Energy Efficiency in the U.S. Energy Outlook

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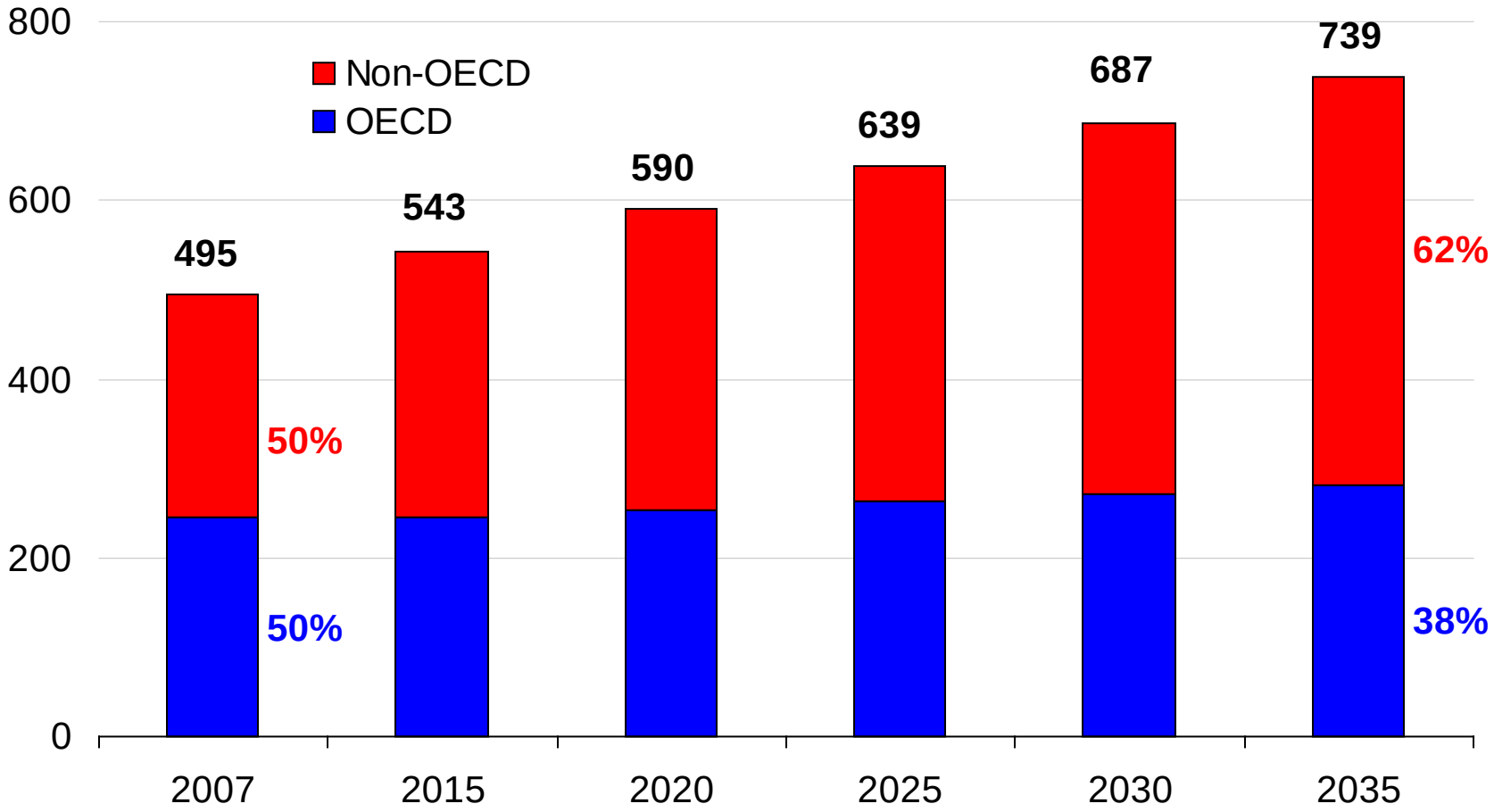
Independent Statistics and Analysis

Overview

- The U.S. Energy Outlook
- Vehicle fuel economy in the Energy Outlook
- Residential and commercial energy efficiency in the Energy Outlook
- Concluding remarks

Global energy consumption grows 49% and non-OECD countries account for 86% of the increase through 2035

