1,386.0 |
| 1985 | 3,462 | 351,073 | 565,677 | 163 | 62.1% | 9,048 | 1,701.4 |
| 1990 | 4,724 | 472,236 | 753,211 | 159 | 62.7% | 16,403 | 2,180.2 |
| 1995 | 5,627 | 558,794 | 832,081 | 148 | 67.2% | 23,375 | 2,338.6 |
| 1996 | 5,855 | 596,164 | 859,721 | 147 | 69.3% | 24,892 | 2,409.1 |
| 1997 | 6,025 | 620,029 | 880,715 | 146 | 70.4% | 27,610 | 2,513.6 |
| 1998 | 6,220 | 634,933 | 899,029 | 145 | 70.6% | 28,015 | 2,459.5 |
| 1999 | 6,558 | 668,626 | 942,311 | 144 | 71.0% | 25,147 | 2,665.0 |
| 2000 | 6,946 | 708,926 | 981,080 | 141 | 72.3% | 30,221 | 2,750.4 |
| 2001 | 6,814 | 664,849 | 950,519 | 139 | 69.9% | 27,882 | 2,592.5 |
| 2002 | 6,834 | 655,215 | 913,898 | 134 | 71.7% | 30,507 | 2,430.1 |
| 2003 | 7,367 | 674,160 | 922,440 | 125 | 73.1% | 32,446 | 2,470.6 |
| 2004 | 7,479 | 752,341 | 1,000,193 | 134 | 75.2% | 37,958 | 2,657.2 |
| 2005 | 7,716 | 795,117 | 1,029,316 | 133 | 77.2% | 39,286 | 2,693.3 |
| 2006 | 8,220 | 810,086 | 1,027,526 | 125 | 78.8% | 38,251 | 2,661.1 |
| 2007 | 8,415 | 842,007 | 1,060,093 | 126 | 79.4% | 38,433 | 2,684.6 |
| 2008 | 8,142 | 823,783 | 1,040,840 | 128 | 79.1% | 35,227 | 2,547.8 |
| 2009 | 7,534 | 779,997 | 975,307 | 129 | 80.0% | 30,317 | 2,303.2 |
| 2010 | 7,666 | 809,051 | 991,934 | 129 | 81.6% | 35,209 | 2,335.3 |
| 2011 | 7,783 | 825,916 | 1,012,597 | 130 | 81.6% | 35,713 | 2,370.3 |
| 2012 | 7,727 | 832,733 | 1,012,261 | 131 | 82.3% | 34,937 | 2,287.7 |
| 2013 | 7,725 | 848,000 | 1,025,616 | 133 | 82.7% | 33,561 | 2,271.3 |
| 2014 | 7,740 | 869,688 | 1,048,107 | 135 | 83.0% | 34,471 | 2,265.3 |
| 2015 | 7,877 | 908,795 | 1,090,185 | 138 | 83.4% | 35,011 | 2,342.1 |
| 2016 | 8,077 | 939,240 | 1,131,983 | 140 | 83.0% | 35,920 | 2,385.2 |
| 2017 | 8,223 | 969,904 | 1,168,055 | 142 | 83.0% | 39,867 | 2,433.9 |
| 2018 | 8,545 | 1,016,994 | 1,220,539 | 143 | 83.3% | 42,629 | 2,531.2 |
| 2019 | 8,763 | 1,061,005 | 1,259,515 | 144 | 84.2% | 42,220 | 2,592.6 |
| 2020 | 5,288 | 382,096 | 655,534 | 124 | 58.3% | 45,352 | 1,549.9 |
| | | | <i>Average annual percentage change</i> | | | | |
| 1970-2020 | 1.5% | 1.9% | 1.8% | 0.3% | 0.1% | 5.1% | 0.3% |
| 2010-2020 | -3.6% | -7.2% | -4.1% | -0.4% | -3.3% | 2.6% | -4.0% |

Sources:

U.S. Department of Transportation, Bureau of Transportation Statistics, www.transtats.bts.gov. (Additional resources: www.bts.gov)

1970–76 Energy Use – U.S. Department of Transportation, Civil Aeronautics Board, *Fuel Cost and Consumption*, Washington, DC, 1981, and annual.

^a Data are for all U.S. air carriers reporting on Form 41.

^b Available seats per aircraft is calculated as the ratio of available seat-miles to revenue aircraft-miles.

^c Passenger load factor is calculated as the ratio of revenue passenger-miles to available seat-miles for scheduled and nonscheduled services.

^d Energy use includes fuel purchased abroad for international flights.

General aviation includes: (1) aircraft operating under general operating and flight rules; (2) not-for-hire airplanes with a seating capacity of 20 or more or a maximum payload capacity of 6,000 lbs. or more; (3) rotorcraft external load operations; (4) on-demand and commuter operations not covered under Federal Aviation Regulations Part 121; and (5) agricultural aircraft operations.

Table 10.3 (Updated August 2021)
Summary Statistics for General Aviation, 1970–2019

| Calendar year | Total number of aircraft | Aircraft hours flown (thousands) | Energy use (trillion Btu) |
|---------------|---|-------------------------------------|---------------------------|
| 1970 | 131,700 ^a | 26,030 ^b | 94.3 |
| 1975 | 168,475 | 30,298 | 110.7 |
| 1980 | 211,045 | 41,016 | 165.9 |
| 1985 | 196,500 | 31,456 | 143.9 |
| 1986 | 205,300 | 31,782 | 147.9 |
| 1987 | 202,700 | 30,883 | 139.1 |
| 1988 | 196,200 | 31,114 | 148.5 |
| 1989 | 205,000 | 32,332 | 134.1 |
| 1990 | 198,000 | 32,096 | 131.8 |
| 1991 | 196,874 | 29,862 | 120.0 |
| 1992 | 185,650 | 26,747 | 103.7 |
| 1993 | 177,120 | 24,455 | 93.6 |
| 1994 | 172,935 | 24,092 | 95.3 |
| 1995 | 188,089 | 26,612 | 106.6 |
| 1996 | 191,129 | 26,909 | 111.0 |
| 1997 | 192,414 | 27,713 | 121.1 |
| 1998 | 204,710 | 28,100 | 147.4 |
| 1999 | 219,464 | 31,231 | 172.1 |
| 2000 | 217,533 | 29,960 | 175.2 |
| 2001 | 211,446 | 27,017 | 165.1 |
| 2002 | 211,244 | 27,040 | 141.5 |
| 2003 | 209,708 | 27,329 | 141.4 |
| 2004 | 219,426 | 28,126 | 175.9 |
| 2005 | 224,352 | 26,982 | 242.4 |
| 2006 | 221,943 | 27,705 | 256.3 |
| 2007 | 231,607 | 27,852 | 243.6 |
| 2008 | 228,663 | 26,009 | 265.7 |
| 2009 | 223,877 | 23,763 | 210.3 |
| 2010 | 223,370 | 24,802 | 221.2 |
| 2011 | 220,770 | 24,570 | 227.1 |
| 2012 | 209,034 | 24,403 | 228.8 |
| 2013 | 199,927 | 22,876 | 203.6 |
| 2014 | 204,408 | 23,271 | 221.0 |
| 2015 | 210,030 | 24,142 | 208.9 |
| 2016 | 211,793 | 24,833 | 217.8 |
| 2017 | 211,757 | 25,212 | 232.2 |
| 2018 | 211,749 | 25,506 | 272.8 |
| 2019 | 210,981 | 25,566 | 227.1 |
| | <i>Average annual percentage change</i> | | |
| 1970-2019 | 1.0% | 0.0% | 1.8% |
| 2009-2019 | -0.6% | 0.7% | 0.8% |

Sources:

U.S. Department of Transportation, Federal Aviation Administration, *General Aviation and Part 135 Activity Surveys, CY 2019*, Tables 1.1, 1.4, 5.1, and annual. 2011 Data: *Aviation Forecasts*, Tables 28 and 29, May 2013. (Additional resources: www.faa.gov/data-research/aviation_data_statistics/general_aviation)

^a Active fixed-wing general aviation aircraft only.

^b Includes rotorcraft.

In the early seventies, domestic waterborne commerce accounted for over 60% of total tonnage, but by 1994 foreign tonnage grew to more than half of all waterborne tonnage. Total foreign and domestic tons shipped reached a peak of 2.59 billion tons in 2006 and in 2019 were 2.36 billion tons.

Table 10.4 (Updated August 2021)
Tonnage Statistics for Domestic and International Waterborne Commerce, 1970–2019
(million tons shipped)

| Year | Foreign and domestic total | Foreign total ^a | Domestic total ^b | Percent domestic of total |
|---|----------------------------|----------------------------|-----------------------------|---------------------------|
| 1970 | 1,532 | 581 | 951 | 62.1% |
| 1975 | 1,695 | 749 | 946 | 55.8% |
| 1980 | 1,999 | 921 | 1,077 | 53.9% |
| 1985 | 1,788 | 774 | 1,014 | 56.7% |
| 1990 | 2,164 | 1,042 | 1,122 | 51.8% |
| 1995 | 2,240 | 1,147 | 1,093 | 48.8% |
| 1996 | 2,284 | 1,183 | 1,101 | 48.2% |
| 1997 | 2,333 | 1,221 | 1,113 | 47.7% |
| 1998 | 2,340 | 1,245 | 1,094 | 46.8% |
| 1999 | 2,323 | 1,261 | 1,062 | 45.7% |
| 2000 | 2,425 | 1,355 | 1,070 | 44.1% |
| 2001 | 2,393 | 1,351 | 1,042 | 43.5% |
| 2002 | 2,340 | 1,319 | 1,021 | 43.6% |
| 2003 | 2,394 | 1,378 | 1,016 | 42.4% |
| 2004 | 2,552 | 1,505 | 1,050 | 41.0% |
| 2005 | 2,527 | 1,499 | 1,029 | 40.7% |
| 2006 | 2,588 | 1,565 | 1,028 | 39.5% |
| 2007 | 2,564 | 1,543 | 1,022 | 39.9% |
| 2008 | 2,477 | 1,521 | 956 | 38.6% |
| 2009 | 2,211 | 1,354 | 858 | 38.8% |
| 2010 | 2,335 | 1,441 | 894 | 38.3% |
| 2011 | 2,368 | 1,480 | 892 | 37.5% |
| 2012 | 2,307 | 1,422 | 890 | 38.4% |
| 2013 | 2,274 | 1,383 | 891 | 39.2% |
| 2014 | 2,346 | 1,409 | 937 | 39.9% |
| 2015 | 2,279 | 1,374 | 905 | 39.7% |
| 2016 | 2,292 | 1,415 | 877 | 38.3% |
| 2017 | 2,385 | 1,512 | 873 | 36.6% |
| 2018 | 2,438 | 1,589 | 849 | 34.8% |
| 2019 | 2,361 | 1,543 | 818 | 34.6% |
| <i>Average annual percentage change</i> | | | | |
| 1970-2019 | 0.9% | 2.0% | -0.3% | |
| 2009-2019 | 0.7% | 1.3% | -0.5% | |

Source:

1970–2016—U.S. Department of the Army, Corps of Engineers, *Waterborne Commerce of the United States, Calendar Year 2016, Part 5—National Summaries*, 2017, Table 1-1. (Additional resources: www.navigationdatacenter.us/index.htm)

2017–2019—U.S. Department of the Army, Corps of Engineers, *The U.S. Waterway System, 2019 Transportation Facts and Information*, New Orleans, LA, 2020 and annual.

^a All movements between the United States and foreign countries and between Puerto Rico and the Virgin Islands and foreign countries are classified as foreign trade.

^b All movements between U.S. ports, continental and noncontiguous, and on the inland rivers, canals, and connecting channels of the United States, Puerto Rico, and the Virgin Islands, excluding the Panama Canal. Beginning in 1996, fish was excluded for internal and intra-port domestic traffic.

The U.S. Army Corps of Engineers Navigation Data Center collects a wealth of waterborne commerce data. Energy use data, however, have never been collected as part of this effort. The average length of haul in domestic waterborne commerce was 560 miles in 2019.

Table 10.5 (Updated August 2021)
Summary Statistics for Domestic Waterborne Commerce, 1970–2019

| Year | Number of vessels ^a | Ton-miles (billions) | Tons shipped ^b (millions) | Average length of haul (miles) |
|---|--------------------------------|-------------------------|--------------------------------------|-----------------------------------|
| 1970 | 25,832 | 596 | 949 | 628.2 |
| 1975 | 31,666 | 566 | 944 | 599.9 |
| 1980 | 38,792 | 922 | 1,074 | 856.4 |
| 1985 | 41,672 | 893 | 1,011 | 883.5 |
| 1990 | 41,119 | 834 | 1,118 | 745.7 |
| 1995 | 36,860 | 808 | 1,086 | 743.6 |
| 1996 | 37,945 | 765 | 1,093 | 699.4 |
| 1997 | 41,419 | 707 | 1,106 | 639.5 |
| 1998 | 42,032 | 673 | 1,087 | 618.9 |
| 1999 | 41,766 | 656 | 1,056 | 621.1 |
| 2000 | 40,665 | 646 | 1,064 | 606.8 |
| 2001 | 41,003 | 622 | 1,037 | 599.7 |
| 2002 | 41,002 | 612 | 1,016 | 602.5 |
| 2003 | 39,983 | 606 | 1,010 | 600.3 |
| 2004 | 40,290 | 621 | 1,045 | 596.7 |
| 2005 | 41,354 | 591 | 1,025 | 577.3 |
| 2006 | 40,104 | 563 | 1,022 | 551.3 |
| 2007 | 40,695 | 553 | 1,016 | 544.2 |
| 2008 | 40,301 | 521 | 952 | 546.7 |
| 2009 | 40,109 | 477 | 853 | 559.7 |
| 2010 | 39,883 | 502 | 889 | 565.0 |
| 2011 | 40,545 | 500 | 888 | 562.4 |
| 2012 | 40,530 | 475 | 888 | 535.0 |
| 2013 | 39,999 | 465 | 890 | 522.6 |
| 2014 | 40,381 | 505 | 936 | 539.1 |
| 2015 | 40,791 | 491 | 903 | 543.2 |
| 2016 | 42,674 | 478 | 875 | 546.1 |
| 2017 | 42,539 | 489 | 873 | 560.1 |
| 2018 | 42,138 | 492 | 849 | 579.5 |
| 2019 | 43,254 | 456 | 818 | 557.7 |
| <i>Average annual percentage change</i> | | | | |
| 1970-2019 | 1.1% | -0.5% | -0.3% | -0.2% |
| 2009-2019 | 0.8% | -0.4% | -0.4% | 0.0% |

Sources:

Number of vessels 1970–92, 1995–2018 – U.S. Department of the Army, Corps of Engineers, *Waterborne Transportation Lines of the United States, 2018*, New Orleans, LA, 2018, Table 2 and annual. 1993–94 – U.S. Department of the Army, Corps of Engineers, *The U.S. Waterway System-Facts*, Navigation Data Center, New Orleans, Louisiana, January 1996.

Ton-miles, tons shipped, average length of haul. 1970–2016 – U.S. Department of the Army, Corps of Engineers, *Waterborne Commerce of the United States, Calendar Year 2016, Part 5: National Summaries*, New Orleans, LA, 2017, Table 1-4 and annual. 2017–19 – U.S. Department of the Army, Corps of Engineers, *The U.S. Waterway System, 2019 Transportation Facts and Information*, New Orleans, LA, 2020. (Additional resources: www.navigationdatacenter.us/index.htm)

^a Grand total for self-propelled and non-self-propelled.

^b These figures are not consistent with the figures on Table 10.4 because intra-territory tons are not included in this table. Intra-territory traffic is traffic between ports in Puerto Rico and the Virgin Islands.

The data displayed in this table come from 1970 to 1998 are from the Environmental Protection Agency's The MOVES2014a model. From 1999-2018, the data are from the updated MOVES2014b model. In 2019 the data are from MOVES3.0.1 model.

Table 10.6 (Updated August 2021)
Recreational Boat Energy Use, 1970–2019

| Year | Number of boats (thousands) | Diesel fuel | Gasoline (trillion Btu) | Total energy use |
|---|--------------------------------|-------------|----------------------------|------------------|
| 1970 | 10,087 | 5.5 | 151.7 | 157.2 |
| 1975 | 10,337 | 10.7 | 156.4 | 167.1 |
| 1980 | 10,587 | 16.0 | 161.2 | 177.1 |
| 1981 | 10,637 | 17.0 | 162.1 | 179.1 |
| 1982 | 10,687 | 18.0 | 163.1 | 181.1 |
| 1983 | 10,737 | 19.1 | 164.0 | 183.1 |
| 1984 | 10,787 | 20.1 | 165.0 | 185.1 |
| 1985 | 10,837 | 21.2 | 165.9 | 187.1 |
| 1986 | 10,887 | 22.2 | 166.9 | 189.1 |
| 1987 | 10,937 | 23.3 | 167.8 | 191.1 |
| 1988 | 11,030 | 24.3 | 170.4 | 194.7 |
| 1989 | 11,122 | 25.4 | 172.9 | 198.3 |
| 1990 | 11,215 | 26.4 | 175.4 | 201.8 |
| 1991 | 11,327 | 27.5 | 178.7 | 206.2 |
| 1992 | 11,440 | 28.5 | 182.0 | 210.5 |
| 1993 | 11,553 | 29.5 | 185.3 | 214.8 |
| 1994 | 11,770 | 30.6 | 192.5 | 223.1 |
| 1995 | 11,988 | 31.6 | 199.7 | 231.3 |
| 1996 | 12,206 | 32.7 | 206.8 | 239.5 |
| 1997 | 12,244 | 33.7 | 207.2 | 240.9 |
| 1998 | 12,283 | 34.8 | 207.4 | 242.2 |
| 1999 | 12,358 | 38.0 | 207.6 | 245.6 |
| 2000 | 12,405 | 38.0 | 207.3 | 245.3 |
| 2001 | 12,465 | 38.1 | 207.1 | 245.2 |
| 2002 | 12,513 | 38.2 | 206.1 | 244.3 |
| 2003 | 12,573 | 38.3 | 204.9 | 243.2 |
| 2004 | 12,584 | 38.3 | 202.6 | 240.9 |
| 2005 | 12,777 | 38.7 | 202.7 | 241.5 |
| 2006 | 12,704 | 38.5 | 199.1 | 237.6 |
| 2007 | 12,776 | 38.7 | 197.6 | 236.3 |
| 2008 | 12,547 | 38.0 | 191.9 | 229.9 |
| 2009 | 12,583 | 38.1 | 190.0 | 228.1 |
| 2010 | 12,293 | 37.2 | 183.4 | 220.6 |
| 2011 | 12,064 | 36.6 | 177.7 | 214.2 |
| 2012 | 11,967 | 36.2 | 173.9 | 210.2 |
| 2013 | 11,907 | 36.0 | 171.0 | 207.0 |
| 2014 | 11,810 | 35.8 | 167.7 | 203.5 |
| 2015 | 11,978 | 37.6 | 168.0 | 205.6 |
| 2016 | 12,202 | 39.0 | 169.3 | 208.3 |
| 2017 | 12,397 | 39.9 | 170.4 | 210.3 |
| 2018 | 12,569 | 40.7 | 171.4 | 212.1 |
| 2019 | 12,692 | 41.4 | 171.9 | 213.3 |
| <i>Average annual percentage change</i> | | | | |
| 1970-2019 | 0.5% | 4.2% | 0.3% | 0.6% |
| 2009-2019 | 0.1% | 0.8% | -1.0% | -0.7% |

Sources:

1970–1998: U.S. Environmental Protection Agency, MOVES2014a model.

1999–2018: U.S. Environmental Protection Agency, MOVES2014b model.

2019: U.S. Environmental Protection Agency, MOVES3.0.1 model, <https://www.epa.gov/moves>.

The Interstate Commerce Commission designates Class I railroads on the basis of annual gross revenues. In 2019, seven railroads were given this designation. The number of railroads designated as Class I has changed considerably in the last 30 years; in 1976 there were 52 railroads given Class I designation.

Table 10.7 (Updated August 2021)
Class I Railroad Freight Systems in the United States
Ranked by Revenue Ton-Miles, 2019

| Railroad | Revenue ton-miles (billions) | Percent |
|--------------------------------------|---------------------------------|---------------|
| BNSF Railway Company | 665 | 41.2% |
| Union Pacific Railroad Company | 423 | 26.2% |
| CSX Transportation | 199 | 12.3% |
| Norfolk Southern Railway | 194 | 12.0% |
| Grand Trunk Corporation | 63 | 3.9% |
| Soo Line Corporation | 38 | 2.4% |
| Kansas City Southern Railway Company | 33 | 2.0% |
| Total | 1,615 | 100.0% |

Source:

Association of American Railroads, *Railroad Facts, 2020 Edition*, Washington, DC, October 2020, p. 64. (Additional resources: www.aar.org)

Revenue ton-miles for Class I freight railroads was about 1.6 trillion in 2019. Though there are many regional and local freight railroads, the Class I freight railroads accounted for 94% of the railroad industry's freight revenue in 2019 and 68% of the industry's mileage operated. The energy intensity of Class I railroads hit an all-time low of 289 Btu/ton-mile in 2010 and continued to be below 300 Btu/ton-mile in 2019.

Table 10.8 (Updated August 2021)
Summary Statistics for Class I Freight Railroads, 1970–2019

| Year | Number of locomotives in service ^a | Number of freight cars (thousands) ^b | Train-miles (millions) | Car-miles (millions) | Tons originated ^c (millions) | Average length of haul (miles) | Revenue ton-miles (millions) | Energy intensity (Btu/ton-mile) | Energy use (trillion Btu) |
|---|---|---|------------------------|----------------------|---|--------------------------------|------------------------------|---------------------------------|---------------------------|
| 1970 | 27,077 ^d | 1,424 | 427 | 29,890 | 1,485 | 515 | 764,809 | 691 | 528.1 |
| 1975 | 27,846 | 1,359 | 403 | 27,656 | 1,395 | 541 | 754,252 | 687 | 518.3 |
| 1980 | 28,094 | 1,168 | 428 | 29,277 | 1,492 | 616 | 918,958 | 597 | 548.7 |
| 1985 | 22,548 | 867 | 347 | 24,920 | 1,320 | 665 | 876,984 | 497 | 436.1 |
| 1986 | 20,790 | 799 | 347 | 24,414 | 1,306 | 664 | 867,722 | 486 | 421.5 |
| 1987 | 19,647 | 749 | 361 | 25,627 | 1,372 | 688 | 943,747 | 456 | 430.3 |
| 1988 | 19,364 | 725 | 379 | 26,339 | 1,430 | 697 | 996,182 | 443 | 441.4 |
| 1989 | 19,015 | 682 | 383 | 26,196 | 1,403 | 723 | 1,013,841 | 437 | 442.6 |
| 1990 | 18,835 | 659 | 380 | 26,159 | 1,425 | 726 | 1,033,969 | 420 | 434.7 |
| 1991 | 18,344 | 633 | 375 | 25,628 | 1,383 | 751 | 1,038,875 | 391 | 405.8 |
| 1992 | 18,004 | 605 | 390 | 26,128 | 1,399 | 763 | 1,066,781 | 393 | 419.2 |
| 1993 | 18,161 | 587 | 405 | 26,883 | 1,397 | 794 | 1,109,309 | 389 | 431.6 |
| 1994 | 18,505 | 591 | 441 | 28,485 | 1,470 | 817 | 1,200,701 | 388 | 465.4 |
| 1995 | 18,812 | 583 | 458 | 30,383 | 1,550 | 843 | 1,305,688 | 372 | 485.9 |
| 1996 | 19,269 | 571 | 469 | 31,715 | 1,611 | 842 | 1,355,975 | 368 | 499.4 |
| 1997 | 19,684 | 568 | 475 | 31,660 | 1,585 | 851 | 1,348,926 | 370 | 499.7 |
| 1998 | 20,261 | 576 | 475 | 32,657 | 1,649 | 835 | 1,376,802 | 365 | 502.0 |
| 1999 | 20,256 | 579 | 490 | 33,851 | 1,717 | 835 | 1,433,461 | 363 | 520.0 |
| 2000 | 20,028 | 560 | 504 | 34,590 | 1,738 | 843 | 1,465,960 | 352 | 516.0 |
| 2001 | 19,745 | 500 | 500 | 34,243 | 1,742 | 859 | 1,495,472 | 346 | 517.3 |
| 2002 | 20,506 | 478 | 500 | 34,680 | 1,767 | 853 | 1,507,011 | 345 | 520.3 |
| 2003 | 20,774 | 467 | 516 | 35,555 | 1,799 | 862 | 1,551,438 | 344 | 533.9 |
| 2004 | 22,015 | 474 | 535 | 37,071 | 1,844 | 902 | 1,662,598 | 341 | 566.2 |
| 2005 | 22,779 | 475 | 548 | 37,712 | 1,899 | 894 | 1,696,425 | 337 | 571.4 |
| 2006 | 23,732 | 475 | 563 | 38,995 | 1,957 | 906 | 1,771,897 | 330 | 584.5 |
| 2007 | 24,143 | 460 | 543 | 38,186 | 1,940 | 913 | 1,770,545 | 320 | 566.9 |
| 2008 | 24,003 | 450 | 524 | 37,226 | 1,934 | 919 | 1,777,236 | 305 | 542.5 |
| 2009 | 24,045 | 416 | 436 | 32,115 | 1,668 | 919 | 1,532,214 | 291 | 446.6 |
| 2010 | 23,893 | 398 | 476 | 35,541 | 1,851 | 914 | 1,691,004 | 289 | 488.1 |
| 2011 | 24,250 | 381 | 493 | 36,649 | 1,885 | 917 | 1,729,256 | 298 | 514.6 |
| 2012 | 24,707 | 381 | 500 | 36,525 | 1,760 | 973 | 1,712,567 | 294 | 504.0 |
| 2013 | 25,033 | 374 | 504 | 35,253 | 1,758 | 990 | 1,740,687 | 296 | 514.9 |
| 2014 | 25,916 | 372 | 518 | 37,193 | 1,840 | 1,006 | 1,851,229 | 292 | 540.5 |
| 2015 | 26,574 | 331 | 495 | 35,853 | 1,740 | 1,020 | 1,738,283 | 297 | 516.4 |
| 2016 | 26,716 | 315 | 453 | 32,572 | 1,554 | 1,021 | 1,585,440 | 299 | 474.2 |
| 2017 | 26,547 | 306 | 465 | 34,065 | 1,622 | 1,033 | 1,674,784 | 293 | 490.5 |
| 2018 | 26,086 | 294 | 477 | 35,018 | 1,653 | 1,046 | 1,729,638 | 296 | 512.8 |
| 2019 | 24,597 | 270 | 444 | 33,242 | 1,565 | 1,032 | 1,614,498 | 298 | 480.4 |
| <i>Average annual percentage change</i> | | | | | | | | | |
| 1970-2019 | -0.2% | -3.3% | 0.1% | 0.2% | 0.1% | 1.4% | 1.5% | -1.7% | -0.2% |
| 2009-2019 | 0.2% | -4.2% | 0.2% | 0.3% | -0.6% | 1.2% | 0.5% | 0.2% | 0.7% |

Source:

Association of American Railroads, *Railroad Facts, 2020 Edition*, Washington, DC, October 2020, pp. 30, 31, 36, 37, 39, 50, and 65. (Additional resources: www.aar.org)

^a Does not include self-powered units.

^b Does not include private or shipper-owned cars. Beginning in 2001, Canadian-owned U.S. railroads are excluded.

^c Tons originated is a more accurate representation of total tonnage than revenue tons. Revenue tons often produces double-counting of loads switched between rail companies.

^d Data represent total locomotives used in freight and passenger service. Separate estimates are not available.

According to the 2017 Commodity Flow Survey, 18% of all freight ton-miles are rail intermodal shipments (truck/rail or rail/water). See Table 5.17 for details. Containerization has increased in the last two decades, evidenced by the 449% increase in the number of containers from 1988 to 2019. The number of trailers moved by rail fell to an all-time low in 2019.

Table 10.9 (Updated August 2021)
Intermodal Rail Traffic, 1965–2019^a

| Year | Trailers & containers | Trailers | Containers |
|-----------|---|-----------|------------|
| 1965 | 1,664,929 | b | b |
| 1970 | 2,363,200 | b | b |
| 1975 | 2,238,117 | b | b |
| 1980 | 3,059,402 | b | b |
| 1985 | 4,590,952 | b | b |
| 1986 | 4,997,229 | b | b |
| 1987 | 5,503,819 | b | b |
| 1988 | 5,779,547 | 3,481,020 | 2,298,527 |
| 1989 | 5,987,355 | 3,496,262 | 2,491,093 |
| 1990 | 6,206,782 | 3,451,953 | 2,754,829 |
| 1991 | 6,246,134 | 3,201,560 | 3,044,574 |
| 1992 | 6,627,841 | 3,264,597 | 3,363,244 |
| 1993 | 7,156,628 | 3,464,126 | 3,692,502 |
| 1994 | 8,128,228 | 3,752,502 | 4,375,726 |
| 1995 | 7,936,172 | 3,492,463 | 4,443,709 |
| 1996 | 8,143,258 | 3,302,128 | 4,841,130 |
| 1997 | 8,698,308 | 3,453,907 | 5,244,401 |
| 1998 | 8,772,663 | 3,353,032 | 5,419,631 |
| 1999 | 8,907,626 | 3,207,407 | 5,700,219 |
| 2000 | 9,176,890 | 2,888,630 | 6,288,260 |
| 2001 | 8,935,444 | 2,603,423 | 6,332,021 |
| 2002 | 9,312,360 | 2,531,338 | 6,781,022 |
| 2003 | 9,955,605 | 2,625,837 | 7,329,768 |
| 2004 | 10,993,662 | 2,928,123 | 8,065,539 |
| 2005 | 11,693,512 | 2,979,906 | 8,713,606 |
| 2006 | 12,282,221 | 2,882,699 | 9,399,522 |
| 2007 | 12,026,631 | 2,600,635 | 9,425,996 |
| 2008 | 11,499,978 | 2,478,890 | 9,021,088 |
| 2009 | 9,875,967 | 1,639,603 | 8,236,364 |
| 2010 | 11,283,151 | 1,684,684 | 9,598,467 |
| 2011 | 11,892,418 | 1,698,615 | 10,193,803 |
| 2012 | 12,267,416 | 1,518,323 | 10,749,093 |
| 2013 | 12,831,311 | 1,483,938 | 11,347,373 |
| 2014 | 13,496,876 | 1,530,759 | 11,965,117 |
| 2015 | 13,710,662 | 1,467,913 | 12,242,749 |
| 2016 | 13,490,713 | 1,170,305 | 12,320,408 |
| 2017 | 13,721,632 | 1,142,232 | 12,579,400 |
| 2018 | 14,472,849 | 1,319,846 | 13,153,003 |
| 2019 | 13,732,570 | 1,116,523 | 12,616,047 |
| | <i>Average annual percentage change</i> | | |
| 1965–2019 | 4.0% | b | b |
| 2009–2019 | 3.4% | -3.8% | 4.4% |

Source:

Association of American Railroads, *Railroad Facts, 2020 Edition*, Washington, DC, October 2020, p. 29. (Additional resources: www.aar.org)

^a Beginning in 1995, the Grand Trunk Western Railroad and the Soo Line Railroad Company are excluded. Beginning in 1999, the Illinois Central data are excluded. Beginning in 2002, the Wisconsin Central data are excluded.

^b Data are not available.

The National Railroad Passenger Corporation, known as Amtrak, began operation in 1971. Amtrak revenue passenger-miles have grown at an average annual rate of 2.5% from 1971 to 2019.

Table 10.10 (Updated August 2021)
Summary Statistics for the National Railroad Passenger Corporation (Amtrak), 1971–2019

| Year | Number of locomotives in service | Number of passenger cars | Train-miles (thousands) | Car-miles (thousands) | Revenue passenger-miles (millions) | Average trip length (miles) | Energy intensity (Btu per revenue passenger-mile) | Energy use (trillion Btu) ^a |
|---|----------------------------------|--------------------------|-------------------------|-----------------------|------------------------------------|-----------------------------|---|--|
| 1971 | ^b | 1,165 | 16,537 | 140,147 | 1,993 | 188 | ^b | ^b |
| 1975 | 355 | 1,913 | 30,166 | 253,898 | 3,753 | 224 | 3,311 | 12.4 |
| 1980 | 448 | 2,128 | 29,487 | 235,235 | 4,503 | 217 | 2,859 | 12.9 |
| 1985 | 382 | 1,818 | 30,038 | 250,642 | 4,785 | 238 | 2,237 | 10.7 |
| 1990 | 318 | 1,863 | 33,000 | 300,996 | 6,057 | 273 | 2,052 | 12.4 |
| 1995 | 422 | 1,907 | 31,579 | 282,579 | 5,401 | 266 | 2,071 | 11.2 |
| 1996 | 348 | 1,501 | 30,542 | 277,750 | 5,066 | 257 | 2,194 | 11.1 |
| 1997 | 292 | 1,572 | 32,000 | 287,760 | 5,166 | 255 | 2,289 | 11.8 |
| 1998 | 362 | 1,347 | 32,926 | 315,823 | 5,325 | 251 | 2,246 | 12.0 |
| 1999 | 385 | 1,285 | 34,080 | 349,337 | 5,289 | 245 | 2,362 | 12.5 |
| 2000 | 385 | 1,891 | 35,404 | 371,215 | 5,574 | 243 | 2,651 | 14.8 |
| 2001 | 401 | 2,084 | 36,512 | 377,705 | 5,571 | 238 | 2,690 | 15.0 |
| 2002 | 372 | 2,896 | 37,624 | 378,542 | 5,314 | 228 | 2,537 | 13.5 |
| 2003 | 442 | 1,623 | 37,459 | 331,864 | 5,680 | 231 | 2,145 | 12.2 |
| 2004 | 276 | 1,211 | 37,159 | 308,437 | 5,511 | 219 | 2,068 | 11.4 |
| 2005 | 258 | 1,186 | 36,199 | 264,796 | 5,381 | 215 | 2,025 | 10.9 |
| 2006 | 319 | 1,191 | 36,083 | 263,908 | 5,410 | 220 | 1,948 | 10.5 |
| 2007 | 270 | 1,164 | 37,484 | 266,545 | 5,784 | 218 | 1,824 | 10.5 |
| 2008 | 278 | 1,177 | 37,736 | 271,762 | 6,179 | 215 | 1,745 | 10.8 |
| 2009 | 274 | 1,214 | 38,300 | 282,764 | 5,914 | 217 | 1,773 | 10.5 |
| 2010 | 282 | 1,274 | 37,453 | 294,820 | 6,420 | 220 | 1,668 | 10.7 |
| 2011 | 287 | 1,301 | 37,090 | 296,315 | 6,670 | 213 | 1,628 | 10.7 |
| 2012 | 485 | 2,090 | 37,640 | 319,088 | 6,804 | 218 | 1,561 | 10.6 |
| 2013 | 418 | 1,447 | 38,410 | 324,949 | 6,810 | 218 | 1,608 | 11.0 |
| 2014 | 428 | 1,419 | 38,013 | 324,683 | 6,675 | 218 | 1,629 | 10.9 |
| 2015 | 423 | 1,428 | 37,798 | 319,464 | 6,536 | 218 | 1,589 | 10.4 |
| 2016 | 434 | 1,402 | 37,808 | 316,384 | 6,520 | 208 | 1,551 | 10.1 |
| 2017 | 419 | 1,405 | 37,859 | 316,148 | 6,563 | 205 | 1,524 | 10.0 |
| 2018 | 431 | 1,403 | 37,825 | 272,540 | 6,363 | 200 | 1,579 | 10.0 |
| 2019 | 403 | 1,415 | 38,205 | 278,889 | 6,479 | 198 | 1,506 | 9.8 |
| <i>Average annual percentage change</i> | | | | | | | | |
| 1971-2019 | ^b | 0.4% | 1.8% | 1.4% | 2.5% | 0.1% | ^b | ^b |
| 2009-2019 | 3.9% | 1.5% | 0.0% | -0.1% | 0.9% | -0.9% | -1.6% | -0.7% |

Sources:

1971–83 – Association of American Railroads, Economics and Finance Department, *Statistics of Class I Railroads*, Washington, DC, and annual.

1984–88 – Association of American Railroads, *Railroad Facts*, 1988 Edition, Washington, DC, December 1989, p. 61, and annual.

1989–93 – Personal communication with the Corporate Accounting Office of Amtrak, Washington, DC.

1994–2019 – Number of locomotives in service, number of passenger cars, train-miles, car-miles, revenue passenger-miles, and average trip length - Association of American Railroads, *Railroad Facts*, 2020 Edition, Washington, DC, 2020, p. 73.

Energy use – Personal communication with the Amtrak, Washington, DC. (Additional resources: www.amtrak.com, www.aar.org)

^a Only end-use energy was counted for electricity. Previous editions included primary energy use for electricity which included generation and distribution losses. Energy use for 1994 on is not directly comparable to earlier years. Some commuter rail energy use may have been inadvertently included in earlier years.

^b Data are not available.

Chapter 11

Transportation and the Economy

Summary Statistics from Tables/Figures in this Chapter

| Source | | |
|-------------|--|--------|
| Table 11.1 | Average household transportation expenditures, 2019 | 17.0% |
| Figure 11.2 | Share of gasoline cost attributed to taxes, 2018 | |
| | <i>Canada</i> | 32% |
| | <i>France</i> | 63% |
| | <i>Germany</i> | 61% |
| | <i>Japan</i> | 45% |
| | <i>United Kingdom</i> | 63% |
| | <i>United States</i> | 21% |
| Table 11.13 | Average price of a new car, 2020 (current dollars) | 27,366 |
| | <i>Domestic</i> | 25,754 |
| | <i>Import</i> | 32,378 |
| Table 11.14 | Average price of a new light truck, 2020 (current dollars) | 40,616 |
| | <i>Domestic</i> | 41,880 |
| | <i>Import</i> | 36,181 |
| Table 11.15 | Car operating costs, 2019 | |
| | <i>Variable costs (constant 2019 dollars per 10,000 miles)</i> | 1,786 |
| | <i>Fixed costs (constant 2019 dollars per 10,000 miles)</i> | 5,284 |
| Table 11.19 | Transportation sector share of total employment | |
| | <i>1990</i> | 8.6% |
| | <i>2000</i> | 8.2% |
| | <i>2020</i> | 7.6% |

Adjusting Dollar Amounts for Inflation

A dollar spent in 1970 does not have the purchasing power of a dollar spent in 2016 due to the inflation of prices for all goods and services. Thus, prices in a historical series must be adjusted in order to provide proper comparison. The term “current dollars” is used in this report for dollar amounts that were current as of the year listed – this can also be referred to as “nominal dollars.” The term “constant 2019 dollars” is used in this report for dollar amounts that have been adjusted to a constant purchasing power (2019, in this example) and thus the data are comparable historically – this can also be referred to as “real dollars.”

Appendix B, Table B.17 contains the Consumer Price Inflation Index and Table B.18 contains the Gross National Product Implicit Price Deflator for years 1970 to 2016. Tables in the report with constant dollars have a footnote indicating which of these inflation adjustment indices were used.

The Transportation Services Index (TSI) was created by the U.S. Department of Transportation Bureau of Transportation Statistics (BTS). It is an index that measures the movement of freight and passengers.

The Freight TSI consists of:

- for-hire trucking (parcel services are not included);
- freight railroad services (including rail-based intermodal shipments such as containers on flat cars);
- inland waterway traffic;
- pipeline movements (including principally petroleum and petroleum products and natural gas); and
- air freight.

The index does not include international or coastal steamship movements, private trucking, courier services, or the United States Postal Services.

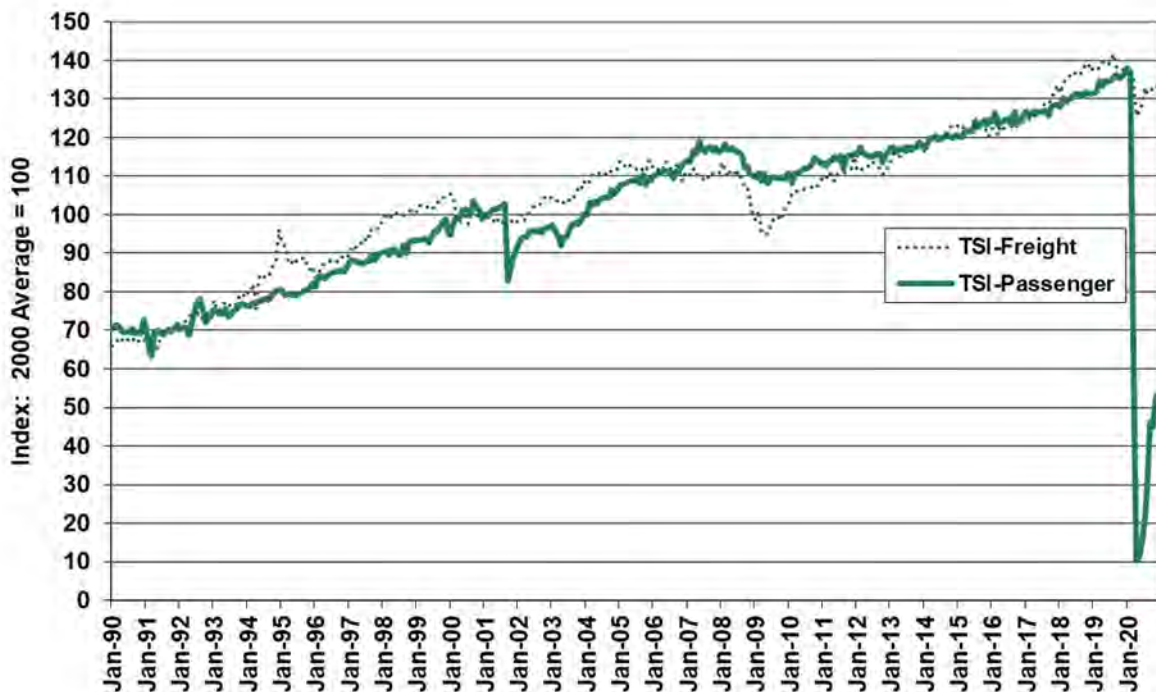
The Passenger TSI consists of:

- local mass transit;
- intercity passenger rail; and
- passenger air transportation.

The index does not include intercity bus, sightseeing services, taxi service, private car usage, or bicycling and other nonmotorized means of transportation.

The sharp travel declines in March and April 2020 were due to the COVID-19 pandemic.

Figure 11.1. Transportation Services Index, January 1990–December 2020 (Updated April 2021)



Source:

U.S. Department of Transportation, Bureau of Transportation Statistics, Transportation Services Index website, www.transtats.bts.gov/OSEA/TSI/. (Additional resources: www.bts.gov)

Table 11.1 (Updated April 2021)
Average Annual Expenditures of Households by Income, 2019^a

| | All households | Income before taxes | | | |
|---------------------------------------|----------------|---|-------------------|-------------------|-------------------|
| | | Less than \$15,000 | \$15,000–\$29,999 | \$30,000–\$39,999 | \$40,000–\$49,999 |
| Total expenditures | \$63,036 | \$26,194 | \$34,201 | \$40,942 | \$47,299 |
| | | Percentage of total expenditures ^b | | | |
| Food ^c | 13.9% | 15.7% | 15.3% | 15.0% | 16.1% |
| Housing | 32.8% | 40.8% | 39.1% | 36.3% | 35.4% |
| Apparel and services | 3.0% | 3.3% | 2.7% | 2.9% | 3.0% |
| Transportation | 17.0% | 16.2% | 16.1% | 18.2% | 17.7% |
| Vehicle purchases (net outlay) | 7.0% | 6.1% | 6.1% | 6.7% | 6.5% |
| Gasoline and motor oil | 3.3% | 3.7% | 3.4% | 4.1% | 3.9% |
| Other vehicle expenditures | 5.5% | 5.0% | 5.6% | 6.6% | 6.1% |
| Public transportation | 1.2% | 1.3% | 1.0% | 0.8% | 1.1% |
| Health care | 8.2% | 8.8% | 10.8% | 9.9% | 9.6% |
| Entertainment | 4.9% | 4.0% | 4.4% | 4.4% | 4.1% |
| Personal Insurance & pensions | 11.4% | 1.9% | 3.3% | 5.1% | 6.6% |
| Others ^d | 8.7% | 9.2% | 8.4% | 8.1% | 7.6% |
| Households ^e (thousands) | 132,242 | 15,848 | 19,856 | 12,991 | 11,208 |
| Percentage of households | 100% | 12.0% | 15.0% | 9.8% | 8.5% |
| Average number of vehicles in HH | 1.9 | 0.9 | 1.3 | 1.6 | 1.7 |

| | | Income before taxes | | | |
|---------------------------------------|-------------|---|-------------------|---------------------|------------------------------|
| | | \$50,000–\$69,999 | \$70,000–\$99,999 | \$100,000–\$149,999 | \$150,000–\$199,999 and over |
| Total expenditures | \$53,104 | \$65,814 | \$85,730 | \$108,909 | \$158,738 |
| | | Percentage of total expenditures ^b | | | |
| Food ^c | 14.4% | 13.9% | 13.5% | 12.7% | 11.7% |
| Housing | 33.7% | 32.4% | 30.7% | 29.9% | 29.5% |
| Apparel and services | 2.9% | 2.8% | 3.0% | 3.2% | 3.0% |
| Transportation | 19.1% | 18.3% | 17.7% | 17.5% | 13.9% |
| Vehicle purchases (net outlay) | 8.1% | 7.7% | 7.3% | 8.0% | 5.6% |
| Gasoline and motor oil | 4.0% | 3.7% | 3.4% | 2.9% | 2.0% |
| Other vehicle expenditures | 6.1% | 5.8% | 5.8% | 5.2% | 4.3% |
| Public transportation | 0.9% | 1.0% | 1.2% | 1.3% | 1.9% |
| Health care | 8.6% | 8.7% | 7.9% | 7.0% | 6.5% |
| Entertainment | 4.4% | 4.7% | 4.9% | 5.2% | 6.1% |
| Personal Insurance & pensions | 9.2% | 11.4% | 14.0% | 15.9% | 17.6% |
| Others ^d | 7.5% | 7.8% | 8.2% | 8.6% | 11.7% |
| Households ^e (thousands) | 17,470 | 19,119 | 18,225 | 8,266 | 9,260 |
| Percentage of households | 13.2% | 14.5% | 13.8% | 6.3% | 7.0% |
| Average number of vehicles in HH | 2.0 | 2.2 | 2.6 | 2.8 | 3.0 |

Source:

U.S. Department of Labor, Bureau of Labor Statistics, website: www.bls.gov/cex, September 2020. (Additional resources: www.bls.gov)

^a Public assistance monies are included in reported income. Data for those reporting incomes.

^b Percentages may not sum to totals due to rounding.

^c Includes alcoholic beverages.

^d Includes personal care, reading, education, tobacco and smoking supplies, cash contributions, and miscellaneous items.

^e The term household refers to a “consumer unit,” which is defined differently than households on Table 8.1.

The average amount of money that a household spends in a year has grown about 11% between 1985 and 2019 in constant dollar terms. Expenditures on transportation were 19.4% of the total in 1985 but were only 17.0% in 2019. Vehicle purchases made up about 41% of transportation expenditures in 2019, while gas and oil were 19%.

Table 11.2 (Updated April 2021)
Annual Household Expenditures for Transportation, 1985-2019
(constant 2019 dollars^a)

| Year | Transportation expenditures | | | | | Average annual household expenditures | Transportation share of annual expenditures |
|-----------|-----------------------------|-----------|-------------------------------------|-----------------------|----------------------|---|---|
| | Vehicle purchases | Gas & Oil | Other vehicle expenses ^b | Public transportation | Total transportation | | |
| 1985 | 4,902 | 2,485 | 3,032 | 630 | 11,046 | 56,967 | 19.4% |
| 1986 | 5,454 | 2,153 | 3,205 | 583 | 11,395 | 57,007 | 20.0% |
| 1987 | 4,537 | 1,983 | 3,220 | 583 | 10,325 | 55,758 | 18.5% |
| 1988 | 5,161 | 2,018 | 3,356 | 575 | 11,108 | 57,029 | 19.5% |
| 1989 | 4,841 | 2,035 | 3,431 | 573 | 10,880 | 58,395 | 18.6% |
| 1990 | 4,247 | 2,062 | 3,263 | 593 | 10,164 | 56,847 | 17.9% |
| 1991 | 4,043 | 1,873 | 3,334 | 578 | 9,826 | 57,226 | 17.2% |
| 1992 | 3,949 | 1,773 | 3,291 | 523 | 9,534 | 55,627 | 17.1% |
| 1993 | 4,094 | 1,729 | 3,340 | 563 | 9,724 | 55,618 | 17.5% |
| 1994 | 4,663 | 1,708 | 3,431 | 678 | 10,482 | 56,479 | 18.6% |
| 1995 | 4,489 | 1,701 | 3,461 | 616 | 10,268 | 56,360 | 18.2% |
| 1996 | 4,761 | 1,802 | 3,498 | 697 | 10,757 | 57,993 | 18.5% |
| 1997 | 4,549 | 1,768 | 3,683 | 621 | 10,623 | 57,576 | 18.5% |
| 1998 | 4,773 | 1,616 | 3,584 | 670 | 10,642 | 58,440 | 18.2% |
| 1999 | 5,228 | 1,644 | 3,583 | 626 | 11,083 | 60,067 | 18.5% |
| 2000 | 5,146 | 1,954 | 3,482 | 655 | 11,236 | 59,739 | 18.8% |
| 2001 | 5,454 | 1,862 | 3,532 | 585 | 11,432 | 59,757 | 19.1% |
| 2002 | 5,369 | 1,779 | 3,624 | 574 | 11,346 | 60,478 | 18.8% |
| 2003 | 5,379 | 1,880 | 3,357 | 556 | 11,172 | 59,387 | 18.8% |
| 2004 | 4,597 | 2,163 | 3,201 | 597 | 10,558 | 58,731 | 18.0% |
| 2005 | 4,639 | 2,635 | 3,062 | 586 | 10,923 | 60,752 | 18.0% |
| 2006 | 4,338 | 2,824 | 2,986 | 640 | 10,789 | 61,375 | 17.6% |
| 2007 | 4,000 | 2,940 | 3,196 | 663 | 10,799 | 61,205 | 17.6% |
| 2008 | 3,271 | 3,224 | 3,112 | 609 | 10,217 | 59,949 | 17.0% |
| 2009 | 3,166 | 2,367 | 3,022 | 571 | 9,126 | 58,472 | 15.6% |
| 2010 | 3,034 | 2,500 | 2,889 | 578 | 9,001 | 56,405 | 16.0% |
| 2011 | 3,033 | 3,018 | 2,789 | 586 | 9,426 | 56,493 | 16.7% |
| 2012 | 3,574 | 3,069 | 2,773 | 604 | 10,019 | 57,282 | 17.5% |
| 2013 | 3,590 | 2,865 | 2,836 | 589 | 9,881 | 56,079 | 17.6% |
| 2014 | 3,565 | 2,665 | 2,941 | 627 | 9,798 | 57,771 | 17.0% |
| 2015 | 4,311 | 2,254 | 2,973 | 713 | 10,250 | 60,380 | 17.0% |
| 2016 | 3,871 | 2,033 | 3,072 | 664 | 9,639 | 61,048 | 15.8% |
| 2017 | 4,228 | 2,053 | 2,964 | 743 | 9,988 | 62,642 | 15.9% |
| 2018 | 4,047 | 2,147 | 2,911 | 833 | 9,938 | 62,333 | 15.9% |
| 2019 | 4,394 | 2,094 | 3,474 | 781 | 10,742 | 63,036 | 17.0% |
| | | | | | | <i>Average annual percentage change</i> | |
| 1985-2019 | -0.3% | -0.5% | 0.4% | 0.6% | -0.1% | 0.3% | |
| 2009-2019 | 3.3% | -1.2% | 1.4% | 3.2% | 1.6% | 0.8% | |

Source:

U.S. Department of Labor, Bureau of Labor Statistics, Consumer Expenditure Survey, www.bls.gov/cex, September 2020. (Additional resources: www.bls.gov)

^a Adjusted using the U.S. Consumer Price Inflation Index.

^b Other vehicle expenses include vehicle finance charges, maintenance and repairs, insurance, licenses, and other vehicle charges.

The United States prices are the lowest of these listed countries. Those in France, the United Kingdom, and Germany paid, on average, over \$5 per gallon in 2018. Data for China and India have been discontinued by the International Energy Agency.

Table 11.3
Gasoline Prices^a for Selected Countries, 1990–2018

| | Current dollars per gallon | | | | | | | Average annual percentage change |
|-----------------------------|----------------------------|------|------|------|------|------|------|----------------------------------|
| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2018 | 1990–2018 |
| China | b | 1.03 | b | 1.70 | 3.71 | b | b | b |
| Japan | 3.16 | 4.43 | 3.65 | 4.28 | 5.73 | 4.30 | 5.27 | 1.8% |
| India | b | b | b | 3.71 | 4.29 | b | b | b |
| South Korea | b | b | b | 5.28 | 5.60 | 5.05 | b | b |
| France ^c | 3.63 | 4.26 | 3.80 | 5.46 | 6.74 | 5.68 | 6.28 | 2.0% |
| United Kingdom ^c | 2.82 | 3.21 | 4.58 | 5.97 | 6.83 | 6.43 | 5.91 | 2.7% |
| Germany ^c | 2.65 | 3.96 | 3.45 | 5.75 | 7.11 | 5.88 | 6.10 | 3.0% |
| Canada | 1.87 | 1.53 | 1.86 | 2.89 | 3.80 | 3.22 | 3.67 | 2.4% |
| United States ^d | 1.16 | 1.15 | 1.51 | 2.27 | 2.78 | 2.43 | 2.72 | 3.1% |

| | Constant 2018 dollars ^e per gallon | | | | | | | Average annual percentage change |
|-----------------------------|---|------|------|------|------|------|------|----------------------------------|
| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2018 | 1990–2018 |
| China | b | 1.70 | b | 2.19 | 4.27 | b | b | b |
| Japan | 6.07 | 7.30 | 5.32 | 5.50 | 6.60 | 4.56 | 5.27 | -0.5% |
| India | b | b | b | 4.77 | 4.94 | b | b | b |
| South Korea | b | b | b | 6.78 | 6.45 | 5.35 | b | b |
| France ^c | 6.97 | 7.02 | 5.54 | 7.02 | 7.76 | 6.02 | 6.28 | -0.4% |
| United Kingdom ^c | 5.42 | 5.29 | 6.68 | 7.67 | 7.87 | 6.81 | 5.91 | 0.3% |
| Germany ^c | 5.09 | 6.52 | 5.03 | 7.39 | 8.18 | 6.23 | 6.10 | 0.6% |
| Canada | 3.59 | 2.52 | 2.71 | 3.71 | 4.38 | 3.41 | 3.67 | 0.1% |
| United States ^d | 2.23 | 1.89 | 2.20 | 2.92 | 3.20 | 2.57 | 2.72 | 0.7% |

Note: Comparisons between prices and price trends in different countries require care. They are of limited validity because of fluctuations in exchange rates; differences in product quality, marketing practices, and market structures; and the extent to which the standard categories of sales are representative of total national sales for a given period.

Source:

International Energy Agency, *Monthly Oil Price Statistics, April 2019*, Paris, France, 2019. (Additional resources: www.iea.org)

^a Prices represent the retail prices (including taxes) for regular unleaded gasoline, except for Korea, France, Germany and the United Kingdom which are premium unleaded gasoline.

^b Data are not available.

^c Premium gasoline.

^d These estimates are international comparisons only and do not necessarily correspond to gasoline price estimates in other sections of the book.

^e Adjusted by the U.S. Consumer Price Inflation Index.

Of these selected countries, the United Kingdom had the highest diesel fuel price average in 2018, while the United States had the lowest. All of the countries listed except the United States had diesel prices over \$4 per gallon in 2018.

Table 11.4
Diesel Fuel Prices^a for Selected Countries, 1990–2018

| | Current dollars per gallon | | | | | | Average annual percentage change |
|----------------------------|---|------|------|------|------|------|----------------------------------|
| | 1990 | 2000 | 2005 | 2010 | 2015 | 2018 | 1990–2018 |
| China | b | b | 1.69 | 3.65 | b | b | b |
| Japan | 1.75 | 2.85 | 3.44 | 4.86 | 3.66 | 4.52 | 3.4% |
| South Korea | b | 2.05 | 3.98 | 4.92 | 4.35 | b | b |
| France | 1.78 | 2.95 | 4.81 | 5.74 | 4.83 | 5.99 | 4.4% |
| United Kingdom | 2.04 | 4.66 | 6.25 | 6.97 | 6.65 | 6.14 | 4.0% |
| Germany | 2.72 | 2.79 | 5.01 | 6.15 | 4.99 | 5.49 | 2.5% |
| United States ^c | 0.99 | 1.50 | 2.40 | 2.99 | 2.71 | 3.18 | 4.3% |
| | Constant 2018 dollars ^d per gallon | | | | | | Average annual percentage change |
| | 1990 | 2000 | 2005 | 2010 | 2015 | 2018 | 1990–2018 |
| China | b | b | 2.18 | 4.21 | b | b | b |
| Japan | 3.36 | 4.16 | 4.43 | 5.60 | 3.88 | 4.52 | 1.1% |
| South Korea | b | 2.99 | 5.12 | 5.67 | 4.61 | b | b |
| France | 3.42 | 4.30 | 6.19 | 6.61 | 5.12 | 5.99 | 2.2% |
| United Kingdom | 3.92 | 6.79 | 8.04 | 8.03 | 7.04 | 6.14 | 1.6% |
| Germany | 5.23 | 4.07 | 6.44 | 7.08 | 5.29 | 5.49 | 0.2% |
| United States ^c | 1.90 | 2.18 | 3.08 | 3.45 | 2.87 | 3.18 | 1.9% |

Note: Comparisons between prices and price trends in different countries require care. They are of limited validity because of fluctuations in exchange rates; differences in product quality, marketing practices, and market structures; and the extent to which the standard categories of sales are representative of total national sales for a given period.

Source:

International Energy Agency, *Monthly Oil Price Statistics*, April 2019, Paris, France, 2019. (Additional resources: www.iea.org)

^a Prices represent the retail prices (including taxes) for car diesel fuel for non-commercial (household) use.

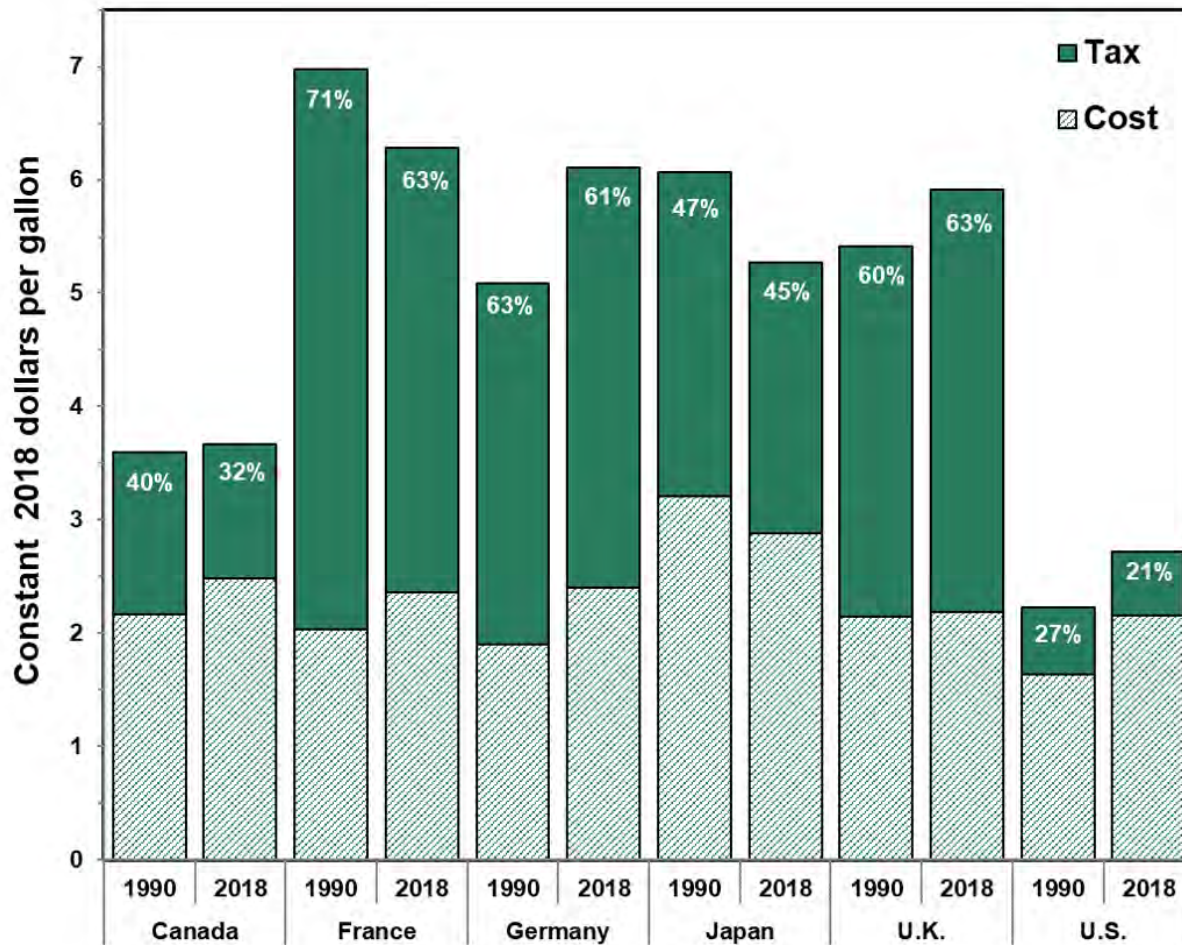
^b Data are not available.

^c These estimates are for international comparisons only and do not necessarily correspond to gasoline price estimates in other sections of the book.

^d Adjusted by the U.S. Consumer Price Inflation Index.

In 2018 over sixty percent of the cost of gasoline in France, Germany, and the United Kingdom went for taxes. Of the listed countries, the United States has the lowest percentage of taxes.

Figure 11.2. Gasoline Prices for Selected Countries, 1990 and 2018



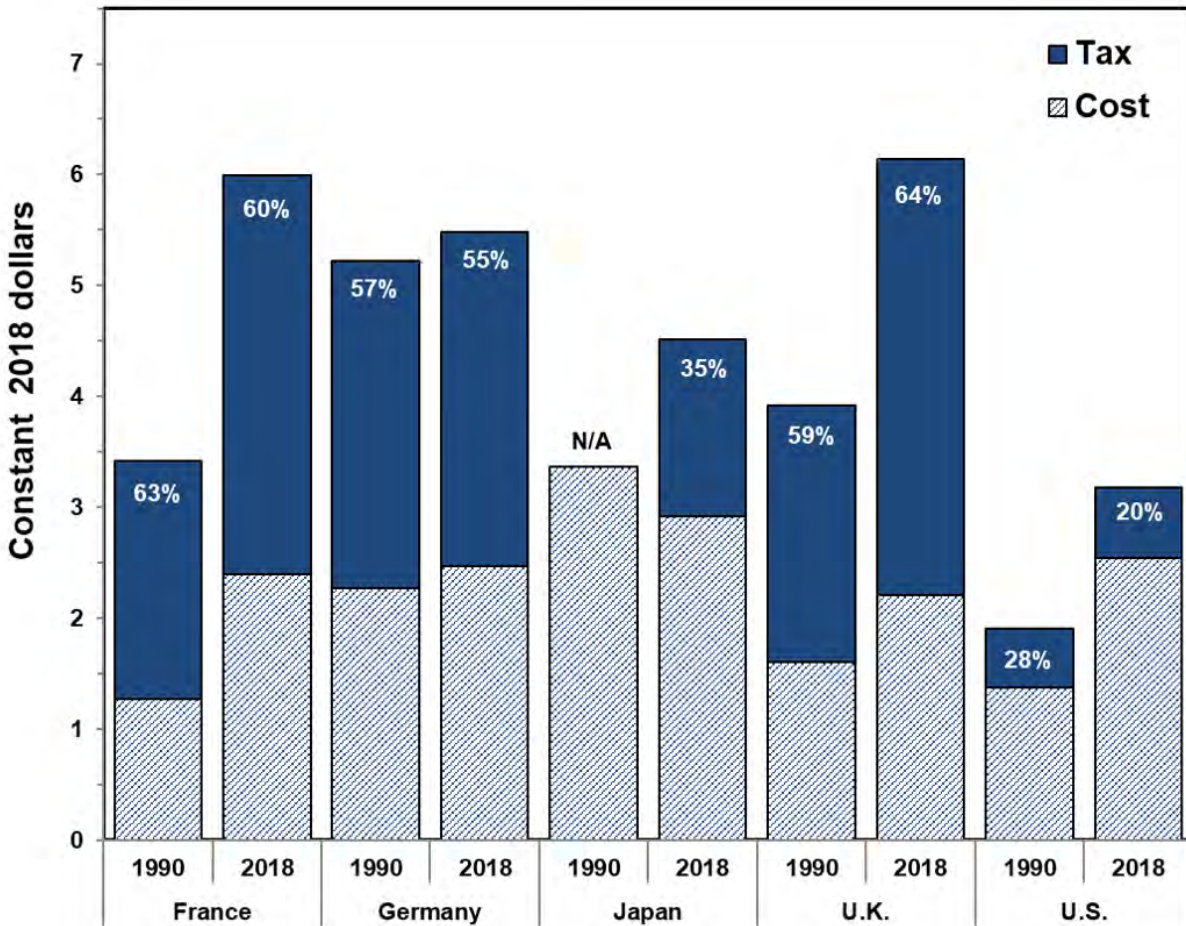
Source:

Table 11.3 and International Energy Agency, *Monthly Oil Price Statistics, April 2019*, Paris, France, 2019.

(Additional resources: www.iea.org)

Diesel fuel is taxed heavily in the European countries shown here. The U.S. diesel fuel tax share is the lowest of the listed countries.

Figure 11.3. Diesel Prices for Selected Countries, 1990 and 2018



Note: Data for Canada are not available.

Source:

Table 11.4 and International Energy Agency, *Monthly Oil Price Statistics, April 2019*, Paris, France, 2019.
(Additional resources: www.iea.org)

The cost of crude oil influences the price of gasoline, but it is not the only factor which determines the price at the pump. Refining cost, transportation cost, marketing cost, and taxes also play a part of the cost of a gallon of gasoline. The average price of a barrel of crude oil declined to 39.8 dollars per barrel in 2020 from a high of 117.2 in 2011 (constant 2020 dollars).

Table 11.5 (Updated April 2021)
Prices for a Barrel of Crude Oil and a Gallon of Gasoline, 1978–2020

| Year | Crude oil ^a (dollars per barrel) | | Gasoline ^b (dollars per gallon) | | Ratio of gasoline price to crude oil price | |
|-----------|--|---|---|----------------------------|--|--|
| | Current | Constant 2020 ^c | Current | Constant 2020 ^c | | |
| 1978 | 12.5 | 49.5 | 0.65 | 2.59 | 2.2 | |
| 1980 | 28.1 | 88.2 | 1.22 | 3.84 | 1.8 | |
| 1985 | 26.8 | 64.3 | 1.20 | 2.88 | 1.9 | |
| 1990 | 22.2 | 44.0 | 1.22 | 2.41 | 2.3 | |
| 1995 | 17.2 | 29.3 | 1.21 | 2.05 | 2.9 | |
| 1996 | 20.7 | 34.2 | 1.29 | 2.12 | 2.6 | |
| 1997 | 19.0 | 30.7 | 1.29 | 2.08 | 2.8 | |
| 1998 | 12.5 | 19.9 | 1.12 | 1.77 | 3.7 | |
| 1999 | 17.5 | 27.2 | 1.22 | 1.90 | 2.9 | |
| 2000 | 28.3 | 42.5 | 1.56 | 2.35 | 2.3 | |
| 2001 | 23.0 | 33.5 | 1.53 | 2.24 | 2.8 | |
| 2002 | 24.1 | 34.7 | 1.44 | 2.07 | 2.5 | |
| 2003 | 28.5 | 40.1 | 1.64 | 2.30 | 2.4 | |
| 2004 | 37.0 | 50.7 | 1.92 | 2.63 | 2.2 | |
| 2005 | 50.2 | 66.6 | 2.34 | 3.10 | 2.0 | |
| 2006 | 60.2 | 77.3 | 2.64 | 3.38 | 1.8 | |
| 2007 | 67.9 | 84.8 | 2.85 | 3.56 | 1.8 | |
| 2008 | 94.7 | 113.9 | 3.32 | 3.99 | 1.5 | |
| 2009 | 59.3 | 71.5 | 2.40 | 2.90 | 1.7 | |
| 2010 | 76.7 | 91.0 | 2.84 | 3.37 | 1.6 | |
| 2011 | 101.9 | 117.2 | 3.58 | 4.12 | 1.5 | |
| 2012 | 100.9 | 113.8 | 3.70 | 4.17 | 1.5 | |
| 2013 | 100.5 | 111.6 | 3.58 | 3.98 | 1.5 | |
| 2014 | 92.0 | 100.6 | 3.43 | 3.74 | 1.6 | |
| 2015 | 48.4 | 52.8 | 2.51 | 2.74 | 2.2 | |
| 2016 | 40.7 | 43.8 | 2.20 | 2.38 | 2.3 | |
| 2017 | 50.7 | 53.5 | 2.47 | 2.61 | 2.0 | |
| 2018 | 64.4 | 66.4 | 2.79 | 2.88 | 1.8 | |
| 2019 | 59.4 | 60.1 | 2.70 | 2.73 | 1.9 | |
| 2020 | 39.8 | 39.8 | 2.24 | 2.24 | 2.4 | |
| | | <i>Average annual percentage change</i> | | | | |
| 1978-2020 | 2.8% | -0.5% | 3.0% | -0.3% | | |
| 2010-2020 | -6.3% | -7.9% | -2.3% | -4.0% | | |

Sources:

Crude oil – U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, March 2021, Washington, DC, Table 9.1.

Gasoline – U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, March 2021, Washington, DC, Table 9.4. (Additional resources: www.eia.doe.gov)

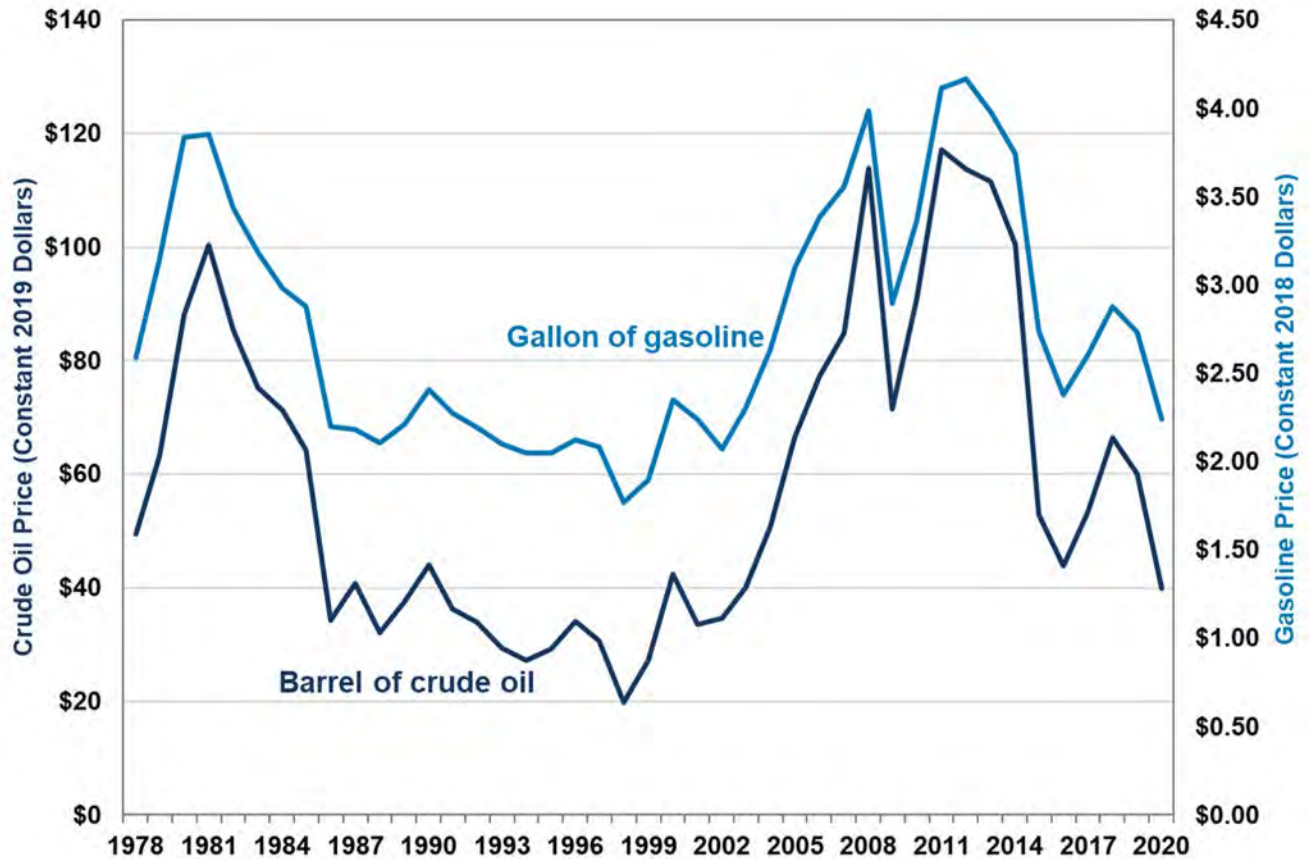
^a Refiner acquisition cost of composite (domestic and imported) crude oil.

^b Average for all types. These prices were collected from a sample of service stations in 85 urban areas selected to represent all urban consumers. Urban consumers make up about 80% of the total U.S. population.

^c Adjusted by the Consumer Price Inflation Index.

Because crude oil is the main cost component for gasoline, the prices of a barrel of crude oil and a gallon of gasoline show similar trends.

Figure 11.4. Prices for a Barrel of Crude Oil and a Gallon of Gasoline, 1978–2020
(Updated April 2021)



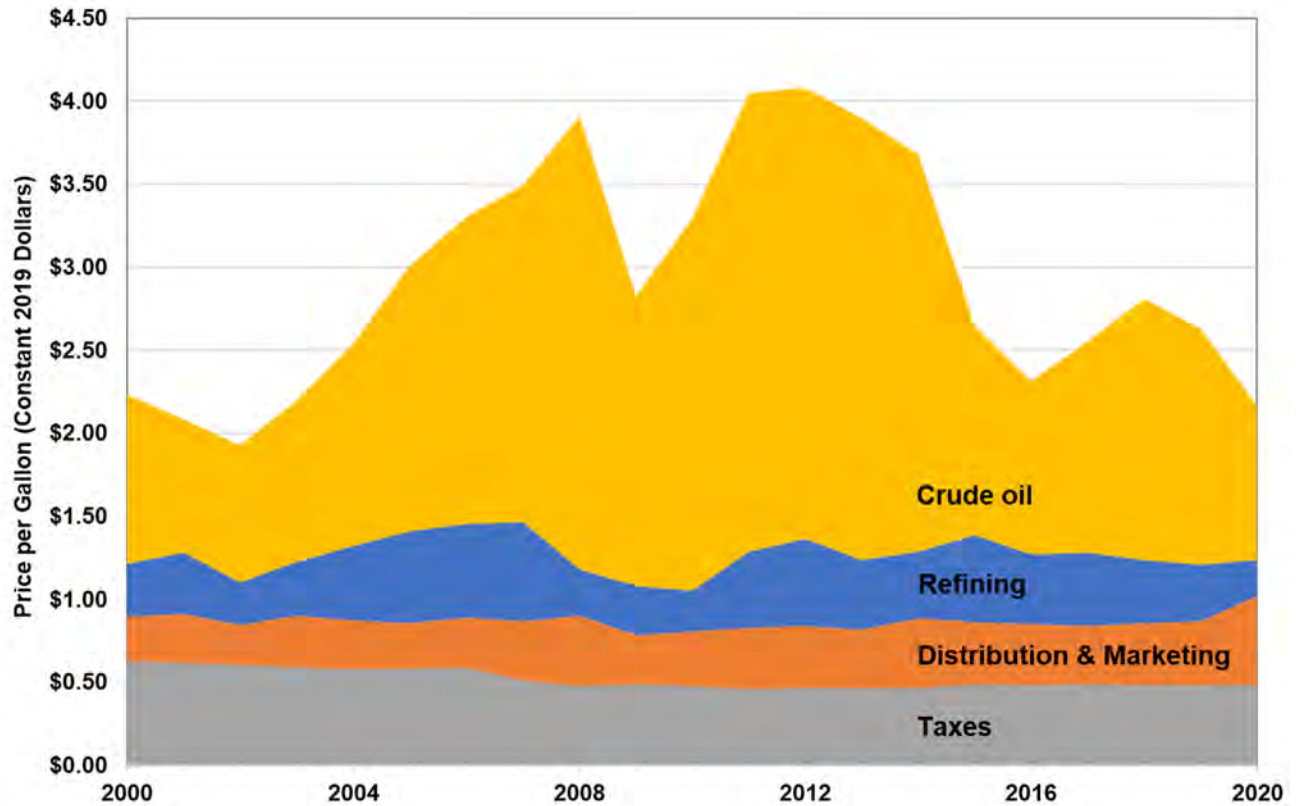
Sources:

Crude oil – U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, March 2021, Washington, DC, Table 9.1.

