

Annual Energy Outlook 2016

Modeling updates in the transportation sector



For

AEO2016 Working Group

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By

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Updates to the *Annual Energy Outlook 2016*

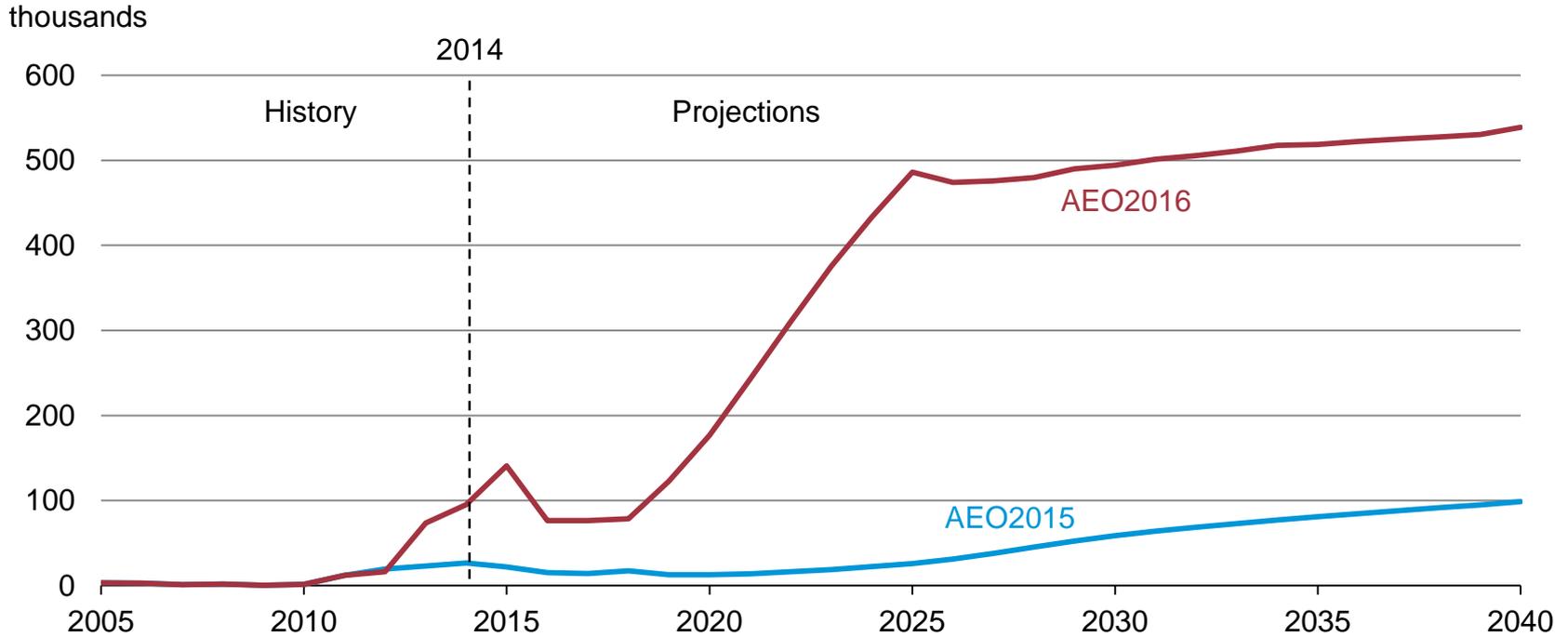
- **New regional stock model for on-road vehicles**
 - Reflects Polk annual data for cars, light trucks, Class 2B, Class 3, Class 4-6, and Class 7&8 vehicles through 2014 by Census Division (CD)
 - Incorporates revisions to fleet and household vehicle allocations
- **Revised and updated travel model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

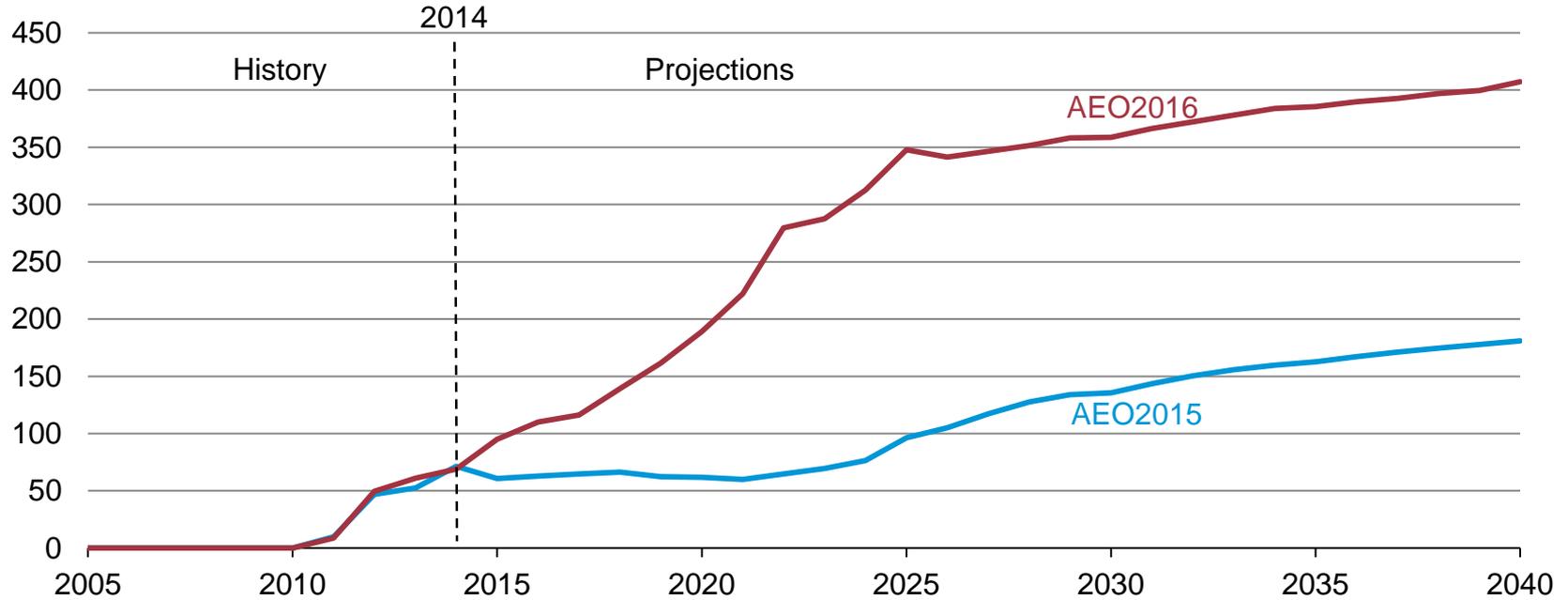


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Source: Annual Energy Outlook 2016 Reference case d022516a

