Annual Energy Outlook 2016

Modeling updates in the transportation sector

For
AEO2016 Working Group
March 09, 2016 | Washington, DC

By
Trisha Hutchins, Melissa Lynes, John Maples, Mark Schipper, and David Stone
Office of Energy Consumption and Efficiency Analysis
Updates to the *Annual Energy Outlook 2016*

- **New regional stock model for on-road vehicles**
  - Reflects Polk annual data for cars, light trucks, Class 2B, Class 3, Class 4-6, and Class 7&8 vehicles through 2014 by Census Division (CD)
  - Incorporates revisions to fleet and household vehicle allocations

- **Revised and updated travel model for LDVs**
  - Updated historical population, licensed driver and travel data
  - Restructured age cohort for licensed driver to align with travel data
  - Re-estimated parameters in travel demand equations

- **International Convention for the Prevention of Pollution from Ships (MARPOL) emission control and efficiency standards -- vessels operating in Emission Control Areas (ECA)**
  - Reflect ship efficiency improvements, shipping demand changes, and fuel price fluctuations
  - Incorporates standards impacting technology and fuel choices as compliance pathways; with growth tied to U.S. trade flows
Updates to the *Annual Energy Outlook 2016* (continued)

- Updated historical sales shares for cars and light trucks

- Updated historical AFV sales for LDVs
  - Choice model re-calibrated to reflect historical sales data for FFVs, Diesels, HEVs, PHEVs, and EVs
  - Includes behavior adjustments to reflect current issues associated with diesel vehicle sales and expected recovery

- Incorporates latest California ZEV mandates
  - Includes Section 177 (CAA) states adopting all California emission regulations:
    - CD1: Connecticut, Maine, Massachusetts, Rhode Island, Vermont
    - CD2: New Jersey, New York, Pennsylvania
    - CD5: Maryland
    - CD9: Oregon

- Updated CAFE compliance for model years 2009-14
ZEV mandates
Battery electric vehicle sales

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Plug-in hybrid vehicle sales

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Hybrid vehicle sales

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Natural gas vehicle sales

thousands

2005 2010 2015 2020 2025 2030 2035 2040

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Fuel cell vehicle sales

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Electric vehicle stocks

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Other ZEV effected vehicle stocks in 2040

PHEV | HEV | NGV | FCV
---|---|---|---
AEO2015 | AEO2016

Discussion purposes only - Do not cite or circulate
Source: Annual Energy Outlook 2016 Reference case d022516a
Fuel economy
Car sales as a percent of new light-duty vehicle sales

Discussion purposes only - Do not cite or circulate
Source: Annual Energy Outlook 2016 Reference case d022516a
New car fuel economy lower in history

miles per gallon (mpg)

2005 2010 2015 2020 2025 2030 2035 2040

25.0 30.0 35.0 40.0 45.0 50.0 55.0

History

Projections

AEO2015

AEO2016

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
New light-duty truck fuel economy lower in history

miles per gallon (mpg)

History

2014

Projections

2005 2010 2015 2020 2025 2030 2035 2040

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Vehicle stock update
Gasoline light-duty vehicle stock – cars

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Gasoline light-duty vehicle stock – light trucks

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Gasoline commercial light truck vehicle stocks

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d022516a
Diesel commercial light truck vehicle stocks

Historical data and projections from 2005 to 2040. The chart shows the number of diesel commercial light truck vehicles in thousands.

- **History** (2005-2014)
- **Projections** (2015-2040)

**Source:** Annual Energy Outlook 2016 Reference case d022516a

**Discussion purposes only - Do not cite or circulate**

AEO2016 Transportation Working Group Meeting Washington, DC, March 9, 2016
Light-medium-duty vehicle (Class 3) stocks

History

Projections

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d030316a
Medium-duty vehicle (Class 4-6) stocks

<table>
<thead>
<tr>
<th>History</th>
<th>Projections</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>millions</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d030316a
Heavy-duty vehicle (Class 7-8) stocks

![Graph showing heavy-duty vehicle stocks from 2005 to 2040, with projections for AEO2015 and AEO2016.]

**Discussion purposes only - Do not cite or circulate**

*Source: Annual Energy Outlook 2016 Reference case d030316a*
Marine vessels
MARPOL impacts fuel choice in ECA int’l shipping

Discussion purposes only - Do not cite or circulate
Sources: International Maritime Organization and Annual Energy Outlook 2016 Reference case d030316a
Transportation energy
Trends in the *Annual Energy Outlook 2016*

- Transportation energy consumption **declines** between 2014 and 2040 (27.6 quadrillion Btu to 26.5 quadrillion Btu)
  - Energy consumption peaks in 2018 (28.8 quadrillion Btu)

- LDV energy consumption **falls** from 15.6 quadrillion Btu to 11.8 quadrillion Btu
  - Peaks in 2017 (16.2 quadrillion Btu)

- HDV energy consumption **increases** from 5.4 quadrillion Btu to 6.9 quadrillion Btu
  - Higher freight travel demand than increase in efficiency

- Aircraft, maritime, and rail energy consumption **similar** (+/- 0.1 quadrillion Btu) in 2014 and 2040.
Comparison of *Annual Energy Outlook 2016* and *Annual Energy Outlook 2015*

- Transportation energy consumption in 2040 in AEO2016 compared to the AEO2015 Oil Export Reference case basically unchanged
  - Considerable variation between projections in intervening years due primarily to LDV energy consumption

- LDV energy consumption in 2040 lower in AEO2016
  - 2040: -0.4 quadrillion Btu

- HDV energy consumption lower in AEO2016
  - 2040: -0.03 quadrillion Btu

- Aircraft energy consumption lower in AEO2016
  - 2040: -0.09 quadrillion Btu

- Commercial light truck (CLT), rail, and other energy consumption higher in AEO2016
  - 2040: 0.23, 0.15, 0.14
LDV miles traveled increases in the near-term due to lower fuel prices, but declines long-term due to economic factors compared to AEO2015.
Light-duty vehicle energy demand

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d030316a
Heavy-duty vehicle energy demand

quadrillion Btu

2005 2010 2015 2020 2025 2030 2035 2040

2014

History Projections

AEO2015

AEO2016

Discussion purposes only - Do not cite or circulate

Source: Annual Energy Outlook 2016 Reference case d030316a
Transportation energy consumption higher in the near term due to growth in LDV travel demand

Source: Annual Energy Outlook 2016 Reference case d022516a
Discussion/questions

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trisha Hutchins</td>
<td>202-586-1029</td>
<td><a href="mailto:patricia.hutchins@eia.gov">patricia.hutchins@eia.gov</a></td>
</tr>
<tr>
<td>Melissa Lynes</td>
<td>202-586-5192</td>
<td><a href="mailto:melissa.lynes@eia.gov">melissa.lynes@eia.gov</a></td>
</tr>
<tr>
<td>John Maples</td>
<td>202-586-1757</td>
<td><a href="mailto:john.maples@eia.gov">john.maples@eia.gov</a></td>
</tr>
<tr>
<td>Mark Schipper</td>
<td>202-586-1136</td>
<td><a href="mailto:mark.schipper@eia.gov">mark.schipper@eia.gov</a></td>
</tr>
<tr>
<td>David Stone</td>
<td>202-586-8851</td>
<td><a href="mailto:david.stone@eia.gov">david.stone@eia.gov</a></td>
</tr>
</tbody>
</table>


Annual Energy Outlook | www.eia.gov/forecasts/aeo