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DO NOT QUOTE OR CITE AS RESULTS ARE SUBJECT TO CHANGE**

# Preliminary AEO2013 Reference Case Results: Coal



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# Key Results for the AEO2013

- Coal's share of generation is 35 percent in 2040
- Coal consumption increases by 88 million short tons between 2011 and 2040
- 48 GW of retirements
- High estimates for U.S. shale gas resources drive increased production and lower prices for natural gas compared to history
- Slightly higher average minemouth and delivered coal prices in AEO2013 compared to AEO2012
- About 170 million tons of coal exports by 2040

# AEO2013: Some relevant assumptions

- Current laws and regulations, excludes a number of pending regulations that will likely affect coal
- **Representation of environmental rules:**
  - SO<sub>2</sub> and NO<sub>x</sub>: Clean Air Interstate Rule (CAIR) instead of Cross-state Air Pollution Rule(CSAPR)
  - Mercury and Air Toxics Standard (MATS)
    - mercury: reduce uncontrolled mercury emissions by 90% representing an approximation for EPA's more specific MACT emission limits
    - acid gases: represented by requiring scrubbers or dry sorbent injection and fabric filter
  - CO<sub>2</sub>: Regional Greenhouse Gas Initiative (RGGI)
  - AB32: California's greenhouse gas program
- **Renewable energy:**

30 States and the District of Columbia have enforceable Renewable Portfolio Standards(RPS)

Wind production tax credits (PTC) expire at end of 2012

Hydro , biomass, geothermal PTC expire at end of 2013

Solar investment tax credit (ITC) reverts from 30% to a permanent 10% ITC in 2016

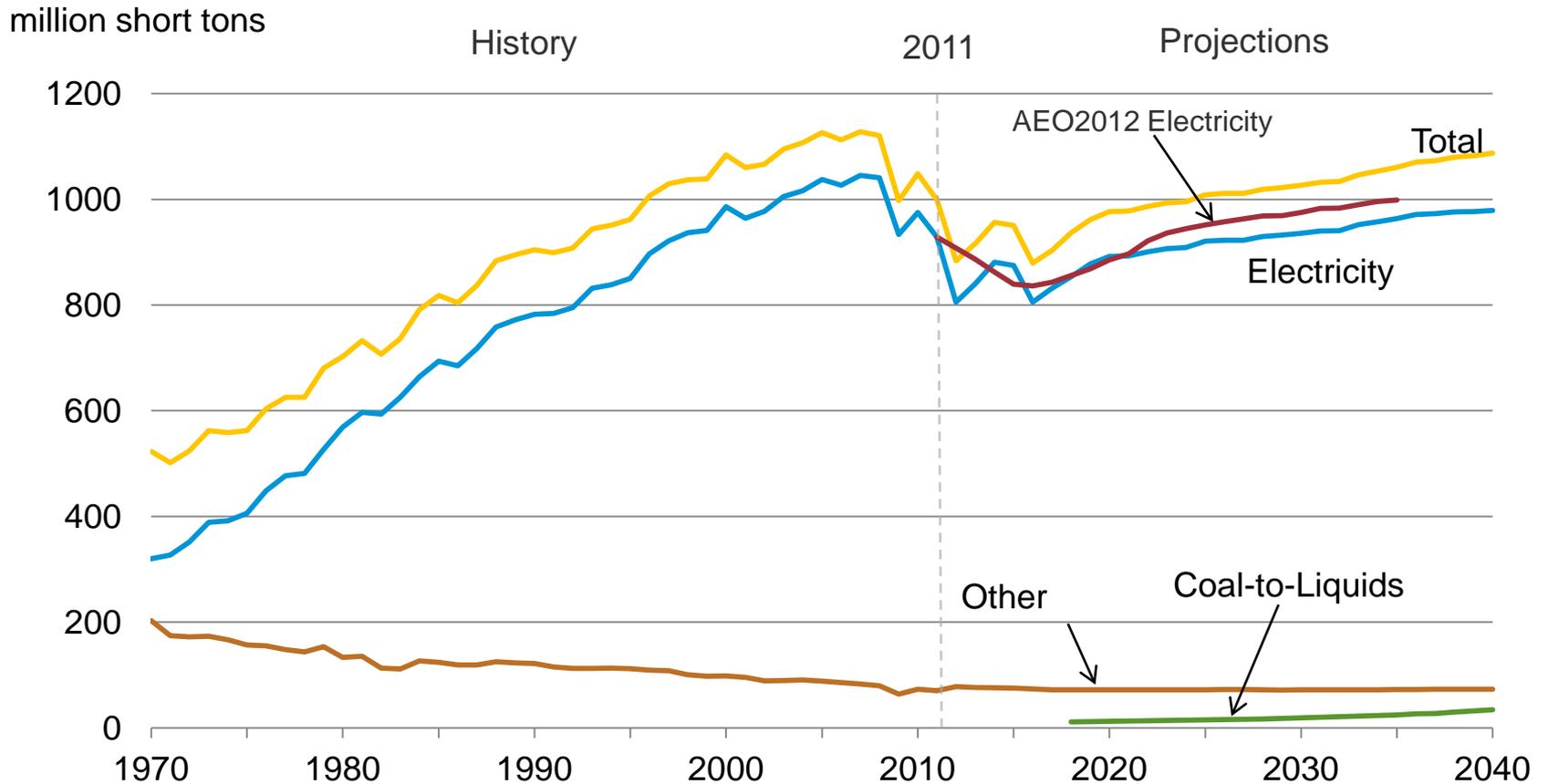
# AEO2013: Some relevant assumptions

- Update of RW Beck's estimates of capital costs for new power plants in the AEO2013; increase for IGCC coal and status quo for PC
- 3% higher cost of capital for greenhouse gas intensive investments for coal plants (including coal-based synthetic liquid plants)
- Approximately 1 gigawatt of coal w/ carbon capture and sequestration (CCS) assumed by 2018 (investment tax credits in the Energy Improvement and Extension Act of 2008 and funding from the American Recovery and Revitalization Act of 2009)
- Coal-to-liquids (CTL) plants feasible beginning in 2018
- Removed coal-and-biomass-to-liquids (CBTL) option

# AEO2013: Some relevant assumptions

- MATS compliance (either retrofits or retirements) begins in 2016 (assuming one-year reprieve)
- Carbon capture and sequestration for new plants is applied to PC rather than IGCC (due to revision in capital costs from RW Beck)
- Planned coal-fired capacity retirements: 28 gigawatts
- Planned coal-fired capacity additions: 6 gigawatts