Plug-in hybrid vehicle sales

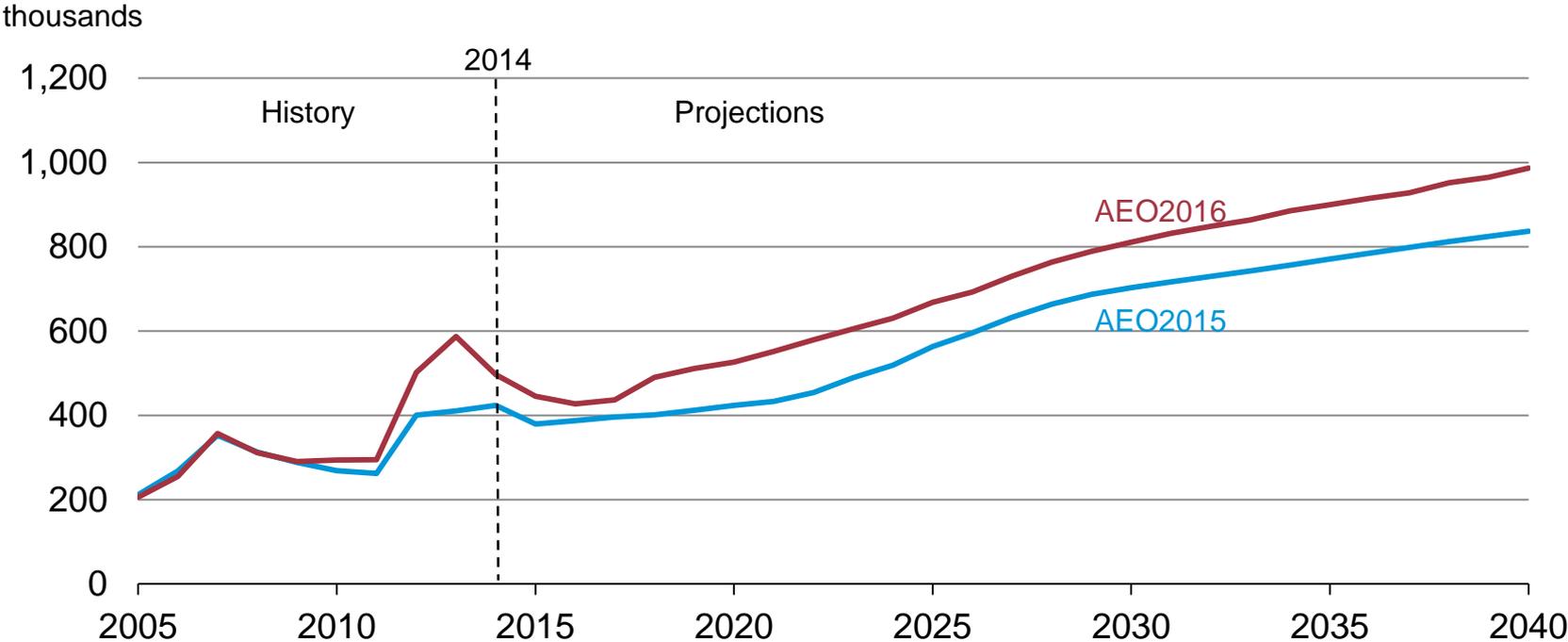
thousands



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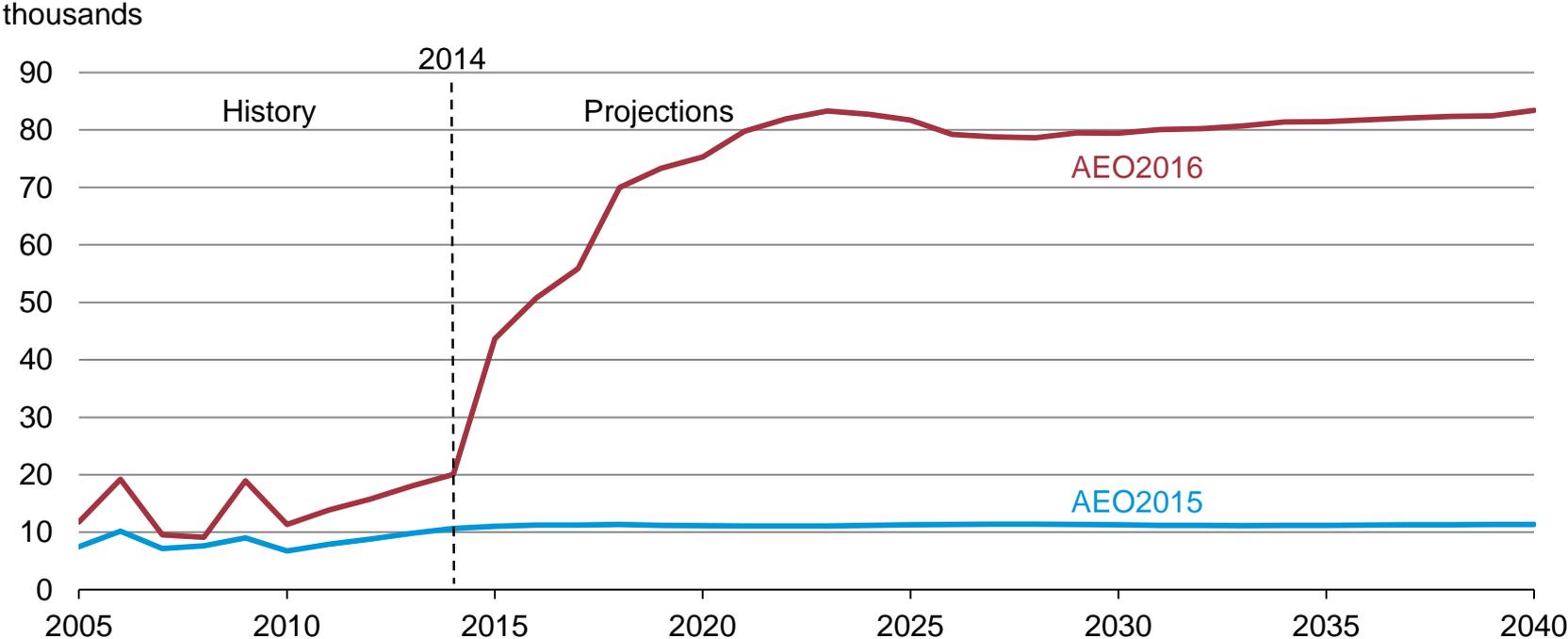
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Hybrid vehicle sales



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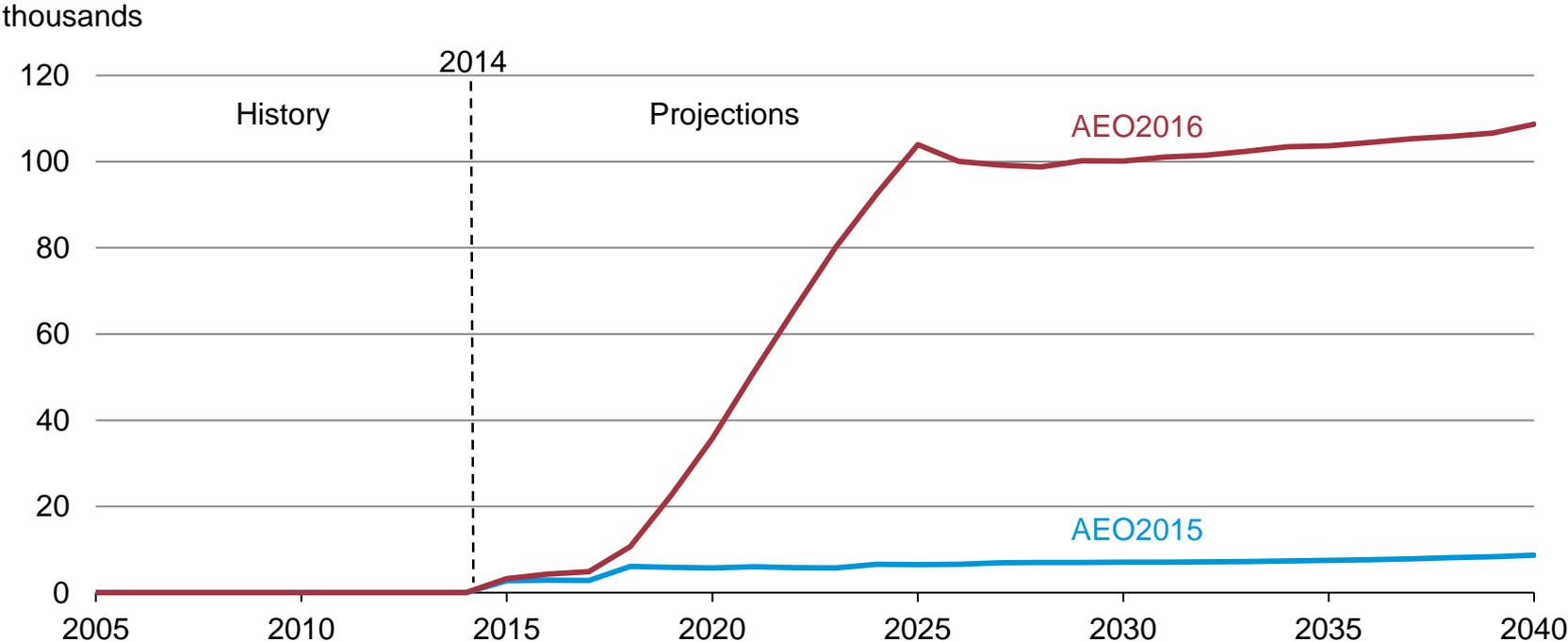
Natural gas vehicle sales



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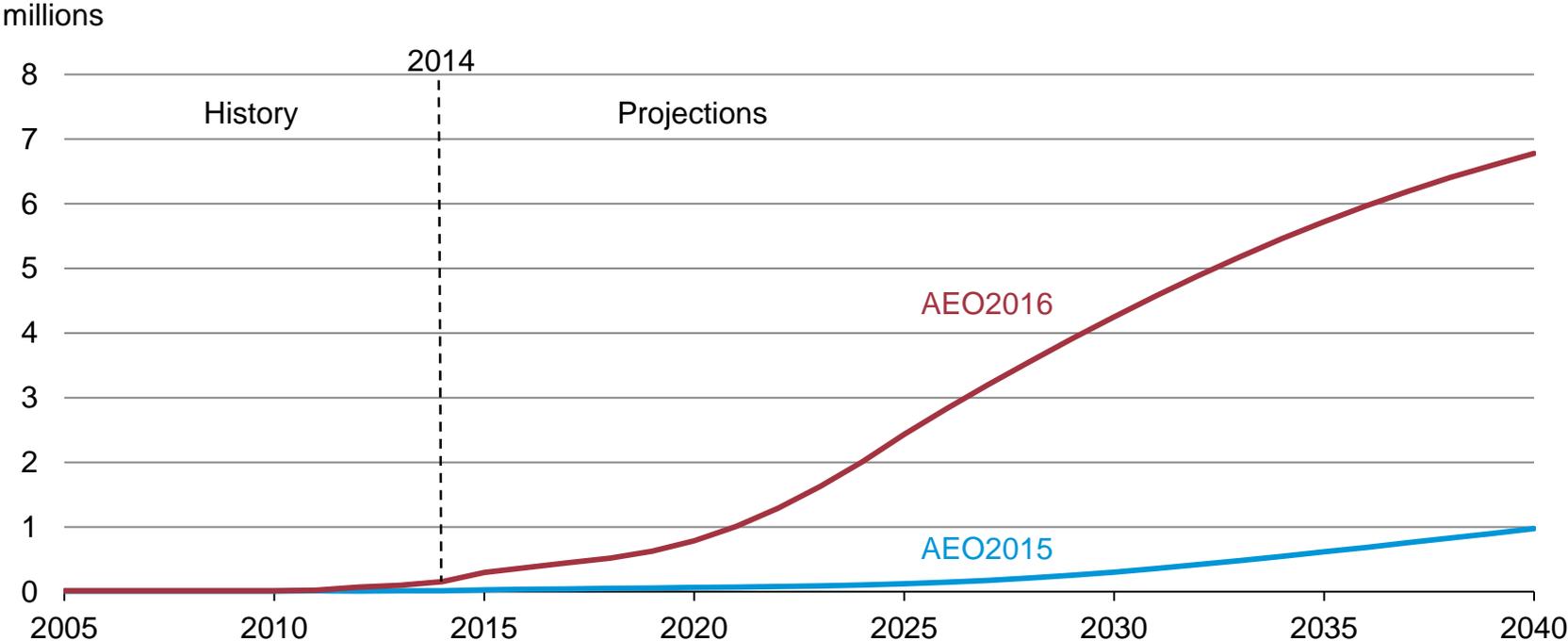
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Fuel cell vehicle sales