Gasoline – U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, March 2021, Washington, DC, Table 9.4. (Additional resources: www.eia.doe.gov)

The price of a gallon of gasoline changes depending on different price components, including taxes, distribution and marketing, refining, and crude oil. The largest component of gasoline price is crude oil. The cost of refining and the cost of crude oil are the most variable over the series.

Figure 11.5. Gasoline Price Components, 2000–2020 (Updated April 2021)



Note: Based on regular motor gasoline in all areas. Annual averages were created from monthly component price data.

Source:

Energy Information Administration, Gasoline and Diesel Fuel Update, Gasoline Pump Components History, https://www.eia.gov/petroleum/gasdiesel/gaspump_hist.php.
(Additional resources: www.eia.gov/petroleum/gasdiesel)

The average price of diesel fuel has been consistently higher than regular gasoline (in constant dollars) since 2005. Premium gasoline in 2020 averaged 62 cents higher than regular gasoline. Prices for diesel and gasoline declined substantially in 2016 but rose again in 2017 and 2018 before declining again in 2019 and 2020.

Table 11.6 (Updated April 2021)
Retail Prices for Motor Fuel, 1978–2020
 (dollars per gallon, including tax)

| Year | Diesel fuel ^a | | Unleaded regular gasoline | | Unleaded premium gasoline | |
|-----------|---|----------------------------|---------------------------|----------------------------|---------------------------|----------------------------|
| | Current | Constant 2019 ^b | Current | Constant 2018 ^b | Current | Constant 2019 ^b |
| 1978 | ^c | ^c | 0.67 | 2.66 | ^c | ^c |
| 1980 | 1.01 | 3.17 | 1.25 | 3.91 | ^c | ^c |
| 1985 | 1.22 | 2.93 | 1.20 | 2.89 | 1.34 | 3.22 |
| 1990 | 1.07 | 2.12 | 1.16 | 2.30 | 1.35 | 2.67 |
| 1991 | 0.91 | 1.73 | 1.14 | 2.17 | 1.32 | 2.51 |
| 1992 | 1.06 | 1.96 | 1.13 | 2.08 | 1.32 | 2.43 |
| 1993 | 0.98 | 1.76 | 1.11 | 1.98 | 1.30 | 2.33 |
| 1994 | 1.11 | 1.95 | 1.11 | 1.94 | 1.31 | 2.28 |
| 1995 | 1.11 | 1.88 | 1.15 | 1.95 | 1.34 | 2.27 |
| 1996 | 1.24 | 2.04 | 1.23 | 2.03 | 1.41 | 2.33 |
| 1997 | 1.20 | 1.93 | 1.23 | 1.99 | 1.42 | 2.28 |
| 1998 | 1.04 | 1.66 | 1.06 | 1.68 | 1.25 | 1.98 |
| 1999 | 1.12 | 1.74 | 1.17 | 1.81 | 1.36 | 2.11 |
| 2000 | 1.49 | 2.24 | 1.51 | 2.27 | 1.69 | 2.54 |
| 2001 | 1.40 | 2.05 | 1.46 | 2.14 | 1.66 | 2.42 |
| 2002 | 1.32 | 1.90 | 1.36 | 1.95 | 1.56 | 2.24 |
| 2003 | 1.51 | 2.12 | 1.59 | 2.24 | 1.78 | 2.50 |
| 2004 | 1.81 | 2.48 | 1.88 | 2.58 | 2.07 | 2.83 |
| 2005 | 2.40 | 3.18 | 2.30 | 3.04 | 2.49 | 3.30 |
| 2006 | 2.71 | 3.47 | 2.59 | 3.32 | 2.81 | 3.60 |
| 2007 | 2.89 | 3.60 | 2.80 | 3.50 | 3.03 | 3.79 |
| 2008 | 3.80 | 4.57 | 3.27 | 3.93 | 3.52 | 4.23 |
| 2009 | 2.47 | 2.98 | 2.35 | 2.83 | 2.61 | 3.15 |
| 2010 | 2.99 | 3.55 | 2.79 | 3.31 | 3.05 | 3.62 |
| 2011 | 3.84 | 4.42 | 3.53 | 4.06 | 3.79 | 4.36 |
| 2012 | 3.97 | 4.47 | 3.64 | 4.11 | 3.92 | 4.42 |
| 2013 | 3.92 | 4.36 | 3.53 | 3.92 | 3.84 | 4.27 |
| 2014 | 3.83 | 4.18 | 3.37 | 3.68 | 3.71 | 4.06 |
| 2015 | 2.71 | 2.96 | 2.45 | 2.67 | 2.87 | 3.13 |
| 2016 | 2.30 | 2.48 | 2.14 | 2.31 | 2.61 | 2.81 |
| 2017 | 2.65 | 2.80 | 2.41 | 2.54 | 2.91 | 3.07 |
| 2018 | 3.18 | 3.28 | 2.74 | 2.82 | 3.27 | 3.37 |
| 2019 | 3.06 | 3.09 | 2.64 | 2.67 | 3.21 | 3.25 |
| 2020 | 2.55 | 2.55 | 2.17 | 2.17 | 2.79 | 2.79 |
| | <i>Average annual percentage change</i> | | | | | |
| 1978-2020 | 2.3% ^d | -0.5% ^d | 1.4% | -1.5% | 1.7% ^d | -1.0% ^d |
| 2010-2020 | -1.6% | -1.4% | -0.7% | -2.4% | 0.6% | -1.1% |

Sources:

Gasoline – U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, March 2021, Washington, DC, Table 9.4.

Diesel – 1980-1994 U.S. Department of Energy, Energy Information Administration, *International Energy Annual 2004*, Washington, DC, June 2004, Table 7.2. 1995–2020 from *Monthly Energy Review*, March 2021, Table 9.4. (Additional resources: www.eia.doe.gov)

^a 1980-1993: Collected from a survey of prices on January 1 of the current year. 1994-on: Annual average.

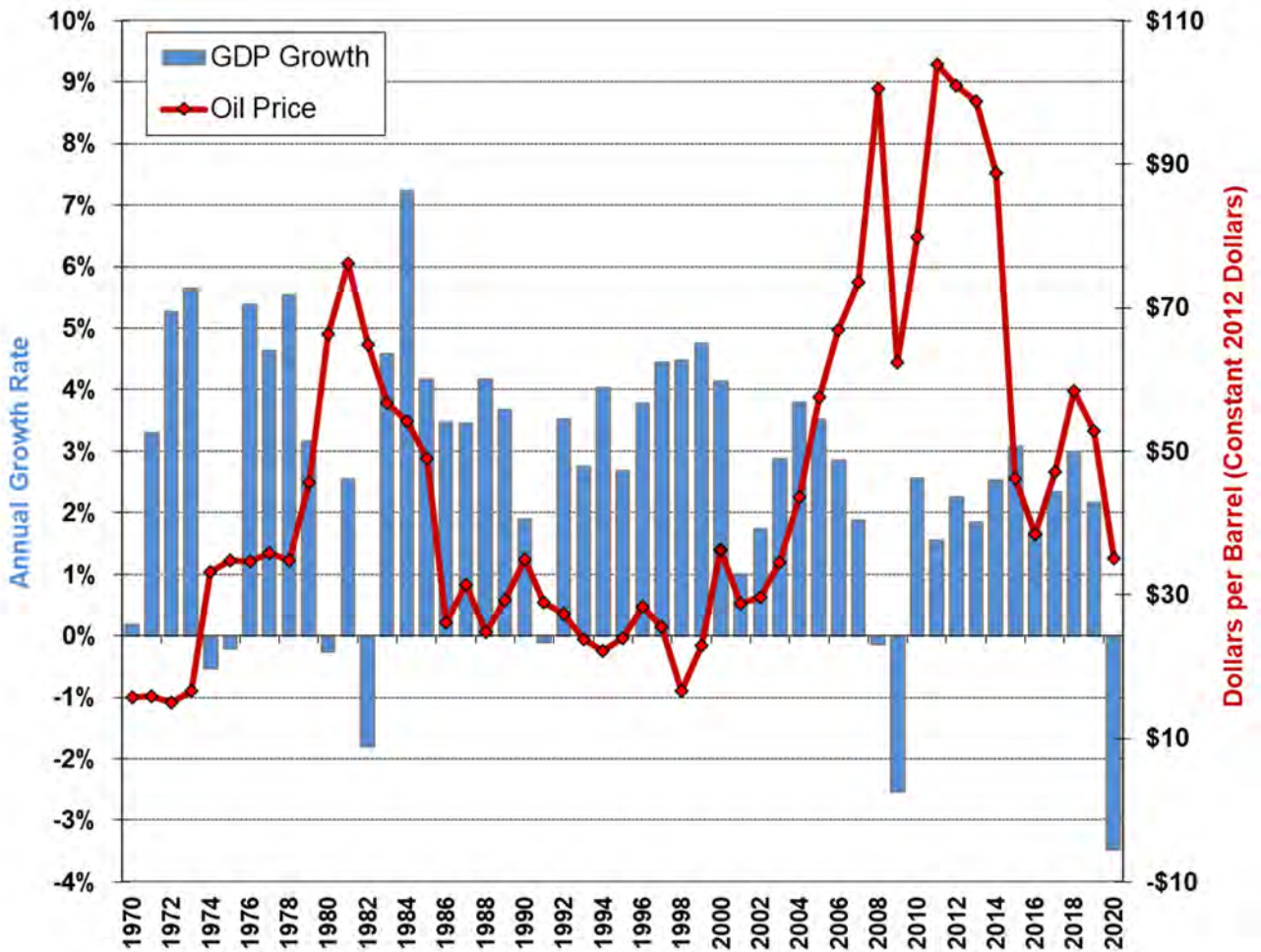
^b Adjusted by the Consumer Price Inflation Index.

^c Data are not available.

^d Average annual percentage change is from the earliest year possible to 2020.

Major oil price shocks have disrupted world energy markets five times in the past 30 years (1973-74, 1979-80, 1990-91, 1999-2000, 2008). Most of the oil price shocks were followed by an economic recession in the United States.

Figure 11.6. Oil Price and Economic Growth, 1970–2020 (Updated April 2021)

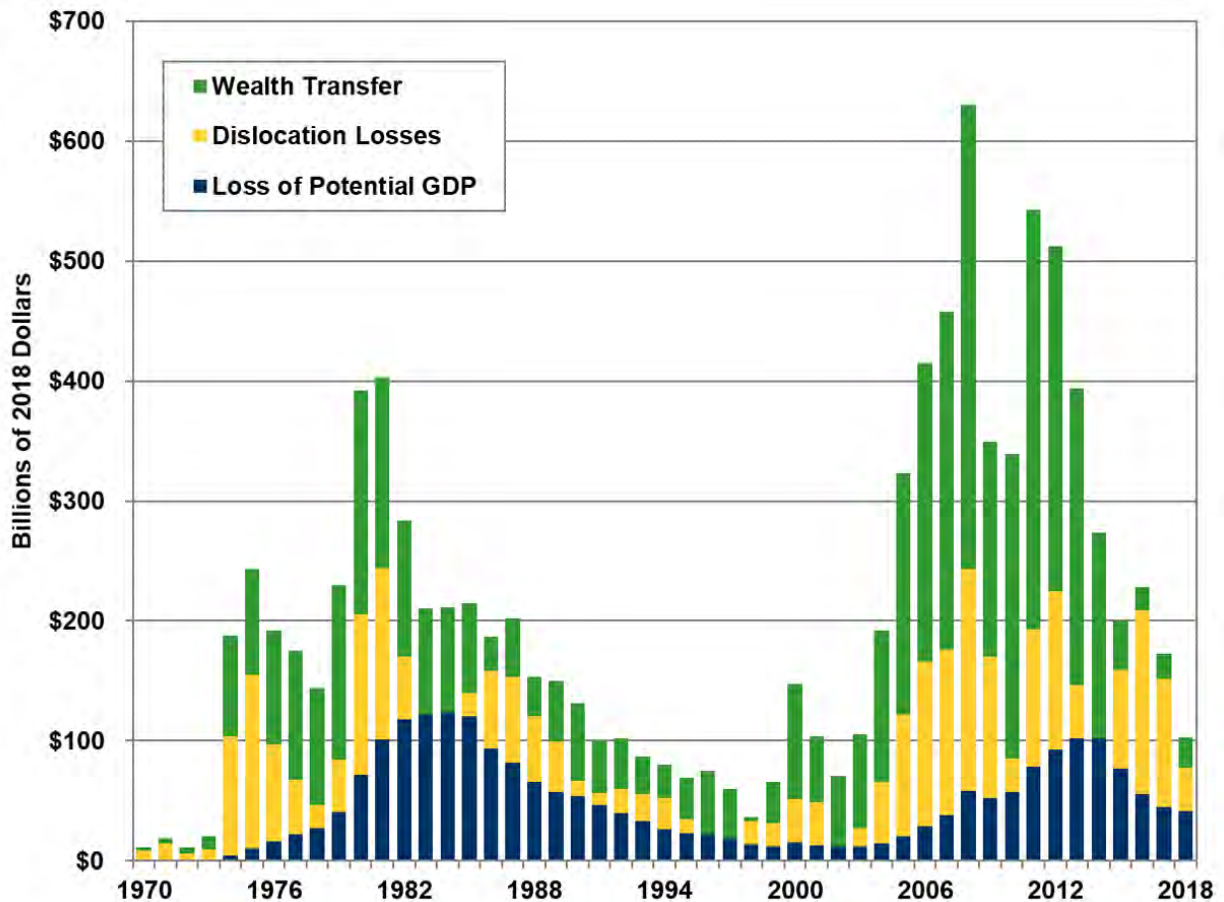


Source:

Greene, D.L. and N. I. Tishchishyna, *Costs of Oil Dependence: A 2000 Update*, Oak Ridge National Laboratory, ORNL/TM-2000/152, Oak Ridge, TN, 2000, and data updates, 2021.

The United States has long recognized the problem of oil dependence and the economic problems that arise from it. Greene, Lee and Hopson define oil dependence as a combination of four factors: (1) a noncompetitive world oil market strongly influenced by the Organization of the Petroleum Exporting Countries (OPEC) cartel, (2) high levels of U.S. imports, (3) the importance of oil to the U.S. economy, and (4) the lack of economical and readily available substitutes for oil. The most recent study shows that the U.S. economy suffered the greatest losses in 2008 when wealth transfer and gross domestic product (GDP) losses (combined) amounted to nearly half a trillion dollars. However, when comparing oil dependence to the size of the economy, the year 1980 is the highest. Low oil prices in 2009-2010 and 2013-2014 caused total dependence cost to drop; in 2018, the total cost was about \$100 billion (in 2018 dollars).

Figure 11.7. Costs of Oil Dependence to the U.S. Economy, 1970–2018



Notes:

Wealth Transfer is the product of total U.S. oil imports and the difference between the actual market price of oil (influenced by market power) and what the price would have been in a competitive market.

Dislocation Losses are temporary reductions in GDP as a result of oil price shocks.

Loss of Potential Gross Domestic Product (GDP) results because a basic resource used by the economy to produce output has become more expensive. As a consequence, with the same endowment of labor, capital, and other resources, our economy cannot produce quite as much as it could have at a lower oil price.

Source:

Greene, David L., Roderick Lee, and Janet L. Hopson, "OPEC and the Costs to the U.S. Economy of Oil Dependence: 1970-2010," Oak Ridge National Laboratory Memorandum, 2011, and updates from the ORNL Transportation Energy Evolution Modeling Team.

The fuel prices shown here are **refiner sales prices** of transportation fuels to end users, excluding tax. Sales to end users are those made directly to the ultimate consumer, including bulk consumers. Bulk sales to utility, industrial, and commercial accounts previously included in the wholesale category are now counted as sales to end users. Both propane and diesel prices fell drastically in 2015. Although both fuels experienced price increases from 2016 to 2018, they declined again in 2019 and 2020.

Table 11.7 (Updated April 2021)
Refiner Sales Prices for Propane and No. 2 Diesel, 1978–2020
 (dollars per gallon, excluding tax)

| Year | Propane ^a | | No 2. diesel fuel | |
|---|----------------------|----------------------------|-------------------|----------------------------|
| | Current | Constant 2020 ^b | Current | Constant 2020 ^b |
| 1978 | 0.34 | 1.33 | 0.38 | 1.50 |
| 1980 | 0.48 | 1.51 | 0.82 | 2.57 |
| 1985 | 0.72 | 1.72 | 0.79 | 1.90 |
| 1990 | 0.75 | 1.48 | 0.73 | 1.44 |
| 1991 | 0.73 | 1.39 | 0.65 | 1.23 |
| 1992 | 0.64 | 1.19 | 0.62 | 1.14 |
| 1993 | 0.67 | 1.21 | 0.60 | 1.08 |
| 1994 | 0.53 | 0.93 | 0.55 | 0.97 |
| 1995 | 0.49 | 0.84 | 0.56 | 0.95 |
| 1996 | 0.61 | 1.00 | 0.68 | 1.12 |
| 1997 | 0.55 | 0.89 | 0.64 | 1.04 |
| 1998 | 0.41 | 0.64 | 0.49 | 0.78 |
| 1999 | 0.46 | 0.71 | 0.58 | 0.91 |
| 2000 | 0.60 | 0.91 | 0.94 | 1.41 |
| 2001 | 0.51 | 0.74 | 0.84 | 1.23 |
| 2002 | 0.42 | 0.60 | 0.76 | 1.10 |
| 2003 | 0.58 | 0.81 | 0.94 | 1.33 |
| 2004 | 0.84 | 1.15 | 1.24 | 1.70 |
| 2005 | 1.09 | 1.44 | 1.79 | 2.37 |
| 2006 | 1.36 | 1.74 | 2.10 | 2.69 |
| 2007 | 1.49 | 1.86 | 2.27 | 2.83 |
| 2008 | 1.89 | 2.27 | 3.15 | 3.79 |
| 2009 | 1.22 | 1.47 | 1.83 | 2.21 |
| 2010 | 1.48 | 1.76 | 2.31 | 2.75 |
| 2011 | 1.71 | 1.97 | 3.12 | 3.59 |
| 2012 | 1.14 | 1.28 | 3.20 | 3.61 |
| 2013 | 1.03 | 1.14 | 3.12 | 3.47 |
| 2014 | 1.10 | 1.20 | 2.92 | 3.20 |
| 2015 | 0.48 | 0.53 | 1.82 | 1.99 |
| 2016 | 0.50 | 0.54 | 1.51 | 1.63 |
| 2017 | 0.77 | 0.82 | 1.81 | 1.91 |
| 2018 | 0.93 | 0.95 | 2.26 | 2.33 |
| 2019 | 0.60 | 0.61 | 2.11 | 2.14 |
| 2020 | 0.50 | 0.50 | 1.49 | 1.49 |
| <i>Average annual percentage change</i> | | | | |
| 1978-2020 | 1.0% | -2.3% | 3.3% | 0.0% |
| 2010-2020 | -10.3% | -11.8% | -4.3% | -6.0% |

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, April 2021, Table 9.7. (Additional resources: www.eia.doe.gov)

^a Consumer grade.

^b Adjusted by the Consumer Price Inflation Index.

Prices of finished aviation gasoline (current dollars) dropped in 2009 but then began to climb. After five years of data withheld, the 2020 price of aviation gasoline was \$2.69 per gallon. In 2012 kerosene-type jet fuel reached its all-time high. Prices were under \$2.00 per gallon in 2019 and 2020.

Table 11.8 (Updated April 2021)
Refiner Sales Prices for Aviation Gasoline and Jet Fuel, 1978–2020
 (dollars per gallon, excluding tax)

| Year | Finished aviation gasoline | | Kerosene-type jet fuel | |
|-----------|----------------------------|---|------------------------|----------------------------|
| | Current | Constant 2020 ^a | Current | Constant 2020 ^a |
| 1978 | 0.52 | 2.05 | 0.39 | 1.54 |
| 1980 | 1.08 | 3.40 | 0.87 | 2.73 |
| 1985 | 1.20 | 2.89 | 0.80 | 1.91 |
| 1986 | 1.01 | 2.39 | 0.53 | 1.25 |
| 1987 | 0.91 | 2.07 | 0.54 | 1.24 |
| 1988 | 0.89 | 1.95 | 0.51 | 1.12 |
| 1989 | 1.00 | 2.08 | 0.59 | 1.24 |
| 1990 | 1.12 | 2.22 | 0.77 | 1.52 |
| 1991 | 1.05 | 1.99 | 0.65 | 1.24 |
| 1992 | 1.03 | 1.89 | 0.61 | 1.13 |
| 1993 | 0.99 | 1.77 | 0.58 | 1.04 |
| 1994 | 0.96 | 1.67 | 0.53 | 0.93 |
| 1995 | 1.01 | 1.71 | 0.54 | 0.92 |
| 1996 | 1.12 | 1.84 | 0.65 | 1.07 |
| 1997 | 1.13 | 1.82 | 0.61 | 0.99 |
| 1998 | 0.96 | 1.52 | 0.45 | 0.72 |
| 1999 | 1.06 | 1.65 | 0.54 | 0.84 |
| 2000 | 1.31 | 1.96 | 0.90 | 1.35 |
| 2001 | 1.32 | 1.93 | 0.78 | 1.13 |
| 2002 | 1.29 | 1.85 | 0.72 | 1.04 |
| 2003 | 1.49 | 2.10 | 0.87 | 1.23 |
| 2004 | 1.82 | 2.49 | 1.21 | 1.65 |
| 2005 | 2.23 | 2.96 | 1.74 | 2.30 |
| 2006 | 2.68 | 3.44 | 2.00 | 2.57 |
| 2007 | 2.85 | 3.56 | 2.17 | 2.70 |
| 2008 | 3.27 | 3.93 | 3.05 | 3.67 |
| 2009 | 2.44 | 2.95 | 1.70 | 2.06 |
| 2010 | 3.03 | 3.59 | 2.20 | 2.61 |
| 2011 | 3.80 | 4.38 | 3.05 | 3.51 |
| 2012 | 3.97 | 4.48 | 3.10 | 3.50 |
| 2013 | 3.93 | 4.37 | 2.98 | 3.31 |
| 2014 | 3.99 | 4.36 | 2.77 | 3.03 |
| 2015 | b | b | 1.63 | 1.78 |
| 2016 | b | b | 1.32 | 1.42 |
| 2017 | b | b | 1.63 | 1.72 |
| 2018 | b | b | 2.12 | 2.18 |
| 2019 | b | b | 1.97 | 1.99 |
| 2020 | 2.69 | 2.69 | 1.29 | 1.29 |
| | | <i>Average annual percentage change</i> | | |
| 1978-2020 | 4.0% | 0.6% | 2.9% | -0.4% |
| 2010-2020 | -1.2% | -2.9% | -5.2% | -6.8% |

Source:

U.S. Department of Energy, Energy Information Administration, Petroleum Data Analysis Tools, *Refiner Petroleum Product Prices by Sales Type*, April 2021, Washington, DC. (Additional resources: www.eia.doe.gov)

^a Adjusted by the Consumer Price Inflation Index.

^b EIA withheld value to avoid disclosure of individual company data.

The federal government taxes highway motor fuel and uses the money to pay for roadway upkeep and improvement, as well as other related expenditures. Compressed natural gas (CNG) and liquefied petroleum gas (LPG) taxes are calculated per energy equivalent of a gallon of gasoline, while liquified natural gas tax is calculated per energy equivalent of diesel.

Table 11.9 (Updated April 2021)
Federal Excise Taxes on Motor Fuels, 2020

| Fuel | Cents per gallon | Effective Date |
|--------------------------------------|-------------------|-----------------|
| Gasoline | 18.4 | October 1, 1997 |
| Diesel and kerosene | 24.4 | October 1, 1997 |
| Gasohol ^a | 18.4 | January 1, 2005 |
| CNG | 18.3 ^c | October 1, 2006 |
| LNG | 24.3 ^d | January 1, 2016 |
| LPG | 18.3 ^c | January 1, 2016 |
| Other alternative fuels ^b | 18.4 | October 1, 1997 |

Sources:

U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2019*, Washington, DC, 2021, Table FE-21B. (Additional resources: www.fhwa.dot.gov)

Public Law 114-41, July 31, 2015. (Additional resources: www.congress.gov)

^a All gasohol blends are taxed at the same rate.

^b Includes benzol, benzene, naphtha, and other liquids used as a motor fuel.

^c Compressed natural gas and liquefied petroleum gas are 18.3 cents per energy equivalent of a gallon of gasoline.

^d Liquefied natural gas is 24.3 cents per energy equivalent of a gallon of diesel.

In addition to the 18.4 cents per gallon federal gasoline tax, the states also tax gasoline at varying rates. Some states have sales and/or use taxes added to gasoline excise taxes while others have inspection fees, environmental fees, leaking underground storage tank taxes, etc. The Energy Information Administration has compiled gasoline excise taxes, along with other state taxes and fees, to arrive at an estimate of the amount of state taxes consumers are paying per gallon.

Table 11.10 (Updated April 2021)
State Gasoline Tax Rates, February 2021
 (cents per gallon)

| State | Tax Rate | State | Tax Rate |
|----------------------|----------|----------------|----------|
| Alabama | 27.0 | Montana | 32.8 |
| Alaska | 9.0 | Nebraska | 29.6 |
| Arizona | 19.0 | Nevada | 23.8 |
| Arkansas | 24.8 | New Hampshire | 23.8 |
| California | 57.7 | New Jersey | 50.8 |
| Colorado | 23.6 | New Mexico | 18.9 |
| Connecticut | 25.0 | New York | 33.0 |
| Delaware | 23.0 | North Carolina | 36.4 |
| District of Columbia | 23.5 | North Dakota | 23.0 |
| Florida | 34.7 | Ohio | 38.5 |
| Georgia | 29.5 | Oklahoma | 20.0 |
| Hawaii | 18.5 | Oregon | 36.0 |
| Idaho | 33.0 | Pennsylvania | 58.7 |
| Illinois | 50.8 | Rhode Island | 35.1 |
| Indiana | 42.2 | South Carolina | 24.8 |
| Iowa | 30.0 | South Dakota | 30.0 |
| Kansas | 25.0 | Tennessee | 27.4 |
| Kentucky | 26.0 | Texas | 20.0 |
| Louisiana | 20.9 | Utah | 32.1 |
| Maine | 31.4 | Vermont | 30.5 |
| Maryland | 36.5 | Virginia | 21.8 |
| Massachusetts | 26.9 | Washington | 52.2 |
| Michigan | 37.2 | West Virginia | 35.7 |
| Minnesota | 30.6 | Wisconsin | 32.9 |
| Mississippi | 18.4 | Wyoming | 24.0 |
| Missouri | 17.4 | | |

Note: Includes gasoline tax plus other per gallon fees, such as leaking underground storage tank fees. See source for additional specifics on individual state rates.

Source:

Energy Information Administration, Petroleum Supply Monthly, Federal and state motor fuels taxes, accessed April 26, 2021. (Additional resources: <https://www.eia.gov/petroleum/marketing/monthly/xls/fueltaxes.xls>)

Federal, state, and local jurisdictions have laws and incentives for alternative fuels production and use.

Table 11.11 (Updated August 2021)
Federal, State, and Local Alternative Fuel Incentives, 2020
(number of incentives)

| State (including jurisdictions in the State) | Biodiesel | Ethanol | Natural Gas | Liquefied petroleum gas (LPG) | Electric vehicles (EVs) | Neighborhood electric vehicles (NEVs) | Hydrogen fuel cells | Aftermarket conversions |
|--|------------|------------|-------------|-------------------------------|-------------------------|---------------------------------------|---------------------|-------------------------|
| Federal | 35 | 29 | 29 | 28 | 30 | 3 | 27 | 6 |
| Alabama | 3 | 3 | 5 | 4 | 7 | 0 | 1 | 2 |
| Alaska | 1 | 2 | 1 | 1 | 5 | 1 | 1 | 1 |
| Arizona | 4 | 4 | 14 | 13 | 23 | 1 | 11 | 0 |
| Arkansas | 4 | 3 | 5 | 4 | 4 | 0 | 2 | 1 |
| California | 14 | 13 | 34 | 17 | 123 | 3 | 50 | 5 |
| Colorado | 8 | 6 | 16 | 11 | 35 | 1 | 9 | 2 |
| Connecticut | 3 | 4 | 6 | 4 | 24 | 0 | 8 | 4 |
| Delaware | 2 | 2 | 4 | 5 | 10 | 1 | 1 | 0 |
| Dist. of Columbia | 3 | 4 | 4 | 4 | 13 | 0 | 7 | 1 |
| Florida | 6 | 5 | 4 | 3 | 13 | 1 | 1 | 0 |
| Georgia | 4 | 4 | 3 | 2 | 6 | 0 | 2 | 1 |
| Hawaii | 8 | 8 | 5 | 6 | 13 | 1 | 9 | 0 |
| Idaho | 4 | 2 | 3 | 3 | 7 | 2 | 2 | 0 |
| Illinois | 11 | 9 | 7 | 6 | 14 | 1 | 4 | 2 |
| Indiana | 12 | 9 | 13 | 9 | 10 | 1 | 5 | 4 |
| Iowa | 10 | 12 | 7 | 5 | 12 | 1 | 5 | 2 |
| Kansas | 7 | 12 | 5 | 3 | 3 | 1 | 0 | 2 |
| Kentucky | 7 | 7 | 5 | 4 | 2 | 1 | 2 | 1 |
| Louisiana | 6 | 4 | 8 | 8 | 6 | 1 | 0 | 2 |
| Maine | 4 | 3 | 3 | 3 | 12 | 2 | 3 | 1 |
| Maryland | 1 | 1 | 3 | 3 | 25 | 2 | 4 | 1 |
| Massachusetts | 5 | 3 | 7 | 6 | 32 | 1 | 11 | 2 |
| Michigan | 2 | 1 | 7 | 6 | 12 | 0 | 6 | 0 |
| Minnesota | 7 | 9 | 7 | 3 | 22 | 4 | 2 | 0 |
| Mississippi | 3 | 3 | 8 | 6 | 4 | 1 | 2 | 2 |
| Missouri | 6 | 6 | 8 | 8 | 7 | 1 | 4 | 1 |
| Montana | 7 | 7 | 6 | 6 | 7 | 2 | 4 | 1 |
| Nebraska | 2 | 5 | 6 | 3 | 5 | 1 | 1 | 1 |
| Nevada | 5 | 4 | 7 | 5 | 16 | 2 | 4 | 1 |
| New Hampshire | 4 | 1 | 3 | 3 | 13 | 2 | 1 | 2 |
| New Jersey | 3 | 2 | 4 | 3 | 21 | 1 | 8 | 0 |
| New Mexico | 11 | 7 | 11 | 7 | 14 | 1 | 9 | 1 |
| New York | 2 | 2 | 9 | 3 | 38 | 1 | 7 | 3 |
| North Carolina | 10 | 9 | 8 | 7 | 20 | 0 | 8 | 1 |
| North Dakota | 10 | 7 | 2 | 2 | 3 | 1 | 2 | 0 |
| Ohio | 5 | 5 | 8 | 7 | 9 | 0 | 4 | 1 |
| Oklahoma | 8 | 10 | 16 | 11 | 16 | 1 | 9 | 6 |
| Oregon | 9 | 10 | 10 | 9 | 33 | 1 | 10 | 2 |
| Pennsylvania | 3 | 3 | 6 | 4 | 14 | 0 | 6 | 3 |
| Rhode Island | 4 | 3 | 5 | 3 | 18 | 3 | 6 | 2 |
| South Carolina | 7 | 5 | 5 | 5 | 7 | 1 | 8 | 2 |
| South Dakota | 7 | 9 | 3 | 4 | 3 | 0 | 1 | 0 |
| Tennessee | 5 | 6 | 7 | 3 | 5 | 1 | 1 | 0 |
| Texas | 5 | 6 | 15 | 8 | 18 | 1 | 7 | 5 |
| Utah | 2 | 1 | 10 | 5 | 18 | 1 | 6 | 2 |
| Vermont | 2 | 1 | 4 | 2 | 27 | 1 | 4 | 1 |
| Virginia | 13 | 12 | 15 | 8 | 25 | 1 | 12 | 2 |
| Washington | 11 | 8 | 10 | 7 | 31 | 1 | 13 | 1 |
| West Virginia | 4 | 4 | 8 | 5 | 6 | 1 | 5 | 0 |
| Wisconsin | 12 | 9 | 9 | 9 | 16 | 1 | 5 | 0 |
| Wyoming | 4 | 5 | 7 | 5 | 6 | 0 | 2 | 1 |
| Total | 335 | 309 | 415 | 309 | 863 | 56 | 322 | 81 |

Source:

U.S. Department of Energy, Energy Efficiency and Renewable Energy, Alternative Fuels Data Center. Data downloaded August 2021. (Additional resources: www.eere.energy.gov/afdc/laws/matrix/tech)

Table 11.12 (Updated August 2021)
Federal, State, and Local Advanced Technology Incentives, 2020
(number of incentives)

| State (including jurisdictions in the State) | Hybrid electric vehicles (HEV) | Plug-in hybrid vehicles (PHEVs) | Fuel economy or efficiency | Idle reduction | Connected and Autonomous Vehicles | Other ^a |
|--|--------------------------------|---------------------------------|----------------------------|----------------|-----------------------------------|--------------------|
| Federal | 10 | 27 | 13 | 7 | 2 | 8 |
| Alabama | 2 | 7 | 1 | 3 | 1 | 0 |
| Alaska | 0 | 4 | 1 | 1 | 0 | 0 |
| Arizona | 3 | 19 | 0 | 2 | 3 | 1 |
| Arkansas | 1 | 4 | 0 | 1 | 1 | 1 |
| California | 11 | 111 | 7 | 5 | 4 | 14 |
| Colorado | 3 | 30 | 1 | 2 | 1 | 3 |
| Connecticut | 2 | 23 | 1 | 2 | 1 | 1 |
| Delaware | 1 | 10 | 1 | 2 | 1 | 0 |
| Dist. of Columbia | 1 | 11 | 2 | 1 | 1 | 2 |
| Florida | 0 | 13 | 1 | 1 | 1 | 0 |
| Georgia | 1 | 6 | 0 | 1 | 1 | 0 |
| Hawaii | 3 | 13 | 1 | 1 | 1 | 1 |
| Idaho | 2 | 6 | 0 | 0 | 1 | 0 |
| Illinois | 3 | 11 | 3 | 4 | 2 | 0 |
| Indiana | 5 | 10 | 3 | 4 | 0 | 2 |
| Iowa | 0 | 11 | 0 | 1 | 1 | 0 |
| Kansas | 1 | 3 | 0 | 1 | 0 | 0 |
| Kentucky | 0 | 2 | 0 | 0 | 0 | 1 |
| Louisiana | 1 | 5 | 1 | 0 | 0 | 0 |
| Maine | 0 | 12 | 2 | 2 | 1 | 3 |
| Maryland | 0 | 22 | 0 | 2 | 0 | 1 |
| Massachusetts | 4 | 26 | 2 | 4 | 2 | 3 |
| Michigan | 1 | 11 | 0 | 0 | 0 | 0 |
| Minnesota | 2 | 21 | 1 | 4 | 1 | 1 |
| Mississippi | 2 | 3 | 1 | 1 | 0 | 0 |
| Missouri | 0 | 5 | 0 | 1 | 0 | 0 |
| Montana | 2 | 7 | 2 | 0 | 0 | 0 |
| Nebraska | 0 | 3 | 0 | 1 | 1 | 1 |
| Nevada | 3 | 11 | 0 | 2 | 2 | 0 |
| New Hampshire | 0 | 12 | 2 | 5 | 2 | 3 |
| New Jersey | 4 | 18 | 3 | 1 | 1 | 4 |
| New Mexico | 3 | 12 | 2 | 1 | 0 | 1 |
| New York | 6 | 36 | 3 | 3 | 0 | 5 |
| North Carolina | 4 | 16 | 1 | 3 | 1 | 1 |
| North Dakota | 0 | 2 | 0 | 1 | 4 | 0 |
| Ohio | 2 | 7 | 0 | 1 | 1 | 0 |
| Oklahoma | 2 | 14 | 1 | 2 | 3 | 3 |
| Oregon | 2 | 30 | 1 | 3 | 1 | 4 |
| Pennsylvania | 1 | 12 | 2 | 3 | 1 | 1 |
| Rhode Island | 3 | 14 | 3 | 4 | 0 | 8 |
| South Carolina | 5 | 8 | 0 | 2 | 0 | 0 |
| South Dakota | 2 | 3 | 0 | 1 | 0 | 1 |
| Tennessee | 2 | 3 | 1 | 1 | 1 | 1 |
| Texas | 3 | 17 | 1 | 3 | 1 | 2 |
| Utah | 4 | 16 | 3 | 3 | 1 | 3 |
| Vermont | 1 | 27 | 1 | 3 | 1 | 1 |
| Virginia | 4 | 24 | 2 | 2 | 0 | 3 |
| Washington | 1 | 28 | 2 | 1 | 1 | 1 |
| West Virginia | 0 | 6 | 0 | 2 | 0 | 1 |
| Wisconsin | 1 | 15 | 0 | 3 | 1 | 1 |
| Wyoming | 1 | 6 | 1 | 1 | 0 | 0 |
| Total | 115 | 773 | 73 | 105 | 49 | 87 |

Source:

U.S. Department of Energy, Energy Efficiency and Renewable Energy, Alternative Fuels Data Center. Data downloaded August 2021. (Additional resources: www.eere.energy.gov/afdc/laws/matrix/tech)

^a Includes Clean Fuel Initiatives and Pollution Prevention.

In current dollars, import cars, on average, were less expensive than domestic cars until 1982. Since then, import prices have more than tripled, while domestic prices have more than doubled (current dollars). The average price for cars increased from 2019 to 2020.

Table 11.13 (Updated April 2021)
Average Price of a New Car (Domestic and Import), 1970–2020

| Year | Domestic ^a | | Import | | Total | |
|---|-----------------------|------------------------------------|-----------------|------------------------------------|-----------------|------------------------------------|
| | Current dollars | Constant 2020 dollars ^b | Current dollars | Constant 2020 dollars ^b | Current dollars | Constant 2020 dollars ^b |
| 1970 | 3,706 | 24,417 | 2,649 | 17,457 | 3,543 | 23,344 |
| 1975 | 5,096 | 24,215 | 4,367 | 20,751 | 4,961 | 23,576 |
| 1980 | 7,591 | 23,554 | 7,468 | 23,171 | 7,557 | 23,448 |
| 1985 | 11,576 | 27,505 | 12,843 | 30,514 | 11,835 | 28,119 |
| 1990 | 14,483 | 28,330 | 16,615 | 32,501 | 15,033 | 29,405 |
| 1991 | 15,188 | 28,509 | 16,343 | 30,677 | 15,476 | 29,049 |
| 1992 | 15,635 | 28,491 | 18,589 | 33,872 | 16,331 | 29,758 |
| 1993 | 15,936 | 28,195 | 20,230 | 35,792 | 16,833 | 29,782 |
| 1994 | 16,817 | 29,011 | 21,885 | 37,753 | 17,798 | 30,702 |
| 1995 | 16,797 | 28,177 | 23,069 | 38,699 | 17,892 | 30,015 |
| 1996 | 17,180 | 27,993 | 26,049 | 42,445 | 18,504 | 30,150 |
| 1997 | 17,532 | 27,927 | 27,682 | 44,095 | 19,182 | 30,555 |
| 1998 | 18,488 | 28,997 | 28,708 | 45,026 | 20,238 | 31,742 |
| 1999 | 19,006 | 29,165 | 27,485 | 42,178 | 20,701 | 31,766 |
| 2000 | 19,559 | 29,038 | 26,008 | 38,612 | 21,030 | 31,222 |
| 2001 | 19,995 | 28,864 | 25,854 | 37,322 | 21,464 | 30,985 |
| 2002 | 20,436 | 29,042 | 25,616 | 36,403 | 21,866 | 31,074 |
| 2003 | 19,956 | 27,727 | 26,150 | 36,334 | 21,663 | 30,100 |
| 2004 | 20,500 | 27,744 | 25,954 | 35,127 | 22,068 | 29,867 |
| 2005 | 21,568 | 28,233 | 26,635 | 34,866 | 23,012 | 30,124 |
| 2006 | 22,126 | 28,059 | 27,019 | 34,264 | 23,611 | 29,942 |
| 2007 | 22,255 | 27,441 | 27,466 | 33,866 | 23,883 | 29,449 |
| 2008 | 22,191 | 26,350 | 25,854 | 30,700 | 23,431 | 27,823 |
| 2009 | 22,039 | 26,264 | 25,166 | 29,990 | 23,108 | 27,538 |
| 2010 | 23,769 | 27,868 | 27,250 | 31,949 | 24,907 | 29,201 |
| 2011 | 24,158 | 27,457 | 28,269 | 32,129 | 25,471 | 28,949 |
| 2012 | 24,116 | 26,854 | 28,974 | 32,264 | 25,536 | 28,435 |
| 2013 | 23,916 | 26,247 | 29,285 | 32,138 | 25,441 | 27,921 |
| 2014 | 23,761 | 25,660 | 28,171 | 30,422 | 24,964 | 26,959 |
| 2015 | 24,119 | 26,337 | 28,326 | 30,931 | 25,196 | 27,513 |
| 2016 | 24,476 | 26,394 | 28,504 | 30,737 | 25,484 | 27,481 |
| 2017 | 23,879 | 25,213 | 30,992 | 32,723 | 25,608 | 27,038 |
| 2018 | 23,503 | 24,224 | 32,327 | 33,319 | 25,530 | 26,313 |
| 2019 | 24,685 | 24,990 | 31,391 | 31,778 | 26,365 | 26,690 |
| 2020 | 25,754 | 25,754 | 32,378 | 32,378 | 27,366 | 27,366 |
| <i>Average annual percentage change</i> | | | | | | |
| 1970-2020 | 4.0% | 0.1% | 5.1% | 1.2% | 4.2% | 0.3% |
| 2010-2020 | 0.8% | -0.9% | 1.7% | 0.0% | 0.9% | -0.8% |

Note: These data are based on an average car and do not include prices for pickups, vans, or sport utility vehicles.

Source:

U.S. Department of Commerce, Bureau of Economic Analysis, *Average Transaction Price per New Car*, Washington, DC, 2021. (Additional resources: www.bea.gov)

^a Includes all vehicles produced in the United States regardless of manufacturer.

^b Adjusted by the Consumer Price Inflation Index.

The average price of a new light truck grew 51% from 1990-2020 in constant dollars terms, and by 199% when not adjusted for inflation. From the earliest available estimates in 2002, average prices for import light trucks were slightly higher than domestic prices until 2009. By 2020, domestic light truck prices averaged more than \$4,000 higher than import prices.

Table 11.14 (Updated April 2021)
Average Price of a New Light Truck^a (Domestic and Import), 1990-2020

| Year | Domestic ^b | | Import | | Total | |
|---|-----------------------|------------------------------------|-----------------|------------------------------------|-----------------|------------------------------------|
| | Current dollars | Constant 2020 dollars ^c | Current dollars | Constant 2020 dollars ^c | Current dollars | Constant 2020 dollars ^c |
| 1990 | d | d | d | d | 13,592 | 26,588 |
| 1991 | d | d | d | d | 14,124 | 26,512 |
| 1992 | d | d | d | d | 15,032 | 27,392 |
| 1993 | d | d | d | d | 15,611 | 27,621 |
| 1994 | d | d | d | d | 16,821 | 29,018 |
| 1995 | d | d | d | d | 17,725 | 29,735 |
| 1996 | d | d | d | d | 19,574 | 31,895 |
| 1997 | d | d | d | d | 21,777 | 34,689 |
| 1998 | d | d | d | d | 22,787 | 35,740 |
| 1999 | d | d | d | d | 23,626 | 36,256 |
| 2000 | d | d | d | d | 23,363 | 34,685 |
| 2001 | d | d | d | d | 24,391 | 35,210 |
| 2002 | 26,066 | 37,042 | 26,753 | 38,019 | 26,149 | 37,161 |
| 2003 | 26,420 | 36,708 | 28,604 | 39,743 | 26,715 | 37,118 |
| 2004 | 26,950 | 36,474 | 28,760 | 38,924 | 27,190 | 36,799 |
| 2005 | 27,296 | 35,732 | 29,543 | 38,673 | 27,590 | 36,117 |
| 2006 | 27,999 | 35,507 | 29,611 | 37,551 | 28,248 | 35,822 |
| 2007 | 29,158 | 35,952 | 29,817 | 36,765 | 29,265 | 36,085 |
| 2008 | 28,267 | 33,565 | 29,958 | 35,573 | 28,555 | 33,908 |
| 2009 | 29,447 | 35,091 | 29,072 | 34,645 | 29,381 | 35,012 |
| 2010 | 32,327 | 37,902 | 32,305 | 37,876 | 32,324 | 37,898 |
| 2011 | 33,373 | 37,930 | 33,317 | 37,867 | 33,365 | 37,921 |
| 2012 | 34,040 | 37,904 | 34,136 | 38,011 | 34,054 | 37,920 |
| 2013 | 34,773 | 38,161 | 33,766 | 37,056 | 34,616 | 37,989 |
| 2014 | 35,793 | 38,654 | 34,204 | 36,937 | 35,546 | 38,387 |
| 2015 | 36,822 | 40,208 | 33,681 | 36,778 | 36,256 | 39,589 |
| 2016 | 37,664 | 40,615 | 33,496 | 36,120 | 36,815 | 39,700 |
| 2017 | 38,301 | 40,440 | 33,741 | 35,625 | 37,308 | 39,392 |
| 2018 | 38,824 | 40,016 | 35,043 | 36,118 | 37,948 | 39,112 |
| 2019 | 39,748 | 40,239 | 35,142 | 35,575 | 38,762 | 39,241 |
| 2020 | 41,880 | 41,880 | 36,181 | 36,181 | 40,616 | 40,616 |
| <i>Average Annual Percentage Change</i> | | | | | | |
| 1990-2020 | d | d | d | d | 3.7% | 1.4% |
| 2010-2020 | 2.6% | 0.9% | 1.1% | -0.6% | 2.3% | 0.6% |

Source:

U.S. Department of Commerce, Bureau of Economic Analysis, *Underlying Detail, Motor Vehicle Output*, March 2021 and Ward's Communications, www.wardsauto.com.

^a Light trucks in this table are 14,000 lb and less.

^b Includes all vehicles produced in the United States regardless of manufacturer.

^c Adjusted by the Consumer Price Inflation Index.

^d Data are not available.

The total cost of operating a car is the sum of the fixed cost (depreciation, insurance, finance charge, and license fee) and the variable cost (gas and oil, tires, and maintenance), which is related to the amount of travel. The gas and oil share of total cost was 13.1% in 2019 which is down from 18.4% in 2012.

Table 11.15
Car Operating Cost per Mile, 1985–2019

| Model year | Constant 2019 dollars per 10,000 miles ^a | | | Total cost per mile ^b (constant 2019 cents ^a) | Percentage gas and oil of total cost |
|------------|---|---|------------|--|--|
| | Variable cost | Fixed cost | Total cost | | |
| 1985 | 1,763 | 4,897 | 6,660 | 66.60 | 19.9% |
| 1986 | 1,521 | 5,381 | 6,902 | 69.02 | 15.1% |
| 1987 | 1,508 | 5,239 | 6,747 | 67.47 | 14.7% |
| 1988 | 1,707 | 6,548 | 8,255 | 82.55 | 13.6% |
| 1989 | 1,649 | 6,020 | 7,670 | 76.70 | 14.2% |
| 1990 | 1,643 | 6,369 | 8,012 | 80.12 | 13.2% |
| 1991 | 1,821 | 6,694 | 8,514 | 85.14 | 14.6% |
| 1992 | 1,640 | 6,895 | 8,535 | 85.35 | 12.6% |
| 1993 | 1,628 | 6,585 | 8,213 | 82.13 | 12.7% |
| 1994 | 1,570 | 6,617 | 8,187 | 81.87 | 11.8% |
| 1995 | 1,610 | 6,719 | 8,329 | 83.29 | 11.7% |
| 1996 | 1,564 | 6,832 | 8,396 | 83.96 | 10.9% |
| 1997 | 1,720 | 6,926 | 8,646 | 86.46 | 12.2% |
| 1998 | 1,678 | 7,102 | 8,780 | 87.80 | 11.1% |
| 1999 | 1,627 | 7,151 | 8,778 | 87.78 | 9.8% |
| 2000 | 1,811 | 7,013 | 8,825 | 88.25 | 11.6% |
| 2001 | 1,963 | 6,671 | 8,634 | 86.34 | 13.2% |
| 2002 | 1,677 | 6,926 | 8,603 | 86.03 | 9.7% |
| 2003 | 1,820 | 6,786 | 8,606 | 86.06 | 11.6% |
| 2004 | 1,705 | 7,624 | 9,329 | 93.29 | 9.4% |
| 2005 | 1,846 | 7,085 | 8,930 | 89.30 | 12.0% |
| 2006 | 1,915 | 5,943 | 7,857 | 78.57 | 15.3% |
| 2007 | 1,788 | 5,875 | 7,663 | 76.63 | 14.3% |
| 2008 | 2,014 | 6,411 | 8,425 | 84.25 | 16.4% |
| 2009 | 1,838 | 6,585 | 8,423 | 84.23 | 14.3% |
| 2010 | 1,961 | 6,705 | 8,667 | 86.67 | 15.4% |
| 2011 | 2,016 | 6,657 | 8,673 | 86.73 | 16.2% |
| 2012 | 2,187 | 6,398 | 8,585 | 85.85 | 18.4% |
| 2013 | 2,241 | 6,356 | 8,597 | 85.97 | 18.4% |
| 2014 | 2,055 | 6,237 | 8,292 | 82.92 | 16.9% |
| 2015 | 1,866 | 6,311 | 8,177 | 81.77 | 14.8% |
| 2016 | 1,569 | 6,468 | 8,037 | 80.37 | 11.2% |
| 2017 | 1,626 | 5,178 | 6,804 | 68.04 | 12.6% |
| 2018 | 1,694 | 5,441 | 7,135 | 71.35 | 12.5% |
| 2019 | 1,786 | 5,284 | 7,070 | 68.46 | 13.1% |
| | | <i>Average annual percentage change</i> | | | |
| 1985-2019 | 0.0% | 0.2% | 0.2% | 0.1% | |
| 2009-2019 | -0.3% | -2.2% | -1.7% | -2.1% | |

Source:

Ward's Communications, *Motor Vehicle Facts and Figures 2019*, Southfield, Michigan, 2019, and annual. Original data from AAA "Your Driving Costs." (Additional resources: newsroom.aaa.com)

^a Adjusted by the U.S. Consumer Price Inflation Index. Can be converted to constant dollars using Table B.17.

^b Based on 10,000 miles per year.

While the previous table shows costs per mile, this table presents costs per year for fixed costs associated with car operation. For 2019 model year cars, the fixed cost is \$14.48 per day per vehicle.

Table 11.16
Fixed Car Operating Costs per Year, 1975–2019
(constant 2019 dollars)^a

| Model year | Insurance ^b | License, registration & taxes | Depreciation | Finance charge ^c | Total | Average fixed cost per day |
|---|------------------------|-------------------------------|--------------|-----------------------------|-------|----------------------------|
| 1975 | 1,820 | 143 | 3,673 | ° | 5,636 | 15.44 |
| 1980 | 1,550 | 254 | 3,221 | ° | 6,308 | 17.28 |
| 1981 | 1,456 | 248 | 3,620 | ° | 6,680 | 18.31 |
| 1982 | 1,198 | 143 | 3,592 | ° | 6,353 | 17.41 |
| 1983 | 1,212 | 249 | 3,332 | ° | 6,145 | 16.84 |
| 1984 | 1,251 | 261 | 2,970 | ° | 5,773 | 15.82 |
| 1985 | 1,111 | 261 | 2,999 | 1,269 | 5,633 | 15.44 |
| 1986 | 1,191 | 303 | 3,079 | 1,486 | 6,056 | 16.59 |
| 1987 | 1,211 | 288 | 3,362 | 1,184 | 6,038 | 16.54 |
| 1988 | 1,246 | 300 | 3,855 | 1,221 | 6,615 | 18.13 |
| 1989 | 1,340 | 297 | 4,161 | 1,212 | 7,000 | 19.17 |
| 1990 | 1,328 | 323 | 4,610 | 1,330 | 7,580 | 20.77 |
| 1991 | 1,337 | 315 | 4,700 | 499 | 6,844 | 18.75 |
| 1992 | 1,441 | 317 | 4,951 | 1,450 | 8,153 | 22.34 |
| 1993 | 1,322 | 315 | 5,007 | 1,185 | 7,824 | 21.44 |
| 1994 | 1,332 | 335 | 5,072 | 1,118 | 7,851 | 21.51 |
| 1995 | 1,319 | 341 | 5,155 | 1,151 | 7,960 | 21.81 |
| 1996 | 1,384 | 350 | 5,165 | 1,170 | 8,062 | 22.10 |
| 1997 | 1,354 | 344 | 5,212 | 1,223 | 8,128 | 22.27 |
| 1998 | 1,415 | 354 | 5,276 | 1,275 | 8,317 | 22.79 |
| 1999 | 1,494 | 347 | 5,273 | 1,271 | 8,379 | 22.96 |
| 2000 | 1,448 | 331 | 5,184 | 1,260 | 8,216 | 22.51 |
| 2001 | 1,437 | 300 | 5,122 | 1,250 | 8,103 | 22.20 |
| 2002 | 1,445 | 286 | 5,288 | 1,177 | 8,191 | 22.44 |
| 2003 | 1,538 | 285 | 5,194 | 1,034 | 8,043 | 22.04 |
| 2004 | 2,169 | 562 | 5,119 | 1,003 | 8,853 | 24.25 |
| 2005 | 1,686 | 509 | 5,078 | 967 | 8,240 | 22.58 |
| 2006 | 1,174 | 678 | 4,302 | 908 | 7,062 | 19.35 |
| 2007 | 1,215 | 663 | 4,182 | 904 | 6,964 | 19.08 |
| 2008 | 1,120 | 658 | 3,943 | 900 | 6,621 | 18.14 |
| 2009 | 1,163 | 676 | 4,124 | 928 | 6,891 | 18.88 |
| 2010 | 1,209 | 686 | 4,167 | 945 | 7,006 | 19.20 |
| 2011 | 1,100 | 676 | 4,237 | 935 | 6,949 | 19.04 |
| 2012 | 1,115 | 679 | 3,946 | 942 | 6,682 | 18.31 |
| 2013 | 1,129 | 671 | 3,919 | 931 | 6,649 | 18.22 |
| 2014 | 1,105 | 692 | 3,791 | 915 | 6,502 | 17.81 |
| 2015 | 1,203 | 717 | 3,941 | 722 | 6,583 | 18.04 |
| 2016 | 1,302 | 732 | 4,004 | 728 | 6,765 | 18.53 |
| 2017 | 1,300 | 574 | 2,784 | 521 | 5,178 | 14.18 |
| 2018 | 1,297 | 568 | 2,974 | 580 | 5,418 | 14.91 |
| 2019 | 1,288 | 570 | 2,747 | 679 | 5,284 | 14.48 |
| <i>Average annual percentage change</i> | | | | | | |
| 1975-2019 | -0.8% | 3.2% | -0.7% | ° | -0.1% | -0.1% |
| 2009-2019 | 1.0% | -1.7% | -4.0% | -3.1% | -2.6% | -2.6% |

Source:

Ward's Communications, *Motor Vehicle Facts and Figures 2019*, Southfield, Michigan, 2019, and annual. Original data from AAA "Your Driving Costs." (Additional resources: newsroom.aaa.com)

^a Adjusted by the U.S. Consumer Price Inflation Index. Can be converted to constant dollars using Table B.17.

^b Fire & Theft: \$50 deductible 1975 through 1977; \$100 deductible 1978 through 1992; \$250 deductible for 1993 – 2003; \$100 deductible 2004-2015. Collision: \$100 deductible through 1979; \$250 deductible 1980-1992; \$500 deductible for 1993 – on. Property Damage & Liability: coverage = \$100,000/\$300,000.

^c Data are not available.

Table 11.17 (Updated April 2021)
Personal Consumption Expenditures, 1970–2020
(billion dollars)

| Year | Personal consumption expenditures | | Transportation personal consumption expenditures | | Transportation PCE as a percent of PCE |
|---|-----------------------------------|----------------------------|--|----------------------------|--|
| | Current | Constant 2020 ^a | Current | Constant 2020 ^a | |
| 1970 | 646.7 | 3,394.6 | 80.8 | 424.1 | 12.5% |
| 1975 | 1,030.5 | 3,927.9 | 132.6 | 505.4 | 12.9% |
| 1980 | 1,750.7 | 4,710.8 | 241.7 | 650.4 | 13.8% |
| 1985 | 2,712.8 | 5,653.6 | 370.7 | 772.6 | 13.7% |
| 1986 | 2,886.3 | 5,895.8 | 373.7 | 763.4 | 12.9% |
| 1987 | 3,076.3 | 6,130.6 | 387.7 | 772.6 | 12.6% |
| 1988 | 3,330.0 | 6,409.8 | 416.3 | 801.3 | 12.5% |
| 1989 | 3,576.8 | 6,624.4 | 440.0 | 814.9 | 12.3% |
| 1990 | 3,809.0 | 6,798.7 | 455.7 | 813.4 | 12.0% |
| 1991 | 3,943.4 | 6,807.1 | 430.5 | 743.1 | 10.9% |
| 1992 | 4,197.6 | 7,084.6 | 463.4 | 782.1 | 11.0% |
| 1993 | 4,452.0 | 7,340.4 | 497.3 | 819.9 | 11.2% |
| 1994 | 4,721.0 | 7,621.4 | 540.0 | 871.8 | 11.4% |
| 1995 | 4,962.6 | 7,846.0 | 565.5 | 894.1 | 11.4% |
| 1996 | 5,244.6 | 8,142.5 | 610.9 | 948.5 | 11.6% |
| 1997 | 5,536.8 | 8,450.4 | 652.6 | 996.0 | 11.8% |
| 1998 | 5,877.2 | 8,869.8 | 677.8 | 1,022.9 | 11.5% |
| 1999 | 6,279.1 | 9,341.7 | 738.5 | 1,098.7 | 11.8% |
| 2000 | 6,762.1 | 9,840.5 | 809.0 | 1,177.3 | 12.0% |
| 2001 | 7,065.6 | 10,061.6 | 821.1 | 1,169.3 | 11.6% |
| 2002 | 7,342.7 | 10,293.3 | 821.1 | 1,151.1 | 11.2% |
| 2003 | 7,723.1 | 10,628.9 | 857.5 | 1,180.1 | 11.1% |
| 2004 | 8,212.7 | 11,006.5 | 913.2 | 1,223.9 | 11.1% |
| 2005 | 8,747.1 | 11,368.5 | 977.7 | 1,270.7 | 11.2% |
| 2006 | 9,260.3 | 11,681.8 | 1,011.7 | 1,276.3 | 10.9% |
| 2007 | 9,706.4 | 11,924.2 | 1,053.7 | 1,294.5 | 10.9% |
| 2008 | 9,976.3 | 12,020.7 | 1,047.1 | 1,261.7 | 10.5% |
| 2009 | 9,842.2 | 11,768.1 | 903.0 | 1,079.7 | 9.2% |
| 2010 | 10,185.8 | 12,038.9 | 986.4 | 1,165.9 | 9.7% |
| 2011 | 10,641.1 | 12,318.6 | 1,107.4 | 1,282.0 | 10.4% |
| 2012 | 11,006.8 | 12,502.2 | 1,159.6 | 1,317.1 | 10.5% |
| 2013 | 11,317.2 | 12,633.2 | 1,195.6 | 1,334.6 | 10.6% |
| 2014 | 11,822.8 | 12,959.1 | 1,228.3 | 1,346.4 | 10.4% |
| 2015 | 12,297.5 | 13,354.5 | 1,183.4 | 1,285.1 | 9.6% |
| 2016 | 12,770.0 | 13,724.0 | 1,180.0 | 1,268.2 | 9.2% |
| 2017 | 13,340.4 | 14,072.5 | 1,252.9 | 1,321.7 | 9.4% |
| 2018 | 13,993.3 | 14,415.3 | 1,339.1 | 1,379.5 | 9.6% |
| 2019 | 14,544.6 | 14,720.7 | 1,340.6 | 1,356.8 | 9.2% |
| 2020 | 14,145.3 | 14,145.3 | 1,151.5 | 1,151.5 | 8.1% |
| <i>Average annual percentage change</i> | | | | | |
| 1970-2020 | 6.4% | 2.9% | 5.5% | 2.0% | |
| 2010-2020 | 3.3% | 1.6% | 1.6% | -0.1% | |

Note: Transportation PCE includes the following categories: transportation, motor vehicles and parts, and gasoline and oil.

Source:

U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Table 2.3.5, www.bea.gov

^a Adjusted by the GNP price deflator.

Table 11.18 (Updated April 2021)
Consumer Price Indices, 1970–2020
(1970 = 1.000)

| Year | Consumer price index | Transportation consumer price index ^a | New car consumer price index | Used car consumer price index | Gross national product index |
|------|----------------------|--|------------------------------|-------------------------------|------------------------------|
| 1970 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 1975 | 1.387 | 1.336 | 1.186 | 1.404 | 1.573 |
| 1980 | 2.124 | 2.216 | 1.667 | 1.997 | 2.678 |
| 1981 | 2.343 | 2.485 | 1.768 | 2.465 | 3.001 |
| 1982 | 2.487 | 2.587 | 1.836 | 2.846 | 3.131 |
| 1983 | 2.567 | 2.648 | 1.881 | 3.163 | 3.400 |
| 1984 | 2.678 | 2.765 | 1.932 | 3.606 | 3.773 |
| 1985 | 2.773 | 2.837 | 1.998 | 3.644 | 4.042 |
| 1986 | 2.825 | 2.728 | 2.083 | 3.487 | 4.257 |
| 1987 | 2.928 | 2.811 | 2.154 | 3.625 | 4.513 |
| 1988 | 3.049 | 2.899 | 2.194 | 3.782 | 4.871 |
| 1989 | 3.196 | 3.043 | 2.245 | 3.859 | 5.248 |
| 1990 | 3.369 | 3.213 | 2.286 | 3.769 | 5.555 |
| 1991 | 3.510 | 3.301 | 2.373 | 3.785 | 5.733 |
| 1992 | 3.616 | 3.373 | 2.433 | 3.949 | 6.068 |
| 1993 | 3.724 | 3.477 | 2.499 | 4.292 | 6.381 |
| 1994 | 3.820 | 3.581 | 2.591 | 4.542 | 6.771 |
| 1995 | 3.928 | 3.709 | 2.655 | 5.016 | 7.102 |
| 1996 | 4.044 | 3.813 | 2.706 | 5.032 | 7.506 |
| 1997 | 4.137 | 3.848 | 2.718 | 4.843 | 7.966 |
| 1998 | 4.201 | 3.776 | 2.701 | 4.827 | 8.410 |
| 1999 | 4.294 | 3.851 | 2.691 | 4.872 | 8.943 |
| 2000 | 4.438 | 4.088 | 2.689 | 4.994 | 9.528 |
| 2001 | 4.564 | 4.115 | 2.676 | 5.087 | 9.846 |
| 2002 | 4.637 | 4.077 | 2.637 | 4.872 | 10.171 |
| 2003 | 4.742 | 4.203 | 2.597 | 4.580 | 10.666 |
| 2004 | 4.869 | 4.349 | 2.582 | 4.272 | 11.385 |
| 2005 | 5.034 | 4.637 | 2.597 | 4.468 | 12.147 |
| 2006 | 5.196 | 4.824 | 2.591 | 4.487 | 12.842 |
| 2007 | 5.344 | 4.925 | 2.566 | 4.351 | 13.486 |
| 2008 | 5.549 | 5.215 | 2.527 | 4.293 | 13.770 |
| 2009 | 5.529 | 4.780 | 2.554 | 4.070 | 13.514 |
| 2010 | 5.620 | 5.157 | 2.599 | 4.587 | 14.067 |
| 2011 | 5.797 | 5.663 | 2.672 | 4.776 | 14.614 |
| 2012 | 5.917 | 5.796 | 2.716 | 4.818 | 15.217 |
| 2013 | 6.004 | 5.798 | 2.745 | 4.804 | 15.760 |
| 2014 | 6.101 | 5.758 | 2.755 | 4.779 | 16.457 |
| 2015 | 6.109 | 5.308 | 2.771 | 4.715 | 17.096 |
| 2016 | 6.186 | 5.197 | 2.775 | 4.599 | 17.576 |
| 2017 | 6.318 | 5.375 | 2.768 | 4.431 | 18.371 |
| 2018 | 6.472 | 5.618 | 2.755 | 4.435 | 19.354 |
| 2019 | 6.589 | 5.602 | 2.765 | 4.480 | 20.101 |
| 2020 | 6.670 | 5.369 | 2.780 | 4.622 | 19.580 |

Sources:

Bureau of Labor Statistics, Consumer Price Index, All Urban Consumers, Multi-screen data search, www.bls.gov/data.
 (Additional resources: www.bls.gov)

GNP – U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Table 1.7.5. (Additional resources: www.bea.gov)

^a Transportation Consumer Price Index includes new and used cars, gasoline, car insurance rates, intracity mass transit, intracity bus fare, and airline fares.

The data below were summarized from the Bureau of Labor Statistics (BLS) Current Employment Statistics Survey data using the North American Industry Classification System (NAICS). Transportation-related employment was 7.6% of total employment in 2020.

Table 11.19 (Updated April 2021)
Transportation-Related Employment, 1990, 2000, and 2020^a
 (thousands)

| | 1990 | 2000 | 2020 | Percent change 1990-2020 |
|--|----------------|-----------------|-----------------|--------------------------------|
| Truck transportation (includes drivers) | 1,122.6 | 1,406.1 | 1,465.6 | 30.6% |
| Transit and ground transportation | 274.2 | 372.1 | 374.8 | 36.7% |
| Air transportation | 529.2 | 614.4 | 430.3 | -18.7% |
| Rail transportation | 271.8 | 231.7 | 149.2 | -45.1% |
| Water transportation | 56.8 | 56.0 | 61.0 | 7.4% |
| Pipeline transportation | 59.8 | 46.0 | 50.9 | -14.9% |
| Motor vehicle and parts - retail | 1,494.4 | 1,846.9 | 1,907.6 | 27.6% |
| Motor vehicles and parts - wholesale | 313.8 | 360.8 | 343.3 | 9.4% |
| Gasoline stations - retail | 910.2 | 935.7 | 930.7 | 2.3% |
| Automotive repair and maintenance | 659.4 | 888.1 | 901.0 | 36.6% |
| Automotive equipment rental and leasing | 163.2 | 208.3 | 191.3 | 17.2% |
| Manufacturing (subtotal) | 2,224.9 | 2,143.9 | 1,637.9 | -26.4% |
| <i>Motor vehicles</i> | 271.5 | 291.4 | 187.0 | -31.1% |
| <i>Motor vehicle bodies and trailers</i> | 129.8 | 182.7 | 149.8 | 15.4% |
| <i>Motor vehicle parts</i> | 653.0 | 839.5 | 535.0 | -18.1% |
| <i>Aerospace products and parts</i> | 840.7 | 516.7 | 511.3 | -39.2% |
| <i>Railroad rolling stock</i> | 65.9 | 72.7 | 58.7 | -10.9% |
| <i>Ship & boat building</i> | 173.7 | 154.1 | 138.7 | -20.1% |
| <i>Tires</i> | 90.3 | 86.8 | 57.4 | -36.4% |
| Oil and gas pipeline construction | 86.0 | 72.2 | 143.9 | 67.3% |
| Highway street and bridge construction | 288.5 | 340.1 | 345.2 | 19.7% |
| Scenic & sightseeing | 15.7 | 27.5 | 23.3 | 48.4% |
| Support activities for transportation | 364.1 | 537.4 | 700.0 | 92.3% |
| Couriers and messengers | 375.0 | 605.0 | 957.1 | 155.2% |
| Travel arrangement and reservation services | 250.0 | 298.6 | 170.5 | -31.8% |
| Total transportation-related employment | 9,459.6 | 10,990.8 | 10,783.6 | 14.0% |
| Total nonfarm employment | 109,976.0 | 133,555.0 | 142,185.0 | 29.3% |
| Transportation-related to total employment | 8.6% | 8.2% | 7.6% | |

Source:

Tabulated from the U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics, www.bls.gov/ces/data.htm, April 2021. (Additional resources: www.bls.gov)

^a Not seasonally adjusted.

The total number of employees involved in the manufacture of motor vehicles decreased by 31% from 1990 to 2020 and by 18% for those involved in the manufacture of motor vehicle parts.

Table 11.20 (Updated April 2021)
U.S. Employment for Motor Vehicles and Motor Vehicle Parts Manufacturing, 1990–2020^a

| Year | All employees (thousands) | Production workers (thousands) | Share of production workers to total employees |
|---------------------|------------------------------|-----------------------------------|---|
| Motor vehicles | | | |
| 1990 | 271.4 | 243.4 | 89.7% |
| 1995 | 294.7 | 273.7 | 92.9% |
| 2000 | 291.4 | 251.0 | 86.1% |
| 2001 | 278.7 | 236.4 | 84.8% |
| 2002 | 265.4 | 220.8 | 83.2% |
| 2003 | 264.6 | 217.1 | 82.0% |
| 2004 | 255.9 | 208.0 | 81.3% |
| 2005 | 247.6 | 198.6 | 80.2% |
| 2006 | 236.5 | 191.8 | 81.1% |
| 2007 | 220.0 | 177.3 | 80.6% |
| 2008 | 191.6 | 151.1 | 78.9% |
| 2009 | 146.4 | 114.2 | 78.0% |
| 2010 | 152.6 | 120.7 | 79.1% |
| 2011 | 157.9 | 124.7 | 79.0% |
| 2012 | 167.6 | 134.7 | 80.4% |
| 2013 | 181.5 | 150.1 | 82.7% |
| 2014 | 194.0 | 160.8 | 82.9% |
| 2015 | 200.8 | 161.6 | 80.5% |
| 2016 | 211.8 | 168.9 | 79.7% |
| 2017 | 218.9 | 173.8 | 79.4% |
| 2018 | 233.6 | 187.0 | 80.1% |
| 2019 | 237.2 | 191.5 | 80.7% |
| Motor vehicle parts | | | |
| 1990 | 653.0 | 527.4 | 80.8% |
| 1995 | 786.9 | 647.7 | 82.3% |
| 2000 | 839.5 | 676.7 | 80.6% |
| 2001 | 774.7 | 624.9 | 80.7% |
| 2002 | 733.6 | 590.9 | 80.5% |
| 2003 | 707.8 | 567.6 | 80.2% |
| 2004 | 692.1 | 561.6 | 81.1% |
| 2005 | 678.1 | 553.9 | 81.7% |
| 2006 | 654.7 | 533.7 | 81.5% |
| 2007 | 607.9 | 488.9 | 80.4% |
| 2008 | 543.7 | 430.6 | 79.2% |
| 2009 | 413.7 | 317.8 | 76.8% |
| 2010 | 418.9 | 323.3 | 77.2% |
| 2011 | 445.5 | 345.0 | 77.4% |
| 2012 | 482.8 | 365.3 | 75.7% |
| 2013 | 508.7 | 385.2 | 75.7% |
| 2014 | 537.0 | 415.9 | 77.4% |
| 2015 | 564.9 | 436.7 | 77.3% |
| 2016 | 581.2 | 448.6 | 77.2% |
| 2017 | 589.2 | 453.3 | 76.9% |
| 2018 | 599.7 | 459.4 | 76.6% |
| 2019 | 594.1 | 447.0 | 75.2% |
| 2020 | 535.0 | 387.9 | 72.5% |

Source:

Tabulated from the U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics, www.bls.gov/ces/data.htm, April 2021. (Additional resources: www.bls.gov)

^a Not seasonally adjusted.

Chapter 12

Greenhouse Gas Emissions

Summary Statistics from Tables/Figures in this Chapter

| Source | | 1990 | 2020 |
|-------------|--|-------|--------|
| Table 12.1 | Carbon dioxide emissions (million metric tons) | | |
| | <i>United States</i> | 4,989 | 5,104 |
| | <i>OECD Europe</i> | 4,149 | 3,668 |
| | <i>China</i> | 2,293 | 10,532 |
| | <i>Russia</i> | 2,393 | 1,692 |
| | <i>Japan</i> | 1,054 | 1,067 |
| | <i>Non-OECD Europe and Eurasia</i> | 4,246 | 2,654 |
| | <i>India</i> | 573 | 2,594 |
| Table 12.5 | Transportation share of U.S. carbon dioxide emissions from fossil fuel consumption | | |
| | <i>1990</i> | | 31.3% |
| | <i>2009</i> | | 32.9% |
| | <i>2019</i> | | 37.7% |
| Table 12.7 | Motor gasoline share of transportation carbon dioxide emissions, 2019 | | 59.7% |
| Table 12.11 | Average annual carbon footprint, 2020 (metric tons of CO ₂) | | |
| | <i>New cars</i> | | 5.4 |
| | <i>New light trucks</i> | | 7.5 |

The U.S. accounted for 23% of the World's carbon dioxide emissions in 1990, 21% in 2005, and only 14% in 2020. About 46% of the U.S. carbon emissions are from oil use.

Table 12.1 (Updated August 2021)
World Carbon Dioxide Emissions, 1990, 2005, and 2020

| Country/Region | 1990 | | 2005 | | 2020 | |
|--------------------------------------|---------------------|-----------------------------------|---------------------|-----------------------------------|---------------------|-----------------------------------|
| | Million metric tons | Percent of emissions from oil use | Million metric tons | Percent of emissions from oil use | Million metric tons | Percent of emissions from oil use |
| OECD^a Americas | | | | | | |
| United States | 4,989 | 44% | 5,985 | 44% | 5,104 | 46% |
| Canada | 471 | 48% | 620 | 49% | 591 | 56% |
| Mexico/Chile | 302 | 77% | 461 | 66% | 507 | 60% |
| Total | 5,762 | 46% | 7,066 | 46% | 6,202 | 48% |
| OECD Europe | 4,149 | 45% | 4,488 | 49% | 3,668 | 52% |
| OECD Asia | | | | | | |
| Japan | 1,054 | 65% | 1,241 | 52% | 1,067 | 39% |
| Australia/New Zealand | 298 | 38% | 438 | 55% | 463 | 40% |
| Other | 243 | 59% | 494 | 30% | 633 | 44% |
| Total | 1,595 | 59% | 2,173 | 47% | 2,163 | 41% |
| Non-OECD Europe & Eurasia | | | | | | |
| Russia | 2,393 | 33% | 1,548 | 25% | 1,692 | 30% |
| Other | 1,853 | 32% | 1,120 | 26% | 962 | 29% |
| Total | 4,246 | 32% | 2,668 | 25% | 2,654 | 29% |
| Non-OECD Asia | | | | | | |
| China | 2,293 | 15% | 5,490 | 16% | 10,532 | 18% |
| India | 573 | 28% | 1,182 | 27% | 2,594 | 26% |
| Other | 811 | 57% | 1,665 | 53% | 2,735 | 48% |
| Total | 3,677 | 26% | 8,337 | 25% | 15,861 | 25% |
| Other Non-OECD | | | | | | |
| Middle East | 704 | 70% | 1,333 | 59% | 2,203 | 54% |
| Africa | 659 | 46% | 978 | 43% | 1,348 | 50% |
| Central & South America | 695 | 76% | 1,011 | 72% | 1,241 | 70% |
| Total | 2,058 | 64% | 3,322 | 58% | 4,792 | 57% |
| Total World | 21,487 | 42% | 28,054 | 40% | 35,340 | 37% |

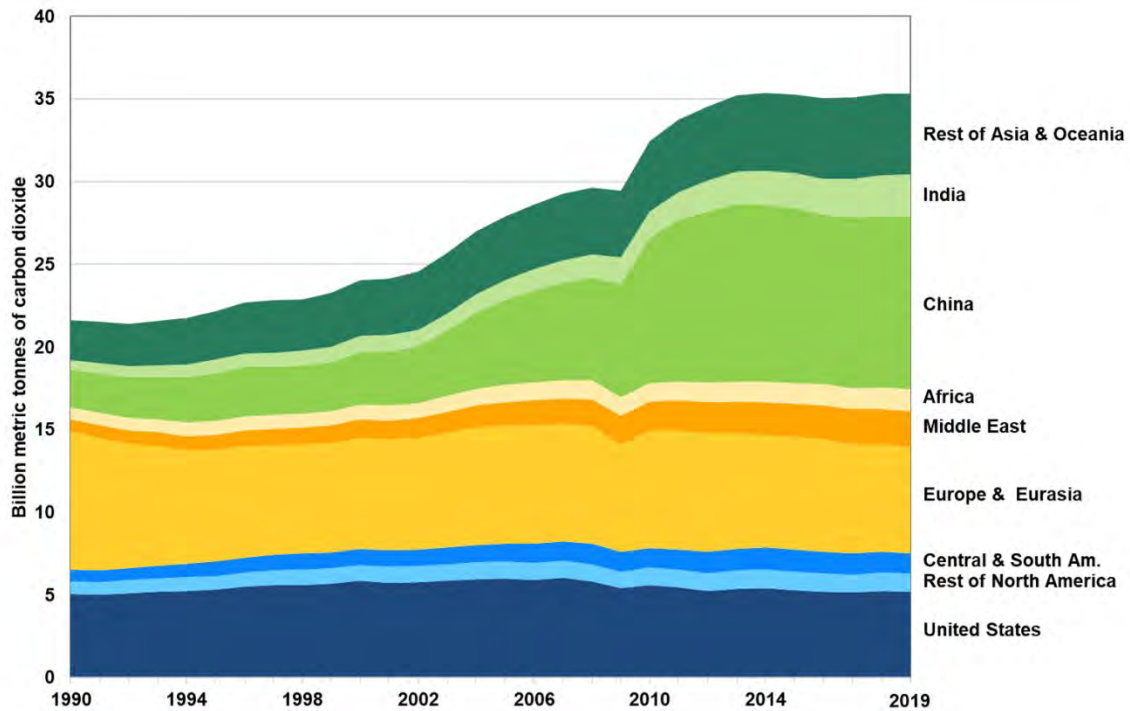
Source:

U.S. Department of Energy, Energy Information Administration, International Energy Statistics Databases, and *International Energy Outlook 2020*, Washington, DC. (Additional resources: www.eia.doe.gov)

^a OECD is the Organization for Economic Cooperation and Development. See Glossary for included countries.