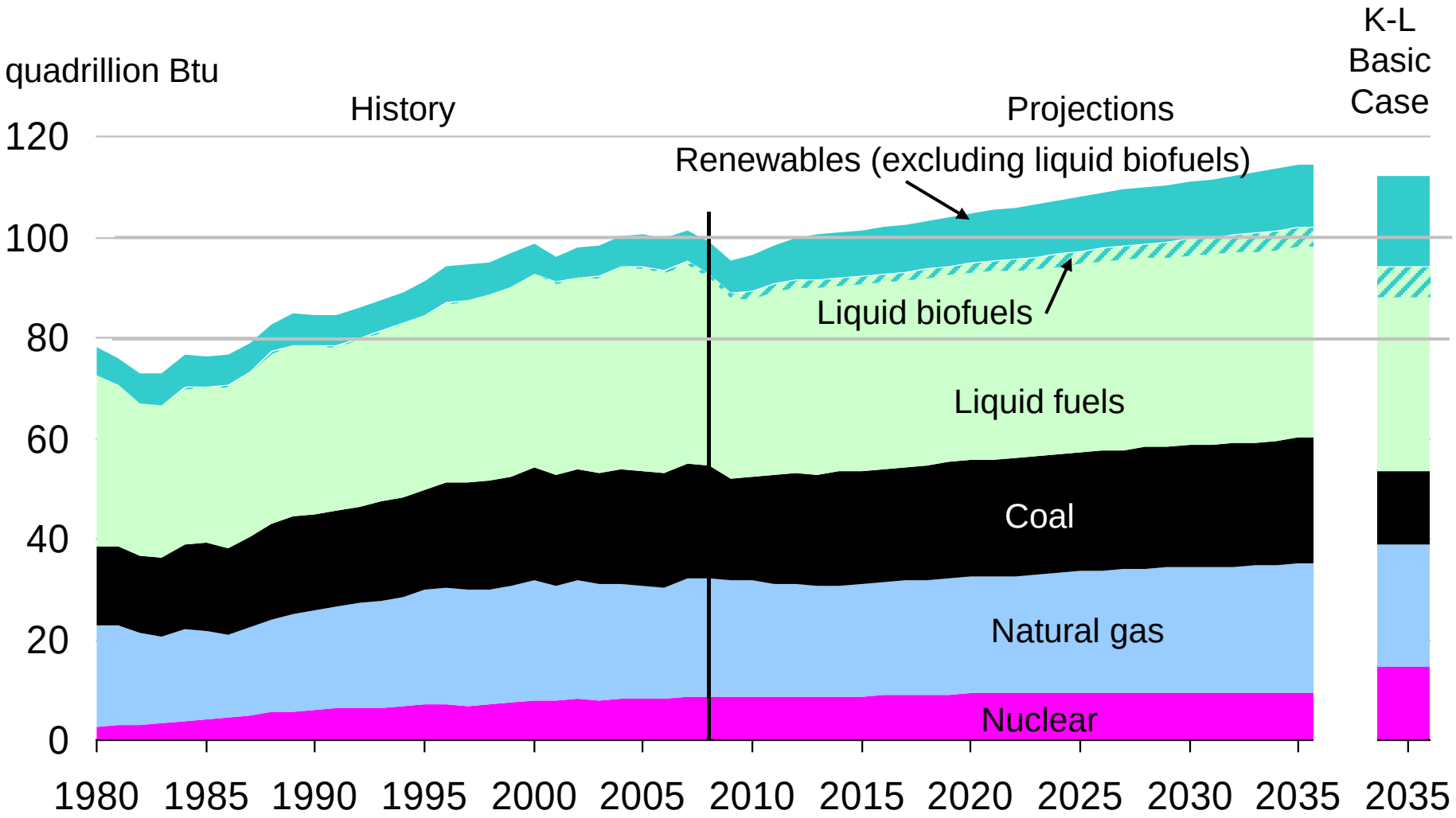
energy consumption
quadrillion Btu



Source: EIA, *International Energy Outlook 2010*

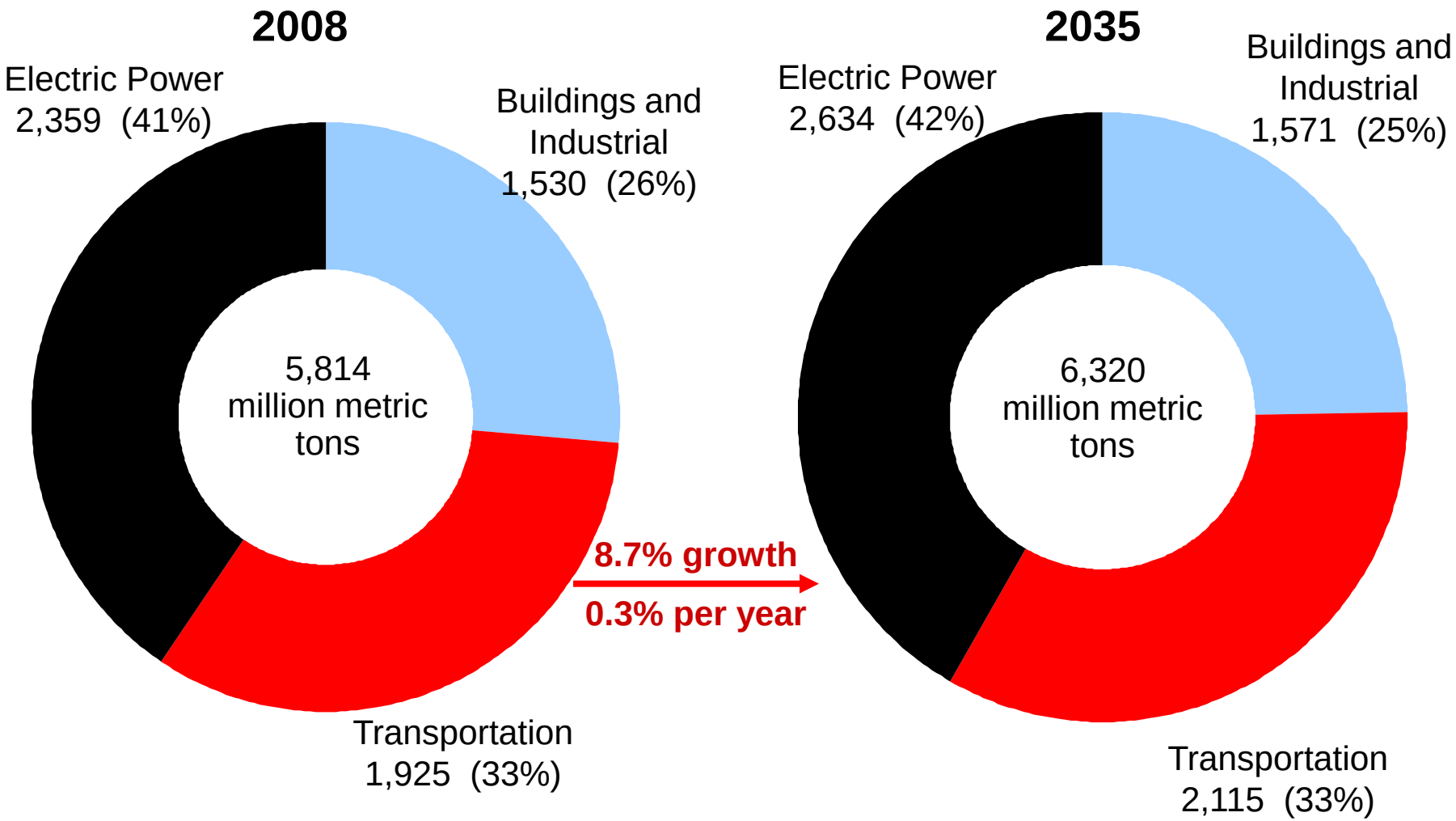
The U.S. Energy Outlook

Non-fossil U.S. energy use grows rapidly, but fossil fuels still provide 78 percent of total energy use in 2035



Source: Annual Energy Outlook 2010; analysis of Kerry-Lieberman American Power Act of 2010 (KL)

Assuming no new policies, growth in U.S. energy-related CO2 is driven by electricity and transportation fuel use