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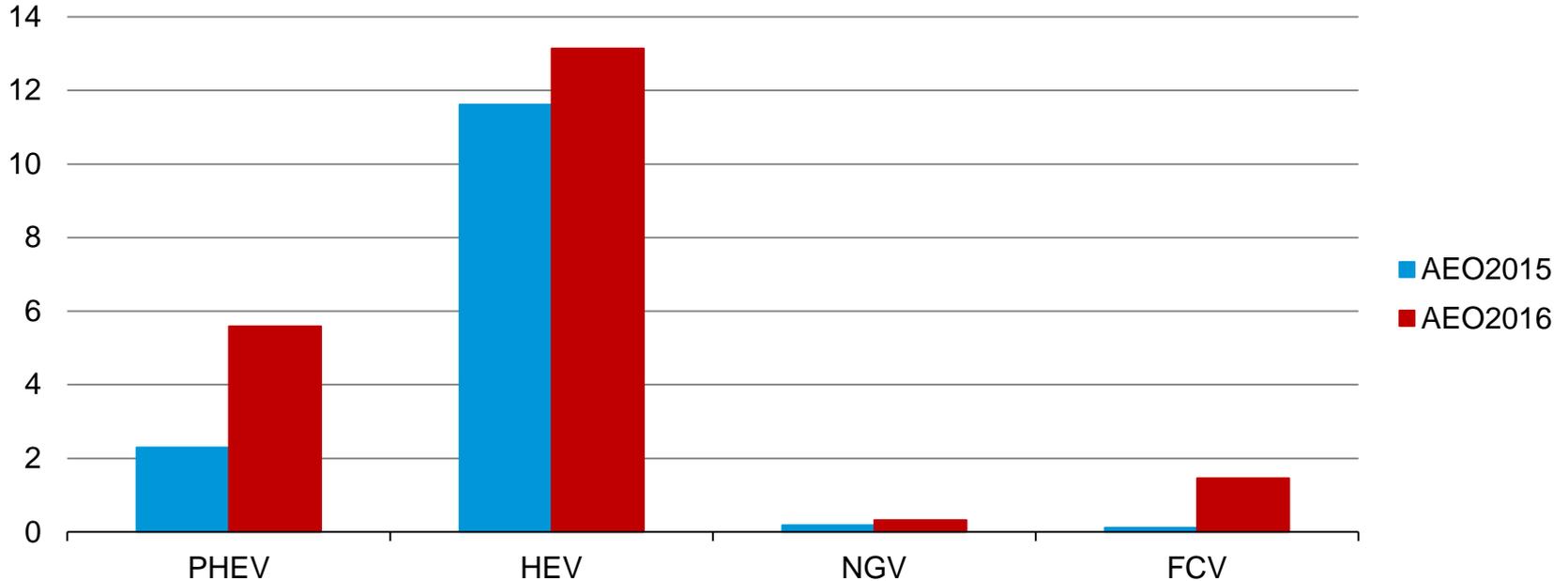
Electric vehicle stocks



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Other ZEV effected vehicle stocks in 2040