Since 1990, China shows the greatest increase of carbon dioxide (CO₂) emissions. The Americas have increased CO₂ emissions by only 10% from 1990 to 2019. Europe and Eurasia have fewer CO₂ emissions in 2019 than 1990.

Figure 12.1. World Carbon Dioxide Emissions, 1990–2019



Source:

1990–2009: U.S. Department of Energy, Energy Information Administration, *International Energy Statistics*, Total Carbon Dioxide Emissions from the Consumption of Energy, www.eia.doe.gov/cfapps/ipdbproject/IEDIndex3.cfm, September 2016.
 2010–2019: U.S. Department of Energy, Energy Information Administration, *International Energy Outlook 2019*, www.eia.gov/forecasts/ieo/index.cfm, accessed September 2020. (Additional resources: www.eia.doe.gov)

Global Warming Potentials (GWP) were developed to allow comparison of the ability of each greenhouse gas to trap heat in the atmosphere relative to carbon dioxide. Extensive research has been performed and it has been discovered that the effects of various gases on global warming are too complex to be precisely summarized by a single number. Further understanding of the subject also causes frequent changes to estimates. Despite that, the scientific community has developed approximations, the latest of which are shown below. Most analysts use the 100-year time horizon.

Table 12.2
Numerical Estimates of Global Warming Potentials Compared with Carbon Dioxide
(kilogram of gas per kilogram of carbon dioxide)

| Gas | Lifetime (years) | Global warming potential direct effect for time horizons of | |
|---|---------------------|--|-----------|
| | | 20 years | 100 years |
| Carbon Dioxide (CO ₂) | 5-200 ^a | 1 | 1 |
| Methane (CH ₄) ^b | 12.4 | 86 | 34 |
| Tetrafluoroethane (HFC-134a) | 13.4 | 3,790 | 1,550 |
| Trichlorofluoromethane (CFC-11) | 45 | 7,020 | 5,350 |
| Nitrous Oxide (N ₂ O) | 121 | 268 | 298 |
| Perfluoromethane (CF ₄) | 50,000 | 4,950 | 7,350 |

Note: Includes climate-carbon feedbacks.

Source:

Myhre, G., D. Shindell, F.-M. Breon, W. Collins, J. Fuglestvedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura and H. Zhang, 2013: Anthropogenic and Natural Radiative Forcing. In: *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, R.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Zia, V. Bex and P.M. Midgley (eds)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

^a No single lifetime can be defined for carbon dioxide due to different rates of uptake by different removal processes.

^b These values do not include carbon dioxide from methane oxidation. Perturbation lifetime is used in the calculation of metrics.

Carbon dioxide emissions in 2019 were 3% higher than in 1990, but down from the highest annual emissions of this data series in 2007. Carbon dioxide accounts for the majority (80%) of greenhouse gases.

Table 12.3 (Updated August 2021)
U.S. Emissions of Greenhouse Gases, Based on Global Warming Potential, 1990–2019
(million metric tons of carbon dioxide equivalent^a)

| Year | Carbon dioxide | Methane | Nitrous oxide | High GWP gases ^b | Total |
|--------------------------------------|----------------|---------|---------------|-----------------------------|---------|
| 1990 | 5,088.4 | 776.7 | 452.5 | 99.5 | 6,417.1 |
| 1995 | 5,394.2 | 767.7 | 468.7 | 117.8 | 6,748.4 |
| 1996 | 5,583.3 | 760.9 | 480.7 | 128.9 | 6,953.8 |
| 1997 | 5,658.2 | 746.8 | 466.9 | 136.4 | 7,008.3 |
| 1998 | 5,703.4 | 731.6 | 467.7 | 152.8 | 7,055.5 |
| 1999 | 5,774.6 | 713.4 | 457.3 | 149.9 | 7,095.2 |
| 2000 | 5,958.9 | 707.5 | 444.5 | 150.8 | 7,261.7 |
| 2001 | 5,846.7 | 699.7 | 460.2 | 137.7 | 7,144.3 |
| 2002 | 5,888.2 | 692.5 | 458.5 | 145.9 | 7,185.1 |
| 2003 | 5,948.8 | 692.5 | 459.9 | 137.0 | 7,238.2 |
| 2004 | 6,049.9 | 687.0 | 469.7 | 144.6 | 7,351.2 |
| 2005 | 6,071.0 | 686.1 | 455.8 | 146.5 | 7,359.4 |
| 2006 | 5,990.8 | 690.7 | 452.5 | 149.4 | 7,283.4 |
| 2007 | 6,073.5 | 693.8 | 463.5 | 161.0 | 7,391.8 |
| 2008 | 5,868.3 | 700.6 | 446.8 | 162.8 | 7,178.5 |
| 2009 | 5,435.9 | 689.5 | 445.4 | 158.6 | 6,729.4 |
| 2010 | 5,639.2 | 692.1 | 454.8 | 168.1 | 6,954.2 |
| 2011 | 5,506.0 | 666.1 | 445.5 | 175.4 | 6,793.0 |
| 2012 | 5,304.4 | 658.2 | 416.9 | 172.3 | 6,551.8 |
| 2013 | 5,445.9 | 654.4 | 463.8 | 172.1 | 6,736.2 |
| 2014 | 5,493.5 | 651.1 | 473.9 | 177.2 | 6,795.7 |
| 2015 | 5,341.9 | 651.5 | 468.3 | 179.6 | 6,641.3 |
| 2016 | 5,221.4 | 642.3 | 450.9 | 179.2 | 6,493.8 |
| 2017 | 5,182.5 | 648.3 | 446.2 | 180.9 | 6,457.9 |
| 2018 | 5,350.3 | 655.8 | 459.0 | 180.8 | 6,645.9 |
| 2019 | 5,230.7 | 659.6 | 457.2 | 185.6 | 6,533.1 |
| <i>Average annual percent change</i> | | | | | |
| 1990-2019 | 0.1% | -0.6% | 0.0% | 2.2% | 0.1% |
| 2009-2019 | -0.4% | -0.4% | 0.3% | 1.6% | -0.3% |

Note: This greenhouse gas emissions inventory includes fossil fuel combustion, use of fluorinated gases and other transportation categories.

Source:

U.S. Environmental Protection Agency, Inventory of U. S. Greenhouse Gas Emissions and Sinks: 1990-2019, April 2021, EPA 430-R-21-005. (Additional resources: www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019)

^a Carbon dioxide equivalents are computed by multiplying the weight of the gas being measured by its estimated Global Warming Potential (See Table 12.2).

^b GWP = Global warming potential. Includes HFC-hydrofluorocarbons; PFC-perfluorocarbons; and SF₆-sulfur hexafluoride.

The transportation sector accounted for 35% of carbon dioxide emissions and 28.8% of all greenhouse gas emissions in 2019. The industrial sector is the only sector that accounts for more greenhouse gas emissions than the transportation sector.

Table 12.4 (Updated August 2021)
Total U.S. Greenhouse Gas Emissions by End-Use Sector, 2019
(million metric tons of carbon dioxide equivalent^a)

| | Carbon dioxide | Methane | Nitrous oxide | Hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride | Total greenhouse gas emissions |
|---------------------------------------|----------------|--------------|---------------|---|--------------------------------|
| Residential | 925.8 | 5.1 | 8.7 | 38.7 | 978.3 |
| Commercial | 807.4 | 115.6 | 35.6 | 63.8 | 1,022.4 |
| Agricultural | 82.0 | 256.5 | 366.0 | 0.1 | 704.6 |
| Industrial | 1,584.6 | 281.0 | 35.3 | 46.3 | 1,947.2 |
| Transportation | 1,830.9 | 1.4 | 11.6 | 36.7 | 1,880.6 |
| Total greenhouse gas emissions | 5,230.7 | 659.6 | 457.2 | 185.6 | 6,533.1 |
| Transportation share of total | 35.0% | 0.2% | 2.5% | 19.8% | 28.8% |

Note: Does not include U.S. territories. Totals may not sum due to rounding.

Source:

U.S. Environmental Protection Agency, *Inventory of U. S. Greenhouse Gas Emissions and Sinks: 1990-2019*, April 2021, EPA 430-R-21-005. (Additional resources: www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019)

^a Carbon dioxide equivalents are computed by multiplying the weight of the gas being measured by its estimated Global Warming Potential (See Table 12.2).

The transportation sector accounts for 37.7% of carbon dioxide emissions. The commercial sector accounts for the lowest share of carbon dioxide emissions.

Table 12.5 (Updated August 2021)
U.S. Carbon Emissions from Fossil Fuel Consumption
by End-Use Sector, 1990–2019^a
(million metric tons of carbon dioxide)

| | End use sector | | | | Transportation percentage | CO ₂ from all sectors |
|-----------|----------------|------------|---|----------------|------------------------------|-------------------------------------|
| | Residential | Commercial | Industrial | Transportation | | |
| 1990 | 931.3 | 766.0 | 1,540.2 | 1,472.2 | 31.3% | 4,709.7 |
| 1991 | 949.3 | 771.2 | 1,513.3 | 1,425.5 | 30.6% | 4,659.3 |
| 1992 | 945.4 | 765.2 | 1,565.6 | 1,480.8 | 31.1% | 4,757.0 |
| 1993 | 998.0 | 785.0 | 1,574.5 | 1,511.8 | 31.0% | 4,869.3 |
| 1994 | 989.0 | 796.8 | 1,596.1 | 1,557.2 | 31.5% | 4,939.1 |
| 1995 | 994.7 | 814.4 | 1,605.9 | 1,583.9 | 31.7% | 4,998.9 |
| 1996 | 1,055.6 | 846.1 | 1,659.5 | 1,630.5 | 31.4% | 5,191.7 |
| 1997 | 1,045.2 | 886.9 | 1,672.9 | 1,646.7 | 31.4% | 5,251.7 |
| 1998 | 1,049.8 | 905.1 | 1,661.0 | 1,682.2 | 31.8% | 5,298.1 |
| 1999 | 1,070.5 | 914.5 | 1,616.2 | 1,749.7 | 32.7% | 5,350.9 |
| 2000 | 1,133.9 | 977.6 | 1,659.0 | 1,795.7 | 32.3% | 5,566.2 |
| 2001 | 1,125.5 | 983.9 | 1,602.4 | 1,766.2 | 32.2% | 5,478.0 |
| 2002 | 1,152.7 | 982.7 | 1,576.8 | 1,806.6 | 32.7% | 5,518.8 |
| 2003 | 1,182.7 | 994.2 | 1,595.9 | 1,816.4 | 32.5% | 5,589.2 |
| 2004 | 1,180.9 | 1,011.2 | 1,622.6 | 1,849.9 | 32.7% | 5,664.6 |
| 2005 | 1,214.9 | 1,030.1 | 1,589.2 | 1,863.4 | 32.7% | 5,697.6 |
| 2006 | 1,151.9 | 1,010.1 | 1,587.2 | 1,863.7 | 33.2% | 5,612.9 |
| 2007 | 1,204.1 | 1,051.3 | 1,582.4 | 1,865.9 | 32.7% | 5,703.7 |
| 2008 | 1,190.4 | 1,042.9 | 1,517.2 | 1,764.4 | 32.0% | 5,514.9 |
| 2009 | 1,122.7 | 981.0 | 1,345.9 | 1,693.0 | 32.9% | 5,142.6 |
| 2010 | 1,174.9 | 997.5 | 1,437.9 | 1,701.4 | 32.0% | 5,311.7 |
| 2011 | 1,116.9 | 962.6 | 1,421.6 | 1,675.5 | 32.4% | 5,176.6 |
| 2012 | 1,007.9 | 900.9 | 1,399.8 | 1,664.3 | 33.5% | 4,972.9 |
| 2013 | 1,063.9 | 928.7 | 1,429.1 | 1,674.1 | 32.9% | 5,095.8 |
| 2014 | 1,080.6 | 938.1 | 1,407.5 | 1,712.7 | 33.3% | 5,138.9 |
| 2015 | 1,001.1 | 907.6 | 1,346.8 | 1,723.5 | 34.6% | 4,979.0 |
| 2016 | 946.2 | 865.2 | 1,310.1 | 1,764.1 | 36.1% | 4,885.6 |
| 2017 | 910.5 | 838.2 | 1,294.5 | 1,786.8 | 37.0% | 4,830.0 |
| 2018 | 980.2 | 850.6 | 1,314.9 | 1,821.2 | 36.7% | 4,966.9 |
| 2019 | 920.3 | 802.1 | 1,287.8 | 1,821.9 | 37.7% | 4,832.1 |
| | | | <i>Average annual percentage change</i> | | | |
| 1990-2019 | 0.0% | 0.2% | -0.6% | 0.7% | | 0.1% |
| 2009-2019 | -2.0% | -2.0% | -0.4% | 0.7% | | -0.6% |

Note: The CO₂ from all sectors does not match Table 12.3 since it is only from fossil fuel consumption and does not include the use of fluorinated gases and other transportation categories. U.S. territories are not included.

Source:

U.S. Environmental Protection Agency, *Inventory of U. S. Greenhouse Gas Emissions and Sinks: 1990-2019*, April 2021, EPA 430-R-21-005. (Additional resources: www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019)

^a Includes energy from petroleum, coal, and natural gas. Electric utility emissions are distributed across consumption sectors.

This report has typically displayed carbon and carbon dioxide data from the Environmental Protection Agency (EPA). However, the Energy Information Administration's (EIA's) Monthly Energy Review also includes carbon dioxide emission data. The differences in the two-data series have been about 5-7%, but as high as 8.5% in 1991. Reasons for the differences include the treatment of international bunker fuel, nonfuel use of fossil fuels, and the agencies' use of different fuel consumption control totals.

Table 12.6 (Updated August 2021)
Transportation Sector Carbon Dioxide Emissions from
Energy Consumption, 1973-2020
(million metric tons of carbon dioxide)

| Year | Energy Information Administration's <i>Monthly Energy Review</i> | Environmental Protection Agency's Greenhouse Gas Inventory Report | Percentage difference |
|------|--|---|-----------------------|
| 1973 | 1,315.2 | a | a |
| 1975 | 1,291.6 | a | a |
| 1980 | 1,400.2 | a | a |
| 1985 | 1,421.2 | a | a |
| 1990 | 1,587.6 | 1,484.1 | 6.5% |
| 1991 | 1,567.9 | 1,436.1 | 8.4% |
| 1992 | 1,591.6 | 1,491.6 | 6.3% |
| 1993 | 1,604.2 | 1,522.8 | 5.1% |
| 1994 | 1,644.1 | 1,568.8 | 4.6% |
| 1995 | 1,678.5 | 1,595.2 | 5.0% |
| 1996 | 1,723.8 | 1,641.5 | 4.8% |
| 1997 | 1,742.2 | 1,658.3 | 4.8% |
| 1998 | 1,779.4 | 1,694.3 | 4.8% |
| 1999 | 1,825.6 | 1,761.9 | 3.5% |
| 2000 | 1,869.7 | 1,807.9 | 3.3% |
| 2001 | 1,849.1 | 1,777.3 | 3.9% |
| 2002 | 1,889.8 | 1,817.5 | 3.8% |
| 2003 | 1,890.7 | 1,826.5 | 3.4% |
| 2004 | 1,957.4 | 1,860.2 | 5.0% |
| 2005 | 1,984.2 | 1,873.6 | 5.6% |
| 2006 | 2,012.3 | 1,873.7 | 6.9% |
| 2007 | 2,017.9 | 1,876.2 | 7.0% |
| 2008 | 1,893.3 | 1,774.0 | 6.3% |
| 2009 | 1,824.8 | 1,701.6 | 6.7% |
| 2010 | 1,842.9 | 1,711.8 | 7.1% |
| 2011 | 1,809.0 | 1,685.5 | 6.8% |
| 2012 | 1,773.4 | 1,673.5 | 5.6% |
| 2013 | 1,796.4 | 1,683.8 | 6.3% |
| 2014 | 1,814.9 | 1,722.8 | 5.1% |
| 2015 | 1,838.9 | 1,734.5 | 5.7% |
| 2016 | 1,871.0 | 1,774.4 | 5.2% |
| 2017 | 1,887.5 | 1,796.4 | 4.8% |
| 2018 | 1,918.5 | 1,830.5 | 4.6% |
| 2019 | 1,920.0 | 1,830.9 | 4.6% |
| 2020 | 1,630.1 | a | a |

Sources:

U.S. Department of Energy, Energy Information Administration, Monthly Energy Review, July 2021, Washington, DC, Table 11.5.

U.S. Environmental Protection Agency, Inventory of U. S. Greenhouse Gas Emissions and Sinks: 1990-2019, April 2021, EPA 430-R-21-005. (Additional resources: www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019)

^a Data are not available.

Most U.S. transportation sector carbon dioxide emissions come from petroleum fuels. Motor gasoline has been responsible for 60%-65% of U.S. carbon dioxide emissions over the last 29 years.

Table 12.7 (Updated August 2021)
U.S. Carbon Emissions from Fossil Fuel Combustion in the Transportation
End-Use Sector, 1990–2019
(million metric tons of carbon dioxide equivalent)

| Year | Motor gasoline | LPG ^a | Jet fuel | Distillate fuel | Residual fuel | Aviation gas | Natural gas | Electricity ^b | Total |
|---|----------------|------------------|----------|-----------------|---------------|--------------|-------------|--------------------------|---------|
| 1990 | 958.9 | 1.4 | 184.3 | 262.9 | 22.6 | 3.1 | 36.0 | 3.0 | 1,472.2 |
| 1991 | 945.0 | 1.0 | 168.0 | 254.0 | 77.0 | 3.0 | 33.0 | 3.0 | 1,484.0 |
| 1992 | 974.0 | 1.0 | 167.0 | 271.0 | 80.0 | 3.0 | 32.0 | 3.0 | 1,531.0 |
| 1993 | 987.0 | 1.0 | 168.0 | 288.0 | 68.0 | 3.0 | 34.0 | 3.0 | 1,552.0 |
| 1994 | 1,000.0 | 2.0 | 176.0 | 311.0 | 66.0 | 3.0 | 38.0 | 3.0 | 1,599.0 |
| 1995 | 1,013.0 | 1.0 | 172.0 | 325.0 | 68.0 | 3.0 | 38.0 | 3.0 | 1,623.0 |
| 1996 | 1,036.0 | 1.0 | 185.0 | 340.0 | 64.0 | 3.0 | 39.0 | 3.0 | 1,671.0 |
| 1997 | 1,049.0 | 1.0 | 184.0 | 354.0 | 53.0 | 3.0 | 41.0 | 3.0 | 1,688.0 |
| 1998 | 1,079.0 | 1.0 | 189.0 | 367.0 | 51.0 | 2.0 | 35.0 | 3.0 | 1,727.0 |
| 1999 | 1,113.0 | 1.0 | 192.0 | 389.0 | 50.0 | 3.0 | 36.0 | 3.0 | 1,787.0 |
| 2000 | 1,118.0 | 1.0 | 195.0 | 407.0 | 67.0 | 3.0 | 36.0 | 3.0 | 1,830.0 |
| 2001 | 1,118.0 | 1.0 | 190.0 | 405.0 | 44.0 | 2.0 | 35.0 | 4.0 | 1,799.0 |
| 2002 | 1,143.0 | 1.0 | 185.0 | 418.0 | 51.0 | 2.0 | 37.0 | 3.0 | 1,840.0 |
| 2003 | 1,162.0 | 1.0 | 179.0 | 426.0 | 43.0 | 2.0 | 33.0 | 4.0 | 1,850.0 |
| 2004 | 1,167.0 | 1.0 | 187.0 | 443.0 | 56.0 | 2.0 | 32.0 | 5.0 | 1,893.0 |
| 2005 | 1,150.1 | 1.8 | 189.4 | 462.7 | 19.3 | 2.4 | 33.1 | 4.7 | 1,863.5 |
| 2006 | 1,143.0 | 2.0 | 182.0 | 474.0 | 68.0 | 2.0 | 33.0 | 5.0 | 1,909.0 |
| 2007 | 1,135.0 | 1.0 | 180.0 | 479.0 | 75.0 | 2.0 | 35.0 | 5.0 | 1,912.0 |
| 2008 | 1,072.0 | 3.0 | 173.0 | 454.0 | 70.0 | 2.0 | 37.0 | 5.0 | 1,816.0 |
| 2009 | 1,071.0 | 2.0 | 154.0 | 409.0 | 59.0 | 2.0 | 38.0 | 4.0 | 1,739.0 |
| 2010 | 1,059.0 | 0.0 | 152.0 | 426.0 | 67.0 | 2.0 | 38.0 | 5.0 | 1,749.0 |
| 2011 | 1,036.0 | 0.0 | 147.0 | 428.0 | 58.0 | 2.0 | 39.0 | 4.0 | 1,714.0 |
| 2012 | 1,030.0 | 0.0 | 143.0 | 427.0 | 50.0 | 2.0 | 41.0 | 4.0 | 1,697.0 |
| 2013 | 1,028.0 | 0.0 | 147.0 | 431.0 | 44.0 | 2.0 | 47.0 | 4.0 | 1,703.0 |
| 2014 | 1,067.0 | 0.0 | 148.0 | 446.0 | 34.0 | 1.0 | 40.0 | 4.0 | 1,740.0 |
| 2015 | 1,058.6 | 0.4 | 157.6 | 457.5 | 4.2 | 1.5 | 39.4 | 4.3 | 1,723.5 |
| 2016 | 1,084.8 | 0.4 | 166.1 | 454.2 | 12.9 | 1.4 | 40.1 | 4.2 | 1,764.1 |
| 2017 | 1,081.8 | 0.4 | 171.7 | 468.3 | 16.5 | 1.4 | 42.3 | 4.3 | 1,786.7 |
| 2018 | 1,097.1 | 0.5 | 172.3 | 480.3 | 14.0 | 1.5 | 50.9 | 4.7 | 1,821.3 |
| 2019 | 1,086.8 | 0.5 | 177.8 | 481.2 | 14.7 | 1.6 | 54.8 | 4.7 | 1,822.1 |
| <i>Average annual percentage change</i> | | | | | | | | | |
| 1990-2019 | 0.4% | -3.5% | -0.1% | 2.1% | -1.5% | -2.3% | 1.5% | 1.6% | 0.7% |
| 2009-2019 | 0.1% | -12.9% | 1.4% | 1.6% | -13.0% | -2.2% | 3.7% | 1.6% | 0.5% |

Note: Emissions from U.S. Territories are not included. Emissions from International Bunker Fuels are not included.

Source:

U.S. Environmental Protection Agency, Inventory of U. S. Greenhouse Gas Emissions and Sinks: 1990-2019, April 2021, EPA 430-R-21-005. (Additional resources: www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019)

^a Liquefied petroleum gas.

^b Share of total electric utility carbon dioxide emissions weighted by sales to the transportation sector.

Highway vehicles are responsible for the majority of greenhouse gas emissions in the transportation sector.

Table 12.8 (Updated August 2021)
Transportation Carbon Dioxide Emissions by Mode, 1990–2019
 (Million metric tons of carbon dioxide equivalent)

| Year | Passenger Vehicles | Heavy Trucks | Highway Total | Water | Air | Rail | Pipeline | Total |
|-----------|---|--------------|---------------|-------|-------|------|----------|---------|
| 1990 | 926.2 | 237.7 | 1,163.9 | 46.4 | 187.4 | 38.5 | 36.0 | 1,472.2 |
| 1991 | 911.0 | 231.0 | 1,142.0 | 41.0 | 171.0 | 36.0 | 33.0 | 1,423.0 |
| 1992 | 943.0 | 242.0 | 1,185.0 | 56.0 | 170.0 | 37.0 | 32.0 | 1,480.0 |
| 1993 | 960.0 | 255.0 | 1,215.0 | 54.0 | 171.0 | 38.0 | 34.0 | 1,512.0 |
| 1994 | 973.0 | 273.0 | 1,246.0 | 55.0 | 179.0 | 41.0 | 38.0 | 1,559.0 |
| 1995 | 987.0 | 283.0 | 1,270.0 | 58.0 | 175.0 | 43.0 | 38.0 | 1,584.0 |
| 1996 | 1,011.0 | 295.0 | 1,306.0 | 55.0 | 188.0 | 43.0 | 39.0 | 1,631.0 |
| 1997 | 1,023.0 | 309.0 | 1,332.0 | 41.0 | 187.0 | 43.0 | 41.0 | 1,644.0 |
| 1998 | 1,054.0 | 323.0 | 1,377.0 | 35.0 | 191.0 | 44.0 | 35.0 | 1,682.0 |
| 1999 | 1,087.0 | 342.0 | 1,429.0 | 44.0 | 195.0 | 45.0 | 36.0 | 1,749.0 |
| 2000 | 1,092.0 | 359.0 | 1,451.0 | 64.0 | 198.0 | 46.0 | 35.0 | 1,794.0 |
| 2001 | 1,095.0 | 356.0 | 1,451.0 | 42.0 | 192.0 | 47.0 | 35.0 | 1,767.0 |
| 2002 | 1,120.0 | 370.0 | 1,490.0 | 47.0 | 187.0 | 45.0 | 37.0 | 1,806.0 |
| 2003 | 1,149.0 | 368.0 | 1,517.0 | 36.0 | 181.0 | 47.0 | 33.0 | 1,814.0 |
| 2004 | 1,156.0 | 384.0 | 1,540.0 | 40.0 | 189.0 | 51.0 | 31.0 | 1,851.0 |
| 2005 | 1,132.9 | 411.1 | 1,544.0 | 44.3 | 191.8 | 50.8 | 32.4 | 1,863.3 |
| 2006 | 1,126.0 | 420.0 | 1,546.0 | 47.0 | 184.0 | 53.0 | 32.0 | 1,862.0 |
| 2007 | 1,094.0 | 450.0 | 1,544.0 | 54.0 | 182.0 | 52.0 | 34.0 | 1,866.0 |
| 2008 | 1,030.0 | 433.0 | 1,463.0 | 44.0 | 175.0 | 48.0 | 36.0 | 1,766.0 |
| 2009 | 1,033.0 | 389.0 | 1,422.0 | 38.0 | 156.0 | 40.0 | 37.0 | 1,693.0 |
| 2010 | 1,023.0 | 402.0 | 1,425.0 | 43.0 | 154.0 | 43.0 | 37.0 | 1,702.0 |
| 2011 | 1,003.0 | 397.0 | 1,400.0 | 44.0 | 149.0 | 44.0 | 38.0 | 1,675.0 |
| 2012 | 999.0 | 398.0 | 1,397.0 | 39.0 | 145.0 | 43.0 | 41.0 | 1,665.0 |
| 2013 | 995.0 | 402.0 | 1,397.0 | 38.0 | 149.0 | 44.0 | 46.0 | 1,674.0 |
| 2014 | 1,034.0 | 417.0 | 1,451.0 | 27.0 | 149.0 | 46.0 | 39.0 | 1,712.0 |
| 2015 | 1,027.1 | 424.8 | 1,451.9 | 30.5 | 159.1 | 43.5 | 38.5 | 1,723.5 |
| 2016 | 1,052.6 | 428.0 | 1,480.6 | 37.1 | 167.5 | 39.8 | 39.2 | 1,764.2 |
| 2017 | 1,048.7 | 442.6 | 1,491.3 | 40.0 | 173.1 | 40.9 | 41.3 | 1,786.6 |
| 2018 | 1,063.6 | 454.2 | 1,517.8 | 37.0 | 173.8 | 42.7 | 49.9 | 1,821.2 |
| 2019 | 1,056.2 | 456.6 | 1,512.8 | 35.9 | 179.4 | 40.2 | 53.7 | 1,822.0 |
| | <i>Average annual percentage change</i> | | | | | | | |
| 1990-2019 | 0.5% | 2.3% | 0.9% | -0.9% | -0.2% | 0.1% | 1.4% | 0.7% |
| 2009-2019 | 0.2% | 1.6% | 0.6% | -0.6% | 1.4% | 0.0% | 3.8% | 0.7% |

Note: Emissions from U.S. Territories are not included. Emissions from International Bunker Fuels are not included. Passenger vehicles include cars, light trucks and motorcycles. Heavy trucks include medium and heavy trucks and buses.

Source:

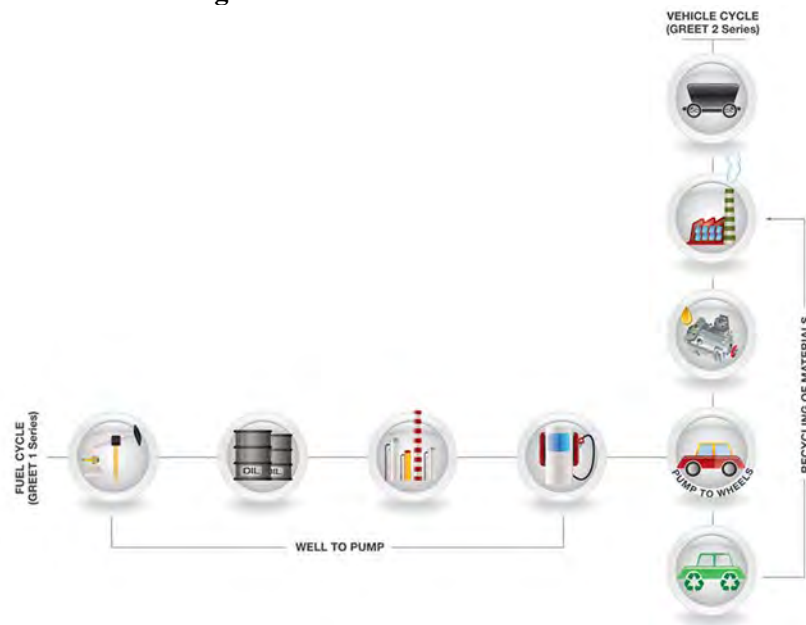
U.S. Environmental Protection Agency, *Inventory of U. S. Greenhouse Gas Emissions and Sinks: 1990-2019*, April 2021, EPA 430-R-21-005. (Additional resources: www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019)

The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) Model

greet.es.anl.gov

Sponsored by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE), Argonne has developed a full life-cycle model called GREET® (Greenhouse gases, Regulated Emissions, and Energy use in Technologies). It allows researchers and analysts to evaluate energy and environmental impacts of various vehicle and fuel combinations on a life-cycle basis. The first version of GREET was released in 1996. Since then, Argonne has continued to update and expand the model. The most recent GREET versions are GREET 1 2020 version for fuel-cycle analysis and GREET 2 2020 version for vehicle-cycle analysis.

Figure 12.2. GREET Model



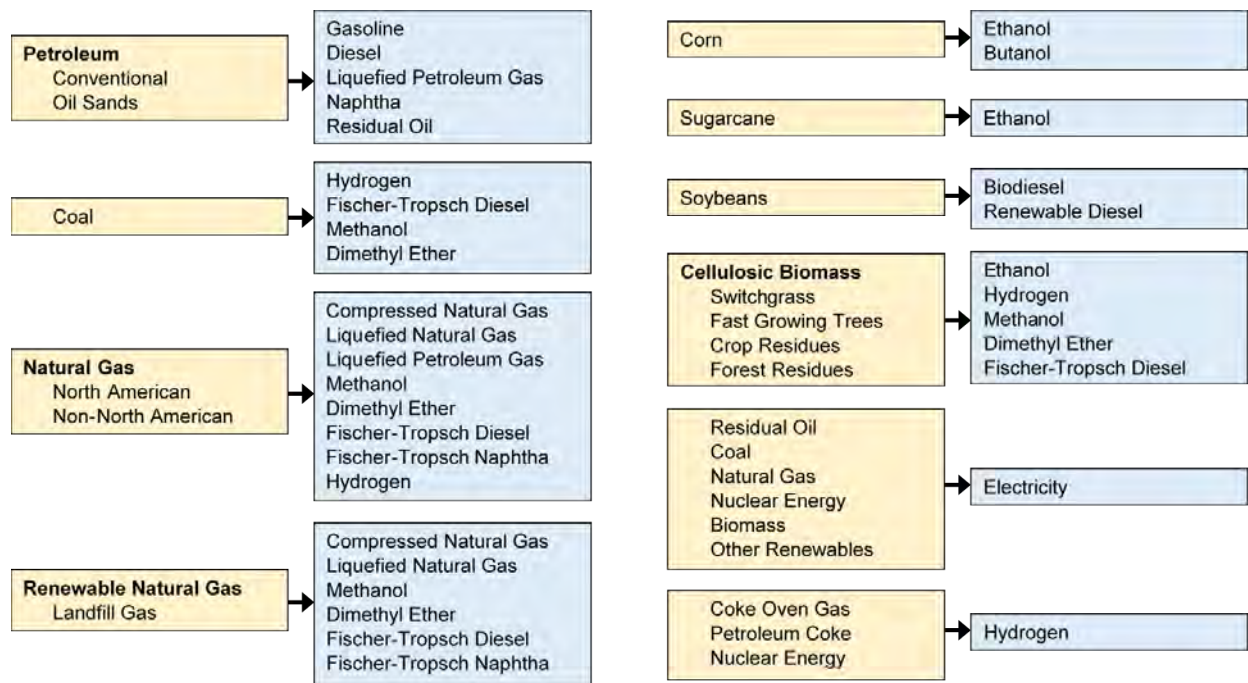
For a given vehicle and fuel system, GREET separately calculates the following:

- Consumption of total resources (energy in non-renewable and renewable sources), fossil fuels (petroleum, natural gas, and coal together), petroleum, coal, natural gas, and water.
- Emissions of CO₂-equivalent greenhouse gases - primarily carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).

- Emissions of seven criteria pollutants: volatile organic compounds (VOCs), carbon monoxide (CO), nitrogen oxide (NO_x), particulate matter with size smaller than 10 micron (PM₁₀), particulate matter with size smaller than 2.5 micron (PM_{2.5}), black carbon (BC) and sulfur oxides (SO_x).

REET includes more than 100 fuel production pathways and more than 80 vehicle/fuel systems. These vehicle/fuel systems cover current and advanced vehicle technologies such as conventional spark-ignition engine vehicles, compression-ignition engine vehicles, hybrid electric vehicles, plug-in hybrid electric vehicles, battery-powered electric vehicles and fuel-cell electric vehicles. REET also evaluates transportation modes other than light-duty vehicles, such as heavy-duty vehicles, aviation, rail and marine.

Figure 12.3. REET Model Feedstocks and Fuels

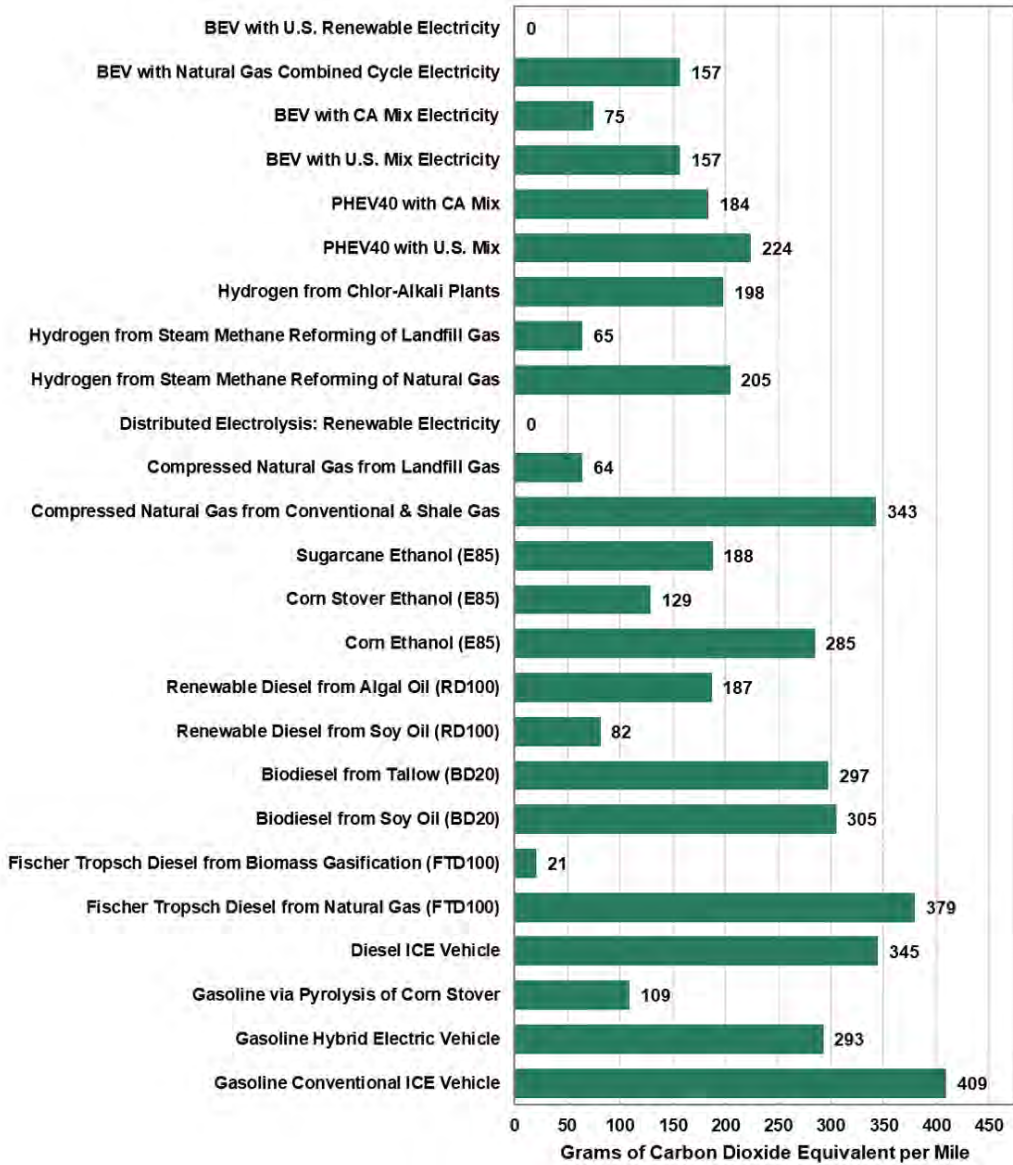


To address technology improvements over time, REET 2020 simulates current and future vehicle/fuel systems up to year 2050.

For additional information about the REET model and associated documentation, please visit the REET website www.greet.es.anl.gov, or contact greet@anl.gov.

Results from the GREET 1 2020 model on emissions of carbon dioxide equivalents per mile are shown for various fuels and vehicle technologies. A full description of the model is on the preceding pages.

Figure 12.4. Well-to-Wheel Emissions for Various Fuels and Vehicle Technologies



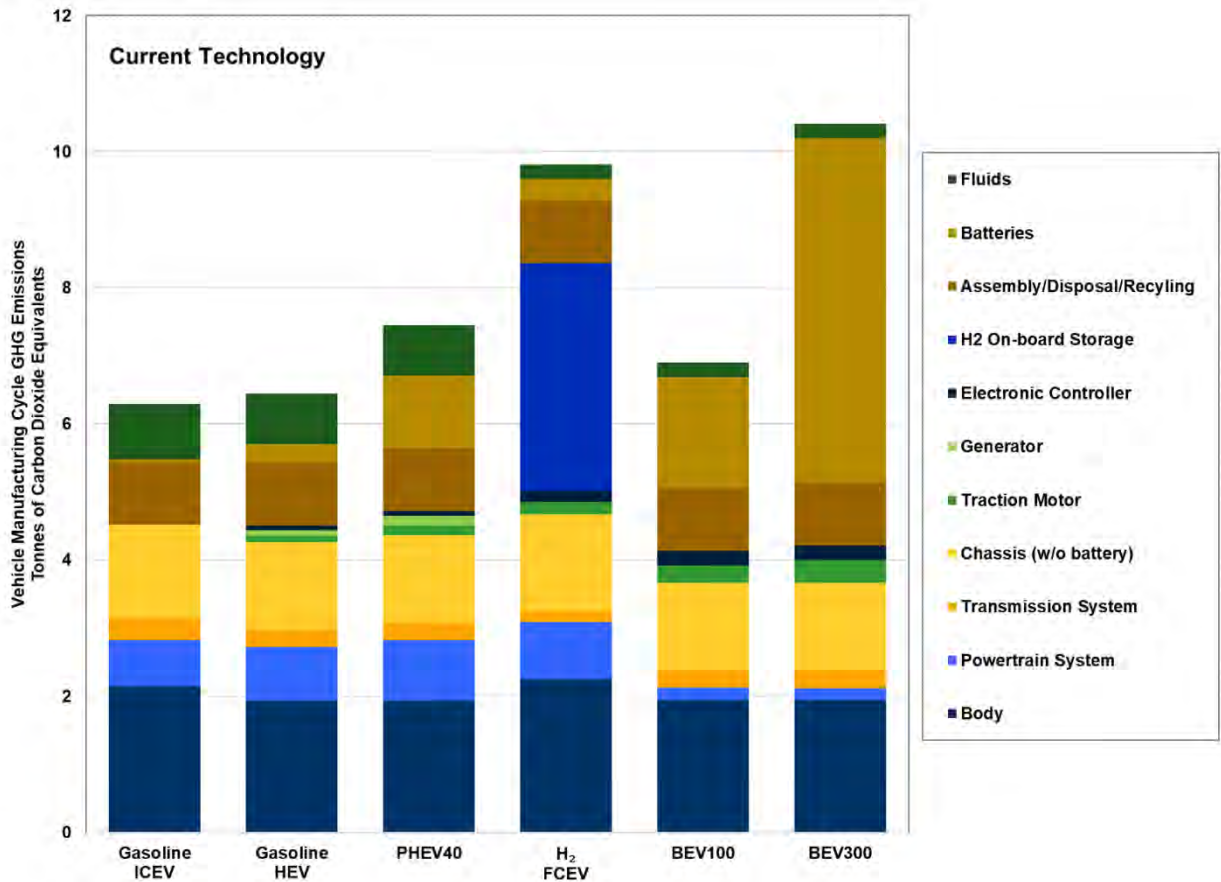
Note: BEV = Battery-electric vehicle. PHEV40 = Plug-in hybrid electric vehicle with 40-mile electric range.

Source:

Argonne National Laboratory, GREET WTW Calculator and Sample Results from GREET 1 2020, greet.es.anl.gov/results. (Additional resources: greet.es.anl.gov)

Greenhouse gas emissions associated with vehicle manufacturing (current technology) were estimated using the GREET model. Emissions from manufacturing the vehicle body are about two tonnes of carbon dioxide equivalent for each of the vehicle types. Emissions from the manufacture of the hydrogen on-board storage cause the total emissions associated with the manufacture of a hydrogen fuel cell vehicle to be higher than the other vehicle types. Emissions from the manufacture of batteries cause BEV300 vehicles to have the highest total emissions.

Figure 12.5. Vehicle Manufacturing Cycle Greenhouse Gas Emissions by Vehicle Component



Note: GHG = greenhouse gases. ICEV = internal combustion engine vehicle. CNG = compressed natural gas. HEV = hybrid-electric vehicle. PHEV40 = Plug-in hybrid electric vehicle with 40-mile electric range. H₂FCEV = Hydrogen fuel cell electric vehicle. BEV100 = Battery-electric vehicle with a 100-mile range. BEV300 = Battery-electric vehicle with a 300-mile range.

Source:

Argonne National Laboratory, *Cradle-to-Grave Lifecycle Analysis of U.S. Light-Duty Vehicle-Fuel Pathways: A Greenhouse Gas Emissions and Economic Assessment of Current (2015) and Future (2025-2030) Technologies*, June 01, 2016, p. 143. Updated in 2020 by Argonne National Laboratory. (Additional resources: greet.es.anl.gov)

Carbon Footprint

The carbon footprint measures a vehicle's impact on climate change in tons of carbon dioxide (CO₂) emitted annually. The following three tables show the carbon footprint for various vehicle classes. The sales-weighted average fuel economy rating for each vehicle class, based on 45% highway and 55% city driving, is used to determine the average annual carbon footprint for vehicles in the class. An estimate of 15,000 annual miles is used for each vehicle class and for each year in the series.

$$\text{CarbonFootprint} = \left(\text{CO}_2 \times \text{LHV} \times \frac{\text{AnnualMiles}}{\text{CombinedMPG}} \right) + (\text{CH}_4 + \text{N}_2\text{O}) \times \text{AnnualMiles}$$

where:

CO₂ = (Tailpipe CO₂ + Upstream Greenhouse Gases) in grams per million Btu

LHV = Lower (or net) Heating Value in million Btu per gallon

CH₄ = Tailpipe CO₂ equivalent methane in grams per mile

N₂O = Tailpipe CO₂ equivalent nitrous oxide in grams per mile

Note: The Environmental Protection Agency publishes tailpipe emissions in terms of grams of CO₂ per mile in the *2020 EPA Automotive Trends Report*, www.epa.gov/fueleconomy/trends-report.

The production-weighted average annual carbon footprint for cars and car SUVs declined by about 2% annually between 1975 and 2020.

Table 12.9 (Updated August 2021)
Production-Weighted Annual Carbon Footprint of New Domestic and Import Cars
Model Years 1975–2020^a
(metric tons of CO₂)

| Model Year | Car | Car SUV ^b |
|---|-------|----------------------|
| 1975 | 12.6 | 15.2 |
| 1980 | 8.5 | 11.6 |
| 1985 | 7.4 | 8.4 |
| 1986 | 7.1 | 8.9 |
| 1987 | 7.1 | 8.7 |
| 1988 | 7.0 | 8.8 |
| 1989 | 7.2 | 8.9 |
| 1990 | 7.3 | 9.0 |
| 1991 | 7.2 | 9.3 |
| 1992 | 7.3 | 9.5 |
| 1993 | 7.2 | 9.9 |
| 1994 | 7.3 | 9.4 |
| 1995 | 7.2 | 9.5 |
| 1996 | 7.3 | 9.2 |
| 1997 | 7.3 | 8.8 |
| 1998 | 7.3 | 9.3 |
| 1999 | 7.4 | 9.1 |
| 2000 | 7.4 | 9.5 |
| 2001 | 7.4 | 9.0 |
| 2002 | 7.3 | 8.8 |
| 2003 | 7.3 | 8.5 |
| 2004 | 7.3 | 8.5 |
| 2005 | 7.2 | 8.4 |
| 2006 | 7.3 | 8.3 |
| 2007 | 7.0 | 8.2 |
| 2008 | 7.0 | 8.0 |
| 2009 | 6.7 | 7.7 |
| 2010 | 6.5 | 7.4 |
| 2011 | 6.6 | 7.2 |
| 2012 | 6.2 | 7.3 |
| 2013 | 6.0 | 7.0 |
| 2014 | 6.0 | 6.9 |
| 2015 | 5.9 | 6.7 |
| 2016 | 5.8 | 6.5 |
| 2017 | 5.6 | 6.5 |
| 2018 | 5.5 | 6.3 |
| 2019 | 5.4 | 6.2 |
| 2020 | 5.3 | 6.0 |
| <i>Average annual percentage change</i> | | |
| 1975–2020 | -1.9% | -2.0% |
| 2010–2020 | -2.0% | -1.9% |

Source:

Calculated using fuel economy from the U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. See TEDB page 12-15 for details. (Additional resources: <https://www.epa.gov/automotive-trends>)

^a Annual carbon footprint is based on 15,000 miles of annual driving. Includes tailpipe plus upstream emissions.

^b Car SUV category is defined in Table 4.10.

The production-weighted average annual carbon footprint of pickups, vans, and truck SUVs decreased from 1975 to 2020. Truck SUVs experienced the greatest decline from overall, and from 2010 to 2020.

Table 12.10 (Updated August 2021)
Production-Weighted Annual Carbon Footprint of New Domestic and Import Trucks
Model Years 1975–2020^a
(metric tons of CO₂)

| Model Year | Pickup | Van | Truck SUV ^b |
|------------|---|-------|------------------------|
| 1975 | 14.2 | 15.2 | 15.3 |
| 1980 | 10.2 | 12.0 | 12.8 |
| 1985 | 9.3 | 10.2 | 10.2 |
| 1990 | 9.7 | 9.5 | 10.3 |
| 1991 | 9.3 | 9.4 | 10.1 |
| 1992 | 9.7 | 9.4 | 10.4 |
| 1993 | 9.6 | 9.3 | 10.4 |
| 1994 | 9.7 | 9.5 | 10.6 |
| 1995 | 10.0 | 9.4 | 10.6 |
| 1996 | 9.9 | 9.2 | 10.4 |
| 1997 | 10.0 | 9.3 | 10.5 |
| 1998 | 10.0 | 9.1 | 10.5 |
| 1999 | 10.4 | 9.3 | 10.5 |
| 2000 | 10.2 | 9.1 | 10.6 |
| 2001 | 10.6 | 9.4 | 10.3 |
| 2002 | 10.7 | 9.1 | 10.4 |
| 2003 | 10.5 | 8.9 | 10.3 |
| 2004 | 10.7 | 8.8 | 10.3 |
| 2005 | 10.7 | 8.8 | 10.1 |
| 2006 | 10.5 | 8.7 | 9.9 |
| 2007 | 10.5 | 8.7 | 9.6 |
| 2008 | 10.3 | 8.5 | 9.3 |
| 2009 | 10.0 | 8.4 | 8.8 |
| 2010 | 10.0 | 8.4 | 8.6 |
| 2011 | 9.8 | 8.1 | 8.5 |
| 2012 | 9.8 | 8.0 | 8.5 |
| 2013 | 9.7 | 8.0 | 8.1 |
| 2014 | 9.4 | 8.0 | 7.8 |
| 2015 | 9.0 | 7.8 | 7.7 |
| 2016 | 8.9 | 7.8 | 7.6 |
| 2017 | 8.9 | 7.6 | 7.6 |
| 2018 | 8.8 | 7.4 | 7.4 |
| 2019 | 8.6 | 7.3 | 7.3 |
| 2020 | 8.5 | 7.2 | 7.2 |
| | <i>Average annual percentage change</i> | | |
| 1975–2020 | -1.1% | -1.6% | -1.7% |
| 2010–2020 | -1.6% | -1.6% | -1.8% |

Note: Light truck data include pickups, vans, and truck SUVs less than 8,500 lb. Beginning with 2011, SUV and passenger vans up to 10,000 lb were also included.

Source:

Calculated using fuel economy from the U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. See TEDB page 12-15 for details. (Additional resources: <https://www.epa.gov/automotive-trends>)

^a Annual carbon footprint is based on 15,000 miles of annual driving. Includes tailpipe plus upstream emissions.

^b Truck SUV category includes all SUV not in the Car SUV category. Car SUV category is defined in Table 4.10.

Between 1975 and 2020, the production-weighted average annual carbon footprint for new light vehicles dropped dramatically. Total new cars experienced a decrease of 56.9% while the carbon footprint for light trucks decreased by 48.3%.

Table 12.11 (Updated August 2021)
Average Annual Carbon Footprint of New Vehicles by Vehicle Classification,
Model Years 1975 and 2020^a
(metric tons of CO₂)

| Vehicle class | Production share | | Carbon footprint | | Percent change 1975 - 2020 |
|------------------------|--------------------|--------------------|--------------------|--------------------|-------------------------------|
| | Model year 1975 | Model year 2020 | Model year 1975 | Model year 2020 | |
| Cars | | | | | |
| Car | 80.6% | 33.3% | 12.6 | 5.3 | -57.7% |
| Car SUV ^b | 0.1% | 9.5% | 15.2 | 5.8 | -62.1% |
| Total cars | 80.7% | 42.8% | 12.6 | 5.4 | -56.9% |
| Light trucks | | | | | |
| Van | 4.5% | 2.6% | 15.2 | 7.4 | -51.6% |
| Truck SUV ^b | 1.7% | 40.8% | 15.3 | 7.1 | -53.6% |
| Pickup | 13.1% | 13.7% | 14.2 | 8.7 | -38.6% |
| Total light trucks | 19.3% | 57.2% | 14.5 | 7.5 | -48.3% |

Note: Light truck data include pickups, vans, and truck SUVs less than 8,500 lb. Beginning with 2011, SUV and passenger vans up to 10,000 lb were also included.

Source:

Calculated using fuel economy from the U.S. Environmental Protection Agency, *The 2020 EPA Automotive Trends Report*, EPA-420-R-21-003, January 2021. See TEDB page 12-15 for details. (Additional resources: <https://www.epa.gov/automotive-trends>)

^a Annual carbon footprint is based on 15,000 miles of annual driving. Includes tailpipe and upstream emissions.

^b Car SUV category is defined in Table 4.10. Truck SUV category includes all SUVs not in the Car SUV category.

The average carbon content of 11 different transportation fuels comes from the GREET Model. Residual oil (used in ships) has the highest carbon content of those listed. Ethanol has the lowest carbon content per gallon.

Table 12.12
Carbon Content of Transportation Fuels

| Fuel Type | Density (grams/gallon) | Carbon ratio (grams of carbon per grams of fuel) | Carbon content (grams/gallon) | Carbon content ^a (grams per Btu) |
|-------------------------------|---------------------------|--|----------------------------------|--|
| Gasoline blendstock | 2,819 | 0.863 | 2,433 | 0.0196 |
| Ethanol | 2,988 | 0.522 | 1,560 | 0.0185 |
| Gasoline (E10) | 2,836 | 0.828 | 2,347 | 0.0195 |
| U.S. conventional diesel | 3,167 | 0.865 | 2,739 | 0.0199 |
| Low-sulfur diesel | 3,206 | 0.871 | 2,792 | 0.0202 |
| Conventional jet fuel | 3,036 | 0.862 | 2,617 | 0.0197 |
| Ultra low-sulfur jet fuel | 2,998 | 0.860 | 2,578 | 0.0196 |
| Residual oil | 3,752 | 0.868 | 3,257 | 0.0217 |
| Liquefied petroleum gas (LPG) | 1,923 | 0.820 | 1,577 | 0.0173 |
| Methyl ester (biodiesel, BD) | 3,361 | 0.776 | 2,608 | 0.0204 |

Source:

Argonne National Laboratory, GREET 1 2015 Model.

^a Based on higher (gross) heating values.

Chapter 13 Criteria Air Pollutants

Summary Statistics from Tables in this Chapter

| Source | | |
|------------|--|--------------|
| Table 13.1 | Transportation's share of U.S. emissions, 2020 | |
| | <i>CO</i> | <i>43.5%</i> |
| | <i>NO_x</i> | <i>52.8%</i> |
| | <i>VOC</i> | <i>14.7%</i> |
| | <i>PM-2.5</i> | <i>3.6%</i> |
| | <i>PM-10</i> | <i>2.0%</i> |
| | <i>SO₂</i> | <i>2.2%</i> |

Transportation accounts for the majority of carbon monoxide and nitrogen oxide emissions. Highway vehicles are responsible for the largest share of transportation emissions.

Table 13.1 (Updated August 2021)
Total National Emissions of Criteria Air Pollutants by Sector, 2020
(millions of short tons/percentage)

| Sector | CO | NO _x | VOC | PM-10 | PM-2.5 | SO ₂ |
|---|--------------|-----------------|--------------|--------------|-------------|-----------------|
| Highway vehicles | 16.19 | 2.41 | 1.38 | 0.22 | 0.09 | 0.02 |
| | 25.6% | 29.3% | 8.3% | 1.3% | 1.6% | 0.8% |
| Other off-highway | 11.33 | 1.93 | 1.06 | 0.12 | 0.11 | 0.03 |
| | 17.9% | 23.5% | 6.4% | 0.7% | 2.0% | 1.4% |
| Transportation total | 27.53 | 4.34 | 2.44 | 0.34 | 0.20 | 0.04 |
| | 43.5% | 52.8% | 14.7% | 2.0% | 3.6% | 2.2% |
| Stationary source fuel combustion | 4.07 | 2.34 | 0.51 | 0.75 | 0.66 | 1.24 |
| | 6.4% | 28.4% | 3.0% | 4.4% | 11.6% | 63.1% |
| Industrial processes | 1.70 | 1.06 | 6.61 | 0.90 | 0.39 | 0.44 |
| | 2.7% | 12.9% | 39.8% | 5.3% | 6.9% | 22.3% |
| Waste disposal and recycling total | 1.30 | 0.08 | 0.18 | 0.23 | 0.20 | 0.03 |
| | 2.1% | 1.0% | 1.1% | 1.3% | 3.6% | 1.3% |
| Miscellaneous | 28.68 | 0.41 | 6.89 | 14.78 | 4.19 | 0.22 |
| | 45.3% | 5.0% | 41.5% | 87.0% | 74.3% | 11.1% |
| Total of all sources | 63.27 | 8.23 | 16.61 | 16.99 | 5.64 | 1.96 |
| | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Note: CO = Carbon monoxide. NO_x = Nitrogen oxides. VOC = Volatile organic compounds. PM-10 = Particulate matter less than 10 microns. PM-2.5 = Particulate matter less than 2.5 microns. SO₂ = Sulfur dioxide.

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

The transportation sector accounted for more than 43% of the nation's carbon monoxide (CO) emissions in 2019. Highway vehicles are by far the source of the greatest amount of CO. For details on the highway emissions of CO, see Table 13.3.

Table 13.2 (Updated August 2021)
Total National Emissions of Carbon Monoxide, 1970–2020^a
(million short tons)

| Source category | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 | Percent of total, 2020 |
|------------------------------------|---------------|---------------|---------------|---------------|--------------|--------------|------------------------|
| Highway vehicles | 163.23 | 143.83 | 110.26 | 68.06 | 28.24 | 16.19 | 25.6% |
| Other off-highway | 11.37 | 16.69 | 21.45 | 24.18 | 15.35 | 11.33 | 17.9% |
| Transportation total | 174.60 | 160.52 | 131.71 | 92.24 | 43.59 | 27.53 | 43.5% |
| Stationary fuel combustion total | 4.63 | 7.30 | 5.51 | 4.78 | 4.52 | 4.07 | 6.4% |
| Industrial processes total | 9.84 | 6.95 | 4.77 | 2.63 | 1.90 | 1.70 | 2.7% |
| Waste disposal and recycling total | 7.06 | 2.30 | 1.08 | 1.85 | 1.20 | 1.30 | 2.1% |
| Miscellaneous total | 7.91 | 8.34 | 11.12 | 12.96 | 22.56 | 28.68 | 45.3% |
| Total of all sources | 204.04 | 185.41 | 154.19 | 114.46 | 73.77 | 63.27 | 100.0% |

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sums of subcategories may not equal total due to rounding.

Though gasoline-powered light vehicles continue to be responsible for the majority of carbon monoxide emissions from highway vehicles, the total pollution from light vehicles in 2005 is less than a fifth of what it was in 1970. This is despite the fact that there were many more light vehicles on the road in 2005. Between 2005 and 2011 the Environmental Protection Agency updated their source from the MOBILE 6.2 emissions model to the MOVES emission model. MOVES results typically show higher emissions, especially for heavy trucks. The 2017 data were released in 2019-2020.

Table 13.3
Emissions of Carbon Monoxide from Highway Vehicles, 1970–2017^a
(million short tons)

| Year | Gasoline | | | Diesel | | | Highway vehicle total | Percent diesel |
|------------------------|-----------------------------|----------------|--------|-----------------------------|----------------|------|-----------------------|----------------|
| | Light vehicles ^b | Heavy vehicles | All | Light vehicles ^b | Heavy vehicles | All | | |
| 1970 | 141.41 | 21.27 | 162.68 | 0.07 | 0.49 | 0.56 | 163.24 | 0.3% |
| 1980 | 127.04 | 15.35 | 142.39 | 0.08 | 1.36 | 1.44 | 143.83 | 1.0% |
| 1990 | 99.47 | 8.92 | 108.39 | 0.07 | 1.81 | 1.88 | 110.27 | 1.7% |
| 1995 | 76.35 | 5.96 | 82.31 | 0.04 | 1.53 | 1.57 | 83.88 | 1.9% |
| 2000 | 63.44 | 3.42 | 66.86 | 0.02 | 1.19 | 1.21 | 68.07 | 1.8% |
| 2005 | 45.38 | 1.97 | 47.35 | 0.02 | 0.85 | 0.87 | 48.22 | 1.8% |
| 2008 | 29.58 | 2.58 | 32.17 | 0.05 | 0.94 | 0.99 | 33.16 | 3.0% |
| 2011 ^c | 25.34 | 0.86 | 26.20 | 0.38 | 0.77 | 1.15 | 27.35 | 4.2% |
| 2014 ^c | 22.48 | 0.78 | 23.27 | 0.52 | 0.65 | 1.17 | 24.44 | 4.8% |
| 2017 ^c | 18.08 | 0.62 | 18.70 | 0.36 | 0.45 | 0.81 | 19.51 | 4.2% |
| Percent of total, 2017 | 92.6% | 3.2% | 95.8% | 1.8% | 2.3% | 4.2% | 100.0% | |

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sums of subcategories may not equal total due to rounding.

^b Less than 8,500 pounds.

^c These data are not directly comparable to the older data due to the change in source from the MOBILE emissions model to the MOVES emissions model.

The transportation sector accounted for more than 50% of the nation's nitrogen oxide (NO_x) emissions in 2020, with the majority coming from highway vehicles. For details on the highway emissions of NO_x, see Table 13.5.

Table 13.4 (Updated August 2021)
Total National Emissions of Nitrogen Oxides, 1970–2020^a
(million short tons)

| Source category | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 | Percent of total, 2020 |
|------------------------------------|--------------|--------------|--------------|--------------|--------------|-------------|------------------------|
| Highway vehicles | 12.62 | 11.49 | 9.59 | 8.39 | 5.70 | 2.41 | 29.3% |
| Other off-highway | 2.65 | 3.35 | 3.78 | 4.17 | 3.32 | 1.93 | 23.5% |
| Transportation total | 15.27 | 14.84 | 13.37 | 12.56 | 9.02 | 4.34 | 52.8% |
| Stationary fuel combustion total | 10.06 | 11.32 | 10.89 | 8.82 | 4.33 | 2.34 | 28.4% |
| Industrial processes total | 0.78 | 0.56 | 0.80 | 0.81 | 1.12 | 1.06 | 12.9% |
| Waste disposal and recycling total | 0.44 | 0.11 | 0.09 | 0.13 | 0.09 | 0.08 | 1.0% |
| Miscellaneous total | 0.33 | 0.25 | 0.37 | 0.28 | 0.29 | 0.41 | 5.0% |
| Total of all sources | 26.88 | 27.08 | 25.52 | 22.60 | 14.85 | 8.23 | 100.0% |

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sums of subcategories may not equal total due to rounding.

Diesel-powered vehicles were responsible for nearly one-half (46.9%) of highway vehicle nitrogen oxide emissions in 2017, while light gasoline vehicles were responsible for the rest. Between 2005 and 2011 the Environmental Protection Agency updated their source from the MOBILE 6.2 emissions model to the MOVES emission model. MOVES results typically show higher emissions, especially for heavy trucks. The 2017 data were released in 2019-2020.

Table 13.5
Emissions of Nitrogen Oxides from Highway Vehicles, 1970–2017^a
(million short tons)

| Year | Gasoline | | | Diesel | | | Highway vehicle total | Percent diesel |
|------------------------|-----------------------------|----------------|-------|-----------------------------|----------------|-------|-----------------------|----------------|
| | Light vehicles ^b | Heavy vehicles | All | Light vehicles ^b | Heavy vehicles | All | | |
| 1970 | 10.08 | 0.72 | 10.80 | 0.07 | 1.76 | 1.83 | 12.63 | 14.5% |
| 1980 | 8.21 | 0.62 | 8.83 | 0.08 | 2.59 | 2.67 | 11.50 | 23.2% |
| 1990 | 5.76 | 0.57 | 6.33 | 0.06 | 3.19 | 3.25 | 9.58 | 33.9% |
| 1995 | 4.51 | 0.52 | 5.03 | 0.03 | 3.82 | 3.85 | 8.88 | 43.4% |
| 2000 | 3.75 | 0.45 | 4.20 | 0.02 | 4.18 | 4.20 | 8.40 | 50.0% |
| 2005 | 3.19 | 0.38 | 3.57 | 0.01 | 2.81 | 2.82 | 6.39 | 44.1% |
| 2008 | 3.39 | 0.27 | 3.67 | 0.08 | 3.20 | 3.27 | 6.94 | 47.2% |
| 2011 ^c | 3.09 | 0.09 | 3.18 | 0.13 | 2.56 | 2.69 | 5.87 | 45.8% |
| 2014 ^c | 2.29 | 0.09 | 2.38 | 0.11 | 2.17 | 2.28 | 4.66 | 48.9% |
| 2017 ^c | 2.51 | 0.08 | 2.59 | 0.17 | 2.12 | 2.29 | 4.88 | 46.9% |
| Percent of total, 2017 | 51.4% | 1.7% | 53.1% | 3.5% | 43.4% | 46.9% | 100.0% | |

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sums of subcategories may not equal total due to rounding.

^b Less than 8,500 pounds.

^c These data are not directly comparable to the older data due to the change in source from the MOBILE emissions model to the MOVES emissions model.

The transportation sector accounted for about 16% of the nation's volatile organic compound (VOC) emissions in 2020, with the majority coming from highway vehicles. For details on the highway emissions of VOC, see Table 13.7.

Table 13.6 (Updated August 2021)
Total National Emissions of Volatile Organic Compounds, 1970–2020^a
(million short tons)

| Source category | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 | Percent of total, 2020 |
|------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------------|
| Highway vehicles | 16.91 | 13.87 | 9.39 | 5.33 | 2.77 | 1.38 | 8.3% |
| Off-highway | 1.62 | 2.19 | 2.66 | 2.64 | 2.30 | 1.06 | 6.6% |
| Transportation total | 18.53 | 16.06 | 12.05 | 7.97 | 5.06 | 2.44 | 15.6% |
| Stationary fuel combustion total | 0.72 | 1.05 | 1.01 | 1.18 | 0.60 | 0.51 | 3.0% |
| Industrial processes total | 12.33 | 12.10 | 9.01 | 7.21 | 6.96 | 6.61 | 39.3% |
| Waste disposal and recycling total | 1.98 | 0.76 | 0.99 | 0.42 | 0.15 | 0.18 | 1.1% |
| Miscellaneous total | 1.10 | 1.13 | 1.06 | 0.73 | 5.06 | 6.89 | 41.0% |
| Total of all sources | 34.66 | 31.10 | 24.12 | 17.51 | 17.84 | 16.61 | 100.0% |

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sum of subcategories may not equal total due to rounding. The EPA's definition of volatile organic compounds excludes methane, ethane, and certain other nonphotochemically reactive organic compounds.

Gasoline-powered vehicles were responsible for 89% of highway vehicle emissions of volatile organic compounds in 2017. VOC emissions from highway vehicles in 2017 were less than one-quarter of the 1990 level. Between 2005 and 2011 the Environmental Protection Agency updated their source from the MOBILE 6.2 emissions model to the MOVES emission model. MOVES results typically show higher emissions, especially for heavy trucks. The 2017 data were released 2019-2020.

Table 13.7
Emissions of Volatile Organic Compounds from Highway Vehicles, 1970–2017^a
(thousand short tons)

| Year | Gasoline | | | Diesel | | | Highway vehicle total | Percent diesel |
|------------------------|-----------------------------|----------------|--------|-----------------------------|----------------|------|-----------------------|----------------|
| | Light vehicles ^b | Heavy vehicles | All | Light vehicles ^b | Heavy vehicles | All | | |
| 1970 | 14,772 | 1,679 | 16,451 | 49 | 411 | 460 | 16,911 | 2.7% |
| 1980 | 12,168 | 1,198 | 13,366 | 44 | 459 | 503 | 13,869 | 3.6% |
| 1990 | 8,307 | 633 | 8,940 | 33 | 415 | 448 | 9,388 | 4.8% |
| 1995 | 5,993 | 421 | 6,414 | 19 | 315 | 334 | 6,748 | 4.9% |
| 2000 | 4,832 | 256 | 5,088 | 7 | 230 | 237 | 5,325 | 4.5% |
| 2005 | 3,740 | 171 | 3,911 | 8 | 159 | 167 | 4,078 | 4.1% |
| 2008 | 2,660 | 169 | 2,829 | 10 | 213 | 223 | 3,052 | 7.3% |
| 2011 ^c | 2,345 | 40 | 2,385 | 43 | 213 | 256 | 2,641 | 9.7% |
| 2014 ^c | 1,811 | 41 | 1,852 | 26 | 174 | 200 | 2,052 | 9.7% |
| 2017 ^c | 1,966 | 36 | 2,002 | 52 | 162 | 214 | 2,216 | 9.7% |
| Percent of total, 2017 | 88.7% | 1.6% | 90.3% | 2.3% | 7.3% | 9.7% | 100.0% | |

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sums of subcategories may not equal total due to rounding.

^b Less than 8,500 pounds.

^c These data are not directly comparable to the older data due to the change in source from the MOBILE emissions model to the MOVES emissions model.

The transportation sector accounted for 2% of the nation's particulate matter (PM-10) emissions in 2020. For details on the highway emissions of PM-10, see Table 13.9.

Table 13.8 (Updated August 2021)
Total National Emissions of Particulate Matter (PM-10), 1970–2020^a
(million short tons)

| Source category | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 | Percent of total, 2020 |
|------------------------------------|--------------|-------------|--------------|--------------|--------------|--------------|------------------------|
| Highway vehicles | 0.48 | 0.43 | 0.39 | 0.23 | 0.28 | 0.22 | 1.3% |
| Off-highway | 0.16 | 0.26 | 0.33 | 0.32 | 0.23 | 0.12 | 0.7% |
| Transportation total | 0.64 | 0.69 | 0.72 | 0.55 | 0.51 | 0.34 | 2.0% |
| Stationary fuel combustion total | 2.87 | 2.45 | 1.20 | 1.47 | 0.98 | 0.75 | 4.4% |
| Industrial processes total | 7.67 | 2.75 | 1.04 | 0.71 | 1.05 | 0.90 | 5.3% |
| Waste disposal and recycling total | 1.00 | 0.27 | 0.27 | 0.36 | 0.21 | 0.23 | 1.3% |
| Miscellaneous total | 0.84 | 0.85 | 24.54 | 20.65 | 18.08 | 14.78 | 87.0% |
| Total of all sources | 13.02 | 7.01 | 27.75 | 23.75 | 20.82 | 16.99 | 100.0% |

Note: Because PM-10 is fine particulate matter less than 10 microns, it also includes PM-2.5. Specific data for PM-2.5 are shown on Tables 13.10 and 13.11.

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a Fine particulate matter less than 10 microns. The sums of subcategories may not equal total due to rounding.

In 2017, diesel-powered vehicles were responsible for 41% of highway vehicle emissions of particulate matter (PM-10); in 1990 diesels were responsible for 73.4%. Between 2005 and 2011 the Environmental Protection Agency updated their source from the MOBILE 6.2 emissions model to the MOVES emission model. MOVES results typically show higher emissions, especially for heavy trucks. The 2017 data were released in 2019-2020.

Table 13.9
Emissions of Particulate Matter (PM-10) from Highway Vehicles, 1970–2017^a
(thousand short tons)

| Year | Gasoline | | | Diesel | | | Highway vehicle total | Percent diesel |
|------------------------|-----------------------------|----------------|-------|-----------------------------|----------------|-------|-----------------------|----------------|
| | Light vehicles ^b | Heavy vehicles | All | Light vehicles ^b | Heavy vehicles | All | | |
| 1970 | 323 | 44 | 367 | 21 | 92 | 113 | 480 | 23.5% |
| 1980 | 190 | 30 | 220 | 21 | 191 | 212 | 432 | 49.1% |
| 1990 | 87 | 17 | 104 | 16 | 268 | 284 | 388 | 73.2% |
| 1995 | 85 | 13 | 98 | 7 | 199 | 206 | 304 | 67.8% |
| 2000 | 82 | 10 | 92 | 2 | 135 | 137 | 229 | 59.8% |
| 2005 | 81 | 8 | 89 | 2 | 92 | 94 | 183 | 51.4% |
| 2008 | 140 | 7 | 147 | 5 | 179 | 185 | 332 | 55.6% |
| 2011 ^c | 199 | 3 | 202 | 10 | 159 | 169 | 371 | 45.6% |
| 2014 ^c | 163 | 4 | 168 | 10 | 127 | 137 | 304 | 44.9% |
| 2017 ^c | 138 | 4 | 141 | 8 | 90 | 98 | 240 | 41.0% |
| Percent of total, 2017 | 57.4% | 1.5% | 59.0% | 3.5% | 37.6% | 41.0% | 100.0% | |

Note: Because PM-10 is fine particulate matter less than 10 microns, it also includes PM-2.5. Specific data for PM-2.5 are shown on Tables 13.10 and 13.11.

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sums of subcategories may not equal total due to rounding.

^b Less than 8,500 pounds.

^c These data are not directly comparable to the older data due to the change in source from the MOBILE emissions model to the MOVES emissions model.

The transportation sector accounted for about 2% of the nation's particulate matter (PM-2.5) emissions in 2020. For details on the highway emissions of PM-2.5, see Table 13.11.

Table 13.10 (Updated August 2021)
Total National Emissions of Particulate Matter (PM-2.5), 1990–2020^a
(million short tons)

| Source category | 1990 | 1995 | 2000 | 2005 | 2010 | 2020 | Percent of total, 2020 |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|------------------------|
| Highway vehicles | 0.32 | 0.25 | 0.17 | 0.31 | 0.20 | 0.09 | 1.6% |
| Off-highway | 0.30 | 0.31 | 0.30 | 0.29 | 0.21 | 0.11 | 2.0% |
| Transportation total | 0.62 | 0.56 | 0.47 | 0.60 | 0.41 | 0.20 | 3.6% |
| Stationary fuel combustion total | 0.91 | 0.90 | 1.29 | 1.13 | 0.84 | 0.66 | 11.6% |
| Industrial processes total | 0.56 | 0.50 | 0.50 | 0.53 | 0.40 | 0.39 | 6.9% |
| Waste disposal and recycling total | 0.23 | 0.25 | 0.33 | 0.27 | 0.18 | 0.20 | 3.6% |
| Miscellaneous total | 5.23 | 4.73 | 4.69 | 3.07 | 4.11 | 4.19 | 74.3% |
| Total of all sources | 7.56 | 6.93 | 7.29 | 5.59 | 5.96 | 5.64 | 100.0% |

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sums of subcategories may not equal total due to rounding.

Diesel vehicles are responsible for the majority of highway vehicle PM-2.5 emissions. Half of all highway vehicles' PM-2.5 emissions are from heavy diesel trucks. Between 2005 and 2011 the Environmental Protection Agency updated their source from the MOBILE 6.2 emissions model to the MOVES emission model. MOVES results typically show higher emissions, especially for heavy trucks. The 2017 data were released in 2019-2020.

Table 13.11
Emissions of Particulate Matter (PM-2.5) from Highway Vehicles, 1990–2017^a
(thousand short tons)

| Year | Gasoline | | | Diesel | | | Highway vehicle total | Percent diesel |
|------------------------|-----------------------------|----------------|-------|-----------------------------|----------------|-------|-----------------------|----------------|
| | Light vehicles ^b | Heavy vehicles | All | Light vehicles ^b | Heavy vehicles | All | | |
| 1990 | 56 | 11 | 67 | 13 | 243 | 256 | 323 | 79.3% |
| 1995 | 50 | 9 | 59 | 6 | 179 | 185 | 244 | 75.8% |
| 2000 | 45 | 7 | 52 | 2 | 119 | 121 | 173 | 69.9% |
| 2005 | 41 | 6 | 47 | 2 | 79 | 81 | 128 | 63.3% |
| 2008 | 83 | 4 | 88 | 5 | 160 | 165 | 253 | 65.4% |
| 2011 ^c | 68 | 2 | 70 | 6 | 120 | 126 | 196 | 64.3% |
| 2014 ^c | 62 | 2 | 64 | 7 | 92 | 99 | 163 | 60.8% |
| 2017 ^c | 50 | 1 | 51 | 6 | 57 | 63 | 114 | 55.2% |
| Percent of total, 2017 | 43.6% | 1.2% | 44.8% | 5.0% | 50.2% | 55.2% | 100.0% | |

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei. (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sums of subcategories may not equal total due to rounding.

^b Less than 8,500 pounds.

^c These data are not directly comparable to the older data due to the change in source from the MOBILE emissions model to the MOVES emissions model. The 2011 data include condensable plus filterable PM-2.5.

The transportation sector accounted for less than 1.5% of the nation's sulfur dioxide (SO₂) emissions in 2020, with off-highway vehicles responsible for most of the emissions. Stationary fuel combustion (e.g. electricity generation) was responsible for about 63% of all SO₂ emissions in 2020.