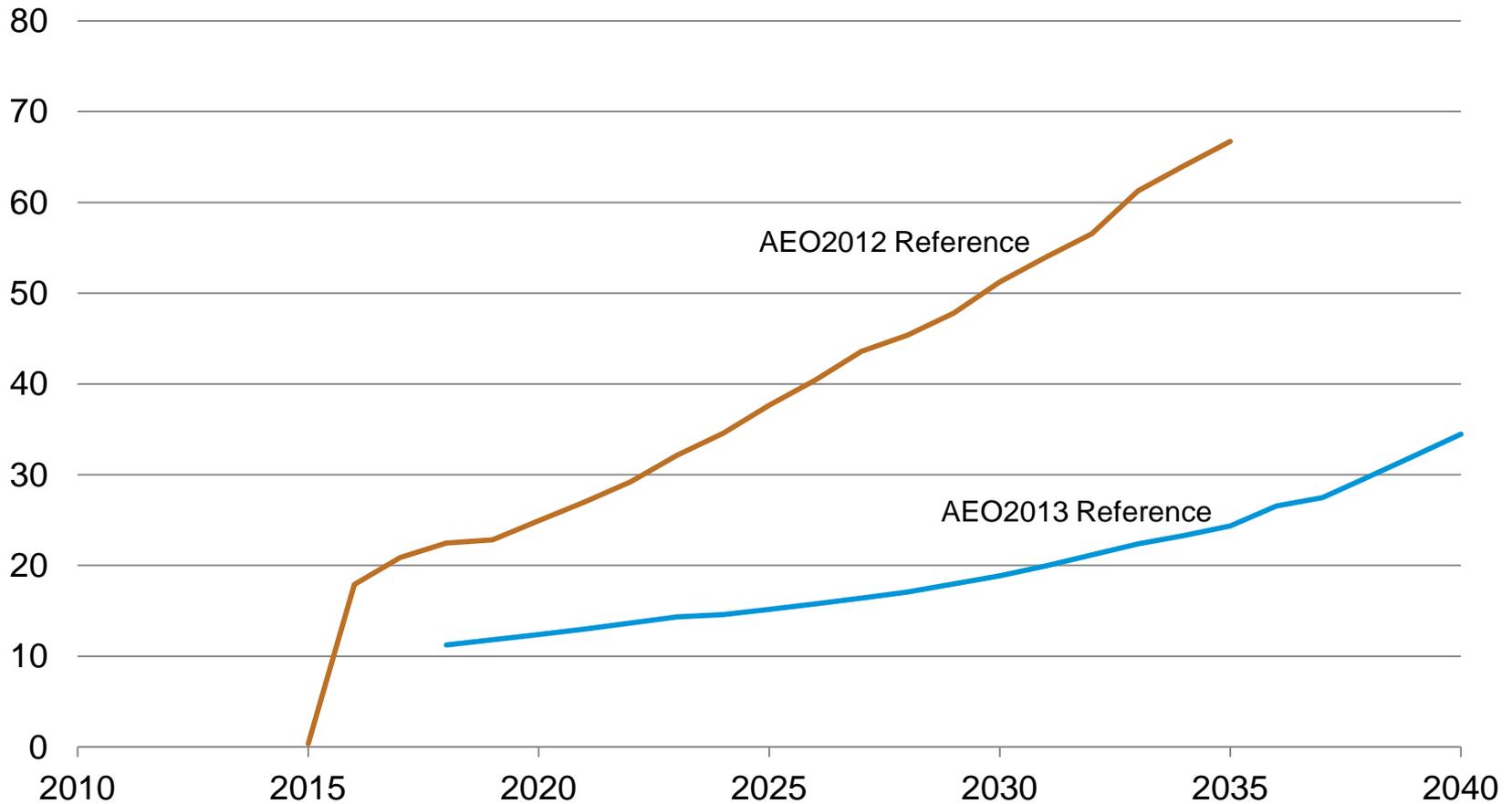
# Coal consumption by sector, 1970-2040



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

# Coal-to-liquids coal consumption, 2010-2040

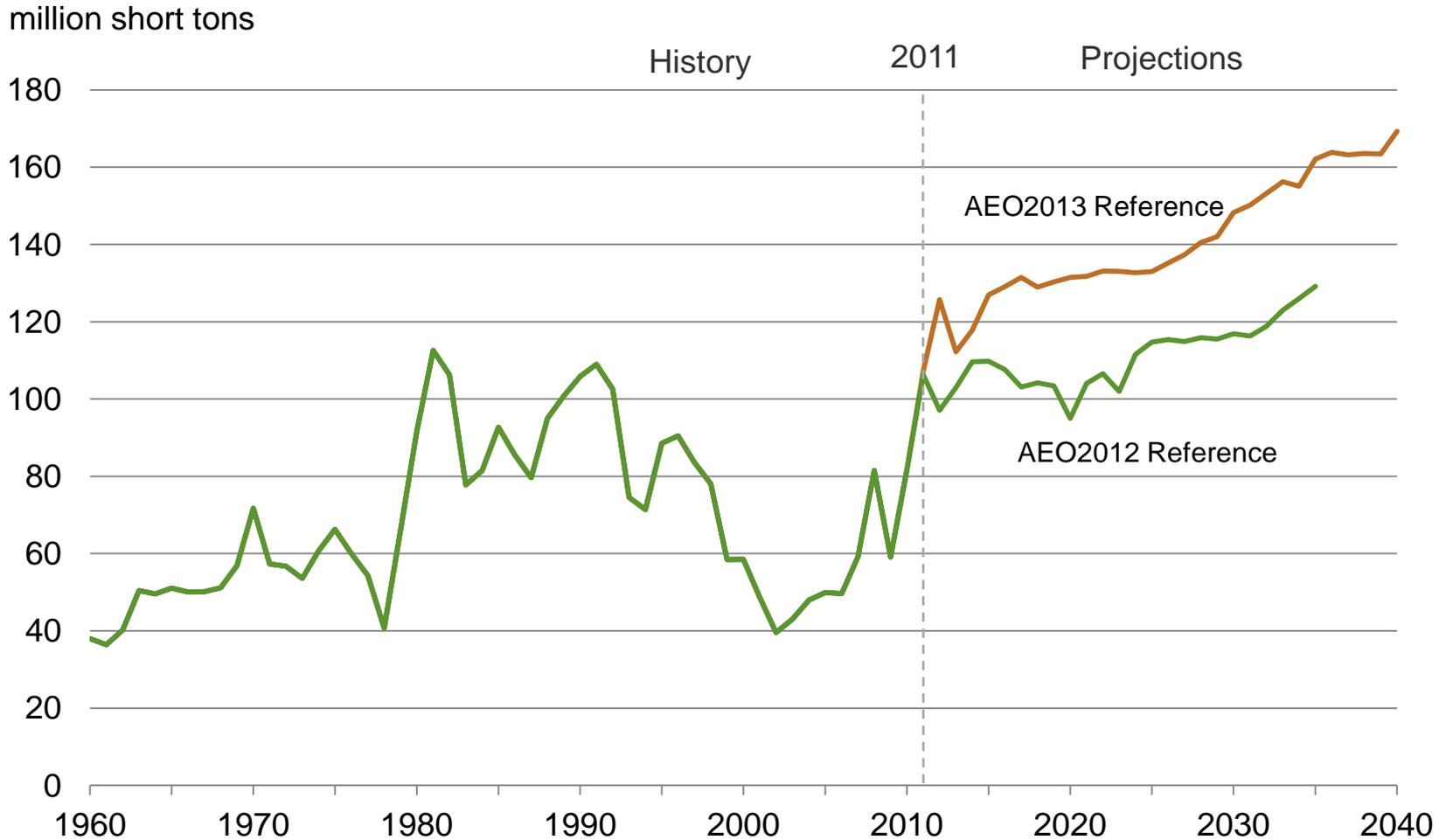
million short tons



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012



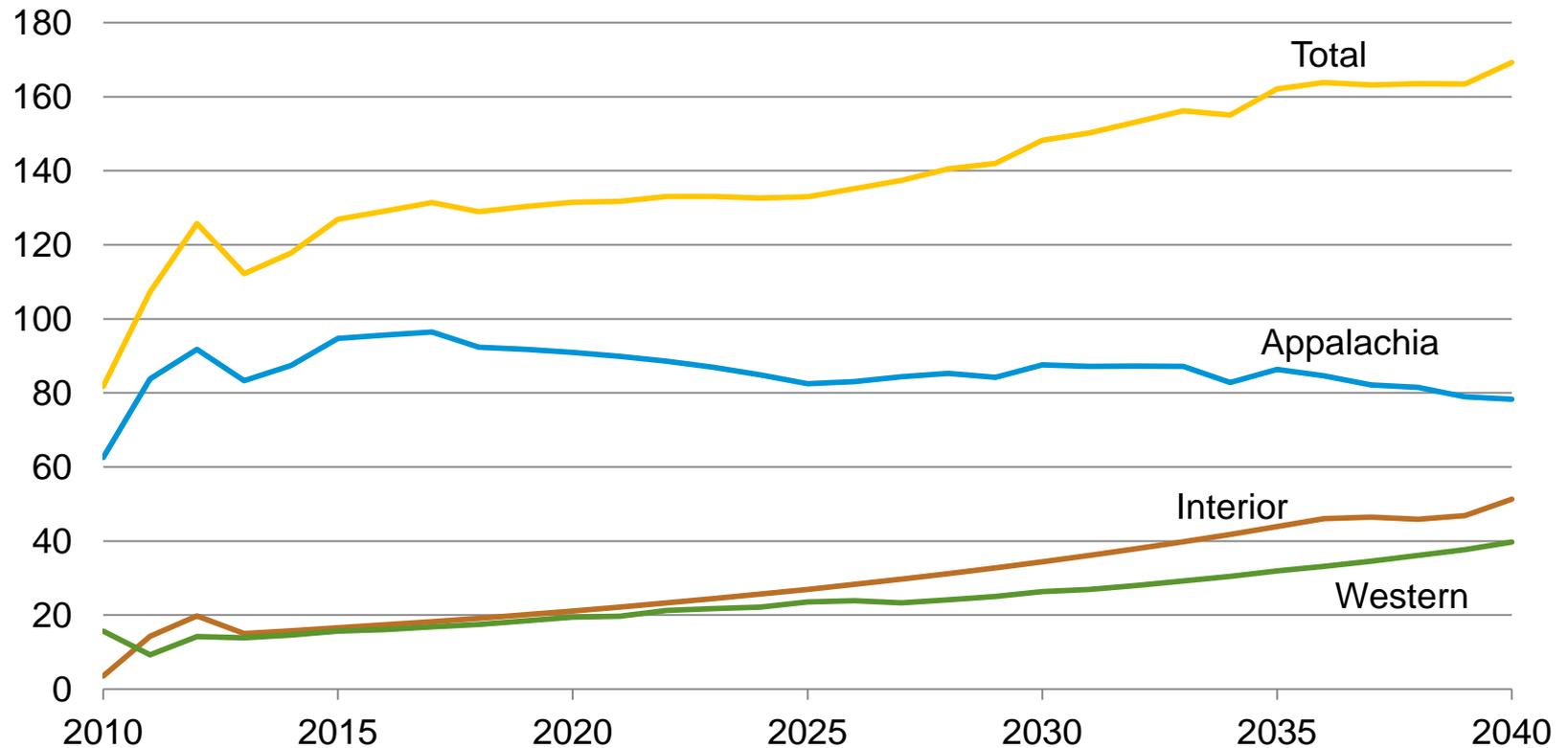
# Coal exports, 1960-2040



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

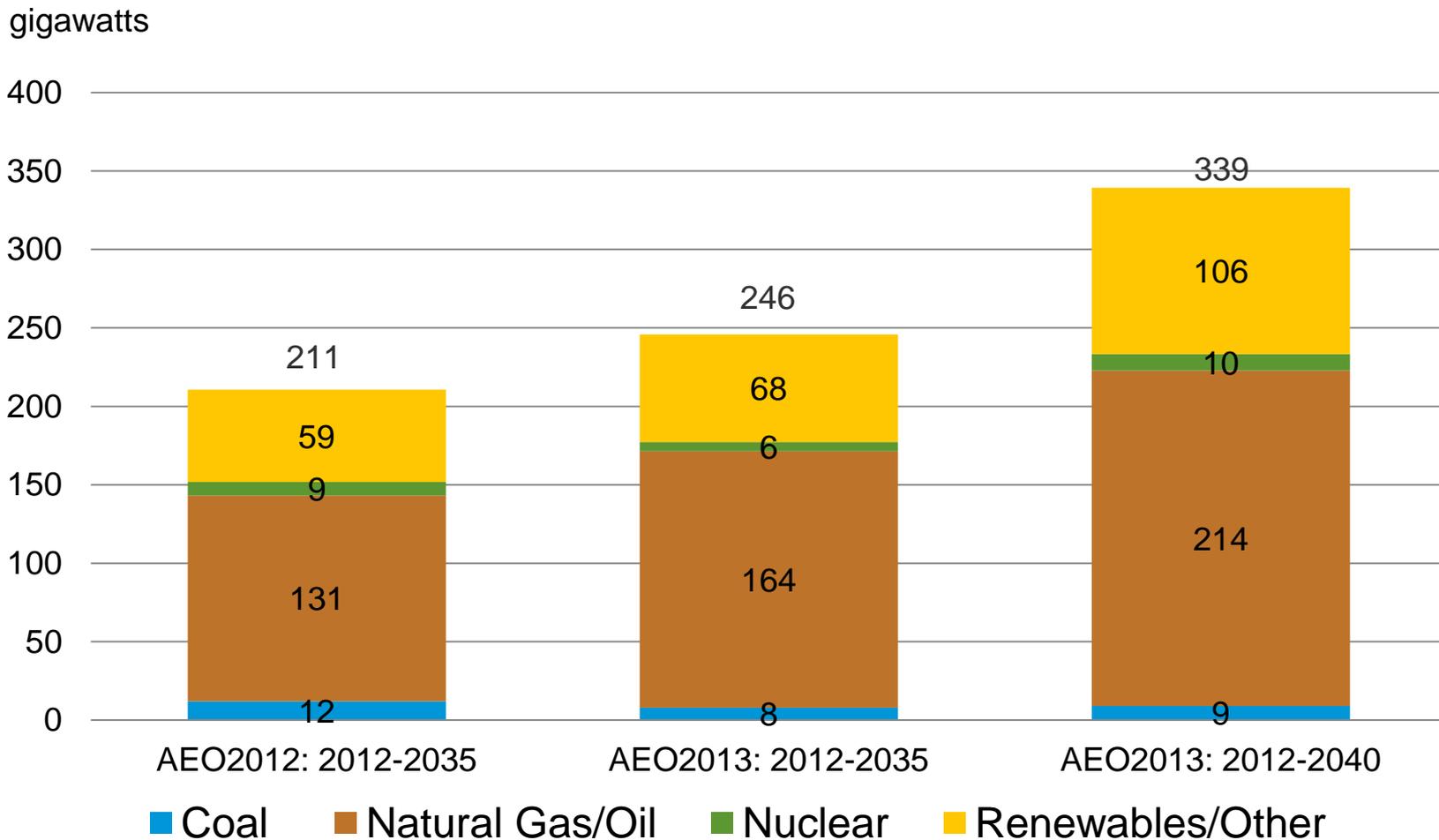