millions

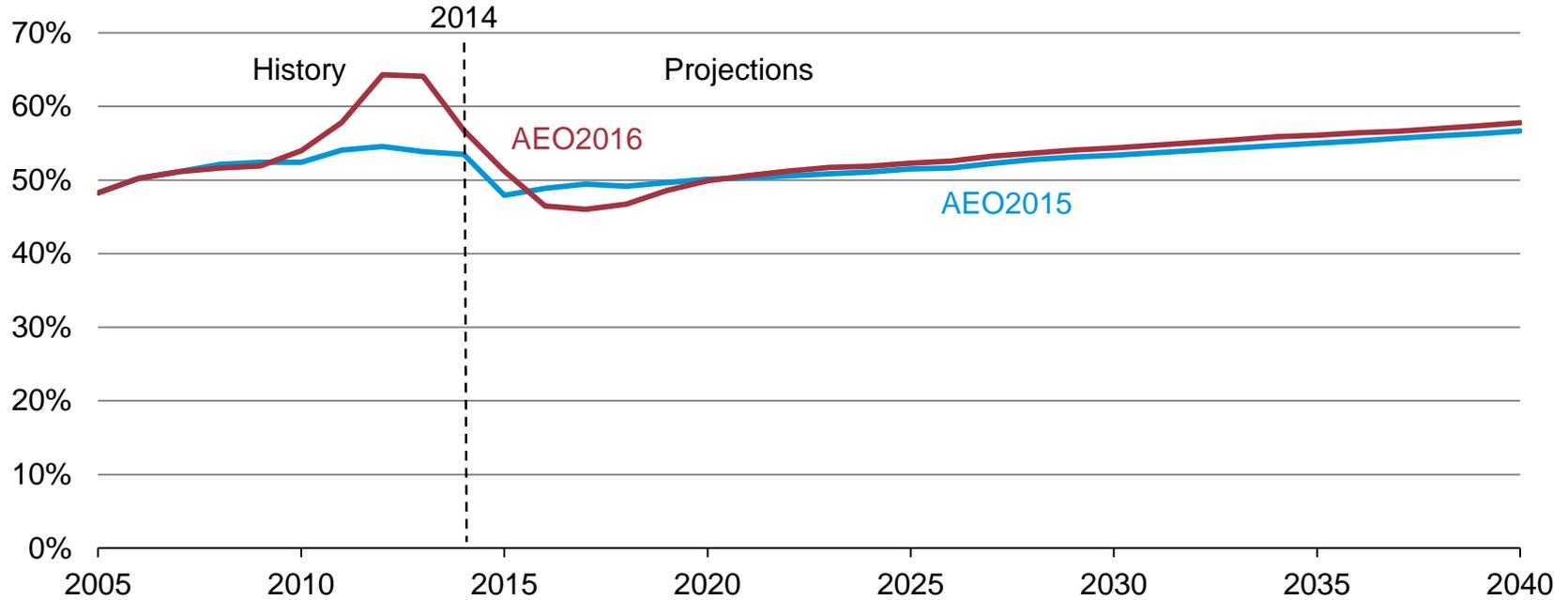


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Fuel economy

Car sales as a percent of new light-duty vehicle sales

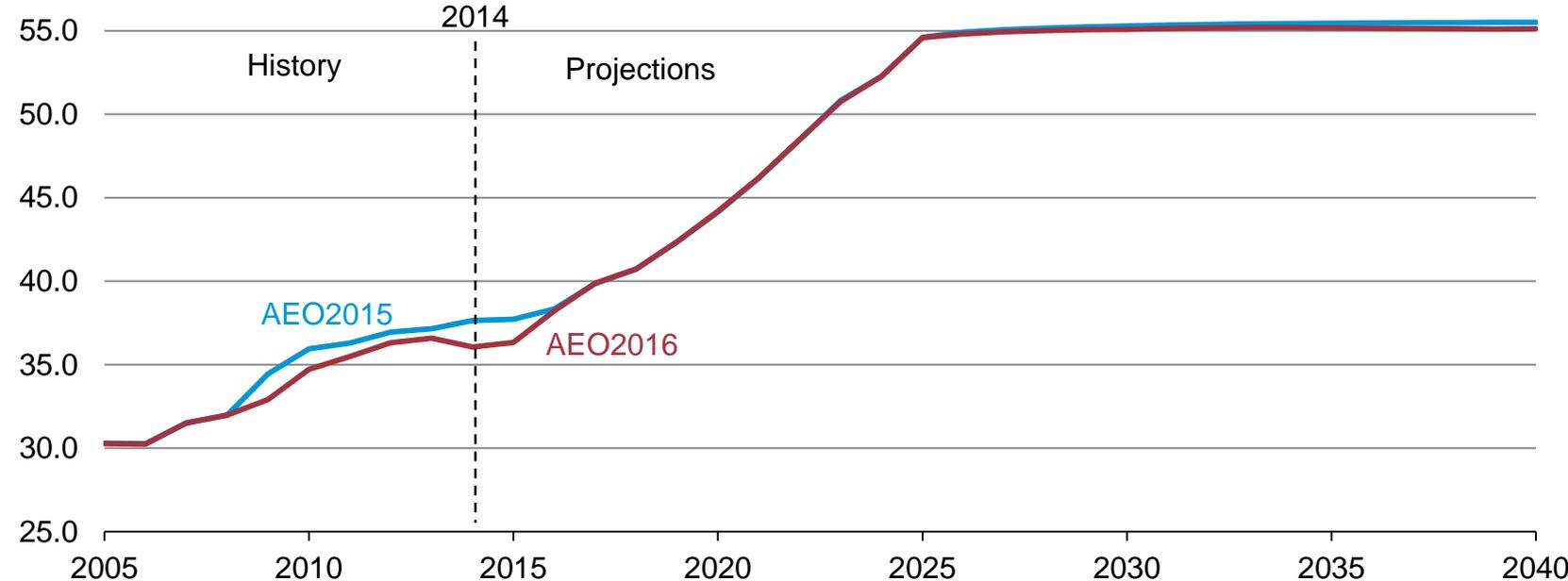


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New car fuel economy lower in history

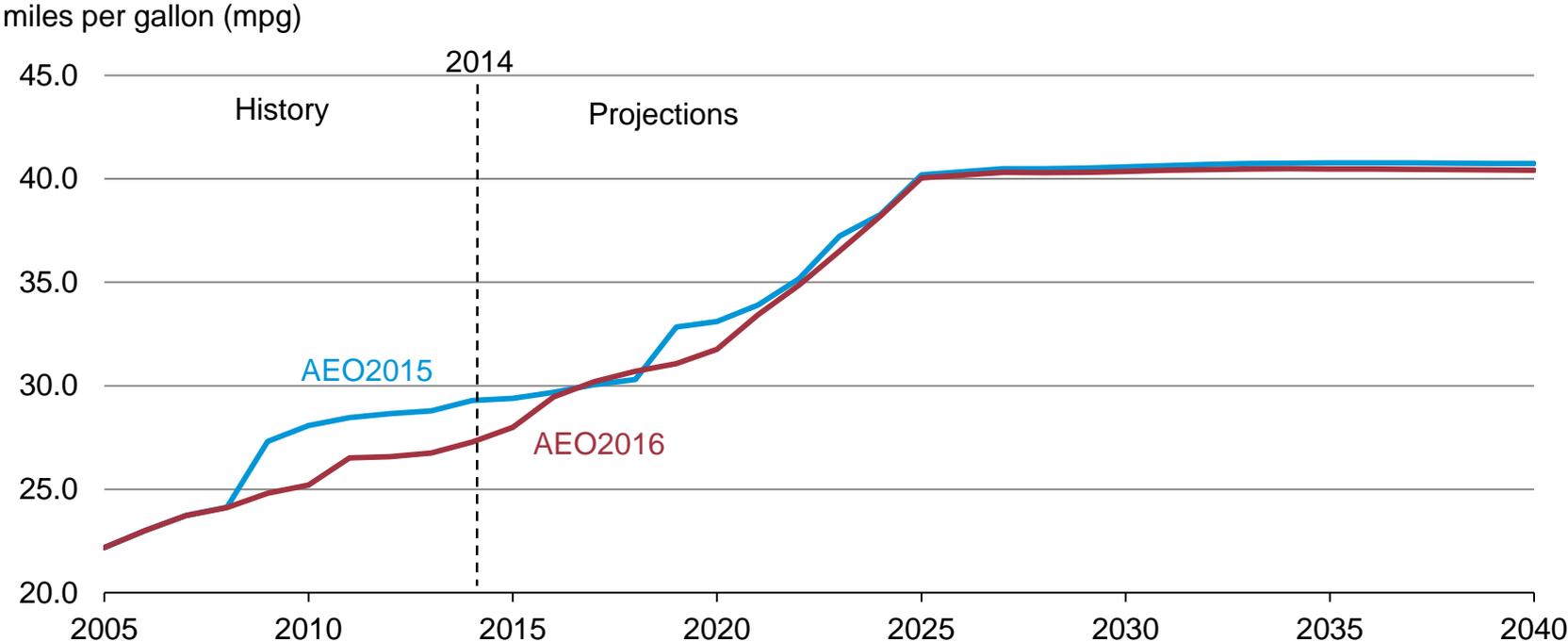
miles per gallon (mpg)



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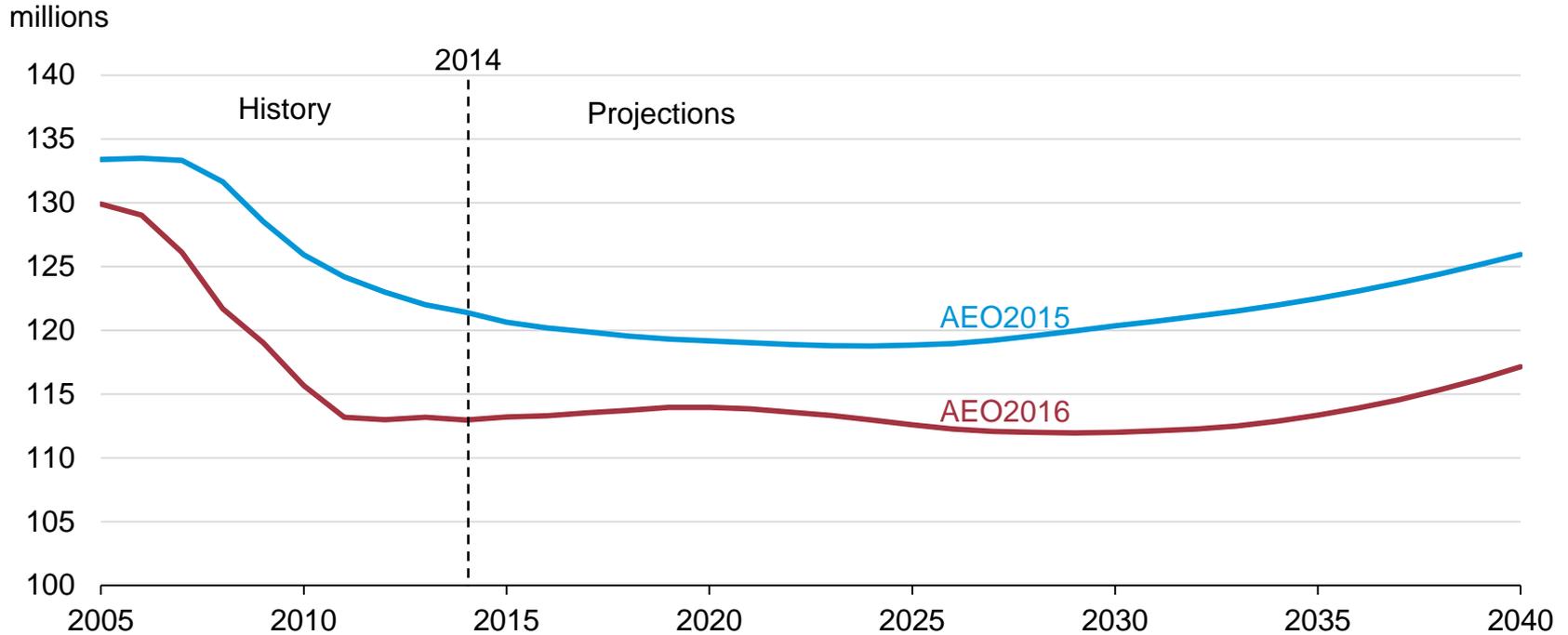
New light-duty truck fuel economy lower in history