Table 13.12 (Updated August 2021)
Total National Emissions of Sulfur Dioxide, 1970–2020^a
(million short tons)

| Source category | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 | Percent of total, 2020 |
|------------------------------------|--------------|--------------|--------------|--------------|-------------|-------------|------------------------|
| Highway vehicles | 0.27 | 0.39 | 0.50 | 0.26 | 0.04 | 0.02 | 0.8% |
| Other off-highway | 0.28 | 0.32 | 0.37 | 0.44 | 0.12 | 0.03 | 1.4% |
| Transportation total | 0.55 | 0.72 | 0.87 | 0.70 | 0.16 | 0.04 | 2.2% |
| Stationary fuel combustion total | 23.46 | 21.39 | 20.21 | 14.16 | 6.75 | 1.24 | 63.1% |
| Industrial processes total | 7.10 | 3.81 | 1.90 | 1.42 | 0.68 | 0.44 | 22.3% |
| Waste disposal and recycling total | 0.01 | 0.03 | 0.04 | 0.03 | 0.02 | 0.03 | 1.3% |
| Miscellaneous total | 0.11 | 0.01 | 0.01 | 0.07 | 0.16 | 0.22 | 11.1% |
| Total of all sources | 31.22 | 25.93 | 23.08 | 16.35 | 7.73 | 1.96 | 100.0% |

Source:

U. S. Environmental Protection Agency, National Emission Inventory Air Pollutant Emission Trends website
www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data.
 (Additional resources: www.epa.gov/air-emissions-inventories/national-emissions-inventory)

^a The sums of subcategories may not equal total due to rounding.

EMISSION STANDARDS

The U.S. Environmental Protection Agency (EPA) regulates emissions from mobile sources including vehicles, engines, and motorized equipment that produce exhaust and evaporative emissions. Mobile sources contribute to four main air pollutants: carbon monoxide, hydrocarbons, nitrogen oxides, and particulate matter. The EPA not only sets standards for the vehicles, engines, and equipment, but also the fuels that they use. Tables 13.13 through Table 13.30 contain summaries of the current standards.

Acronyms Used on Tables 13.13 through Table 13.30

| | | | |
|---------|--|-------|---|
| ABT | Averaging, banking, and credit trading program | LLDT | Light light-duty truck |
| ATV | All-terrain vehicle | LPG | Liquefied petroleum gas |
| bhp | Brake horsepower-hour | LVW | Loaded vehicle weight |
| CFR | Code of Federal Regulations | MDPV | Medium-duty passenger vehicle (8,500-10,000 lbs. GVWR) |
| CI | Compression-ignition | MDV | Medium-duty vehicle |
| CO | Carbon Monoxide | MY | Model year |
| DE | Diesel engine | NMHC | Non-methane hydrocarbon |
| EPA | Environmental Protection Agency | NMOG | Non-methane organic gases |
| FEL | Family emission limit | NR | Nonroad |
| FTP | Federal test procedure | NRLM | Nonroad, locomotive and marine |
| g | Gram | NOx | Nitrogen oxides |
| g/kN | Grams per kilonewton | NTE | Not-to-exceed |
| g/kW-hr | Grams per kilowatt-hour | OEM | Original equipment manufacturer |
| g/mi | Grams per mile | PM | Particulate matter |
| GPA | Geographic Phase-in Area | ppm | Parts per million |
| GVW | Gross vehicle weight | PWC | Personal watercraft |
| HC | Hydrocarbons | rO | Rated output |
| HCHO | Formaldehyde | rPR | Rated pressure ratio |
| HLDT | Heavy light-duty truck | SI | Spark-ignition |
| Hp-hr | Horsepower-hour | SULEV | Super-ultra-low-emission vehicle |
| ICAO | International Civil Aviation Organization | THC | Total hydrocarbons |
| kN | Kilonewton | THCE | Total hydrocarbon equivalent |
| kW | Kilowatt | ULEV | Ultra-low-emission vehicle |
| kW-hr | Kilowatt-hour | ULSD | Ultra-low sulfur diesel |
| LDT | Light-duty truck | ZEV | Zero-emission vehicle |
| LDV | Light-duty vehicle | | |
| LEV | Low-emission vehicle | | |

The Environmental Protection Agency issued final Tier 3 emission standards in 2014. The combined emissions of non-methane organic gases (NMOG) and nitrogen oxides (NOx) that new gasoline engines are allowed to produce from model years 2017 to 2025 are regulated in these new standards. These standards apply to a corporate average, meaning that some vehicles produced in those model years will emit more than the standard, while others will emit less, so long as the average for each Original Equipment Manufacturer (OEM) product offerings meets the standard.

Table 13.13
Tier 3 Non-Methane Organic Gases and Nitrogen Oxide Standards
(milligrams per mile)

| Model Year | Light-duty vehicles and LDT1 | LDT2, 3, 4, and medium-duty passenger vehicles | Class 2b trucks | Class 3 trucks |
|----------------|------------------------------|--|------------------|------------------|
| 2016 | ^a | ^a | 333 ^b | 548 ^b |
| 2017 | 86 | 101 | 310 ^b | 508 ^b |
| 2018 | 79 | 92 | 278 | 451 |
| 2019 | 72 | 83 | 253 | 400 |
| 2020 | 65 | 74 | 228 | 349 |
| 2021 | 58 | 65 | 203 | 298 |
| 2022 | 51 | 56 | 178 | 247 |
| 2023 | 44 | 47 | 178 | 247 |
| 2024 | 37 | 38 | 178 | 247 |
| 2025 and later | 30 | 30 | 178 | 247 |

Notes: Standards are for the Federal Test Procedure. Different standards apply for the Supplemental Federal Test Procedure. For vehicles over 6,000 lbs. gross vehicle weight rating (GVWR), the standards apply beginning in MY 2018.

LDT1 = Light trucks less than 6,000 lbs. GVWR and less than 3,750 lbs. loaded vehicle weight (LVW).

LDT2, 3, 4 = Light trucks less than 8,500 lbs. GVWR and more than 3,750 lbs. LVW.

Class 2b trucks = trucks 8,501-10,000 lbs. GVWR.

Class 3 trucks = trucks 10,001-14,000 lbs. GVWR.

Source:

Federal Register Vol. 79, No. 81, Monday, April 28, 2014.

^a Not applicable.

^b Voluntary standard.

Table 13.14
Tier 3 Particulate Matter Emission Standards for Light Gasoline Vehicles, MY 2017 and Beyond
(milligrams per mile)

| Model Year | Certification standard (milligrams per mile) | In-use standard (milligrams per mile) | Phase-in (percent of U.S. sales) |
|------------|---|--|-------------------------------------|
| 2017 | 3 | 6 | 20 ^a |
| 2018 | 3 | 6 | 20 |
| 2019 | 3 | 6 | 40 |
| 2020 | 3 | 6 | 70 |
| 2021 | 3 | 6 | 100 |
| 2022-on | 3 | 3 | 100 |

Note: Standards are for the Federal Test Procedure. The standards apply to all light-duty vehicles, light-duty trucks, and medium-duty passenger vehicles. For vehicles over 6,000 lbs. gross vehicle weight rating, the standards apply beginning in MY 2018.

Source:

Federal Register Vol. 79, No. 81, Monday, April 28, 2014.

Table 13.15
Tier 3 Evaporative Emission Standards
(grams per test)

| Vehicle class | Highest hot soak + diurnal level (over both 2-day and 3-day diurnal tests) |
|---|---|
| Light-duty vehicles and LDT1 | 0.3 |
| LDT2 | 0.4 |
| LDT3, LT4, and medium-duty passenger vehicles | 0.5 |
| Heavy-duty gasoline vehicles | 0.6 |

Note: LDT1 = Light trucks less than 6,000 lbs. gross vehicle weight rating (GVWR) and less than 3,750 lbs. loaded vehicle weight (LVW).

LDT2 = Light trucks less than 6,000 lbs. GVWR and less than 3,750 lbs. LVW.

LDT3, 4 = Light trucks less than 8,500 lbs. GVWR and more than 3,750 lbs. LVW.

Heavy-duty gasoline vehicles = trucks over 10,000 lbs. GVWR.

Source:

Federal Register Vol. 79, No. 81, Monday, April 28, 2014.

^a Manufacturers comply with 20% of their light-duty truck fleet under 6,000 lbs. gross vehicle weight, alternatively with 10% of their total light-duty vehicles, light-duty trucks and medium-duty passenger vehicle fleet.

These exhaust emission standards were phased-in from 2004 to 2010.

Table 13.16
Light-Duty Vehicle, Light-Duty Truck, and Medium-Duty Passenger Vehicle – Tier 2 Exhaust Emission Standards

| | Standard | Emission limits at 50,000 miles | | | | | Emission limits at full useful life (120,000 miles) ^a | | | | |
|---------|---------------------|---------------------------------|-------------------------------|--------------|--------------|------------------|---|------------------|--------------|--------------|------------------|
| | | NO _x (g/mi) | NMOG (g/mi) | CO (g/mi) | PM (g/mi) | HCHO (g/mi) | NO _x (g/mi) | NMOG (g/mi) | CO (g/mi) | PM (g/mi) | HCHO (g/mi) |
| Federal | Bin 1 | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |
| | Bin 2 | - | - | - | - | - | 0.02 | 0.01 | 2.1 | 0.01 | 0.004 |
| | Bin 3 | - | - | - | - | - | 0.03 | 0.055 | 2.1 | 0.01 | 0.011 |
| | Bin 4 | - | - | - | - | - | 0.04 | 0.07 | 2.1 | 0.01 | 0.011 |
| | Bin 5 | 0.05 | 0.075 | 3.4 | - | 0.015 | 0.07 | 0.09 | 4.2 | 0.01 | 0.018 |
| | Bin 6 | 0.08 | 0.075 | 3.4 | - | 0.015 | 0.1 | 0.09 | 4.2 | 0.01 | 0.018 |
| | Bin 7 | 0.11 | 0.075 | 3.4 | - | 0.015 | 0.15 | 0.09 | 4.2 | 0.02 | 0.018 |
| | Bin 8 | 0.14 | 0.100 / 0.125 ^c | 3.4 | - | 0.015 | 0.2 | 0.125 / 0.156 | 4.2 | 0.02 | 0.018 |
| | Bin 9 ^b | 0.2 | 0.075 / 0.140 | 3.4 | - | 0.015 | 0.3 | 0.090 / 0.180 | 4.2 | 0.06 | 0.018 |
| | Bin 10 ^b | 0.4 | 0.125 / 0.160 | 3.4 / 4.4 | - | 0.015 / 0.018 | 0.6 | 0.156 / 0.230 | 4.2 / 6.4 | 0.08 | 0.018 / 0.027 |
| | Bin 11 ^b | 0.6 | 0.195 | 5 | - | 0.022 | 0.9 | 0.28 | 7.3 | 0.12 | 0.032 |

Note: Tests Covered: Federal Test Procedure (FTP), cold carbon monoxide, highway, and idle. Definitions of acronyms are on page 12-14.

Source:

40 CR 86 Subpart S. (Additional resources: www.epa.gov/emission-standards-reference-guide/light-duty-vehicles-and-trucks-emission-standards)

^a In lieu of intermediate useful life standards (50,000 miles) or to gain additional nitrogen oxides credit, manufacturers may optionally certify to the Tier 2 exhaust emission standards with a useful life of 150,000 miles.

^b Bins 9-11 expired in 2006 for light-duty vehicles and light light-duty trucks and 2008 for heavy light-duty trucks and medium-duty passenger vehicles.

^c Pollutants with two numbers have a separate certification standard (1st number) and in-use standard (2nd number).

Table 13.17
Light-Duty Vehicle, Light-Duty Truck, and Medium-Duty Passenger Vehicle – Tier 2 Evaporative Emission Standards

| | Vehicle type | Model year | 3 Day diurnal + hot soak (g/test) | Supplemental 2 day diurnal + hot soak (g/test) | Running loss (g/mi) |
|---------|------------------------|------------|---|---|---------------------------|
| Federal | LDV/LLDTs ^a | 2004 | 0.95 | 1.20 | 0.05 |
| | HLDTs ^b | 2004 | 1.20 | 1.50 | 0.05 |
| | MDPVs ^{a, b} | 2004 | 1.40 | 1.75 | 0.05 |
| | LDV ^a | 2009 | 0.50 | 0.65 | 0.05 |
| | LLDT ^a | 2009 | 0.65 | 0.85 | 0.05 |
| | HLDT ^b | 2010 | 0.90 | 1.15 | 0.05 |
| | MDPV ^{a, b} | 2010 | 1.00 | 1.25 | 0.05 |

Note: Multi-fuel vehicle phase-in applies. Definitions of acronyms are on page 12-14.

Source:

40 CR 86 Subpart S. (Additional resources: www.epa.gov/emission-standards-reference-guide/light-duty-vehicles-and-trucks-emission-standards)

^a For liquefied petroleum gas-fueled light-duty vehicles (LDV), light-duty trucks (LDT), and medium-duty passenger vehicles (MDPV): 0.15 grams hydrocarbon per gallon (0.04 grams per liter) of fuel dispensed.

^b Refueling standards for heavy light-duty trucks (HLDT) are subject to phase-in requirements. MDPVs must also comply with the phase-in requirement and must be grouped with HLDTs to determine phase-in compliance.

Table 13.18
Heavy-Duty Highway Compression-Ignition Engines and Urban Buses – Exhaust
Emission Standards

| Year | HC (g/bhp-hr) | NMHC (g/bhp-hr) | NMHC + NOx (g/bhp-hr) | NOx (g/bhp-hr) | PM (g/bhp-hr) | CO (g/bhp-hr) | Idle CO (percent Exhaust gas flow) | Smoke ^a (percentage) | Useful life (hours/years/miles) |
|----------------------------|------------------|--------------------|--|-------------------|--|------------------|---|------------------------------------|---|
| 1974-78 | - | - | 16 | - | - | 40 | - | 20 / 15 / 50 | - |
| 1979-84 | 1.5 | - | 10 | - | - | 25 | - | 20 / 15 / 50 | - |
| 1985-87 | 1.3 | - | - | 10.7 | - | 15.5 | - | 20 / 15 / 50 | LHDDE: - / 8 / 110,000 MHDDE: - / 8 / 185,000 HHDDE: - / 8 / 290,000 |
| 1988-89 | 1.3 ^d | - | - | 10.7 | 0.6 | 15.5 | 0.5 ^c | 20 / 15 / 50 | 1990-97 and 1998+ for HC, CO, and PM: LHDDE: - / 8 / 110,000 MHDDE: - / 8 / 185,000 HHDDE: - / 8 / 290,000 |
| 1990 | 1.3 ^d | - | - | 6.0 | 0.6 | 15.5 | 0.5 ^c | 20 / 15 / 50 | |
| 1991-93 | 1.3 | - | - | 5.0 [ABT] | 0.25 [ABT] 0.10 ^e | 15.5 | 0.5 ^c | 20 / 15 / 50 | 1994+ urban buses for PM only: LHDDE: - / 10 / 110,000 1998+ for NOx: LHDDE: - / 10 / 110,000 MHDDE: - / 10 / 185,000 HHDDE: - / 10 / 290,000 |
| 1994-97 | 1.3 | - | - | 5.0 [ABT] | 0.1 [ABT] 0.07 ^f , 0.05 ^g | 15.5 | 0.5 ^c | 20 / 15 / 50 | |
| 1998-2003 | 1.3 | - | - | 4.0 [ABT] | 0.1 [ABT] 0.05 ^g | 15.5 | 0.5 ^c | 20 / 15 / 50 | |
| 2004-2006 ^h | - | - | 2.4 (or 2.5 with a limit of 0.5 on NMHC) ^o [ABT] ^l | - | 0.1 0.05 ^g | 15.5 | 0.5 | 20 / 15 / 50 | For all pollutants: ^p LHDDE: - / 10 / 110,000 MHDDE: - / 10 / 185,000 HHDDE: 22,000 / 10 / 435,000 |
| 2007 ^{+h,k,l,m,n} | - | 0.14 ^o | 2.4 (or 2.5 with a limit of 0.5 on NMHC) [ABT] | 0.2 ^o | 0.01 | 15.5 | 0.5 | 20 / 15 / 50 | |

Note: The test procedures are the EPA Transient Test Procedure and the EPA Smoke Test Procedure. Definitions of acronyms are on page 12-14.

Sources:

40 CFR 86.099-11 Emission standards for 1999 and later model year diesel heavy-duty engines and vehicles.
40 CFR 86.004-11 Emission standards for 2004 and later model year diesel heavy-duty engines and vehicles.
40 CFR 86.007-11 Emission standards and supplemental requirements for 2007 and later model year diesel heavy-duty engines and vehicles. (Additional resources: www.epa.gov/emission-standards-reference-guide/light-duty-vehicles-and-trucks-emission-standards)

^a Percentages apply to smoke opacity at acceleration/lug/peak modes.

^b Standards for 1990 apply only to diesel-fueled heavy-duty engines (HDE). Standards for 1991+ apply to both diesel- and methanol-fueled HDEs. Standards that apply to urban buses specifically are footnoted.

^c This standard applies to the following fueled engines for the following model years: methanol - 1990+, natural gas and liquefied petroleum gas (LPG) - 1994+.

^d For petroleum-fueled engines, the standard is for hydrocarbons (HC). For methanol-fueled engines, the standard is for total hydrocarbon equivalent (THCE).

^e Certification standard for urban buses for 1993.

^f Certification standard for urban buses from 1994-95.

^g Certification standard for urban buses from 1996 and later. The in-use standard is 0.07.

^h Load Response Test certification data submittal requirements take effect for heavy-duty diesel engines beginning in model year 2004. The following requirements take effect with the 2007 model year: steady-state test requirement and Not-to-Exceed (NTE) test procedures for testing of in-use engines. On-board diagnostic requirements applicable to heavy-duty diesel vehicles and engines up to 14,000 pounds gross vehicle weight rating (GVWR) phase in from the 2005 through 2007 model years.

Table 13.18 (continued)
**Heavy-Duty Highway Compression-Ignition Engines and Urban Buses – Exhaust
 Emission Standards**

ⁱ The modified averaging, banking, and trading program for 1998 and later model year engines applies only to diesel cycle engines. Credits generated under the modified program may be used only in 2004 and later model years.

^j For heavy-duty diesel engines, there are three options to the measurement procedures currently in place for alternative fueled engines: (1) use a THC measurement in place of a non-methane hydrocarbon (NMHC) measurement; (2) use a measurement procedure specified by the manufacturer with prior approval of the Administrator; or (3) subtract two percent from the measured THC value to obtain an NMHC value. The methodology must be specified at time of certification and will remain the same for the engine family throughout the engines' useful life. For natural gas vehicles, EPA allows the option of measuring NMHC through direct quantification of individual species by gas chromatography.

^k Starting in 2006, refiners must begin producing highway diesel fuel that meets a maximum sulfur standard of 15 parts per million (ppm).

^l Subject to a Supplemental Emission Test (1.0 x Federal Test Procedure [FTP] standard (or Family Emission Limit [FEL]) for nitrogen oxides [NO_x], NMHC, and particulate matter [PM]) and a NTE test (1.5 x FTP standard [or FEL] for NO_x, NMHC, and PM).

^m EPA adopted the lab-testing and field-testing specifications in 40 CFR Part 1065 for heavy-duty highway engines, including both diesel and Otto-cycle engines. These procedures replace those previously published in 40 Code of Federal Regulations (CFR) Part 86, Subpart N. Any new testing for 2010 and later model years must be done using the 40 CFR Part 1065 procedures.

ⁿ Two-phase in-use NTE testing program for heavy-duty diesel vehicles. The program begins with the 2007 model year for gaseous pollutants and 2008 for PM. The requirements apply to diesel engines certified for use in heavy-duty vehicles (including buses) with GVWRs greater than 8,500 pounds. However, the requirements do not apply to any heavy-duty diesel vehicle that was certified using a chassis dynamometer, including medium-duty passenger vehicles with GVWRs of between 8,500 and 10,000 pounds.

^o NO_x and NMHC standards will be phased in together between 2007 and 2010. The phase-in will be on a percent-of-sales basis: 50 percent from 2007 to 2009 and 100 percent in 2010.

^p Note that for an individual engine, if the useful life hours interval is reached before the engine reaches 10 years or 100,000 miles, the useful life shall become 10 years or 100,000 miles, whichever occurs first, as required under Clean Air Act section 202(d).

**Table 13.19
Heavy-Duty Highway Spark-Ignition Engines – Exhaust Emission Standards**

| Engine or vehicle | Year | Gross vehicle weight (lbs) | HC ^a (g/bhp-hr) | NMHC ^b (g/bhp-hr) | NOx (g/bhp-hr) | NOx + NMHC ^c (g/bhp-hr) | PM (g/bhp-hr) | CO (g/bhp-hr) | Idle CO (% exhaust gas flow) | Formaldehyde (g/mile) | Useful life (years / miles) | |
|--------------------|---------------------------------|--|----------------------------|------------------------------|----------------|------------------------------------|------------------|---------------|------------------------------|-----------------------|-----------------------------|------------|
| Federal | Heavy duty engines ^d | Prior to Control | - | 12.7 | - | - | 6.86 | - | 155 | - | - | 5 / 50,000 |
| | | 1970-73 | - | 275 ppm | - | - | - | - | 1.50% | - | - | |
| | | 1974-78 | - | - | - | 16 | - | - | 40 | - | - | |
| | | 1979-84 | - | 1.5 | - | 10 | - | - | 25 | - | - | |
| | | 1985-86 | - | 1.9 | - | - | 10.6 | - | 37.1 | - | - | |
| | | | ≤ 14,000 | 1.1 | - | - | 10.6 | - | 14.4 | 0.5 | - | |
| | | > 14,000 | 1.9 | - | - | 10.6 | - | 37.1 | - | | | |
| | | 1988-90 | ≤ 14,000 | 1.1 | - | - | 6.0 | - | 14.4 | - | - | |
| | | | > 14,000 | 1.9 | - | - | 6.0 | - | 37.1 | - | - | |
| | | 1990 ^e | ≤ 14,000 | 1.1 | - | - | 6.0 | - | 14.4 | 0.5 ⁱ | - | |
| | | | > 14,000 | 1.9 | - | - | 6.0 | - | 37.1 | | - | |
| | | 1991-97 ^f | ≤ 14,000 | 1.1 ^g | - | - | 5.0 | - | 14.4 | | - | |
| | | | > 14,000 | 1.9 ^h | - | - | 5.0 | - | 37.1 | | - | |
| | | 1998-2004 ^f | ≤ 14,000 | 1.1 ^g | - | - | 4.0 ^j | - | 14.4 | | - | |
| | | | > 14,000 | 1.9 ^h | - | - | | - | 37.1 | | - | |
| | | 2005-2007 ^f | ≤ 14,000 | 1.1 ^g | - | 1.0 ^l | - | - | 14.4 | | - | |
| | | | > 14,000 | 1.9 ^h | - | | - | - | 37.1 | | - | |
| | | 2008+ | All | - | 0.14 | 0.2 | - | 0.01 | 14.4 | | - | |
| | | Complete heavy-duty vehicles ^{h, i} | 2005-2007 | 8,500 - 10,000 | - | 0.280 ^m | - | 0.9 | - | | 7.3 | - |
| | | | | 10,000 - 14,000 | - | 0.330 ^m | - | 1.0 | - | 8.1 | - | |
| 2008+ ^p | 8,500 - 10,000 | | - | 0.195 ^o | - | 0.2 | 0.02 | 7.3 | 0.032 | | | |
| | 10,000 - 14,000 | | - | 0.230 ^o | - | 0.4 | 0.02 | 8.1 | 0.04 | | | |

Note: Definitions of acronyms are on page 12-14.

Sources:

- 40 CFR 86.1816-05, 86.1816-08 Emission standards for complete heavy-duty vehicles
- 40 CFR 86.1806-01, 86.1806-04, 86.1806-05 Onboard diagnostics requirements
- 40 CFR 86.1817-05, 86.1817-08 Complete heavy-duty vehicle averaging, banking, and trading program
- 40 CFR 86.091-10 Heavy-duty engine averaging, banking, and trading program for 1991 and later - Not available in the e-CFR
- 40 CFR Part 86 Subpart B Vehicle test procedures (Additional resources: www.epa.gov/emission-standards-reference-guide/light-duty-vehicles-and-trucks-emission-standards)

^a For methanol-fueled engines, the standard is for total hydrocarbon equivalent (THCE).
^b For methanol and alcohol fueled vehicles the standard is for non-methane hydrocarbon equivalent (NMHCE).
^c For methanol fueled engines the standard is for nitrogen oxides (NOx) plus NMHCE.
^d Standards for heavy-duty engines are expressed in grams per brake horsepower-hour (g/bhp-hr). Starting with the 1998 model year, crankcase emissions are not allowed.
^e Standards for 1990 apply to gasoline and methanol-fueled engines.
^f Standards for 1991 and later apply to gasoline and methanol engines and are optional for natural gas and Liquefied Petroleum Gas-fueled engines through the 1996 model year.
^g For natural gas fueled engines the standard is 0.9 g/bhp-hr non-methane hydrocarbon (NMHC).

Table 13.19 (continued)
Heavy-Duty Highway Spark-Ignition Engines – Exhaust Emission Standards

^h For natural gas fueled engines the standard is 1.7 g/bhp-hr NMHC.

ⁱ The NOx standard is 5.0 for all natural gas-fueled engines.

^j This standard applies to the following engines utilizing aftertreatment technology (except for methanol) for the following model years: gasoline/1990+; natural gas and LPG/1991+; methanol/1990+. Starting in 2005, engines certified to on-board diagnostics requirements are not required to meet the idle carbon monoxide (CO) standard.

^k Useful life is expressed in years or miles, whichever comes first. Useful life for the 1998 and later NOx standard and for all 2004 standards is 10 years or 110,000 miles, whichever comes first.

^l Manufacturers can choose this standard or one of the following options: (1) a standard of 1.5 g/bhp-hr NMHC+NOX that applies to the 2004 through 2007 model years, with complete heavy-duty vehicle standards taking effect in 2005; or (2) a standard of 1.5 g/bhp-hr NMHC + NOX that would apply to the 2003 through 2007 heavy-duty engines and optionally to 2003 through 2006 complete heavy-duty vehicles.

^m Standard is expressed as non-methane organic gas, but compliance can optionally be shown using measurement of NMHC or total hydrocarbon (THC).

ⁿ Complete heavy-duty vehicles have the primary load-carrying container or device attached. Incomplete heavy-duty vehicles are certified to heavy-duty engine standards. Standards for complete heavy-duty vehicles are expressed in grams per mile (g/mi). Starting in 2005 (or 2003 or 2004 depending on the selected phase in option; see footnote l), complete heavy-duty vehicles under 14,000 lbs gross vehicle weight are tested on chassis-based rather than engine-based procedures and must meet these complete heavy-duty vehicle standards.

^o Although expressed as NMHC, compliance can optionally be shown using measurement of NMOG or THC.

^p At least 50 percent of a manufacturer's sales must meet these standards in 2008, with 100 percent required in 2009.

^q Gross vehicle weight ranges are more accurately specified as follows: $8,500 \leq \text{GVW} \leq 10,000$ and $10,000 < \text{GVW} < 14,000$.

Table 13.20
Heavy-Duty Highway Compression-Ignition and Spark-Ignition Engines – Evaporative Emission Standards

| | Engine type | Year | Gross vehicle weight (lbs) | Conventional diurnal + hot soak (g/test) ^a | Three-diurnal test sequence (g/test) ^b | Supplemental two-diurnal test sequence (g/test) ^c | Running loss (g/mi) ^c | Spitback (g/test) ^c | Useful life ^d |
|---------|-------------|-----------------------------------|----------------------------|---|---|--|----------------------------------|--------------------------------|--|
| Federal | SI | 1991-95 | ≤ 14,000 | 3.0 | - | - | - | - | 8 / 110,000 |
| | | | > 14,000 ^e | 4.0 | - | - | - | | |
| | | 1996-2007 (Enhanced) ^f | ≤ 14,000 | - | 3.0 | 3.5 | 0.05 | 1.0 | 10 / 120,000 |
| | | | > 14,000 ^e | - | 4.0 | 4.5 | | - | |
| | | 2008+ (Enhanced) | 8500-14,000 | - | 1.4 | 1.75 | | 1.0 | 11 / 110,000 |
| | | | > 14,000 ^e | - | 1.9 | 2.3 | | - | |
| | CI | 1996-97 | ≤ 14,000 | - | 3.0 | - | - | - | MHDDE: 8 / 185,000 HHDE: 8 / 290,000 MHDDE: 8 / 185,000 HHDE: 8 / 290,000 |
| | | | > 14,000 ^e | - | 4.0 | - | - | - | |
| | | 1998+ (Enhanced) ^g | ≤ 14,000 | - | 3.0 | 3.5 | 0.05 | 1.0 | |
| | | | > 14,000 ^e | - | 4.0 | 4.5 | | - | |

Note: Definitions of acronyms are on page 12-14.

Sources:

40 CFR 86.099-11 Emission standards for 1999 and later model year diesel heavy-duty engines and vehicles.

40 CFR 86.004-11 Emission standards for 2004 and later model year diesel heavy-duty engines and vehicles.

CFR 86.007-11 Emission standards and supplemental requirements for 2007 and later model year diesel heavy-duty engines and vehicles. (Additional resources: www.epa.gov/emission-standards-reference-guide/light-duty-vehicles-and-trucks-emission-standards)

^a Applies to gasoline and methanol engines. Standard is hydrocarbon (HC) for gasoline engines, total hydrocarbon equivalent (THCE) for methanol engines.

^b For spark-ignition (SI) engines, standard applies to gasoline, methanol, natural gas, and liquefied petroleum gas engines. For compression-ignition (CI) engines, standard applies to methanol, natural gas, and liquefied petroleum gas engines. Standard is THCE for methanol engines, HC for others.

^c For SI engines, standard applies to gasoline and methanol engines. For CI engines, standard applies to methanol engines. Standard is THCE for methanol engines, HC for others.

^d Useful life is expressed in years or miles, whichever comes first.

^e Vehicles over 26,000 pounds gross vehicle weight may demonstrate compliance with an engineering design evaluation in lieu of testing.

^f A new enhanced evaporative test procedure applies, which is considerably more stringent than the previous test procedure despite the fact that the standard values do not change from prior years. Gasoline and methanol engines are phased in at the following rates of a manufacturer's sales for the specified model year: 1996: 20 percent; 1997: 40 percent; 1998: 90 percent; 1999: 100 percent.

^g A new enhanced evaporative test procedure applies, which is considerably more stringent than the previous test procedure despite the fact that the standard values do not change from prior years. Methanol-fueled vehicles are phased in at a rate of 90 percent of a manufacturer's production in 1998 and 100 percent in 1999.

The LEV III exhaust standards apply to new cars, light trucks, and medium vehicles, including fuel-flexible, bi-fuel, and dual-fuel vehicles from model year 2015-on.

Table 13.21
California New Car, Light Truck and Medium Truck Emission Certification Standards,
Model Year 2015-On

| Vehicle type | Vehicle emission category | Non-methane organic gases + nitrogen oxides (g/mi) | Carbon monoxide (g/mi) | Formaldehyde (mg/mi) | Particulates (g/mi) |
|--|---------------------------|--|------------------------|----------------------|---------------------|
| All passenger cars; LDTs 8,500 lbs. GVW or less | LEV160 | 0.16 | 4.2 | 4 | 0.01 |
| | ULEV125 | 0.125 | 2.1 | 4 | 0.01 |
| | ULEV70 | 0.07 | 1.7 | 4 | 0.01 |
| All MDPVs | ULEV50 | 0.05 | 1.7 | 4 | 0.01 |
| | SULEV30 | 0.03 | 1.0 | 4 | 0.01 |
| Vehicles in this category are tested at their loaded vehicle weight | SULEV20 | 0.02 | 1.0 | 4 | 0.01 |
| MDVs 8,501-10,000 lbs. GVW Vehicles in this category are tested at their adjusted loaded vehicle weight | LEV395 | 0.395 | 6.4 | 6 | 0.12 |
| | ULEV340 | 0.34 | 6.4 | 6 | 0.06 |
| | ULEV250 | 0.25 | 6.4 | 6 | 0.06 |
| | ULEV200 | 0.2 | 4.2 | 6 | 0.06 |
| | SULEV170 | 0.17 | 4.2 | 6 | 0.06 |
| | SULEV150 | 0.15 | 3.2 | 6 | 0.06 |
| MDVs 10,000-14,000 lbs. GVW Vehicles in this category are tested at their adjusted loaded vehicle weight | LEV630 | 0.63 | 7.3 | 6 | 0.12 |
| | ULEV570 | 0.57 | 7.3 | 6 | 0.06 |
| | ULEV400 | 0.4 | 7.3 | 6 | 0.06 |
| | ULEV270 | 0.27 | 4.2 | 6 | 0.06 |
| | SULEV230 | 0.23 | 4.2 | 6 | 0.06 |
| | SULEV200 | 0.2 | 3.7 | 6 | 0.06 |

Note: Definitions of acronyms are on page 12-14. These standards would also apply to states that adopted California emissions regulations.

Source:

California LEV III Regulations with amendments effective January 1, 2016,
www.arb.ca.gov/msprog/levprog/cleandoc/cleancomplete%201ev-ghg%20regs%201-16.pdf. (Additional resources: www.arb.ca.gov)

These exhaust emission standards apply to commercial aircraft engines.

Table 13.22
Aircraft – Exhaust Emission Standards

| | Year | Pressure ratio (PR) | Applicability ^a | HC (g/kN) | NO _x | CO (g/kN) | Smoke |
|----------------------|-------|---------------------|--|-------------------------|---|-----------|--|
| Federal ^b | 1974+ | - | T8 | - | - | - | 30 |
| | 1976+ | - | TF with rO ^c ≥ 129 kN | - | - | - | 83.6(rO) ^{-0.274} |
| | 1978+ | - | T3 ^d | - | - | - | 25 |
| | 1983+ | - | TF with rO < 26.7 kN | - | - | - | 83.6(rO) ^{-0.274} NTE max of SN=50 |
| | 1984+ | - | T3, T8, TF with rO ≥ 26.7 kN | 19.6 | - | - | 83.6(rO) ^{-0.274} NTE max of SN=50 |
| | | - | TSS | 140(.92) ^{rPR} | - | - | 83.6(rO) ^{-0.274} NTE max of SN=50 |
| | | - | TSS with rO ≥ 26.7 kN | 140(.92) ^{rPR} | - | - | 83.6(rO) ^{-0.274} NTE max of SN=50 |
| | | - | TP with rO ≥ 1,000 kW | - | - | - | 187(rO) ^{-0.168} |
| | 1997+ | - | T3, T8, TF with rO > 26.7 kN | 19.6 | 40+2(rPR) | 118 | 83.6(rO) ^{-0.274} NTE max of SN=50 |
| | | - | T3, T8, TF newly certified with rO > 26.7 kN | 19.6 | 32+1.6(rPR) | 118 | 83.6(rO) ^{-0.274} NTE max of SN=50 |
| | 2000+ | - | T3, T8, TF newly manufactured with rO > 26.7 kN | 19.6 | 32+1.6(rPR) | 118 | 83.6(rO) ^{-0.274} NTE max of SN=50 |
| | 2005+ | PR ≤ 30 | T3, T8, TF newly certified with rO > 89 kN | - | 19+1.6(rPR) | - | - |
| | | | T3, T8, TF newly certified with 26.7 kN < rO ≤ 89 kN | - | 37.572+1.6(rPR)-0.2087(rO) | - | - |
| | | 30 < PR < 62.5 | T3, T8, TF newly certified with rO > 89 kN | - | 7+2.0(rPR) | - | - |
| | | | T3, T8, TF newly certified with 26.7kN < rO ≤ 89kN | - | 42.71+1.4286(rPR)-0.4013(rO)+0.00642(rPR)(rO) | - | - |
| PR ≤ 62.5 | | T3, T8, TF | - | 32+1.6(rPR) | - | - | |

Note: The test procedures are the International Civil Aviation Organization (ICAO) Smoke Emission Test Procedure and the ICAO Gaseous Emissions Test Procedure. There is no useful life or warranty period for purposes of compliance with aircraft emissions standards. Definitions of acronyms are on page 12-14.

Source:

40 CFR Part 87, Aircraft emission standards, test procedures, certification requirements (Additional resources: www.epa.gov/emission-standards-reference-guide/nonroad-engines-and-vehicles-emission-standards)

^a T8=all aircraft gas turbine engines of the JT8D model family
TF=all turbofan and turbojet aircraft engines except engines of Class T3, T8, and TSS
T3=all aircraft gas turbine engines of the JT3D model family
TSS=all aircraft gas turbine engines for aircraft operations at supersonic flight speeds
TP=all aircraft turboprop engines

^b Federal standards apply to planes operating in the United States, regardless of where they were manufactured.

^c Rated output (rO) is the maximum power/thrust available for takeoff.

^d T3 engines are no longer manufactured but are in the existing fleet.

These standards apply to construction and agricultural equipment, such as excavators, paving equipment, tractors, combines, bulldozers, and skidders.

**Table 13.23
Nonroad Compression-Ignition Engines – Exhaust Emission Standards**

| | Rated power (kW) | Tier | Model year | NMHC (g/kW-hr) | NMHC + NOx (g/kW-hr) | NOx (g/kW-hr) | PM (g/kW-hr) | CO (g/kW-hr) | Smoke ^a percentage | Useful life (hours/years) ^b |
|--------------------|------------------|---------------------------|------------------------|------------------|----------------------|-------------------|-------------------|--------------|-------------------------------|--|
| Federal | kW < 8 | 1 | 2000-2004 | -- | 10.5 | -- | 1.0 | 8.0 | 20 / 15 / 50 | 3,000 / 5 |
| | | 2 | 2005-2007 | -- | 7.5 | -- | 0.80 | 8.0 | | |
| | | 4 | 2008+ | -- | 7.5 | -- | 0.40 ^c | 8.0 | | |
| | 8 ≤ kW < 19 | 1 | 2000-2004 | -- | 9.5 | -- | 0.80 | 6.6 | | 3,000 / 5 |
| | | 2 | 2005-2007 | -- | 7.5 | -- | 0.80 | 6.6 | | |
| | | 4 | 2008+ | -- | 7.5 | -- | 0.40 | 6.6 | | |
| | 19 ≤ kW < 37 | 1 | 1999-2003 | -- | 9.5 | -- | 0.80 | 5.5 | | 5,000 / 7 ^d |
| | | 2 | 2004-2007 | -- | 7.5 | -- | 0.60 | 5.5 | | |
| | | 4 | 2008-2012 | -- | 7.5 | -- | 0.30 | 5.5 | | |
| | | | 2013+ | -- | 4.7 | -- | 0.03 | 5.5 | | |
| | 37 ≤ kW < 56 | 1 | 1998-2003 | -- | -- | 9.2 | -- | -- | | 8,000 / 10 |
| | | 2 | 2004-2007 | -- | 7.5 | -- | 0.40 | 5.0 | | |
| | | 3 ^c | 2008-2011 | -- | 4.7 | -- | 0.40 | 5.0 | | |
| | | 4 (Option 1) ^f | 2008-2012 | -- | 4.7 | -- | 0.30 | 5.0 | | |
| | | 4 (Option 2) ^f | 2012 | -- | 4.7 | -- | 0.03 | 5.0 | | |
| | | 4 | 2013+ | -- | 4.7 | -- | 0.03 | 5.0 | | |
| | 56 ≤ kW < 75 | 1 | 1998-2003 | -- | -- | 9.2 | -- | -- | | 8,000 / 10 |
| | | 2 | 2004-2007 | -- | 7.5 | -- | 0.40 | 5.0 | | |
| | | 3 | 2008-2011 | -- | 4.7 | -- | 0.40 | 5.0 | | |
| | | 4 | 2012-2103 ^g | -- | 4.7 | -- | 0.02 | 5.0 | | |
| | | | 2014+ ^h | 0.19 | -- | 0.4 | 0.02 | 5.0 | | |
| | 75 ≤ kW < 130 | 1 | 1997-2002 | -- | -- | 9.2 | -- | -- | | 20 / 15 / 50 |
| | | 2 | 2003-2006 | -- | 6.6 | -- | 0.3 | 5.0 | | |
| | | 3 | 2007-2011 | -- | 4.0 | -- | 0.3 | 5.0 | | |
| | | 4 | 2012-2013 ^g | -- | 4.0 | -- | 0.02 | 5.0 | | |
| | | | 2014+ | 0.19 | -- | 0.4 | 0.02 | 5.0 | | |
| | 130 ≤ kW < 225 | 1 | 1996-2002 | 1.3 ⁱ | -- | 9.2 | 0.54 | 11.4 | | 8,000 / 10 |
| | | 2 | 2003-2005 | -- | 6.6 | -- | 0.20 | 3.5 | | |
| | | 3 | 2006-2010 | -- | 4.0 | -- | 0.20 | 3.5 | | |
| | | 4 | 2011-2013 ^g | -- | 4.0 | -- | 0.02 | 3.5 | | |
| 2014+ ^h | | | 0.19 | -- | 0.4 | 0.02 | 3.5 | | | |
| 225 ≤ kW < 450 | 1 | 1996-2000 | 1.3 ⁱ | -- | 9.2 | 0.54 | 11.4 | 8,000 / 10 | | |
| | 2 | 2001-2005 | -- | 6.4 | -- | 0.20 | 3.5 | | | |
| | 3 | 2006-2010 | -- | 4.0 | -- | 0.20 | 3.5 | | | |
| | 4 | 2011-2013 ^g | -- | 4.0 | -- | 0.02 | 3.5 | | | |
| | | 2014+ ^h | 0.19 | -- | 0.4 | 0.02 | 3.5 | | | |
| 450 ≤ kW < 560 | 1 | 1996-2001 | 1.3 ⁱ | -- | 9.2 | 0.54 | 11.4 | 8,000 / 10 | | |
| | 2 | 2002-2005 | -- | 6.4 | -- | 0.20 | 3.5 | | | |
| | 3 | 2006-2010 | -- | 4.0 | -- | 0.20 | 3.5 | | | |
| | 4 | 2011-2013 ^g | -- | 4.0 | -- | 0.02 | 3.5 | | | |
| | | 2014+ ^h | 0.19 | -- | 0.4 | 0.02 | 3.5 | | | |
| 560 ≤ kW < 900 | 1 | 2000-2005 | 1.3 ⁱ | -- | 9.2 | 0.54 | 11.4 | 8,000 / 10 | | |
| | 2 | 2006-2010 | -- | 6.4 | -- | 0.20 | 3.5 | | | |
| | 4 | 2011-2014 | 0.4 | -- | 3.5 | 0.10 | 3.5 | | | |
| | | 2015+ ^h | 0.19 | -- | 3.5 ^j | 0.04 ^k | 3.5 | | | |

Table 13.23 (continued)
Nonroad Compression-Ignition Engines – Exhaust Emission Standards

| | Rated power (kW) | Tier | Model year | NMHC (g/kW-hr) | NMHC + NOx (g/kW-hr) | NOx (g/kW-hr) | PM (g/kW-hr) | CO (g/kW-hr) | Smoke ^a percentage | Useful life (hours/years) ^b |
|---------|------------------|------|--------------------|------------------|----------------------|------------------|-------------------|--------------|-------------------------------|--|
| Federal | kW > 900 | 1 | 2000-2005 | 1.3 ⁱ | -- | 9.2 | 0.54 | 11.4 | 20 / 15 / 50 | 8,000 / 10 |
| | | 2 | 2006-2010 | -- | 6.4 | -- | 0.20 | 3.5 | | |
| | | 4 | 2011-2014 | 0.4 | -- | 3.5 ^j | 0.10 | 3.5 | | |
| | | | 2015 ^{+h} | 0.19 | -- | 3.5 ^j | 0.04 ^k | 3.5 | | |

Note: Definitions of acronyms are on page 12-14.

Sources:

40 CFR 98.112 = Exhaust emission standards

40 CFR 1039.101 = Exhaust emission standards for after 2014 model year

40 CFR 1039.102 = Exhaust emission standards for model year 2014 and earlier

40 CFR 1039 Subpart F = Exhaust emissions transient and steady state test procedures

40 CFR 86 Subpart I = Smoke emission test procedures

40 CFR 1065 = Test equipment and emissions measurement procedures (Additional resources:

www.epa.gov/emission-standards-reference-guide/nonroad-engines-and-vehicles-emission-standards)

^a Smoke emissions may not exceed 20 percent during the acceleration mode, 15 percent during the lugging mode, and 50 percent during the peaks in either mode. Smoke emission standards do not apply to single-cylinder engines, constant-speed engines, or engines certified to a PM emission standard of 0.07 grams per kilowatt-hour (g/kW-hr) or lower. Smoke emissions are measured using procedures in 40 CFR Part 86 Subpart I.

^b Useful life and warranty period are expressed hours and years, whichever comes first.

^c Hand-startable air-cooled direct injection engines may optionally meet a PM standard of 0.60 g/kW-hr. These engines may optionally meet Tier 2 standards through the 2009 model years. In 2010 these engines are required to meet a PM standard of 0.60 g/kW-hr.

^d Useful life for constant speed engines with rated speed 3,000 revolutions per minute (rpm) or higher is 5 years or 3,000 hours, whichever comes first.

^e These Tier 3 standards apply only to manufacturers selecting Tier 4 Option 2. Manufacturers selecting Tier 4 Option 1 will be meeting those standards in lieu of Tier 3 standards.

^f A manufacturer may certify all their engines to either Option 1 or Option 2 sets of standards starting in the indicated model year. Manufacturers selecting Option 2 must meet Tier 3 standards in the 2008-2011 model years.

^g These standards are phase-out standards. Not more than 50 percent of a manufacturer's engine production is allowed to meet these standards in each model year of the phase out period. Engines not meeting these standards must meet the final Tier 4 standards.

^h These standards are phased in during the indicated years. At least 50 percent of a manufacturer's engine production must meet these standards during each year of the phase in. Engines not meeting these standards must meet the applicable phase-out standards.

ⁱ For Tier 1 engines the standard is for total hydrocarbons.

^j The NOx standard for generator sets is 0.67 g/kW-hr.

^k The PM standard for generator sets is 0.03 g/kW-hr.

These standards apply to gasoline and propane industrial equipment such as forklifts, generators, airport service equipment, compressors and ice-grooming machines.

Table 13.24
Nonroad Large Spark-Ignition Engines – Exhaust and Evaporative Emission Standards

| | Tier | Year | General duty-cycle standards | | Alternative standards for severe-duty engines | | Field testing standards | | Useful life (years/hours) | |
|----------------------|--|-----------|--|---|---|--------------|-------------------------------|------------------|---------------------------|-------|
| | | | HC+NOx ^a (g/kW-hr) | CO (g/kW-hr) | HC+NOx ^a (g/kW-hr) | CO (g/kW-hr) | HC+NOx ^a (g/kW-hr) | CO (g/kW-hr) | | |
| Federal ^b | 1 ^c | 2004-2006 | 4.0 ^d | 50.0 | 4.0 ^d | 130.0 | - | - | 7 / 5,000 ^e | |
| | 2 ^f | 2007+ | 2.7 ^f | 4.4 ^f | 2.7 | 130.0 | 3.8 ^f | 6.5 ^f | 7 / 5,000 ^e | |
| | | | Evaporative emission standards (for engines fueled by a volatile liquid fuel) | | | | | | | 5 / - |
| | | | Fuel line permeation | Nonmetallic fuel lines must meet the permeation specifications of SAE J2260 (November 1996) | | | | | | |
| Diurnal emissions | Evaporative HC emissions may not exceed 0.2 grams per gallon of fuel tank capacity | | | | | | | | | |
| | | | Running loss | Liquid fuel in the fuel tank may not reach boiling during continuous engine operation in the final installation at an ambient temperature of 30°C | | | | | | |

Sources:

40 CFR 1048.101 = Exhaust emission standards

40 CFR 1048.105 = Evaporative emission standards

40 CFR 1048.110 = Engine diagnostic requirements (Additional resources: www.epa.gov/emission-standards-reference-guide/nonroad-engines-and-vehicles-emission-standards)

^a The numerical emission standards for hydrocarbons (HC) must be met based on the following types of hydrocarbon emissions for engines powered by the following fuels: (1) non-methane hydrocarbons (NMHC) for natural gas; (2) total hydrocarbon equivalent (THCE) for alcohol; and (3) total hydrocarbons (THC) for other fuels.

^b Voluntary Blue Sky standards for large spark-ignition (SI) engines are available. Engines with displacement at or below 1,000 cubic centimeters (cc) and maximum power at or below 30 kilowatts (kW) may be certified under the program for small SI engines.

^c Emission standards are based on testing over a steady-state duty-cycle.

^d The Tier 1 HC plus nitrogen oxides (NOx) emission standard for in-use testing is 5.4 grams per kW-hour (g/kW-hr).

^e Useful life is expressed in years and hours, whichever comes first. These are the minimum useful life requirements. For severe-duty engines, the minimum useful life is seven years or 1,500 hours of operation, whichever comes first. A longer useful life in hours is required if: (a) the engine is designed to operate longer than the minimum useful life based on the recommended rebuild interval; or (b) the basic mechanical warranty is longer than the minimum useful life.

^f Optional engine certification is allowed according to the following formula: $(\text{HC}+\text{NOx}) \times \text{CO}^{0.784} \leq 8.57$. The HC+NOx and carbon monoxide (CO) emission levels selected to satisfy this formula, rounded to the nearest 0.1 g/kW-hr, become the emission standards that apply for those engines. One may not select an HC+NOx emission standard higher than 2.7 g/kW-hr or a CO emission standard higher than 20.6 g/kW-hr.

Table 13.25
Locomotives – Exhaust Emission Standards

| | Duty-cycle ^b | Tier | Year ^c | HC ⁱ (g/hp-hr) | NOx (g/bhp-hr) | PM (g/bhp-hr) | CO (g/bhp-hr) | Smoke (percentage) ^m | Minimum useful life (hours / years / miles) ⁿ |
|----------------------|-------------------------|--------|--------------------------|------------------------------|-------------------|-------------------------|------------------|------------------------------------|---|
| Federal ^o | Line-haul | Tier 0 | 1973-1992 ^{d,e} | 1.0 | 9.5 [ABT] | 0.22 [ABT] | 5.0 | 30 / 40 / 50 | (7.5 x hp) / 10 / 750,000 ^o |
| | | Tier 1 | 1993-2004 ^{d,e} | 0.55 | 7.4 [ABT] | 0.22 [ABT] | 2.2 | 25 / 40 / 50 | (7.5 x hp) / 10 / 750,000 ^o |
| | | Tier 2 | 2005-2011 ^d | 0.30 | 5.5 [ABT] | 0.10 ^k [ABT] | 1.5 | 20 / 40 / 50 | (7.5 x hp) / 10 / - |
| | | Tier 3 | 2012-2014 ^f | 0.30 | 5.5 [ABT] | 0.10 [ABT] | 1.5 | 20 / 40 / 50 | (7.5 x hp) / 10 / - |
| | | Tier 4 | 2015+ ^g | 0.14 | 1.3 [ABT] | 0.03 [ABT] | 1.5 | - | (7.5 x hp) / 10 / - |
| | Switch | Tier 0 | 1973-2001 | 2.10 | 11.8 [ABT] | 0.26 [ABT] | 8.0 | 30 / 40 / 50 | (7.5 x hp) / 10 / 750,000 ^o |
| | | Tier 1 | 2002-2004 ^h | 1.20 | 11.0 [ABT] | 0.26 [ABT] | 2.5 | 25 / 40 / 50 | (7.5 x hp) / 10 / - |
| | | Tier 2 | 2005-2010 ^h | 0.60 | 8.1 [ABT] | 0.13 ^l [ABT] | 2.4 | 20 / 40 / 50 | (7.5 x hp) / 10 / - |
| | | Tier 3 | 2011-2014 | 0.60 | 5.0 [ABT] | 0.10 [ABT] | 2.4 | 20 / 40 / 50 | (7.5 x hp) / 10 / - |
| | | Tier 4 | 2015+ | 0.14 ⁱ | 1.3 [ABT] | 0.03 [ABT] | 2.4 | - | (7.5 x hp) / 10 / - |

Source:

40 CFR 1033.101 = Emission Standards and Useful Life. (Additional resources: www.epa.gov/emission-standards-reference-guide/nonroad-engines-and-vehicles-emission-standards)

^a These standards apply to locomotives that are propelled by engines with total rated horsepower (hp) of 750 kilowatts (kW) (1006 hp) or more, unless the owner chooses to have the equipment certified to meet the requirements of locomotives. This does not include vehicles propelled by engines with total rated horsepower of less than 750 kW (1006 hp); see the requirements in 40 Code of Federal Regulations (CFR) Parts 86, 89 and 1039. The test procedures specify chassis-based testing of locomotives. These test procedures include certification testing, production line testing, and in-use testing using the Federal Test Procedure (FTP) when the locomotive has reached between 50-70 percent of its useful life.

^b Line-haul locomotives are powered by an engine with a maximum rated power (or a combination of engines having a total rated power) greater than 2300 hp. Switch locomotives are powered by an engine with a maximum rated power (or a combination of engines having a total rated power) of 2300 hp or less.

^c The Tier 0 standards apply to locomotives manufactured after 1972 when they are manufactured or remanufactured. Note that interim standards may apply for Tier 0 or Tier 1 locomotives remanufactured in 2008 or 2009, or for Tier 2 locomotives manufactured or remanufactured in 2008-2012.

^d Line-haul locomotives subject to the Tier 0 through Tier 2 emission standards must also meet switch standards of the same tier.

^e The Tier 0 standards apply for 1993-2001 locomotives not originally manufactured with a separate loop intake air cooling system.

^f Tier 3 line-haul locomotives must also meet Tier 2 switch standards.

^g Manufacturers using credits may elect to meet a combined nitrogen oxides (NOx) plus hydrocarbon (HC) standard of 1.4 grams per brakehorsepower-hour (g/bhp-hr) instead of the otherwise applicable Tier 4 NOx and HC standards.

^h Tier 1 and Tier 2 switch locomotives must also meet line-haul standards of the same tier.

ⁱ The numerical emission standards for HC must be met based on the following types of hydrocarbon emissions for locomotives powered by the following fuels: (1) alcohol: total hydrocarbon equivalent (THCE) emissions for Tier 3 and earlier locomotives, and non-methane hydrocarbon equivalent (NMHCE) for Tier 4; (2) natural gas and liquefied petroleum gas: non-methane hydrocarbon (NMHC) emissions; and (3) diesel: total hydrocarbon (THC) emissions for Tier 3 and earlier locomotives, and NMHC for Tier 4.

Table 13.25 (continued)
Locomotives – Exhaust Emission Standards

^j Manufacturers may elect to meet a combined NO_x+HC standard of 1.4 g/bhp-hr instead of the otherwise applicable Tier 4 NO_x and HC standards.

^k The line-haul particulate matter (PM) standard for newly remanufactured Tier 2 locomotives is 0.20 g/bhp-hr until January 1, 2013, except as specified in 40 CFR Part 1033.150(a).

^l The switch PM standard for new Tier 2 locomotives is 0.24 g/bhp-hr until January 1, 2013, except as specified in 40 CFR Part 1033.150(a).

^m The smoke opacity standards apply only for locomotives certified to one or more PM standards or Family Emission Limits (FEL) greater than 0.05 g/bhp-hr. Percentages apply to smoke opacity at steady state/30-second peak/3-second peak, as measured continuously during testing.

ⁿ Useful life and warranty period are expressed in megawatt-hours (MW-hr), years, or miles, whichever comes first. Manufacturers are required to certify to longer useful lives if their locomotives are designed to last longer between overhauls than the minimum useful life value.

^o For locomotives originally manufactured before January 1, 2000, and not equipped with MW-hr meters.

These standards apply to auxiliary and propulsion engines used by all types of recreational and commercial vessels, from small fishing boats to ocean-going ships.

**Table 13.26
Marine Compression-Ignition (CI) Engines – Exhaust Emission Standards**

| | Category ^{a,b} | Tier | Displacement (L/cylinder) | Power ^c (kW) | Speed (rpm) | Model Year | NOx (g/kW-hr) | HC (g/kW-hr) | HC+NOx ^d (g/kW-hr) | PM (g/kW-hr) | CO (g/kW-hr) | Useful Life ^e (years/hours) | |
|--|---|------------------------------|---------------------------|-------------------------|-------------------|---------------------------|---------------------------|--------------|-------------------------------|---------------------------------------|---|---|---------------------------------------|
| Federal ^f | C1 Commercial | 1 | ≥ 2.5 | ≥ 37 | rpm < 130 | 2004 ^h | 17.0 | - | - | - | - | 10 / 10,000 | |
| | | | | | 130 ≤ rpm < 2000 | | 45.0 × N ^{0.201} | - | - | - | | | |
| | | | | | rpm ≥ 2000 | | 9.8 | - | - | - | | | |
| | | 2 | disp. < 0.9 | ≥ 37 | - | 2005 ^h | - | - | 7.5 (ABT) | 0.40 (ABT) | 5.0 | 10 / 10,000 | |
| | | | 0.9 ≤ disp < 1.2 | all | - | 2004 ^h | - | - | 7.2 (ABT) | 0.30 (ABT) | 5.0 | | |
| | | | 1.2 ≤ disp < 2.5 | | 2004 ^h | - | - | 7.2 (ABT) | 0.20 (ABT) | 5.0 | | | |
| | | | 2.5 ≤ disp < 5.0 | | 2007 ^h | - | - | 7.2 (ABT) | 0.20 (ABT) | 5.0 | | | |
| | | C1 Commercial & Recreational | 1 | ≥ 2.5 | ≥ 37 | rpm < 130 | 2004 | 17.0 | - | - | - | - | 10 / 1,000 |
| | 130 ≤ rpm < 2000 | | | | | 45.0 × N ^{0.201} | | - | - | - | | | |
| | rpm ≥ 2000 | | | | | 9.8 | | - | - | - | | | |
| | 2 | | disp < 0.9 | ≥ 37 | - | 2007 | - | - | 7.5 (ABT) | 0.40 (ABT) | 5.0 | 10 / 1,000 | |
| | | | 0.9 ≤ disp < 1.2 | all | - | 2006 | - | - | 7.2 (ABT) | 0.30 (ABT) | 5.0 | | |
| | | | 1.2 ≤ disp < 2.5 | | 2006 | - | - | 7.2 (ABT) | 0.20 (ABT) | 5.0 | | | |
| | | | 2.5 ≤ disp < 5.0 | | 2009 | - | - | 7.2 (ABT) | 0.20 (ABT) | 5.0 | | | |
| | C1 Commercial & Recreational < 75 kW | | 3 | < 0.9 | < 8 | - | 2009+ | - | - | 7.5 (ABT) | 0.40 (ABT) | 8.0 | 5 / 3,000 7 / 5,000 10 / 10,000 |
| | | 8 ≤ kW < 19 | | | - | 2009+ | - | - | 7.5 (ABT) | 0.40 (ABT) | 6.6 | | |
| | | 19 ≤ kW < 37 | | | - | 2009-2013 | - | - | 7.5 ⁱ (ABT) | 0.30 ^j (ABT) | 5.5 | | |
| | | 37 ≤ kW < 75 | | | - | 2014+ | - | - | 4.7 ⁱ (ABT) | 0.20 (ABT) | 5.0 | | |
| | | 37 ≤ kW < 75 | | | - | 2009-2013 | - | - | 7.5 ⁱ (ABT) | 0.30 ^j (ABT) | 5.0 | | |
| | | 3 ^l | < 0.9 | - | - | 2012+ | - | - | 5.4 (ABT) | 0.14 (ABT) | 8.0 for < 8 kW | 5 / 3,000 for commercial engines < 19 kW | |
| | | | 0.9 ≤ disp < 1.2 | All | - | 2013+ | - | - | 5.4 (ABT) | 0.12 (ABT) | 6.6 for 8 ≤ kW < 19 | 7 / 5,000 for commercial engines 19 ≤ kW < 37 | |
| | | | 1.2 ≤ disp < 2.5 | < 600 | - | 2014-2017 | - | - | 5.6 (ABT) | 0.11 (ABT) | 5.5 for 19 ≤ kW < 37 | 10 / 10,000 for C1 Commercial ≤ 37 kW | |
| | C1 Commercial Engines with ≤ 35 kW/L power density ^k | 3 ^l | 1.2 ≤ disp < 2.5 | ≥ 600 | - | 2014+ | - | - | 5.6 (ABT) | 0.11 (ABT) | 5.0 for ≤ 37 kW | | |
| | | | | < 600 | - | 2013-2017 | - | - | 5.6 (ABT) | 0.11 (ABT) | | | |
| 2.5 ≤ disp < 3.5 | | | < 600 | - | 2018+ | - | - | 5.6 (ABT) | 0.10 (ABT) | | | | |
| | | | ≥ 600 | - | 2013+ | - | - | 5.6 (ABT) | 0.11 (ABT) | | | | |
| 3.5 ≤ disp < 7.0 | | < 600 | - | 2012-2017 | - | - | 5.8 (ABT) | 0.11 (ABT) | | | | | |
| | | < 600 | - | 2018+ | - | - | 5.8 (ABT) | 0.10 (ABT) | | | | | |
| | | ≥ 600 | - | 2012+ | - | - | 5.8 (ABT) | 0.11 (ABT) | | | | | |
| | | ≥ 600 | - | 2012+ | - | - | 5.8 (ABT) | 0.11 (ABT) | | | | | |
| C1 Commercial engines with > 35 kW/L power density & All Recreational Engines ^k | 3 ^l | < 0.9 | ≥ 75 | - | 2012+ | - | - | 5.8 (ABT) | 0.15 (ABT) | 8.0 for < 8 kW | 5 / 3,000 for commercial engines < 19 kW | | |
| | | 0.9 ≤ disp < 1.2 | All | - | 2013+ | - | - | 5.8 (ABT) | 0.14 (ABT) | 6.6 for 8 ≤ kW < 19 | 7 / 5,000 for commercial engines 19 ≤ kW < 37 | | |
| | | 1.2 ≤ disp < 2.5 | | 2014+ | - | - | 5.8 (ABT) | 0.14 (ABT) | 5.5 for 19 ≤ kW < 37 | 10 / 10,000 for C1 Commercial ≥ 37 kW | | | |
| | | 2.5 ≤ disp < 3.5 | | 2013+ | - | - | 5.8 (ABT) | 0.12 (ABT) | 5.0 for ≥ 37 kW | 10 / 1,000 for CI Recreational | | | |
| | | 3.5 ≤ disp < 7.0 | | 2012+ | - | - | 5.8 (ABT) | 0.11 (ABT) | | | | | |

(Continued on next page)

Table 13.26 (continued)
Marine Compression-Ignition (CI) Engines – Exhaust Emission Standards

| | Category ^{a,b} | Tier | Displacement (L/cylinder) | Power ^c (kW) | Speed (rpm) | Model Year | NOx (g/kW-hr) | HC (g/kW-hr) | HC+NOx ^d (g/kW-hr) | PM (g/kW-hr) | CO (g/kW-hr) | Useful Life ^e (years/hours) | | |
|----------------------|-------------------------|--------------------|---------------------------|---------------------------------|-------------------|---------------------------|---------------------------|--------------|-------------------------------|--------------|--------------|--|-------------|-----|
| Federal ^f | C1 Commercial > 600 kW | 4 ^m | All | 600 ≤ kW < 1,400 | - | 2017+ | 1.8 (ABT) | - | 0.19 HC ^g | 0.04 (ABT) | 5.0 | 10 / 10,000 | | |
| | | | All | 1,400 ≤ kW < 2,000 | - | 2016+ | 1.8 (ABT) | - | 0.19 HC ^g | 0.04 (ABT) | | | | |
| | | | All | 2,000 ≤ kW < 3,700 | - | 2014+ | 1.8 (ABT) | - | 0.19 HC ^g | 0.04 (ABT) | | | | |
| | | | < 7.0 | ≥ 3,700 | - | 2014-2015 | 1.8 (ABT) | - | 0.19 HC ^g | 0.12 (ABT) | | | | |
| | | | | | - | 2016+ | 1.8 (ABT) | - | 0.19 HC ^g | 0.06 (ABT) | | | | |
| | C2 | 1 | ≥ 2.5 | ≥ 37 | rpm < 130 | 2004 | 17.0 | - | - | - | - | - | 10 / 20,000 | |
| | | | | | 130 ≤ rpm < 2,000 | | 45.0 × N ^{0.201} | - | - | - | - | | | |
| | | | | | rpm ≥ 2,000 | | 9.8 | - | - | - | - | | | |
| | | 2 | 5.0 ≤ disp < 15.0 | all | - | 2007 | - | - | 7.8 (ABT) | 0.27 (ABT) | 5.0 | 10 / 20,000 | | |
| | | | | | | | 15.0 ≤ disp < 20.0 | - | - | 8.7 (ABT) | 0.50 (ABT) | | 5.0 | |
| | | | | | | | 15.0 ≤ disp < 20.0 | ≥ 3,300 | - | - | 9.8 (ABT) | | 0.50 (ABT) | 5.0 |
| | | | | | | | 20.0 ≤ disp < 25.0 | all | - | - | 9.8 (ABT) | | 0.50 (ABT) | 5.0 |
| | | | | | | | 25.0 ≤ disp < 30.0 | all | - | - | 11.0 (ABT) | | 0.50 (ABT) | 5.0 |
| | | 3 ^{m,p} | 7.0 ≤ disp < 15.0 | < 2,000 | - | 2013+ | - | - | 6.2 (ABT) | 0.14 (ABT) | 5.0 | 10 / 20,000 | | |
| | | | | | | | 2,000 ≤ kW < 3,700 | - | - | 7.8 (ABT) | 0.14 (ABT) | | 5.0 | |
| | | | 15.0 ≤ disp < 20.0 | < 2,000 | - | 2014+ | - | - | 7.0 (ABT) | 0.34 (ABT) | 5.0 | | | |
| | | | 20.0 ≤ disp < 25.0 | < 2,000 | - | - | - | - | 9.8 (ABT) | 0.27 (ABT) | 5.0 | | | |
| | | 25.0 ≤ disp < 30.0 | < 2,000 | - | - | - | - | 11.0 (ABT) | 0.27 (ABT) | 5.0 | | | | |
| | | 4 ^{m,p} | All | 600 ≤ kW < 1,400 | - | 2017+ | 1.8 (ABT) | - | 0.19 HC ^g | 0.04 (ABT) | 5.0 | 10 / 20,000 | | |
| | | | All | 1400 ≤ kW < 2,000 | - | 2016+ | 1.8 (ABT) | - | 0.19 HC ^g | 0.04 (ABT) | | | | |
| | | | All | 2,000 ≤ kW < 3,700 ^h | - | 2014+ | 1.8 (ABT) | - | 0.19 HC ^g | 0.04 (ABT) | | | | |
| | | | < 15.0 | ≥ 3,700 | - | 2014-2015 | 1.8 (ABT) | - | 0.19 HC ^g | 0.12 (ABT) | | | | |
| | | | 15.0 ≤ disp < 30.0 | | - | 2014-2015 | 1.8 (ABT) | - | 0.19 HC ^g | 0.25 (ABT) | | | | |
| | | | All | | - | 2016+ | 1.8 (ABT) | - | 0.19 HC ^g | 0.06 (ABT) | | | | |
| | C3 | 1 | ≥ 30.0 | All | rpm < 130 | 2004 | 17.0 | - | - | - | - | - | 3 / 10,000 | |
| | | | | | 130 ≤ rpm < 2,000 | | 45.0 × N ^{0.201} | - | - | - | - | | | |
| | | | | | rpm ≥ 2,000 | | 9.8 | - | - | - | - | | | |
| 2 | | ≥ 30.0 | All | rpm < 130 | 2011 | 14.4 | 2.0 | - | - | 5.0 | 3 / 10,000 | | | |
| | | | | 130 ≤ rpm < 2,000 | | 44.0 × N ^{0.231} | | - | - | - | | | | |
| | | | | rpm ≥ 2,000 | | 7.7 | | - | - | - | | | | |
| 3 | | ≥ 30.0 | All | rpm < 130 | 2016 | 3.4 | 2.0 | - | - | 5.0 | 3 / 10,000 | | | |
| | | | | 130 ≤ rpm < 2,000 | | 9.0 × N ^{0.201} | | - | - | - | | | | |
| | | | | rpm ≥ 2,000 | | 2.0 | | - | - | - | | | | |

Sources:

- 40 CFR 89.104 = Tiers 1 and 2 useful life & warranty period for marine CI engines less than 37 kW
- 40 CFR 89.112 = Tiers 1 and 2 emission standards for marine CI engines less than 37 kW
- 40 CFR 89 Subpart E = Tiers 1 and 2 test procedures for marine CI engines less than 37 kW
- 40 CFR 94.8 = Tiers 1 and 2 emission standards for C1 (both commercial & recreational), C2 and C3 engines
- 40 CFR 94.9 = Tiers 1 and 2 useful life for C1 (both commercial & recreational), C2 and C3 engines
- 40 CFR 94 Subpart B = Tiers 1 and 2 test procedures for C1 (both commercial & recreational), C2 and C3 engines
- 40 CFR 1042.101 = Tiers 3 and 4 exhaust emission standards and useful life

Table 13.26 (continued)
Marine Compression-Ignition (CI) Engines – Exhaust Emission Standards

Sources (continued):

40 CFR 1042.107 = Tiers 3 and 4 evaporative emission standards engines using a volatile liquid fuel (e.g., methanol)

40 CFR 1042.120 = Tiers 3 and 4 warranty period

40 CFR 1042 Subpart F = Tiers 3 and 4 test procedures (Additional resources: www.epa.gov/emission-standards-reference-guide/nonroad-engines-and-vehicles-emission-standards)

^a For Tiers 1 and 2, Category 1 marine engines are greater than or equal to 37 kilowatts (kW) and have a displacement less than 5.0 liters per cylinder (L/cylinder); Category 2 marine engines have a displacement greater than or equal to 5.0 L/cylinder and less than 30 L/cylinder; and Category 3 marine engines have a displacement greater than or equal to 30.0 L/cylinder. For Tiers 3 and 4, Category 1 represents engines up to 7 L/cylinder displacement; and Category 2 includes engines from 7 to 30 L/cylinder. The definition of Category 3 marine engines remains the same.

^b Tiers 1 and 2 for marine engines less than 37 kW are subject to the same emission standards as for land-based engines. See Table 1 in 40 Code of Federal Regulations (CFR) Part 89.112 and 40 CFR Part 89.104.

^c For Tiers 1 and 2, this refers to the rated power; for Tiers 3 and 4, this refers to the maximum engine power.

^d Total hydrocarbon (THC) plus nitrogen oxides (NOx) for Tier 2 standards.

^e Useful life is expressed in hours or years, whichever comes first. For Tiers 3 and 4, a longer useful life in hours for an engine family must be specified if either: 1) the engine is designed, advertised, or marketed to operate longer than the minimum useful life; or 2) the basic mechanical warranty is longer than the minimum useful life.

^f Warranty period is expressed in years and hours, whichever comes first.

^g For Tiers 3 and 4, there are no evaporative emission standards for diesel-fueled engines, or engines using other nonvolatile or nonliquid fuels (e.g., natural gas). If an engine uses a volatile liquid fuel, such as methanol, the engine's fuel system and the vessel in which the engine is installed must meet the evaporative emission requirements of 40 Code of Federal Regulations (CFR) Part 1045 that apply with respect to spark-ignition engines. Manufacturers subject to evaporative emission standards must meet the requirements of 40 CFR 1045.112 as described in 40 CFR 1060.1(a)(2).

^h Indicates the model years for which the specified standards start.

ⁱ N is the maximum test speed of the engine in revolutions per minute (rpm).

^j Manufacturers of Tier 3 engines greater than or equal to 19 kW and less than 75 kW with displacement below 0.9 L/cylinder may alternatively certify some or all of their engine families to a particulate matter (PM) emission standard of 0.20 grams per kilowatt-hour (g/kW-hr) and a NOx+HC emission standard of 5.8 g/kW-hr for 2014 and later model years.

^k The applicable Tier 2 NOx+HC standards continue to apply instead of the Tier 3 values for engines at or above 2000 kW.

^l These Tier 3 standards apply to Category 1 engines below 3700 kW except for recreational marine engines at or above 3700 kW (with any displacement), which must meet the Tier 3 standards specified for recreational marine engines with a displacement of 3.5 to 7.0 L/cylinder.

^m The following provisions are optional: 1) Manufacturers may use NOx credits to certify Tier 4 engines to a NOx+HC emission standard of 1.9 g/kW-hr instead of the NOx and HC standards. See 40 CFR 1042.101(a)(8)(i) for more details. 2) For engines below 1000 kW, manufacturers may delay complying with the Tier 4 standards until October 1, 2017. 3) For engines at or above 3700 kW, manufacturers may delay complying with the Tier 4 standards until December 31, 2016.

ⁿ The Tier 4 standard is for HC (not HC+NOx) in g/kW-hr.

^o These Tier 3 standards apply to Category 2 engines below 3700 kW; no Tier 3 standards apply for Category 2 engines at or above 3700 kW, although there are Tier 4 standards that apply.

Table 13.26 (continued)
Marine Compression-Ignition (CI) Engines – Exhaust Emission Standards

^p An alternative set of Tier 3 and Tier 4 standards for PM, NO_x, and HC are available for Category 2 engines at or above 1400 kW, but must be applied to all of a manufacturer's engines in a given displacement category in model years 2012 through 2015.

| Tier | Maximum engine power | Model year | PM (g/kW-hr) | NO _x (g/kW-hr) | HC (g/kW-hr) |
|------|----------------------|------------|--------------|---------------------------|--------------|
| 3 | kW ≥ 1400 | 2012-2014 | 0.14 | 7.8 NO _x +HC | |
| 4 | 1400 ≤ kW < 3700 | 2015 | 0.04 | 1.8 | 0.19 |
| | kW ≥ 3700 | 2015 | 0.06 | 1.8 | 0.19 |

^q Interim Tier 4 PM standards apply for 2014 and 2015 model year Category 2 engines with per-cylinder displacement at or above 15.0 liters: 0.34 g/kW-hr for engines 2000 = kW < 3000, and 0.27 g/kW-hr for engines 3300 = kW < 3700.

These standards apply to gasoline boats and personal watercraft, such as pleasure boats, jet-skis, outboard engines and sterndrive/inboard engines.

**Table 13.27
Marine Spark-Ignition Engines and Vessels – Exhaust Emission Standards**

| | Engine type | Model year | HC + NOx ^a (g/KW-hr) | | CO ^c (g/KW-hr) | | Useful life (hours/years) ^d |
|--------------------------------|---|---------------------|------------------------------------|--|------------------------------|-------------------------|---|
| | | | P ≤ 4.3 kW ^b | P > 4.3 kW ^b | P ≤ 4.3 kW ^b | P > 4.3 kW ^b | |
| Federal ^e | Personal watercraft & outboard marine engines | 1998 | 278 ABT | $(0.917 \times (151 + 557/P^{0.9}) + 2.44)$ [ABT] | -- | -- | 350 / 5 |
| | | 1999 | 253 ABT | $(0.833 \times (151 + 557/P^{0.9}) + 2.89)$ [ABT] | -- | -- | |
| | | 2000 | 228 ABT | $(0.750 \times (151 + 557/P^{0.9}) + 3.33)$ [ABT] | -- | -- | |
| | | 2001 | 204 ABT | $(0.667 \times (151 + 557/P^{0.9}) + 3.78)$ [ABT] | -- | -- | |
| | | 2002 | 179 ABT | $(0.583 \times (151 + 557/P^{0.9}) + 4.22)$ [ABT] | -- | -- | |
| | | 2003 | 155 ABT | $(0.500 \times (151 + 557/P^{0.9}) + 4.67)$ [ABT] | -- | -- | |
| | | 2004 | 130 ABT | $(0.417 \times (151 + 557/P^{0.9}) + 5.11)$ [ABT] | -- | -- | |
| | | 2005 | 105 ABT | $(0.333 \times (151 + 557/P^{0.9}) + 5.56)$ [ABT] | -- | -- | |
| | | 2006-2009 | 81 ABT | $(0.250 \times (151 + 557/P^{0.9}) + 6.00)$ [ABT] | -- | -- | |
| | | 2010 + ^g | 30 ABT | $2.1 + 0.09 \times (151 + 557/P^{0.9})$ [ABT] | 500 - 5.0 x P | 300 | |
| Sterndrive/ inboard engines | Conventional engines ^g | 2010 + | 5.0 [ABT] | | 75 [ABT] | | 480 / 10 ⁱ |
| | High-performance engines | | P ≤ kW ^b | P > 485 kW ^b | 350 | | P ≤ 485 kW: 150 / 3 |
| | | 2010 | 20.0 | 25.0 | | | P > 485 kW: 50 / 1 |
| | | 2011+ | 16.0 | 22.0 | | | |

Sources:

40 CFR 91.104 = Outboard and personal watercraft (PWC) exhaust emission standards (1998-2009)

40 CFR 91.105 = Outboard and PWC useful life (1998-2009)

40 CFR 1045.103 = Outboard and PWC exhaust emission standards (2010+)

40 CFR 1045.105 = Sterndrive/Inboard exhaust emission standards

40 CFR 1045.107 = Not-to-exceed exhaust emission standards (Additional resources: www.epa.gov/emission-standards-reference-guide/nonroad-engines-and-vehicles-emission-standards)

^a The numerical emission standards for hydrocarbons (HC) must be met based on the following types of HC emissions for engines powered by the following fuels: (1) total hydrocarbon equivalent for alcohol; (2) non-methane hydrocarbon for natural gas; and (3) total hydrocarbons for other fuels.

Table 13.27 (continued)
Marine Spark-Ignition Engines and Vessels – Exhaust Emission Standards

^b P stands for the maximum engine power in kilowatts.

^c Manufacturers may generate or use emission credits for averaging, but not for banking or trading.