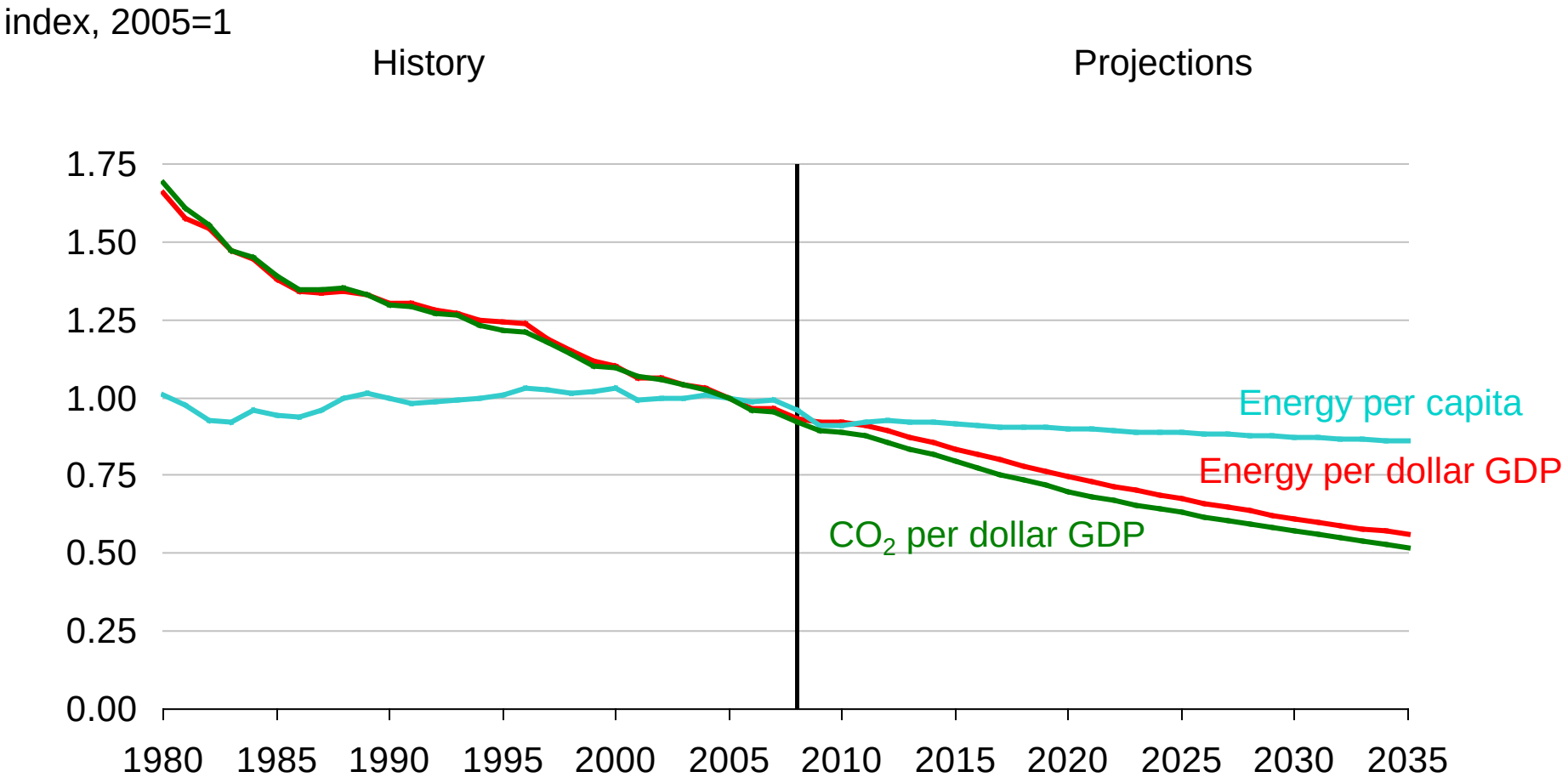


Source: *Annual Energy Outlook 2010*

Key concepts

- Energy efficiency
  - energy services provided per unit of energy consumption (e.g., MPG)
  - driven by technology improvements
- Energy intensity of the economy
  - primary energy consumption per unit of real GDP
  - inverse of efficiency, applied at the economy-wide level
  - efficiency + structural changes
- Carbon intensity of the economy
  - carbon emissions per unit of real GDP
  - efficiency + structural changes + decarbonization

U.S. energy and CO2 per dollar GDP continue to decline; per capita energy use also declines



Source: *Annual Energy Outlook 2010*

Examples of structural changes

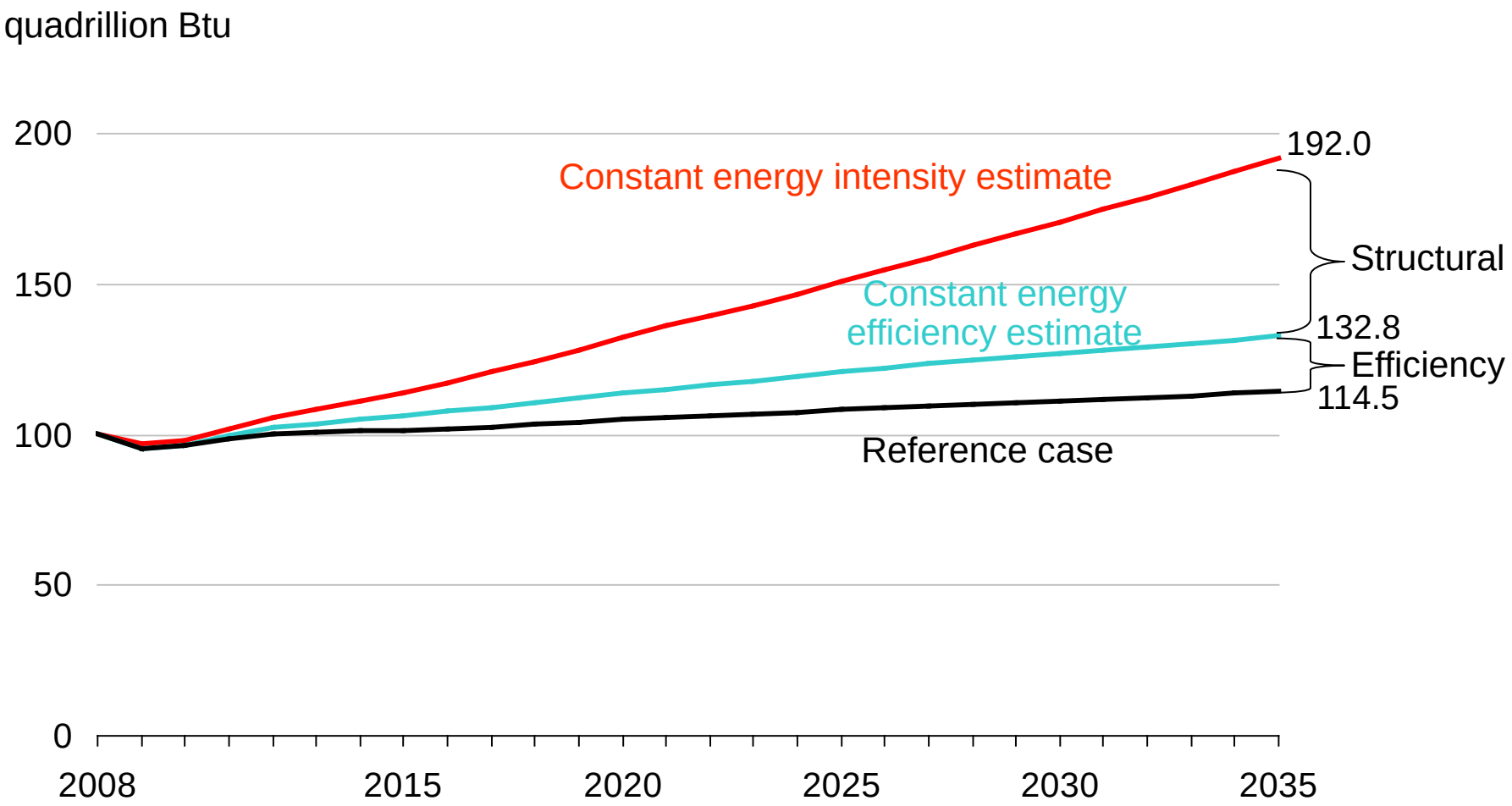
- Buildings
  - migration to moderate climates
  - housing type shifts / commercial building mix
- Industry
  - shifts to less energy-intensive industries
  - growth of service sector relative to industry
- Transportation
  - vehicle type shifts (cars, mini-vans, SUVs, and light trucks)
  - urbanization, shifts to mass transit, biking / walking
- Other changes in the demand for energy services
  - e.g., due to energy price changes

Structural drivers grow slower than GDP, thereby lowering energy intensity

	Average annual growth rate 2008 – 2035
Macroeconomic	
Real Gross Domestic Product	2.4%
Population	0.9%
NEMS Sectoral Drivers	
Buildings	
Households	1.0%
Commercial Floorspace	1.3%
Industrial (Real Value Shipments)	
Non-Manufacuring	0.9%
Energy Intensive Manufacturing	0.8%
Non-Energy Intensive Manufacturing	1.8%
Transportation	
Light Duty Vehicle-Miles Traveled	1.7%
Freight Truck Vehicle-Miles Traveled	1.7%
Air Seat Miles	1.3%
Rail Ton-Miles	0.8%

Source: Annual Energy Outlook 2010

Energy consumption would be 16% higher in 2035 without efficiency improvements; and 68% higher without structural change as well