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Vehicle stock update

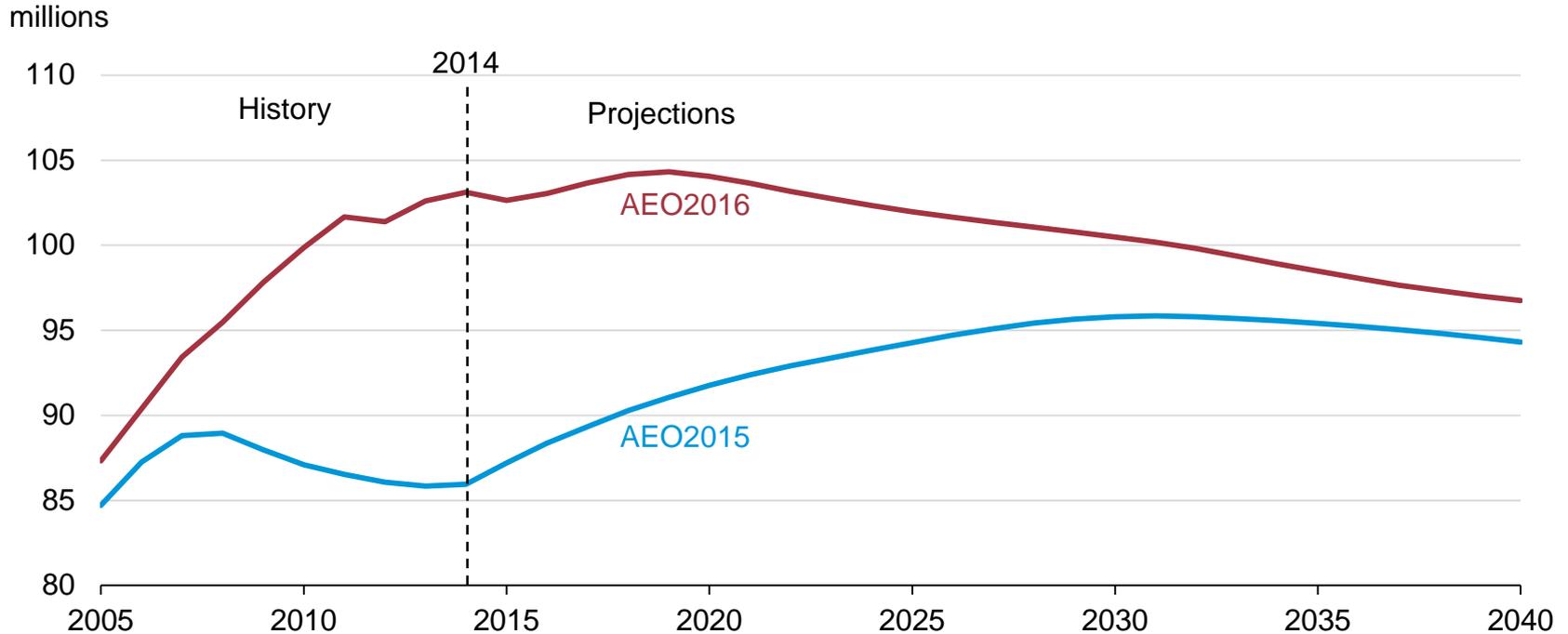
Gasoline light-duty vehicle stock – cars



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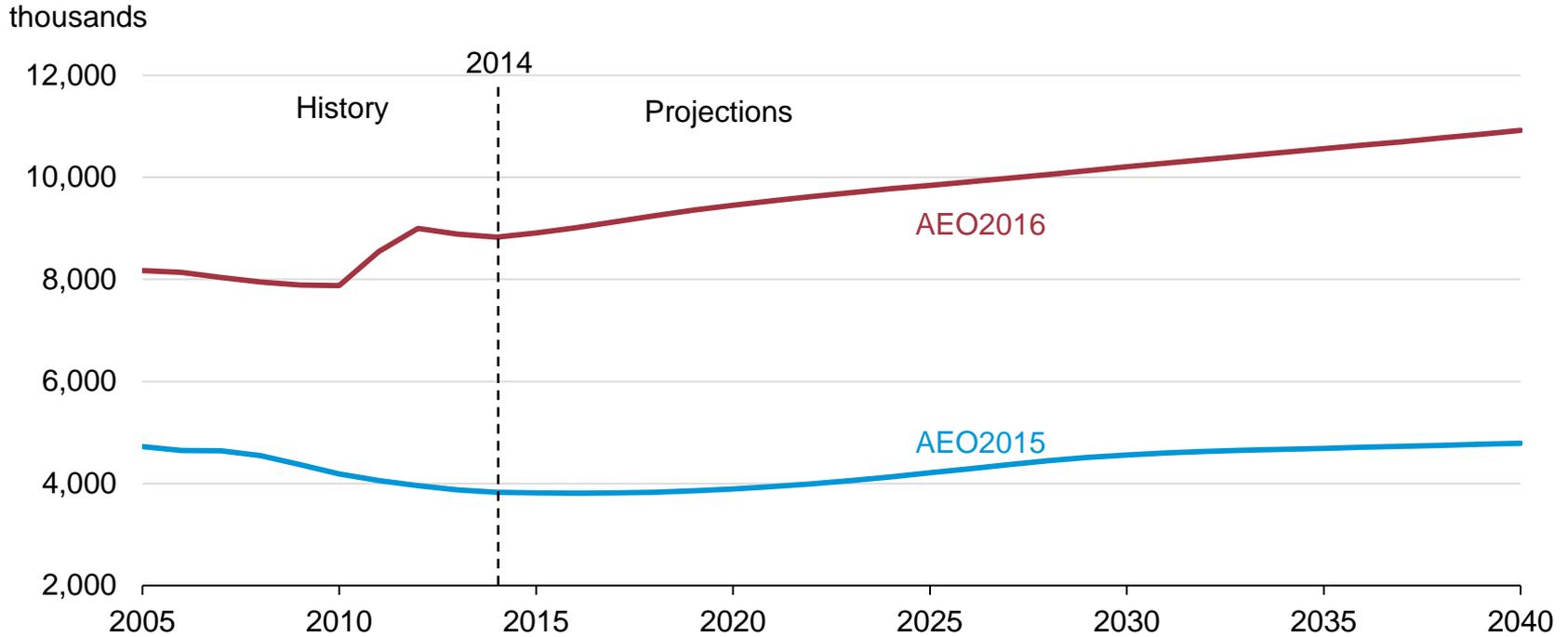
Gasoline light-duty vehicle stock – light trucks



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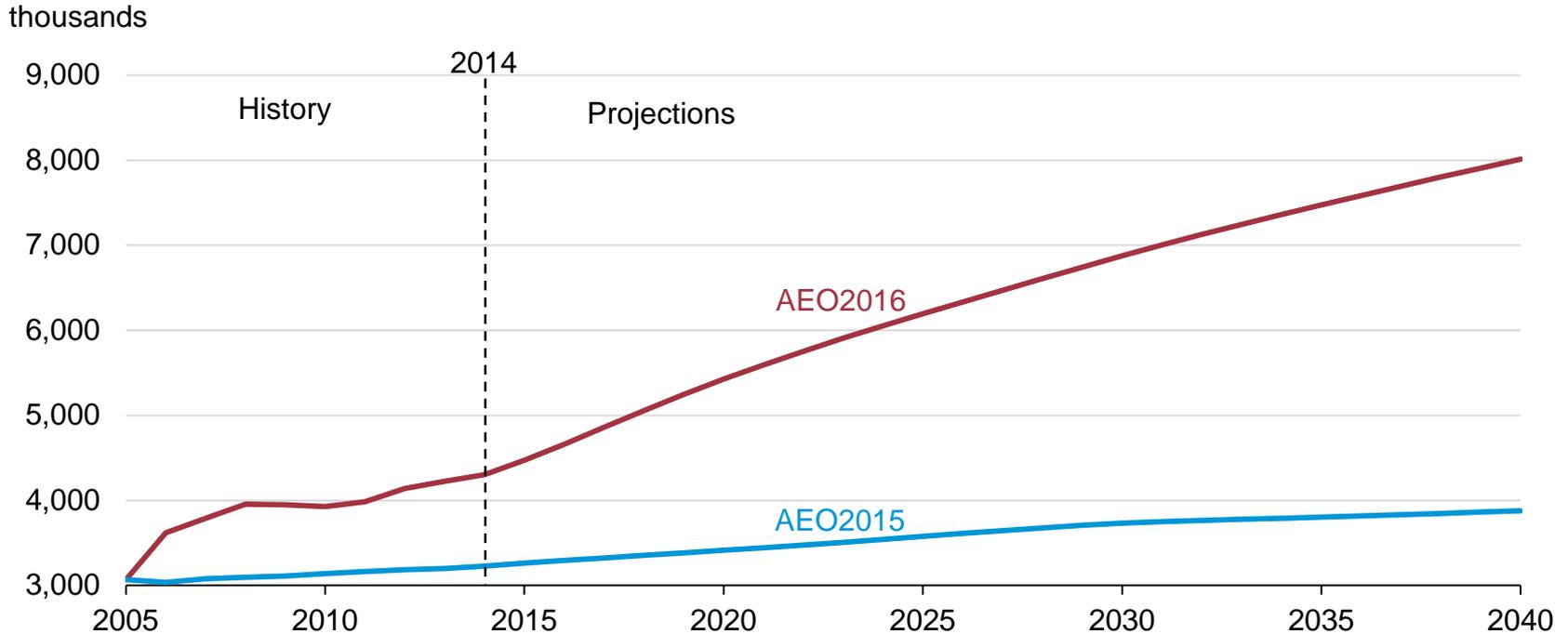
Gasoline commercial light truck vehicle stocks