^d Useful life and warranty period are expressed hours or years of operation (unless otherwise indicated), whichever comes first.

^e The test procedure for federal standards uses the International Organization for Standardization (ISO) 8178 E4 5-Mode Steady-State Test Cycle.

^f Also applies to model year (MY) 1997 engine families certified pursuant to 40 Code of Federal Regulations (CFR) 91.205.

^g Not-to-exceed emission standards specified in 40 CFR 1045.107 also apply.

^h A longer useful life in terms of hours must be specified for the engine family if the average service life is longer than the minimum value as described in 40 CFR 1045.103(e)(3).

ⁱ The useful life may not be shorter than: (1) 150 hours of operation; (2) the recommended overhaul interval; or (3) the engine's mechanical warranty. A longer useful life must be specified in terms of hours if the average service life is longer than the minimum value as described in 40 CFR 1045.105(e)(3).

These standards apply to land-based recreational vehicles, such as snowmobiles, dirt bikes, all-terrain vehicles and go-karts.

**Table 13.28
Nonroad Recreational Engines and Vehicles – Exhaust Emission Standards**

| | Vehicle | Phase | Year | HC ^a g/kW-hr | HC + NOx g/km | CO | | Minimum useful life (hours/years/km) ^b |
|---------|---|----------------|---------------|----------------------------|------------------------------|---------------------------|-----------------------------|--|
| | | | | | | g/kW-hr | g/km | |
| Federal | Snowmobiles ^c | 1 ^d | 2006+ | 100 [ABT] | - | 275 [ABT] | - | 400 / 5 / 8,000 |
| | | 2 | 2010- 2011 | 75 [ABT] | - | 275 [ABT] | - | |
| | | 3 ^e | 2012+ | 150 ^f [ABT] | - | 400 ^f [ABT] | - | |
| | Off-highway motorcycles ^g | 1 ^d | 2006+ | - | 2.0 ^{h, i} [ABT] | - | 25 ^{h, i} [ABT] | > 70 cc Displacement: - / 5 / 10,000 |
| | | | | | | | | ≤ 70 cc Displacement: - / 5 / 5,000 |
| | ATVs ^g | 1 ^d | 2006+ | - | 1.5 ^{i, k} [ABT] | - | 35 ^k [ABT] | ≥ 100 cc Displacement: 1000 / 5 / 10,000 < 100 cc Displacement: 500 / 5 / 5,000 |

Source:

40 CFR 1051.101-115 = Emission standards (Additional resources: www.epa.gov/emission-standards-reference-guide/nonroad-engines-and-vehicles-emission-standards)

^a The numerical emission standards for hydrocarbons (HC) must be met based on the following types of hydrocarbon emissions for recreational engines and vehicles powered by the following fuels: (1) non-methane hydrocarbons for natural gas; (2) total hydrocarbon equivalent for alcohol; and (3) total hydrocarbons for other fuels.

^b Useful life is expressed in hours, years, or kilometers (km), whichever comes first; warranty period is expressed in hours, months, or kilometers (km), whichever comes first. Nonroad recreational engines and vehicles must meet emission standards over their full useful life. A longer useful life in terms of km and hours must be specified for the engine family if the average service life is longer than the minimum value as described in 40 Code of Federal Regulations (CFR) 1051 Subpart B.

^c Test procedures for snowmobiles use the equipment and procedures for spark-ignition engines in 40 CFR Part 1065.

^d Phase 1 standards will be phased in: 50 percent by 2006, 100 percent by 2007.

^e Litigation on the November 2002 final rule resulted in a court decision that requires EPA to clarify the evidence and analysis upon which the Phase 3 carbon monoxide (CO) and HC standards were based. EPA will address this in a future rulemaking.

^f These are the maximum allowable family emission limits (FEL). The HC and CO standards are defined by a functional relationship as described in 40 CFR 1051.103(a)(2).

^g For off-highway motorcycles and ATVs, chassis dynamometer emissions test procedures are specified in 40 CFR Part 86, Subpart F and engine dynamometer emissions test procedures are specified in 40 CFR Part 1065.

^h Maximum allowable FEL: 20.0 grams per kilometer (g/km) for HC plus nitrogen oxides (NOx) and 50 g/km for CO.

Table 13.28 (continued)
Nonroad Recreational Engines and Vehicles – Exhaust Emission Standards

ⁱ Manufacturers may certify off-highway motorcycles with engines that have total displacement of 70 cubic centimeters (cc) or less to an HC+NO_x standard of 16.1 grams per kilowatt-hour (g/kW-hr) (with an FEL cap of 32.2 g/kW-hr) and a CO standard of 519 g/kW-hr.

^j Maximum allowable FEL for HC+NO_x is 20.0 g/km.

^k Manufacturers may certify all-terrain vehicles with engines that have total displacement of less than 100 cc to an HC+NO_x standard of 25.0 g/kW-hr (with an FEL cap of 40.0 g/kW-hr) and a CO standard of 500 g/kW-hr.

The latest standards were established by the Environmental Protection Agency in conjunction with the Tier 3 emission standards.

Table 13.29
Gasoline Sulfur Standards

| | Regulated entity | Refinery average and per-gallon cap by year (ppm) | | | | | | |
|---------|---|---|----------------------------|-----------|---------|-----------|-----------|---------|
| | | 2004 | 2005 | 2006 | 2007 | 2008-2016 | 2017-2019 | 2020 |
| Federal | Large refiners / importers ^a | 120 ^b / 300 ^c | 30 / 90 ^b / 300 | 30 / 80 | 30 / 80 | 30 / 80 | 10 / 80 | 10 / 80 |
| | GPA refiners ^{d, e} | 150 / 300 ^c | 150 / 300 | 150 / 300 | 30 / 80 | 30 / 80 | 30 / 80 | 10 / 80 |
| | Small refiners ^{f, g, h} | k | k | k | k | 30 / 80 | 30 / 80 | 10 / 80 |
| | Downstream standards ^{i, j} | 378 | 326 | 95 | 95 | 95 | 95 | 95 |

Source:

40 CFR 80 Subpart H (Additional resources: www.epa.gov/emission-standards-reference-guide/fuel-sulfur-standards)

^a Standards effective January 1 at the refinery gate.

^b No Refinery Average Standard applies in 2004; Corporate Average Standard applies in 2004 (120 ppm) and 2005 (90 ppm).

^c Cap exceedances up to 50 ppm in 2004 must be made up in 2005.

^d Geographic Phase-in Area (GPA) refiners must also comply with the corporate average standards in 2004 and 2005 if less than 50% of the refiner's gasoline is designated as GPA gasoline in a given compliance period.

^e GPA refiners may receive an additional two years (i.e., through 2008) to comply with the 30 / 80 ppm gasoline sulfur standards in exchange for producing 95% of their highway diesel fuel at the 15 ppm sulfur standard by June 1, 2006.

^f Small refiners may receive an additional two years (i.e., through 2009) to comply with the 30 / 80 ppm gasoline sulfur standards via a hardship demonstration.

^g Small refiners may receive an additional three years (i.e., through 2010) to comply with the 30 / 80 ppm gasoline sulfur standards in exchange for producing 95% of their highway diesel fuel at the 15 ppm sulfur standard by June 1, 2006.

^h Small refiners may receive a 20% increase in their annual average and per-gallon cap standards in exchange for producing 95% of their highway, nonroad, locomotive, and marine diesel fuel at the 15 ppm sulfur standard by June 1, 2006.

ⁱ Downstream standards are effective February 1 at any downstream location other than at a retail outlet or wholesale purchaser-consumer (e.g., pipelines and terminals) and March 1 at any downstream location.

^j Downstream standards for gasoline that is not blended with small refiner gasoline are shown. Refer to the Code of Federal Regulations (CFR) for the downstream standards that apply when a gasoline blend includes small refiner gasoline.

^k

| 1997-98 Refinery baseline sulfur level (ppm) | Small refiner interim gasoline sulfur standards (ppm) 2004 - 2007 | |
|--|---|---------------------|
| | Average | Cap |
| 0 to 30 | 30 | 300 |
| 31 to 200 | baseline level | 300 |
| 201 to 400 | 200 | 300 |
| 401 to 600 | 50% of baseline | 1.5 x avg. standard |
| 601 and above | 300 | 450 |

Ultra-low sulfur diesel (ULSD) fuel is necessary for new advanced emission control technologies. It also reduces particulate matter in the existing fleet of nonroad engines and equipment.

Table 13.30
Highway, Nonroad, Locomotive, and Marine (NRLM) Diesel Fuel Sulfur Standards

| | Regulated entity | Covered fuel | Per-gallon maximum sulfur level by year (ppm) | | | | | | | | |
|-----------------|-----------------------------|--------------------------------|---|-------------------|------|------|---------------------|------|------|------|------|
| | | | 2006 ^a | 2007 ^b | 2008 | 2009 | 2010 ^{c,d} | 2011 | 2012 | 2013 | 2014 |
| Federal | Large refiners & importers | Highway | 80% 15 | | | | 15 | | | | |
| | | | 20% 500 | | | | | | | | |
| | Small refiners | Highway | 500 | | | | | | | | |
| | Large refiners & importers | NR | - | 500 | 500 | 500 | 15 | 15 | 15 | 15 | 15 |
| | | LM | - | 500 | 500 | 500 | 500 | 500 | 15 | 15 | 15 |
| | | NRLM with credits ^e | - | HS | HS | HS | 500 | 500 | 500 | 500 | 15 |
| | Small refiners | NRLM ^f | - | HS | HS | HS | 500 | 500 | 500 | 500 | 15 |
| | Transmix processor & in-use | NR ^e | - | HS | HS | HS | 500 | 500 | 500 | 500 | 15 |
| LM ^e | | - | HS | HS | HS | 500 | 500 | 500 | 500 | 500 | |

Source:

40 CFR 80 Subpart I (Additional resources: www.epa.gov/emission-standards-reference-guide/fuel-sulfur-standards)

^a For highway diesel fuel, standards are effective June 1 for refiners/importers, September 1 for pipelines and terminals, and October 15 for retailers and wholesale purchaser-consumers. Anti-downgrading provisions effective October 16, 2006.

^b For Nonroad, Locomotive, and Marine (NRLM) diesel fuel, standards are effective June 1 for refiners; downstream requirements apply for Northeast/Mid-Atlantic area only (August 1 for terminals, October 1 for retailers and wholesale purchaser-consumers, and December 1 for in-use).

^c For highway diesel fuel, standards are effective June 1 for refiners/importers, October 1 for pipelines and terminals, and December 1 for retailers and wholesale purchaser-consumers.

^d For NRLM diesel fuel, standards are effective June 1 for refiners, August 1 for terminals, October 1 for retailers and wholesale purchaser-consumers, and December 1 for in-use.

^e Excluding the Northeast and Alaska.

^f Excluding the Northeast, with approval in Alaska.

APPENDIX A

SOURCES & METHODOLOGIES

SOURCES & METHODOLOGIES

This TEDB Appendix Contains documentation of the estimation procedures used by ORNL. The reader can examine the methodology behind the estimates and form an opinion as to their utility. The appendix is arranged by subject heading. Only tables which contain ORNL estimations are documented in Appendix A; all other tables have sources listed at the bottom of the table. Since abbreviations are used throughout the appendix, a list of abbreviations is also included.

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1. LIST OF ABBREVIATIONS USED IN APPENDIX A

| | |
|-----------------|--|
| AAR | Association of American Railroads |
| APTA | American Public Transportation Association |
| Amtrak | National Railroad Passenger Corporation |
| BTS | Bureau of Transportation Statistics |
| Btu | British thermal unit |
| CD | Compact Disc |
| CNG | Compressed Natural Gas |
| CO ₂ | Carbon Dioxide |
| CPI | Consumer Price Index |
| CY | Calendar Year |
| DOE | Department of Energy |
| DOT | Department of Transportation |
| EIA | Energy Information Administration |
| EPA | Environmental Protection Agency |
| FAA | Federal Aviation Administration |
| FHWA | Federal Highway Administration |
| IRS | Internal Revenue Service |
| gal | Gallons |
| kWh | Kilowatt hour |
| L | Liter |
| lb | Pound |
| lng | Liquefied Natural Gas |
| lpg | Liquefied Petroleum Gas |
| mpg | Miles per Gallon |
| NHTS | National Household Travel Survey |
| NPTS | Nationwide Personal Transportation Survey |
| NVPP | National Vehicle Population Profile |
| ORNL | Oak Ridge National Laboratory |
| RTECS | Residential Transportation Energy Consumption Survey |
| SCF | Standard Cubic Feet |
| TEDB | Transportation Energy Data Book |
| TIUS | Truck Inventory and Use Survey |
| VIUS | Vehicle Inventory and Use Survey |
| vmt | vehicle-miles traveled |

2. ENERGY USE SOURCES

2.1 HIGHWAY ENERGY USE

2.1.1 Cars

Fuel use in gallons (1970-2008) – DOT, FHWA, *Highway Statistics 2008*, Table VM-1 and annual editions back to 1996; DOT, FHWA, *Highway Statistics Summary* to 1995.

Fuel use in gallons (2009–2018) – See Section 7. Appendix A Car and Light Truck Shares.

Fuel type distribution for gallons – Fuel use was distributed among fuel types using the percentages shown in Table A.1. The FHWA discontinued gasohol data in 2005. Therefore, data from EIA, *Alternatives to Traditional Transportation Fuels*, 2006-2011, Table C1 were used through 2013. From 2014-on, author estimates were used, with knowledge of how the Renewable Fuels Standard affects the gasoline/gasohol mix.

Electricity use (2010-2018) – Estimates derived using cumulative electric vehicle (EV) and plug-in hybrid vehicle (PHEV) sales as a proxy for vehicle population; sales-weighted vehicle efficiencies from the U.S. Department of Energy and U.S. Environmental Protection Agency’s vehicle database on www.fueleconomy.gov; and annual miles traveled from varying PHEV utility factors and EV usage assumptions. Methodology documented in an Argonne National Laboratory report *Assessment of Light-Duty Plug-in Electric Vehicles in the United States, 2010 – 2019, 2020*, www.osti.gov/biblio/1642114-assessment-light-duty-plug-electric-vehicles-united-states. For tables in the main body of the TEDB, electricity was converted from kWh to Btu using 3,412 Btu/kWh. For tables in TEDB Appendix C, electricity generation and distribution were considered. TEDB Table C.1 contains the conversion factors used for tables in TEDB Appendix C.

Table A.1
Car Fuel Use and Fuel Type Shares for Calculation of Energy Use

| Year | Fuel use (million gallons) | Source for gasohol shares | Source for gasoline/diesel shares | Shares by fuel type ^b | | |
|--|-------------------------------|------------------------------|--------------------------------------|----------------------------------|------------|------------|
| | | | | Gasoline | Gasohol | Diesel |
| 1970 | 67,820 | | 1984 NVPP | 99.8% | 0.0% | 0.2% |
| 1971 | 71,346 | | interpolated | 99.2% | 0.0% | 0.8% |
| 1972 | 75,937 | | interpolated | 98.7% | 0.0% | 1.3% |
| 1973 | 78,233 | | interpolated | 98.1% | 0.0% | 1.9% |
| 1974 | 74,229 | | interpolated | 97.5% | 0.0% | 2.5% |
| 1975 | 74,140 | | interpolated | 97.0% | 0.0% | 3.0% |
| 1976 | 78,297 | | interpolated | 96.4% | 0.0% | 3.6% |
| 1977 | 79,060 | | interpolated | 95.8% | 0.0% | 4.2% |
| 1978 | 80,652 | | interpolated | 95.3% | 0.0% | 4.7% |
| 1979 | 76,588 | | 1979 RTECS | 94.7% | 0.0% | 5.3% |
| 1980 | 69,981 | FHWA, MF-33e | interpolated | 93.9% | 0.5% | 5.6% |
| 1981 | 69,112 | FHWA, MF-33e | 1981 RTECS | 93.4% | 0.7% | 5.9% |
| 1982 | 69,116 | FHWA, MF-33e | interpolated | 93.5% | 2.3% | 4.2% |
| 1983 | 70,322 | FHWA, MF-33e | 1983 RTECS | 93.2% | 4.3% | 2.5% |
| 1984 | 70,663 | FHWA, MF-33e | interpolated | 92.7% | 5.3% | 2.0% |
| 1985 | 71,518 | FHWA, MF-33e | 1985 RTECS | 90.8% | 7.7% | 1.5% |
| 1986 | 73,174 | FHWA, MF-33e | interpolated | 91.0% | 7.6% | 1.4% |
| 1987 | 73,308 | FHWA, MF-33e | interpolated | 92.4% | 6.3% | 1.3% |
| 1988 | 73,345 | FHWA, MF-33e | 1988 RTECS | 91.4% | 7.4% | 1.2% |
| 1989 | 73,913 | FHWA, MF-33e | interpolated | 92.6% | 6.2% | 1.2% |
| 1990 | 69,568 | FHWA, MF-33e | interpolated | 92.0% | 6.8% | 1.2% |
| 1991 | 64,318 | FHWA, MF-33e | 1991 RTECS | 90.8% | 8.0% | 1.2% |
| 1992 | 65,436 | FHWA, MF-33e | interpolated | 90.8% | 7.9% | 1.2% |
| 1993 | 67,047 | FHWA, MF-33e | interpolated | 89.7% | 9.1% | 1.3% |
| 1994 | 67,874 | FHWA, MF-33e | 1994 RTECS | 89.1% | 9.6% | 1.3% |
| 1995 | 68,072 | FHWA, MF-33e | interpolated | 87.6% | 11.2% | 1.2% |
| 1996 | 69,221 | FHWA, MF-33e | interpolated | 88.8% | 10.1% | 1.0% |
| 1997 | 69,892 | FHWA, MF-33e | interpolated | 86.9% | 12.2% | 0.9% |
| 1998 | 71,695 | FHWA, MF-33e | interpolated | 88.0% | 11.2% | 0.8% |
| 1999 | 73,283 | FHWA, MF-33e | interpolated | 88.3% | 11.0% | 0.6% |
| 2000 | 73,065 | FHWA, MF-33e | 2000 NVPP | 86.9% | 12.6% | 0.5% |
| 2001 | 73,559 | FHWA, MF-33e | 2001 NVPP | 86.5% | 13.0% | 0.5% |
| 2002 | 75,471 | FHWA, MF-33e | 2001 NVPP | 83.9% | 15.6% | 0.5% |
| 2003 | 74,590 | FHWA, MF-33e | 2001 NVPP | 75.3% | 24.2% | 0.5% |
| 2004 | 75,402 | FHWA, MF-33e | 2001 NVPP | 67.2% | 32.3% | 0.5% |
| 2005 | 77,418 | FHWA, MF-33e | 2001 NVPP | 66.9% | 32.6% | 0.5% |
| 2006 | 75,009 | EIA, C1 | 2001 NVPP | 78.2% | 21.3% | 0.5% |
| 2007 | 74,377 | EIA, C1 | 2001 NVPP | 72.9% | 26.6% | 0.5% |
| 2008 | 71,497 ^a | EIA, C1 | 2001 NVPP | 61.8% | 37.7% | 0.5% |
| 2009 | 66,587 | EIA, C1 | 2001 NVPP | 55.8% | 43.7% | 0.5% |
| 2010 | 62,245 | EIA, C1 | 2001 NVPP | 49.5% | 50.0% | 0.5% |
| 2011 | 59,646 | EIA, C1 | 2001 NVPP | 48.7% | 50.8% | 0.5% |
| 2012 | 57,899 | EIA, C1 | 2001 NVPP | 48.7% | 50.8% | 0.5% |
| 2013 | 57,290 | EIA, C1 | 2001 NVPP | 49.0% | 50.5% | 0.5% |
| 2014 | 56,420 | Author estimates | 2001 NVPP | 24.5% | 75.0% | 0.5% |
| 2015 | 55,212 | Author estimates | 2001 NVPP | 14.5% | 85.0% | 0.5% |
| 2016 | 54,248 | Author estimates | 2001 NVPP | 4.5% | 95.0% | 0.5% |
| 2017 | 52,268 | Author estimates | 2001 NVPP | 4.5% | 95.0% | 0.5% |
| 2018 | 51,174 | Author estimates | 2001 NVPP | 4.5% | 95.0% | 0.5% |
| Heat content used for conversion to btu: | | | | 125,000 | 120,900 | 138,700 |
| | | | | btu/gallon | btu/gallon | btu/gallon |

^a Data are not continuous between 2008 and 2009 due to changes in source.

^b Percentages may not sum due to rounding.

2.1.2 Motorcycles

DOT, FHWA, *Highway Statistics 2018*, Table VM-1, and annual editions. The FHWA made methodology changes for *Highway Statistics 2009-10*. At that time, they published historical data back to 2007 which do not match the previous data.

Table A.2
Motorcycle Fuel Use

| Year | Fuel use (thousand gallons) | Year | Fuel use (thousand gallons) |
|--|--------------------------------|--------------------|--------------------------------|
| 1970 | 59,580 | 1995 | 198,262 |
| 1971 | 72,140 | 1996 | 195,940 |
| 1972 | 86,620 | 1997 | 201,620 |
| 1973 | 103,880 | 1998 | 205,660 |
| 1974 | 108,900 | 1999 | 211,680 |
| 1975 | 112,580 | 2000 | 209,380 |
| 1976 | 120,060 | 2001 | 192,780 |
| 1977 | 126,980 | 2002 | 191,040 |
| 1978 | 143,160 | 2003 | 190,780 |
| 1979 | 172,740 | 2004 | 202,447 |
| 1980 | 204,280 | 2005 | 189,495 |
| 1981 | 213,800 | 2006 | 221,030 ^a |
| 1982 | 198,200 | 2007 | 474,923 |
| 1983 | 175,200 | 2008 | 489,417 |
| 1984 | 175,680 | 2009 | 482,290 |
| 1985 | 181,720 | 2010 | 426,732 |
| 1986 | 187,940 | 2011 | 426,378 |
| 1987 | 190,120 | 2012 | 491,130 |
| 1988 | 200,480 | 2013 | 467,716 |
| 1989 | 207,420 | 2014 | 458,628 |
| 1990 | 191,140 | 2015 | 447,879 |
| 1991 | 183,560 | 2016 | 465,802 |
| 1992 | 191,140 | 2017 | 458,429 |
| 1993 | 198,120 | 2018 | 456,657 |
| 1994 | 204,800 | | |
| Heat content used for conversion to btu: | | 125,000 btu/gallon | |

^a Data are not continuous between 2006 and 2007 due to changes in estimation methodology. See source document for details.

2.1.3 Buses

Transit

APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020. Includes motorbus and trolley bus data.

Table A.3
Transit Bus Fuel Use

| Year | LNG (million gallons) | LPG (million gallons) | CNG (million gallons) | Gasoline (million gallons) | Diesel fuel (million gallons) | Electricity (thousand kilowatt hours) | Biodiesel (million gallons) | Methanol (million gallons) |
|--|-----------------------------|-----------------------------|-----------------------------|----------------------------------|--|--|-----------------------------------|----------------------------------|
| 1994 | 1.1 | 0.2 | 3.1 | 2.1 | 565.1 | 102.9 | ^a | 12.5 |
| 1995 | 1.7 | 0.3 | 10.0 | 2.3 | 563.8 | 100.0 | ^a | 12.0 |
| 1996 | 2.3 | 0.6 | 11.5 | 1.8 | 577.7 | 69.0 | ^a | 11.6 |
| 1997 | 3.3 | 1.0 | 20.0 | 2.7 | 597.6 | 78.0 | ^a | 8.7 |
| 1998 | 3.1 | 0.9 | 32.6 | 2.0 | 606.6 | 74.0 | ^a | 5.0 |
| 1999 | 5.3 | 0.8 | 39.9 | 1.4 | 618.0 | 75.0 | ^a | 2.7 |
| 2000 | 10.5 | 0.7 | 50.4 | 1.3 | 635.2 | 77.0 | ^a | 0.8 |
| 2001 | 11.7 | 1.2 | 60.9 | 1.5 | 587.2 | 74.0 | ^a | 0.8 |
| 2002 | 16.8 | 1.8 | 77.8 | 1.3 | 559.0 | 73.0 | ^a | 1.8 |
| 2003 | 14.2 | 1.8 | 94.9 | 1.1 | 536.0 | 69.0 | ^a | 1.9 |
| 2004 | 16.5 | 1.7 | 106.7 | 1.8 | 550.5 | 68.0 | ^a | 4.7 |
| 2005 | 18.3 | 2.0 | 117.2 | 1.0 | 533.8 | 67.0 | ^a | 8.1 |
| 2006 | 19.6 | 1.6 | 138.8 | 2.3 | 536.7 | 62.0 | 20.5 | 0.9 |
| 2007 | 18.3 | ^a | 129.1 | 2.5 | 494.1 | 61.0 | 25.8 | 1.3 |
| 2008 | 17.9 | ^a | 135.5 | 3.8 | 493.3 | 62.2 | 41.8 | 0.9 |
| 2009 | 25.5 | ^a | 141.6 | 6.7 | 455.5 | 69.5 | 40.6 | 0.0 |
| 2010 | 23.0 | ^a | 126.2 | 8.1 | 435.4 | 66.0 | 43.5 | 0.0 |
| 2011 | 21.6 | ^a | 131.1 | 8.9 | 455.1 | 61.0 | 51.1 | 0.0 |
| 2012 | 19.6 | ^a | 127.3 | 12.5 | 439.0 | 61.0 | 56.6 | 0.0 |
| 2013 | 17.6 | 6.3 | 134.9 | 12.9 | 427.5 | 63.0 | 66.2 | 0.0 |
| 2014 | 15.4 | 6.2 | 146.0 | 11.7 | 413.6 | 64.0 | 38.1 | 1.2 |
| 2015 | 11.3 | 8.2 | 158.9 | 11.1 | 415.0 | 62.0 | 43.9 | 0.9 |
| 2016 | 10.7 | 6.9 | 170.3 | 11.6 | 428.9 | 64.0 | 43.2 | 0.0 |
| 2017 | 4.9 | 6.7 | 173.8 | 12.9 | 432.0 | 62.0 | 37.2 | 0.6 |
| 2018 | 3.0 | 2.8 | 181.0 | 13.3 | 399.5 | 62.8 | 49.4 | 0.2 |
| Heat content used for conversion to btu: | 84,800 btu/gallon | 91,300 btu/gallon | 138,700 btu/gallon | 125,000 btu/gallon | 138,700 btu/gallon | 3,412 btu/kWh | 126,200 btu/gallon | 64,600 btu/gallon |

Note: CNG is reported in diesel-gallon equivalents.

^a Data are not available.

Intercity and School

Eno Transportation Foundation, *Transportation in America, 2001, Nineteenth Edition, 2003*, Washington, DC, pp. 20–23. School bus fuel was assumed to be 90% diesel fuel and 10% gasoline based on estimates from the National Association of State Directors of Pupil Transportation Services. Intercity bus fuel was assumed to be 100% diesel.

Table A.4
Intercity and School Bus Fuel Use

| Year | Intercity (million gallons) | School (million gallons) |
|--|--------------------------------|--|
| 1970 | 305.34 | 299.88 |
| 1975 | 181.02 | 341.88 |
| 1980 | 213.78 | 379.68 |
| 1981 | 205.38 | 386.82 |
| 1982 | 227.22 | 398.58 |
| 1983 | 237.30 | 400.68 |
| 1984 | 169.26 | 375.06 |
| 1985 | 165.48 | 425.04 |
| 1986 | 148.68 | 462.42 |
| 1987 | 155.82 | 487.20 |
| 1988 | 160.44 | 511.14 |
| 1989 | 166.74 | 498.12 |
| 1990 | 159.60 | 472.08 |
| 1991 | 160.44 | 533.40 |
| 1992 | 157.08 | 546.00 |
| 1993 | 171.36 | 533.40 |
| 1994 | 195.30 | 546.00 |
| 1995 | 195.30 | 545.16 |
| 1996 | 199.92 | 545.16 |
| 1997 | 212.52 | 544.74 |
| 1998 | 220.08 | 550.20 |
| 1999 | 241.08 | 555.66 |
| 2000 | 233.10 | 577.08 |
| 2001 | 217.35 ^a | 538.08 ^a |
| 2002 | 210.22 ^a | 520.44 ^a |
| 2003 | 208.32 ^a | 515.72 ^a |
| 2004 | 208.87 ^a | 517.09 ^a |
| 2005 | 214.37 ^a | 530.70 ^a |
| 2006 | 208.32 ^a | 515.72 ^a |
| 2007 | 214.37 ^a | 530.70 ^a |
| 2008 | 218.48 ^a | 540.89 ^a |
| 2009 | 224.58 ^a | 556.00 ^a |
| 2010 | 214.95 ^a | 532.15 ^a |
| 2011 | 215.53 ^a | 533.58 ^a |
| 2012 | 230.42 ^a | 570.45 ^a |
| 2013 | 236.76 ^a | 586.14 ^a |
| 2014 | 249.75 ^a | 618.29 ^a |
| 2015 | 253.35 ^a | 627.22 ^a |
| 2016 | 255.22 ^a | 631.84 ^a |
| 2017 | 268.92 ^a | 665.76 ^a |
| 2018 | 285.72 ^a | 707.35 ^a |
| Fuel type shares | 100% diesel | 90% diesel 10% gasoline |
| Heat content used for conversion to btu: | 138,700 btu/gallon | 138,700 btu/gallon 125,000 btu/gallon |

^a Estimated using the rate of change of bus vehicle-miles traveled from FHWA *Highway Statistics*, Table VM-1.

2.1.4 Trucks

Light Trucks

Fuel use in gallons (1970-2007) – DOT, FHWA, *Highway Statistics 2008*, Table VM-1 and annual editions back to 1996 and DOT, FHWA, *Highway Statistics Summary to 1995*.

Fuel use in gallons (2008-2018) – See Section 7. Appendix A Car and Light Truck Shares.

Fuel type distribution for gallons – Fuel use was distributed among fuel types using the percentages shown in Table A.1. The FHWA discontinued gasohol data in 2005. Therefore, data from EIA, *Alternatives to Traditional Transportation Fuels*, 2006-2011, Table C1 were used through 2013. From 2014-on, author estimates were used, with knowledge of how the Renewable Fuels Standard affects the gasoline/gasohol mix.

Electricity use (2010-2018) – Estimates derived using cumulative electric vehicle (EV) and plug-in hybrid vehicle (PHEV) sales as a proxy for vehicle population; sales-weighted vehicle efficiencies from the U.S. Department of Energy and U.S. Environmental Protection Agency’s vehicle database on www.fueleconomy.gov; and annual miles traveled from varying PHEV utility factors and EV usage assumptions. Methodology documented in an Argonne National Laboratory report *Assessment of Light-Duty Plug-in Electric Vehicles in the United States, 2010 – 2019*, 2020, www.osti.gov/biblio/1642114-assessment-light-duty-plug-electric-vehicles-united-states. For tables in the main body of the TEDB, electricity was converted from kWh to Btu using 3,412 Btu/kWh. For tables in TEDB Appendix C, electricity generation and distribution were considered. TEDB Table C.1 contains the conversion factors used for tables in TEDB Appendix C.

Table A.5
Light Truck Fuel Use and Fuel Type Shares for Calculation of Energy Use

| Year | Fuel use (million gallons) | Source for gasohol shares | Source for gasoline/diesel /lpg shares | Shares by fuel type | | | |
|--|----------------------------------|------------------------------|--|---------------------|------------|------------|------------|
| | | | | Gasoline | Gasohol | Diesel | Lpg |
| 1970 | 12,313 | | 1977 TIUS | 97.6% | 0.0% | 1.6% | 0.8% |
| 1975 | 19,081 | | 1977 TIUS | 97.6% | 0.0% | 1.6% | 0.8% |
| 1976 | 20,828 | | 1977 TIUS | 97.6% | 0.0% | 1.6% | 0.8% |
| 1977 | 22,383 | | 1977 TIUS | 97.6% | 0.0% | 1.6% | 0.8% |
| 1978 | 24,162 | | Interpolated | 97.1% | 0.0% | 2.0% | 0.9% |
| 1979 | 24,445 | | Interpolated | 96.7% | 0.0% | 2.4% | 1.0% |
| 1980 | 23,796 | FHWA, MF-33e | Interpolated | 95.7% | 0.5% | 2.7% | 1.0% |
| 1981 | 23,697 | FHWA, MF-33e | Interpolated | 95.1% | 0.7% | 3.1% | 1.1% |
| 1982 | 22,702 | FHWA, MF-33e | 1982 TIUS | 93.0% | 2.3% | 3.5% | 1.2% |
| 1983 | 23,945 | FHWA, MF-33e | Interpolated | 91.0% | 4.3% | 3.5% | 1.2% |
| 1984 | 25,604 | FHWA, MF-33e | Interpolated | 90.0% | 5.3% | 3.5% | 1.2% |
| 1985 | 27,363 | FHWA, MF-33e | Interpolated | 87.6% | 7.7% | 3.5% | 1.2% |
| 1986 | 29,074 | FHWA, MF-33e | Interpolated | 87.7% | 7.6% | 3.5% | 1.2% |
| 1987 | 30,598 | FHWA, MF-33e | 1987 TIUS | 89.0% | 6.3% | 3.5% | 1.2% |
| 1988 | 32,653 | FHWA, MF-33e | Interpolated | 88.2% | 7.4% | 3.5% | 1.0% |
| 1989 | 33,271 | FHWA, MF-33e | Interpolated | 89.5% | 6.2% | 3.4% | 0.8% |
| 1990 | 35,611 | FHWA, MF-33e | Interpolated | 89.2% | 6.8% | 3.4% | 0.7% |
| 1991 | 38,217 | FHWA, MF-33e | Interpolated | 88.1% | 8.0% | 3.3% | 0.5% |
| 1992 | 40,929 | FHWA, MF-33e | 1992 TIUS | 88.5% | 7.9% | 3.3% | 0.3% |
| 1993 | 42,851 | FHWA, MF-33e | Interpolated | 87.3% | 9.1% | 3.3% | 0.3% |
| 1994 | 44,112 | FHWA, MF-33e | Interpolated | 86.8% | 9.6% | 3.3% | 0.3% |
| 1995 | 45,605 | FHWA, MF-33e | Interpolated | 85.1% | 11.2% | 3.4% | 0.3% |
| 1996 | 47,354 | FHWA, MF-33e | Interpolated | 86.2% | 10.1% | 3.4% | 0.3% |
| 1997 | 49,388 | FHWA, MF-33e | 1997 VIUS | 84.2% | 12.2% | 3.4% | 0.2% |
| 1998 | 50,462 | FHWA, MF-33e | Interpolated | 85.0% | 11.2% | 3.5% | 0.3% |
| 1999 | 52,859 | FHWA, MF-33e | Interpolated | 84.9% | 11.0% | 3.6% | 0.4% |
| 2000 | 52,939 | FHWA, MF-33e | Interpolated | 83.1% | 12.6% | 3.8% | 0.6% |
| 2001 | 53,522 | FHWA, MF-33e | Interpolated | 82.4% | 13.0% | 3.9% | 0.7% |
| 2002 | 55,220 | FHWA, MF-33e | 2002 VIUS | 79.6% | 15.6% | 4.0% | 0.8% |
| 2003 | 60,758 | FHWA, MF-33e | 2002 VIUS | 71.0% | 24.2% | 4.0% | 0.8% |
| 2004 | 63,417 | FHWA, MF-33e | 2002 VIUS | 62.9% | 32.3% | 4.0% | 0.8% |
| 2005 | 58,869 | FHWA, MF-33e | 2002 VIUS | 62.6% | 32.6% | 4.0% | 0.8% |
| 2006 | 60,685 | EIA, C1 | 2002 VIUS | 73.9% | 21.3% | 4.0% | 0.8% |
| 2007 | 61,836 | EIA, C1 | 2002 VIUS | 68.6% | 26.6% | 4.0% | 0.8% |
| 2008 | 61,199 ^a | EIA, C1 | 2002 VIUS | 57.5% | 37.7% | 4.0% | 0.8% |
| 2009 | 61,824 | EIA, C1 | 2002 VIUS | 51.5% | 43.7% | 4.0% | 0.8% |
| 2010 | 64,687 | EIA, C1 | 2002 VIUS | 45.2% | 50.0% | 4.0% | 0.8% |
| 2011 | 65,786 | EIA, C1 | 2002 VIUS | 44.4% | 50.8% | 4.0% | 0.8% |
| 2012 | 66,395 | EIA, C1 | 2002 VIUS | 44.4% | 50.8% | 4.0% | 0.8% |
| 2013 | 65,555 | EIA, C1 | 2002 VIUS | 44.7% | 50.5% | 4.0% | 0.8% |
| 2014 | 69,012 | Author estimates | 2002 VIUS | 25.2% | 70.0% | 4.0% | 0.8% |
| 2015 | 70,933 | Author estimates | 2002 VIUS | 15.2% | 80.0% | 4.0% | 0.8% |
| 2016 | 73,107 | Author estimates | 2002 VIUS | 5.2% | 90.0% | 4.0% | 0.8% |
| 2017 | 73,835 | Author estimates | 2002 VIUS | 0.2% | 95.0% | 4.0% | 0.8% |
| 2018 | 73,802 | Author estimates | 2002 VIUS | 0.2% | 95.0% | 4.0% | 0.8% |
| Heat content used for conversion to btu: | | | | 125,000 | 120,900 | 138,700 | 90,800 |
| | | | | btu/gallon | btu/gallon | btu/gallon | btu/gallon |

^a Data are not continuous between 2008 and 2009 due to changes in source.

Medium/Heavy Trucks

DOT, FHWA, *Highway Statistics 2018*, Table VM-1 and annual editions back to 1996 and DOT, FHWA, *Highway Statistics Summary to 1995*. The FHWA made methodology changes for *Highway Statistics 2009*. At that time, they published historical data back to 2007 which do not match the previous data. Total gallons for medium/heavy trucks are the sum of single-unit trucks and combination trucks.

Table A.6
Medium/Heavy Truck Fuel Use and Fuel Type Shares for Calculation of Energy Use

| Year | Fuel use (million gallons) | Source for fuel type shares | Shares by fuel type | | |
|--|-------------------------------|--------------------------------|---------------------|------------|------------|
| | | | Gasoline | Diesel | Lpg |
| 1970 | 11,316 | 1977 TIUS | 10.4% | 89.5% | 0.1% |
| 1975 | 14,598 | 1977 TIUS | 10.4% | 89.5% | 0.1% |
| 1980 | 19,960 | Interpolated | 27.9% | 71.4% | 0.6% |
| 1981 | 20,376 | Interpolated | 33.8% | 65.4% | 0.8% |
| 1982 | 20,386 | 1982 TIUS | 39.6% | 59.4% | 1.0% |
| 1983 | 20,761 | Interpolated | 35.6% | 63.6% | 0.8% |
| 1984 | 21,428 | Interpolated | 31.5% | 67.8% | 0.7% |
| 1985 | 21,405 | Interpolated | 27.5% | 72.0% | 0.5% |
| 1986 | 21,861 | Interpolated | 23.4% | 76.2% | 0.4% |
| 1987 | 22,513 | 1987 TIUS | 19.4% | 80.4% | 0.2% |
| 1988 | 22,925 | Interpolated | 18.8% | 81.0% | 0.3% |
| 1989 | 23,512 | Interpolated | 18.1% | 81.6% | 0.3% |
| 1990 | 24,490 | Interpolated | 17.5% | 82.1% | 0.4% |
| 1991 | 24,981 | Interpolated | 16.8% | 82.7% | 0.4% |
| 1992 | 25,453 | 1992 TIUS | 16.2% | 83.3% | 0.5% |
| 1993 | 26,236 | Interpolated | 15.4% | 84.1% | 0.5% |
| 1994 | 27,685 | Interpolated | 14.7% | 84.8% | 0.5% |
| 1995 | 28,828 | Interpolated | 13.9% | 85.6% | 0.5% |
| 1996 | 29,601 | Interpolated | 13.2% | 86.3% | 0.5% |
| 1997 | 29,878 | 1997 VIUS | 12.4% | 87.1% | 0.5% |
| 1998 | 30,841 | Interpolated | 12.1% | 87.4% | 0.5% |
| 1999 | 33,909 | Interpolated | 11.8% | 87.6% | 0.5% |
| 2000 | 35,229 | Interpolated | 11.6% | 87.9% | 0.5% |
| 2001 | 35,179 | Interpolated | 11.3% | 88.1% | 0.5% |
| 2002 | 36,800 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2003 | 35,775 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2004 | 33,150 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2005 | 37,190 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2006 | 37,959 ^a | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2007 | 47,218 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2008 | 47,705 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2009 | 44,303 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2010 | 45,024 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2011 | 42,396 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2012 | 42,351 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2013 | 43,297 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2014 | 44,012 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2015 | 43,734 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2016 | 44,893 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2017 | 45,963 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| 2018 | 46,405 | 2002 VIUS | 11.0% | 88.4% | 0.5% |
| Heat content used for conversion to btu: | | | 125,000 | 138,700 | 90,800 |
| | | | btu/gallon | btu/gallon | btu/gallon |

^a Data are not continuous between 2006 and 2007 due to changes in methodology. See source for details.

Shares of Class 3-6 and 7-8 energy use by fuel type were calculated from the 2002 Vehicle Inventory and Use Survey (VIUS) and applied to all years 1970-2018.

Table A.7
Share of Medium and Heavy Truck Energy Use

| Fuel type | Share of energy use | | Total |
|-----------|---------------------|-----------|-------|
| | Class 3-6 | Class 7-8 | |
| Gasoline | 92% | 8% | 100% |
| Diesel | 14% | 86% | 100% |
| LPG | 99% | 1% | 100% |

2.2 OFF-HIGHWAY ENERGY USE

U.S. Environmental Protection Agency, MOVES2014b model, results generated September 2020. Data by fuel type were produced for agricultural equipment, airport equipment, construction and mining equipment, industrial equipment, lawn and garden equipment, logging equipment, railroad maintenance equipment, and recreational equipment. Some non-transportation-related equipment, such as generators, chain saws, compressors, and pumps, were excluded from the data. Model output was converted from grams to gallons using EPA's methodology documented in the technical report *Greenhouse Gas and Energy Consumption Rates for On-road Vehicles: Updates for MOVES2014*, www.epa.gov/moves/can-moves-report-output-terms-fuel-consumption.

2.3 NONHIGHWAY ENERGY USE

2.3.1 Air

General Aviation

DOT, FAA, *General Aviation and Part 135 Activity Surveys - CY 2018*, Table 5.1, and annual. 2011 Data: *Aviation Forecasts*, Tables 28 and 29, May 2013.

Table A.8
General Aviation Fuel Use

| Year | Jet fuel (million gallons) | Aviation gasoline (million gallons) | Year | Jet fuel (million gallons) | Aviation gasoline (million gallons) |
|---|----------------------------------|--|------|-------------------------------|--|
| 1970 | 208.0 | 551.0 | 1995 | 544.0 | 276.0 |
| 1971 | 226.0 | 508.0 | 1996 | 567.5 | 286.5 |
| 1972 | 245.0 | 584.0 | 1997 | 639.4 | 289.7 |
| 1973 | 304.0 | 411.0 | 1998 | 814.6 | 311.4 |
| 1974 | 357.0 | 443.0 | 1999 | 967.2 | 345.4 |
| 1975 | 453.0 | 412.0 | 2000 | 998.1 | 336.3 |
| 1976 | 495.0 | 432.0 | 2001 | 938.7 | 319.3 |
| 1977 | 536.0 | 456.0 | 2002 | 815.5 | 261.4 |
| 1978 | 763.0 | 518.0 | 2003 | 820.0 | 255.5 |
| 1979 | 736.0 | 570.0 | 2004 | 1,075.2 | 256.1 |
| 1980 | 766.0 | 520.0 | 2005 | 1,507.4 | 323.6 |
| 1981 | 759.0 | 489.0 | 2006 | 1,636.3 | 294.7 |
| 1982 | 887.0 | 448.0 | 2007 | 1,516.3 | 314.8 |
| 1983 | 613.0 | 428.0 | 2008 | 1,688.6 | 306.3 |
| 1984 | 738.9 | 462.4 | 2009 | 1,350.6 | 226.6 |
| 1985 | 691.0 | 421.0 | 2010 | 1,451.5 | 210.3 |
| 1986 | 732.1 | 408.6 | 2011 | 1,490.7 | 215.5 |
| 1987 | 672.7 | 401.8 | 2012 | 1,492.1 | 227.7 |
| 1988 | 746.0 | 398.0 | 2013 | 1,353.6 | 173.3 |
| 1989 | 688.0 | 342.8 | 2014 | 1,454.1 | 205.8 |
| 1990 | 662.0 | 353.0 | 2015 | 1,384.4 | 183.2 |
| 1991 | 579.0 | 348.0 | 2016 | 1,445.7 | 187.8 |
| 1992 | 496.0 | 306.0 | 2017 | 1,548.7 | 192.4 |
| 1993 | 454.1 | 268.4 | 2018 | 1,822.7 | 222.3 |
| 1994 | 470.8 | 264.1 | | | |
| Heat content used for conversion to btu: | 135,000 btu/gallon | 120,200 btu/gallon | | 135,000 btu/gallon | 120,200 btu/gallon |

Domestic and International Air Carrier

DOT, Bureau of Transportation Statistics, "Fuel Cost and Consumption Tables," www.transtats.bts.gov/fuel. The table below shows all international fuel use. Because the data for international include fuel purchased abroad, for the tables in TEDB Chapter 2, the international total was divided in half to estimate domestic fuel use for international flights.

Table A.9
Air Carrier Fuel Use

| Year | Domestic (thousand gallons) | International (thousand gallons) | Total (thousand gallons) |
|--|---|----------------------------------|--------------------------|
| 1970 | Separate estimates for domestic and international are not available from 1970-1976. | | 10,085,000 |
| 1975 | | | 10,412,640 |
| 1976 | | | 10,400,040 |
| 1977 | 8,202,051 | 1,708,376 | 9,910,427 |
| 1978 | 8,446,117 | 1,741,918 | 10,188,035 |
| 1979 | 8,865,885 | 1,828,435 | 10,694,320 |
| 1980 | 8,519,233 | 1,747,306 | 10,266,539 |
| 1981 | 8,555,249 | 2,032,520 | 10,587,769 |
| 1982 | 8,432,465 | 1,967,733 | 10,400,198 |
| 1983 | 8,672,574 | 1,998,289 | 10,670,863 |
| 1984 | 9,625,958 | 2,286,407 | 11,912,365 |
| 1985 | 10,115,007 | 2,487,929 | 12,602,936 |
| 1986 | 11,137,331 | 2,544,996 | 13,682,327 |
| 1987 | 11,586,838 | 2,893,617 | 14,480,455 |
| 1988 | 11,917,904 | 3,262,824 | 15,180,728 |
| 1989 | 11,905,144 | 3,557,294 | 15,462,438 |
| 1990 | 12,429,305 | 3,963,081 | 16,392,386 |
| 1991 | 11,506,477 | 3,939,666 | 15,446,144 |
| 1992 | 11,762,852 | 4,120,132 | 15,882,983 |
| 1993 | 11,958,663 | 4,113,321 | 16,071,984 |
| 1994 | 12,475,549 | 4,310,879 | 16,786,428 |
| 1995 | 12,811,717 | 4,511,418 | 17,323,135 |
| 1996 | 13,187,305 | 4,658,093 | 17,845,398 |
| 1997 | 13,659,581 | 4,964,181 | 18,623,762 |
| 1998 | 13,876,971 | 5,185,562 | 19,062,533 |
| 1999 | 14,402,127 | 5,250,492 | 19,652,619 |
| 2000 | 14,844,592 | 5,474,685 | 20,319,277 |
| 2001 | 14,017,461 | 5,237,487 | 19,254,948 |
| 2002 | 12,848,329 | 4,990,798 | 17,839,127 |
| 2003 | 12,958,581 | 4,836,356 | 17,794,936 |
| 2004 | 13,622,603 | 4,931,546 | 18,554,149 |
| 2005 | 13,778,869 | 5,520,889 | 19,309,758 |
| 2006 | 13,694,437 | 6,017,638 | 19,712,075 |
| 2007 | 13,681,664 | 6,204,502 | 19,886,165 |
| 2008 | 12,666,911 | 6,186,747 | 18,853,658 |
| 2009 | 11,339,220 | 5,721,298 | 17,060,517 |
| 2010 | 11,256,900 | 6,041,500 | 17,288,400 |
| 2011 | 11,035,400 | 6,522,600 | 17,558,000 |
| 2012 | 10,439,700 | 6,506,300 | 16,946,000 |
| 2013 | 10,337,000 | 6,487,300 | 16,824,300 |
| 2014 | 10,458,600 | 6,321,400 | 16,780,000 |
| 2015 | 10,928,600 | 6,420,600 | 17,349,200 |
| 2016 | 11,373,600 | 6,294,800 | 17,668,400 |
| 2017 | 11,587,600 | 6,441,300 | 18,028,900 |
| 2018 | 12,148,200 | 6,599,100 | 18,747,300 |
| Heat content used for conversion to btu: | 135,000 btu/gallon | 135,000 btu/gallon | 135,000 btu/gallon |

2.3.2 Water

Freight

Total – DOE, EIA, *Petroleum and Other Liquids Database*, September 2020. Adjusted sales of distillate and residual fuel oil for vessel bunkering. (This may include some amounts of bunker fuels used for recreational purposes.)

Table A.10
Diesel and Residual Fuel Oil for Vessel Bunkering

| Year | Distillate fuel oil (thousand gallons) | Residual fuel oil (thousand gallons) |
|---|---|---|
| 1970 | 819,000 | 3,774,120 |
| 1975 | 1,097,880 | 4,060,140 |
| 1980 | 717,376 | 7,454,242 |
| 1981 | 1,723,143 | 7,922,512 |
| 1982 | 1,423,216 | 6,408,818 |
| 1983 | 1,418,890 | 5,724,115 |
| 1984 | 1,692,045 | 5,688,931 |
| 1985 | 1,894,265 | 5,269,733 |
| 1986 | 2,034,215 | 5,690,250 |
| 1987 | 2,223,258 | 5,869,154 |
| 1988 | 2,310,367 | 6,025,511 |
| 1989 | 2,356,444 | 6,621,100 |
| 1990 | 2,197,004 | 6,248,095 |
| 1991 | 2,167,640 | 6,786,055 |
| 1992 | 2,240,170 | 7,199,078 |
| 1993 | 2,043,745 | 6,269,882 |
| 1994 | 2,026,899 | 5,944,383 |
| 1995 | 1,978,105 | 6,431,238 |
| 1996 | 2,177,608 | 5,804,977 |
| 1997 | 2,107,561 | 4,789,861 |
| 1998 | 2,125,568 | 4,640,153 |
| 1999 | 2,064,590 | 5,598,630 |
| 2000 | 2,041,433 | 6,192,294 |
| 2001 | 2,099,011 | 4,345,284 |
| 2002 | 2,056,465 | 4,783,956 |
| 2003 | 1,863,150 | 3,801,425 |
| 2004 | 2,313,448 | 4,886,978 |
| 2005 | 2,115,381 | 5,533,552 |
| 2006 | 2,206,690 | 6,000,434 |
| 2007 | 2,158,930 | 6,773,950 |
| 2008 | 1,980,729 | 6,274,047 |
| 2009 | 2,138,690 | 5,331,657 |
| 2010 | 2,427,051 | 6,032,367 |
| 2011 | 2,651,859 | 5,207,886 |
| 2012 | 1,842,107 | 4,560,546 |
| 2013 | 1,655,258 | 3,876,795 |
| 2014 | 1,626,527 | 2,987,363 |
| 2015 | 2,415,253 | 3,103,402 |
| 2016 | 2,020,587 | 4,192,719 |
| 2017 | 1,807,230 | 4,472,233 |
| 2018 | 2,101,132 | 4,117,841 |
| Heat content used for conversion to btu: | 138,700 btu/gallon | 149,700 btu/gallon |
| Domestic share of total fuel use | 77.5% | 9.3% |

Recreational Boating

Fuel use by recreational boating for years 1970-1998 comes from the EPA's MOVES2014a model. Data from 1999-on come from the updated MOVES2014b model. Model output was converted from grams to gallons using EPA's methodology documented in the technical report *Greenhouse Gas and Energy Consumption Rates for On-road Vehicles: Updates for MOVES2014*, www.epa.gov/moves/can-moves-report-output-terms-fuel-consumption.

Table A.11
Recreational Boating Fuel Use

| Year | Diesel use (gallons) | Gasoline use (gallons) |
|---|-------------------------|---------------------------|
| 1970 | 39,589,953 | 1,213,397,311 |
| 1975 | 77,294,680 | 1,251,387,972 |
| 1976 | 84,835,632 | 1,258,986,070 |
| 1977 | 92,376,573 | 1,266,584,111 |
| 1978 | 99,917,523 | 1,274,182,341 |
| 1979 | 107,458,470 | 1,281,780,460 |
| 1980 | 114,999,421 | 1,289,378,532 |
| 1981 | 122,540,357 | 1,296,976,672 |
| 1982 | 130,081,302 | 1,304,574,832 |
| 1983 | 137,622,248 | 1,312,172,890 |
| 1984 | 145,163,202 | 1,319,771,007 |
| 1985 | 152,704,140 | 1,327,369,146 |
| 1986 | 160,245,074 | 1,334,967,322 |
| 1987 | 167,786,030 | 1,342,565,455 |
| 1988 | 175,326,970 | 1,362,856,034 |
| 1989 | 182,867,916 | 1,383,146,636 |
| 1990 | 190,408,869 | 1,403,437,194 |
| 1991 | 197,949,808 | 1,429,688,292 |
| 1992 | 205,490,749 | 1,455,939,504 |
| 1993 | 213,031,707 | 1,482,190,597 |
| 1994 | 220,572,649 | 1,539,794,180 |
| 1995 | 228,113,596 | 1,597,269,921 |
| 1996 | 235,654,521 | 1,654,446,069 |
| 1997 | 243,195,481 | 1,657,737,628 |
| 1998 | 250,736,414 | 1,659,056,085 |
| 1999 | 273,614,890 | 1,660,897,656 |
| 2000 | 273,885,726 | 1,658,797,382 |
| 2001 | 274,699,518 | 1,656,581,817 |
| 2002 | 275,242,097 | 1,648,949,353 |
| 2003 | 276,055,034 | 1,639,089,564 |
| 2004 | 275,783,985 | 1,621,105,112 |
| 2005 | 279,309,693 | 1,621,729,779 |
| 2006 | 277,411,274 | 1,593,043,638 |
| 2007 | 279,037,889 | 1,580,468,954 |
| 2008 | 274,156,923 | 1,535,255,008 |
| 2009 | 274,970,396 | 1,519,694,458 |
| 2010 | 268,462,593 | 1,466,964,903 |
| 2011 | 263,581,279 | 1,421,359,003 |
| 2012 | 261,140,658 | 1,391,588,940 |
| 2013 | 259,784,908 | 1,367,836,644 |
| 2014 | 257,886,775 | 1,341,947,672 |
| 2015 | 270,902,771 | 1,344,235,659 |
| 2016 | 281,478,856 | 1,354,416,848 |
| 2017 | 287,444,461 | 1,363,320,915 |
| 2018 | 293,681,413 | 1,371,130,522 |
| Heat content used for conversion to btu: | 138,700 btu/gallon | 125,000 btu/gallon |

2.3.3 Pipeline

The sum of natural gas, crude petroleum and petroleum product, and coal slurry and water.

Natural Gas

The amount of natural gas used to transport natural gas was defined as "pipeline fuel" as reported in DOE, EIA, *Natural Gas Annual 2019*, Table 1. Cubic feet were converted to Btu using 1,031 Btu/ft³. Electricity use was estimated using the following procedure as reported on p. 5-110 of J. N. Hooker et al., *End Use Energy Consumption DataBase: Transportation Sector*. The energy consumption of a natural gas pipeline was taken to be the energy content of the fuel used to drive the pumps. Some 94% of the installed pumping horsepower was supplied by natural gas. The remaining 6% of the horsepower was generated more efficiently, mostly by electric motors. The energy consumed by natural gas pipeline pumps that were electrically powered was not known. In order to estimate the electricity consumed, the Btu of natural gas pipeline fuel consumed was multiplied by a factor of 0.015.

Crude Petroleum and Petroleum Product

J. N. Hooker, *Oil Pipeline Energy Consumption and Efficiency*, ORNL-5697, ORNL, Oak Ridge, TN, 1981. (Data held constant; Latest available data.)

Coal Slurry and Water

W. F. Banks, Systems, Science and Software, *Energy Consumption in the Pipeline Industry*, LaJolla, CA, October 1977. (Data held constant; Latest available data.)

Table A.12
Pipeline Fuel Use

| Year | Natural gas (million cubic feet) | Estimated natural gas pipeline electricity use (million kWh) | Electricity constant (trillion btu) |
|---|--|--|---|
| 1970 | 722,166 | 3,272.9 | 70.0 |
| 1975 | 582,963 | 2,642.0 | 70.0 |
| 1976 | 548,323 | 2,485.0 | 70.0 |
| 1977 | 532,669 | 2,414.1 | 70.0 |
| 1978 | 530,451 | 2,404.0 | 70.0 |
| 1979 | 600,964 | 2,723.6 | 70.0 |
| 1980 | 634,622 | 2,876.1 | 70.0 |
| 1981 | 642,325 | 2,911.0 | 70.0 |
| 1982 | 596,411 | 2,703.0 | 70.0 |
| 1983 | 490,042 | 2,220.9 | 70.0 |
| 1984 | 528,754 | 2,396.3 | 70.0 |
| 1985 | 503,766 | 2,283.1 | 70.0 |
| 1986 | 485,041 | 2,198.2 | 70.0 |
| 1987 | 519,170 | 2,352.9 | 70.0 |
| 1988 | 613,912 | 2,782.3 | 70.0 |
| 1989 | 629,308 | 2,852.0 | 70.0 |
| 1990 | 659,816 | 2,990.3 | 70.0 |
| 1991 | 601,305 | 2,725.1 | 70.0 |
| 1992 | 587,710 | 2,663.5 | 70.0 |
| 1993 | 624,308 | 2,829.4 | 70.0 |
| 1994 | 685,362 | 3,106.1 | 70.0 |
| 1995 | 700,335 | 3,173.9 | 70.0 |
| 1996 | 711,446 | 3,224.3 | 70.0 |
| 1997 | 751,470 | 3,405.7 | 70.0 |
| 1998 | 635,477 | 2,880.0 | 70.0 |
| 1999 | 645,319 | 2,924.6 | 70.0 |
| 2000 | 642,210 | 2,910.5 | 70.0 |
| 2001 | 624,964 | 2,832.3 | 70.0 |
| 2002 | 666,920 | 3,022.5 | 70.0 |
| 2003 | 591,492 | 2,680.7 | 70.0 |
| 2004 | 566,187 | 2,566.0 | 70.0 |
| 2005 | 584,026 | 2,646.8 | 70.0 |
| 2006 | 584,213 | 2,647.7 | 70.0 |
| 2007 | 621,364 | 2,816.0 | 70.0 |
| 2008 | 647,956 | 2,936.6 | 70.0 |
| 2009 | 670,174 | 3,037.2 | 70.0 |
| 2010 | 674,124 | 3,055.1 | 70.0 |
| 2011 | 687,784 | 3,117.0 | 70.0 |
| 2012 | 730,790 | 3,312.0 | 70.0 |
| 2013 | 833,061 | 3,775.4 | 70.0 |
| 2014 | 700,150 | 3,173.1 | 70.0 |
| 2015 | 678,183 | 3,073.5 | 70.0 |
| 2016 | 686,732 | 3,112.3 | 70.0 |
| 2017 | 721,518 | 3,269.9 | 70.0 |
| 2018 | 862,891 | 3,910.6 | 70.0 |
| Heat content used for conversion to btu: | 1,031 btu/cubic foot | 3,412 Btu/kWh ^a | |

^a For tables in the main body of the TEDB, electricity was converted from kWh to Btu using 3,412 Btu/kWh. For tables in TEDB Appendix C, electricity generation and distribution were considered. TEDB Table C.1 contains the conversion factors used for tables in TEDB Appendix C.

Note: Formula for estimating electricity use for natural gas pipelines is:
Natural gas use (in million cubic ft) × 1,031 btu/cubic ft × 0.015 × 29.305 × 10⁻⁵ kWh/btu.

2.3.4 Rail

Freight

AAR, *Railroad Facts*, 2019 Edition, Washington, DC, 2019.

Table A.13
Class I Freight Railroad Fuel Use

| Year | Diesel fuel (thousand gallons) |
|---|-----------------------------------|
| 1970 | 3,807,663 |
| 1971 | 3,822,907 |
| 1972 | 3,996,985 |
| 1973 | 4,160,730 |
| 1974 | 4,175,375 |
| 1975 | 3,736,484 |
| 1976 | 3,895,542 |
| 1977 | 3,985,069 |
| 1978 | 3,968,007 |
| 1979 | 4,072,187 |
| 1980 | 3,955,996 |
| 1981 | 3,756,439 |
| 1982 | 3,178,116 |
| 1983 | 3,137,295 |
| 1984 | 3,388,173 |
| 1985 | 3,144,190 |
| 1986 | 3,039,069 |
| 1987 | 3,102,227 |
| 1988 | 3,182,267 |
| 1989 | 3,190,815 |
| 1990 | 3,134,446 |
| 1991 | 2,925,970 |
| 1992 | 3,022,108 |
| 1993 | 3,111,981 |
| 1994 | 3,355,802 |
| 1995 | 3,503,096 |
| 1996 | 3,600,649 |
| 1997 | 3,602,793 |
| 1998 | 3,619,341 |
| 1999 | 3,749,428 |
| 2000 | 3,720,107 |
| 2001 | 3,729,985 |
| 2002 | 3,751,413 |
| 2003 | 3,849,229 |
| 2004 | 4,082,236 |
| 2005 | 4,119,879 |
| 2006 | 4,214,459 |
| 2007 | 4,087,405 |
| 2008 | 3,911,178 |
| 2009 | 3,220,059 |
| 2010 | 3,519,021 |
| 2011 | 3,710,485 |
| 2012 | 3,634,025 |
| 2013 | 3,712,582 |
| 2014 | 3,897,113 |
| 2015 | 3,723,491 |
| 2016 | 3,418,577 |
| 2017 | 3,536,618 |
| 2018 | 3,697,139 |
| Heat content used for conversion to btu: | 138,700 Btu/gallon |

Passenger

Commuter - APTA, 2020 Public Transportation Fact Book, Washington, DC, 2020.

Table A.14
Commuter Rail Fuel Use

| Year | Diesel (thousand gallons) | Electricity (million kWh) |
|---|------------------------------|-------------------------------|
| 1984 | 58,320 | 901 |
| 1985 | 55,372 | 1,043 |
| 1986 | 54,608 | 1,170 |
| 1987 | 51,594 | 1,155 |
| 1988 | 53,054 | 1,195 |
| 1989 | 52,516 | 1,293 |
| 1990 | 52,681 | 1,226 |
| 1991 | 54,315 | 1,239 |
| 1992 | 54,951 | 1,124 |
| 1993 | 59,766 | 1,196 |
| 1994 | 61,900 | 1,244 |
| 1995 | 63,064 | 1,253 |
| 1996 | 61,888 | 1,255 |
| 1997 | 63,195 | 1,270 |
| 1998 | 69,200 | 1,299 |
| 1999 | 73,005 | 1,322 |
| 2000 | 70,818 | 1,370 |
| 2001 | 72,204 | 1,354 |
| 2002 | 72,847 | 1,334 |
| 2003 | 72,264 | 1,383 |
| 2004 | 71,999 | 1,449 |
| 2005 | 76,714 | 1,484 |
| 2006 | 78,600 | 1,478 |
| 2007 | 80,700 | 1,763 |
| 2008 | 83,500 | 1,718 |
| 2009 | 95,000 | 1,780 |
| 2010 | 93,200 | 1,797 |
| 2011 | 93,900 | 1,813 |
| 2012 | 92,800 | 1,808 |
| 2013 | 98,700 | 1,816 |
| 2014 | 93,900 | 1,809 |
| 2015 | 97,400 | 1,792 |
| 2016 | 102,878 | 1,764 |
| 2017 | 104,245 | 1,776 |
| 2018 | 102,650 | 1,764 |
| Heat content used for conversion to btu: | 138,700 Btu/gallon | 3,412 Btu/kWh ^a |

^a For tables in the main body of the TEDB, electricity was converted from kWh to Btu using 3,412 Btu/kWh. For tables in TEDB Appendix C, electricity generation and distribution were considered. TEDB Table C.1 contains the conversion factors used for tables in TEDB Appendix C.

Transit – APTA, 2020 Public Transportation Fact Book, Washington, DC, 2020. Includes light rail and heavy rail.

Table A.15
Transit Rail Fuel Use

| Year | Electricity (million kWh) | | Total |
|--|------------------------------------|-------------------------------|-------------------------------|
| | Light rail | Heavy rail | |
| 1970 | | | 2,561 |
| 1975 | | | 2,646 |
| 1976 | Light rail and heavy rail data are | | 2,576 |
| 1977 | not available separately from | | 2,303 |
| 1978 | 1970 to 1985. | | 2,223 |
| 1979 | | | 2,473 |
| 1980 | | | 2,446 |
| 1981 | | | 2,655 |
| 1982 | | | 2,722 |
| 1983 | | | 2,930 |
| 1984 | | | 3,092 |
| 1985 | | | 2,928 |
| 1986 | 173 | 3,066 | 3,239 |
| 1987 | 191 | 3,219 | 3,410 |
| 1988 | 243 | 3,256 | 3,499 |
| 1989 | 242 | 3,286 | 3,528 |
| 1990 | 239 | 3,284 | 3,523 |
| 1991 | 274 | 3,248 | 3,522 |
| 1992 | 297 | 3,193 | 3,490 |
| 1993 | 281 | 3,287 | 3,568 |
| 1994 | 282 | 3,431 | 3,713 |
| 1995 | 288 | 3,401 | 3,689 |
| 1996 | 321 | 3,322 | 3,643 |
| 1997 | 363 | 3,253 | 3,616 |
| 1998 | 382 | 3,280 | 3,662 |
| 1999 | 416 | 3,385 | 3,801 |
| 2000 | 563 | 3,549 | 4,112 |
| 2001 | 587 | 3,646 | 4,233 |
| 2002 | 510 | 3,683 | 4,193 |
| 2003 | 507 | 3,632 | 4,138 |
| 2004 | 553 | 3,684 | 4,237 |
| 2005 | 571 | 3,769 | 4,339 |
| 2006 | 634 | 3,709 | 4,343 |
| 2007 | 687 | 3,817 | 4,505 |
| 2008 | 721 | 3,898 | 4,619 |
| 2009 | 738 | 3,866 | 4,624 |
| 2010 | 749 | 3,780 | 4,529 |
| 2011 | 789 | 3,854 | 4,643 |
| 2012 | 806 | 3,795 | 4,601 |
| 2013 | 882 | 3,856 | 4,738 |
| 2014 | 985 | 3,812 | 4,797 |
| 2015 | 898 | 3,816 | 4,713 |
| 2016 | 907 | 3,760 | 4,667 |
| 2017 | 930 | 3,728 | 4,658 |
| 2018 | 939 | 3,874 | 4,812 |
| Heat content used for conversion to btu: | 3,412 Btu/kWh ^a | 3,412 Btu/kWh ^a | 3,412 Btu/kWh ^a |

^a For tables in the main body of the TEDB, electricity was converted from kWh to Btu using 3,412 Btu/kWh. For tables in TEDB Appendix C, electricity generation and distribution were considered. TEDB Table C.1 contains the conversion factors used for tables in TEDB Appendix C.

Intercity – Personal communication with Amtrak, Washington, DC, 2018. Amtrak was not able to supply 2018 data, thus 2018 energy use was set the same as 2017. This will be updated once data are available.

Table A.16
Intercity Rail Fuel Use

| Year | Diesel fuel (thousand gallons) | Electricity (thousand kWh) |
|--|-----------------------------------|-------------------------------|
| 1994 | 73,516 | 308,948 |
| 1995 | 72,371 | 335,818 |
| 1996 | 71,226 | 362,689 |
| 1997 | 75,656 | 389,559 |
| 1998 | 75,999 | 416,429 |
| 1999 | 79,173 | 443,300 |
| 2000 | 94,968 | 470,170 |
| 2001 | 96,846 | 455,703 |
| 2002 | 84,432 | 518,306 |
| 2003 | 74,621 | 536,950 |
| 2004 | 68,605 | 550,695 |
| 2005 | 65,477 | 531,377 |
| 2006 | 62,463 | 548,856 |
| 2007 | 61,824 | 577,864 |
| 2008 | 63,428 | 582,022 |
| 2009 | 61,704 | 564,968 |
| 2010 | 63,474 | 558,662 |
| 2011 | 63,450 | 555,425 |
| 2012 | 63,058 | 549,201 |
| 2013 | 66,036 | 525,127 |
| 2014 | 65,711 | 515,332 |
| 2015 | 62,468 | 504,017 |
| 2016 | 60,212 | 515,711 |
| 2017 | 60,076 | 489,949 |
| 2018 | 60,076 | 489,949 |
| Heat content used for conversion to Btu | 138,700 Btu/gallon | 3,412 Btu/kWh ^a |

^a For tables in the main body of the TEDB, electricity was converted from kWh to Btu using 3,412 Btu/kWh. For tables in TEDB Appendix C, electricity generation and distribution were considered. TEDB Table C.1 contains the conversion factors used for tables in TEDB Appendix C.

2.4 CALCULATION OF MILLION BARRELS PER DAY CRUDE OIL EQUIVALENT

One gallon of gasoline, diesel fuel, or lpg is estimated to be the equivalent of one gallon of crude oil. Petroleum used for electricity was calculated using the following formula:

$$\left(\frac{BTU \times S}{G} \right) / P \times 365 / 1000$$

- BTU = Btus of electricity
 S = Share of petroleum used in making primary electricity (Calculated from Table 2.6 from the EIA, Monthly Energy Review)
 G = Electricity generation and distribution (assumed 29%)
 P = Btus per barrel of petroleum product (Table A3 from the EIA, Monthly Energy Review).

3. PASSENGER TRAVEL AND ENERGY USE

3.1 CARS

Number of vehicles – DOT, FHWA, *Highway Statistics 2018*, Table MV-1 and annual editions back to 2009. From 1970-2008, Table VM-1 was used.

Vehicle-miles – See Appendix A, Section 7. Car and Light Truck Shares.

Passenger-miles – Vehicle-miles multiplied by an average load factor.

Load factor – 2017 NHTS shows car load factor as 1.54 persons per vehicle.

Energy intensities –

Btu per vehicle-mile – Car energy use divided by vehicle-miles.

Btu per passenger-mile – Car energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 2.8.

3.2 LIGHT TRUCKS

Number of vehicles – DOT, FHWA, *Highway Statistics 2018*, Table MV-9 and annual editions back to 2009. From 1970-2008, Table VM-1 was used. Columns for pickups, vans, sport utility vehicles, and other light trucks. Data were multiplied by the shares of light trucks which are for personal use (TEDB Table A.17) which were derived by ORNL from the 2002 VIUS Micro Data File on CD.

Vehicle-miles – See Appendix A, Section 7. Car and Light Truck Shares. Data were multiplied by the shares of vehicle miles which are for personal use (TEDB Table A.17) which were derived by ORNL from the 2002 VIUS Micro Data File on CD.

Passenger-miles – Vehicle-miles multiplied by an average load factor.

Load factor – 2017 NHTS shows personal light truck load factor as 1.82 persons per vehicle.

Energy intensities -

Btu per vehicle-mile – Personal light truck energy use divided by personal light truck vehicle-miles.

Btu per passenger-mile – Personal light truck energy use divided by personal light truck passenger-miles.

Energy use – See Section 2. Energy Use Sources (light trucks, medium/heavy trucks). Data by truck type were multiplied by the shares of truck fuel use which are for personal use (TEDB Table A.17) which were derived by ORNL from the 2002 VIUS Micro Data File on CD.

Table A.17
Share of Trucks, Truck Travel,
and Fuel Use for Personal Travel

| | |
|--------------------------------|--|
| Personal trucks | |
| 85.6% | 2-axle, 4-tire trucks |
| 26.9% | Other single-unit and combination trucks |
| Personal truck travel | |
| 80.9% | 2-axle, 4-tire trucks |
| 13.1% | Other single-unit and combination trucks |
| Personal truck fuel use | |
| 78.0% | 2-axle, 4-tire trucks |
| 6.0% | Other single-unit and combination trucks |

Note: Since these shares come from the 2002 VIUS, they may underestimate the amount of personal trucks, truck travel, and energy use for 2018.

3.3 MOTORCYCLES

Number of vehicles, vehicle-miles – DOT, FHWA, *Highway Statistics 2018*, Table VM-1.

Passenger-miles – Vehicle-miles multiplied by an average load factor.

Load factor – 2018 NHTS shows motorcycle load factor as 1.20 persons per vehicle.

Energy intensities –

Btu per vehicle-mile – Motorcycle energy use divided by vehicle-miles.

Btu per passenger-mile – Motorcycle energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 2.8.

3.4 DEMAND RESPONSE

Number of vehicles, vehicle-miles, passenger-miles – APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020.

Load factor – Passenger-miles divided by vehicle-miles.

Energy intensities –

Btu per vehicle-mile – Energy use divided by vehicle-miles.

Btu per passenger-mile – Energy use divided by passenger-miles.

Energy use – APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020.

3.5 BUSES

3.5.1 Transit

Number of vehicles, vehicle-miles, passenger-miles – APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020. Data series shown on TEDB Table 7.1.

Load factor – Passenger-miles divided by vehicle-miles.

Energy intensities –

Btu per vehicle-mile – Transit bus energy use divided by transit bus vehicle-miles.

Btu per passenger-mile – Transit bus energy use divided by transit bus passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 7.1.

3.5.2 Intercity

Energy use – See Section 2. Energy Use Sources. Because the data past 2000 are not available, the rate of change in bus VMT from FHWA, *Highway Statistics 2018*, was used to estimate the change in energy use.

3.5.3 School

Number of vehicles – DOT, FHWA, *Highway Statistics 2018*, Table MV-10.

Energy use – See Section 2. Energy Use Sources. Because the data past 2000 are not available, the rate of change in bus VMT from FHWA, *Highway Statistics 2018*, was used to estimate the change in energy use.

3.6 AIR

3.6.1 Certificated Air Carriers

Aircraft-miles, passenger-miles – DOT, BTS, U.S. Air Traffic Statistics Through December 2018, www.transtats.bts.gov, Washington, DC.

Load factor – Passenger-miles divided by aircraft-miles.

Energy intensities –

Btu per passenger-mile – Certificated air carrier energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. All of domestic fuel use and half of international fuel use was considered to be domestic use.

Note: These data differ from the data in TEDB Table 10.2 because that table contains data on ALL domestic AND international air carrier energy use and passenger-miles.

3.6.2 General Aviation

Number of vehicles – DOT, FAA, *General Aviation and Air Taxi Activity Surveys - CY 2018*. 2011 Data: *Aviation Forecasts*, Tables 28 and 29, May 2013. Data series shown in TEDB Table 10.3.

Energy intensities –

Btu per passenger-mile – General aviation energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 10.3.

3.7 RECREATIONAL BOATING

Number of vehicles and energy use – U.S. EPA’s MOVES2014b model.

3.8 RAIL**3.8.1 Intercity**

Number of vehicles, vehicle-miles, passenger-miles – AAR, *Railroad Facts, 2019 Edition*, Washington, DC, 2019.

Load factor – Passenger-miles divided by vehicle-miles.

Energy Intensities –

Btu per vehicle-mile – Intercity rail energy use divided by vehicle-miles.

Btu per passenger-mile – Intercity rail energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 10.10.

3.8.2 Transit

Number of vehicles, vehicle-miles, passenger-miles – APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020. Sum of light and heavy rail transit. Data series shown on TEDB Table 7.4.

Load factor – Passenger-miles divided by vehicle-miles.

Energy intensities –

Btu per vehicle-mile – Light and heavy transit rail energy use divided by vehicle-miles.

Btu per passenger-mile – Light and heavy transit rail energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 7.4.

3.8.3 Commuter

Number of vehicles, vehicle-miles, passenger-miles – APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020.

Load factor – Passenger-miles divided by vehicle-miles.

Energy intensities –

Btu per vehicle-mile – Commuter rail energy use divided by vehicle-miles.

Btu per passenger-mile – Commuter rail energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 7.3.

4. HIGHWAY PASSENGER MODE ENERGY INTENSITIES

4.1 CARS

Btu per vehicle-mile – Car energy use divided by car vehicle miles of travel.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 2.8.

Vehicle-miles – 1970-2008: DOT, FHWA, *Highway Statistics 2009*, Table VM-1 and annual editions back to 1996 and DOT, FHWA, *Highway Statistics Summary to 1995*. Data series shown in TEDB Table 4.1.

2009-2018: See Appendix A, Section 7. Car and Light Truck Shares.

Btu per passenger-mile – Car energy use divided by car passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 2.8.

Passenger miles – Vehicle miles multiplied by an average load factor.

Vehicle-miles – 1970-2008: DOT, FHWA, *Highway Statistics 2009*, Table VM-1 and annual editions back to 1996 and DOT, FHWA, *Highway Statistics Summary to 1995*. Data series shown in TEDB Table 4.1.

2009-2015: See Appendix A, Section 7. Car and Light Truck Shares.

Load factor – NPTS 1969, 1977, 1983/84, 1990, and 1995; NHTS 2001, 2009, and 2017. Data series shown in TEDB Table A.18.