# Coal exports by major supply region, 2010-2040

million short tons



Source: 2010: U.S. Energy Information Administration (EIA), Annual Coal Distribution Report;  
2011-2040: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a)

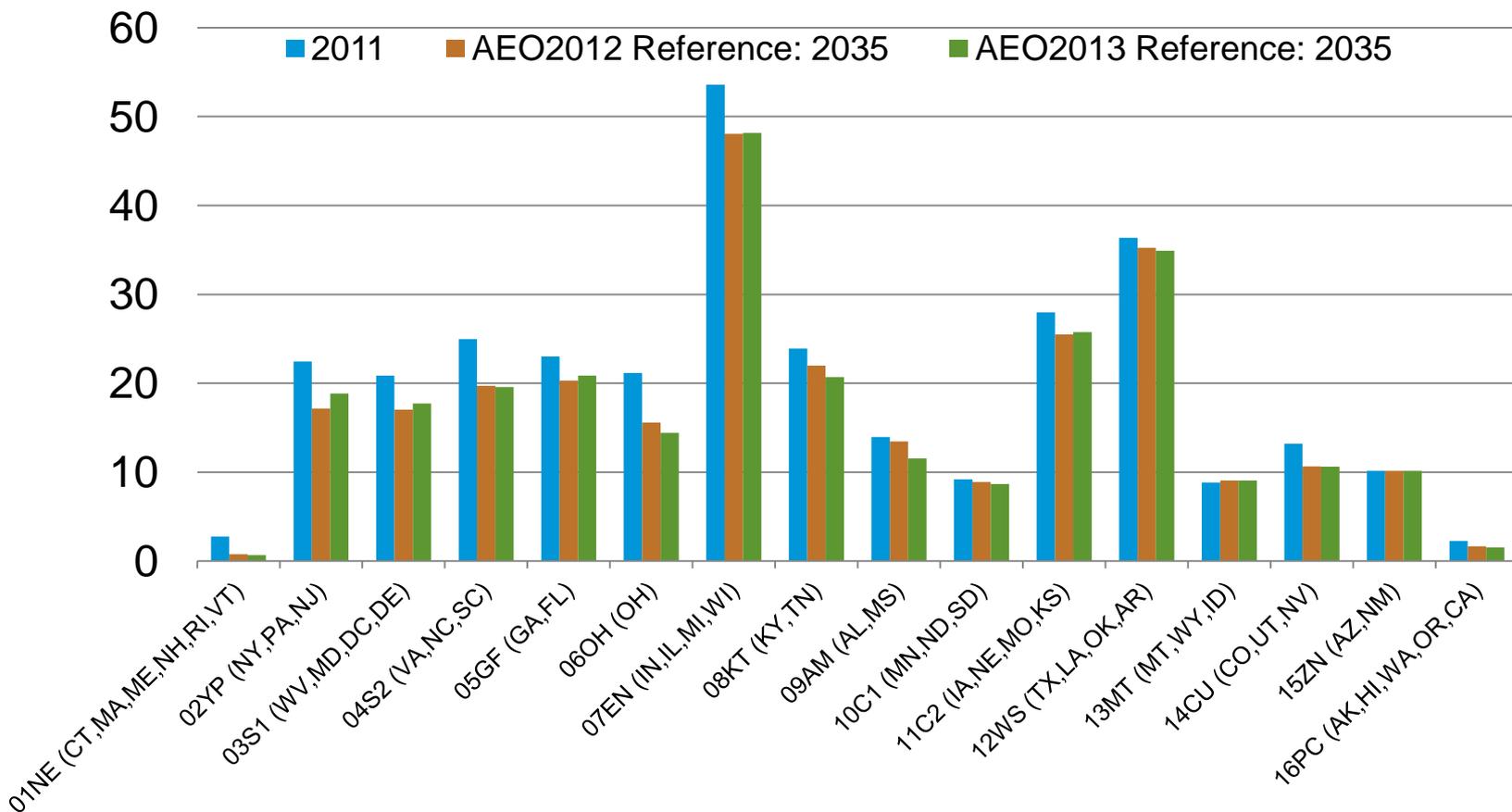
# Cumulative electricity generating capacity additions, 2012-2035 and 2012-2040



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

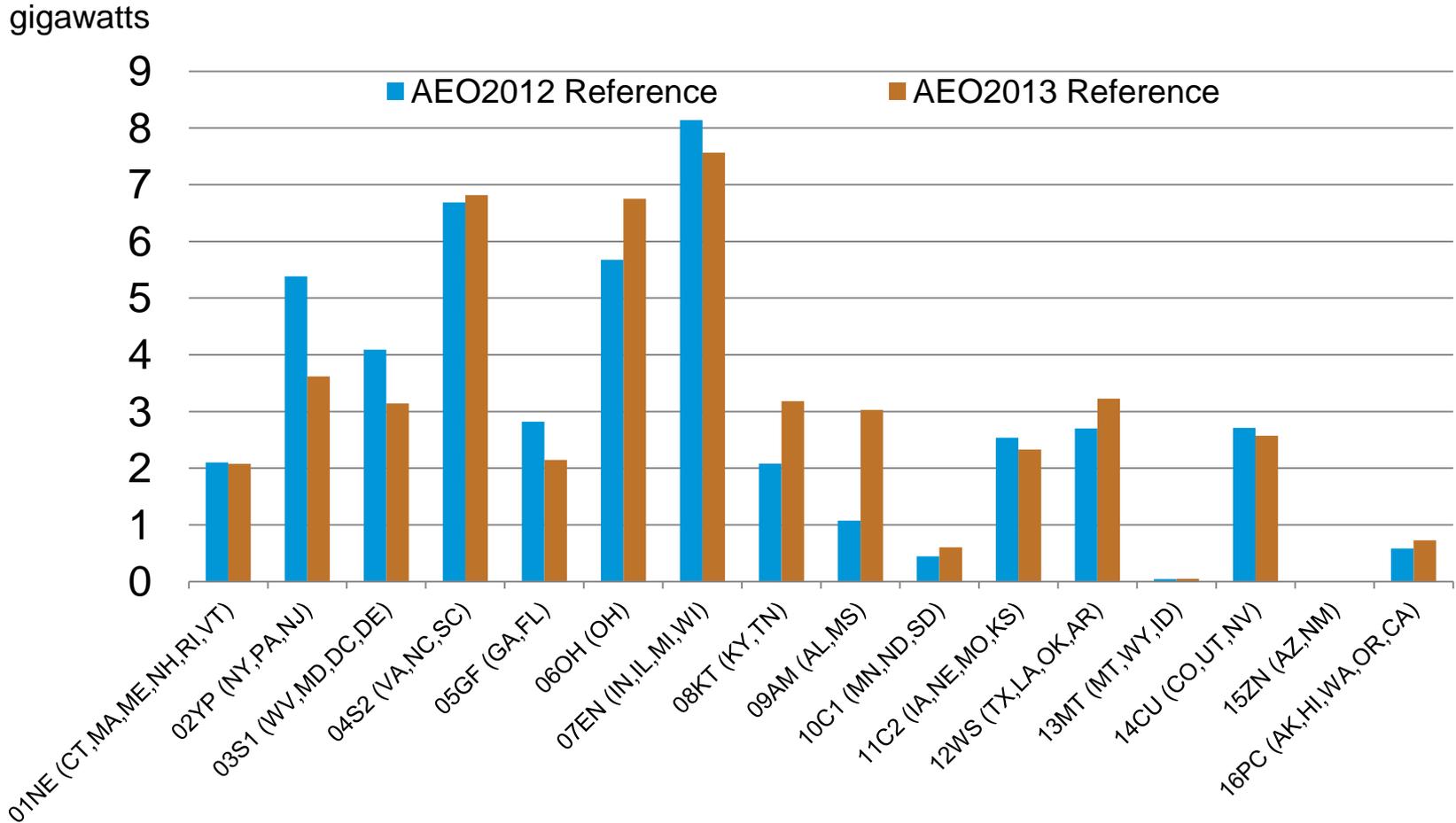
# Coal-fired generating capacity by coal demand region, 2011 and 2035