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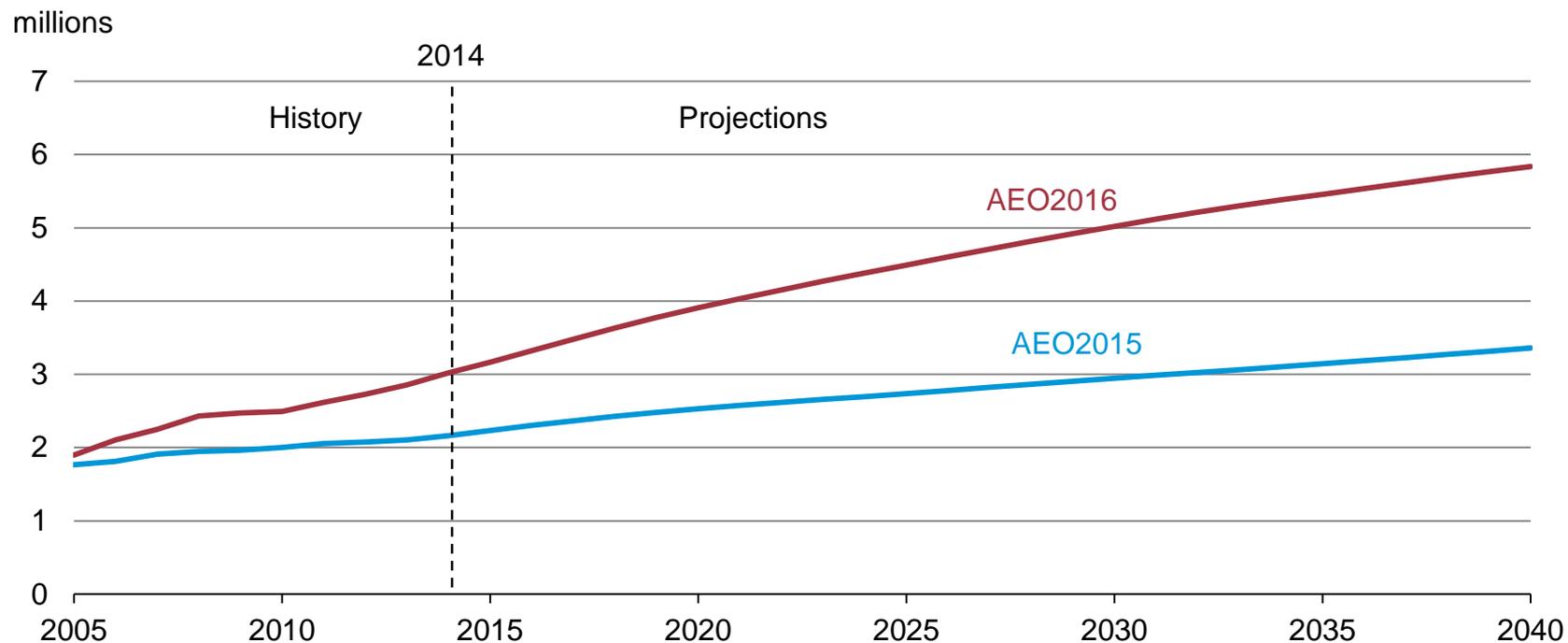
Diesel commercial light truck vehicle stocks



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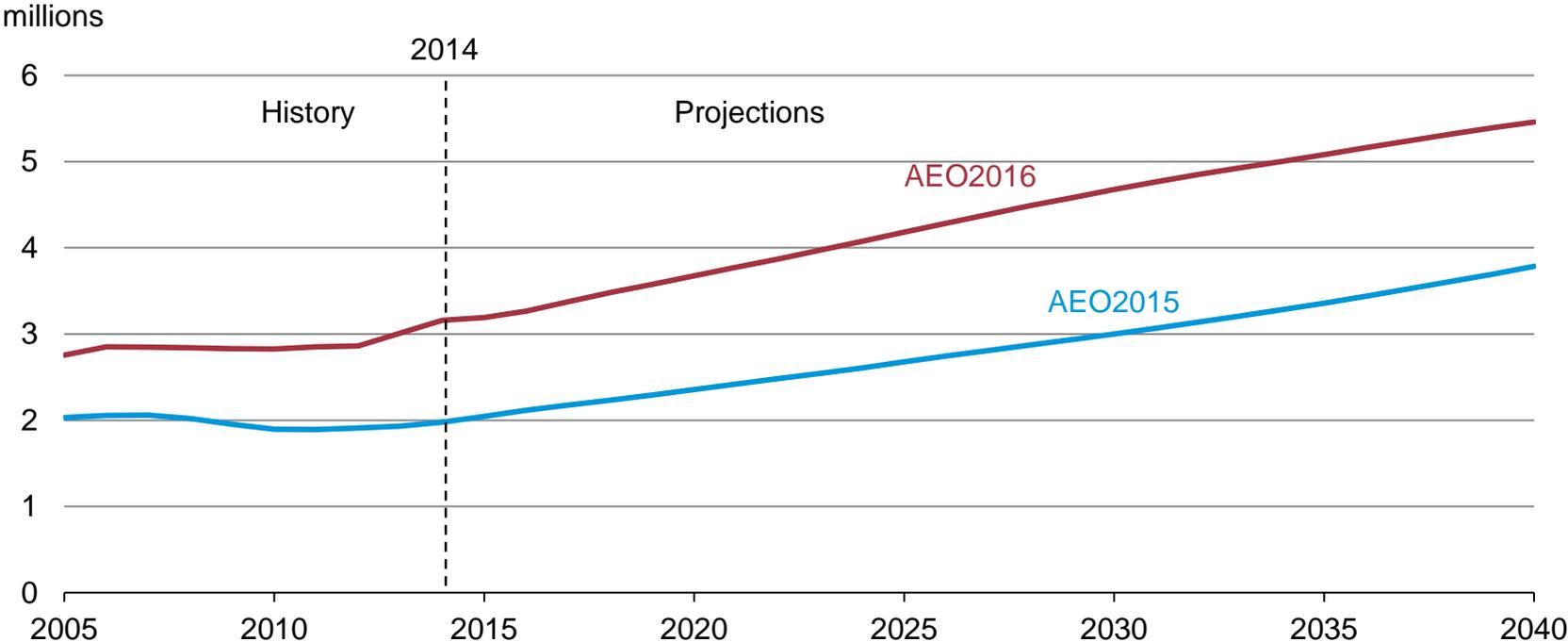
Light-medium-duty vehicle (Class 3) stocks



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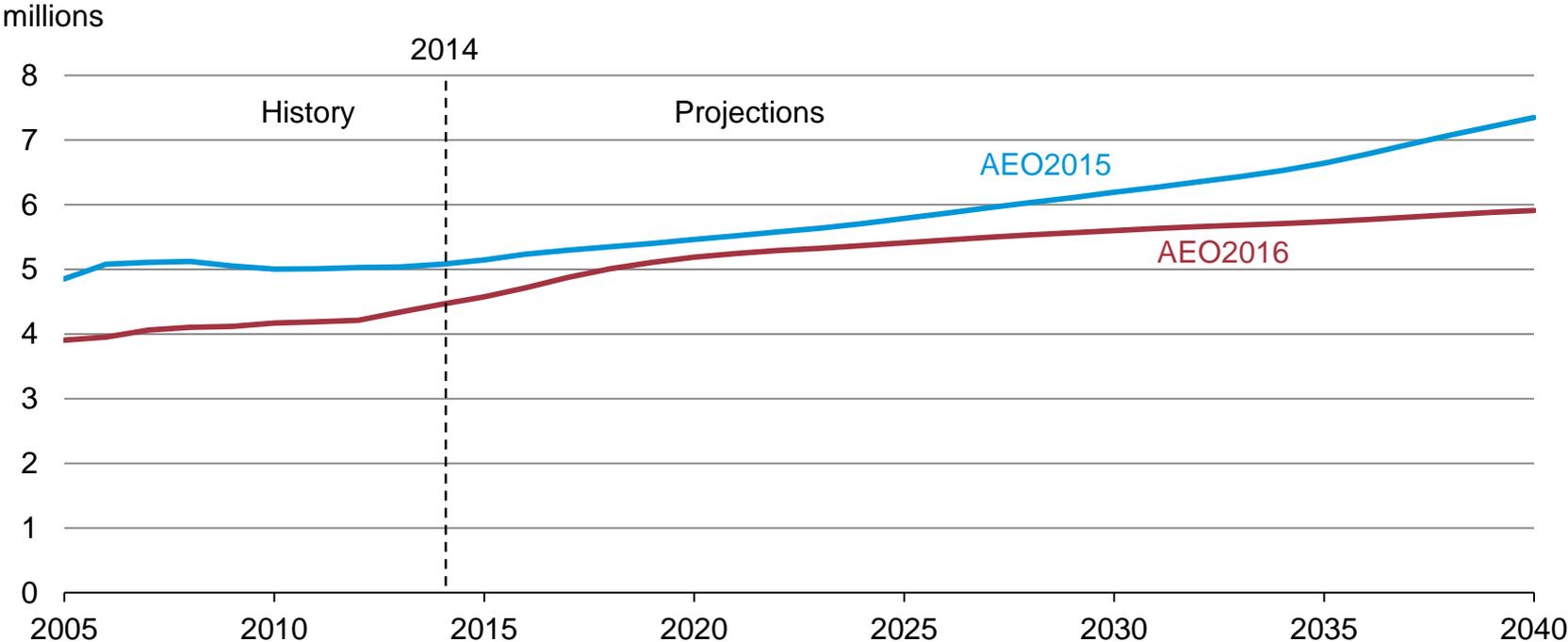
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Medium-duty vehicle (Class 4-6) stocks