Table A.18
Car Load Factor used to Calculate Passenger-Miles

| Year | Source | Load Factor |
|------|--------------|-------------|
| 1970 | 1969 NPTS | 1.90 |
| 1971 | Interpolated | 1.90 |
| 1972 | Interpolated | 1.90 |
| 1973 | Interpolated | 1.90 |
| 1974 | Interpolated | 1.90 |
| 1975 | Interpolated | 1.90 |
| 1976 | Interpolated | 1.90 |
| 1977 | 1977 NPTS | 1.90 |
| 1978 | Interpolated | 1.88 |
| 1979 | Interpolated | 1.87 |
| 1980 | Interpolated | 1.85 |
| 1981 | Interpolated | 1.83 |
| 1982 | Interpolated | 1.82 |
| 1983 | 1983/84 NPTS | 1.80 |
| 1984 | Interpolated | 1.77 |
| 1985 | Interpolated | 1.74 |
| 1986 | Interpolated | 1.71 |
| 1987 | Interpolated | 1.69 |
| 1988 | Interpolated | 1.66 |
| 1989 | Interpolated | 1.63 |
| 1990 | 1990 NPTS | 1.60 |
| 1991 | Interpolated | 1.60 |
| 1992 | Interpolated | 1.60 |
| 1993 | Interpolated | 1.60 |
| 1994 | Interpolated | 1.60 |
| 1995 | 1995 NPTS | 1.60 |
| 1996 | Interpolated | 1.60 |
| 1997 | Interpolated | 1.59 |
| 1998 | Interpolated | 1.59 |
| 1999 | Interpolated | 1.58 |
| 2000 | Interpolated | 1.58 |
| 2001 | 2001 NHTS | 1.57 |
| 2002 | Interpolated | 1.57 |
| 2003 | Interpolated | 1.57 |
| 2004 | Interpolated | 1.56 |
| 2005 | Interpolated | 1.56 |
| 2006 | Interpolated | 1.56 |
| 2007 | Interpolated | 1.56 |
| 2008 | Interpolated | 1.55 |
| 2009 | 2009 NHTS | 1.55 |
| 2010 | Interpolated | 1.55 |
| 2011 | Interpolated | 1.55 |
| 2012 | Interpolated | 1.55 |
| 2013 | Interpolated | 1.55 |
| 2014 | Interpolated | 1.54 |
| 2015 | Interpolated | 1.54 |
| 2016 | 2017 NHTS | 1.54 |
| 2017 | 2017 NHTS | 1.54 |
| 2018 | 2017 NHTS | 1.54 |

4.2 LIGHT TRUCKS

Btu per vehicle-mile – Light truck energy use divided by light truck vehicle miles of travel.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 2.8.

Vehicle-miles – 1970-2008: DOT, FHWA, *Highway Statistics 2008*, Table VM-1 and annual editions back to 1996 and DOT, FHWA, *Highway Statistics Summary to 1995*.

Data series shown in TEDB Table 4.2. 2009-2018: See Appendix A, Section 7. Car and Light Truck Shares.

Table A.19
Light Truck Load Factor used to Calculate Passenger-Miles

| Year | Source | Load Factor |
|------|--------------|-------------|
| 1970 | 1969 NPTS | 1.90 |
| 1971 | Interpolated | 1.89 |
| 1972 | Interpolated | 1.87 |
| 1973 | Interpolated | 1.86 |
| 1974 | Interpolated | 1.84 |
| 1975 | Interpolated | 1.83 |
| 1976 | Interpolated | 1.81 |
| 1977 | 1977 NPTS | 1.80 |
| 1978 | Interpolated | 1.81 |
| 1979 | Interpolated | 1.83 |
| 1980 | Interpolated | 1.84 |
| 1981 | Interpolated | 1.86 |
| 1982 | Interpolated | 1.87 |
| 1983 | 1983/84 NPTS | 1.90 |
| 1984 | Interpolated | 1.87 |
| 1985 | Interpolated | 1.84 |
| 1986 | Interpolated | 1.81 |
| 1987 | Interpolated | 1.79 |
| 1988 | Interpolated | 1.76 |
| 1989 | Interpolated | 1.73 |
| 1990 | 1990 NPTS | 1.70 |
| 1991 | Interpolated | 1.68 |
| 1992 | Interpolated | 1.66 |
| 1993 | Interpolated | 1.64 |
| 1994 | Interpolated | 1.62 |
| 1995 | 1995 NPTS | 1.60 |
| 1996 | Interpolated | 1.62 |
| 1997 | Interpolated | 1.64 |
| 1998 | Interpolated | 1.66 |
| 1999 | Interpolated | 1.68 |
| 2000 | Interpolated | 1.70 |
| 2001 | 2001 NHTS | 1.72 |
| 2002 | Interpolated | 1.74 |
| 2003 | Interpolated | 1.75 |
| 2004 | Interpolated | 1.77 |
| 2005 | Interpolated | 1.79 |
| 2006 | Interpolated | 1.81 |
| 2007 | Interpolated | 1.82 |
| 2008 | Interpolated | 1.84 |
| 2009 | 2009 NHTS | 1.84 |
| 2010 | Interpolated | 1.84 |
| 2011 | Interpolated | 1.83 |
| 2012 | Interpolated | 1.83 |
| 2013 | Interpolated | 1.83 |
| 2014 | Interpolated | 1.83 |
| 2015 | Interpolated | 1.82 |
| 2016 | 2017 NHTS | 1.82 |
| 2017 | 2017 NHTS | 1.82 |
| 2018 | 2017 NHTS | 1.82 |

Btu per passenger-mile – Light truck energy use divided by light trucks passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 2.8.

Passenger miles – Vehicle miles multiplied by an average load factor.

Vehicle-miles – 1970-2008: DOT, FHWA, *Highway Statistics 2009*, Table VM-1 and annual editions back to 1996 and DOT, FHWA, *Highway Statistics Summary to 1995*. Data series shown in TEDB Table 4.2.

2009-2018: See Appendix A, Section 7. Car and Light Truck Shares.

Load factor – NPTS 1969, 1977, 1983/84, 1990, and 1995; NHTS 2001, 2009, and 2017. Data series shown in TEDB Table A.19.

4.3 Buses

4.3.1 Transit

Btu per vehicle-mile – Transit bus energy use divided by transit bus vehicle-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 7.1.

Vehicle-miles – APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020. Data series shown on TEDB Table 7.1.

Btu per passenger-mile – Transit bus energy use divided by transit bus passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 7.1.

Passenger-miles – APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020.

4.3.2 Intercity

Btu per passenger-mile – Data are not available.

Energy use – See Section 2. Energy Use Sources. Because the data past 2000 are not available, the rate of change in bus VMT from FHWA, *Highway Statistics 2018*, was used to estimate the change in energy use.

Passenger-miles – Data are not available.

5. NONHIGHWAY MODE ENERGY INTENSITIES

5.1 AIR

5.1.1 Certificated Air Carriers

Btu per passenger-mile – Certificated air carrier energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. All of domestic fuel use and half of international fuel use was considered to be domestic use.

Passenger-miles – DOT, BTS, *Air Carrier Traffic Statistics*, Washington, DC, www.transtats.bts.gov. Pre-1994 data are from various editions of the *FAA Statistical Handbook of Aviation* (no longer published). Scheduled service passenger-miles of domestic air carriers and half of international air carriers were used to coincide with fuel use.

Note: These data differ from the data in TEDB Table 10.2 because that table contains data on ALL domestic AND international air carrier energy use and passenger-miles.

5.1.2 General Aviation

Btu per passenger-mile – Data are not available.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 10.3.

Passenger-miles – Data are not available.

5.2 RAIL

5.2.1 Intercity

Btu per passenger-mile – Intercity rail energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 10.10.

Passenger-miles – AAR, *Railroad Facts, 2019 Edition*, and previous annual editions.

5.2.2 Transit

Btu per passenger-mile – Transit rail energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 7.4.

Passenger-miles – APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020. Data series shown on TEDB Table 7.4.

5.2.3 Commuter

Btu per passenger-mile – Commuter rail energy use divided by passenger-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 7.3.

Passenger-miles – APTA, *2020 Public Transportation Fact Book*, Washington, DC, 2020. Data series shown on TEDB Table 7.3.

6. FREIGHT MODE ENERGY INTENSITIES

6.1 TRUCK

Btu per vehicle-mile – Heavy single-unit and combination truck energy use divided by vehicle miles

Energy use – See Section 2. Energy Use Sources (medium/heavy trucks).

Vehicle-miles – DOT, FHWA, *Highway Statistics 2018*, Table VM-1 and annual editions back to 1996 and DOT, FHWA, *Highway Statistics Summary to 1995*. Data series is the total of vehicle travel data on TEDB Tables 5.1 and 5.2.

6.2 RAIL

Btu per freight car-mile – Class I rail energy use divided by freight car-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 10.8.

Freight car miles – AAR, *Railroad Facts, 2019 Edition*, Washington, DC, 2019. Data series shown in TEDB Table 10.8.

Btu per ton-mile – Class I rail energy use divided by ton-miles.

Energy use – See Section 2. Energy Use Sources. Data series shown in TEDB Table 10.8.

Ton-miles – AAR, *Railroad Facts, 2019 Edition*, Washington, DC, 2019. Data series shown in TEDB Table 10.8.

6.3 WATER

Btu per ton-mile – Domestic waterborne commerce energy use on taxable waterways divided by ton-miles on taxable waterways.

Energy use – Modeled by Chrisman A. Dager, University of Tennessee, Knoxville, using Waterborne Commerce Statistics Center detail records and annual IRS reports on the Inland Waterway Trust Fund tax on diesel fuel used on the inland waterway.

Note: These data are not available for 2015-on.

Ton-miles – Based on detailed records from the U.S. Department of the Army, Army Corps of Engineers, Waterborne Commerce Statistics Center. Includes only ton-miles on taxable waterways.

7. CAR AND LIGHT TRUCK SHARES

In 2011, the Federal Highway Administration (FHWA) changed the methodology for producing the data on the VM-1 Table in the annual *Highway Statistics* publication. Historically, VM-1 included individual categories for passenger cars and 2-axle, 4-tire trucks. VM-1 included the vehicle miles of travel (VMT), registrations, fuel use, and fuel economy of passenger cars and 2-axle, 4-tire trucks. After the methodology change, the categories of light vehicles on VM-1 changed to Light-Duty Vehicles with Short wheelbase (less than or equal to 121 inches) and Light-Duty Vehicles with Long Wheelbase (over 121 inches). As some passenger cars have long wheelbases and some 2-axle, 4-tire trucks have short wheelbases, the categories of cars and 2-axle, 4-tire trucks are no longer available. Despite these changes, there are many transportation analysts who require information on cars and 2-axle, 4-tire trucks. Thus, a new methodology to estimate the data in these categories was developed for years 2009 through 2018.

7.1 CARS

Registrations – DOT, FHWA, *Highway Statistics 2019*, Table MV-1 and annual editions back to 2009.

Vehicle travel –

Total for all light vehicles – DOT, FHWA, *Highway Statistics 2019*, Table VM-1 and annual editions back to 2009; sum of light-duty short wheelbase and light-duty long wheelbase VMT.

Cars – Using historical shares of passenger cars/2-axle, 4-tire trucks from the Highway Statistics, the percent of light vehicle travel attributable to cars was estimated for 2009-2019, keeping in mind the economic conditions present in those years and the general trend in total light vehicle VMT. The estimated share was applied to total VMT as shown in TEDB Table A.20.

Table A.20 (Updated April 2021)
Estimated Car VMT

| Year | Total Light Vehicle VMT (billions) | Share Attributable to Cars | Total Car VMT (billions) |
|------|---------------------------------------|----------------------------|-----------------------------|
| 2009 | 2,633.3 | 59.5% | 1,566.8 |
| 2010 | 2,648.5 | 56.5% | 1,496.4 |
| 2011 | 2,650.5 | 55.0% | 1,457.8 |
| 2012 | 2,664.1 | 54.0% | 1,438.6 |
| 2013 | 2,677.8 | 54.0% | 1,446.0 |
| 2014 | 2,710.6 | 53.0% | 1,436.6 |
| 2015 | 2,779.7 | 52.0% | 1,445.4 |
| 2016 | 2,849.7 | 51.0% | 1,453.4 |
| 2017 | 2,877.4 | 49.5% | 1,424.3 |
| 2018 | 2,897.1 | 49.0% | 1,419.6 |
| 2019 | 2,924.1 | 47.0% | 1,374.3 |

Miles per Vehicle – Vehicle travel divided by registrations.

Fuel Use – Vehicle travel divided by fuel economy.

Fuel Economy – DOE, EIA, *Annual Energy Outlook 2020*, January 2020 and annual editions back to 2012.

7.2 2-AXLE, 4-TIRE TRUCKS

Registrations – DOT, FHWA, *Highway Statistics 2019*, Table MV-1 and annual editions back to 2009.

Vehicle travel –

Total for all light vehicles – DOT, FHWA, *Highway Statistics 2019*, Table VM-1 and annual editions back to 2009; sum of light-duty short wheelbase and light-duty long wheelbase VMT.

2-axle, 4-tire truck VMT – Using historical shares of passenger cars/2-axle, 4-tire trucks from the Highway Statistics, the percent of light vehicle travel attributable to cars was estimated for 2009-2019, keeping in mind the economic conditions present in those years and the general trend in total light vehicle VMT. The estimated share was applied to total VMT as shown in TEDB Table A.21.

Table A.21 (Updated April 2021)
Estimated 2-axle, 4-tire Truck VMT

| Year | Total Light Vehicle VMT (billions) | Share Attributable to 2-axle, 4-tire Trucks | Total 2-axle, 4-tire Truck VMT (billions) |
|------|------------------------------------|---|---|
| 2009 | 2,633.2 | 40.5% | 1,066.5 |
| 2010 | 2,648.5 | 43.5% | 1,152.1 |
| 2011 | 2,650.5 | 45.0% | 1,192.7 |
| 2012 | 2,664.1 | 46.0% | 1,225.5 |
| 2013 | 2,677.8 | 46.0% | 1,231.8 |
| 2014 | 2,710.6 | 47.0% | 1,274.0 |
| 2015 | 2,779.7 | 48.0% | 1,334.3 |
| 2016 | 2,849.7 | 49.0% | 1,396.4 |
| 2017 | 2,877.4 | 50.5% | 1,453.1 |
| 2018 | 2,897.1 | 51.0% | 1,477.5 |
| 2019 | 2,924.1 | 53.0% | 1,549.7 |

Miles per Vehicle – Vehicle travel divided by registrations.

Fuel Use – Vehicle travel divided by fuel economy.

Fuel Economy – DOE, EIA, *Annual Energy Outlook 2020*, January 2020 and annual editions back to 2012.

APPENDIX B

CONVERSIONS

CONVERSIONS

A Note about Heating Values

The heat content of a fuel is the quantity of energy released by burning a unit amount of that fuel. However, this value is not absolute and can vary according to several factors. For example, empirical formulae for determining the heating value of liquid fuels depend on the fuels' American Petroleum Institute (API) gravity. The API gravity varies depending on the percent by weight of the chemical constituents and impurities in the fuel, both of which are affected by the combination of raw materials used to produce the fuel and by the type of manufacturing process. Temperature and climatic conditions are also factors.

Because of these variations, the heating values in Table B.4 may differ from values in other publications. The figures in this report are representative or average values, not absolute ones. The gross (higher) heating values used here agree with those used by the Energy Information Administration (EIA).

Heating values fall into two categories, usually referred to as “higher” (or gross) and “lower” (or net). If the products of fuel combustion are cooled back to the initial fuel-air or fuel-oxidizer mixture temperature and the water formed during combustion is condensed, the energy released by the process is the higher (gross) heating value. If the products of combustion are cooled to the initial fuel-air temperature, but the water is considered to remain as a vapor, the energy released by the process is the lower (net) heating value. Usually the difference between the gross and net heating values for fuels used in transportation is around 5 to 8 percent; however, it is important to be consistent in their use.

The Transportation Energy Data Book has always used gross heating values for fuel conversion.

Table B.1
Hydrogen Heat Content

| 1 kilogram hydrogen = | |
|-----------------------|---------------------|
| Higher heating value | Lower heating value |
| 134,200 Btu | 113,400 Btu |
| 39.3 kWhr | 33.2 kWhr |
| 141,600 kJ | 119,600 kJ |
| 33,800 kCal | 28,560 kCal |

Table B.2
Hydrogen Conversions

| | Weight | | Gas | | Liquid | |
|-----------------------|----------------|-------------------|---------------------------------|---|------------------|---------------|
| | Pounds (lb) | Kilograms (kg) | Standard cubic feet (SCF) | Normal cubic meter (Nm ³) | Gallons (gal) | Liters (L) |
| 1 lb | 1.0 | 0.4536 | 192.00 | 5.047 | 1.6928 | 6.408 |
| 1 kg | 2.205 | 1.0 | 423.3 | 11.126 | 3.733 | 14.128 |
| 1 SCF gas | 0.005209 | 0.002363 | 1.0 | 0.02628 | 0.00882 | 0.0339 |
| 1 Nm ³ gas | 0.19815 | 0.08988 | 38.04 | 1.0 | 0.3355 | 1.2699 |
| 1 gal liquid | 0.5906 | 0.2679 | 113.41 | 2.981 | 1.0 | 3.785 |
| 1 L liquid | 0.15604 | 0.07078 | 29.99 | 0.77881 | 0.2642 | 1.0 |

Table B.3
Pressure Conversions

| | Bar | Atmosphere | lb/in ² (or psi) |
|-----------------------------|--------|------------|-----------------------------|
| Bar | 1.0 | 0.987 | 14.5 |
| Atmosphere | 1.013 | 1.0 | 14.696 |
| lb/in ² (or psi) | 0.0689 | 0.0680 | 1.0 |

Table B.4
Heat Content for Various Fuels

| | |
|-------------------------------|---|
| Conventional gasoline | 125,000 Btu/gal (gross) = 115,400 Btu/gal (net) |
| E10 | 120,900 Btu/gal (gross) = 112,400 Btu/gal (net) |
| E15 | 119,000 Btu/gal (gross) = 109,400 Btu/gal (net) |
| Hydrogen | 134,200 Btu/kg (gross) = 113,400 Btu/kg (net) |
| Low-sulfur diesel | 138,700 Btu/gal (gross) = 128,700 Btu/gal (net) |
| Biodiesel | 126,200 Btu/gal (gross) = 117,100 Btu/gal (net) |
| Methanol | 64,600 Btu/gal (gross) = 56,600 Btu/gal (net) |
| Ethanol | 84,600 Btu/gal (gross) = 75,700 Btu/gal (net) |
| E85 | 90,700 Btu/gal (gross) = 81,600 Btu/gal (net) |
| Aviation gasoline | 120,200 Btu/gal (gross) = 112,000 Btu/gal (net) |
| Liquefied petroleum gas (LPG) | 91,300 Btu/gal (gross) = 83,500 Btu/gal (net) |
| Butane | 103,000 Btu/gal (gross) = 93,000 Btu/gal (net) |
| Jet fuel (naphtha) | 127,500 Btu/gal (gross) = 118,700 Btu/gal (net) |
| Jet fuel (kerosene) | 135,000 Btu/gal (gross) = 128,100 Btu/gal (net) |
| Lubricants | 144,400 Btu/gal (gross) = 130,900 Btu/gal (net) |
| Waxes | 131,800 Btu/gal (gross) = 120,200 Btu/gal (net) |
| Asphalt and road oil | 158,000 Btu/gal (gross) = 157,700 Btu/gal (net) |
| Liquefied natural gas (LNG) | 23,700 Btu/lb (gross) = 20,900 Btu/lb (net) |
| Compressed natural gas (CNG) | 22,500 Btu/lb (gross) = 20,200 Btu/lb (net) |
| Crude petroleum | 138,100 Btu/gal (gross) = 131,800 Btu/gal (net) |
| Fuel Oils | |
| Residual | 149,700 Btu/gal (gross) = 138,400 Btu/gal (net) |
| Distillate | 138,700 Btu/gal (gross) = 131,800 Btu/gal (net) |
| Coal | |
| Production average | 19.880 x 10 ⁶ Btu/short ton |
| Consumption average | 19.499 x 10 ⁶ Btu/short ton |

Note: Heat content values are approximate. Data are rounded to the nearest hundred.

Table B.5
Fuel Equivalents

| | |
|---|---|
| 1 million bbl crude oil/day | = 0.365 billion bbl crude oil/year = 2.089 quadrillion Btu/year = 107.110 million short tons coal/year = 97.170 million metric tons coal/year = 2.016 trillion ft ³ natural gas/year = 2,203 petajoules/year |
| 1 billion bbl crude oil/year | = 2.740 million bbl crude oil/day = 5.722 quadrillion Btu/year = 293.451 million short tons coal/year = 266.219 million metric tons coal/year = 5.523 trillion ft ³ natural gas/year = 6,037 petajoules/year |
| 1 quadrillion Btu/year | = 8.000 billion gasoline gallon equivalents/year = 0.479 million bbl crude oil/day = 174.764 million bbl crude oil/year = 51.285 million short tons coal/year = 46.525 million metric tons coal/year = 965.251 billion ft ³ natural gas/year = 1,055 petajoules/year |
| 1 billion short tons coal/year | = 0.907 billion metric tons coal/year = 9.336 million bbl crude oil/day = 3.408 billion bbl crude oil/year = 19.499 quadrillion Btu/year = 18.821 trillion ft ³ natural gas/year = 20,572 petajoules/year |
| 1 billion metric tons coal/year | = 1.102 billion short tons coal/year = 8.470 million bbl crude oil/day = 3.091 billion bbl crude oil/year = 17.689 quadrillion btu/year = 17.075 trillion ft ³ natural gas/year = 18,662 petajoules/year |
| 1 trillion ft ³ natural gas/year | = 0.496 million bbl crude oil/day = 0.181 billion bbl crude oil/year = 1.036 quadrillion Btu/year = 53.131 million short tons coal/year = 48.200 million metric tons coal/year = 1,093 petajoules/year |
| 1 petajoule/year | = 453.844 bbl crude oil/day = 165.653 thousand bbl crude oil/year = 0.948 trillion Btu/year = 48.661 thousand short tons coal/year = 44.100 thousand metric tons coal/year = 0.915 billion ft ³ natural gas/year |

Table B.6
Energy Unit Conversions

| | | | |
|--------|--|---------------|---|
| 1 Btu | = 778.2 ft-lb = 107.6 kg-m = 1055 J = 39.30×10^{-5} hp-h = 39.85×10^{-5} metric hp-h = 29.31×10^{-5} kWhr | 1 kWhr | = 3412 Btu ^a = 2.655×10^6 ft-lb = 3.671×10^5 kg-m = 3.600×10^6 J = 1.341 hp-h = 1.360 metric hp-h |
| 1 kg-m | = 92.95×10^{-4} Btu = 7.233 ft-lb = 9.806 J = 36.53×10^{-7} hp-h = 37.04×10^{-7} metric hp-h = 27.24×10^{-7} kWhr | 1 Joule | = 94.78×10^{-5} Btu = 0.7376 ft-lb = 0.1020 kg-m = 37.25×10^{-8} hp-h = 37.77×10^{-8} metric hp-h = 27.78×10^{-8} kWhr |
| 1 hp-h | = 2544 Btu = 1.98×10^6 ft-lb = 2.738×10^6 kgm = 2.685×10^6 J = 1.014 metric hp-h = 0.7475 kWhr | 1 metric hp-h | = 2510 Btu = 1.953×10^6 ft-lb = 27.00×10^4 kg-m = 2.648×10^6 J = 0.9863 hp-h = 0.7355 kWhr |

^aThis figure does not take into account the fact that electricity generation and distribution efficiency is approximately 33%. If generation and distribution efficiency are taken into account, 1 kWhr = 10,339 Btu.

Table B.7
International Energy Conversions

| | To: | Petajoules | Giga-calories | Million metric tons of oil equivalent | Million Btu | Gigawatt-hours |
|--|---------------------|-------------------------|----------------------|--|---------------------|------------------------|
| From: | <i>multiply by:</i> | | | | | |
| Petajoules | | 1 | 238.8×10^3 | 2.388×10^{-2} | 947.8×10^3 | 277.8 |
| Gigacalories | | 4.1868×10^{-6} | 1 | 10^{-7} | 3.968 | 1.163×10^{-3} |
| Million metric tons of oil equivalent | | 41.868 | 10^7 | 1 | 3.968×10^7 | 11,630 |
| Million Btu | | 1.0551×10^{-6} | 0.252 | 2.52×10^{-8} | 1 | 2.931×10^{-4} |
| Gigawatt-hours | | 3.6×10^{-3} | 860 | 8.6×10^{-5} | 3412 | 1 |

Table B.8
Distance and Velocity Conversions

| | |
|---|--|
| 1 in = 83.33×10^{-3} ft = 27.78×10^{-3} yd = 15.78×10^{-6} mile = 25.40×10^{-3} m = 0.2540×10^{-6} km | 1 ft = 12.0 in = 0.33 yd = 189.4×10^{-3} mile = 0.3048 m = 0.3048×10^{-3} km |
| 1 mile = 63360 in = 5280 ft = 1760 yd = 1609 m = 1.609 km | 1 km = 39370 in = 3281 ft = 1093.6 yd = 0.6214 mile = 1000 m |
| 1 ft/sec = 0.3048 m/s = 0.6818 mph = 1.0972 km/h 1 m/sec = 3.281 ft/s = 2.237 mph = 3.600 km/h 1 km/h = 0.9114 ft/s = 0.2778 m/s = 0.6214 mph 1 mph = 1.467 ft/s = 0.4469 m/s = 1.609 km/h | |

Table B.9
Alternative Measures of Greenhouse Gases

| | | |
|--|---|--|
| 1 pound methane, measured in carbon units (CH ₄) | = | 1.333 pounds methane, measured at full molecular weight (CH ₄) |
| 1 pound carbon dioxide, measured in carbon units (CO ₂ -C) | = | 3.6667 pounds carbon dioxide, measured at full molecular weight (CO ₂) |
| 1 pound carbon monoxide, measured in carbon units (CO-C) | = | 2.333 pounds carbon monoxide, measured at full molecular weight (CO) |
| 1 pound nitrous oxide, measured in nitrogen units (N ₂ O-N) | = | 1.571 pounds nitrous oxide, measured at full molecular weight (N ₂ O) |

Table B.10
Volume and Flow Rate Conversions^a

| A U.S. gallon of gasoline weighs 6.2 pounds | | | |
|---|---|---------|--|
| 1 U.S. gal | = 231 in ³ = 0.1337 ft ³ = 3.785 liters = 0.8327 imperial gal = 0.0238 bbl = 0.003785 m ³ | 1 liter | = 61.02 in ³ = 3.531 x 10 ⁻² ft ³ = 0.2642 U.S. gal = 0.2200 imperial gal = 6.29 x 10 ⁻³ bbl = 0.001 m ³ |
| 1 imperial gal | = 277.4 in ³ = 0.1605 ft ³ = 4.546 liters = 1.201 U.S. gal = 0.0286 bbl = 0.004546 m ³ | 1 bbl | = 9702 in ³ = 5.615 ft ³ = 158.97 liters = 42 U.S. gal = 34.97 imperial gal = 0.15898 m ³ |
| 1 U.S. gal/hr | = 3.208 ft ³ /day = 90.85 liter/day = 19.78 imperial gal/day = 0.5714 bbl/day | | = 1171 ft ³ /year = 33160 liter/year = 7220 imperial gal/year = 208.57 bbl/year |
| 1 liter/hr | = 0.8476 ft ³ /day = 6.340 U.S. gal/day = 5.28 imperial gal/day = 0.1510 bbl/day | | = 309.3 ft ³ /year = 2308 U.S. gal/year = 1927 imperial gal/year = 55.10 bbl/year |
| 1 bbl/hr | = 134.7 ft ³ /day = 1008 U.S. gal/day = 839.3 imperial gal/day = 3816 liter/day | | = 49184 ft ³ /year = 3.679 x 10 ⁵ U.S. gal/year = 3.063 x 10 ⁵ imperial gal/year = 1.393 x 10 ⁶ liter/day |

^a The conversions for flow rates are identical to those for volume measures, if the time units are identical. Conversions to/from barrels (bbl) are based on barrels of petroleum.

**Table B.11
Power Conversions**

| FROM | TO | | | | | |
|----------------------|-----------------------|------------------------|-----------------------|---------------|-------------------------|------------------------|
| | Horsepower | Kilowatts | Metric horsepower | Ft-lb per sec | Kilocalories per sec | Btu per sec |
| Horsepower | 1 | 0.7457 | 1.014 | 550 | 0.1781 | 0.7068 |
| Kilowatts | 1.341 | 1 | 1.360 | 737.6 | 0.239 | 0.9478 |
| Metric horsepower | 0.9863 | 0.7355 | 1 | 542.5 | 0.1757 | 0.6971 |
| Ft-lb per sec | 1.36×10^{-3} | 1.356×10^{-3} | 1.84×10^{-3} | 1 | 0.3238×10^{-3} | 1.285×10^{-3} |
| Kilocalories per sec | 5.615 | 4.184 | 5.692 | 3088 | 1 | 3.968 |
| Btu per sec | 1.415 | 1.055 | 1.434 | 778.2 | 0.2520 | 1 |

**Table B.12
Mass Conversions**

| FROM | TO | | | | |
|------------|-------|----------|-------------------------|-------------------------|-------------------------|
| | Pound | Kilogram | Short ton | Long ton | Metric ton |
| Pound | 1 | 0.4536 | 5.0×10^{-4} | 4.4643×10^{-4} | 4.5362×10^{-4} |
| Kilogram | 2.205 | 1 | 1.1023×10^{-3} | 9.8425×10^{-4} | 1.0×10^{-3} |
| Short ton | 2,000 | 907.2 | 1 | 0.8929 | 0.9072 |
| Long ton | 2,240 | 1,106 | 1.12 | 1 | 1.016 |
| Metric ton | 2,205 | 1,000 | 1.102 | 0.9842 | 1 |

Table B.13
Fuel Efficiency Conversions

| MPG | Miles/liter | Kilometers/L | L/100 kilometers | Grams of CO ₂ per mile ^a | Pounds of CO ₂ per mile ^a |
|---------|-------------|-------------------|------------------|--|---|
| 10 | 2.64 | 4.25 | 23.52 | 877.80 | 1.94 |
| 15 | 3.96 | 6.38 | 15.68 | 585.20 | 1.29 |
| 20 | 5.28 | 8.50 | 11.76 | 438.90 | 0.97 |
| 25 | 6.60 | 10.63 | 9.41 | 351.12 | 0.78 |
| 30 | 7.92 | 12.75 | 7.84 | 292.60 | 0.65 |
| 35 | 9.25 | 14.88 | 6.72 | 250.80 | 0.55 |
| 40 | 10.57 | 17.00 | 5.88 | 219.45 | 0.49 |
| 45 | 11.89 | 19.13 | 5.23 | 195.07 | 0.43 |
| 50 | 13.21 | 21.25 | 4.70 | 175.56 | 0.39 |
| 55 | 14.53 | 23.38 | 4.28 | 159.60 | 0.35 |
| 60 | 15.85 | 25.51 | 3.92 | 146.30 | 0.32 |
| 65 | 17.17 | 27.63 | 3.62 | 135.05 | 0.30 |
| 70 | 18.49 | 29.76 | 3.36 | 125.40 | 0.28 |
| 75 | 19.81 | 31.88 | 3.14 | 117.04 | 0.26 |
| 80 | 21.13 | 34.01 | 2.94 | 109.73 | 0.24 |
| 85 | 22.45 | 36.13 | 2.77 | 103.27 | 0.23 |
| 90 | 23.77 | 38.26 | 2.61 | 97.53 | 0.22 |
| 95 | 25.09 | 40.38 | 2.48 | 92.40 | 0.20 |
| 100 | 26.42 | 42.51 | 2.35 | 87.78 | 0.19 |
| 105 | 27.74 | 44.64 | 2.24 | 83.60 | 0.18 |
| 110 | 29.06 | 46.76 | 2.14 | 79.80 | 0.18 |
| 115 | 30.38 | 48.89 | 2.05 | 76.33 | 0.17 |
| 120 | 31.70 | 51.01 | 1.96 | 73.15 | 0.16 |
| 125 | 33.02 | 53.14 | 1.88 | 70.22 | 0.16 |
| 130 | 34.34 | 55.26 | 1.81 | 67.52 | 0.15 |
| 135 | 35.66 | 57.39 | 1.74 | 65.02 | 0.14 |
| 140 | 36.98 | 59.51 | 1.68 | 62.70 | 0.14 |
| 145 | 38.30 | 61.64 | 1.62 | 60.54 | 0.13 |
| 150 | 39.62 | 63.76 | 1.57 | 58.52 | 0.13 |
| Formula | MPG/3.785 | MPG/[3.785/1.609] | 235.24/MPG | 8,778/MPG | 19.4/MPG |

^a For gasoline-fueled vehicles.

Table B.14
SI Prefixes and Their Values

| | Value | Prefix | Symbol |
|--------------------------------|------------|--------|--------|
| One million million millionth | 10^{-18} | atto | a |
| One thousand million millionth | 10^{-15} | femto | f |
| One million millionth | 10^{-12} | pico | p |
| One thousand millionth | 10^{-9} | nano | n |
| One millionth | 10^{-6} | micro | μ |
| One thousandth | 10^{-3} | milli | m |
| One hundredth | 10^{-2} | centi | c |
| One tenth | 10^{-1} | deci | |
| One | 10^0 | | |
| Ten | 10^1 | deca | |
| One hundred | 10^2 | hecto | |
| One thousand | 10^3 | kilo | k |
| One million | 10^6 | mega | M |
| One billion ^a | 10^9 | giga | G |
| One trillion ^a | 10^{12} | tera | T |
| One quadrillion ^a | 10^{15} | peta | P |
| One quintillion ^a | 10^{18} | exa | E |

^aCare should be exercised in the use of this nomenclature, especially in foreign correspondence, as it is either unknown or carries a different value in other countries. A "billion," for example, signifies a value of 10^{12} in most other countries.

Table B.15
Metric Units and Abbreviations

| Quantity | Unit name | Symbol |
|---------------------------------|---------------------------|------------------|
| Energy | Joule | J |
| Specific energy | Joule/kilogram | J/kg |
| Specific energy consumption | Joule/kilogram•kilometer | J/(kg•km) |
| Energy consumption | Joule/kilometer | J/km |
| Energy economy | kilometer/kilojoule | km/kJ |
| Power | kilowatt | kW |
| Specific power | Watt/kilogram | W/kg |
| Power density | Watt/meter ³ | W/m ³ |
| Speed | kilometer/hour | km/h |
| Acceleration | meter/second ² | m/s ² |
| Range (distance) | kilometer | km |
| Weight | kilogram | kg |
| Torque | Newton•meter | N•m |
| Volume | meter ³ | m ³ |
| Mass; payload | kilogram | kg |
| Length; width | meter | m |
| Brake specific fuel consumption | kilogram/Joule | kg/J |
| Fuel economy (heat engine) | Liters/100 km | L/100 km |

Table B.16
Carbon Coefficients
(Million metric tons carbon per quadrillion Btu)

| Energy Source | Fuel Type | Carbon Coefficients |
|--------------------|---------------------------------|---------------------|
| Coal | Anthracite | 28.28 |
| | Bituminous | 25.45 |
| | Subbituminous | 26.51 |
| | Lignite | 26.65 |
| | Coke | 31.12 |
| | Coal (All types) | 26.00 |
| | Natural gas | Natural Gas |
| Flared natural gas | | 14.92 |
| Propane | | 17.20 |
| Butane | | 17.71 |
| Butane/Propane Mix | | 17.46 |
| Petroleum | | Gasoline |
| | Diesel fuel | 19.95 |
| | Jet Fuel | 19.34 |
| | Aviation Gas | 18.87 |
| | Kerosene | 19.72 |
| | Residual Heating Fuel | 21.49 |
| | Petroleum coke | 27.85 |
| | Asphalt and Road Oil | 20.62 |
| | Lubricants | 20.24 |
| | Petrochemical Feedstocks | 19.37 |
| | Special Naphthas (solvents) | 19.85 |
| | Waxes | 19.81 |
| | Other petroleum & miscellaneous | 19.81 |

Note: Additional information:

www.eia.gov/environment/emissions/co2_vol_mass.cfm

Conversion of Constant Dollar Values

Many types of information in this data book are expressed in dollars. Generally, constant dollars are used—that is, dollars of a fixed value for a specific year, such as 2010 dollars. Converting current dollars to constant dollars, or converting constant dollars for one year to constant dollars for another year, requires conversion factors (Table B.17 and Table B.18). Table B.17 shows conversion factors for the Consumer Price Index inflation factors. Table B.18 shows conversion factors using the Gross National Product Implicit Price Deflator.

Table B.17 (Updated April 2021)
Consumer Price Inflation (CPI) Index

| From: | To: | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
| 1970 | 1.000 | 1.044 | 1.077 | 1.144 | 1.271 | 1.387 | 1.466 | 1.562 | 1.680 | 1.871 |
| 1971 | 0.958 | 1.000 | 1.032 | 1.096 | 1.217 | 1.328 | 1.405 | 1.496 | 1.610 | 1.793 |
| 1972 | 0.928 | 0.969 | 1.000 | 1.062 | 1.179 | 1.287 | 1.361 | 1.450 | 1.560 | 1.737 |
| 1973 | 0.874 | 0.912 | 0.941 | 1.000 | 1.110 | 1.212 | 1.282 | 1.365 | 1.468 | 1.635 |
| 1974 | 0.787 | 0.822 | 0.848 | 0.901 | 1.000 | 1.091 | 1.154 | 1.229 | 1.323 | 1.473 |
| 1975 | 0.721 | 0.753 | 0.777 | 0.825 | 0.916 | 1.000 | 1.058 | 1.126 | 1.212 | 1.349 |
| 1976 | 0.682 | 0.712 | 0.735 | 0.780 | 0.866 | 0.946 | 1.000 | 1.065 | 1.146 | 1.276 |
| 1977 | 0.640 | 0.668 | 0.690 | 0.733 | 0.814 | 0.888 | 0.939 | 1.000 | 1.076 | 1.198 |
| 1978 | 0.595 | 0.621 | 0.641 | 0.681 | 0.756 | 0.825 | 0.873 | 0.929 | 1.000 | 1.113 |
| 1979 | 0.534 | 0.558 | 0.576 | 0.612 | 0.679 | 0.741 | 0.784 | 0.835 | 0.898 | 1.000 |
| 1980 | 0.471 | 0.492 | 0.507 | 0.539 | 0.598 | 0.653 | 0.691 | 0.735 | 0.791 | 0.881 |
| 1981 | 0.427 | 0.446 | 0.460 | 0.488 | 0.542 | 0.592 | 0.626 | 0.667 | 0.717 | 0.799 |
| 1982 | 0.402 | 0.420 | 0.433 | 0.460 | 0.511 | 0.558 | 0.590 | 0.628 | 0.676 | 0.752 |
| 1983 | 0.390 | 0.407 | 0.420 | 0.446 | 0.495 | 0.540 | 0.571 | 0.608 | 0.655 | 0.729 |
| 1984 | 0.373 | 0.390 | 0.402 | 0.427 | 0.474 | 0.518 | 0.548 | 0.583 | 0.628 | 0.699 |
| 1985 | 0.361 | 0.376 | 0.388 | 0.413 | 0.458 | 0.500 | 0.529 | 0.563 | 0.606 | 0.675 |
| 1986 | 0.354 | 0.370 | 0.381 | 0.405 | 0.450 | 0.491 | 0.519 | 0.553 | 0.595 | 0.662 |
| 1987 | 0.342 | 0.357 | 0.368 | 0.391 | 0.434 | 0.474 | 0.501 | 0.533 | 0.574 | 0.639 |
| 1988 | 0.328 | 0.342 | 0.353 | 0.375 | 0.417 | 0.455 | 0.481 | 0.512 | 0.551 | 0.614 |
| 1989 | 0.313 | 0.327 | 0.337 | 0.358 | 0.398 | 0.434 | 0.459 | 0.489 | 0.526 | 0.585 |
| 1990 | 0.297 | 0.310 | 0.320 | 0.340 | 0.377 | 0.412 | 0.435 | 0.464 | 0.499 | 0.555 |
| 1991 | 0.285 | 0.297 | 0.307 | 0.326 | 0.362 | 0.395 | 0.418 | 0.445 | 0.479 | 0.533 |
| 1992 | 0.277 | 0.289 | 0.298 | 0.316 | 0.351 | 0.383 | 0.406 | 0.432 | 0.465 | 0.517 |
| 1993 | 0.269 | 0.280 | 0.289 | 0.307 | 0.341 | 0.372 | 0.394 | 0.419 | 0.451 | 0.502 |
| 1994 | 0.262 | 0.273 | 0.282 | 0.300 | 0.333 | 0.363 | 0.384 | 0.409 | 0.440 | 0.490 |
| 1995 | 0.255 | 0.266 | 0.274 | 0.291 | 0.323 | 0.353 | 0.373 | 0.398 | 0.428 | 0.476 |
| 1996 | 0.247 | 0.258 | 0.266 | 0.283 | 0.314 | 0.343 | 0.363 | 0.386 | 0.416 | 0.463 |
| 1997 | 0.242 | 0.252 | 0.260 | 0.277 | 0.307 | 0.335 | 0.355 | 0.378 | 0.406 | 0.452 |
| 1998 | 0.238 | 0.248 | 0.256 | 0.272 | 0.302 | 0.330 | 0.349 | 0.372 | 0.400 | 0.445 |
| 1999 | 0.233 | 0.243 | 0.251 | 0.267 | 0.296 | 0.323 | 0.342 | 0.364 | 0.391 | 0.436 |
| 2000 | 0.225 | 0.235 | 0.243 | 0.258 | 0.286 | 0.312 | 0.330 | 0.352 | 0.379 | 0.422 |
| 2001 | 0.219 | 0.229 | 0.236 | 0.251 | 0.278 | 0.304 | 0.321 | 0.342 | 0.368 | 0.410 |
| 2002 | 0.216 | 0.225 | 0.232 | 0.247 | 0.274 | 0.299 | 0.316 | 0.337 | 0.362 | 0.404 |
| 2003 | 0.211 | 0.220 | 0.227 | 0.241 | 0.268 | 0.292 | 0.309 | 0.329 | 0.354 | 0.395 |
| 2004 | 0.205 | 0.214 | 0.221 | 0.235 | 0.261 | 0.285 | 0.301 | 0.321 | 0.345 | 0.384 |
| 2005 | 0.199 | 0.207 | 0.214 | 0.227 | 0.252 | 0.275 | 0.291 | 0.310 | 0.334 | 0.372 |
| 2006 | 0.192 | 0.201 | 0.207 | 0.220 | 0.245 | 0.267 | 0.282 | 0.301 | 0.323 | 0.360 |
| 2007 | 0.187 | 0.195 | 0.202 | 0.214 | 0.238 | 0.259 | 0.274 | 0.292 | 0.314 | 0.350 |
| 2008 | 0.180 | 0.188 | 0.194 | 0.206 | 0.229 | 0.250 | 0.264 | 0.281 | 0.303 | 0.337 |
| 2009 | 0.181 | 0.189 | 0.195 | 0.207 | 0.230 | 0.251 | 0.265 | 0.282 | 0.304 | 0.338 |
| 2010 | 0.178 | 0.186 | 0.192 | 0.204 | 0.226 | 0.247 | 0.261 | 0.278 | 0.299 | 0.333 |
| 2011 | 0.172 | 0.180 | 0.186 | 0.197 | 0.219 | 0.239 | 0.253 | 0.269 | 0.290 | 0.323 |
| 2012 | 0.169 | 0.176 | 0.182 | 0.193 | 0.215 | 0.234 | 0.248 | 0.264 | 0.284 | 0.316 |
| 2013 | 0.167 | 0.174 | 0.179 | 0.191 | 0.212 | 0.231 | 0.244 | 0.260 | 0.280 | 0.312 |
| 2014 | 0.164 | 0.171 | 0.177 | 0.188 | 0.208 | 0.227 | 0.240 | 0.256 | 0.275 | 0.307 |
| 2015 | 0.164 | 0.171 | 0.176 | 0.187 | 0.208 | 0.227 | 0.240 | 0.256 | 0.275 | 0.306 |
| 2016 | 0.162 | 0.169 | 0.174 | 0.185 | 0.205 | 0.224 | 0.237 | 0.252 | 0.272 | 0.302 |
| 2017 | 0.158 | 0.165 | 0.171 | 0.181 | 0.201 | 0.219 | 0.232 | 0.247 | 0.266 | 0.296 |
| 2018 | 0.155 | 0.161 | 0.166 | 0.177 | 0.196 | 0.214 | 0.227 | 0.241 | 0.260 | 0.289 |
| 2019 | 0.152 | 0.158 | 0.164 | 0.174 | 0.193 | 0.210 | 0.223 | 0.237 | 0.255 | 0.284 |
| 2020 | 0.150 | 0.156 | 0.162 | 0.172 | 0.190 | 0.208 | 0.220 | 0.234 | 0.252 | 0.281 |

Table B.17 (Updated April 2021)
Consumer Price Inflation (CPI) Index (Continued)

| From: | To: | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
| 1970 | 2.124 | 2.343 | 2.487 | 2.567 | 2.678 | 2.773 | 2.825 | 2.928 | 3.049 | 3.196 |
| 1971 | 2.035 | 2.244 | 2.383 | 2.459 | 2.565 | 2.657 | 2.706 | 2.805 | 2.921 | 3.062 |
| 1972 | 1.971 | 2.175 | 2.309 | 2.383 | 2.486 | 2.574 | 2.622 | 2.718 | 2.830 | 2.967 |
| 1973 | 1.856 | 2.047 | 2.173 | 2.243 | 2.340 | 2.423 | 2.468 | 2.559 | 2.664 | 2.793 |
| 1974 | 1.671 | 1.844 | 1.957 | 2.020 | 2.108 | 2.183 | 2.223 | 2.304 | 2.400 | 2.515 |
| 1975 | 1.532 | 1.690 | 1.794 | 1.851 | 1.931 | 2.000 | 2.037 | 2.112 | 2.199 | 2.305 |
| 1976 | 1.448 | 1.598 | 1.696 | 1.750 | 1.826 | 1.891 | 1.926 | 1.996 | 2.079 | 2.179 |
| 1977 | 1.360 | 1.500 | 1.592 | 1.644 | 1.715 | 1.776 | 1.809 | 1.875 | 1.952 | 2.046 |
| 1978 | 1.264 | 1.394 | 1.480 | 1.528 | 1.594 | 1.650 | 1.681 | 1.742 | 1.814 | 1.902 |
| 1979 | 1.135 | 1.252 | 1.329 | 1.372 | 1.431 | 1.482 | 1.510 | 1.565 | 1.629 | 1.708 |
| 1980 | 1.000 | 1.103 | 1.171 | 1.209 | 1.261 | 1.306 | 1.330 | 1.379 | 1.436 | 1.505 |
| 1981 | 0.906 | 1.000 | 1.062 | 1.096 | 1.143 | 1.184 | 1.206 | 1.250 | 1.301 | 1.364 |
| 1982 | 0.854 | 0.942 | 1.000 | 1.032 | 1.077 | 1.115 | 1.136 | 1.177 | 1.226 | 1.285 |
| 1983 | 0.827 | 0.913 | 0.969 | 1.000 | 1.043 | 1.080 | 1.100 | 1.141 | 1.188 | 1.245 |
| 1984 | 0.793 | 0.875 | 0.929 | 0.959 | 1.000 | 1.036 | 1.055 | 1.093 | 1.139 | 1.193 |
| 1985 | 0.766 | 0.845 | 0.897 | 0.926 | 0.966 | 1.000 | 1.019 | 1.056 | 1.099 | 1.152 |
| 1986 | 0.752 | 0.829 | 0.880 | 0.909 | 0.948 | 0.982 | 1.000 | 1.036 | 1.079 | 1.131 |
| 1987 | 0.725 | 0.800 | 0.849 | 0.877 | 0.915 | 0.947 | 0.965 | 1.000 | 1.041 | 1.092 |
| 1988 | 0.697 | 0.768 | 0.816 | 0.842 | 0.878 | 0.910 | 0.926 | 0.960 | 1.000 | 1.048 |
| 1989 | 0.665 | 0.733 | 0.778 | 0.803 | 0.838 | 0.868 | 0.884 | 0.916 | 0.954 | 1.000 |
| 1990 | 0.630 | 0.695 | 0.738 | 0.762 | 0.795 | 0.823 | 0.839 | 0.869 | 0.905 | 0.949 |
| 1991 | 0.605 | 0.667 | 0.709 | 0.731 | 0.763 | 0.790 | 0.805 | 0.834 | 0.869 | 0.910 |
| 1992 | 0.587 | 0.648 | 0.688 | 0.710 | 0.741 | 0.767 | 0.781 | 0.810 | 0.843 | 0.884 |
| 1993 | 0.570 | 0.629 | 0.668 | 0.689 | 0.719 | 0.745 | 0.758 | 0.786 | 0.819 | 0.858 |
| 1994 | 0.556 | 0.613 | 0.651 | 0.672 | 0.701 | 0.726 | 0.740 | 0.767 | 0.798 | 0.837 |
| 1995 | 0.541 | 0.596 | 0.633 | 0.654 | 0.682 | 0.706 | 0.719 | 0.745 | 0.776 | 0.814 |
| 1996 | 0.525 | 0.579 | 0.615 | 0.635 | 0.662 | 0.686 | 0.699 | 0.724 | 0.754 | 0.790 |
| 1997 | 0.513 | 0.566 | 0.601 | 0.621 | 0.647 | 0.670 | 0.683 | 0.708 | 0.737 | 0.773 |
| 1998 | 0.506 | 0.558 | 0.592 | 0.611 | 0.637 | 0.660 | 0.672 | 0.697 | 0.726 | 0.761 |
| 1999 | 0.495 | 0.546 | 0.579 | 0.598 | 0.624 | 0.646 | 0.658 | 0.682 | 0.710 | 0.744 |
| 2000 | 0.479 | 0.528 | 0.560 | 0.578 | 0.603 | 0.625 | 0.636 | 0.660 | 0.687 | 0.720 |
| 2001 | 0.465 | 0.513 | 0.545 | 0.562 | 0.587 | 0.608 | 0.619 | 0.641 | 0.668 | 0.700 |
| 2002 | 0.458 | 0.505 | 0.536 | 0.554 | 0.578 | 0.598 | 0.609 | 0.631 | 0.658 | 0.689 |
| 2003 | 0.448 | 0.494 | 0.524 | 0.541 | 0.565 | 0.585 | 0.596 | 0.617 | 0.643 | 0.674 |
| 2004 | 0.436 | 0.481 | 0.511 | 0.527 | 0.550 | 0.570 | 0.580 | 0.601 | 0.626 | 0.656 |
| 2005 | 0.422 | 0.465 | 0.494 | 0.510 | 0.532 | 0.551 | 0.561 | 0.582 | 0.606 | 0.635 |
| 2006 | 0.409 | 0.451 | 0.479 | 0.494 | 0.515 | 0.534 | 0.544 | 0.563 | 0.587 | 0.615 |
| 2007 | 0.397 | 0.438 | 0.465 | 0.480 | 0.501 | 0.519 | 0.529 | 0.548 | 0.571 | 0.598 |
| 2008 | 0.383 | 0.422 | 0.448 | 0.463 | 0.483 | 0.500 | 0.509 | 0.528 | 0.549 | 0.576 |
| 2009 | 0.384 | 0.424 | 0.450 | 0.464 | 0.484 | 0.502 | 0.511 | 0.530 | 0.551 | 0.578 |
| 2010 | 0.378 | 0.417 | 0.443 | 0.457 | 0.476 | 0.493 | 0.503 | 0.521 | 0.543 | 0.569 |
| 2011 | 0.366 | 0.404 | 0.429 | 0.443 | 0.462 | 0.478 | 0.487 | 0.505 | 0.526 | 0.551 |
| 2012 | 0.359 | 0.396 | 0.420 | 0.434 | 0.453 | 0.469 | 0.477 | 0.495 | 0.515 | 0.540 |
| 2013 | 0.354 | 0.390 | 0.414 | 0.428 | 0.446 | 0.462 | 0.470 | 0.488 | 0.508 | 0.532 |
| 2014 | 0.348 | 0.384 | 0.408 | 0.421 | 0.439 | 0.455 | 0.463 | 0.480 | 0.500 | 0.524 |
| 2015 | 0.348 | 0.384 | 0.407 | 0.420 | 0.438 | 0.454 | 0.462 | 0.479 | 0.499 | 0.523 |
| 2016 | 0.343 | 0.379 | 0.402 | 0.415 | 0.433 | 0.448 | 0.457 | 0.473 | 0.493 | 0.517 |
| 2017 | 0.336 | 0.371 | 0.394 | 0.406 | 0.424 | 0.439 | 0.447 | 0.463 | 0.483 | 0.506 |
| 2018 | 0.328 | 0.362 | 0.384 | 0.397 | 0.414 | 0.429 | 0.436 | 0.452 | 0.471 | 0.494 |
| 2019 | 0.322 | 0.356 | 0.377 | 0.390 | 0.406 | 0.421 | 0.429 | 0.444 | 0.463 | 0.485 |
| 2020 | 0.318 | 0.351 | 0.373 | 0.385 | 0.401 | 0.416 | 0.423 | 0.439 | 0.457 | 0.479 |

Table B.17 (Updated April 2021)
Consumer Price Inflation (CPI) Index (Continued)

| From: | To: | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
| 1970 | 3.369 | 3.510 | 3.616 | 3.724 | 3.820 | 3.928 | 4.044 | 4.137 | 4.201 | 4.294 |
| 1971 | 3.227 | 3.363 | 3.464 | 3.568 | 3.659 | 3.763 | 3.874 | 3.963 | 4.025 | 4.114 |
| 1972 | 3.127 | 3.258 | 3.356 | 3.457 | 3.545 | 3.646 | 3.754 | 3.840 | 3.900 | 3.986 |
| 1973 | 2.944 | 3.068 | 3.160 | 3.255 | 3.338 | 3.432 | 3.534 | 3.615 | 3.671 | 3.752 |
| 1974 | 2.651 | 2.763 | 2.846 | 2.931 | 3.006 | 3.091 | 3.183 | 3.256 | 3.306 | 3.379 |
| 1975 | 2.429 | 2.532 | 2.608 | 2.686 | 2.755 | 2.833 | 2.916 | 2.983 | 3.030 | 3.097 |
| 1976 | 2.297 | 2.394 | 2.466 | 2.540 | 2.605 | 2.678 | 2.757 | 2.821 | 2.865 | 2.928 |
| 1977 | 2.157 | 2.248 | 2.315 | 2.384 | 2.446 | 2.515 | 2.589 | 2.649 | 2.690 | 2.749 |
| 1978 | 2.005 | 2.089 | 2.152 | 2.216 | 2.273 | 2.337 | 2.406 | 2.462 | 2.500 | 2.555 |
| 1979 | 1.800 | 1.876 | 1.933 | 1.990 | 2.041 | 2.099 | 2.161 | 2.211 | 2.245 | 2.295 |
| 1980 | 1.586 | 1.653 | 1.703 | 1.754 | 1.799 | 1.850 | 1.904 | 1.948 | 1.978 | 2.022 |
| 1981 | 1.438 | 1.498 | 1.543 | 1.590 | 1.630 | 1.677 | 1.726 | 1.766 | 1.793 | 1.833 |
| 1982 | 1.354 | 1.411 | 1.454 | 1.497 | 1.536 | 1.579 | 1.626 | 1.663 | 1.689 | 1.726 |
| 1983 | 1.312 | 1.367 | 1.409 | 1.451 | 1.488 | 1.530 | 1.575 | 1.611 | 1.637 | 1.673 |
| 1984 | 1.258 | 1.311 | 1.350 | 1.391 | 1.426 | 1.467 | 1.510 | 1.545 | 1.569 | 1.603 |
| 1985 | 1.215 | 1.266 | 1.304 | 1.343 | 1.377 | 1.416 | 1.458 | 1.492 | 1.515 | 1.548 |
| 1986 | 1.193 | 1.243 | 1.280 | 1.318 | 1.352 | 1.391 | 1.432 | 1.464 | 1.487 | 1.520 |
| 1987 | 1.151 | 1.199 | 1.235 | 1.272 | 1.305 | 1.342 | 1.381 | 1.413 | 1.435 | 1.467 |
| 1988 | 1.105 | 1.151 | 1.186 | 1.221 | 1.253 | 1.288 | 1.326 | 1.357 | 1.378 | 1.408 |
| 1989 | 1.054 | 1.098 | 1.131 | 1.165 | 1.195 | 1.229 | 1.265 | 1.294 | 1.315 | 1.344 |
| 1990 | 1.000 | 1.042 | 1.073 | 1.106 | 1.134 | 1.166 | 1.200 | 1.228 | 1.247 | 1.275 |
| 1991 | 0.960 | 1.000 | 1.030 | 1.061 | 1.088 | 1.119 | 1.152 | 1.178 | 1.197 | 1.223 |
| 1992 | 0.932 | 0.971 | 1.000 | 1.030 | 1.056 | 1.086 | 1.118 | 1.144 | 1.162 | 1.187 |
| 1993 | 0.904 | 0.943 | 0.971 | 1.000 | 1.026 | 1.055 | 1.086 | 1.111 | 1.128 | 1.153 |
| 1994 | 0.882 | 0.919 | 0.947 | 0.975 | 1.000 | 1.028 | 1.059 | 1.083 | 1.100 | 1.124 |
| 1995 | 0.858 | 0.894 | 0.921 | 0.948 | 0.972 | 1.000 | 1.030 | 1.053 | 1.070 | 1.093 |
| 1996 | 0.833 | 0.868 | 0.894 | 0.921 | 0.945 | 0.971 | 1.000 | 1.023 | 1.039 | 1.062 |
| 1997 | 0.814 | 0.849 | 0.874 | 0.900 | 0.923 | 0.950 | 0.978 | 1.000 | 1.016 | 1.038 |
| 1998 | 0.802 | 0.836 | 0.861 | 0.887 | 0.909 | 0.935 | 0.963 | 0.985 | 1.000 | 1.022 |
| 1999 | 0.785 | 0.818 | 0.842 | 0.867 | 0.890 | 0.915 | 0.942 | 0.963 | 0.978 | 1.000 |
| 2000 | 0.759 | 0.791 | 0.815 | 0.839 | 0.861 | 0.885 | 0.911 | 0.932 | 0.947 | 0.967 |
| 2001 | 0.738 | 0.769 | 0.792 | 0.816 | 0.837 | 0.861 | 0.886 | 0.906 | 0.920 | 0.941 |
| 2002 | 0.727 | 0.757 | 0.780 | 0.803 | 0.824 | 0.847 | 0.872 | 0.892 | 0.906 | 0.926 |
| 2003 | 0.710 | 0.740 | 0.763 | 0.785 | 0.805 | 0.828 | 0.853 | 0.872 | 0.886 | 0.905 |
| 2004 | 0.692 | 0.721 | 0.743 | 0.765 | 0.785 | 0.807 | 0.831 | 0.850 | 0.863 | 0.882 |
| 2005 | 0.669 | 0.697 | 0.718 | 0.740 | 0.759 | 0.780 | 0.803 | 0.822 | 0.835 | 0.853 |
| 2006 | 0.648 | 0.676 | 0.696 | 0.717 | 0.735 | 0.756 | 0.778 | 0.796 | 0.809 | 0.826 |
| 2007 | 0.630 | 0.657 | 0.677 | 0.697 | 0.715 | 0.735 | 0.757 | 0.774 | 0.786 | 0.804 |
| 2008 | 0.607 | 0.633 | 0.652 | 0.671 | 0.688 | 0.708 | 0.729 | 0.745 | 0.757 | 0.774 |
| 2009 | 0.609 | 0.635 | 0.654 | 0.674 | 0.691 | 0.710 | 0.731 | 0.748 | 0.760 | 0.777 |
| 2010 | 0.599 | 0.625 | 0.643 | 0.663 | 0.680 | 0.699 | 0.720 | 0.736 | 0.748 | 0.764 |
| 2011 | 0.581 | 0.605 | 0.624 | 0.642 | 0.659 | 0.678 | 0.698 | 0.714 | 0.725 | 0.741 |
| 2012 | 0.569 | 0.593 | 0.611 | 0.629 | 0.645 | 0.664 | 0.683 | 0.699 | 0.710 | 0.726 |
| 2013 | 0.561 | 0.585 | 0.602 | 0.620 | 0.636 | 0.654 | 0.674 | 0.689 | 0.700 | 0.715 |
| 2014 | 0.552 | 0.575 | 0.593 | 0.610 | 0.626 | 0.644 | 0.663 | 0.678 | 0.689 | 0.704 |
| 2015 | 0.551 | 0.575 | 0.592 | 0.610 | 0.625 | 0.643 | 0.662 | 0.677 | 0.688 | 0.703 |
| 2016 | 0.545 | 0.567 | 0.585 | 0.602 | 0.617 | 0.635 | 0.654 | 0.669 | 0.679 | 0.694 |
| 2017 | 0.533 | 0.556 | 0.572 | 0.590 | 0.605 | 0.622 | 0.640 | 0.655 | 0.665 | 0.680 |
| 2018 | 0.520 | 0.542 | 0.559 | 0.575 | 0.590 | 0.607 | 0.625 | 0.639 | 0.649 | 0.663 |
| 2019 | 0.511 | 0.533 | 0.549 | 0.565 | 0.580 | 0.596 | 0.614 | 0.628 | 0.638 | 0.652 |
| 2020 | 0.505 | 0.526 | 0.542 | 0.558 | 0.573 | 0.589 | 0.606 | 0.620 | 0.630 | 0.644 |

Table B.17 (Updated April 2021)
Consumer Price Inflation (CPI) Index (Continued)

| From: | To: | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| 1970 | 4.438 | 4.564 | 4.637 | 4.742 | 4.869 | 5.034 | 5.196 | 5.344 | 5.549 | 5.529 |
| 1971 | 4.252 | 4.373 | 4.442 | 4.543 | 4.664 | 4.822 | 4.978 | 5.120 | 5.316 | 5.297 |
| 1972 | 4.120 | 4.237 | 4.304 | 4.402 | 4.519 | 4.672 | 4.823 | 4.960 | 5.151 | 5.132 |
| 1973 | 3.878 | 3.989 | 4.052 | 4.144 | 4.255 | 4.399 | 4.541 | 4.670 | 4.849 | 4.832 |
| 1974 | 3.493 | 3.592 | 3.649 | 3.732 | 3.832 | 3.961 | 4.089 | 4.206 | 4.367 | 4.352 |
| 1975 | 3.201 | 3.292 | 3.344 | 3.420 | 3.511 | 3.630 | 3.747 | 3.854 | 4.002 | 3.988 |
| 1976 | 3.026 | 3.112 | 3.162 | 3.234 | 3.320 | 3.432 | 3.543 | 3.644 | 3.784 | 3.770 |
| 1977 | 2.842 | 2.922 | 2.969 | 3.036 | 3.117 | 3.223 | 3.327 | 3.421 | 3.553 | 3.540 |
| 1978 | 2.641 | 2.716 | 2.759 | 2.822 | 2.897 | 2.995 | 3.092 | 3.180 | 3.302 | 3.290 |
| 1979 | 2.372 | 2.439 | 2.478 | 2.534 | 2.602 | 2.690 | 2.777 | 2.856 | 2.966 | 2.955 |
| 1980 | 2.090 | 2.149 | 2.183 | 2.233 | 2.292 | 2.370 | 2.447 | 2.516 | 2.613 | 2.604 |
| 1981 | 1.894 | 1.948 | 1.979 | 2.024 | 2.078 | 2.149 | 2.218 | 2.281 | 2.369 | 2.360 |
| 1982 | 1.784 | 1.835 | 1.864 | 1.907 | 1.958 | 2.024 | 2.089 | 2.149 | 2.231 | 2.223 |
| 1983 | 1.729 | 1.778 | 1.806 | 1.847 | 1.897 | 1.961 | 2.024 | 2.082 | 2.162 | 2.154 |
| 1984 | 1.657 | 1.705 | 1.731 | 1.771 | 1.818 | 1.880 | 1.940 | 1.996 | 2.072 | 2.065 |
| 1985 | 1.600 | 1.646 | 1.672 | 1.710 | 1.756 | 1.815 | 1.874 | 1.927 | 2.001 | 1.994 |
| 1986 | 1.571 | 1.616 | 1.641 | 1.679 | 1.724 | 1.782 | 1.839 | 1.892 | 1.964 | 1.957 |
| 1987 | 1.516 | 1.559 | 1.584 | 1.620 | 1.663 | 1.719 | 1.775 | 1.825 | 1.895 | 1.889 |
| 1988 | 1.456 | 1.497 | 1.521 | 1.555 | 1.597 | 1.651 | 1.704 | 1.753 | 1.820 | 1.813 |
| 1989 | 1.389 | 1.428 | 1.451 | 1.484 | 1.523 | 1.575 | 1.626 | 1.672 | 1.736 | 1.730 |
| 1990 | 1.318 | 1.355 | 1.376 | 1.408 | 1.445 | 1.494 | 1.542 | 1.586 | 1.647 | 1.641 |
| 1991 | 1.264 | 1.300 | 1.321 | 1.351 | 1.387 | 1.434 | 1.480 | 1.522 | 1.581 | 1.575 |
| 1992 | 1.227 | 1.262 | 1.282 | 1.311 | 1.346 | 1.392 | 1.437 | 1.478 | 1.535 | 1.529 |
| 1993 | 1.192 | 1.226 | 1.245 | 1.273 | 1.307 | 1.352 | 1.395 | 1.435 | 1.490 | 1.485 |
| 1994 | 1.162 | 1.195 | 1.214 | 1.242 | 1.275 | 1.318 | 1.360 | 1.399 | 1.453 | 1.448 |
| 1995 | 1.130 | 1.162 | 1.180 | 1.207 | 1.240 | 1.281 | 1.323 | 1.360 | 1.413 | 1.408 |
| 1996 | 1.098 | 1.129 | 1.147 | 1.173 | 1.204 | 1.245 | 1.285 | 1.321 | 1.372 | 1.367 |
| 1997 | 1.073 | 1.103 | 1.121 | 1.146 | 1.177 | 1.217 | 1.256 | 1.292 | 1.341 | 1.337 |
| 1998 | 1.056 | 1.087 | 1.104 | 1.129 | 1.159 | 1.198 | 1.237 | 1.272 | 1.321 | 1.316 |
| 1999 | 1.034 | 1.063 | 1.080 | 1.104 | 1.134 | 1.172 | 1.210 | 1.245 | 1.292 | 1.288 |
| 2000 | 1.000 | 1.028 | 1.045 | 1.069 | 1.097 | 1.134 | 1.171 | 1.204 | 1.250 | 1.246 |
| 2001 | 0.972 | 1.000 | 1.016 | 1.039 | 1.067 | 1.103 | 1.138 | 1.171 | 1.216 | 1.211 |
| 2002 | 0.957 | 0.984 | 1.000 | 1.023 | 1.050 | 1.086 | 1.121 | 1.153 | 1.197 | 1.193 |
| 2003 | 0.936 | 0.963 | 0.978 | 1.000 | 1.027 | 1.061 | 1.096 | 1.127 | 1.170 | 1.166 |
| 2004 | 0.912 | 0.938 | 0.952 | 0.974 | 1.000 | 1.034 | 1.067 | 1.098 | 1.140 | 1.136 |
| 2005 | 0.882 | 0.907 | 0.921 | 0.942 | 0.967 | 1.000 | 1.032 | 1.062 | 1.102 | 1.098 |
| 2006 | 0.854 | 0.878 | 0.892 | 0.913 | 0.937 | 0.969 | 1.000 | 1.028 | 1.068 | 1.064 |
| 2007 | 0.831 | 0.854 | 0.868 | 0.887 | 0.911 | 0.942 | 0.972 | 1.000 | 1.038 | 1.035 |
| 2008 | 0.800 | 0.823 | 0.836 | 0.855 | 0.877 | 0.907 | 0.936 | 0.963 | 1.000 | 0.996 |
| 2009 | 0.803 | 0.825 | 0.839 | 0.858 | 0.881 | 0.910 | 0.940 | 0.966 | 1.004 | 1.000 |
| 2010 | 0.790 | 0.812 | 0.825 | 0.844 | 0.866 | 0.896 | 0.925 | 0.951 | 0.987 | 0.984 |
| 2011 | 0.766 | 0.787 | 0.800 | 0.818 | 0.840 | 0.868 | 0.896 | 0.922 | 0.957 | 0.954 |
| 2012 | 0.750 | 0.771 | 0.784 | 0.801 | 0.823 | 0.851 | 0.878 | 0.903 | 0.938 | 0.934 |
| 2013 | 0.739 | 0.760 | 0.772 | 0.790 | 0.811 | 0.838 | 0.865 | 0.890 | 0.924 | 0.921 |
| 2014 | 0.727 | 0.748 | 0.760 | 0.777 | 0.798 | 0.825 | 0.852 | 0.876 | 0.909 | 0.906 |
| 2015 | 0.727 | 0.747 | 0.759 | 0.776 | 0.797 | 0.824 | 0.851 | 0.875 | 0.908 | 0.905 |
| 2016 | 0.717 | 0.738 | 0.750 | 0.767 | 0.787 | 0.814 | 0.840 | 0.864 | 0.897 | 0.894 |
| 2017 | 0.703 | 0.723 | 0.734 | 0.751 | 0.771 | 0.797 | 0.822 | 0.846 | 0.878 | 0.875 |
| 2018 | 0.686 | 0.705 | 0.716 | 0.733 | 0.752 | 0.778 | 0.803 | 0.826 | 0.857 | 0.854 |
| 2019 | 0.674 | 0.693 | 0.704 | 0.720 | 0.739 | 0.764 | 0.789 | 0.811 | 0.842 | 0.839 |
| 2020 | 0.665 | 0.684 | 0.695 | 0.711 | 0.730 | 0.755 | 0.779 | 0.801 | 0.832 | 0.829 |

Table B.17 (Updated April 2021)
Consumer Price Inflation (CPI) Index (Continued)

| From: | To: | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| 1970 | 5.620 | 5.797 | 5.917 | 6.004 | 6.101 | 6.109 | 6.186 | 6.318 | 6.472 | 6.589 | 6.670 |
| 1971 | 5.384 | 5.554 | 5.669 | 5.752 | 5.845 | 5.852 | 5.926 | 6.052 | 6.200 | 6.313 | 6.390 |
| 1972 | 5.217 | 5.381 | 5.493 | 5.573 | 5.664 | 5.670 | 5.742 | 5.864 | 6.007 | 6.116 | 6.192 |
| 1973 | 4.911 | 5.066 | 5.171 | 5.247 | 5.332 | 5.338 | 5.406 | 5.521 | 5.656 | 5.758 | 5.829 |
| 1974 | 4.423 | 4.563 | 4.657 | 4.725 | 4.802 | 4.808 | 4.868 | 4.972 | 5.093 | 5.186 | 5.250 |
| 1975 | 4.053 | 4.181 | 4.268 | 4.330 | 4.400 | 4.406 | 4.461 | 4.556 | 4.667 | 4.752 | 4.811 |
| 1976 | 3.832 | 3.953 | 4.035 | 4.094 | 4.161 | 4.166 | 4.218 | 4.308 | 4.413 | 4.493 | 4.549 |
| 1977 | 3.598 | 3.712 | 3.789 | 3.844 | 3.907 | 3.911 | 3.961 | 4.045 | 4.144 | 4.219 | 4.271 |
| 1978 | 3.344 | 3.450 | 3.521 | 3.573 | 3.631 | 3.635 | 3.681 | 3.760 | 3.851 | 3.921 | 3.969 |
| 1979 | 3.004 | 3.098 | 3.162 | 3.209 | 3.261 | 3.265 | 3.306 | 3.376 | 3.459 | 3.521 | 3.565 |
| 1980 | 2.646 | 2.730 | 2.786 | 2.827 | 2.873 | 2.876 | 2.913 | 2.975 | 3.047 | 3.103 | 3.141 |
| 1981 | 2.399 | 2.475 | 2.526 | 2.563 | 2.604 | 2.607 | 2.640 | 2.697 | 2.762 | 2.813 | 2.847 |
| 1982 | 2.260 | 2.331 | 2.379 | 2.414 | 2.453 | 2.456 | 2.487 | 2.540 | 2.602 | 2.649 | 2.682 |
| 1983 | 2.189 | 2.258 | 2.305 | 2.339 | 2.377 | 2.380 | 2.410 | 2.461 | 2.521 | 2.567 | 2.599 |
| 1984 | 2.099 | 2.165 | 2.210 | 2.242 | 2.278 | 2.281 | 2.310 | 2.359 | 2.417 | 2.461 | 2.491 |
| 1985 | 2.027 | 2.091 | 2.134 | 2.165 | 2.200 | 2.203 | 2.231 | 2.278 | 2.334 | 2.376 | 2.405 |
| 1986 | 1.990 | 2.052 | 2.095 | 2.126 | 2.160 | 2.163 | 2.190 | 2.236 | 2.291 | 2.333 | 2.361 |
| 1987 | 1.920 | 1.980 | 2.021 | 2.051 | 2.084 | 2.086 | 2.113 | 2.158 | 2.210 | 2.251 | 2.278 |
| 1988 | 1.843 | 1.901 | 1.941 | 1.969 | 2.001 | 2.004 | 2.029 | 2.072 | 2.123 | 2.161 | 2.188 |
| 1989 | 1.759 | 1.814 | 1.852 | 1.879 | 1.909 | 1.911 | 1.936 | 1.977 | 2.025 | 2.062 | 2.087 |
| 1990 | 1.668 | 1.721 | 1.757 | 1.782 | 1.811 | 1.813 | 1.836 | 1.875 | 1.921 | 1.956 | 1.980 |
| 1991 | 1.601 | 1.652 | 1.686 | 1.710 | 1.738 | 1.740 | 1.762 | 1.800 | 1.844 | 1.877 | 1.900 |
| 1992 | 1.554 | 1.603 | 1.636 | 1.660 | 1.687 | 1.689 | 1.711 | 1.747 | 1.790 | 1.822 | 1.845 |
| 1993 | 1.509 | 1.557 | 1.589 | 1.612 | 1.638 | 1.640 | 1.661 | 1.696 | 1.738 | 1.769 | 1.791 |
| 1994 | 1.471 | 1.518 | 1.549 | 1.572 | 1.597 | 1.599 | 1.619 | 1.654 | 1.694 | 1.725 | 1.746 |
| 1995 | 1.431 | 1.476 | 1.507 | 1.529 | 1.553 | 1.555 | 1.575 | 1.608 | 1.648 | 1.678 | 1.698 |
| 1996 | 1.390 | 1.434 | 1.463 | 1.485 | 1.509 | 1.511 | 1.530 | 1.562 | 1.600 | 1.629 | 1.650 |
| 1997 | 1.359 | 1.401 | 1.430 | 1.451 | 1.475 | 1.477 | 1.495 | 1.527 | 1.565 | 1.593 | 1.613 |
| 1998 | 1.338 | 1.380 | 1.409 | 1.429 | 1.452 | 1.454 | 1.472 | 1.504 | 1.541 | 1.568 | 1.588 |
| 1999 | 1.309 | 1.350 | 1.378 | 1.398 | 1.421 | 1.423 | 1.441 | 1.471 | 1.507 | 1.535 | 1.553 |
| 2000 | 1.266 | 1.306 | 1.333 | 1.353 | 1.375 | 1.376 | 1.394 | 1.423 | 1.458 | 1.485 | 1.503 |
| 2001 | 1.231 | 1.270 | 1.296 | 1.315 | 1.337 | 1.338 | 1.355 | 1.384 | 1.418 | 1.444 | 1.461 |
| 2002 | 1.212 | 1.250 | 1.276 | 1.295 | 1.316 | 1.317 | 1.334 | 1.363 | 1.396 | 1.421 | 1.439 |
| 2003 | 1.185 | 1.222 | 1.248 | 1.266 | 1.287 | 1.288 | 1.304 | 1.332 | 1.365 | 1.389 | 1.407 |
| 2004 | 1.154 | 1.191 | 1.215 | 1.233 | 1.253 | 1.255 | 1.271 | 1.298 | 1.329 | 1.353 | 1.370 |
| 2005 | 1.117 | 1.152 | 1.176 | 1.193 | 1.212 | 1.214 | 1.229 | 1.255 | 1.286 | 1.309 | 1.325 |
| 2006 | 1.082 | 1.116 | 1.139 | 1.156 | 1.174 | 1.176 | 1.191 | 1.216 | 1.246 | 1.268 | 1.284 |
| 2007 | 1.052 | 1.085 | 1.107 | 1.124 | 1.142 | 1.143 | 1.158 | 1.182 | 1.211 | 1.233 | 1.248 |
| 2008 | 1.013 | 1.045 | 1.066 | 1.082 | 1.100 | 1.101 | 1.115 | 1.138 | 1.166 | 1.187 | 1.202 |
| 2009 | 1.016 | 1.048 | 1.070 | 1.086 | 1.103 | 1.105 | 1.119 | 1.143 | 1.170 | 1.192 | 1.206 |
| 2010 | 1.000 | 1.032 | 1.053 | 1.068 | 1.086 | 1.087 | 1.101 | 1.124 | 1.152 | 1.172 | 1.187 |
| 2011 | 0.969 | 1.000 | 1.021 | 1.036 | 1.052 | 1.054 | 1.067 | 1.090 | 1.116 | 1.137 | 1.151 |
| 2012 | 0.950 | 0.980 | 1.000 | 1.015 | 1.031 | 1.032 | 1.045 | 1.068 | 1.094 | 1.114 | 1.127 |
| 2013 | 0.936 | 0.966 | 0.986 | 1.000 | 1.016 | 1.017 | 1.030 | 1.052 | 1.078 | 1.097 | 1.111 |
| 2014 | 0.921 | 0.950 | 0.970 | 0.984 | 1.000 | 1.001 | 1.014 | 1.035 | 1.061 | 1.080 | 1.093 |
| 2015 | 0.920 | 0.949 | 0.969 | 0.983 | 0.999 | 1.000 | 1.013 | 1.034 | 1.059 | 1.079 | 1.092 |
| 2016 | 0.909 | 0.937 | 0.957 | 0.971 | 0.986 | 0.988 | 1.000 | 1.021 | 1.046 | 1.065 | 1.078 |
| 2017 | 0.890 | 0.918 | 0.937 | 0.950 | 0.966 | 0.967 | 0.979 | 1.000 | 1.024 | 1.043 | 1.056 |
| 2018 | 0.868 | 0.896 | 0.914 | 0.928 | 0.943 | 0.944 | 0.956 | 0.976 | 1.000 | 1.018 | 1.031 |
| 2019 | 0.853 | 0.880 | 0.898 | 0.911 | 0.926 | 0.927 | 0.939 | 0.959 | 0.982 | 1.000 | 1.012 |
| 2020 | 0.843 | 0.869 | 0.887 | 0.900 | 0.915 | 0.916 | 0.927 | 0.947 | 0.970 | 0.988 | 1.000 |

Source:

U.S. Bureau of Labor Statistics.