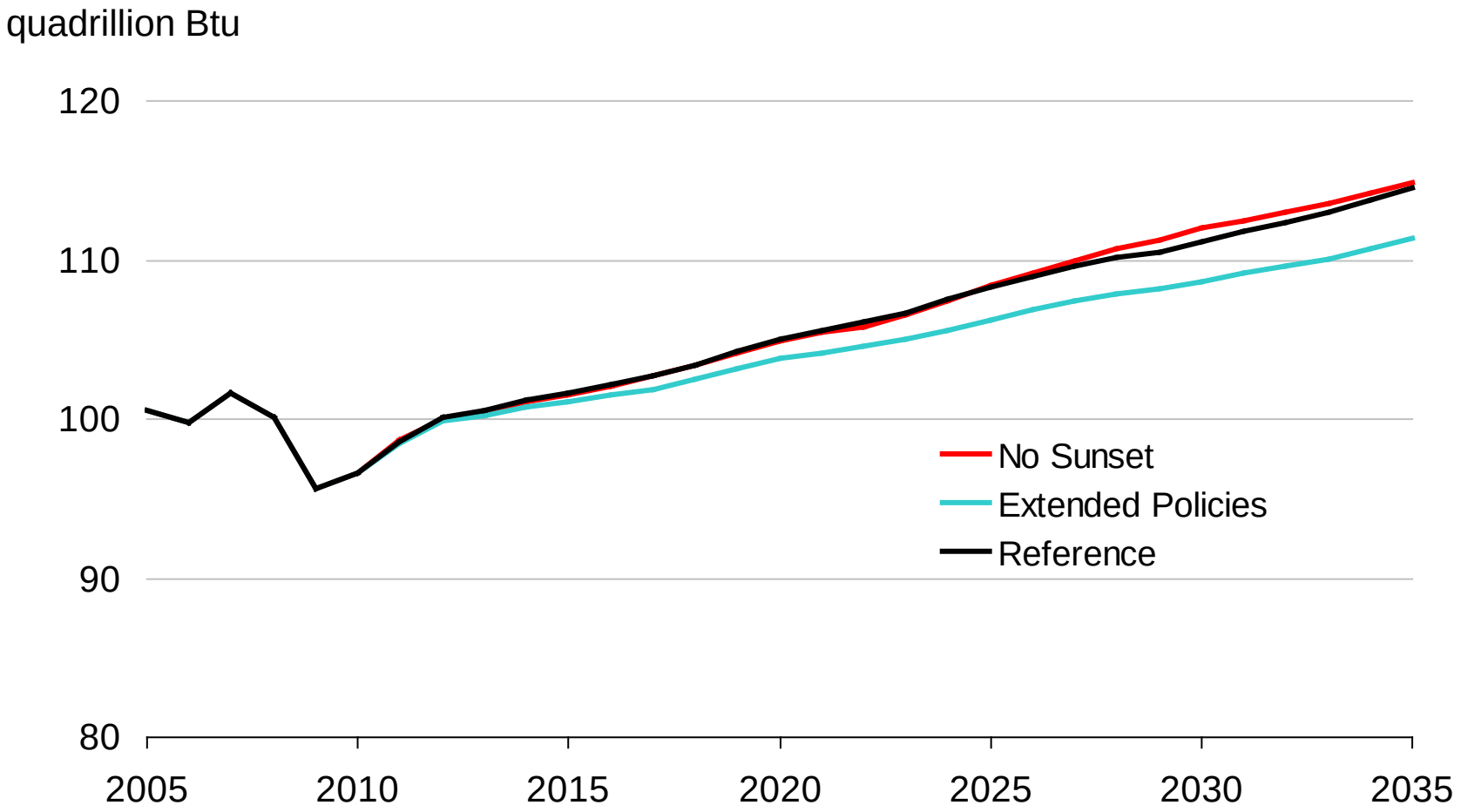


Source: *Annual Energy Outlook 2010*

Key drivers of energy efficiency changes in EIA analysis

- Market drivers
  - energy prices
  - technology costs and innovation
  - consumer and investor behavior
  - technology diffusion and stock turnover
- Government standards
  - vehicle fuel economy
  - appliance efficiency and building standards
- Government financial incentives
  - tax credits
  - funding in the Recovery Act
- Prospective policy analyses (e.g., H.R. 2454, APA)
  - greenhouse gas cap-and-trade
  - combined efficiency and renewable electricity standard

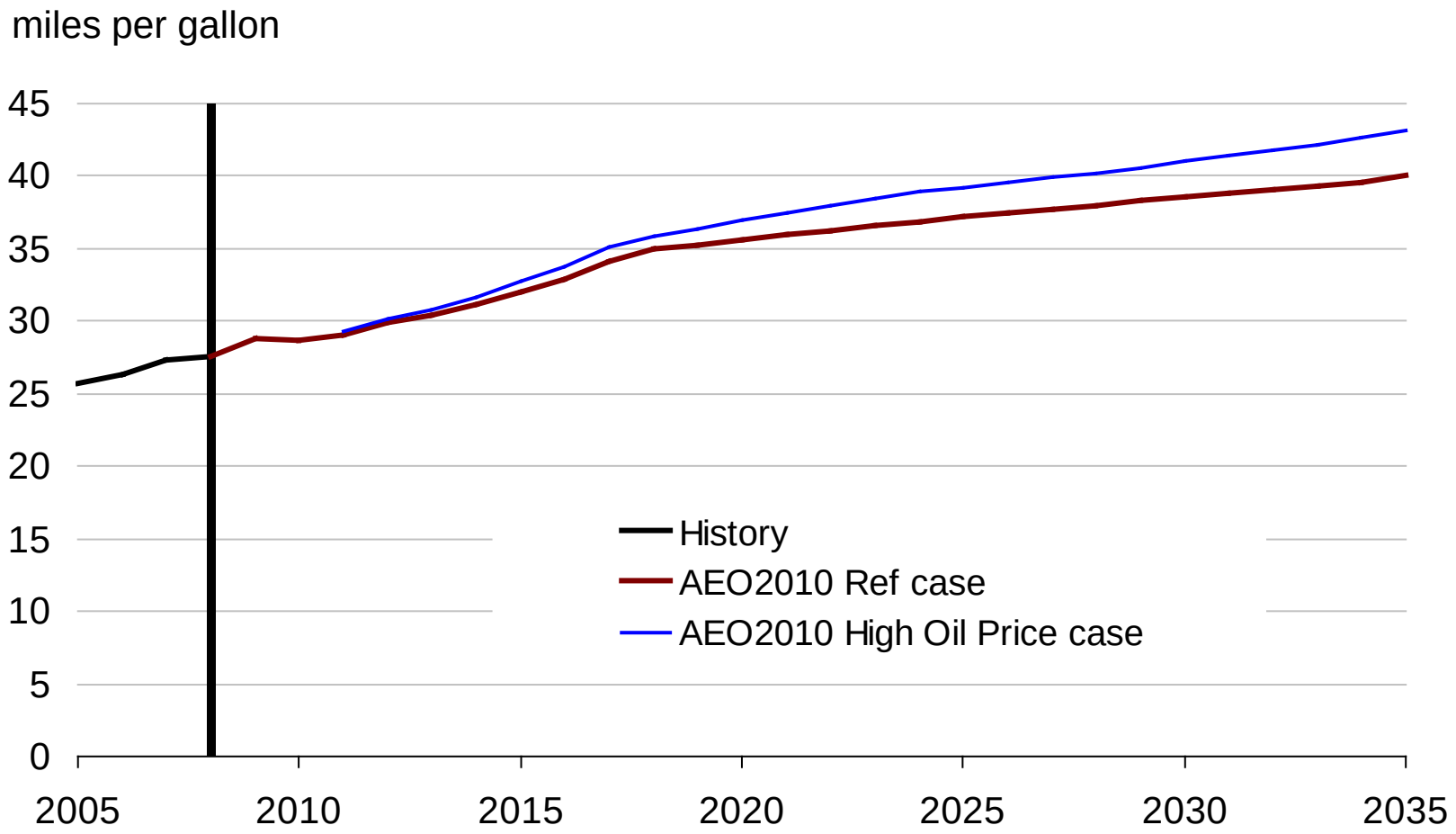
Extended policies case illustrates the impact of continued efficiency standard increases under existing laws