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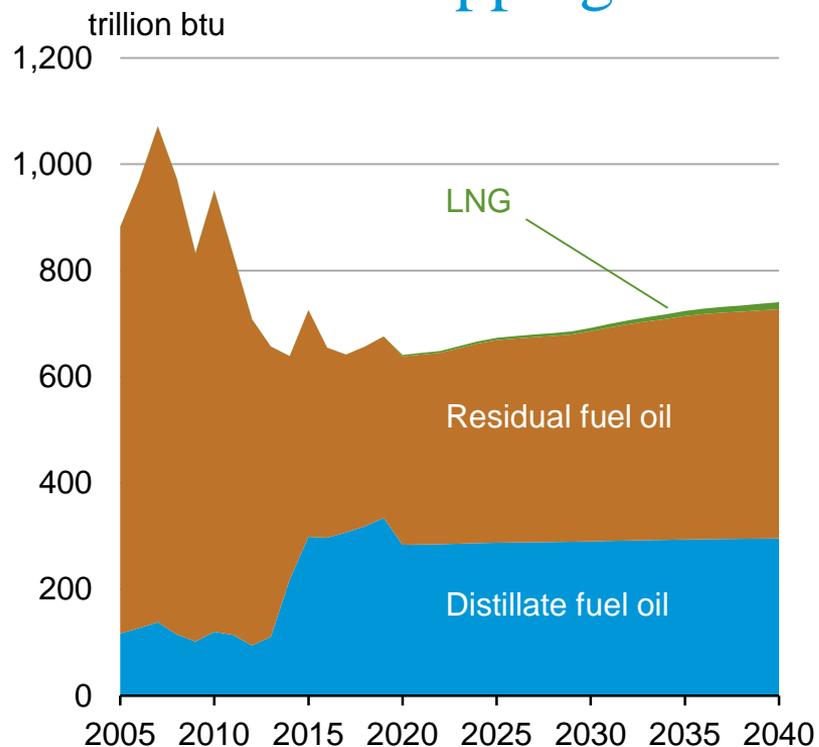
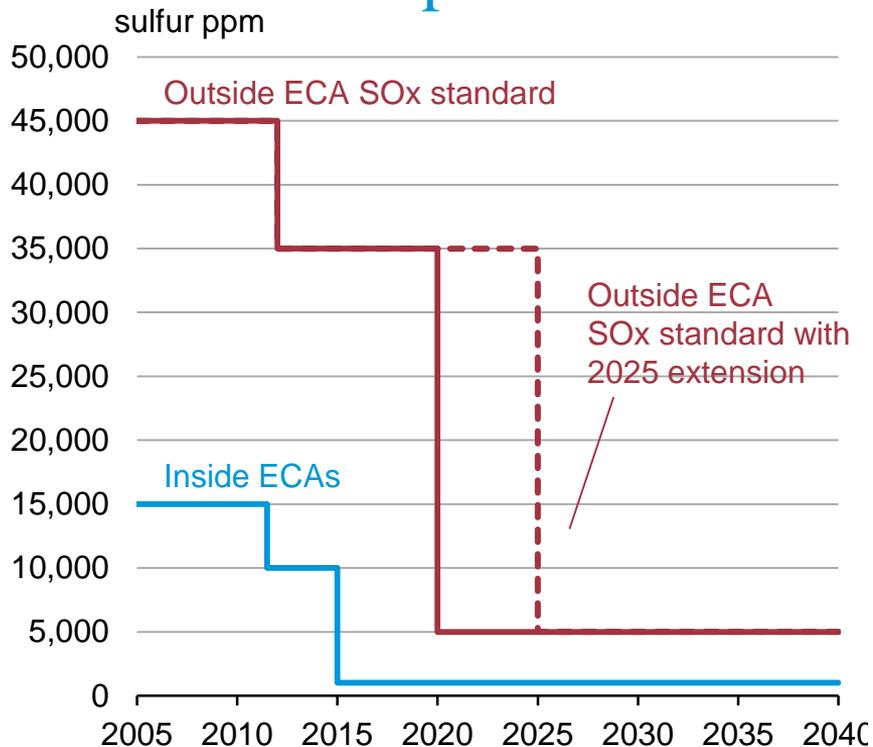
Heavy-duty vehicle (Class 7-8) stocks



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Source: Annual Energy Outlook 2016 Reference case d030316a

Marine vessels

MARPOL impacts fuel choice in ECA int'l shipping



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Sources: International Maritime Organization and Annual Energy Outlook 2016 Reference case d030316a

Transportation energy

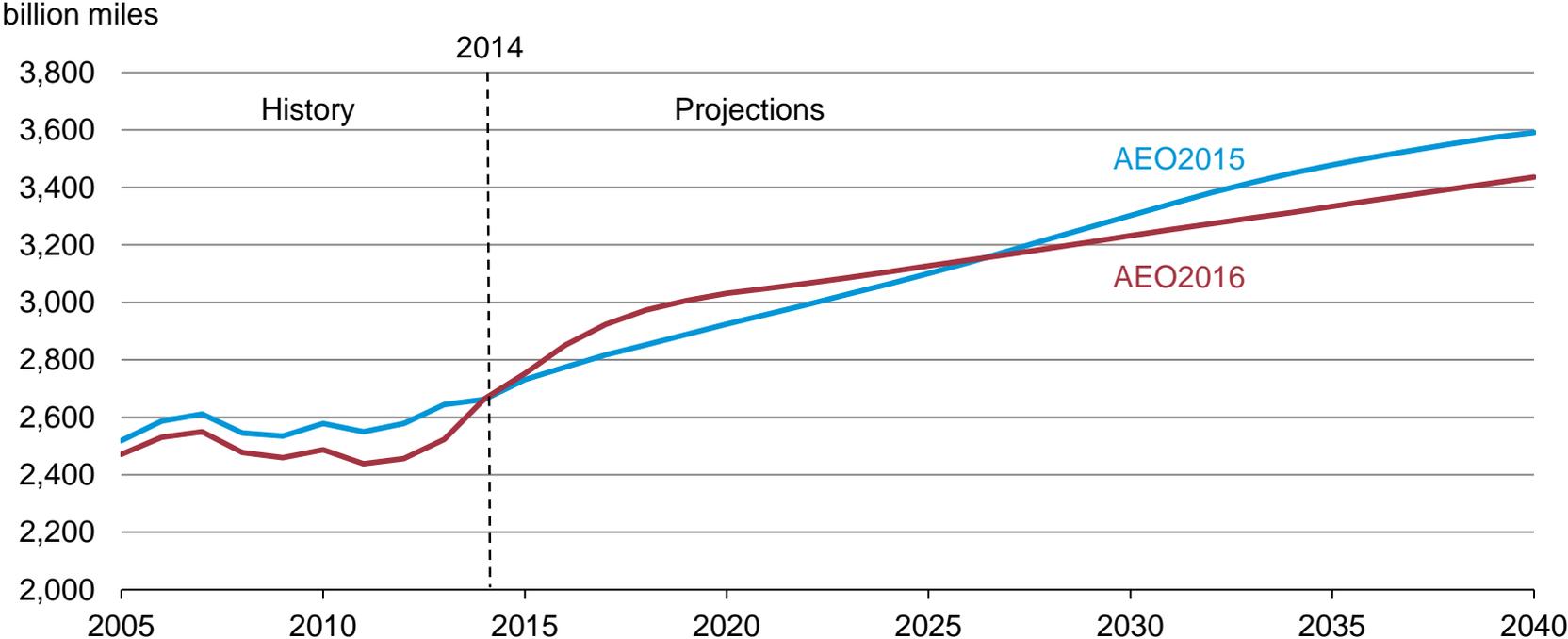
Trends in the *Annual Energy Outlook 2016*