gigawatts



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

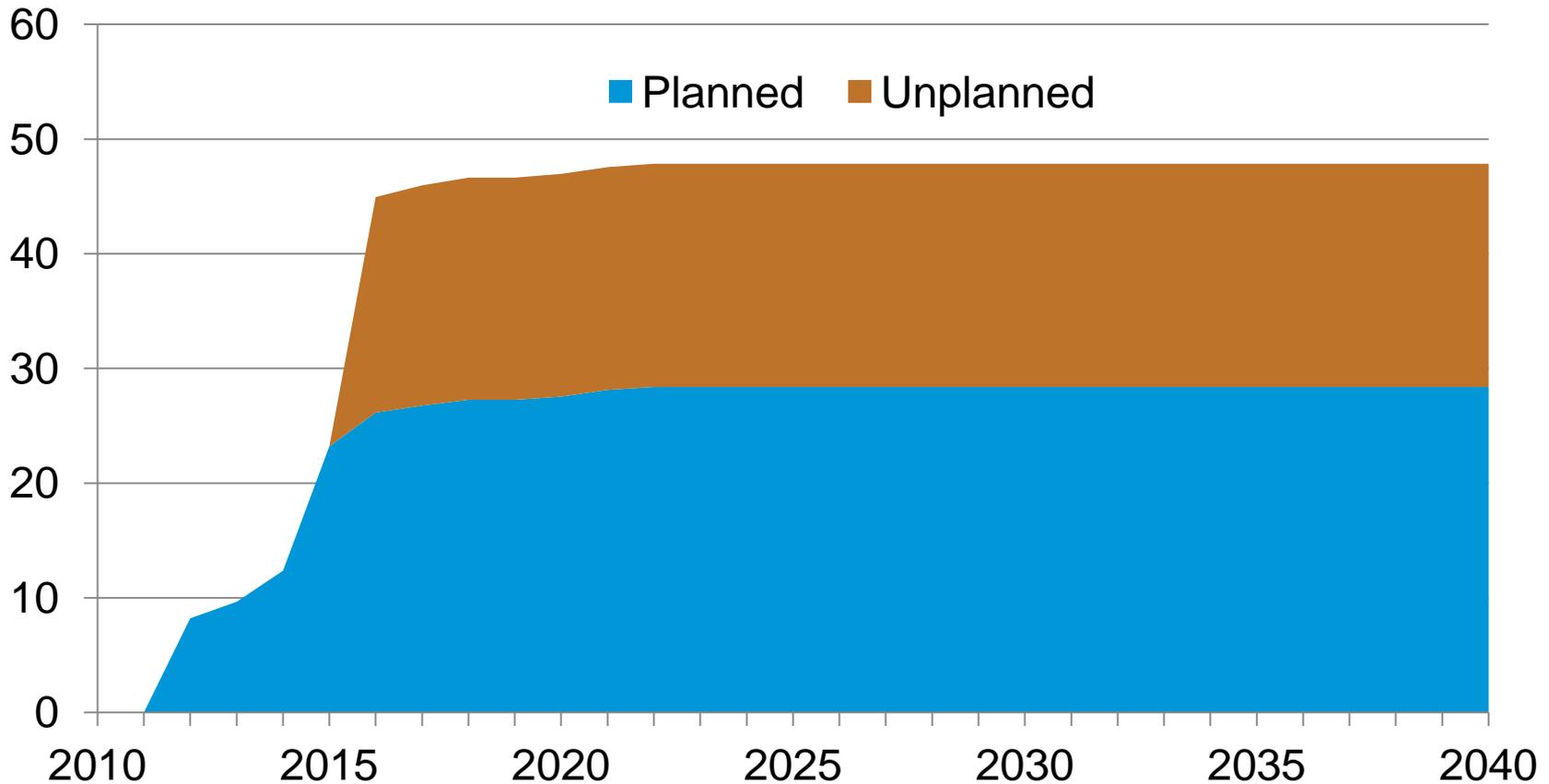
# Cumulative coal-fired capacity retirements by coal demand region, 2012-2035