Source: *Annual Energy Outlook 2010*

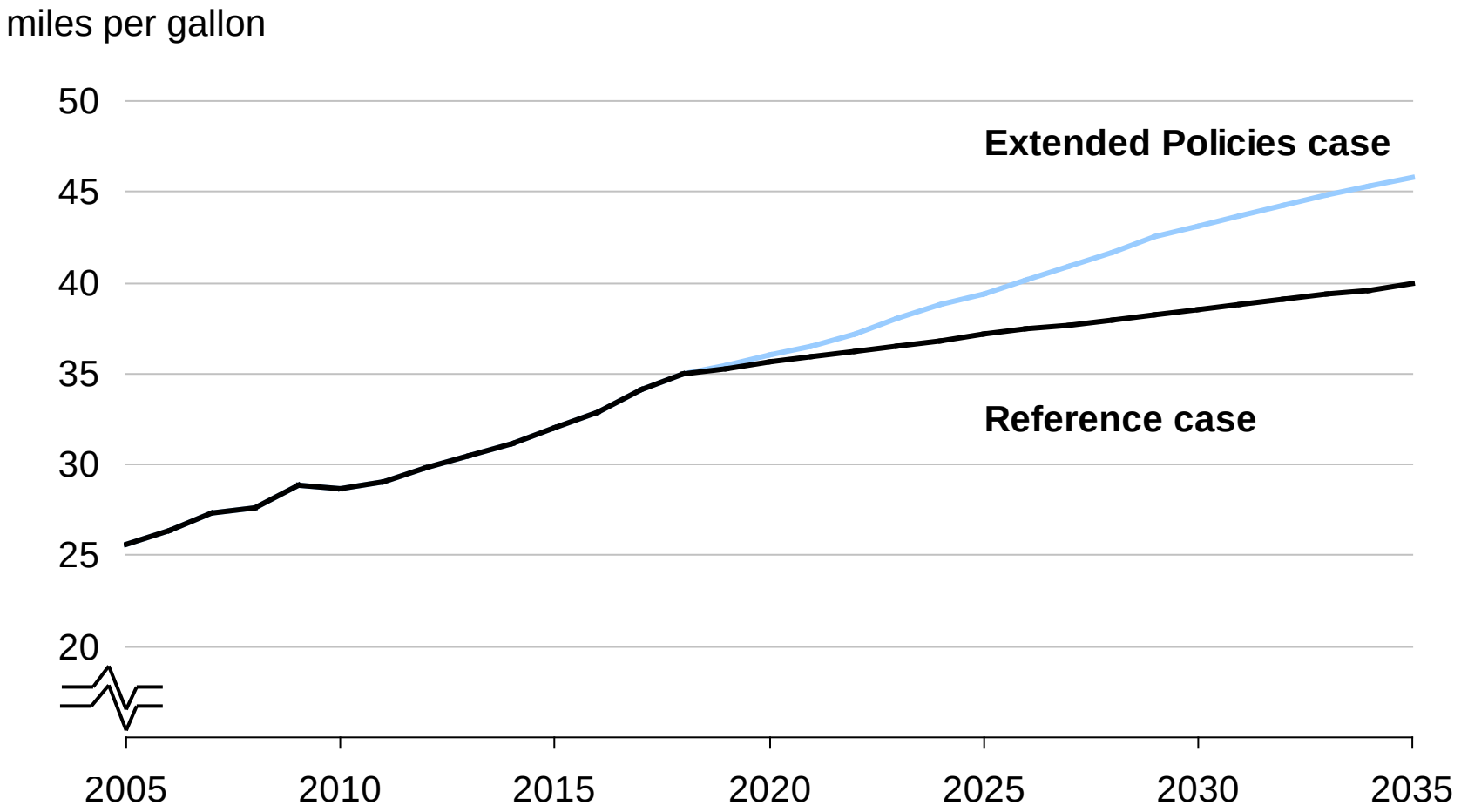
Vehicle fuel economy in the U.S. Energy Outlook

New light duty vehicle efficiency reaches 40 mpg by 2035



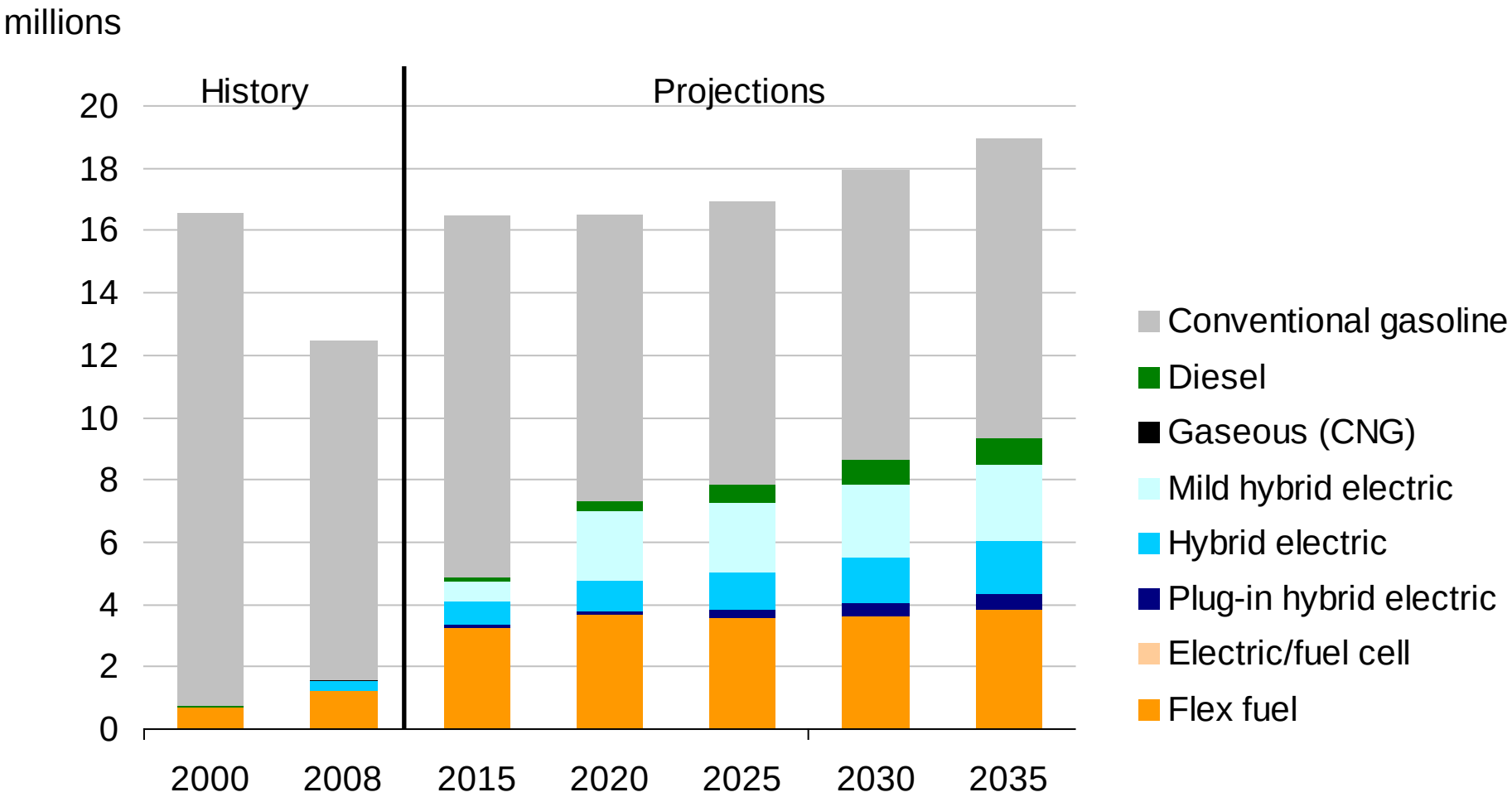
Source: *Annual Energy Outlook 2010*

The continuation of existing policies into the future would increase light-duty vehicle fuel economy