Table B.18 (Updated April 2021)
Gross National Product Implicit Price Deflator

| From: | To: | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
| 1970 | 1.000 | 1.051 | 1.097 | 1.156 | 1.260 | 1.377 | 1.453 | 1.543 | 1.651 | 1.788 |
| 1971 | 0.952 | 1.000 | 1.043 | 1.100 | 1.199 | 1.310 | 1.382 | 1.468 | 1.571 | 1.701 |
| 1972 | 0.912 | 0.958 | 1.000 | 1.055 | 1.149 | 1.256 | 1.325 | 1.407 | 1.506 | 1.630 |
| 1973 | 0.865 | 0.909 | 0.948 | 1.000 | 1.090 | 1.191 | 1.256 | 1.334 | 1.428 | 1.546 |
| 1974 | 0.794 | 0.834 | 0.870 | 0.918 | 1.000 | 1.093 | 1.153 | 1.224 | 1.311 | 1.419 |
| 1975 | 0.726 | 0.763 | 0.796 | 0.840 | 0.915 | 1.000 | 1.055 | 1.121 | 1.199 | 1.298 |
| 1976 | 0.688 | 0.723 | 0.755 | 0.796 | 0.867 | 0.948 | 1.000 | 1.062 | 1.137 | 1.231 |
| 1977 | 0.648 | 0.681 | 0.711 | 0.749 | 0.817 | 0.892 | 0.942 | 1.000 | 1.070 | 1.159 |
| 1978 | 0.606 | 0.636 | 0.664 | 0.700 | 0.763 | 0.834 | 0.880 | 0.934 | 1.000 | 1.083 |
| 1979 | 0.559 | 0.588 | 0.613 | 0.647 | 0.705 | 0.770 | 0.813 | 0.863 | 0.924 | 1.000 |
| 1980 | 0.513 | 0.539 | 0.563 | 0.593 | 0.647 | 0.707 | 0.745 | 0.792 | 0.847 | 0.917 |
| 1981 | 0.469 | 0.493 | 0.515 | 0.543 | 0.591 | 0.646 | 0.682 | 0.724 | 0.775 | 0.839 |
| 1982 | 0.442 | 0.464 | 0.485 | 0.511 | 0.557 | 0.608 | 0.642 | 0.682 | 0.730 | 0.790 |
| 1983 | 0.425 | 0.447 | 0.466 | 0.492 | 0.536 | 0.585 | 0.617 | 0.656 | 0.702 | 0.760 |
| 1984 | 0.411 | 0.431 | 0.450 | 0.475 | 0.517 | 0.565 | 0.596 | 0.633 | 0.678 | 0.734 |
| 1985 | 0.398 | 0.418 | 0.436 | 0.460 | 0.501 | 0.548 | 0.578 | 0.614 | 0.657 | 0.711 |
| 1986 | 0.390 | 0.410 | 0.428 | 0.451 | 0.491 | 0.537 | 0.566 | 0.602 | 0.644 | 0.697 |
| 1987 | 0.380 | 0.399 | 0.417 | 0.440 | 0.479 | 0.523 | 0.552 | 0.586 | 0.628 | 0.679 |
| 1988 | 0.367 | 0.386 | 0.403 | 0.425 | 0.463 | 0.506 | 0.533 | 0.567 | 0.606 | 0.656 |
| 1989 | 0.353 | 0.371 | 0.388 | 0.409 | 0.445 | 0.487 | 0.513 | 0.545 | 0.584 | 0.632 |
| 1990 | 0.341 | 0.358 | 0.374 | 0.394 | 0.429 | 0.469 | 0.495 | 0.526 | 0.563 | 0.609 |
| 1991 | 0.330 | 0.346 | 0.362 | 0.381 | 0.415 | 0.454 | 0.479 | 0.509 | 0.544 | 0.589 |
| 1992 | 0.322 | 0.339 | 0.353 | 0.373 | 0.406 | 0.444 | 0.468 | 0.497 | 0.532 | 0.576 |
| 1993 | 0.315 | 0.331 | 0.345 | 0.364 | 0.397 | 0.434 | 0.457 | 0.486 | 0.520 | 0.563 |
| 1994 | 0.308 | 0.324 | 0.338 | 0.357 | 0.389 | 0.425 | 0.448 | 0.476 | 0.509 | 0.551 |
| 1995 | 0.302 | 0.317 | 0.331 | 0.349 | 0.381 | 0.416 | 0.439 | 0.466 | 0.499 | 0.540 |
| 1996 | 0.297 | 0.312 | 0.325 | 0.343 | 0.374 | 0.408 | 0.431 | 0.458 | 0.490 | 0.530 |
| 1997 | 0.292 | 0.306 | 0.320 | 0.337 | 0.367 | 0.401 | 0.424 | 0.450 | 0.481 | 0.521 |
| 1998 | 0.288 | 0.303 | 0.316 | 0.334 | 0.363 | 0.397 | 0.419 | 0.445 | 0.476 | 0.516 |
| 1999 | 0.284 | 0.299 | 0.312 | 0.329 | 0.358 | 0.392 | 0.413 | 0.439 | 0.470 | 0.508 |
| 2000 | 0.278 | 0.292 | 0.305 | 0.322 | 0.350 | 0.383 | 0.404 | 0.429 | 0.459 | 0.497 |
| 2001 | 0.272 | 0.286 | 0.298 | 0.314 | 0.343 | 0.374 | 0.395 | 0.419 | 0.449 | 0.486 |
| 2002 | 0.268 | 0.281 | 0.294 | 0.310 | 0.337 | 0.369 | 0.389 | 0.413 | 0.442 | 0.479 |
| 2003 | 0.262 | 0.276 | 0.288 | 0.303 | 0.331 | 0.361 | 0.381 | 0.405 | 0.433 | 0.469 |
| 2004 | 0.255 | 0.268 | 0.280 | 0.295 | 0.322 | 0.352 | 0.371 | 0.394 | 0.422 | 0.457 |
| 2005 | 0.248 | 0.260 | 0.271 | 0.286 | 0.312 | 0.341 | 0.360 | 0.382 | 0.409 | 0.442 |
| 2006 | 0.240 | 0.252 | 0.263 | 0.278 | 0.303 | 0.331 | 0.349 | 0.370 | 0.397 | 0.429 |
| 2007 | 0.234 | 0.246 | 0.256 | 0.270 | 0.295 | 0.322 | 0.340 | 0.361 | 0.386 | 0.418 |
| 2008 | 0.229 | 0.241 | 0.252 | 0.265 | 0.289 | 0.316 | 0.333 | 0.354 | 0.379 | 0.410 |
| 2009 | 0.228 | 0.239 | 0.250 | 0.263 | 0.287 | 0.313 | 0.331 | 0.351 | 0.376 | 0.407 |
| 2010 | 0.225 | 0.236 | 0.246 | 0.260 | 0.283 | 0.309 | 0.326 | 0.347 | 0.371 | 0.402 |
| 2011 | 0.220 | 0.232 | 0.242 | 0.255 | 0.278 | 0.303 | 0.320 | 0.340 | 0.364 | 0.394 |
| 2012 | 0.217 | 0.228 | 0.237 | 0.250 | 0.273 | 0.298 | 0.315 | 0.334 | 0.358 | 0.387 |
| 2013 | 0.213 | 0.224 | 0.234 | 0.247 | 0.269 | 0.294 | 0.310 | 0.329 | 0.352 | 0.381 |
| 2014 | 0.210 | 0.220 | 0.230 | 0.243 | 0.264 | 0.289 | 0.305 | 0.324 | 0.346 | 0.375 |
| 2015 | 0.207 | 0.217 | 0.226 | 0.239 | 0.260 | 0.284 | 0.300 | 0.319 | 0.341 | 0.369 |
| 2016 | 0.204 | 0.214 | 0.224 | 0.236 | 0.257 | 0.281 | 0.296 | 0.315 | 0.337 | 0.365 |
| 2017 | 0.200 | 0.211 | 0.220 | 0.232 | 0.252 | 0.276 | 0.291 | 0.309 | 0.331 | 0.358 |
| 2018 | 0.196 | 0.206 | 0.215 | 0.227 | 0.247 | 0.270 | 0.285 | 0.303 | 0.324 | 0.351 |
| 2019 | 0.193 | 0.203 | 0.211 | 0.223 | 0.243 | 0.265 | 0.280 | 0.298 | 0.318 | 0.345 |
| 2020 | 0.191 | 0.200 | 0.209 | 0.220 | 0.240 | 0.262 | 0.277 | 0.294 | 0.315 | 0.341 |

Table B.18 (Updated April 2021)
Gross National Product Implicit Price Deflator (Continued)

| From: | To: | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
| 1970 | 1.949 | 2.131 | 2.263 | 2.353 | 2.436 | 2.514 | 2.565 | 2.631 | 2.723 | 2.830 |
| 1971 | 1.854 | 2.028 | 2.153 | 2.239 | 2.318 | 2.392 | 2.441 | 2.504 | 2.591 | 2.693 |
| 1972 | 1.777 | 1.943 | 2.064 | 2.145 | 2.222 | 2.293 | 2.339 | 2.399 | 2.484 | 2.580 |
| 1973 | 1.685 | 1.843 | 1.957 | 2.034 | 2.107 | 2.174 | 2.218 | 2.275 | 2.355 | 2.447 |
| 1974 | 1.547 | 1.691 | 1.796 | 1.867 | 1.933 | 1.995 | 2.036 | 2.088 | 2.161 | 2.246 |
| 1975 | 1.415 | 1.548 | 1.644 | 1.709 | 1.769 | 1.826 | 1.863 | 1.911 | 1.978 | 2.055 |
| 1976 | 1.341 | 1.467 | 1.558 | 1.619 | 1.677 | 1.731 | 1.766 | 1.811 | 1.875 | 1.948 |
| 1977 | 1.263 | 1.381 | 1.467 | 1.525 | 1.579 | 1.629 | 1.662 | 1.705 | 1.765 | 1.834 |
| 1978 | 1.180 | 1.290 | 1.370 | 1.425 | 1.475 | 1.522 | 1.553 | 1.593 | 1.649 | 1.714 |
| 1979 | 1.090 | 1.192 | 1.266 | 1.316 | 1.363 | 1.406 | 1.435 | 1.472 | 1.523 | 1.583 |
| 1980 | 1.000 | 1.093 | 1.161 | 1.207 | 1.250 | 1.290 | 1.316 | 1.350 | 1.398 | 1.452 |
| 1981 | 0.915 | 1.000 | 1.062 | 1.104 | 1.143 | 1.180 | 1.204 | 1.235 | 1.278 | 1.328 |
| 1982 | 0.861 | 0.942 | 1.000 | 1.040 | 1.076 | 1.111 | 1.133 | 1.163 | 1.203 | 1.250 |
| 1983 | 0.828 | 0.906 | 0.962 | 1.000 | 1.035 | 1.069 | 1.090 | 1.118 | 1.158 | 1.203 |
| 1984 | 0.800 | 0.875 | 0.929 | 0.966 | 1.000 | 1.032 | 1.053 | 1.080 | 1.118 | 1.162 |
| 1985 | 0.775 | 0.848 | 0.900 | 0.936 | 0.969 | 1.000 | 1.020 | 1.047 | 1.083 | 1.126 |
| 1986 | 0.760 | 0.831 | 0.882 | 0.917 | 0.950 | 0.980 | 1.000 | 1.026 | 1.062 | 1.103 |
| 1987 | 0.741 | 0.810 | 0.860 | 0.894 | 0.926 | 0.956 | 0.975 | 1.000 | 1.035 | 1.075 |
| 1988 | 0.716 | 0.782 | 0.831 | 0.864 | 0.895 | 0.923 | 0.942 | 0.966 | 1.000 | 1.039 |
| 1989 | 0.689 | 0.753 | 0.800 | 0.831 | 0.861 | 0.888 | 0.906 | 0.930 | 0.962 | 1.000 |
| 1990 | 0.664 | 0.726 | 0.771 | 0.802 | 0.830 | 0.857 | 0.874 | 0.897 | 0.928 | 0.964 |
| 1991 | 0.643 | 0.703 | 0.746 | 0.776 | 0.803 | 0.829 | 0.846 | 0.867 | 0.898 | 0.933 |
| 1992 | 0.628 | 0.687 | 0.730 | 0.758 | 0.785 | 0.810 | 0.827 | 0.848 | 0.878 | 0.912 |
| 1993 | 0.614 | 0.671 | 0.713 | 0.741 | 0.767 | 0.792 | 0.808 | 0.828 | 0.858 | 0.891 |
| 1994 | 0.601 | 0.657 | 0.698 | 0.725 | 0.751 | 0.775 | 0.791 | 0.811 | 0.840 | 0.872 |
| 1995 | 0.588 | 0.644 | 0.683 | 0.710 | 0.736 | 0.759 | 0.775 | 0.795 | 0.822 | 0.855 |
| 1996 | 0.578 | 0.632 | 0.671 | 0.698 | 0.722 | 0.746 | 0.761 | 0.780 | 0.808 | 0.839 |
| 1997 | 0.568 | 0.621 | 0.660 | 0.686 | 0.710 | 0.733 | 0.748 | 0.767 | 0.794 | 0.825 |
| 1998 | 0.562 | 0.615 | 0.653 | 0.679 | 0.703 | 0.725 | 0.740 | 0.759 | 0.786 | 0.816 |
| 1999 | 0.554 | 0.606 | 0.644 | 0.669 | 0.693 | 0.715 | 0.729 | 0.748 | 0.774 | 0.805 |
| 2000 | 0.542 | 0.592 | 0.629 | 0.654 | 0.677 | 0.699 | 0.713 | 0.732 | 0.757 | 0.787 |
| 2001 | 0.530 | 0.579 | 0.615 | 0.639 | 0.662 | 0.683 | 0.697 | 0.715 | 0.740 | 0.769 |
| 2002 | 0.522 | 0.570 | 0.606 | 0.630 | 0.652 | 0.673 | 0.687 | 0.704 | 0.729 | 0.757 |
| 2003 | 0.511 | 0.559 | 0.594 | 0.617 | 0.639 | 0.660 | 0.673 | 0.691 | 0.715 | 0.743 |
| 2004 | 0.498 | 0.544 | 0.578 | 0.601 | 0.622 | 0.642 | 0.655 | 0.672 | 0.696 | 0.723 |
| 2005 | 0.482 | 0.527 | 0.560 | 0.582 | 0.603 | 0.622 | 0.635 | 0.651 | 0.674 | 0.700 |
| 2006 | 0.468 | 0.512 | 0.543 | 0.565 | 0.585 | 0.604 | 0.616 | 0.632 | 0.654 | 0.679 |
| 2007 | 0.456 | 0.498 | 0.529 | 0.550 | 0.570 | 0.588 | 0.600 | 0.615 | 0.637 | 0.662 |
| 2008 | 0.447 | 0.489 | 0.519 | 0.540 | 0.559 | 0.577 | 0.588 | 0.604 | 0.625 | 0.649 |
| 2009 | 0.444 | 0.485 | 0.515 | 0.536 | 0.555 | 0.572 | 0.584 | 0.599 | 0.620 | 0.644 |
| 2010 | 0.438 | 0.479 | 0.508 | 0.529 | 0.547 | 0.565 | 0.576 | 0.591 | 0.612 | 0.636 |
| 2011 | 0.429 | 0.469 | 0.499 | 0.518 | 0.537 | 0.554 | 0.565 | 0.580 | 0.600 | 0.623 |
| 2012 | 0.422 | 0.461 | 0.490 | 0.509 | 0.527 | 0.544 | 0.555 | 0.570 | 0.590 | 0.613 |
| 2013 | 0.416 | 0.455 | 0.483 | 0.502 | 0.520 | 0.536 | 0.547 | 0.561 | 0.581 | 0.604 |
| 2014 | 0.409 | 0.447 | 0.475 | 0.493 | 0.511 | 0.527 | 0.538 | 0.552 | 0.571 | 0.593 |
| 2015 | 0.402 | 0.440 | 0.467 | 0.486 | 0.503 | 0.519 | 0.530 | 0.543 | 0.562 | 0.584 |
| 2016 | 0.397 | 0.435 | 0.461 | 0.480 | 0.497 | 0.513 | 0.523 | 0.537 | 0.555 | 0.577 |
| 2017 | 0.390 | 0.427 | 0.453 | 0.471 | 0.488 | 0.504 | 0.514 | 0.527 | 0.546 | 0.567 |
| 2018 | 0.383 | 0.419 | 0.445 | 0.462 | 0.479 | 0.494 | 0.504 | 0.517 | 0.535 | 0.556 |
| 2019 | 0.376 | 0.412 | 0.437 | 0.454 | 0.471 | 0.486 | 0.495 | 0.508 | 0.526 | 0.546 |
| 2020 | 0.372 | 0.407 | 0.432 | 0.449 | 0.465 | 0.480 | 0.490 | 0.502 | 0.520 | 0.540 |

Table B.18 (Updated April 2021)
Gross National Product Implicit Price Deflator (Continued)

| From: | To: | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
| 1970 | 2.935 | 3.033 | 3.102 | 3.176 | 3.243 | 3.311 | 3.372 | 3.429 | 3.467 | 3.517 |
| 1971 | 2.793 | 2.886 | 2.952 | 3.022 | 3.086 | 3.151 | 3.209 | 3.263 | 3.299 | 3.346 |
| 1972 | 2.676 | 2.766 | 2.829 | 2.896 | 2.958 | 3.020 | 3.075 | 3.128 | 3.162 | 3.207 |
| 1973 | 2.538 | 2.623 | 2.683 | 2.746 | 2.805 | 2.863 | 2.916 | 2.966 | 2.998 | 3.041 |
| 1974 | 2.329 | 2.407 | 2.462 | 2.520 | 2.574 | 2.628 | 2.676 | 2.722 | 2.751 | 2.791 |
| 1975 | 2.131 | 2.203 | 2.253 | 2.307 | 2.356 | 2.405 | 2.449 | 2.491 | 2.518 | 2.554 |
| 1976 | 2.020 | 2.088 | 2.135 | 2.186 | 2.233 | 2.279 | 2.321 | 2.361 | 2.387 | 2.421 |
| 1977 | 1.902 | 1.966 | 2.011 | 2.058 | 2.102 | 2.146 | 2.185 | 2.223 | 2.247 | 2.279 |
| 1978 | 1.777 | 1.837 | 1.879 | 1.923 | 1.964 | 2.005 | 2.042 | 2.077 | 2.099 | 2.130 |
| 1979 | 1.642 | 1.697 | 1.735 | 1.776 | 1.814 | 1.852 | 1.886 | 1.918 | 1.939 | 1.967 |
| 1980 | 1.506 | 1.556 | 1.592 | 1.630 | 1.664 | 1.699 | 1.730 | 1.760 | 1.779 | 1.805 |
| 1981 | 1.377 | 1.423 | 1.456 | 1.490 | 1.522 | 1.554 | 1.582 | 1.609 | 1.627 | 1.650 |
| 1982 | 1.297 | 1.340 | 1.371 | 1.403 | 1.433 | 1.463 | 1.490 | 1.516 | 1.532 | 1.554 |
| 1983 | 1.247 | 1.289 | 1.319 | 1.350 | 1.379 | 1.408 | 1.433 | 1.458 | 1.474 | 1.495 |
| 1984 | 1.205 | 1.245 | 1.273 | 1.304 | 1.331 | 1.359 | 1.384 | 1.408 | 1.423 | 1.444 |
| 1985 | 1.167 | 1.206 | 1.234 | 1.263 | 1.290 | 1.317 | 1.341 | 1.364 | 1.379 | 1.399 |
| 1986 | 1.144 | 1.182 | 1.209 | 1.238 | 1.264 | 1.291 | 1.315 | 1.337 | 1.352 | 1.371 |
| 1987 | 1.115 | 1.153 | 1.179 | 1.207 | 1.233 | 1.259 | 1.282 | 1.303 | 1.318 | 1.337 |
| 1988 | 1.078 | 1.114 | 1.139 | 1.166 | 1.191 | 1.216 | 1.238 | 1.259 | 1.273 | 1.291 |
| 1989 | 1.037 | 1.072 | 1.096 | 1.122 | 1.146 | 1.170 | 1.192 | 1.212 | 1.225 | 1.243 |
| 1990 | 1.000 | 1.033 | 1.057 | 1.082 | 1.105 | 1.128 | 1.149 | 1.169 | 1.181 | 1.198 |
| 1991 | 0.968 | 1.000 | 1.023 | 1.047 | 1.069 | 1.092 | 1.112 | 1.131 | 1.143 | 1.159 |
| 1992 | 0.946 | 0.978 | 1.000 | 1.024 | 1.046 | 1.067 | 1.087 | 1.106 | 1.118 | 1.134 |
| 1993 | 0.924 | 0.955 | 0.977 | 1.000 | 1.021 | 1.043 | 1.062 | 1.080 | 1.092 | 1.107 |
| 1994 | 0.905 | 0.935 | 0.956 | 0.979 | 1.000 | 1.021 | 1.040 | 1.057 | 1.069 | 1.084 |
| 1995 | 0.886 | 0.916 | 0.937 | 0.959 | 0.979 | 1.000 | 1.018 | 1.036 | 1.047 | 1.062 |
| 1996 | 0.870 | 0.899 | 0.920 | 0.942 | 0.962 | 0.982 | 1.000 | 1.017 | 1.028 | 1.043 |
| 1997 | 0.856 | 0.884 | 0.905 | 0.926 | 0.946 | 0.966 | 0.983 | 1.000 | 1.011 | 1.025 |
| 1998 | 0.847 | 0.875 | 0.895 | 0.916 | 0.936 | 0.955 | 0.973 | 0.989 | 1.000 | 1.014 |
| 1999 | 0.835 | 0.862 | 0.882 | 0.903 | 0.922 | 0.942 | 0.959 | 0.975 | 0.986 | 1.000 |
| 2000 | 0.816 | 0.843 | 0.863 | 0.883 | 0.902 | 0.921 | 0.938 | 0.954 | 0.964 | 0.978 |
| 2001 | 0.798 | 0.824 | 0.843 | 0.863 | 0.882 | 0.900 | 0.917 | 0.932 | 0.942 | 0.956 |
| 2002 | 0.786 | 0.812 | 0.830 | 0.850 | 0.868 | 0.886 | 0.903 | 0.918 | 0.928 | 0.941 |
| 2003 | 0.770 | 0.796 | 0.814 | 0.834 | 0.851 | 0.869 | 0.885 | 0.900 | 0.910 | 0.923 |
| 2004 | 0.750 | 0.775 | 0.792 | 0.811 | 0.829 | 0.846 | 0.861 | 0.876 | 0.886 | 0.898 |
| 2005 | 0.726 | 0.751 | 0.768 | 0.786 | 0.803 | 0.820 | 0.835 | 0.849 | 0.858 | 0.870 |
| 2006 | 0.705 | 0.728 | 0.745 | 0.763 | 0.779 | 0.795 | 0.810 | 0.824 | 0.832 | 0.844 |
| 2007 | 0.686 | 0.709 | 0.726 | 0.743 | 0.759 | 0.775 | 0.789 | 0.802 | 0.811 | 0.823 |
| 2008 | 0.673 | 0.696 | 0.712 | 0.729 | 0.744 | 0.760 | 0.773 | 0.787 | 0.795 | 0.807 |
| 2009 | 0.668 | 0.690 | 0.706 | 0.723 | 0.738 | 0.754 | 0.768 | 0.781 | 0.789 | 0.800 |
| 2010 | 0.659 | 0.681 | 0.697 | 0.713 | 0.729 | 0.744 | 0.758 | 0.770 | 0.779 | 0.790 |
| 2011 | 0.647 | 0.668 | 0.683 | 0.700 | 0.715 | 0.729 | 0.743 | 0.756 | 0.764 | 0.775 |
| 2012 | 0.635 | 0.657 | 0.672 | 0.688 | 0.702 | 0.717 | 0.730 | 0.743 | 0.751 | 0.761 |
| 2013 | 0.626 | 0.647 | 0.662 | 0.677 | 0.692 | 0.706 | 0.719 | 0.732 | 0.740 | 0.750 |
| 2014 | 0.616 | 0.636 | 0.651 | 0.666 | 0.680 | 0.695 | 0.707 | 0.719 | 0.727 | 0.738 |
| 2015 | 0.606 | 0.626 | 0.641 | 0.656 | 0.670 | 0.684 | 0.696 | 0.708 | 0.716 | 0.727 |
| 2016 | 0.598 | 0.618 | 0.633 | 0.648 | 0.661 | 0.675 | 0.688 | 0.699 | 0.707 | 0.718 |
| 2017 | 0.588 | 0.608 | 0.621 | 0.636 | 0.650 | 0.663 | 0.675 | 0.687 | 0.695 | 0.705 |
| 2018 | 0.577 | 0.597 | 0.610 | 0.625 | 0.638 | 0.651 | 0.663 | 0.675 | 0.682 | 0.692 |
| 2019 | 0.567 | 0.586 | 0.600 | 0.614 | 0.627 | 0.640 | 0.652 | 0.663 | 0.670 | 0.680 |
| 2020 | 0.560 | 0.579 | 0.592 | 0.607 | 0.619 | 0.632 | 0.644 | 0.655 | 0.663 | 0.672 |

Table B.18 (Updated April 2021)
Gross National Product Implicit Price Deflator (Continued)

| From: | To: | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| 1970 | 3.596 | 3.679 | 3.735 | 3.810 | 3.915 | 4.040 | 4.164 | 4.275 | 4.359 | 4.393 |
| 1971 | 3.422 | 3.501 | 3.555 | 3.626 | 3.725 | 3.845 | 3.963 | 4.068 | 4.148 | 4.180 |
| 1972 | 3.280 | 3.355 | 3.407 | 3.475 | 3.570 | 3.685 | 3.798 | 3.899 | 3.976 | 4.006 |
| 1973 | 3.110 | 3.181 | 3.230 | 3.295 | 3.385 | 3.494 | 3.601 | 3.697 | 3.770 | 3.799 |
| 1974 | 2.854 | 2.920 | 2.965 | 3.024 | 3.107 | 3.206 | 3.305 | 3.393 | 3.460 | 3.487 |
| 1975 | 2.612 | 2.672 | 2.713 | 2.767 | 2.843 | 2.934 | 3.025 | 3.105 | 3.166 | 3.191 |
| 1976 | 2.476 | 2.532 | 2.571 | 2.623 | 2.695 | 2.781 | 2.867 | 2.943 | 3.001 | 3.024 |
| 1977 | 2.331 | 2.384 | 2.421 | 2.470 | 2.537 | 2.619 | 2.699 | 2.771 | 2.825 | 2.847 |
| 1978 | 2.178 | 2.228 | 2.262 | 2.307 | 2.371 | 2.447 | 2.522 | 2.589 | 2.640 | 2.660 |
| 1979 | 2.012 | 2.058 | 2.090 | 2.131 | 2.190 | 2.260 | 2.330 | 2.392 | 2.439 | 2.457 |
| 1980 | 1.846 | 1.888 | 1.917 | 1.955 | 2.009 | 2.073 | 2.137 | 2.194 | 2.237 | 2.254 |
| 1981 | 1.688 | 1.726 | 1.753 | 1.788 | 1.837 | 1.896 | 1.954 | 2.006 | 2.046 | 2.062 |
| 1982 | 1.589 | 1.626 | 1.651 | 1.684 | 1.730 | 1.785 | 1.840 | 1.889 | 1.926 | 1.941 |
| 1983 | 1.529 | 1.564 | 1.588 | 1.620 | 1.664 | 1.717 | 1.770 | 1.817 | 1.853 | 1.867 |
| 1984 | 1.476 | 1.510 | 1.533 | 1.564 | 1.607 | 1.659 | 1.710 | 1.755 | 1.789 | 1.803 |
| 1985 | 1.431 | 1.463 | 1.486 | 1.516 | 1.557 | 1.607 | 1.657 | 1.701 | 1.734 | 1.747 |
| 1986 | 1.402 | 1.434 | 1.456 | 1.485 | 1.526 | 1.575 | 1.624 | 1.667 | 1.700 | 1.713 |
| 1987 | 1.367 | 1.398 | 1.420 | 1.448 | 1.488 | 1.536 | 1.583 | 1.625 | 1.657 | 1.670 |
| 1988 | 1.321 | 1.351 | 1.372 | 1.399 | 1.437 | 1.484 | 1.529 | 1.570 | 1.601 | 1.613 |
| 1989 | 1.271 | 1.300 | 1.320 | 1.347 | 1.383 | 1.428 | 1.472 | 1.511 | 1.541 | 1.553 |
| 1990 | 1.225 | 1.254 | 1.273 | 1.298 | 1.334 | 1.377 | 1.419 | 1.457 | 1.485 | 1.497 |
| 1991 | 1.186 | 1.213 | 1.232 | 1.256 | 1.291 | 1.332 | 1.373 | 1.410 | 1.437 | 1.448 |
| 1992 | 1.159 | 1.186 | 1.204 | 1.228 | 1.262 | 1.302 | 1.343 | 1.378 | 1.405 | 1.416 |
| 1993 | 1.132 | 1.158 | 1.176 | 1.200 | 1.233 | 1.272 | 1.311 | 1.346 | 1.373 | 1.383 |
| 1994 | 1.109 | 1.134 | 1.152 | 1.175 | 1.207 | 1.246 | 1.284 | 1.318 | 1.344 | 1.355 |
| 1995 | 1.086 | 1.111 | 1.128 | 1.151 | 1.182 | 1.220 | 1.258 | 1.291 | 1.317 | 1.327 |
| 1996 | 1.067 | 1.091 | 1.108 | 1.130 | 1.161 | 1.198 | 1.235 | 1.268 | 1.293 | 1.303 |
| 1997 | 1.049 | 1.073 | 1.089 | 1.111 | 1.141 | 1.178 | 1.214 | 1.247 | 1.271 | 1.281 |
| 1998 | 1.037 | 1.061 | 1.077 | 1.099 | 1.129 | 1.165 | 1.201 | 1.233 | 1.257 | 1.267 |
| 1999 | 1.023 | 1.046 | 1.062 | 1.083 | 1.113 | 1.149 | 1.184 | 1.216 | 1.240 | 1.249 |
| 2000 | 1.000 | 1.023 | 1.039 | 1.059 | 1.088 | 1.123 | 1.158 | 1.189 | 1.212 | 1.222 |
| 2001 | 0.978 | 1.000 | 1.015 | 1.036 | 1.064 | 1.098 | 1.132 | 1.162 | 1.185 | 1.194 |
| 2002 | 0.963 | 0.985 | 1.000 | 1.020 | 1.048 | 1.082 | 1.115 | 1.145 | 1.167 | 1.176 |
| 2003 | 0.944 | 0.966 | 0.980 | 1.000 | 1.027 | 1.060 | 1.093 | 1.122 | 1.144 | 1.153 |
| 2004 | 0.919 | 0.940 | 0.954 | 0.973 | 1.000 | 1.032 | 1.064 | 1.092 | 1.114 | 1.122 |
| 2005 | 0.890 | 0.911 | 0.925 | 0.943 | 0.969 | 1.000 | 1.031 | 1.058 | 1.079 | 1.087 |
| 2006 | 0.864 | 0.883 | 0.897 | 0.915 | 0.940 | 0.970 | 1.000 | 1.027 | 1.047 | 1.055 |
| 2007 | 0.841 | 0.861 | 0.874 | 0.891 | 0.916 | 0.945 | 0.974 | 1.000 | 1.020 | 1.028 |
| 2008 | 0.825 | 0.844 | 0.857 | 0.874 | 0.898 | 0.927 | 0.955 | 0.981 | 1.000 | 1.008 |
| 2009 | 0.819 | 0.837 | 0.850 | 0.867 | 0.891 | 0.920 | 0.948 | 0.973 | 0.992 | 1.000 |
| 2010 | 0.808 | 0.826 | 0.839 | 0.856 | 0.879 | 0.908 | 0.936 | 0.960 | 0.979 | 0.987 |
| 2011 | 0.792 | 0.810 | 0.823 | 0.839 | 0.862 | 0.890 | 0.917 | 0.942 | 0.960 | 0.968 |
| 2012 | 0.779 | 0.797 | 0.809 | 0.825 | 0.848 | 0.875 | 0.902 | 0.926 | 0.944 | 0.951 |
| 2013 | 0.767 | 0.785 | 0.797 | 0.813 | 0.835 | 0.862 | 0.888 | 0.912 | 0.930 | 0.937 |
| 2014 | 0.755 | 0.772 | 0.784 | 0.800 | 0.822 | 0.848 | 0.874 | 0.898 | 0.915 | 0.922 |
| 2015 | 0.744 | 0.761 | 0.772 | 0.788 | 0.809 | 0.835 | 0.861 | 0.884 | 0.901 | 0.908 |
| 2016 | 0.734 | 0.751 | 0.762 | 0.778 | 0.799 | 0.825 | 0.850 | 0.873 | 0.890 | 0.897 |
| 2017 | 0.721 | 0.738 | 0.749 | 0.764 | 0.785 | 0.810 | 0.835 | 0.857 | 0.874 | 0.881 |
| 2018 | 0.708 | 0.723 | 0.735 | 0.748 | 0.768 | 0.792 | 0.816 | 0.838 | 0.855 | 0.861 |
| 2019 | 0.695 | 0.711 | 0.722 | 0.735 | 0.755 | 0.779 | 0.802 | 0.824 | 0.840 | 0.846 |
| 2020 | 0.687 | 0.702 | 0.713 | 0.727 | 0.746 | 0.769 | 0.793 | 0.814 | 0.830 | 0.836 |

Table B.18 (Updated April 2021)
Gross National Product Implicit Price Deflator (Continued)

| From: | To: | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| 1970 | 4.451 | 4.539 | 4.618 | 4.688 | 4.767 | 4.841 | 4.903 | 4.991 | 5.098 | 5.188 | 5.249 |
| 1971 | 4.236 | 4.319 | 4.395 | 4.461 | 4.536 | 4.607 | 4.666 | 4.749 | 4.851 | 4.937 | 4.995 |
| 1972 | 4.059 | 4.140 | 4.212 | 4.275 | 4.348 | 4.415 | 4.472 | 4.552 | 4.650 | 4.732 | 4.788 |
| 1973 | 3.849 | 3.925 | 3.994 | 4.054 | 4.123 | 4.187 | 4.241 | 4.317 | 4.408 | 4.486 | 4.539 |
| 1974 | 3.533 | 3.602 | 3.665 | 3.720 | 3.784 | 3.842 | 3.892 | 3.961 | 4.045 | 4.116 | 4.165 |
| 1975 | 3.233 | 3.297 | 3.354 | 3.405 | 3.463 | 3.516 | 3.562 | 3.625 | 3.702 | 3.767 | 3.812 |
| 1976 | 3.064 | 3.125 | 3.179 | 3.227 | 3.282 | 3.333 | 3.376 | 3.436 | 3.508 | 3.570 | 3.612 |
| 1977 | 2.885 | 2.942 | 2.993 | 3.038 | 3.090 | 3.138 | 3.179 | 3.235 | 3.303 | 3.361 | 3.401 |
| 1978 | 2.696 | 2.749 | 2.797 | 2.839 | 2.887 | 2.932 | 2.970 | 3.023 | 3.085 | 3.140 | 3.177 |
| 1979 | 2.490 | 2.539 | 2.583 | 2.622 | 2.667 | 2.708 | 2.743 | 2.792 | 2.849 | 2.899 | 2.934 |
| 1980 | 2.284 | 2.329 | 2.370 | 2.406 | 2.447 | 2.485 | 2.517 | 2.561 | 2.613 | 2.659 | 2.691 |
| 1981 | 2.089 | 2.130 | 2.167 | 2.200 | 2.237 | 2.272 | 2.301 | 2.343 | 2.387 | 2.429 | 2.458 |
| 1982 | 1.967 | 2.006 | 2.041 | 2.072 | 2.107 | 2.139 | 2.167 | 2.206 | 2.248 | 2.288 | 2.315 |
| 1983 | 1.892 | 1.929 | 1.963 | 1.993 | 2.027 | 2.058 | 2.085 | 2.122 | 2.163 | 2.201 | 2.228 |
| 1984 | 1.827 | 1.863 | 1.896 | 1.924 | 1.957 | 1.987 | 2.013 | 2.049 | 2.088 | 2.125 | 2.150 |
| 1985 | 1.771 | 1.806 | 1.837 | 1.865 | 1.896 | 1.926 | 1.951 | 1.986 | 2.024 | 2.060 | 2.084 |
| 1986 | 1.735 | 1.770 | 1.801 | 1.828 | 1.859 | 1.888 | 1.912 | 1.946 | 1.984 | 2.019 | 2.043 |
| 1987 | 1.692 | 1.725 | 1.755 | 1.782 | 1.812 | 1.840 | 1.864 | 1.897 | 1.935 | 1.970 | 1.993 |
| 1988 | 1.634 | 1.667 | 1.696 | 1.721 | 1.751 | 1.778 | 1.801 | 1.833 | 1.869 | 1.902 | 1.925 |
| 1989 | 1.573 | 1.604 | 1.632 | 1.657 | 1.685 | 1.711 | 1.733 | 1.764 | 1.799 | 1.830 | 1.852 |
| 1990 | 1.517 | 1.547 | 1.574 | 1.597 | 1.625 | 1.650 | 1.671 | 1.701 | 1.733 | 1.764 | 1.785 |
| 1991 | 1.468 | 1.497 | 1.523 | 1.546 | 1.572 | 1.596 | 1.617 | 1.646 | 1.676 | 1.706 | 1.726 |
| 1992 | 1.435 | 1.463 | 1.489 | 1.511 | 1.537 | 1.561 | 1.581 | 1.609 | 1.639 | 1.668 | 1.688 |
| 1993 | 1.402 | 1.429 | 1.454 | 1.476 | 1.501 | 1.525 | 1.544 | 1.572 | 1.601 | 1.629 | 1.649 |
| 1994 | 1.372 | 1.400 | 1.424 | 1.445 | 1.470 | 1.493 | 1.512 | 1.539 | 1.568 | 1.595 | 1.614 |
| 1995 | 1.344 | 1.371 | 1.395 | 1.416 | 1.440 | 1.462 | 1.481 | 1.507 | 1.535 | 1.563 | 1.581 |
| 1996 | 1.320 | 1.346 | 1.370 | 1.390 | 1.414 | 1.436 | 1.454 | 1.480 | 1.508 | 1.534 | 1.553 |
| 1997 | 1.298 | 1.324 | 1.347 | 1.367 | 1.390 | 1.412 | 1.430 | 1.455 | 1.482 | 1.508 | 1.526 |
| 1998 | 1.284 | 1.309 | 1.332 | 1.352 | 1.375 | 1.397 | 1.415 | 1.440 | 1.466 | 1.492 | 1.509 |
| 1999 | 1.266 | 1.291 | 1.313 | 1.333 | 1.354 | 1.375 | 1.393 | 1.418 | 1.445 | 1.470 | 1.488 |
| 2000 | 1.238 | 1.262 | 1.284 | 1.303 | 1.324 | 1.345 | 1.362 | 1.386 | 1.413 | 1.438 | 1.455 |
| 2001 | 1.210 | 1.234 | 1.255 | 1.274 | 1.295 | 1.315 | 1.332 | 1.356 | 1.383 | 1.407 | 1.424 |
| 2002 | 1.192 | 1.215 | 1.236 | 1.255 | 1.275 | 1.295 | 1.312 | 1.335 | 1.361 | 1.385 | 1.402 |
| 2003 | 1.168 | 1.191 | 1.212 | 1.230 | 1.250 | 1.270 | 1.286 | 1.309 | 1.337 | 1.360 | 1.376 |
| 2004 | 1.137 | 1.160 | 1.180 | 1.198 | 1.217 | 1.236 | 1.252 | 1.274 | 1.302 | 1.325 | 1.340 |
| 2005 | 1.102 | 1.123 | 1.143 | 1.160 | 1.179 | 1.197 | 1.213 | 1.234 | 1.262 | 1.284 | 1.300 |
| 2006 | 1.069 | 1.090 | 1.109 | 1.126 | 1.144 | 1.161 | 1.176 | 1.197 | 1.225 | 1.247 | 1.261 |
| 2007 | 1.041 | 1.062 | 1.080 | 1.097 | 1.114 | 1.131 | 1.146 | 1.166 | 1.193 | 1.214 | 1.228 |
| 2008 | 1.021 | 1.041 | 1.059 | 1.075 | 1.092 | 1.109 | 1.124 | 1.144 | 1.170 | 1.191 | 1.205 |
| 2009 | 1.013 | 1.033 | 1.051 | 1.067 | 1.084 | 1.101 | 1.115 | 1.135 | 1.161 | 1.182 | 1.196 |
| 2010 | 1.000 | 1.020 | 1.038 | 1.053 | 1.070 | 1.086 | 1.100 | 1.120 | 1.148 | 1.168 | 1.182 |
| 2011 | 0.981 | 1.000 | 1.017 | 1.033 | 1.048 | 1.064 | 1.078 | 1.097 | 1.124 | 1.144 | 1.158 |
| 2012 | 0.964 | 0.983 | 1.000 | 1.015 | 1.030 | 1.045 | 1.059 | 1.077 | 1.103 | 1.123 | 1.136 |
| 2013 | 0.949 | 0.968 | 0.985 | 1.000 | 1.015 | 1.029 | 1.042 | 1.060 | 1.084 | 1.103 | 1.116 |
| 2014 | 0.935 | 0.954 | 0.971 | 0.986 | 1.000 | 1.010 | 1.024 | 1.042 | 1.064 | 1.083 | 1.096 |
| 2015 | 0.920 | 0.940 | 0.957 | 0.972 | 0.990 | 1.000 | 1.013 | 1.031 | 1.053 | 1.072 | 1.086 |
| 2016 | 0.909 | 0.928 | 0.945 | 0.960 | 0.977 | 0.987 | 1.000 | 1.018 | 1.042 | 1.061 | 1.075 |
| 2017 | 0.893 | 0.911 | 0.928 | 0.943 | 0.960 | 0.970 | 0.982 | 1.000 | 1.022 | 1.042 | 1.055 |
| 2018 | 0.871 | 0.889 | 0.907 | 0.922 | 0.940 | 0.950 | 0.960 | 0.978 | 1.000 | 1.018 | 1.030 |
| 2019 | 0.856 | 0.874 | 0.891 | 0.906 | 0.923 | 0.932 | 0.942 | 0.960 | 0.983 | 1.000 | 1.012 |
| 2020 | 0.846 | 0.864 | 0.880 | 0.896 | 0.912 | 0.921 | 0.930 | 0.948 | 0.971 | 0.988 | 1.000 |

Source:

U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, Washington, DC, monthly.

APPENDIX C

ENERGY TABLES INCLUDING ELECTRICITY GENERATION AND DISTRIBUTION

ENERGY TABLES INCLUDING ELECTRICITY GENERATION AND DISTRIBUTION

The heat content of electricity is “the amount of heat energy available to be released by the transformation or use of a specified physical unit of an energy form (e.g., a ton of coal, a barrel of oil, a kilowatt-hour of electricity, a cubic foot of natural gas, or a pound of steam).^a” The heat content does not change whether the electricity is created from coal, natural gas, oil, biomass, etc. Table C.1 shows the heat content of electricity.

The heat rate for electricity is “a measure of generating station thermal efficiency commonly stated as Btu per kilowatt-hour.^a” The heat rate for electricity can change depending on power plant efficiency and the source from which electricity is created. Table C.1 shows the heat rate for electricity for fossil-fuels, noncombustible renewable energy^b, and nuclear.

The tables in the body of the *Transportation Energy Data Book* show only end-use energy for transportation modes using electricity, thus, were converted from kilowatt-hours to Btu using 3,412 Btu per kilowatt-hour. In Appendix C, those same tables and graphics are displayed taking electricity generation and distribution into account by using the conversion rates in Table C.1 for fossil-fuels and noncombustible renewable energy. Only tables/figures with electricity use are displayed in Appendix C.

^a U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, March 2019, Glossary.

^b Noncombustible renewable energy includes hydro, geothermal, solar, thermal, photovoltaic, and wind.

Table C.1
Approximate Heat Rates and Heat Content of Electricity, 1970-2018
(Btu per kilowatt-hour)

| Year | Electricity Net Generation Heat Rate for Fossil-Fuels | Electricity Net Generation Heat Rate for Nuclear | Electricity Net Generation Heat Rate for Noncombustible Renewable Energy ^a | Heat Content of Electricity |
|------|---|--|---|--------------------------------|
| 1970 | 10,494 | 10,977 | 10,494 | 3,412 |
| 1975 | 10,406 | 11,013 | 10,406 | 3,412 |
| 1980 | 10,388 | 10,908 | 10,388 | 3,412 |
| 1981 | 10,453 | 11,030 | 10,453 | 3,412 |
| 1982 | 10,454 | 11,073 | 10,454 | 3,412 |
| 1983 | 10,520 | 10,905 | 10,520 | 3,412 |
| 1984 | 10,440 | 10,843 | 10,440 | 3,412 |
| 1985 | 10,447 | 10,622 | 10,447 | 3,412 |
| 1986 | 10,446 | 10,579 | 10,446 | 3,412 |
| 1987 | 10,419 | 10,442 | 10,419 | 3,412 |
| 1988 | 10,324 | 10,602 | 10,324 | 3,412 |
| 1989 | 10,432 | 10,583 | 10,432 | 3,412 |
| 1990 | 10,402 | 10,582 | 10,402 | 3,412 |
| 1991 | 10,436 | 10,484 | 10,436 | 3,412 |
| 1992 | 10,342 | 10,471 | 10,342 | 3,412 |
| 1993 | 10,309 | 10,504 | 10,309 | 3,412 |
| 1994 | 10,316 | 10,452 | 10,316 | 3,412 |
| 1995 | 10,312 | 10,507 | 10,312 | 3,412 |
| 1996 | 10,340 | 10,503 | 10,340 | 3,412 |
| 1997 | 10,213 | 10,494 | 10,213 | 3,412 |
| 1998 | 10,197 | 10,491 | 10,197 | 3,412 |
| 1999 | 10,226 | 10,450 | 10,226 | 3,412 |
| 2000 | 10,201 | 10,429 | 10,201 | 3,412 |
| 2001 | 10,333 | 10,443 | 10,333 | 3,412 |
| 2002 | 10,173 | 10,442 | 10,173 | 3,412 |
| 2003 | 10,125 | 10,422 | 10,125 | 3,412 |
| 2004 | 10,016 | 10,428 | 10,016 | 3,412 |
| 2005 | 9,999 | 10,436 | 9,999 | 3,412 |
| 2006 | 9,919 | 10,435 | 9,919 | 3,412 |
| 2007 | 9,884 | 10,489 | 9,884 | 3,412 |
| 2008 | 9,854 | 10,452 | 9,854 | 3,412 |
| 2009 | 9,760 | 10,459 | 9,760 | 3,412 |
| 2010 | 9,756 | 10,452 | 9,756 | 3,412 |
| 2011 | 9,716 | 10,464 | 9,716 | 3,412 |
| 2012 | 9,516 | 10,479 | 9,516 | 3,412 |
| 2013 | 9,541 | 10,449 | 9,541 | 3,412 |
| 2014 | 9,510 | 10,459 | 9,510 | 3,412 |
| 2015 | 9,319 | 10,458 | 9,319 | 3,412 |
| 2016 | 9,232 | 10,459 | 9,232 | 3,412 |
| 2017 | 9,213 | 10,459 | 9,213 | 3,412 |
| 2018 | 9,104 | 10,455 | 9,104 | 3,412 |
| 2019 | 9,104 | 10,455 | 9,104 | 3,412 |

Source:

U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Washington, DC, March 2019, Table A6.

^a The fossil-fuels heat rate is used as the thermal conversion factor for electricity net generation from noncombustible renewable energy to approximate the quantity of fossil fuels replaced by these sources. Noncombustible renewable energy includes hydro, geothermal, solar, thermal, photovoltaic, and wind.

This table is the same as Table 2.6 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. Please see Appendix A for a description of the methodology used to develop these data.

Table C.2
Domestic Consumption of Transportation Energy by Mode and Fuel Type with Electricity
Generation and Distribution, 2018^a
(trillion Btu)

| | Gasoline | Diesel fuel | Liquefied petroleum gas | Jet fuel | Residual fuel oil | Natural gas | Electricity ^b | Total ^c |
|---|-----------------|----------------|-------------------------|----------------|-------------------|--------------|--------------------------|--------------------|
| <u>HIGHWAY</u> | 15,366.1 | 6,324.3 | 75.3 | - | - | 25.4 | 26.1 | 21,817.2 |
| Light vehicles | 14,717.5 | 444.9 | 53.9 | - | - | - | 25.5 | 15,241.8 |
| Cars | 6,165.5 | 35.5 | | | | | 22.1 | 6,223.1 |
| Light trucks ^d | 8,495.0 | 409.5 | 53.9 | | | | 3.4 | 8,961.7 |
| Motorcycles | 57.1 | | | | | | | 57.1 |
| Buses | 10.5 | 189.6 | 0.3 | - | - | 25.4 | 0.6 | 226.3 |
| Transit | 1.7 | 61.6 | 0.3 | | | 25.4 | 0.6 | 89.5 |
| Intercity | | 39.6 | | | | | | 39.6 |
| School | 8.8 | 88.3 | | | | | | 97.1 |
| Medium/heavy trucks | 638.1 | 5,689.8 | 21.2 | - | - | - | - | 6,349.0 |
| Class 3-6 trucks | 587.0 | 796.6 | 21.0 | | | | | 1,404.6 |
| Class 7-8 trucks | 51.0 | 4,893.2 | 0.2 | | | | | 4,944.5 |
| <u>NONHIGHWAY</u> | 198.1 | 867.5 | - | 2,331.5 | 616.4 | 889.6 | 278.1 | 5,181.3 |
| Air | 26.7 | - | - | 2,331.5 | - | - | - | 2,358.2 |
| General aviation | 26.7 | | | 246.1 | | | | 272.8 |
| Domestic air carriers | | | | 1,640.0 | | | | 1,640.0 |
| International air carriers ^e | | | | 445.4 | | | | 445.4 |
| Water | 171.4 | 332.2 | - | - | 616.4 | - | - | 1,120.0 |
| Freight | | 291.4 | | | 616.4 | | | 907.9 |
| Recreational | 171.4 | 40.7 | | | | | | 212.1 |
| Pipeline | - | - | - | - | - | 889.6 | 222.3 | 1,111.9 |
| Rail | - | 535.4 | - | - | - | - | 55.8 | 591.1 |
| Freight (Class I) | | 512.8 | | | | | | 512.8 |
| Passenger | | 22.6 | | | | | 55.8 | 78.4 |
| Transit | | | | | | | 35.3 | 35.3 |
| Commuter | | 14.2 | | | | | 16.1 | 30.3 |
| Intercity ^f | | 8.3 | | | | | 4.5 | 12.8 |
| TOTAL HWY & NONHWY^c | 15,564.2 | 7,191.8 | 75.3 | 2,331.5 | 616.4 | 915.0 | 304.1 | 26,998.5 |

Source:

See Appendix A, Section 2. Energy Use Sources.

^a Civilian consumption only. Totals may not include all possible uses of fuels for transportation (e.g., snowmobiles).

^b Primary energy use for electricity including electricity generation and distribution losses.

^c Totals may not sum due to rounding.

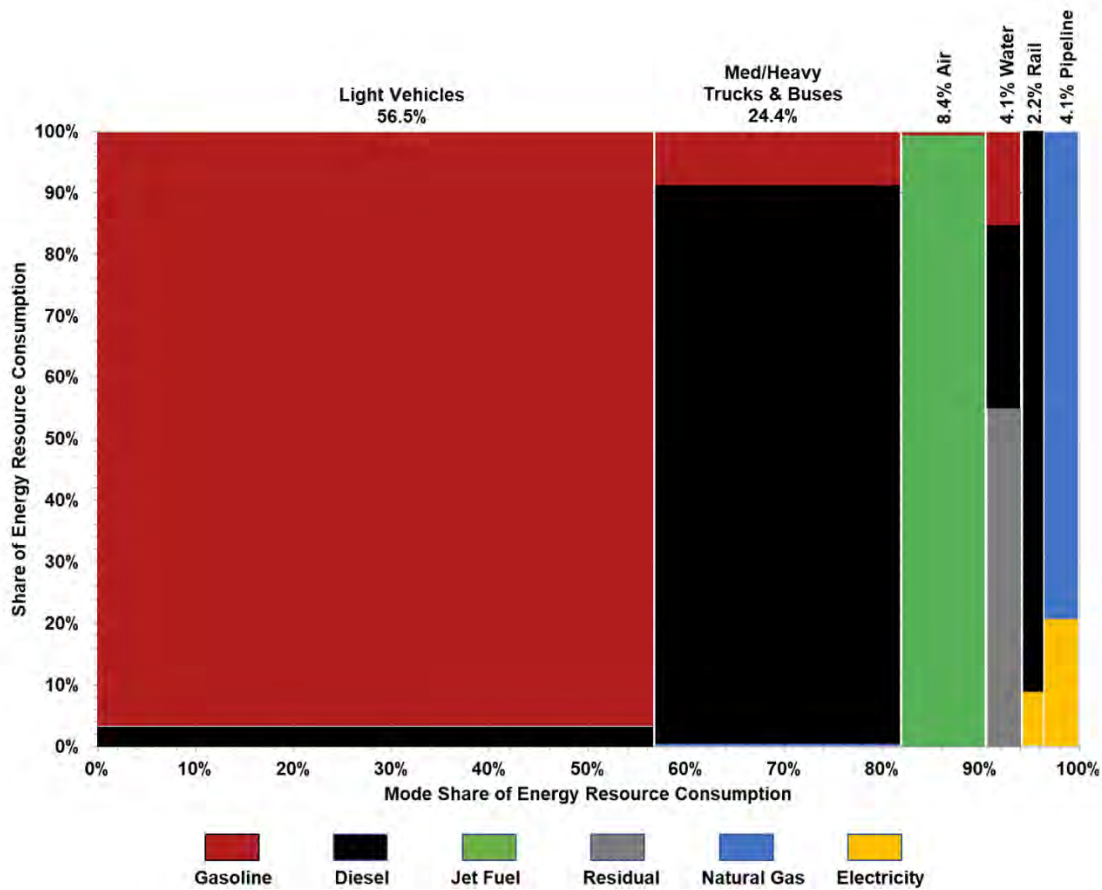
^d Two-axle, four-tire trucks.

^e One half of fuel used by domestic carriers in international operation.

^f Data for 2018 were not available. Data for 2017 are shown.

This figure is the same as Figure 2.6 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. The gasoline and diesel used in highway modes accounted for the majority of transportation energy use (80.9%) and nearly all highway use in 2018.

Figure C.1. Domestic Consumption of Transportation Energy Use by Mode and Fuel Type, 2018^a



Note: Residual fuel oil is heavier oil which can be used in vessel bunkering.

Source:
See Table C.2 or Appendix A, Section 2. Energy Use Sources.

^a Civilian consumption only. Totals may not include all possible uses of fuels for transportation (e.g., snowmobiles). Primary energy use for electricity including electricity generation and distribution losses.

This table is the same as Table 2.7 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. Please see Appendix A for a description of the methodology used to develop these data.

Table C.3
Transportation Energy Use by Mode, 2017–2018^a

| | Trillion Btu | | Percentage of total based on Btus | |
|--------------------------------|-----------------|-----------------|-----------------------------------|---------------|
| | 2017 | 2018 | 2017 | 2018 |
| HIGHWAY | 21,817.2 | 21,817.2 | 80.8% | 80.8% |
| Light vehicles | 15,241.8 | 15,241.8 | 56.5% | 56.5% |
| Cars | 6,223.1 | 6,223.1 | 23.0% | 23.0% |
| Light trucks ^b | 8,961.7 | 8,961.7 | 33.2% | 33.2% |
| Motorcycles | 57.1 | 57.1 | 0.2% | 0.2% |
| Buses | 226.3 | 226.3 | 0.8% | 0.8% |
| Transit | 89.5 | 89.5 | 0.3% | 0.3% |
| Intercity | 39.6 | 39.6 | 0.1% | 0.1% |
| School | 97.1 | 97.1 | 0.4% | 0.4% |
| Medium/heavy trucks | 6,349.0 | 6,349.0 | 23.5% | 23.5% |
| Class 3–6 trucks | 1,404.6 | 1,404.6 | 5.2% | 5.2% |
| Class 7–8 trucks | 4,944.5 | 4,944.5 | 18.3% | 18.3% |
| NONHIGHWAY | 5,181.3 | 5,181.3 | 19.2% | 19.2% |
| Air | 2,358.2 | 2,358.2 | 8.7% | 8.7% |
| General aviation | 272.8 | 272.8 | 1.0% | 1.0% |
| Domestic air carriers | 1,640.0 | 1,640.0 | 6.1% | 6.1% |
| International air | 445.4 | 445.4 | 1.6% | 1.6% |
| Water | 1,120.0 | 1,120.0 | 4.1% | 4.1% |
| Freight | 907.9 | 907.9 | 3.4% | 3.4% |
| Recreational | 212.1 | 212.1 | 0.8% | 0.8% |
| Pipeline | 1,111.9 | 1,111.9 | 4.1% | 4.1% |
| Rail | 591.1 | 591.1 | 2.2% | 2.2% |
| Freight (Class I) | 512.8 | 512.8 | 1.9% | 1.9% |
| Passenger | 78.4 | 78.4 | 0.3% | 0.3% |
| Transit | 35.3 | 35.3 | 0.1% | 0.1% |
| Commuter | 30.3 | 30.3 | 0.1% | 0.1% |
| Intercity ^c | 12.8 | 12.8 | 0.0% | 0.0% |
| HWY & NONHWY TOTAL | 26,998.5 | 26,998.5 | 100.0% | 100.0% |
| Off-highway^d | 1,980.80 | 2,147.39 | | |

Source:

See Appendix A, Section 2. Energy Use Sources.

^a Civilian consumption only. Totals may not include all possible uses of fuels for transportation (e.g., snowmobiles). Includes primary energy use for electricity including electricity generation and distribution losses.

^b Two-axle, four-tire trucks.

^c Data for 2018 were not available. Data for 2017 are shown.

^d Includes equipment that does not travel on roads, such as equipment from agriculture, construction, and airports.

This table is the same as Table 2.8 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. Light trucks include pick-ups, minivans, sport-utility vehicles, and vans.

Table C.4
Highway Transportation Energy Consumption by Mode, 1970–2018
(trillion Btu)

| Year | Cars | Light trucks | Light vehicles subtotal | Motor-cycles | Buses | Class 3-6 trucks | Class 7-8 trucks | Heavy trucks subtotal | Highway subtotal | Total transportation ^a |
|---|-------|--------------|-------------------------|--------------|-------|------------------|------------------|-----------------------|------------------|-----------------------------------|
| 1970 | 8,479 | 1,539 | 10,018 | 7 | 129 | 333 | 1,220 | 1,553 | 11,707 | 15,379 |
| 1975 | 9,298 | 2,384 | 11,682 | 14 | 124 | 430 | 1,574 | 2,003 | 13,823 | 17,384 |
| 1980 | 8,800 | 2,975 | 11,775 | 26 | 143 | 929 | 1,757 | 2,686 | 14,630 | 18,941 |
| 1985 | 8,932 | 3,413 | 12,345 | 23 | 153 | 986 | 1,897 | 2,883 | 15,404 | 19,208 |
| 1986 | 9,138 | 3,629 | 12,767 | 23 | 161 | 920 | 2,038 | 2,958 | 15,909 | 20,279 |
| 1987 | 9,157 | 3,819 | 12,976 | 24 | 165 | 858 | 2,203 | 3,061 | 16,226 | 20,772 |
| 1988 | 9,158 | 4,078 | 13,236 | 25 | 170 | 860 | 2,257 | 3,118 | 16,549 | 21,325 |
| 1989 | 9,232 | 4,156 | 13,388 | 26 | 170 | 869 | 2,330 | 3,199 | 16,783 | 21,686 |
| 1990 | 8,688 | 4,451 | 13,139 | 24 | 167 | 891 | 2,442 | 3,334 | 16,664 | 21,581 |
| 1991 | 8,029 | 4,774 | 12,803 | 23 | 178 | 895 | 2,507 | 3,402 | 16,406 | 21,183 |
| 1992 | 8,169 | 5,117 | 13,286 | 24 | 184 | 897 | 2,570 | 3,468 | 16,962 | 21,838 |
| 1993 | 8,368 | 5,356 | 13,724 | 25 | 183 | 906 | 2,671 | 3,577 | 17,509 | 22,318 |
| 1994 | 8,470 | 5,515 | 13,985 | 26 | 183 | 936 | 2,842 | 3,778 | 17,972 | 22,926 |
| 1995 | 8,489 | 5,695 | 14,184 | 25 | 184 | 954 | 2,983 | 3,937 | 18,330 | 23,461 |
| 1996 | 8,634 | 5,917 | 14,551 | 24 | 186 | 958 | 3,088 | 4,045 | 18,806 | 23,970 |
| 1997 | 8,710 | 6,169 | 14,879 | 25 | 192 | 945 | 3,141 | 4,086 | 19,182 | 24,320 |
| 1998 | 8,936 | 6,303 | 15,239 | 26 | 196 | 967 | 3,251 | 4,218 | 19,679 | 24,653 |
| 1999 | 9,134 | 6,602 | 15,736 | 26 | 203 | 1,054 | 3,584 | 4,638 | 20,603 | 25,955 |
| 2000 | 9,100 | 6,607 | 15,707 | 26 | 209 | 1,085 | 3,734 | 4,819 | 20,761 | 26,265 |
| 2001 | 9,161 | 6,678 | 15,839 | 24 | 196 | 1,074 | 3,738 | 4,813 | 20,872 | 25,939 |
| 2002 | 9,391 | 6,883 | 16,274 | 24 | 192 | 1,114 | 3,921 | 5,035 | 21,525 | 26,525 |
| 2003 | 9,255 | 7,551 | 16,806 | 24 | 190 | 1,083 | 3,812 | 4,895 | 21,915 | 26,700 |
| 2004 | 9,331 | 7,861 | 17,192 | 25 | 194 | 1,003 | 3,532 | 4,535 | 21,946 | 27,153 |
| 2005 | 9,579 | 7,296 | 16,875 | 24 | 196 | 1,126 | 3,963 | 5,088 | 22,183 | 27,561 |
| 2006 | 9,316 | 7,550 | 16,866 | 28 | 199 | 1,149 | 4,045 | 5,193 | 22,286 | 27,733 |
| 2007 | 9,221 | 7,679 | 16,900 | 59 | 195 | 1,429 | 5,031 | 6,460 | 23,615 | 29,193 |
| 2008 | 8,831 | 7,572 | 16,404 | 61 | 200 | 1,444 | 5,083 | 6,527 | 23,192 | 28,554 |
| 2009 | 8,209 | 7,635 | 15,843 | 60 | 200 | 1,341 | 4,720 | 6,061 | 22,164 | 27,065 |
| 2010 | 7,657 | 7,971 | 15,628 | 53 | 190 | 1,363 | 4,797 | 6,160 | 22,032 | 27,136 |
| 2011 | 7,336 | 8,104 | 15,440 | 53 | 195 | 1,283 | 4,517 | 5,801 | 21,489 | 26,543 |
| 2012 | 7,122 | 8,180 | 15,301 | 61 | 200 | 1,282 | 4,512 | 5,794 | 21,358 | 26,148 |
| 2013 | 7,050 | 8,077 | 15,127 | 58 | 204 | 1,310 | 4,613 | 5,924 | 21,313 | 26,054 |
| 2014 | 6,895 | 8,448 | 15,343 | 57 | 206 | 1,332 | 4,689 | 6,022 | 21,628 | 26,132 |
| 2015 | 6,720 | 8,656 | 15,376 | 56 | 210 | 1,324 | 4,660 | 5,984 | 21,625 | 26,263 |
| 2016 | 6,584 | 8,891 | 15,475 | 58 | 214 | 1,359 | 4,783 | 6,142 | 21,890 | 26,663 |
| 2017 | 6,349 | 8,965 | 15,314 | 57 | 221 | 1,391 | 4,897 | 6,289 | 21,880 | 26,774 |
| 2018 | 6,223 | 8,962 | 15,185 | 57 | 226 | 1,405 | 4,944 | 6,349 | 21,817 | 21,817 |
| <i>Average annual percentage change</i> | | | | | | | | | | |
| 1970-2018 | -0.6% | 3.7% | 0.9% | 4.5% | 1.2% | 3.0% | 3.0% | 3.0% | 1.3% | 1.3% |
| 2008-2018 | -3.4% | 1.7% | -0.8% | -0.7% | 1.2% | -0.3% | -0.3% | -0.3% | -0.6% | -0.6% |

Note: Totals may not add due to rounding.

Source:

See Appendix A, Section 2.1 Highway Energy Use.

^a Total transportation figures do not include military and off-highway energy use and may not include all possible uses of fuel for transportation (e.g., snowmobiles). Includes primary energy use for electricity including electricity generation and distribution losses.

^b Due to changes in the FHWA fuel use methodology, motorcycle, bus, and heavy truck data are not comparable with data before the year 2007. Car and light truck data changed after 2008; see Appendix A for car/light truck shares.

This table is the same as Table 2.9 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. About 19% of transportation energy use is for nonhighway modes. Air travel accounts for 46% of nonhighway energy use.

Table C.5
Nonhighway Transportation Energy Consumption by Mode, 1970–2018
(trillion Btu)

| Year | Air | Water | Pipeline | Rail | Nonhighway subtotal | Total transportation ^a | |
|-----------|-------|-------|---|-------|------------------------|--------------------------------------|--|
| 1970 | 1,287 | 836 | 994 | 555 | 3,672 | 15,379 | |
| 1975 | 1,234 | 927 | 842 | 558 | 3,561 | 17,384 | |
| 1980 | 1,434 | 1,393 | 897 | 587 | 4,311 | 18,941 | |
| 1985 | 1,677 | 871 | 757 | 498 | 3,804 | 19,208 | |
| 1986 | 1,823 | 1,323 | 737 | 486 | 4,369 | 20,279 | |
| 1987 | 1,899 | 1,378 | 773 | 496 | 4,546 | 20,772 | |
| 1988 | 1,978 | 1,417 | 873 | 508 | 4,776 | 21,325 | |
| 1989 | 1,981 | 1,516 | 892 | 513 | 4,903 | 21,686 | |
| 1990 | 2,046 | 1,442 | 925 | 504 | 4,917 | 21,581 | |
| 1991 | 1,916 | 1,523 | 862 | 475 | 4,776 | 21,183 | |
| 1992 | 1,945 | 1,599 | 846 | 487 | 4,876 | 21,838 | |
| 1993 | 1,986 | 1,437 | 884 | 502 | 4,809 | 22,318 | |
| 1994 | 2,075 | 1,394 | 950 | 536 | 4,955 | 22,926 | |
| 1995 | 2,141 | 1,468 | 966 | 556 | 5,131 | 23,461 | |
| 1996 | 2,206 | 1,411 | 979 | 569 | 5,164 | 23,970 | |
| 1997 | 2,300 | 1,250 | 1,019 | 569 | 5,138 | 24,320 | |
| 1998 | 2,275 | 1,232 | 894 | 573 | 4,973 | 24,653 | |
| 1999 | 2,483 | 1,370 | 905 | 594 | 5,351 | 25,955 | |
| 2000 | 2,554 | 1,455 | 901 | 594 | 5,504 | 26,265 | |
| 2001 | 2,397 | 1,187 | 885 | 597 | 5,067 | 25,939 | |
| 2002 | 2,229 | 1,246 | 927 | 598 | 5,000 | 26,525 | |
| 2003 | 2,260 | 1,071 | 845 | 610 | 4,785 | 26,700 | |
| 2004 | 2,456 | 1,293 | 815 | 643 | 5,206 | 27,153 | |
| 2005 | 2,532 | 1,363 | 834 | 649 | 5,378 | 27,561 | |
| 2006 | 2,511 | 1,442 | 832 | 661 | 5,446 | 27,733 | |
| 2007 | 2,509 | 1,550 | 871 | 648 | 5,578 | 29,193 | |
| 2008 | 2,396 | 1,444 | 899 | 624 | 5,363 | 28,554 | |
| 2009 | 2,127 | 1,323 | 921 | 529 | 4,900 | 27,065 | |
| 2010 | 2,149 | 1,460 | 925 | 570 | 5,104 | 27,136 | |
| 2011 | 2,157 | 1,362 | 939 | 597 | 5,054 | 26,543 | |
| 2012 | 2,077 | 1,148 | 980 | 584 | 4,790 | 26,148 | |
| 2013 | 2,037 | 1,017 | 1,091 | 597 | 4,741 | 26,054 | |
| 2014 | 2,060 | 876 | 947 | 621 | 4,504 | 26,132 | |
| 2015 | 2,118 | 1,005 | 919 | 596 | 4,637 | 26,263 | |
| 2016 | 2,178 | 1,116 | 926 | 553 | 4,773 | 26,663 | |
| 2017 | 2,231 | 1,130 | 963 | 569 | 4,893 | 26,774 | |
| 2018 | 2,358 | 1,120 | 1,112 | 591 | 5,181 | 26,998 | |
| | | | <i>Average annual percentage change</i> | | | | |
| 1970-2018 | 1.3% | 0.6% | 0.2% | 0.1% | 0.7% | 1.2% | |
| 2008-2018 | -0.2% | -2.5% | 2.1% | -0.5% | -0.3% | -0.6% | |

Note: Totals may not add due to rounding.

Source:

See Appendix A, Section 2.3 Nonhighway Energy Use.

^a Total transportation figures do not include military and off-highway energy use and may not include all possible uses of fuel for transportation (e.g., snowmobiles). Includes primary energy use for electricity including electricity generation and distribution losses.

This table is the same as Table 2.12 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. Great care should be taken when comparing modal energy intensity data among modes. Because of the inherent differences among the transportation modes in the nature of services, routes available, and many additional factors, it is not possible to obtain truly comparable national energy intensities among modes. These values are averages, and there is a great deal of variability even within a mode.

Table C.6
Passenger Travel and Energy Use, 2018^a

| | Number of vehicles (thousands) | Vehicle-miles (millions) | Passenger-miles (millions) | Load factor (persons/vehicle) | Energy intensities | | Energy use (trillion Btu) |
|------------------------------------|--------------------------------|--------------------------|----------------------------|-------------------------------|------------------------|--------------------------|---------------------------|
| | | | | | (Btu per vehicle-mile) | (Btu per passenger-mile) | |
| Cars | 111,242.1 | 1,419,571 | 2,186,139 | 1.5 | 4,384 | 2,847 | 6,223.1 |
| Personal trucks | 3,678.4 | 1,235,245 | 2,248,145 | 1.8 | 5,963 | 3,276 | 7,365.8 |
| Motorcycles | 8,666.2 | 20,076 | 24,091 | 1.2 | 2,843 | 2,369 | 57.1 |
| Demand response^b | 70.1 | 1,702 | 1,821 | 1.1 | 15,687 | 14,660 | 26.7 |
| Buses | ^b | ^b | ^b | ^b | ^b | ^b | 218.3 |
| Transit | 72.3 | 2,543 | 19,559 | 7.7 | 35,215 | 4,578 | 89.5 |
| Intercity ^d | ^b | ^b | ^b | ^b | ^b | ^b | 37.3 |
| School ^d | 708.8 | ^b | ^b | ^b | ^b | ^b | 91.4 |
| Air | ^b | ^b | ^b | ^b | ^b | ^b | 1,965.4 |
| Certificated route ^c | ^b | 6,092 | 722,935 | 118.7 | 277,822 | 2,341 | 1,692.6 |
| General aviation | 215.4 | ^b | ^b | ^b | ^b | ^b | 272.8 |
| Recreational boats | 12,568.5 | ^b | ^b | ^b | ^b | ^b | 212.1 |
| Rail | 20.7 | 1,475 | 38,449 | 26.1 | 53,109 | 2,038 | 78.4 |
| Intercity (Amtrak) | 0.4 | 273 | 6,363 | 23.3 | 46,940 | 1,963 | 12.8 ^f |
| Transit | 13.0 | 826 | 19,452 | 23.5 | 42,680 | 1,813 | 35.3 |
| Commuter | 7.2 | 377 | 12,634 | 33.6 | 80,459 | 2,398 | 30.3 |

Source:

See Appendix A, Section 3. Passenger Travel and Energy Use.

^a Includes primary energy use for electricity including electricity generation and distribution losses.

^b Includes passenger cars, vans, and small buses operating in response to calls from passengers to the transit operator who dispatches the vehicles.

^c Data are not available.

^d Energy use is estimated.

^e Only domestic service and domestic energy use are shown on this table. (Previous editions included half of international energy.) These energy intensities may be inflated because all energy use is attributed to passengers—cargo energy use is not taken into account.

^f Data for 2018 were not available. Data for 2017 are shown.

This table is the same as Table 2.13 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. Great care should be taken when comparing modal energy intensity data among modes. Because of the inherent differences among the transportation modes in the nature of services, routes available, and many additional factors, it is not possible to obtain truly comparable national energy intensities among modes. These values are averages, and there is a great deal of variability even within a mode.

Table C.7
Energy Intensities of Highway Passenger Modes, 1970–2018

| Year | Cars | | Light truck ^b | | Transit Buses ^c | |
|-----------|------------------------|--------------------------|---|--------------------------|----------------------------|--------------------------|
| | (Btu per vehicle-mile) | (Btu per passenger-mile) | (Btu per vehicle-mile) | (Btu per passenger-mile) | (Btu per vehicle-mile) | (Btu per passenger-mile) |
| 1970 | 9,250 | 4,868 | 12,479 | 6,568 | 31,796 | 2,472 |
| 1975 | 8,993 | 4,733 | 11,879 | 6,496 | 33,748 | 2,814 |
| 1980 | 7,916 | 4,279 | 10,224 | 5,548 | 36,553 | 2,813 |
| 1985 | 7,164 | 4,110 | 8,730 | 4,737 | 38,876 | 3,423 |
| 1990 | 6,169 | 3,856 | 7,746 | 4,557 | 37,374 | 3,794 |
| 1991 | 5,912 | 3,695 | 7,351 | 4,376 | 37,732 | 3,877 |
| 1992 | 5,956 | 3,723 | 7,239 | 4,361 | 40,243 | 4,310 |
| 1993 | 6,087 | 3,804 | 7,182 | 4,379 | 39,043 | 4,262 |
| 1994 | 6,024 | 3,765 | 7,212 | 4,452 | 37,258 | 4,262 |
| 1995 | 5,902 | 3,689 | 7,208 | 4,505 | 37,250 | 4,307 |
| 1996 | 5,874 | 3,683 | 7,247 | 4,473 | 37,452 | 4,340 |
| 1997 | 5,797 | 3,646 | 7,251 | 4,421 | 38,857 | 4,434 |
| 1998 | 5,767 | 3,638 | 7,260 | 4,373 | 41,292 | 4,399 |
| 1999 | 5,821 | 3,684 | 7,327 | 4,361 | 40,574 | 4,344 |
| 2000 | 5,687 | 3,611 | 7,158 | 4,211 | 41,690 | 4,531 |
| 2001 | 5,626 | 3,583 | 7,080 | 4,116 | 38,535 | 4,146 |
| 2002 | 5,662 | 3,612 | 7,125 | 4,142 | 37,543 | 4,133 |
| 2003 | 5,535 | 3,537 | 7,673 | 4,461 | 37,090 | 4,212 |
| 2004 | 5,489 | 3,513 | 7,653 | 4,449 | 37,846 | 4,363 |
| 2005 | 5,607 | 3,594 | 7,009 | 4,075 | 37,421 | 4,249 |
| 2006 | 5,511 | 3,538 | 6,974 | 4,055 | 39,558 | 4,315 |
| 2007 | 5,513 | 3,546 | 6,904 | 4,014 | 39,919 | 4,371 |
| 2008 | 5,466 | 3,520 | 6,830 | 3,712 | 39,894 | 4,347 |
| 2009 | 5,239 | 3,380 | 7,159 | 3,891 | 39,261 | 4,253 |
| 2010 | 5,117 | 3,304 | 6,919 | 3,760 | 36,030 | 4,126 |
| 2011 | 5,032 | 3,252 | 6,795 | 3,693 | 37,806 | 4,250 |
| 2012 | 4,951 | 3,202 | 6,675 | 3,628 | 37,191 | 4,039 |
| 2013 | 4,875 | 3,156 | 6,557 | 3,564 | 37,432 | 4,070 |
| 2014 | 4,799 | 3,109 | 6,631 | 3,604 | 35,397 | 3,827 |
| 2015 | 4,649 | 3,014 | 6,487 | 3,526 | 36,472 | 4,076 |
| 2016 | 4,530 | 2,939 | 6,368 | 3,499 | 36,975 | 4,300 |
| 2017 | 4,458 | 2,895 | 6,169 | 3,390 | 36,611 | 4,552 |
| 2018 | 4,384 | 2,847 | 6,167 | 3,389 | 35,215 | 4,578 |
| | | | <i>Average annual percentage change</i> | | | |
| 1970-2018 | -1.5% | -1.1% | -1.5% | -1.4% | 0.2% | 1.3% |
| 2008-2018 | -2.2% | -2.1% | -1.0% | -0.9% | -1.2% | 0.5% |

Source:

See Appendix A, Section 4. Highway Passenger Mode Energy Intensities.