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

# Cumulative coal-fired capacity retirements: planned and unplanned, 2012-2040

gigawatts

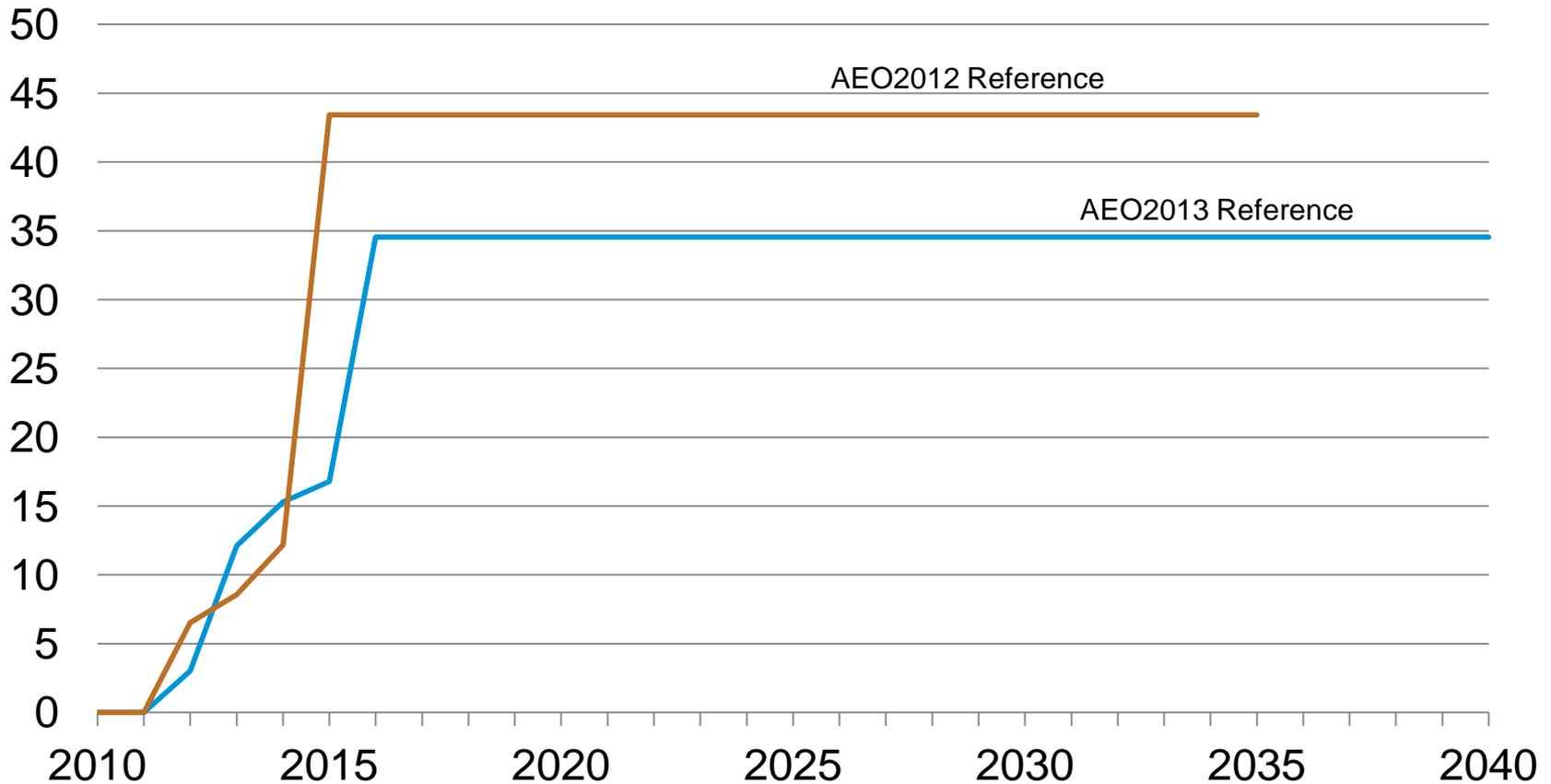


**Note:** Planned retirements represent those reported to EIA by generators in the electric power sector.

**Source:** EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

# Cumulative SO2 scrubber retrofits, 2012-2040

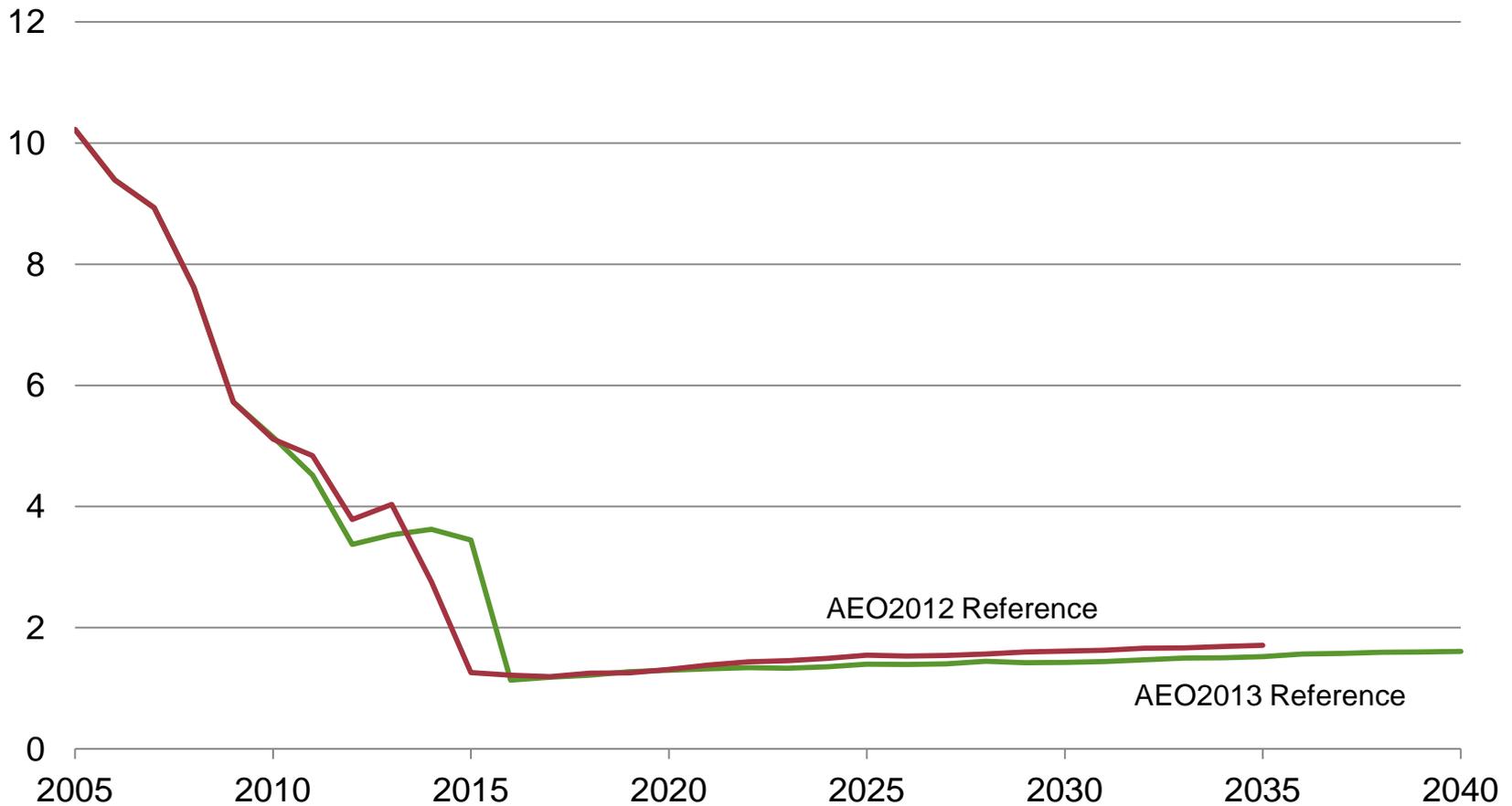
gigawatts



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

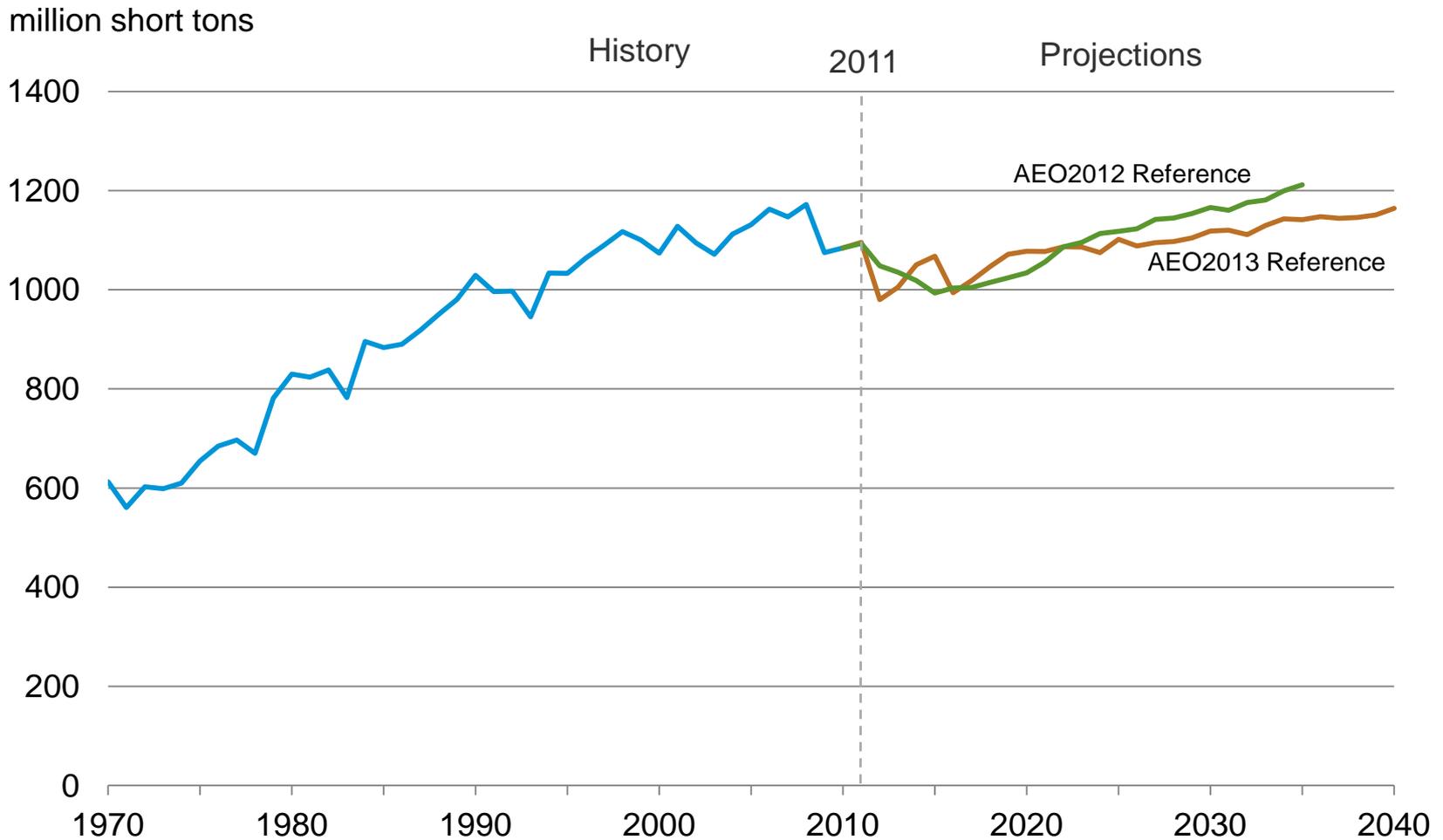
# Total sulfur dioxide emissions, 2005-2040

Million short tons



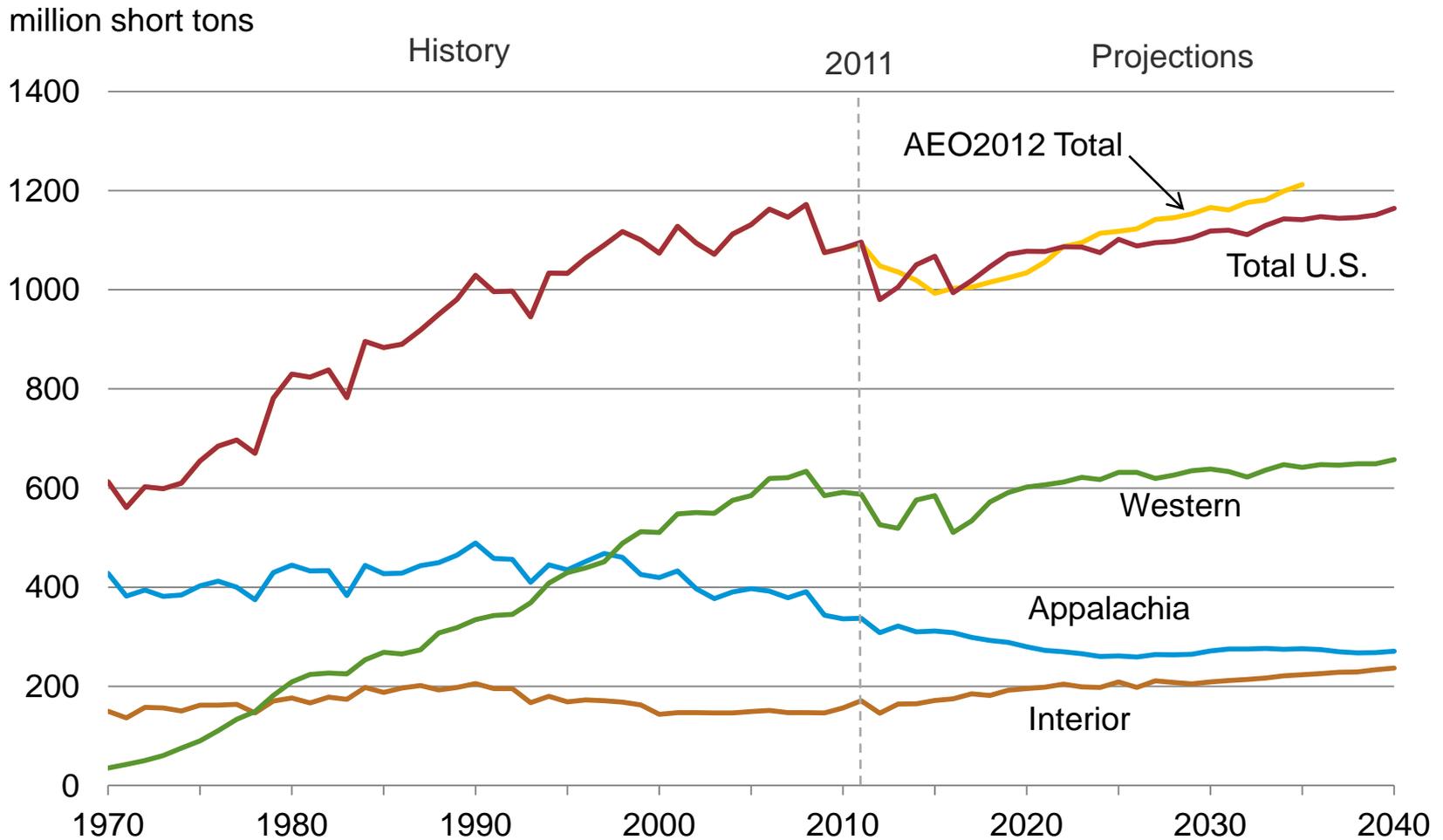
Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