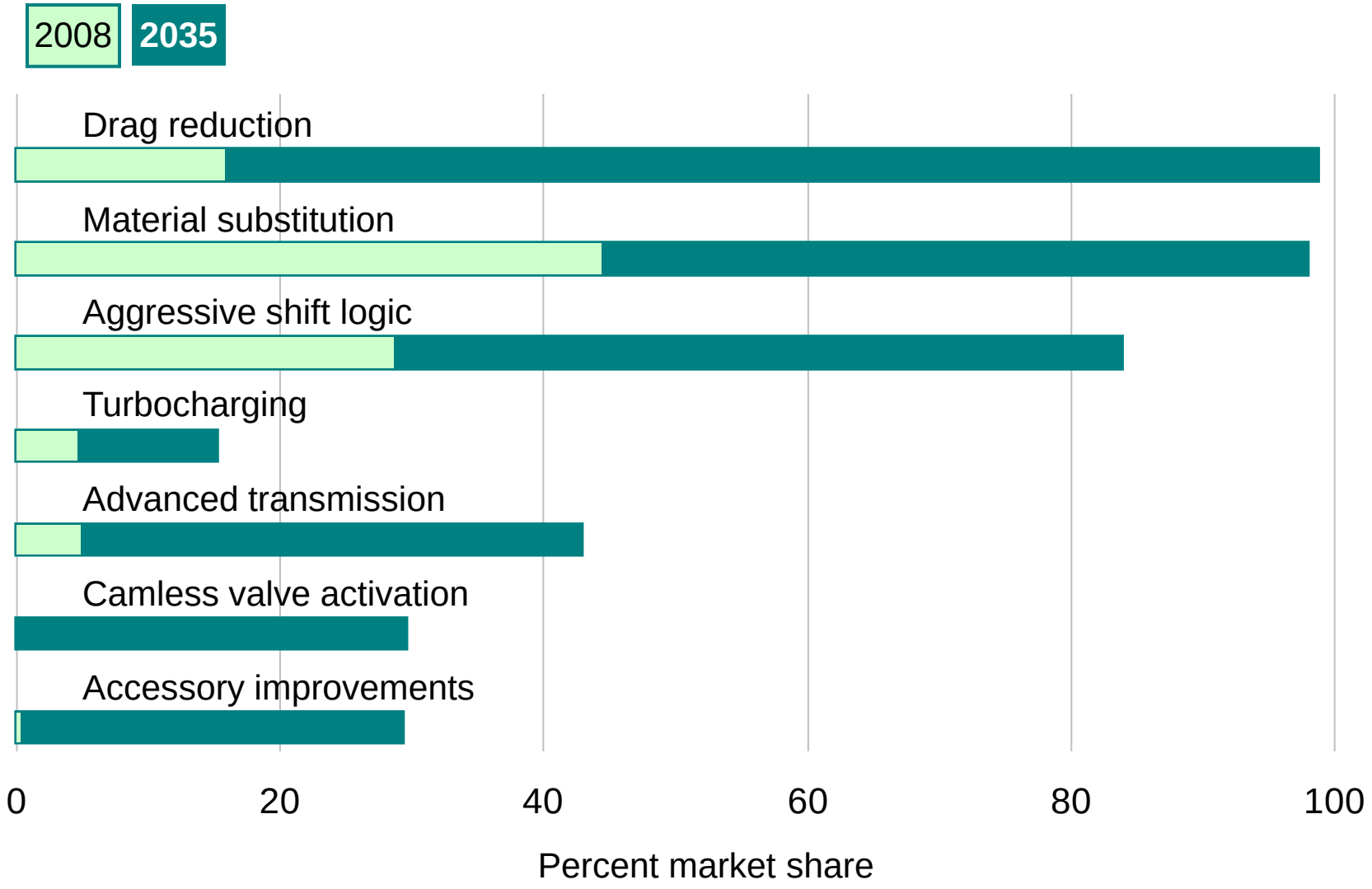
Source: *Annual Energy Outlook 2010*

Alternative vehicle technologies meet half of light-duty vehicle sales in 2035



Source: *Annual Energy Outlook 2010*

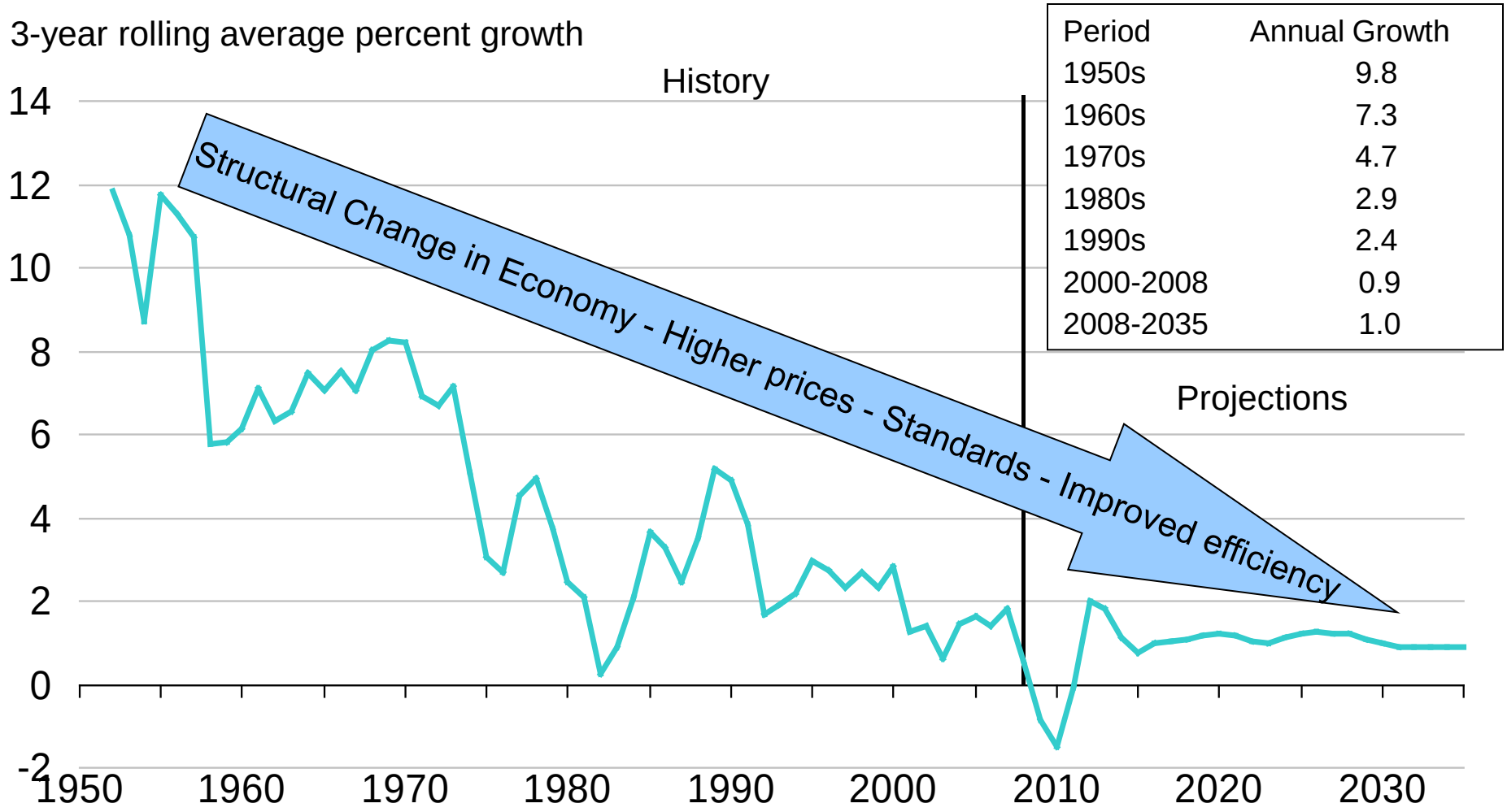
Market penetration of new technologies for light-duty vehicles, 2008 and 2035