^a Includes primary energy use for electricity including electricity generation and distribution losses.

^b All two-axle, four-tire trucks.

^c Series not continuous between 1983 and 1984 because of a change in data source by the American Public Transportation Association (APTA).

This table is the same as Table 2.14 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. Great care should be taken when comparing modal energy intensity data among modes. Because of the inherent differences between the transportation modes in the nature of services, routes available, and many additional factors, it is not possible to obtain truly comparable national energy intensities among modes.

Table C.8
Energy Intensities of Nonhighway Passenger Modes, 1970–2018^a

| Year | Air | Intercity Amtrak (Btu per passenger-mile) | Rail | |
|-----------|---|---|---|--|
| | Certificated air carriers ^b (Btu per passenger-mile) | | Rail transit (Btu per passenger-mile) | Commuter rail (Btu per passenger-mile) |
| 1970 | 10,115 | ^c | 2,190 | ^c |
| 1975 | 7,625 | 3,311 | 2,642 | ^c |
| 1980 | 5,561 | 2,859 | 2,323 | ^c |
| 1985 | 5,053 | 2,710 | 2,838 | 2,843 |
| 1986 | 5,011 | 2,487 | 2,909 | 2,945 |
| 1987 | 4,827 | 2,456 | 2,891 | 2,815 |
| 1988 | 4,861 | 2,378 | 2,854 | 2,869 |
| 1989 | 4,844 | 2,621 | 2,734 | 2,881 |
| 1990 | 4,797 | 2,509 | 2,836 | 2,832 |
| 1991 | 4,602 | 2,422 | 3,029 | 2,786 |
| 1992 | 4,455 | 2,534 | 2,887 | 2,629 |
| 1993 | 4,490 | 2,564 | 3,099 | 2,971 |
| 1994 | 4,407 | 2,280 | 3,077 | 2,679 |
| 1995 | 4,349 | 2,500 | 3,071 | 2,628 |
| 1996 | 4,199 | 2,690 | 2,751 | 2,582 |
| 1997 | 4,173 | 2,801 | 2,538 | 2,704 |
| 1998 | 3,987 | 2,777 | 2,494 | 2,625 |
| 1999 | 4,108 | 2,933 | 2,454 | 2,697 |
| 2000 | 3,960 | 3,224 | 2,382 | 2,531 |
| 2001 | 3,943 | 3,256 | 2,413 | 2,514 |
| 2002 | 3,718 | 3,196 | 2,482 | 2,491 |
| 2003 | 3,614 | 2,779 | 2,438 | 2,514 |
| 2004 | 3,505 | 2,728 | 2,316 | 2,521 |
| 2005 | 3,346 | 2,675 | 2,338 | 2,690 |
| 2006 | 3,250 | 2,608 | 2,218 | 2,467 |
| 2007 | 3,153 | 2,470 | 2,088 | 2,566 |
| 2008 | 3,055 | 2,352 | 2,028 | 2,580 |
| 2009 | 2,901 | 2,380 | 1,996 | 2,720 |
| 2010 | 2,825 | 2,220 | 1,985 | 2,801 |
| 2011 | 2,772 | 2,162 | 1,918 | 2,681 |
| 2012 | 2,633 | 2,054 | 1,821 | 2,690 |
| 2013 | 2,568 | 2,081 | 1,805 | 2,615 |
| 2014 | 2,506 | 2,100 | 1,740 | 2,580 |
| 2015 | 2,477 | 2,044 | 1,717 | 2,557 |
| 2016 | 2,449 | 2,011 | 1,659 | 2,568 |
| 2017 | 2,415 | 1,957 | 1,703 | 2,489 |
| 2018 | 2,408 | 1,963 ^d | 1,813 | 2,398 |
| | | <i>Average annual percentage change</i> | | |
| 1970-2018 | -2.9% | -1.4% | -0.4% | -0.5% ^e |
| 2008-2018 | -2.4% | -1.8% | -1.1% | -0.7% ^e |

Source:

See Appendix A, Section 5. Nonhighway Passenger Mode Energy Intensities.

^a Includes primary energy use for electricity including electricity generation and distribution losses.

^b These data differ from the data on Table C.6 because they include half of international services. These energy intensities may be inflated because all energy use is attributed to passengers—cargo energy use is not taken into account.

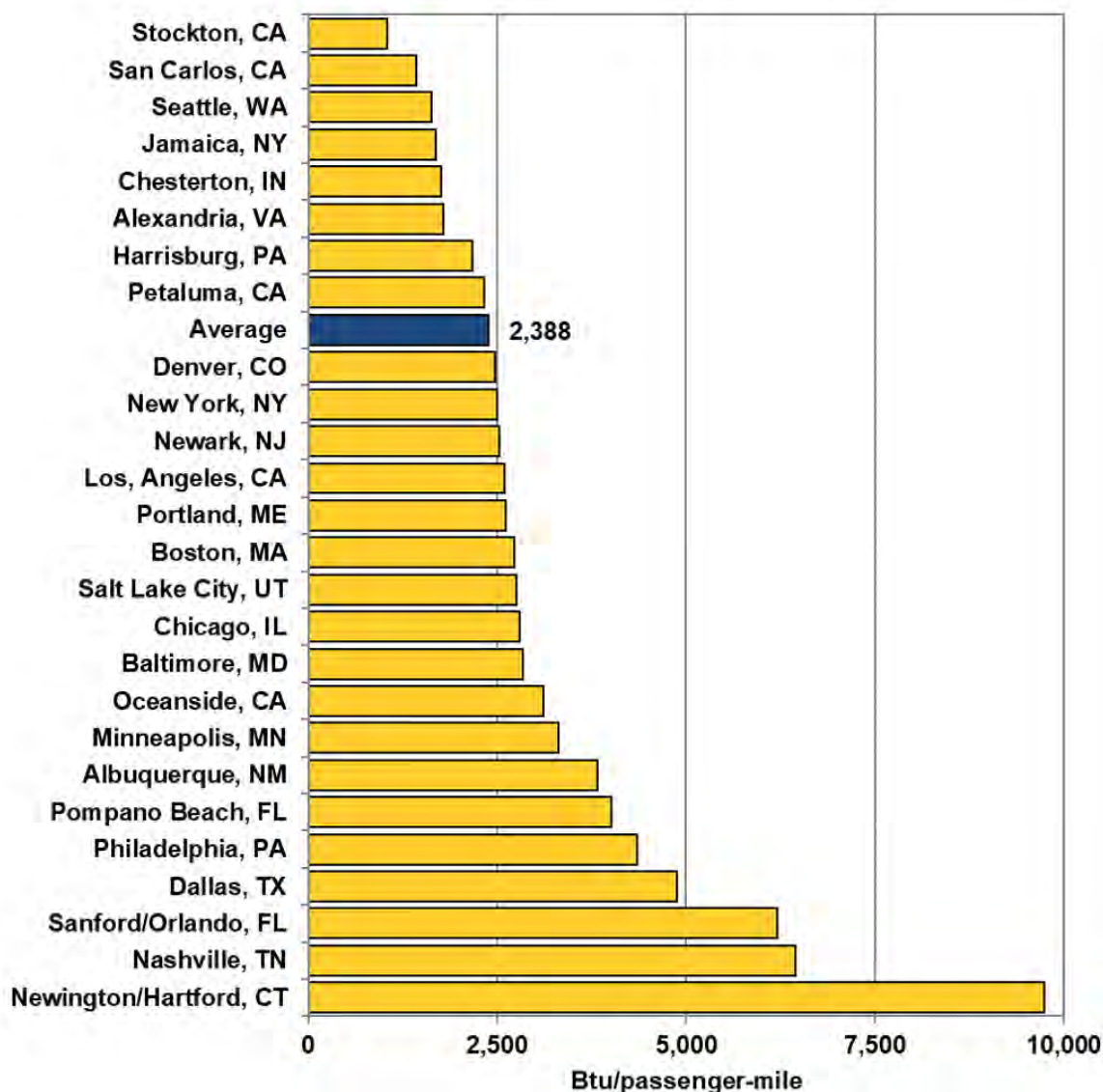
^c Data are not available.

^d Energy data for 2018 were not available, thus were assumed to be the same as 2017.

^e Average annual percentage calculated to earliest year possible.

This table is the same as Figure 7.1 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. The energy intensity of commuter rail systems, measured in Btu per passenger-mile, varies greatly. The average of all commuter rail systems in 2018 is 2,388 Btu/passenger-mile. Most of these 26 systems used diesel power, but nine systems used both diesel and electricity: Chesterton, IN; Harrisburg, PA; Jamaica, NY; Denver, CO; New York, NY; Newark, NJ; Philadelphia, PA; Chicago, IL; and Baltimore, MD.

Figure C.2. Energy Intensity of Commuter Rail Transit Systems^a, 2018



Note: Does not include systems classified as hybrid rail, which is a subset of commuter rail operating exclusively on freight railroad right-of-way.

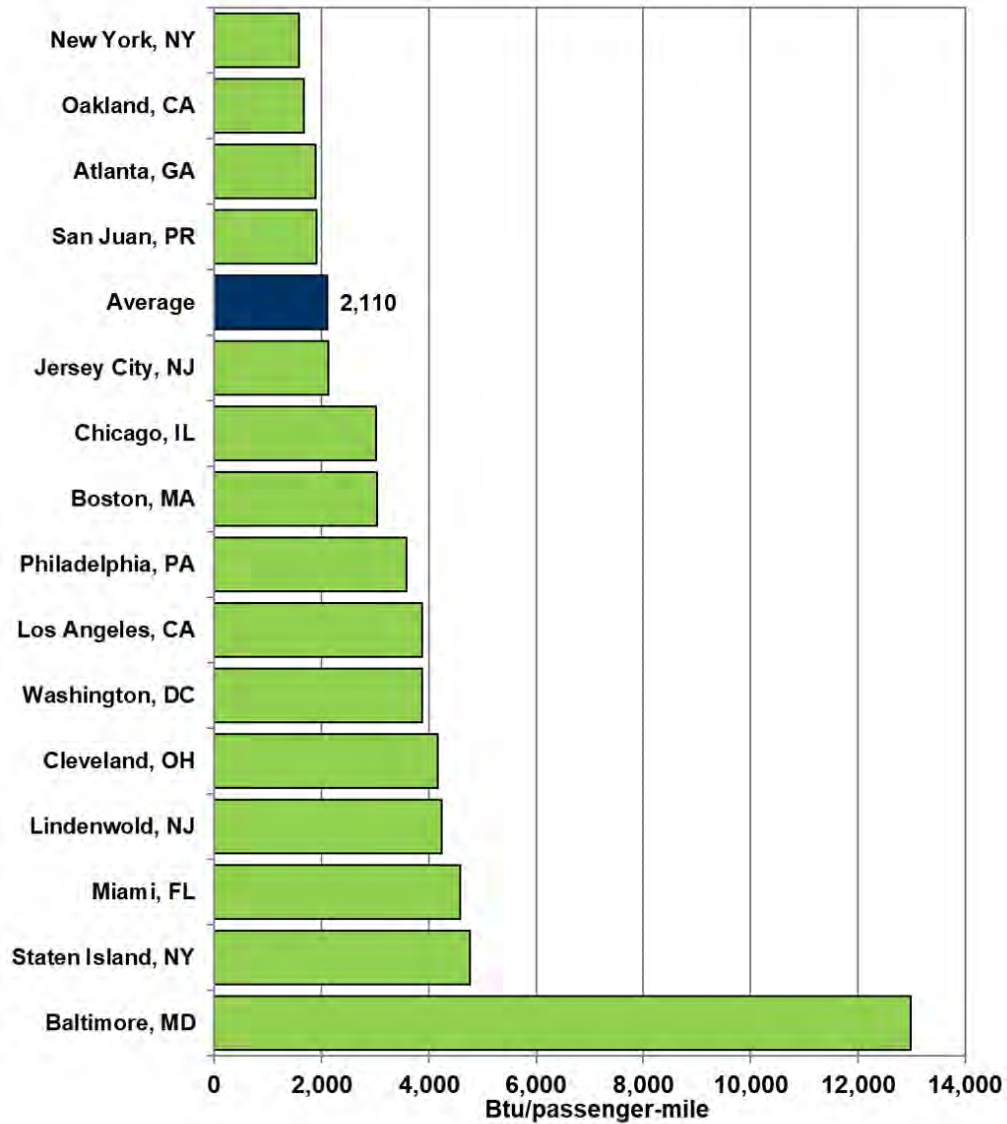
Source:

U.S. Department of Transportation, *2018 National Transit Database*, December 2019. (Additional resources: www.transit.dot.gov/ntd)

^a Electric railcar or diesel-propelled railway for urban passenger train service between a central city and adjacent suburbs. Includes primary energy use for electricity including electricity generation and distribution losses.

This table is the same as Figure 7.2 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. The energy intensity of heavy rail systems, measured in Btu per passenger-mile, varies greatly. The average of all heavy rail systems in 2018 is 2,110 Btu/passenger-mile.

Figure C.3. Energy Intensity of Heavy Rail Systems^a, 2018



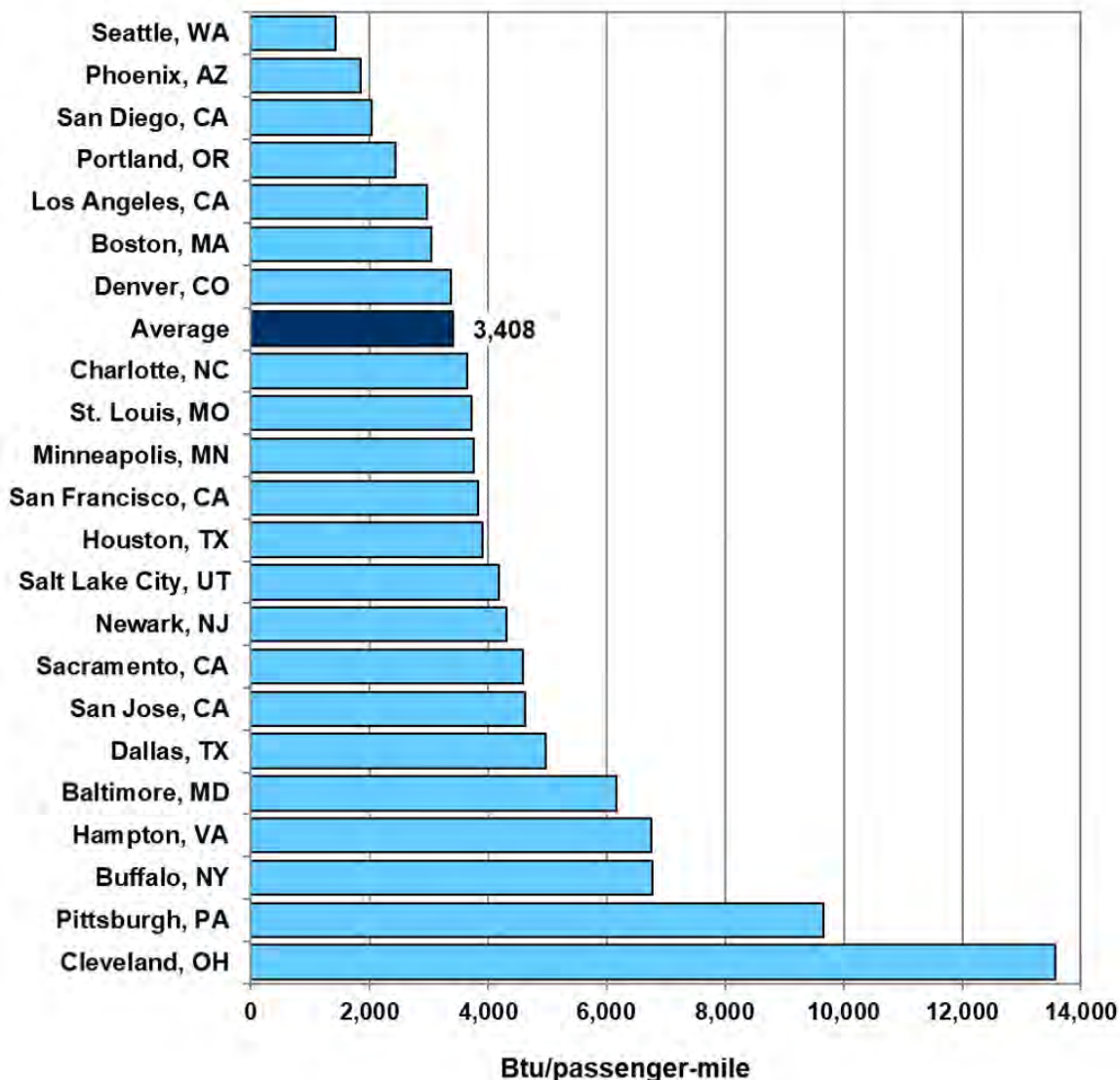
Source:

U.S. Department of Transportation, *2018 National Transit Database*, December 2019. (Additional resources: www.transit.dot.gov/ntd)

^a An electric railway with the capacity for a heavy volume of traffic. Includes primary energy use for electricity including electricity generation and distribution losses.

This table is the same as Figure 7.3 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. The energy intensity of light rail systems, measured in Btu per passenger-mile, varies greatly. The average of all light rail systems in 2018 is 3,408 Btu/passenger-mile.

Figure C.4. Energy Intensity of Light Rail Transit Systems^a, 2018



Source:

U.S. Department of Transportation, *2018 National Transit Database*, December 2019. (Additional resources: www.transit.dot.gov/ntd)

^a An electric railway with a light volume traffic capacity with power drawn from an overhead electric line. Includes primary energy use for electricity including electricity generation and distribution losses.

This table is the same as Table 10.10 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. The National Railroad Passenger Corporation, known as Amtrak, began operation in 1971.

Table C.9
Summary Statistics for the National Railroad Passenger Corporation (Amtrak), 1971–2018

| Year | Number of locomotives in service | Number of passenger cars | Train-miles (thousands) | Car-miles (thousands) | Revenue passenger-miles (millions) | Average trip length (miles) | Energy intensity (Btu per revenue passenger-mile) | Energy use (trillion Btu) ^a |
|---|----------------------------------|--------------------------|-------------------------|-----------------------|------------------------------------|-----------------------------|---|--|
| 1971 | ^a | 1,165 | 16,537 | 140,147 | 1,993 | 188 | ^a | ^a |
| 1975 | 355 | 1,913 | 30,166 | 253,898 | 3,753 | 224 | 3,311 | 12.4 |
| 1980 | 448 | 2,128 | 29,487 | 235,235 | 4,503 | 217 | 2,859 | 12.9 |
| 1985 | 382 | 1,818 | 30,038 | 250,642 | 4,785 | 238 | 2,710 | 13.0 |
| 1990 | 318 | 1,863 | 33,000 | 300,996 | 6,057 | 273 | 2,509 | 15.2 |
| 1991 | 316 | 1,786 | 34,000 | 312,484 | 6,273 | 285 | 2,422 | 15.2 |
| 1992 | 336 | 1,796 | 34,000 | 307,282 | 6,091 | 286 | 2,534 | 15.4 |
| 1993 | 360 | 1,853 | 34,936 | 302,739 | 6,199 | 280 | 2,564 | 15.9 |
| 1994 | 411 | 1,874 | 34,940 | 305,600 | 5,869 | 276 | 2,280 | 13.4 |
| 1995 | 422 | 1,907 | 31,579 | 282,579 | 5,401 | 266 | 2,500 | 13.5 |
| 1996 | 348 | 1,501 | 30,542 | 277,750 | 5,066 | 257 | 2,690 | 13.6 |
| 1997 | 292 | 1,572 | 32,000 | 287,760 | 5,166 | 255 | 2,801 | 14.5 |
| 1998 | 362 | 1,347 | 32,926 | 315,823 | 5,325 | 251 | 2,777 | 14.8 |
| 1999 | 385 | 1,285 | 34,080 | 349,337 | 5,289 | 245 | 2,933 | 15.5 |
| 2000 | 385 | 1,891 | 35,404 | 371,215 | 5,574 | 243 | 3,224 | 18.0 |
| 2001 | 401 | 2,084 | 36,512 | 377,705 | 5,571 | 238 | 3,256 | 18.1 |
| 2002 | 372 | 2,896 | 37,624 | 378,542 | 5,314 | 228 | 3,196 | 17.0 |
| 2003 | 442 | 1,623 | 37,459 | 331,864 | 5,680 | 231 | 2,779 | 15.8 |
| 2004 | 276 | 1,211 | 37,159 | 308,437 | 5,511 | 219 | 2,728 | 15.0 |
| 2005 | 258 | 1,186 | 36,199 | 264,796 | 5,381 | 215 | 2,675 | 14.4 |
| 2006 | 319 | 1,191 | 36,083 | 263,908 | 5,410 | 220 | 2,608 | 14.1 |
| 2007 | 270 | 1,164 | 37,484 | 266,545 | 5,784 | 218 | 2,470 | 14.3 |
| 2008 | 278 | 1,177 | 37,736 | 271,762 | 6,179 | 215 | 2,352 | 14.5 |
| 2009 | 274 | 1,214 | 38,300 | 282,764 | 5,914 | 217 | 2,380 | 14.1 |
| 2010 | 282 | 1,274 | 37,453 | 294,820 | 6,420 | 220 | 2,220 | 14.3 |
| 2011 | 287 | 1,301 | 37,090 | 296,315 | 6,670 | 213 | 2,162 | 14.2 |
| 2012 | 485 | 2,090 | 37,640 | 319,088 | 6,804 | 218 | 2,054 | 14.0 |
| 2013 | 418 | 1,447 | 38,410 | 324,949 | 6,810 | 218 | 2,081 | 14.2 |
| 2014 | 428 | 1,419 | 38,013 | 324,683 | 6,675 | 218 | 2,100 | 14.0 |
| 2015 | 423 | 1,428 | 37,798 | 319,464 | 6,536 | 218 | 2,044 | 13.4 |
| 2016 | 434 | 1,402 | 37,808 | 316,384 | 6,520 | 208 | 2,011 | 13.1 |
| 2017 | 419 | 1,405 | 37,859 | 316,148 | 6,563 | 205 | 1,957 | 12.8 |
| 2018 | 431 | 1,403 | 37,825 | 272,540 | 6,363 | 200 | 1,963 | ^b |
| <i>Average annual percentage change</i> | | | | | | | | |
| 1971-2018 | ^b | 0.4% | 1.8% | 1.4% | 2.5% | 0.1% | ^b | ^b |
| 2008-2018 | 4.5% | 1.8% | 0.0% | 0.0% | 0.3% | -0.7% | -1.8% | -1.3% |

Sources:

1971–83 – Association of American Railroads, Economics and Finance Department, *Statistics of Class I Railroads*, Washington, DC, and annual.

1984–88 – Association of American Railroads, *Railroad Facts*, 1988 Edition, Washington, DC, December 1989, p. 61, and annual.

1989–93 – Personal communication with the Corporate Accounting Office of Amtrak, Washington, DC.

1994–2018 – Number of locomotives in service, number of passenger cars, train-miles, car-miles, revenue passenger-miles, and average trip length - Association of American Railroads, *Railroad Facts*, 2019 Edition, Washington, DC, 2020, p. 73.

Energy use – Personal communication with the Amtrak, Washington, DC. (Additional resources: www.amtrak.com, www.aar.org)

^a Includes primary energy use for electricity including electricity generation and distribution losses.

^b Data are not available.

^c Energy use for 1994 on is not directly comparable to earlier years. Some commuter rail energy use may have been inadvertently included in earlier years.

This table is the same as Table 7.3 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. Commuter rail, which is also known as regional rail or suburban rail, is long-haul rail passenger service operating between metropolitan and suburban areas, whether within or across state lines. Commuter rail lines usually have reduced fares for multiple rides and commutation tickets for regular, recurring riders.

Table C.10
Summary Statistics for Commuter Rail Operations, 1984–2018

| Year | Number of passenger vehicles | Vehicle-miles (millions) | Passenger trips (millions) | Passenger-miles (millions) | Average trip length (miles) | Energy intensity (Btu/passenger-mile) ^a | Energy use (trillion Btu) ^a |
|---|------------------------------|--------------------------|----------------------------|----------------------------|-----------------------------|--|--|
| 1984 | 1984 | 4,075 | 167.9 | 267 | 6,207 | 23.2 | 2,819 |
| 1985 | 1985 | 4,035 | 182.7 | 275 | 6,534 | 23.8 | 2,843 |
| 1990 | 4,982 | 212.7 | 328 | 7,082 | 21.6 | 2,832 | 20.1 |
| 1991 | 5,126 | 214.9 | 318 | 7,344 | 23.1 | 2,786 | 20.5 |
| 1992 | 5,164 | 218.8 | 314 | 7,320 | 23.3 | 2,629 | 19.2 |
| 1993 | 4,982 | 223.9 | 322 | 6,940 | 21.6 | 2,971 | 20.6 |
| 1994 | 5,126 | 230.8 | 339 | 7,996 | 23.6 | 2,679 | 21.4 |
| 1995 | 5,164 | 237.7 | 344 | 8,244 | 24.0 | 2,628 | 21.7 |
| 1996 | 5,240 | 241.9 | 352 | 8,351 | 23.7 | 2,582 | 21.6 |
| 1997 | 5,426 | 250.7 | 357 | 8,038 | 22.5 | 2,704 | 21.7 |
| 1998 | 5,536 | 259.5 | 381 | 8,704 | 22.8 | 2,625 | 22.8 |
| 1999 | 5,550 | 265.9 | 396 | 8,766 | 22.1 | 2,697 | 23.6 |
| 2000 | 5,498 | 270.9 | 413 | 9,402 | 22.8 | 2,531 | 23.8 |
| 2001 | 5,572 | 277.3 | 419 | 9,548 | 22.8 | 2,514 | 24.0 |
| 2002 | 5,724 | 283.7 | 414 | 9,504 | 22.9 | 2,491 | 23.7 |
| 2003 | 5,959 | 286.0 | 410 | 9,559 | 23.3 | 2,514 | 24.0 |
| 2004 | 6,228 | 294.7 | 414 | 9,719 | 23.5 | 2,521 | 24.5 |
| 2005 | 6,392 | 303.4 | 423 | 9,473 | 22.4 | 2,690 | 25.5 |
| 2006 | 6,403 | 314.7 | 441 | 10,361 | 23.5 | 2,467 | 25.6 |
| 2007 | 6,391 | 325.7 | 459 | 11,153 | 24.3 | 2,566 | 28.6 |
| 2008 | 6,617 | 310.2 | 472 | 11,049 | 23.4 | 2,580 | 28.5 |
| 2009 | 6,941 | 343.5 | 468 | 11,232 | 24.0 | 2,720 | 30.5 |
| 2010 | 6,927 | 345.3 | 464 | 10,874 | 23.4 | 2,801 | 30.5 |
| 2011 | 7,193 | 345.2 | 466 | 11,427 | 24.5 | 2,681 | 30.6 |
| 2012 | 7,059 | 346.4 | 471 | 11,181 | 23.7 | 2,690 | 30.1 |
| 2013 | 7,310 | 359.1 | 480 | 11,862 | 24.7 | 2,615 | 31.0 |
| 2014 | 7,337 | 370.8 | 490 | 11,718 | 23.9 | 2,580 | 30.2 |
| 2015 | 7,216 | 373.7 | 495 | 11,813 | 23.9 | 2,557 | 30.2 |
| 2016 | 7,350 | 376.0 | 504 | 11,899 | 23.6 | 2,568 | 30.6 |
| 2017 | 7,290 | 378.2 | 503 | 12,384 | 24.6 | 2,489 | 30.8 |
| 2018 | 7,184 | 376.5 | 505 | 12,634 | 23.2 | 2,398 | 30.3 |
| <i>Average annual percentage change</i> | | | | | | | |
| 1984-2018 | 1.7% | 2.4% | 1.9% | 2.1% | 0.0% | -0.5% | 1.6% |
| 2008-2018 | 0.8% | 1.1% | 0.7% | 1.3% | 0.0% | -0.7% | 0.6% |

Source:

American Public Transportation Association, *2020 Public Transportation Fact Book*, Washington, DC, March 2020, Appendix A. (Additional resources: www.apta.com)

^a Includes primary energy use for electricity including electricity generation and distribution losses.

This table is the same as Table 7.4 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. This table includes data on light rail and heavy rail systems. Light rail vehicles are usually single vehicles driven electrically with power drawn from overhead wires. Heavy rail is characterized by high speed and rapid acceleration of rail cars operating on a separate right-of-way.

Table C.11
Summary Statistics for Rail Transit Operations, 1970–2017^a

| Year | Number of passenger vehicles | Vehicle-miles (millions) | Passenger trips (millions) ^b | Passenger-miles (millions) ^c | Average trip length (miles) ^d | Energy intensity (Btu/passenger-mile) ^e | Energy use (trillion Btu) ^e |
|---|------------------------------|--------------------------|---|---|--|--|--|
| 1970 | 10,548 | 440.8 | 2,116 | 12,273 | f | 2,190 | 26.9 |
| 1975 | 10,617 | 446.9 | 1,797 | 10,423 | f | 2,642 | 27.5 |
| 1980 | 10,654 | 402.2 | 2,241 | 10,939 | 4.9 | 2,323 | 25.4 |
| 1985 | 11,109 | 467.8 | 2,422 | 10,777 | 4.4 | 2,838 | 30.6 |
| 1990 | 11,332 | 560.9 | 2,521 | 12,046 | 4.8 | 2,836 | 34.2 |
| 1995 | 11,156 | 571.8 | 2,284 | 11,419 | 5.0 | 3,071 | 35.1 |
| 1996 | 11,341 | 580.7 | 2,418 | 12,487 | 5.2 | 2,751 | 34.4 |
| 1997 | 11,471 | 598.9 | 2,692 | 13,091 | 4.9 | 2,538 | 33.2 |
| 1998 | 11,521 | 609.5 | 2,669 | 13,412 | 5.0 | 2,494 | 33.4 |
| 1999 | 11,603 | 626.4 | 2,813 | 14,108 | 5.0 | 2,454 | 34.6 |
| 2000 | 12,168 | 648.0 | 2,952 | 15,200 | 5.1 | 2,382 | 36.2 |
| 2001 | 12,084 | 662.4 | 3,064 | 15,615 | 5.1 | 2,413 | 37.7 |
| 2002 | 12,479 | 681.9 | 3,025 | 15,095 | 5.0 | 2,482 | 37.5 |
| 2003 | 12,236 | 694.2 | 3,005 | 15,082 | 5.0 | 2,438 | 36.8 |
| 2004 | 12,480 | 709.7 | 3,098 | 15,930 | 5.1 | 2,316 | 36.9 |
| 2005 | 12,755 | 715.4 | 3,189 | 16,118 | 5.1 | 2,338 | 37.7 |
| 2006 | 12,853 | 726.4 | 3,334 | 16,587 | 5.0 | 2,218 | 36.8 |
| 2007 | 13,032 | 741.2 | 3,879 | 18,070 | 4.7 | 2,088 | 37.7 |
| 2008 | 13,346 | 762.8 | 4,001 | 18,941 | 4.7 | 2,028 | 38.4 |
| 2009 | 13,529 | 775.3 | 3,955 | 19,004 | 4.8 | 1,996 | 37.9 |
| 2010 | 13,614 | 759.6 | 4,007 | 18,580 | 4.6 | 1,985 | 36.9 |
| 2011 | 13,328 | 744.1 | 4,083 | 19,520 | 4.8 | 1,918 | 37.4 |
| 2012 | 12,455 | 749.5 | 4,192 | 19,835 | 4.7 | 1,821 | 36.1 |
| 2013 | 12,434 | 774.3 | 4,275 | 20,381 | 4.8 | 1,805 | 36.8 |
| 2014 | 12,608 | 780.9 | 4,411 | 20,829 | 4.7 | 1,740 | 36.3 |
| 2015 | 12,820 | 803.2 | 4,339 | 20,710 | 4.8 | 1,717 | 35.6 |
| 2016 | 12,912 | 810.2 | 4,346 | 20,922 | 4.8 | 1,659 | 34.7 |
| 2017 | 12,848 | 823.6 | 4,314 | 20,169 | 4.7 | 1,703 | 34.3 |
| 2018 | 13,046 | 826.3 | 4,211 | 19,452 | 4.6 | 1,813 | 35.3 |
| <i>Average annual percentage change</i> | | | | | | | |
| 1970-2018 | 0.4% | 1.3% | 1.4% | 1.0% | -0.6% | -0.4% | 0.6% |
| 2008-2018 | -0.2% | 0.8% | 0.5% | 0.3% | -0.2% | -1.1% | -0.8% |

Sources:

American Public Transportation Association, *2020 Public Transportation Fact Book*, Washington, DC, March 2020, Appendix A. (Additional resources: www.apta.com)
Energy use – See Appendix A for Rail Transit Energy Use.

^a Heavy rail and light rail. Series not continuous between 1983 and 1984 because of a change in data source by the American Public Transit Association (APTA). Beginning in 1984, data provided by APTA are taken from mandatory reports filed with the Urban Mass Transit Administration (UMTA). Data for prior years were provided on a voluntary basis by APTA members and expanded statistically.

^b 1970–79 data represents total passenger rides; after 1979, data represents unlinked passenger trips.

^c Estimated for years 1970–76 based on an average trip length of 5.8 miles.

^d Calculated as the ratio of passenger-miles to passenger trips.

^e Includes primary energy use for electricity including electricity generation and distribution losses.

^f Data are not available.

^g Average annual percentage change is calculated for years 1977–2018.

This table is the same as Table 10.1 but with electricity generation and distribution considered when converting kilowatt-hours of electricity to Btu. Nonhighway transportation modes accounted for 19.2% of total transportation energy use in 2018.

Table C.12
Nonhighway Energy Use Shares, 1970–2018

| Year | Share of transportation energy use | | | | | Transportation total (trillion Btu) ^a |
|------|------------------------------------|-------|----------|------|------------------|--|
| | Air | Water | Pipeline | Rail | Nonhighway total | |
| 1970 | 8.4% | 5.4% | 6.5% | 3.6% | 23.9% | 15,379 |
| 1975 | 7.1% | 5.3% | 4.8% | 3.2% | 20.5% | 17,384 |
| 1980 | 7.6% | 7.4% | 4.7% | 3.1% | 22.8% | 18,941 |
| 1981 | 7.8% | 6.8% | 4.8% | 3.0% | 22.4% | 18,743 |
| 1982 | 7.9% | 5.8% | 4.7% | 2.6% | 21.1% | 18,240 |
| 1983 | 7.8% | 5.3% | 4.1% | 2.6% | 19.8% | 18,373 |
| 1984 | 8.5% | 5.1% | 4.1% | 2.8% | 20.5% | 18,965 |
| 1985 | 8.7% | 4.5% | 3.9% | 2.6% | 19.8% | 19,208 |
| 1986 | 9.0% | 6.5% | 3.6% | 2.4% | 21.5% | 20,279 |
| 1987 | 9.1% | 6.6% | 3.7% | 2.4% | 21.9% | 20,772 |
| 1988 | 9.3% | 6.6% | 4.1% | 2.4% | 22.4% | 21,325 |
| 1989 | 9.1% | 7.0% | 4.1% | 2.4% | 22.6% | 21,686 |
| 1990 | 9.5% | 6.7% | 4.3% | 2.3% | 22.8% | 21,581 |
| 1991 | 9.0% | 7.2% | 4.1% | 2.2% | 22.5% | 21,183 |
| 1992 | 8.9% | 7.3% | 3.9% | 2.2% | 22.3% | 21,838 |
| 1993 | 8.9% | 6.4% | 4.0% | 2.2% | 21.5% | 22,318 |
| 1994 | 9.1% | 6.1% | 4.1% | 2.3% | 21.6% | 22,926 |
| 1995 | 9.1% | 6.3% | 4.1% | 2.4% | 21.9% | 23,461 |
| 1996 | 9.2% | 5.9% | 4.1% | 2.4% | 21.5% | 23,970 |
| 1997 | 9.5% | 5.1% | 4.2% | 2.3% | 21.1% | 24,320 |
| 1998 | 9.2% | 5.0% | 3.6% | 2.3% | 20.2% | 24,653 |
| 1999 | 9.6% | 5.3% | 3.5% | 2.3% | 20.6% | 25,955 |
| 2000 | 9.7% | 5.5% | 3.4% | 2.3% | 21.0% | 26,265 |
| 2001 | 9.2% | 4.6% | 3.4% | 2.3% | 19.5% | 25,939 |
| 2002 | 8.4% | 4.7% | 3.5% | 2.3% | 18.8% | 26,525 |
| 2003 | 8.5% | 4.0% | 3.2% | 2.3% | 17.9% | 26,700 |
| 2004 | 9.0% | 4.8% | 3.0% | 2.4% | 19.2% | 27,153 |
| 2005 | 9.2% | 4.9% | 3.0% | 2.4% | 19.5% | 27,561 |
| 2006 | 9.1% | 5.2% | 3.0% | 2.4% | 19.6% | 27,733 |
| 2007 | 8.6% | 5.3% | 3.0% | 2.2% | 19.1% | 29,193 |
| 2008 | 8.4% | 5.1% | 3.1% | 2.2% | 18.8% | 28,554 |
| 2009 | 7.9% | 4.9% | 3.4% | 2.0% | 18.1% | 27,065 |
| 2010 | 7.9% | 5.4% | 3.4% | 2.1% | 18.8% | 27,136 |
| 2011 | 8.1% | 5.1% | 3.5% | 2.2% | 19.0% | 26,543 |
| 2012 | 7.9% | 4.4% | 3.7% | 2.2% | 18.3% | 26,148 |
| 2013 | 7.8% | 3.9% | 4.2% | 2.3% | 18.2% | 26,054 |
| 2014 | 7.9% | 3.4% | 3.6% | 2.4% | 17.2% | 26,132 |
| 2015 | 8.1% | 3.8% | 3.5% | 2.3% | 17.7% | 26,263 |
| 2016 | 8.2% | 4.2% | 3.5% | 2.1% | 17.9% | 26,663 |
| 2017 | 8.3% | 4.2% | 3.6% | 2.1% | 18.3% | 26,774 |
| 2018 | 8.7% | 4.1% | 4.1% | 2.2% | 19.2% | 26,998 |

Source:

See Appendix A, Section 2.3. Nonhighway Energy Use.

^a Includes primary energy use for electricity including electricity generation and distribution losses.

GLOSSARY

Acceleration power – Often measured in kilowatts. Pulse power obtainable from a battery used to accelerate a vehicle. This is based on a constant current pulse for 30 seconds at no less than 2/3 of the maximum open-circuit-voltage, at 80% depth-of-discharge relative to the battery's rated capacity and at 20° C ambient temperature.

Age – The amount of time a person or thing has existed.

Air Carrier – The commercial system of air transportation consisting of certificated air carriers, air taxis (including commuters), supplemental air carriers, commercial operators of large aircraft, and air travel clubs.

Certificated route air carrier: An air carrier holding a Certificate of Public Convenience and Necessity issued by the Department of Transportation to conduct scheduled interstate services. Nonscheduled or charter operations may also be conducted by these carriers. These carriers operate large aircraft (30 seats or more, or a maximum payload capacity of 7,500 pounds or more) in accordance with Federal Aviation Regulation part 121.

Domestic air operator: Commercial air transportation within and between the 50 States and the District of Columbia. Includes operations of certificated route air carriers, Pan American, local service, helicopter, intra-Alaska, intra-Hawaii, all-cargo carriers and other carriers. Also included are transborder operations conducted on the domestic route segments of U.S. air carriers. Domestic operators are classified based on their operating revenue as follows:

- Majors - over \$1 billion
- Nationals - \$100 million to \$1 billion
- Large Regionals - \$20 million to \$99 million
- Medium Regionals – Less than \$20 million

International air operator: Commercial air transportation outside the territory of the United States, including operations between the U.S. and foreign countries and between the U.S. and its territories and possessions.

Supplemental air carrier: A class of air carriers which hold certificates authorizing them to perform passenger and cargo charter services supplementing the scheduled service of the certificated route air carriers. Supplemental air carriers are often referred to as nonscheduled air carriers or "nonskeds."

Alcohol – The family name of a group of organic chemical compounds composed of carbon, hydrogen, and oxygen. The molecules in the series vary in chain length and are composed of a hydrocarbon plus a hydroxyl group. Alcohol includes methanol and ethanol.

Alternative fuel – For transportation applications, includes the following: methanol; denatured ethanol, and other alcohols; fuel mixtures containing 85 percent or more by volume of methanol, denatured ethanol, and other alcohols with gasoline or other fuels; natural gas; liquefied petroleum gas (propane); hydrogen; coal-derived liquid fuels; fuels (other than alcohol) derived from biological materials (biofuels such as soy diesel fuel); and electricity (including electricity from solar energy). The term "alternative fuel" does not include alcohol or other blended portions of primarily petroleum-based fuels used as oxygenates or extenders, i.e. MTBE, ETBE, other ethers, and the 10-percent ethanol portion of gasohol.

Amtrak – See Rail.

Anthropogenic – Human made. Usually used in the context of emissions that are produced as the result of human activities.

Aviation – See *General aviation*.

Aviation gasoline – All special grades of gasoline for use in aviation reciprocating engines, as given in the American Society for Testing and Materials (ASTM) Specification D 910. Includes all refinery products within the gasoline range that are to be marketed straight or in blends as aviation gasoline without further processing (any refinery operation except mechanical blending). Also included are finished components in the gasoline range which will be used for blending or compounding into aviation gasoline.

Barges – Shallow, non-self-propelled vessels used to carry bulk commodities on the rivers and the Great Lakes.

Battery efficiency – Measured in percentage. Net DC energy delivered on discharge, as a percentage of the total DC energy required to restore the initial state-of-charge. The efficiency value must include energy losses resulting from self-discharge, cell equalization, thermal loss compensation, and all battery-specific auxiliary equipment.

Bike sharing – Allows users access to bicycles on an as-needed basis for a pre-determined fee. Station-based bike sharing typically involves an unattended kiosk and bikes can be returned to any kiosk. Some bike share users have annual/monthly memberships and others are casual users paying higher usage rates than members. Some bike share programs offer electric-assist bikes, often called e-bikes.

Btu – British thermal unit. The amount of energy required to raise the temperature of 1 pound of water 1 degree Fahrenheit at or near 39.2 degrees Fahrenheit. An average Btu content of fuel is the heat value per quantity of fuel as determined from tests of fuel samples.

Bunker – A storage tank.

Bunker fuels – Fuel supplied to ships and aircraft, both domestic and foreign, consisting primarily of residual and distillate fuel oil for ships and kerosene-based jet fuel for aircraft.

Bus –A mode of transit service characterized by roadway vehicles powered by diesel, gasoline, battery, or alternative fuel engines contained within the vehicle.

Intercity bus: A standard size bus equipped with front doors only, high backed seats, luggage compartments separate from the passenger compartment and usually with restroom facilities, for high-speed long-distance service.

Motor bus: Rubber-tired, self-propelled, manually-steered bus with fuel supply on board the vehicle. Motor bus types include intercity, school, and transit.

School and other nonrevenue bus: Bus services for which passengers are not directly charged for transportation, either on a per passenger or per vehicle basis.

Transit bus: A bus designed for frequent stop service with front and center doors, normally with a rear-mounted diesel engine, low-back seating, and without luggage storage compartments or restroom facilities.

Trolley coach: Rubber-tired electric transit vehicle, manually-steered, propelled by a motor drawing current, normally through overhead wires, from a central power source not on board the vehicle.

Calendar year – The period of time between January 1 and December 31 of any given year.

Captive imports – Products produced overseas specifically for domestic manufacturers.

Carsharing – Users have access to a light vehicle on a temporary basis, typically paying a fee for each use in addition to membership fees. The carshare operator maintains a fleet of vehicles that are parked in various locations across a city or urban area. The operator typically provides the insurance, gasoline, parking, and maintenance.

Car size classifications – Size classifications of cars are established by the Environmental Protection Agency (EPA) as follows:

Minicompact – less than 85 cubic feet of passenger and luggage volume.

Subcompact – between 85 to 99 cubic feet of passenger and luggage volume.

Compact – between 100 to 109 cubic feet of passenger and luggage volume.

Midsize – between 110 to 119 cubic feet of passenger and luggage volume.

Large – 120 cubic feet or more of passenger and luggage volume.

Two seater – cars designed primarily to seat only two adults.

Small station wagon – less than 130 cubic feet of passenger and luggage volume.

Mid-size station wagon – between 130 to 159 cubic feet of passenger and luggage volume.

Large station wagon – 160 or more cubic feet of passenger and luggage volume.

Carbon dioxide (CO₂) – A colorless, odorless, non-poisonous gas that is a normal part of the ambient air. Carbon dioxide is a product of fossil fuel combustion.

Carbon monoxide (CO) – A colorless, odorless, highly toxic gas that is a by-product of incomplete fossil fuel combustion. Carbon monoxide, one of the major air pollutants, can be harmful in small amounts if breathed over a certain period of time.

Car-mile (railroad) – A single railroad car moved a distance of one mile.

Cargo ton-mile – See *Ton-mile*.

Certificated route air carriers – See *Air carriers*.

Class I freight railroad – See *Rail*.

Coal slurry – Finely crushed coal mixed with sufficient water to form a fluid.

Combination trucks – Consist of a power unit (a truck tractor) and one or more trailing units (a semi-trailer or trailer). The most frequently used combination is popularly referred to as a "tractor-semitrailer" or "tractor trailer."

Commercial sector – An energy-consuming sector that consists of service-providing facilities of: businesses; Federal, State, and local governments; and other private and public organizations, such as religious, social or fraternal groups. Includes institutional living quarters.

Commuter rail – A mode of transit service (also called metropolitan rail, regional rail, or suburban rail) characterized by an electric or diesel propelled railway for urban passenger train service consisting of local short distance travel operating between a central city and adjacent suburbs.

Compact car – See *car size classifications*.

Compression ignition – The form of ignition that initiates combustion in a diesel engine. The rapid compression of air within the cylinders generates the heat required to ignite the fuel as it is injected.

Constant dollars – A time series of monetary figures is expressed in constant dollars when the effect of change over time in the purchasing power of the dollar has been removed. Usually the data are expressed in terms of dollars of a selected year or the average of a set of years.

Consumer Price Index (CPI) – A measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services.

Continuous discharge capacity – Measured as percent of rated energy capacity. Energy delivered in a constant power discharge required by an electric vehicle for hill climbing and/or high-speed cruise, specified as the percent of its rated energy capacity delivered in a one hour constant-power discharge.

Conventional Refueling Station – An establishment for refueling motor vehicles with traditional transportation fuels, such as gasoline and diesel fuel.

Corporate Average Fuel Economy (CAFE) Standards – CAFE standards were originally established by Congress for new cars, and later for light-duty trucks, in Title V of the Motor Vehicle Information and Cost Savings Act (15 U.S.C.1901, et seq.) with subsequent amendments. Under CAFE, car manufacturers are required by law to produce vehicle fleets with a composite sales-weighted fuel economy which cannot be lower than the CAFE standards in a given year, or for every vehicle which does not meet the standard, a fine of \$5.00 is paid for every one-tenth of a mpg below the standard.

Criteria pollutant – A pollutant determined to be hazardous to human health and regulated under EPA's National Ambient Air Quality Standards. The 1970 amendments to the Clean Air Act require EPA to describe the health and welfare impacts of a pollutant as the "criteria" for inclusion in the regulatory regime.

Crude oil – A mixture of hydrocarbons that exists in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. Crude oil production is measured at the wellhead and includes lease condensate.

Crude oil imports – The volume of crude oil imported into the 50 States and the District of Columbia, including imports from U.S. territories, but excluding imports of crude oil into the Hawaiian Foreign Trade Zone.

Curb weight – The weight of a vehicle including all standard equipment, spare tire and wheel, all fluids and lubricants to capacity, full tank of fuel, and the weight of major optional accessories normally found on the vehicle.

Current dollars – Represents dollars current at the time designated or at the time of the transaction. In most contexts, the same meaning would be conveyed by the use of the term "dollars." See also constant dollars.

Demand Response – A transit mode that includes passenger cars, vans, and small buses operating in response to calls from passengers to the transit operator who dispatches the vehicles. The vehicles do not operate over a fixed route on a fixed schedule. Can also be known as paratransit or dial-a-ride.

Diesel fuel – See *Distillate fuel oil*.

Disposable personal income – See *Income*.

Distillate fuel oil – The lighter fuel oils distilled off during the refining process. Included are products known as ASTM grades numbers 1 and 2 heating oils, diesel fuels, and number 4 fuel oil. The major uses of distillate fuel oils include heating, fuel for on-and off-highway diesel engines, and railroad diesel fuel.

Domestic air operator – See *Air carrier*.

Domestic water transportation – See *Internal water transportation*.

E85 – 85% ethanol and 15% gasoline.

E95 – 95% ethanol and 5% gasoline.

Electric utilities sector – Consists of privately and publicly owned establishments which generate electricity primarily for resale.

Emission standards – Limits or ranges established for pollution levels emitted by vehicles as well as stationary sources. The first standards were established under the 1963 Clean Air Act.

End-use sector – See *Sector*.

Energy capacity – Often measured in kilowatt hours. The energy delivered by the battery up to termination of discharge specified by the battery manufacturer.

Energy efficiency – In reference to transportation, the inverse of energy intensiveness: the ratio of outputs from a process to the energy inputs; for example, miles traveled per gallon of fuel (mpg).

Energy intensity – In reference to transportation, the ratio of energy inputs to a process to the useful outputs from that process; for example, gallons of fuel per passenger-mile or Btu per ton-mile.

Ethanol (C₂H₅OH) – Otherwise known as ethyl alcohol, alcohol, or grain-spirit. A clear, colorless, flammable oxygenated hydrocarbon with a boiling point of 78.5 degrees Celsius in the anhydrous state. In transportation, ethanol is used as a vehicle fuel by itself (E100 – 100% ethanol by volume), blended with gasoline (E85 – 85% ethanol by volume), or as a gasoline octane enhancer and oxygenate (10% by volume).

Excise tax – Paid when purchases are made on a specific good, such as gasoline. Excise taxes are often included in the price of the product. There are also excise taxes on activities, such as highway usage by trucks.

Ferry boat – A transit mode comprising vessels carrying passengers and in some cases vehicles over a body of water, and that are generally steam or diesel-powered.

Fixed operating cost – See *Operating cost*.

Fleet vehicles –

Private fleet vehicles: Ideally, a vehicle could be classified as a member of a fleet if it is:

- a) operated in mass by a corporation or institution,
- b) operated under unified control, or
- c) used for non-personal activities.

However, the definition of a fleet is not consistent throughout the fleet industry. Some companies make a distinction between cars that were bought in bulk rather than singularly, or whether they are operated in bulk, as well as the minimum number of vehicles that constitute a fleet (i.e. 4 or 10).

Government fleet vehicles: Includes vehicles owned by all Federal, state, county, city, and metro units of government, including toll road operations.

Foreign freight – Movements between the United States and foreign countries and between Puerto Rico, the Virgin Islands, and foreign countries. Trade between U.S. territories and possessions (e.g. American Samoa, Guam, North Mariana Islands and U.S. Outlying Islands) and foreign countries is excluded. Traffic to or from the Panama Canal Zone is included, but traffic with U.S. origin and U.S. destination traveling through the Panama Canal is not.

Gas Guzzler Tax – Originates from the 1978 Energy Tax Act (Public Law 95-618). A new car purchaser is required to pay the tax if the car purchased has a combined city/highway fuel economy rating that is below the standard for that year. For model years 1986 and later, the standard is 22.5 mpg.

Gasohol – A mixture of 10% anhydrous ethanol and 90% gasoline by volume; 7.5% anhydrous ethanol and 92.5% gasoline by volume; or 5.5% anhydrous ethanol and 94.5% gasoline by volume. There are other fuels that contain methanol and gasoline, but these fuels are not referred to as gasohol.

Gasoline – See *Motor gasoline*.

General aviation – That portion of civil aviation which encompasses all facets of aviation except air carriers. It includes any air taxis, commuter air carriers, and air travel clubs which do not hold Certificates of Public Convenience and Necessity.

Global warming potential (GWP) – An index used to compare the relative radiative forcing of different gases without directly calculating the changes in atmospheric concentrations. GWPs are calculated as the ratio of the radiative forcing that would result from the emission of one kilogram of a greenhouse gas to that from the emission of one kilogram of carbon dioxide over a fixed period of time, such as 100 years.

Greenhouse gases – Those gases, such as water vapor, carbon dioxide, nitrous oxide, methane, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride, that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.

Gross Domestic Product (GDP) – The market value of goods and services produced by labor and property in the United States, regardless of nationality; gross domestic product replaced gross national product as the primary measure of U.S. production in 1991.

Gross National Product (GNP) – A measure of monetary value of the goods and services becoming available to the nation from economic activity. The market value of goods and services produced by labor and property supplied by U.S. residents, regardless of where they are located. Calculated quarterly by the Department of Commerce, the gross national product is the broadest available measure of the level of economic activity.

Gross vehicle weight (gvw) – The weight of the empty truck plus the maximum anticipated load weight, including passengers, fluids, and cargo.

Gross vehicle weight rating (gvwr) – The gross vehicle weight which is assigned to each new truck by the manufacturer. This rating may be different for trucks of the same model because of certain features, such as heavy-duty suspension. Passenger cars are not assigned gross vehicle weight ratings.

Heavy-heavy truck – See *Truck size classifications*.

Heavy rail – A mode of transit service (also called metro, subway, rapid transit, or rapid rail) operating on an electric railway with the capacity for a heavy volume of traffic. Characterized by high speed and rapid acceleration of passenger rail cars.

Household – Consists of all persons who occupy a housing unit, including the related family members and all unrelated persons, if any, who share the housing unit.

Housing unit – A house, apartment, a group of rooms, or a single room occupied or intended for occupancy as separate living quarters. Separate living quarters are those in which the occupants do not live and eat with any other persons in the structure and which have either (1) direct access from the outside of the building or through a common hallway intended to be used by the occupants of another unit or by the general public, or (2) complete kitchen facilities for the exclusive use of the occupants. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements.

Hybrid-electric vehicles – Combines the benefits of gasoline engines and electric motors and can be configured to obtain different objectives, such as improved fuel economy, increased power, or additional auxiliary power for electronic devices and power tools.

Hybrid rail – A subset of commuter rail operating exclusively on freight railroad right-of-way.

Hydrocarbon (HC) – A compound that contains only hydrogen and carbon. The simplest and lightest forms of hydrocarbon are gaseous. With greater molecular weights they are liquid, while the heaviest are solids.

Income –

Disposable personal income: Personal income less personal tax and non-tax payments.

National income: The aggregate earnings of labor and property which arise in the current production of goods and services by the nation's economy.

Personal income: The current income received by persons from all sources, net of contributions for social insurance.

Industrial sector – Construction, manufacturing, agricultural and mining establishments.

Inertia weight – The curb weight of a vehicle plus 300 pounds.

Intercity bus – See *Bus*.

Intermodal – Transportation activities involving more than one mode of transportation, including transportation connections and coordination of various modes.

Internal water transportation – Includes all local (intraport) traffic and traffic between ports or landings wherein the entire movement takes place on inland waterways. Also termed internal are movements involving carriage on both inland waterways and the water of the Great Lakes, and inland movements that cross short stretches of open water that link inland systems.

International air operator – See *Air carrier*.

International freight – See *Foreign freight*.

Jet fuel – Includes both naphtha-type and kerosene-type fuels meeting standards for use in aircraft turbine engines. Although most jet fuel is used in aircraft, some is used for other purposes such as generating electricity in gas turbines.

Kerosene-type jet fuel: A quality kerosene product with an average gravity of 40.7 degrees API and 10% to 90% distillation temperatures of 217 to 261 degrees Celsius. Used primarily as fuel for commercial turbojet and turboprop aircraft engines. It is a relatively low freezing point distillate of the kerosene type.

Naphtha-type jet fuel: A fuel in the heavy naphtha boiling range with an average gravity of 52.8 degrees API and 10% to 90% distillation temperatures of 117 to 233 degrees Celsius used for turbojet and turboprop aircraft engines, primarily by the military. Excludes ramjet and petroleum.

Kerosene – A petroleum distillate in the 300 to 500 degrees Fahrenheit boiling range and generally having a flash point higher than 100 degrees Fahrenheit by the American Society of Testing and Material (ASTM) Method D56, a gravity range from 40 to 46 degrees API, and a burning point in the range of 150 to 175 degrees Fahrenheit. It is a clean-burning product suitable for use as an illuminant when burned in wick lamps. Includes grades of kerosene called range oil having properties similar to Number 1 fuel oil, but with a gravity of about 43 degrees API and an end point of 625 degrees Fahrenheit. Used in space heaters, cooking stoves, and water heaters.

Kerosene-type jet fuel – See Jet fuel.

Large car – See *Car size classifications*.

Lease Condensate – A liquid recovered from natural gas at the well or at small gas/oil separators in the field. Consists primarily of pentanes and heavier hydrocarbons (also called field condensate).

Light-duty vehicles – Cars and light-duty trucks combined.

Light-duty truck – Light-duty trucks are defined differently by different agencies/companies. Therefore, this document does not have one single definition of light-duty trucks. The Environmental Protection Agency defines light-duty trucks size classes as follows:

| Class | Gross Vehicle Weight Rating (GVWR) | |
|---------------------------------|------------------------------------|--------------------|
| Pickup Trucks | Through 2007 | As of 2008 |
| | Small | < 4,500 lbs |
| | Standard | 4,500 to 8,500 lbs |
| Vans | Through 2010 | As of 2011 |
| | Passenger | < 8,500 lbs |
| | Cargo | < 8,500 lbs |
| Minivans | < 8,500 lbs | |
| SUVs | Through 2010 | 2011–12 |
| | All | < 8,500 lbs |
| | | As of 2013 |
| | Small | < 6,000 lbs |
| | Standard | 6,000 to 9,999 lbs |
| Special Purpose Vehicles | Through 2010 | As of 2011 |
| | < 8,500 lbs | < 8,500 lbs |
| | | or < 10,000 lbs |
| | depending on configuration | |

Light-heavy truck – See *Truck size classifications*.

Light rail – Mode of transit service (also called streetcar, tramway or trolley) operating passenger rail cars singly (or in short, usually two-car or three-car trains) on fixed rails in right-of-way that is often separated from other traffic for part or much of the way.

Liquefied petroleum gas (lpg) – Consists of propane and butane and is usually derived from natural gas. In locations where there is no natural gas and the gasoline consumption is low, naphtha is converted to lpg by catalytic reforming.

Load factor – Total passenger miles divided by total vehicle miles.

Low emission vehicle – Any vehicle certified to the low emission standards which are set by the Federal government and/or the state of California.

M85 – 85% methanol and 15% gasoline.

M100 – 100% methanol.

Medium truck – See *Truck size classifications*.

Methanol (CH₃OH) – A colorless highly toxic liquid with essentially no odor and very little taste. It is the simplest alcohol and boils at 64.7 degrees Celsius. In transportation, methanol is used as a vehicle fuel by itself (M100), or blended with gasoline (M85).

Midsized car – See *Car size classifications*.

Minicompact car – See *Car size classifications*.

Model year – In this publication, model year is referring to the "sales" model year, the period from October 1 to the next September 31.

Motor bus – See *Bus*.

Motor gasoline – A mixture of volatile hydrocarbons suitable for operation of an internal combustion engine whose major components are hydrocarbons with boiling points ranging from 78 to 217 degrees Celsius and whose source is distillation of petroleum and cracking, polymerization, and other chemical reactions by which the naturally occurring petroleum hydrocarbons are converted into those that have superior fuel properties.

Regular gasoline: Gasoline having an antiknock index, i.e., octane rating, greater than or equal to 85 and less than 88. Note: Octane requirements may vary by altitude.

Midgrade gasoline: Gasoline having an antiknock index, i.e., octane rating, greater than or equal to 88 and less than or equal to 90. Note: Octane requirements may vary by altitude.

Premium gasoline: Gasoline having an antiknock index, i.e., octane rating, greater than 90. Note: Octane requirements may vary by altitude.

Reformulated gasoline: Finished motor gasoline formulated for use in motor vehicles, the composition and properties of which meet the requirements of the reformulated gasoline regulations promulgated by the U.S. Environmental Protection Agency under Section 211(k) of the Clean Air Act. For more details on this clean fuel program see <http://www.epa.gov/otaq/fuels/gasolinefuels/rfg/index.htm>. Note: This category includes oxygenated fuels program reformulated gasoline (OPRG) but excludes reformulated gasoline blendstock for oxygenate blending (RBOB).

MTBE – Methyl Tertiary Butyl Ether—a colorless, flammable, liquid oxygenated hydrocarbon containing 18.15 percent oxygen.

Naphtha-type jet fuel – See *Jet fuel*.

National income – See *Income*.

Nationwide Household Travel Survey (NHTS) – A nationwide survey of households that provides information on the characteristics and personal travel patterns of the U.S. population. Surveys were conducted in 2001, 2009, and 2017 by the U.S. Bureau of Census for the U.S. Department of Transportation. This is a follow-on to the NPTS.

Nationwide Personal Transportation Survey (NPTS) – A nationwide survey of households that provides information on the characteristics and personal travel patterns of the U.S. population. Surveys were conducted in 1969, 1977, 1983, 1990, and 1995 by the U.S. Bureau of Census for the U.S. Department of Transportation.

Natural gas – A mixture of hydrocarbon compounds and small quantities of various non-hydrocarbons existing in the gaseous phase or in solution with crude oil in natural underground reservoirs at reservoir conditions.

Natural gas, dry: Natural gas which remains after: 1) the liquefiable hydrocarbon portion has been removed from the gas stream; and 2) any volumes of nonhydrocarbon gases have been removed where they occur in sufficient quantity to render the gas unmarketable. Dry natural gas is also known as consumer-grade natural gas. The parameters for measurement are cubic feet at 60 degrees Fahrenheit and 14.73 pounds per square inch absolute.

Natural gas, wet: The volume of natural gas remaining after removal of lease condensate in lease and/or field separation facilities, if any, and after exclusion of nonhydrocarbon gases where they occur in sufficient quantity to render the gas unmarketable. Natural gas liquids may be recovered from volumes of natural gas, wet after lease separation, at natural gas processing plants.

Natural gas plant liquids: Natural gas liquids recovered from natural gas in processing plants and from natural gas field facilities and fractionators. Products obtained include ethane, propane, normal butane, isobutane, pentanes plus, and other products from natural gas processing plants.

Nitrogen oxides (NO_x) – A product of combustion of fossil fuels whose production increases with the temperature of the process. It can become an air pollutant if concentrations are excessive.

Nonattainment area – Any area that does not meet the national primary or secondary ambient air quality standard established by the Environmental Protection Agency for designated pollutants, such as carbon monoxide and ozone.

Oil Stocks – Oil stocks include crude oil (including strategic reserves), unfinished oils, natural gas plant liquids, and refined petroleum products.

Operating cost –

Fixed operating cost: In reference to passenger car operating cost, refers to those expenditures that are independent of the amount of use of the car, such as insurance costs, fees for license and registration, depreciation and finance charges.

Variable operating cost: In reference to passenger car operating cost, expenditures which are dependent on the amount of use of the car, such as the cost of gas and oil, tires, and other maintenance.

Organization for Economic Cooperation and Development (OECD) – Consists of Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States. Total OECD includes the United States Territories (Guam, Puerto Rico, and the U.S. Virgin Islands).

OECD Europe: Consists of Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, and United Kingdom.

OECD Pacific: Consists of Australia, Japan, South Korea, and New Zealand.

Organization for Petroleum Exporting Countries (OPEC) – Includes Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela.

Arab OPEC – Consists of Algeria, Bahrain, Egypt, Iraq, Kuwait, Libya, Qatar, Saudi Arabia, Syria, Tunisia, and the United Arab Emirates.

Other single-unit truck – See *Single-unit truck*.

Oxygenate – A substance which, when added to gasoline, increases the amount of oxygen in that gasoline blend. Includes fuel ethanol, methanol, and methyl tertiary butyl ether (MTBE).

Paratransit – Mode of transit service (also called demand response or dial-a-ride) characterized by the use of passenger cars, vans or small buses operating in response to calls from passengers or their agents to the transit operator, who then dispatches a vehicle to pick up the passengers and transport them to their destinations.

Particulates – Carbon particles formed by partial oxidation and reduction of the hydrocarbon fuel. Also included are trace quantities of metal oxides and nitrides, originating from engine wear, component degradation, and inorganic fuel additives. In the transportation sector, particulates are emitted mainly from diesel engines.

Passenger-miles traveled (PMT) – One person traveling the distance of one mile. Total passenger-miles traveled, thus, give the total mileage traveled by all persons.

Passenger rail – See *Rail*, "*Amtrak*" and "*Transit Railroad*".

Persian Gulf countries – Consists of Bahrain, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates.

Personal Consumption Expenditures (PCE) – As used in the national accounts, the market value of purchases of goods and services by individuals and nonprofit institutions and the value of food, clothing, housing, and financial services received by them as income in kind. It includes the rental value of owner-occupied houses but excludes purchases of dwellings, which are classified as capital goods (investment).

Personal income – See *Income*.

Petroleum – A generic term applied to oil and oil products in all forms, such as crude oil, lease condensate, unfinished oil, refined petroleum products, natural gas plant liquids, and non-hydrocarbon compounds blended into finished petroleum products.

Petroleum consumption: A calculated demand for petroleum products obtained by summing domestic production, imports of crude petroleum and natural gas liquids, imports of petroleum products, and the primary stocks at the beginning of the period and then subtracting the exports and the primary stocks at the end of the period.

Petroleum exports: Shipments of petroleum products from the 50 States and the District of Columbia to foreign countries, Puerto Rico, the Virgin Islands, and other U.S. possessions and territories.

Petroleum imports: All imports of crude petroleum, natural gas liquids, and petroleum products from foreign countries and receipts from Guam, Puerto Rico, the Virgin Islands, and the Hawaiian Trade Zone. The commodities included are crude oil, unfinished oils, plant condensate, and refined petroleum products.

Petroleum inventories: The amounts of crude oil, unfinished oil, petroleum products, and natural gas liquids held at refineries, at natural gas processing plants, in pipelines, at bulk terminals operated by refining and pipeline companies, and at independent bulk terminals. Crude oil held in storage on leases is also included; these stocks are known as primary stocks. Secondary stocks—those held by jobbers dealers, service station operators, and consumers—are excluded. Prior to 1975, stock held at independent bulk terminals were classified as secondary stocks.

Petroleum products supplied: For each petroleum product, the amount supplied is calculated by summing production, crude oil burned directly, imports, and net withdrawals from primary stocks and subtracting exports.

Plug-in hybrid-electric vehicles (PHEVs) — Hybrid-electric vehicles with high capacity batteries that can be charged by plugging them into an electrical outlet or charging station. There are two basic PHEV configurations:

Parallel or Blended PHEV: Both the engine and electric motor are mechanically connected to the wheels, and both propel the vehicle under most driving conditions. Electric-only operation usually occurs only at low speeds.

Series PHEVs, also called Extended Range Electric Vehicles (EREVs): Only the electric motor turns the wheels; the gasoline engine is only used to generate electricity. Series PHEVs can run solely on electricity until the battery needs to be recharged. The gasoline engine will then generate the electricity needed to power the electric motor. For shorter trips, these vehicles might use no gasoline at all.

Processing Gain – The amount by which the total volume of refinery output is greater than the volume of input for given period of time. The processing gain arises when crude oil and other hydrocarbons are processed into products that are, on average, less dense than the input.

Processing Loss – The amount by which the total volume of refinery output is less than the volume of input for given period of time. The processing loss arises when crude oil and other hydrocarbons are processed into products that are, on average, denser than the input.

Proved Reserves of Crude Oil – The estimated quantities of all liquids defined as crude oil, which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions.

Quad – Quadrillion, 10^{15} . In this publication, a Quad refers to Quadrillion Btu.

Rail –

Amtrak (American Railroad Tracks): Operated by the National Railroad Passenger Corporation of Washington, DC. This rail system was created by President Nixon in 1970, and was given the responsibility for the operation of intercity, as distinct from suburban, passenger trains between points designated by the Secretary of Transportation.

Class I freight railroad: Defined by the Interstate Commerce Commission each year based on annual operating revenue. A railroad is dropped from the Class I list if it fails to meet the annual earnings threshold for three consecutive years.

Commuter railroad: Those portions of mainline railroad (not electric railway) transportation operations which encompass urban passenger train service for local travel between a central city and adjacent suburbs. Commuter railroad service—using both locomotive-hauled and self-propelled railroad passenger cars—is characterized by multi-trip tickets, specific station-to-station fares, and usually only one or two stations in the central business district. Also known as suburban railroad.

Transit railroad: Includes "heavy" and "light" transit rail. **Heavy transit rail** is characterized by exclusive rights-of-way, multi-car trains, high speed rapid acceleration, sophisticated signaling, and high platform loading. Also known as subway, elevated railway, or metropolitan railway (metro). **Light transit rail** may be on exclusive or shared rights-of-way, high or low platform loading, multi-car trains or single cars, automated or manually operated. In generic usage, light rail includes streetcars, trolley cars, and tramways.

Refiner sales price – Sales from the refinery made directly to ultimate consumers, including bulk consumers (such as agriculture, industry, and electric utilities) and residential and commercial consumers.

Reformulated gasoline (RFG) – See *Motor gasoline*.

RFG area – An ozone nonattainment area designated by the Environmental Protection Agency which requires the use of reformulated gasoline.

Residential sector – An energy consuming sector that consists of living quarters for private households. Excludes institutional living quarters.

Residential Transportation Energy Consumption Survey (RTECS) – This survey was designed by the Energy Information Administration of the Department of Energy to provide information on how energy is used by households for personal vehicles. It has been conducted five times since 1979, the most recent being 1991.

Residual fuel oil – The heavier oils that remain after the distillate fuel oils and lighter hydrocarbons are boiled off in refinery operations. Included are products known as ASTM grade numbers 5 and 6 oil, heavy diesel oil, Navy Special Fuel Oil, Bunker C oil, and acid sludge and pitch used as refinery fuels. Residual fuel oil is used for the production of electric power, for heating, and for various industrial purposes.

Ride hailing – Ride hailing services (also called transportation network companies) provide on-demand transportation for a fee, typically via a mobile phone application that matches drivers and riders. The most popular ride hailing companies in the U.S. are Uber and Lyft.

Rural – Usually refers to areas with population less than 5,000.

Sales period – October 1 of the previous year to September 30 of the given year. Approximately the same as a model year.

Sales-weighted miles per gallon (mpg) – Calculation of a composite vehicle fuel economy based on the distribution of vehicle sales.

Scrapage rate – As applied to motor vehicles, it is usually expressed as the percentage of vehicles of a certain type in a given age class that are retired from use (lacking registration) in a given year.

School and other nonrevenue bus – See *Bus*.

Sector – A group of major energy-consuming components of U.S. society developed to measure and analyze energy use. The sectors most commonly referred to are: residential, commercial, industrial, transportation, and electric power.

Shared micromobility –Refers to small fleets of fully or partially human-powered vehicles including bikes, e-bikes and e-scooters.

Shared mobility – Any mode of shared transportation, such as public transit, bike and scooter sharing, carsharing, carpooling, and ride hailing.

Single-unit truck – Includes two-axle, four-tire trucks and other single-unit trucks.

Two-axle, four-tire truck: A motor vehicle consisting primarily of a single motorized device with two axles and four tires.

Other single-unit truck: A motor vehicle consisting primarily of a single motorized device with more than two axles or more than four tires.

Spark ignition engine – An internal combustion engine in which the charge is ignited electrically (e.g., with a spark plug).

Special fuels – Consist primarily of diesel fuel with small amount of liquefied petroleum gas, as defined by the Federal Highway Administration.

Specific acceleration power – Measured in watts per kilogram. Acceleration power divided by the battery system weight. Weight must include the total battery system.

Specific energy – Measured in watt hours per kilogram. The rated energy capacity of the battery divided by the total battery system weight.

Subcompact car – See *Car size classifications*.

Supplemental air carrier – See *Air carrier*.

Survival rate – As applied to motor vehicles, it is usually expressed as the percentage of vehicles of a certain type in a given age class that will be in use at the end of a given year.

Tax incentives – In general, a means of employing the tax code to stimulate investment in or development of a socially desirable economic objective without direct expenditure from the budget of a given unit of government. Such incentives can take the form of tax exemptions or credits.

Test weight – The weight setting at which a vehicle is tested on a dynamometer by the U.S. Environmental Protection Agency (EPA). This weight is determined by the EPA using the inertia weight of the vehicle.

Ton-mile – The movement of one ton of freight the distance of one mile. Ton-miles are computed by multiplying the weight in tons of each shipment transported by the distance hauled.

Transmission types –

- A3 – Automatic three speed
- A4 – Automatic four speed
- A5 – Automatic five speed
- L4 – Automatic lockup four speed
- M5 – Manual five speed

Transit bus – See *Bus*.

Transit railroad – See *Rail*.

Transportation network company (TNC) – provides on-demand transportation for a fee, typically via a mobile phone application that matches drivers and riders. The most popular TNCs in the U.S. are Uber and Lyft.

Transportation sector – Consists of both private and public passenger and freight transportation, as well as government transportation, including military operations.

Truck Inventory and Use Survey (TIUS) – Survey designed to collect data on the characteristics and operational use of the nation's truck population. It is conducted every five years by the U.S. Bureau of the Census. Surveys were conducted in 1963, 1967, 1972, 1977, 1982, 1987, and 1992. For the 1997 survey, it was renamed the Vehicle Inventory and Use Survey in anticipation of including additional vehicle types. However, no additional vehicle types were added to the 1997 survey.

Trolleybus – Mode of transit service (also called transit coach) using vehicles propelled by a motor drawing current from overhead wires via connecting poles called a trolley pole, from a central power source not onboard the vehicle.

Truck size classifications – U.S. Bureau of the Census has categorized trucks by gross vehicle weight (gvw) as follows:

- Light – Less than 10,000 pounds gvw (Also see *Light-duty truck*.)
- Medium – 10,001 to 20,000 pounds gvw
- Light-heavy – 20,001 to 26,000 pounds gvw
- Heavy-heavy – 26,001 pounds gvw or more.

Two-axle, four-tire truck – See *Single-unit truck*.

Two-seater car – See *Car size classifications*.

Ultra-low emission vehicle – Any vehicle certified to the ultra-low emission standards which are set by the Federal government and/or the state of California.

Urban – Usually refers to areas with population of 5,000 or greater.

Vanpool: A ridesharing prearrangement using vans or small buses providing round-trip transportation between the participant's prearranged boarding points and a common and regular destination.

Variable operating cost – See *Operating cost*.

Vehicle Inventory and Use Survey – Last conducted in 2002. See *Truck Inventory and Use Survey*.

Vehicle-miles traveled (vmt) – One vehicle traveling the distance of one mile. Total vehicle miles, thus, is the total mileage traveled by all vehicles.

Volatile organic compounds (VOCs) – Organic compounds that participate in atmospheric photochemical reactions.

Waterborne Commerce –

Coastwise: Domestic traffic receiving a carriage over the ocean, or the Gulf of Mexico. Traffic between Great Lakes ports and seacoast ports, when having a carriage over the ocean, is also termed Coastwise.

Domestic: Includes coastwise, lakewise, and internal waterborne movements.

Foreign: Waterborne import, export, and in-transit traffic between the United States, Puerto Rico and the Virgin Islands and any foreign country.

Internal: Vessel movements (origin and destination) which take place solely on inland waterways. An inland waterway is one geographically located within the boundaries of the contiguous 48 states or within the boundaries of the State of Alaska.

Lakewise: Waterborne traffic between the United States ports on the Great Lakes System. The Great Lakes System is treated as a separate waterway system rather than as a part of the inland waterway system. In comparing historical data for the Great Lakes System, one should note that prior to calendar year 1990, marine products, sand and gravel being moved from the Great Lakes to Great Lake destinations were classified as local traffic. From 1990-on, these activities are classified as lakewise traffic.

Well-to-wheel – A life cycle analysis used in transportation to consider the entire energy cycle for a given mode, rather than just tailpipe emissions. The analysis starts at the primary energy source and ends with the turning wheels of the vehicle.

Zero-emission vehicle – Any vehicle certified to the zero emission standards which are set by the Federal government and/or the state of California. These standards apply to the vehicle emissions only.