# Coal production, 1970-2040



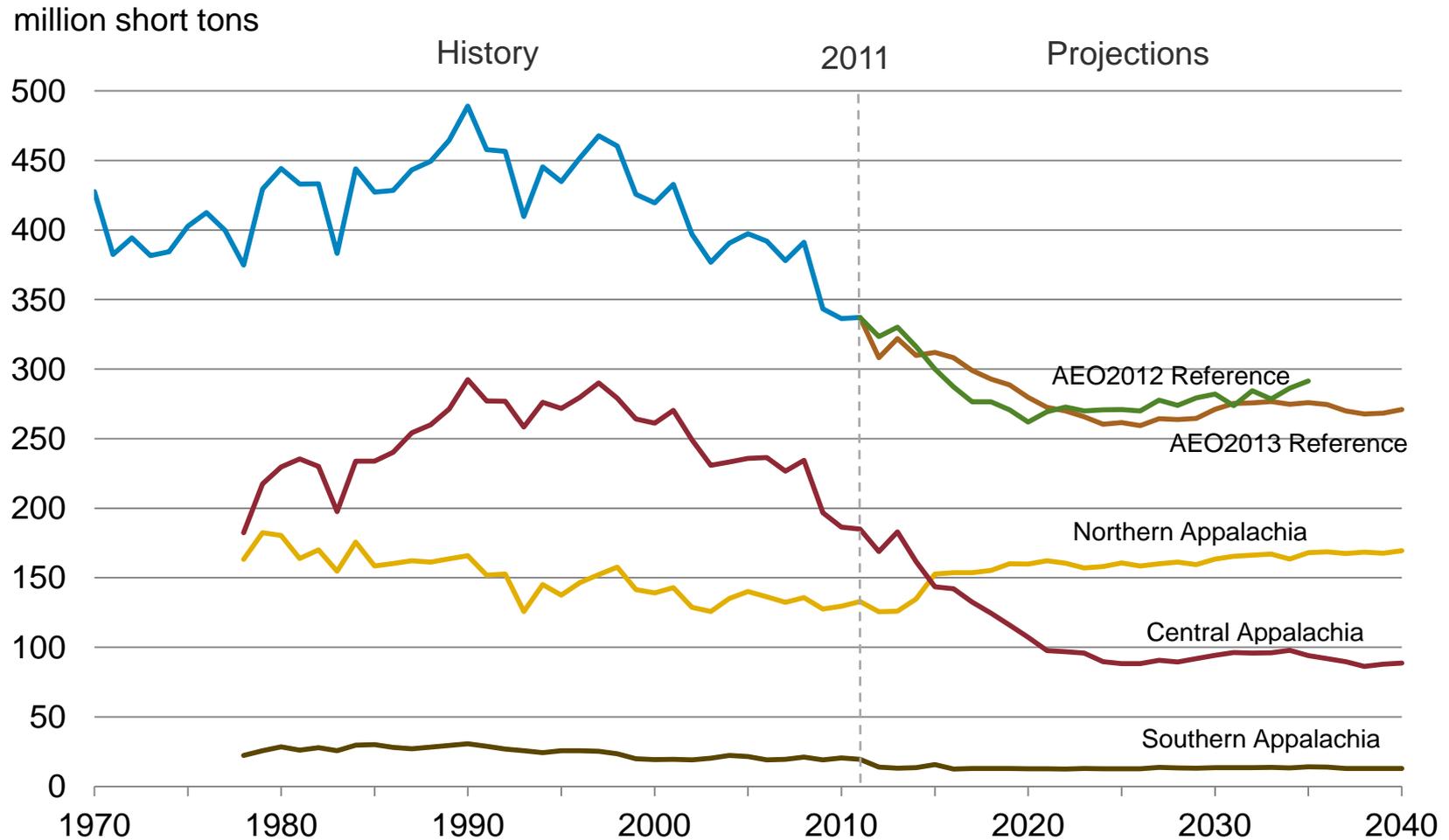
Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

# Coal production by region, 1970-2040



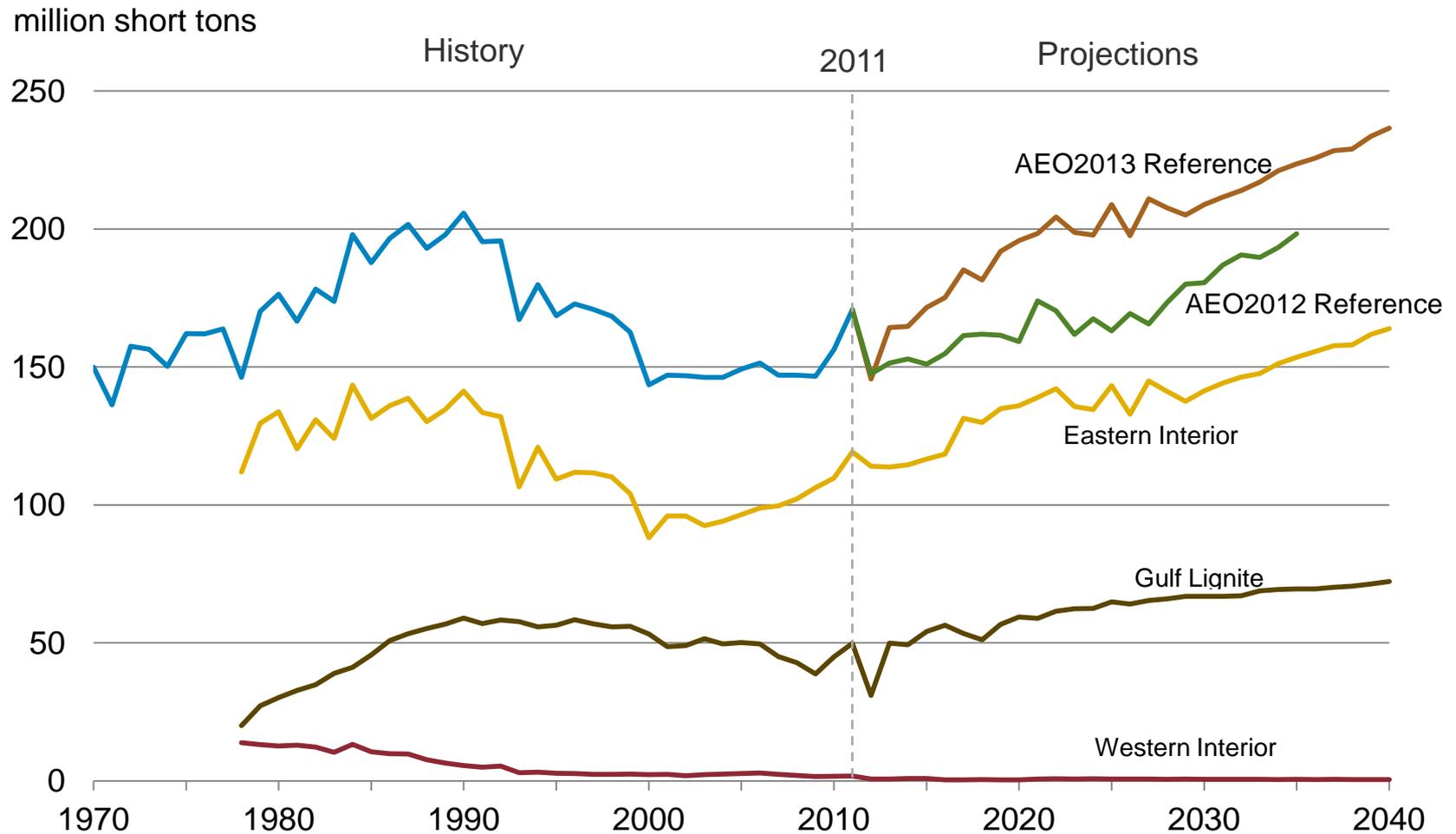
Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