Source: *Annual Energy Outlook 2010*

Residential and commercial energy efficiency in the U.S. Energy Outlook

Growth in electricity use continues to slow



Period	Annual Growth
1950s	9.8
1960s	7.3
1970s	4.7
1980s	2.9
1990s	2.4
2000-2008	0.9
2008-2035	1.0

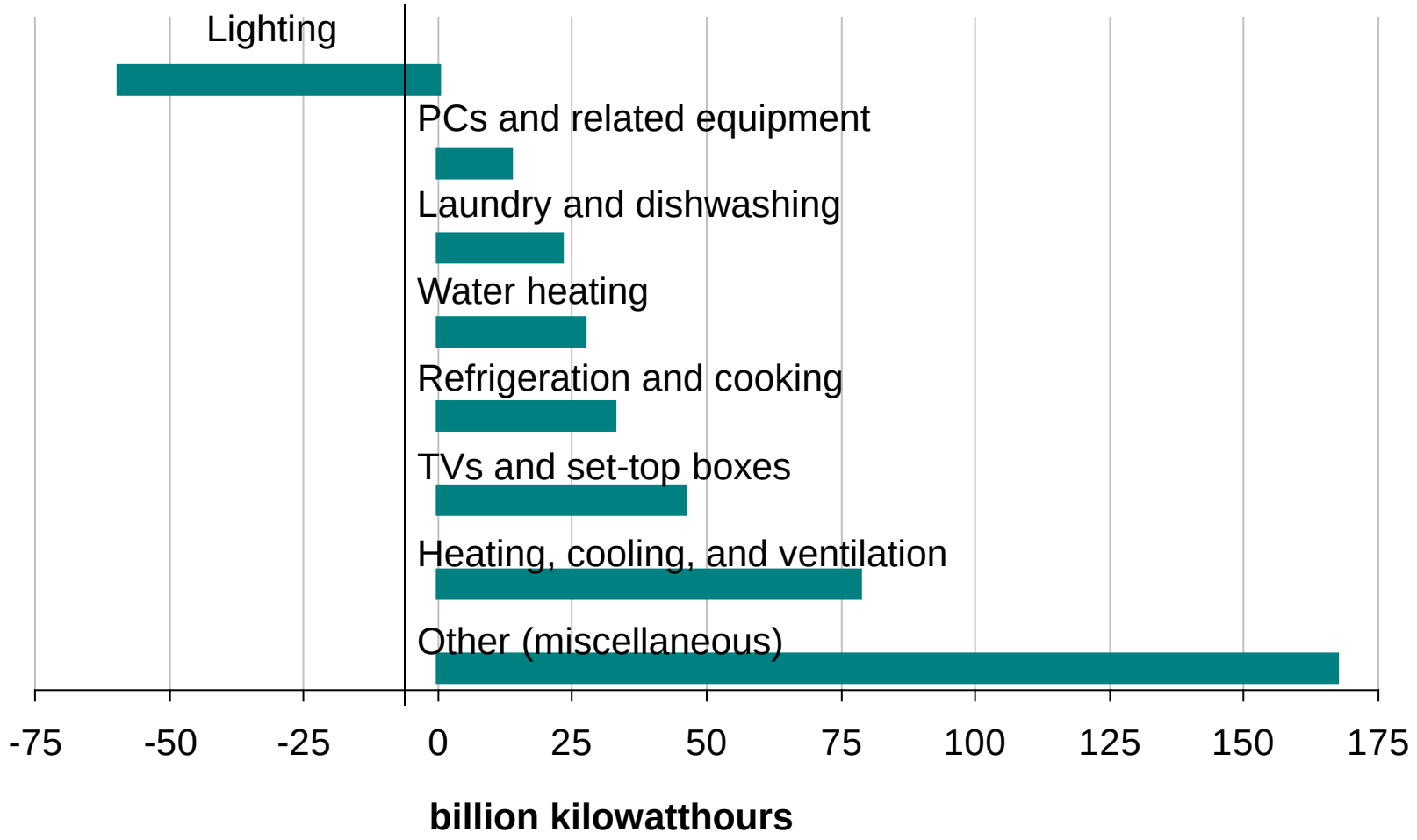
Source: *Annual Energy Outlook 2010*

Alternative building energy efficiency cases

- Low technology case
  - equipment and shells limited to what was available in 2009
  - no technology advance, but equipment stocks improve through turnover
- Reference case
  - future technology improvements
  - equipment purchases calibrated to observed behavior
- High technology case
  - advanced equipment available earlier at lower cost
  - building shells get more efficient than Reference case
  - purchases based on reduced discount rates
- Best technology case
  - equipment costs ignored; only the most efficient technologies allowed
  - shells even better than High technology case