- 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*

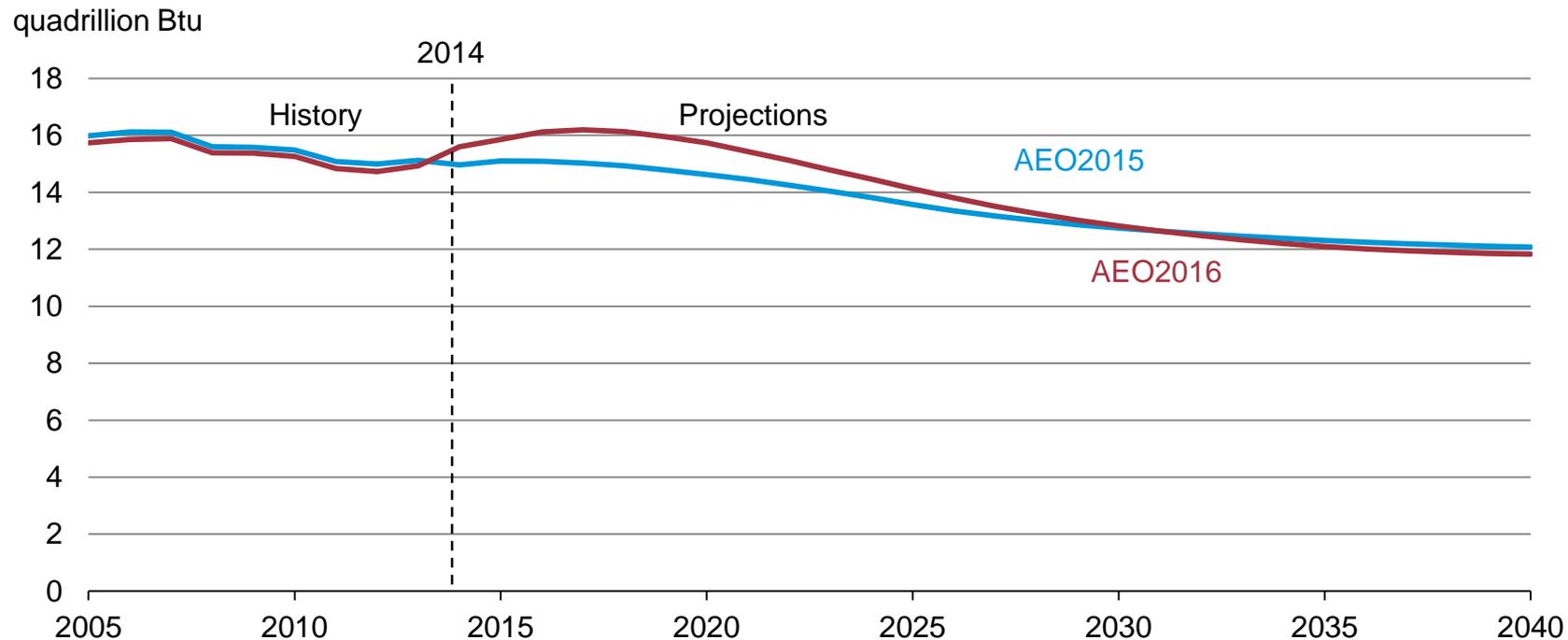
- Transportation energy consumption in 2040 in *AEO2016* compared to the *AEO2015 Oil Export Reference case basically unchanged*
 - Considerable variation between projections in intervening years due primarily to LDV energy consumption
- LDV energy consumption in 2040 **lower** in *AEO2016*
 - 2040: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



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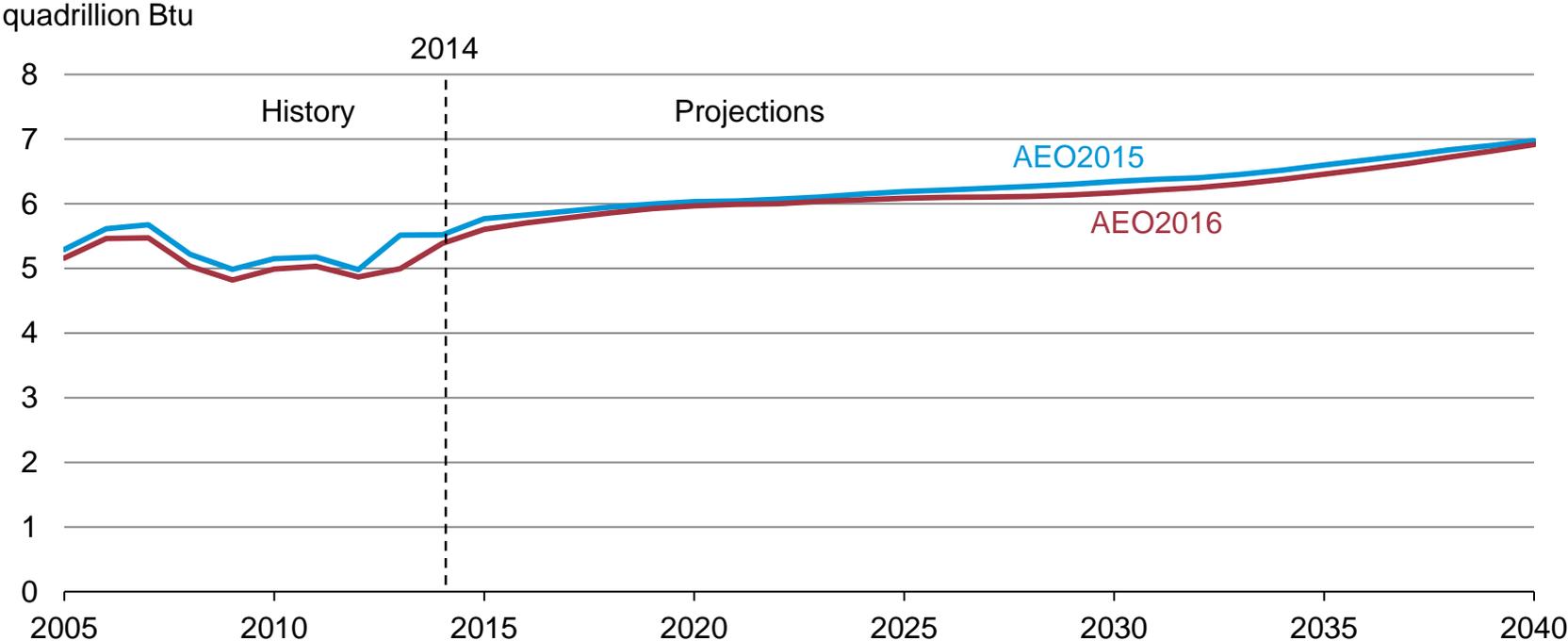
Light-duty vehicle energy demand



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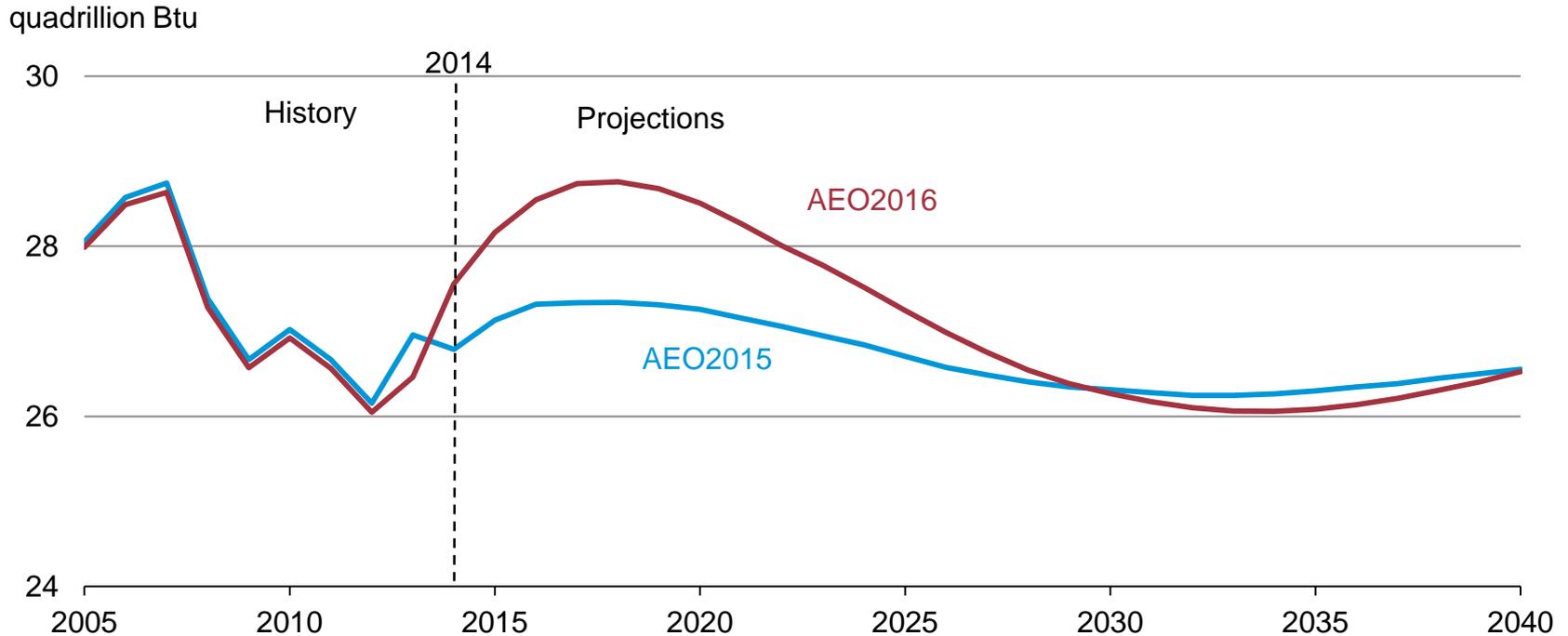
Heavy-duty vehicle energy demand



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Transportation energy consumption higher in the near term due to growth in LDV travel demand



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Discussion/questions

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