# Appalachian coal production, 1970-2040



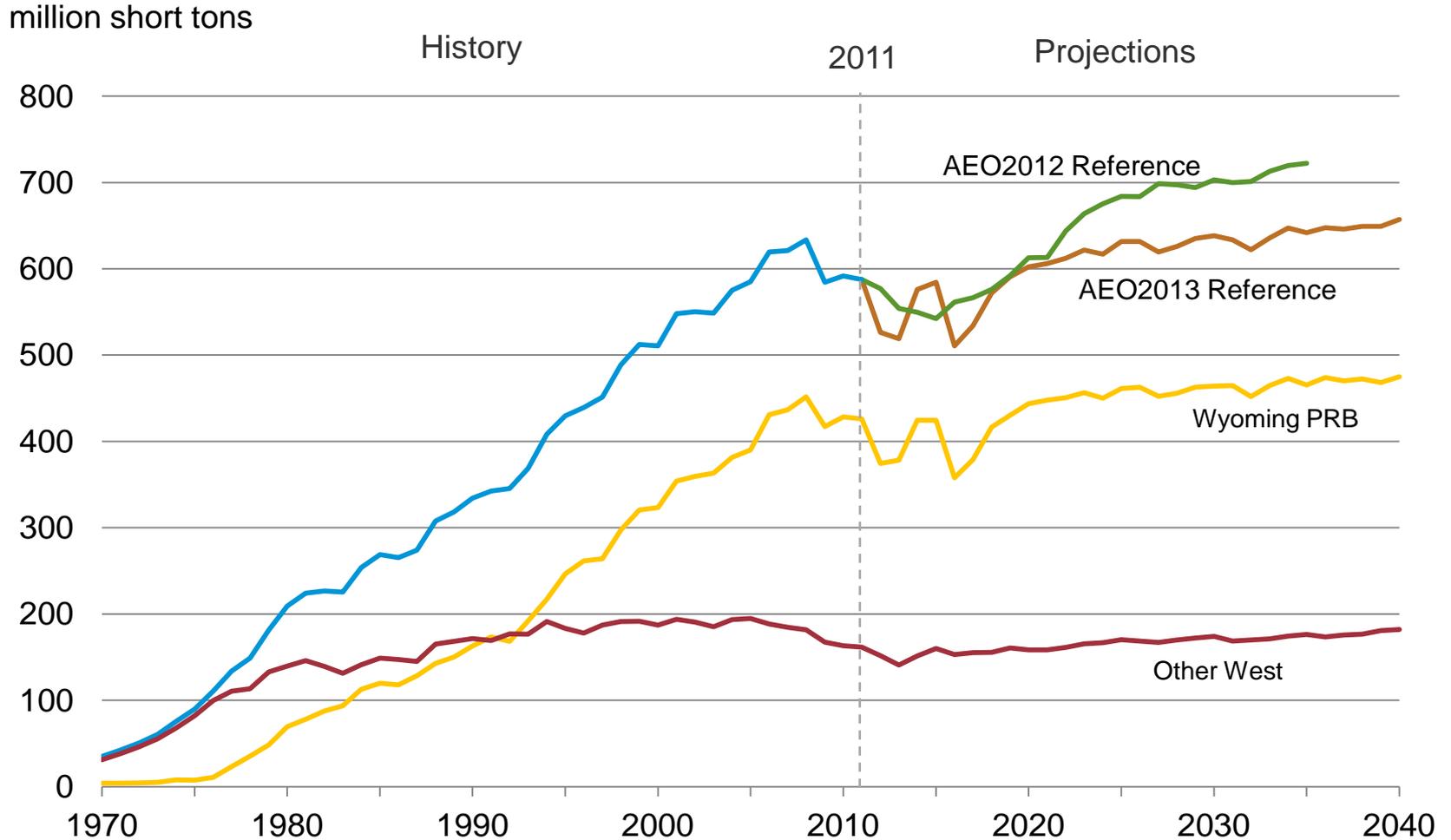
Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012; Except for Appalachian total, data for 1978-1985 exclude production from small (<10,000 short tons) coal mines

# Interior coal production, 1970-2040



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012; Except for Interior total, data for 1978-1985 exclude production from small (<10,000 short tons) coal mines

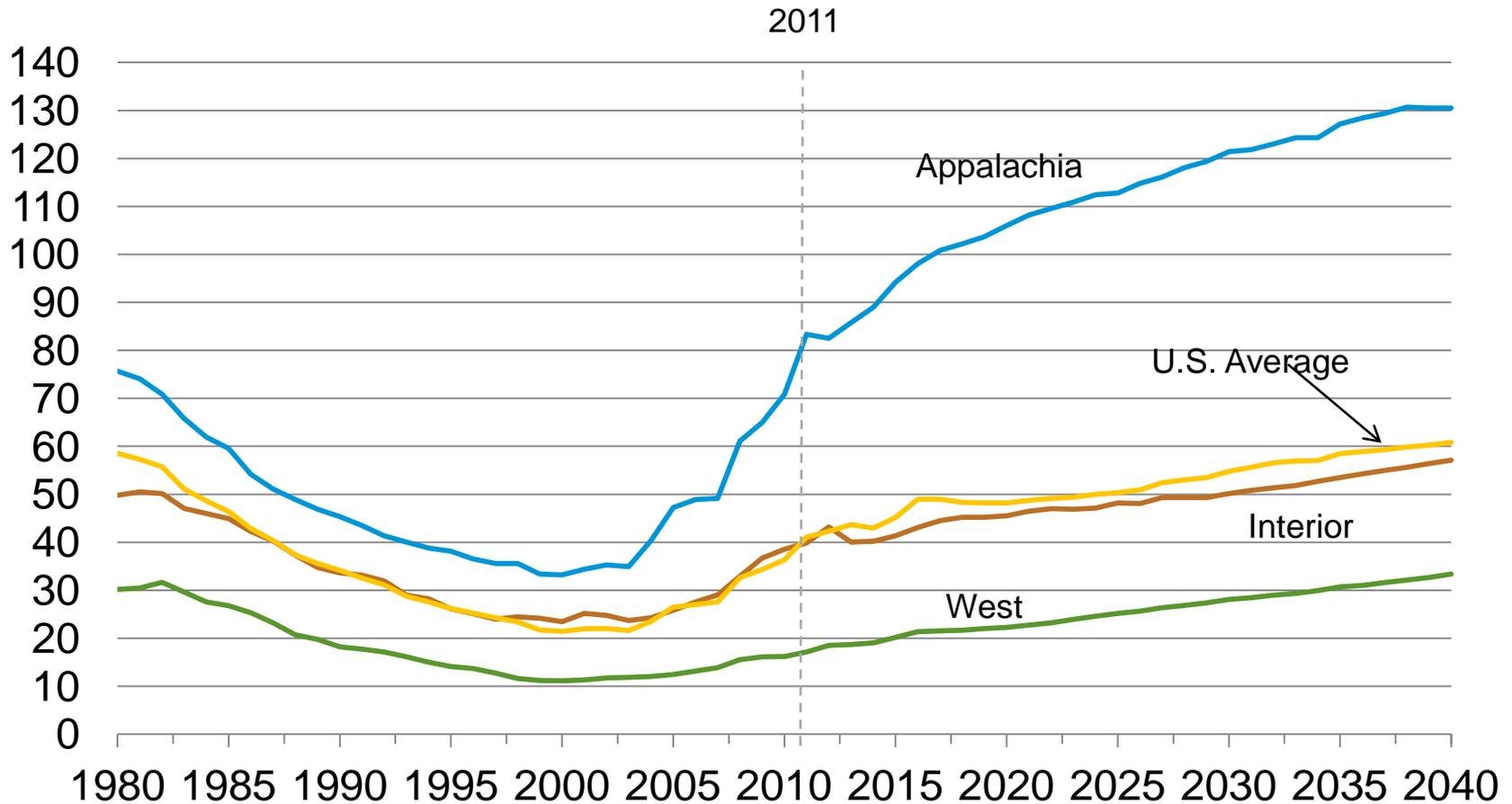
# Western coal production, 1970-2040



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012; Except for Western total, data for 1978-1985 exclude production from small (<10,000 short tons) coal mines

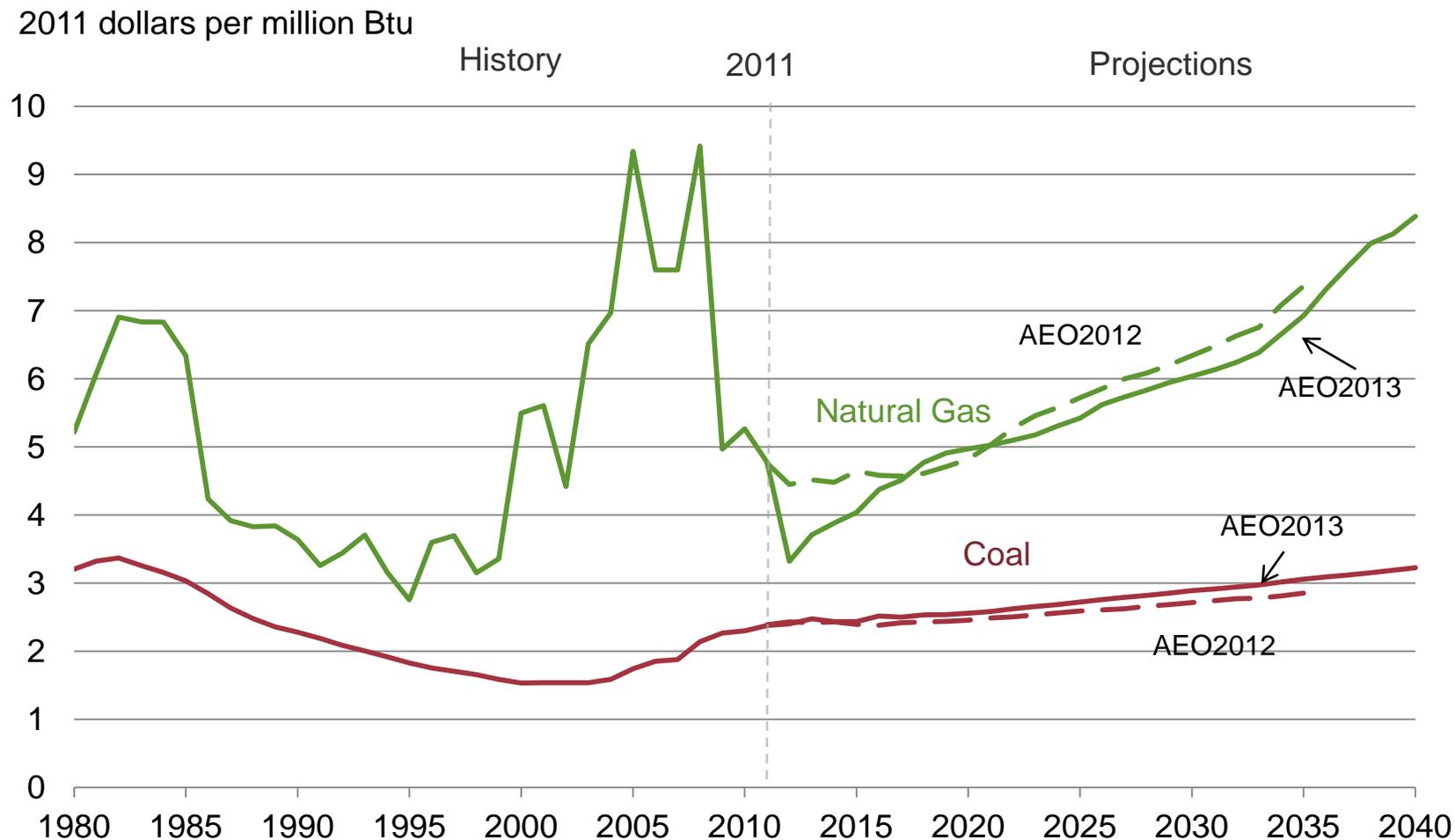
# Average minemouth coal prices by region, 1980-2040