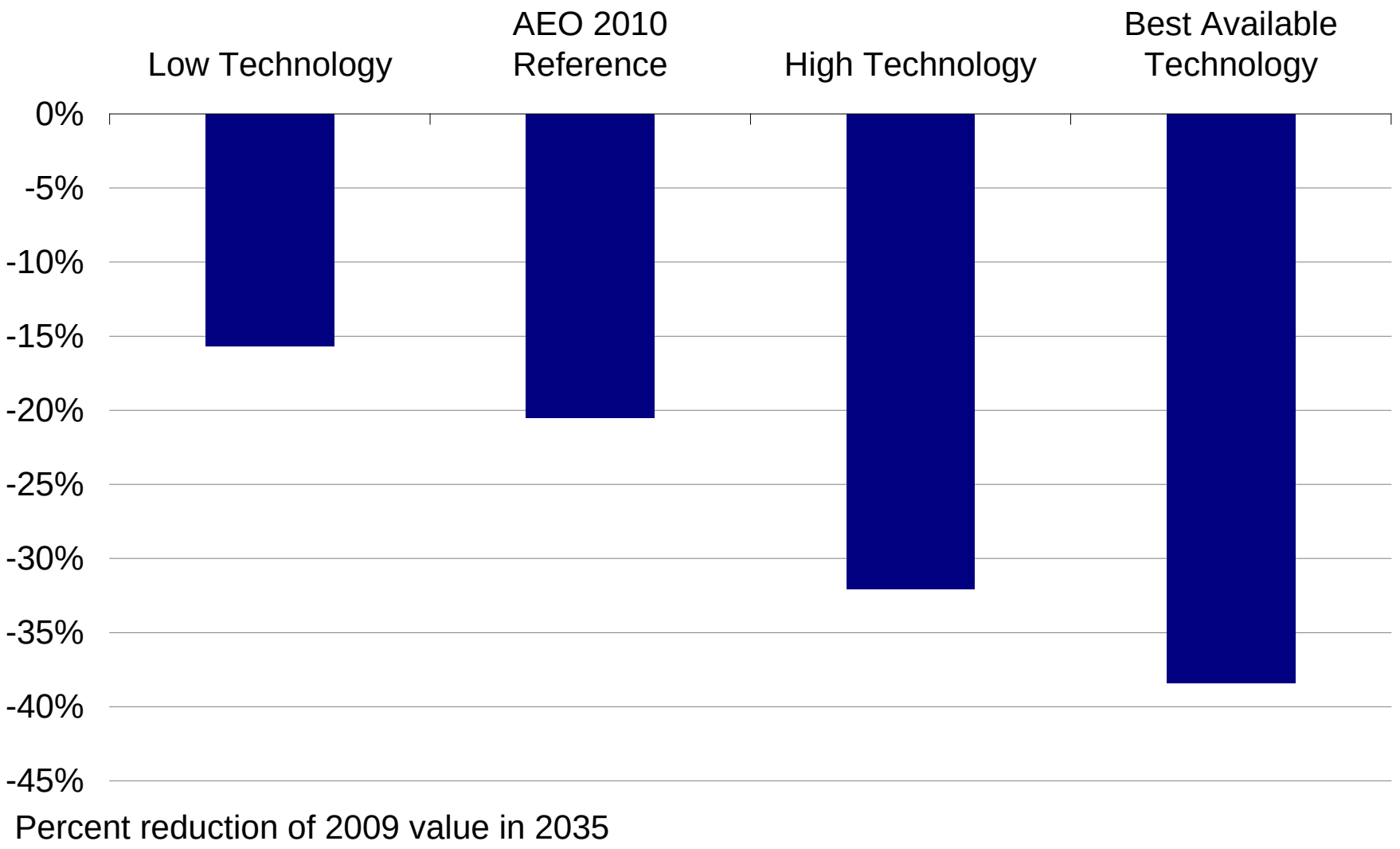
But buildings growth and new residential uses could more than offset efficiency improvements

Change in residential electricity consumption in the Reference case, 2008-2035



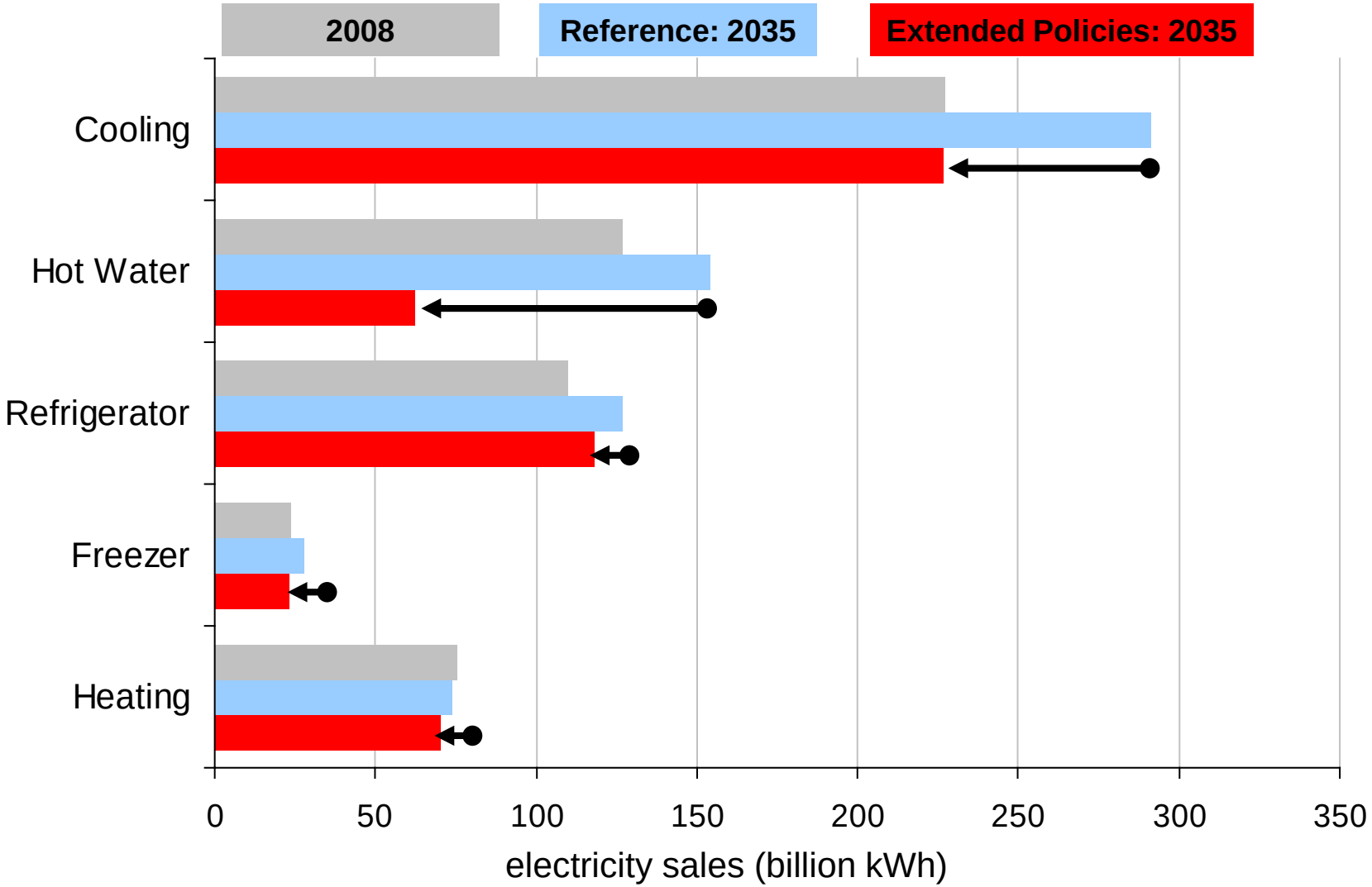
Source: *Annual Energy Outlook 2010*

Stock turnover and new technology will drive down building energy use per square foot



Source: *Annual Energy Outlook 2010*

Growth in residential electricity sales is substantially cut by extending policies for: cooling, hot water, and refrigeration



Source: *Annual Energy Outlook 2010*

Concluding remarks

- Market uptake tends to be considerably less efficient than best available technology
  - market behavior and slow stock turnover tends to moderate the impact of new innovations
- Analysis cases illustrate a range of possible future energy consumption paths depending on how energy markets, technologies, and policies unfold
- Tracking and understanding energy consumption, technology, and efficiency trends is a critical component of EIA's work
  - ongoing policy interest has increased the need for quality data and analysis

For more information

U.S. Energy Information Administration home page	www.eia.gov
Short-Term Energy Outlook	www.eia.gov/emeu/steo/pub/contents.html
Annual Energy Outlook	www.eia.gov/oiaf/aeo/index.html
International Energy Outlook	www.eia.gov/oiaf/ieo/index.html
Monthly Energy Review	www.eia.gov/emeu/mer/contents.html
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