2011 dollars per short ton



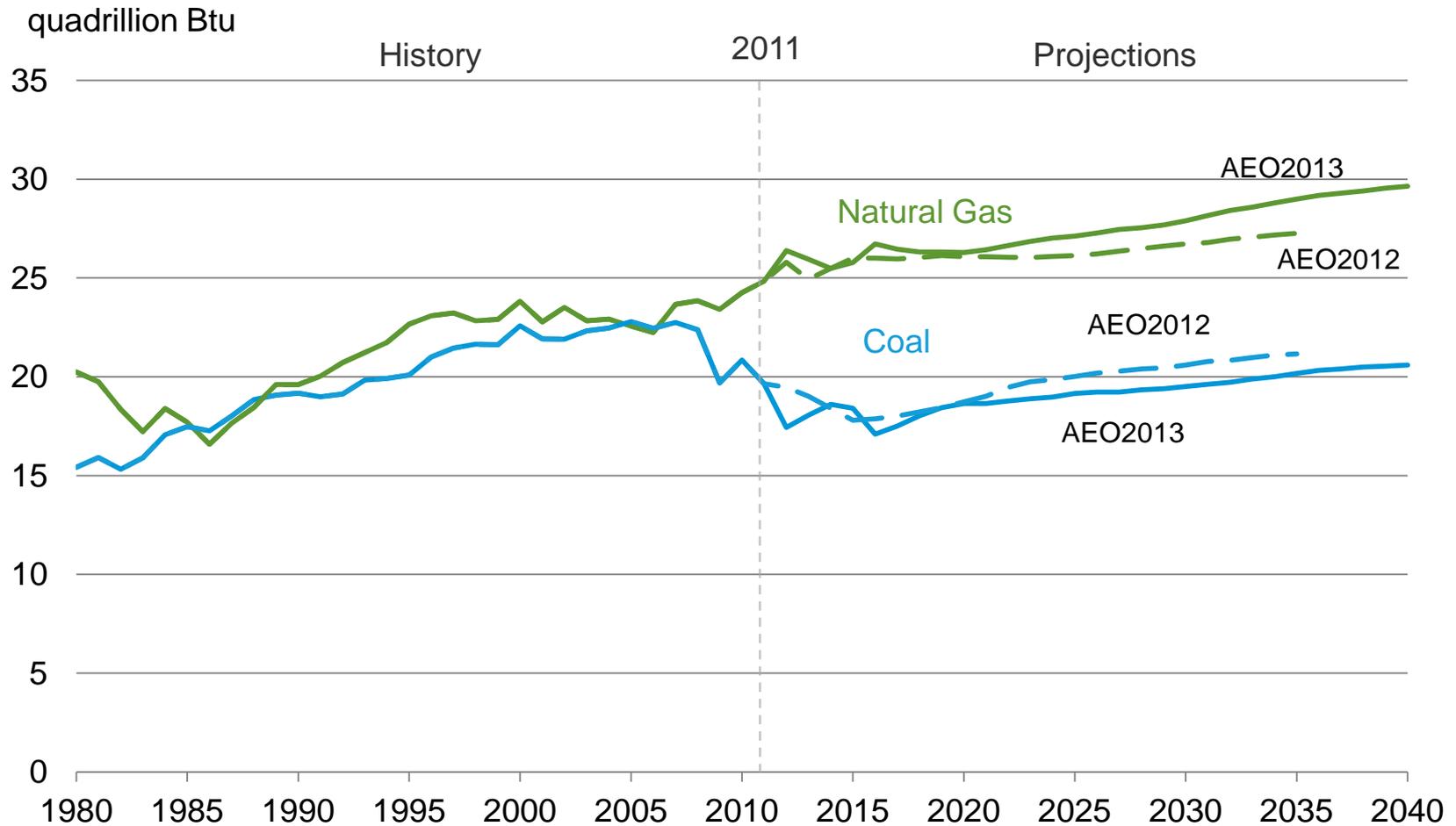
Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a)

# Natural gas and coal prices to the electric power sector, 1980-2040



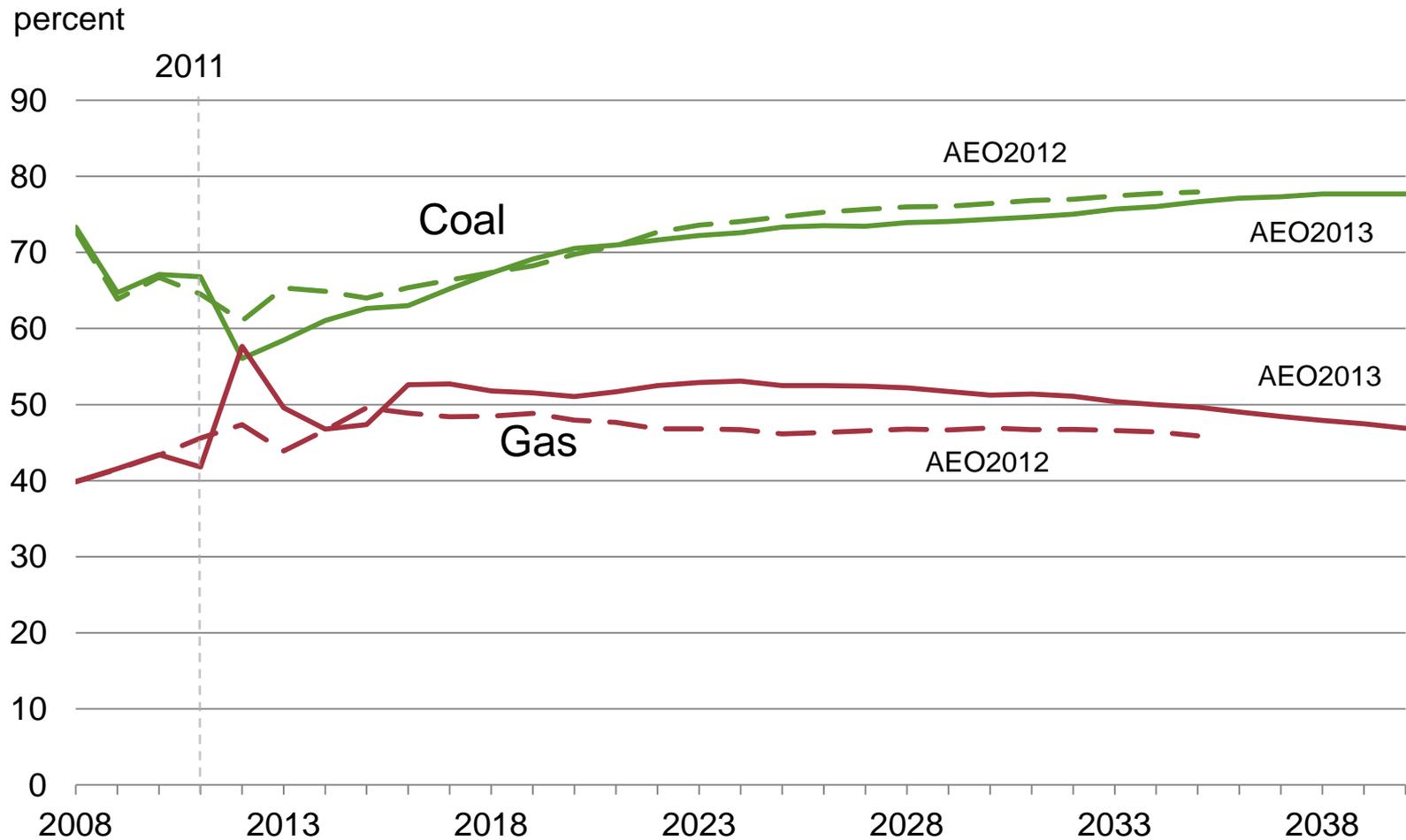
Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

# Natural gas and coal consumption, 1980-2040



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

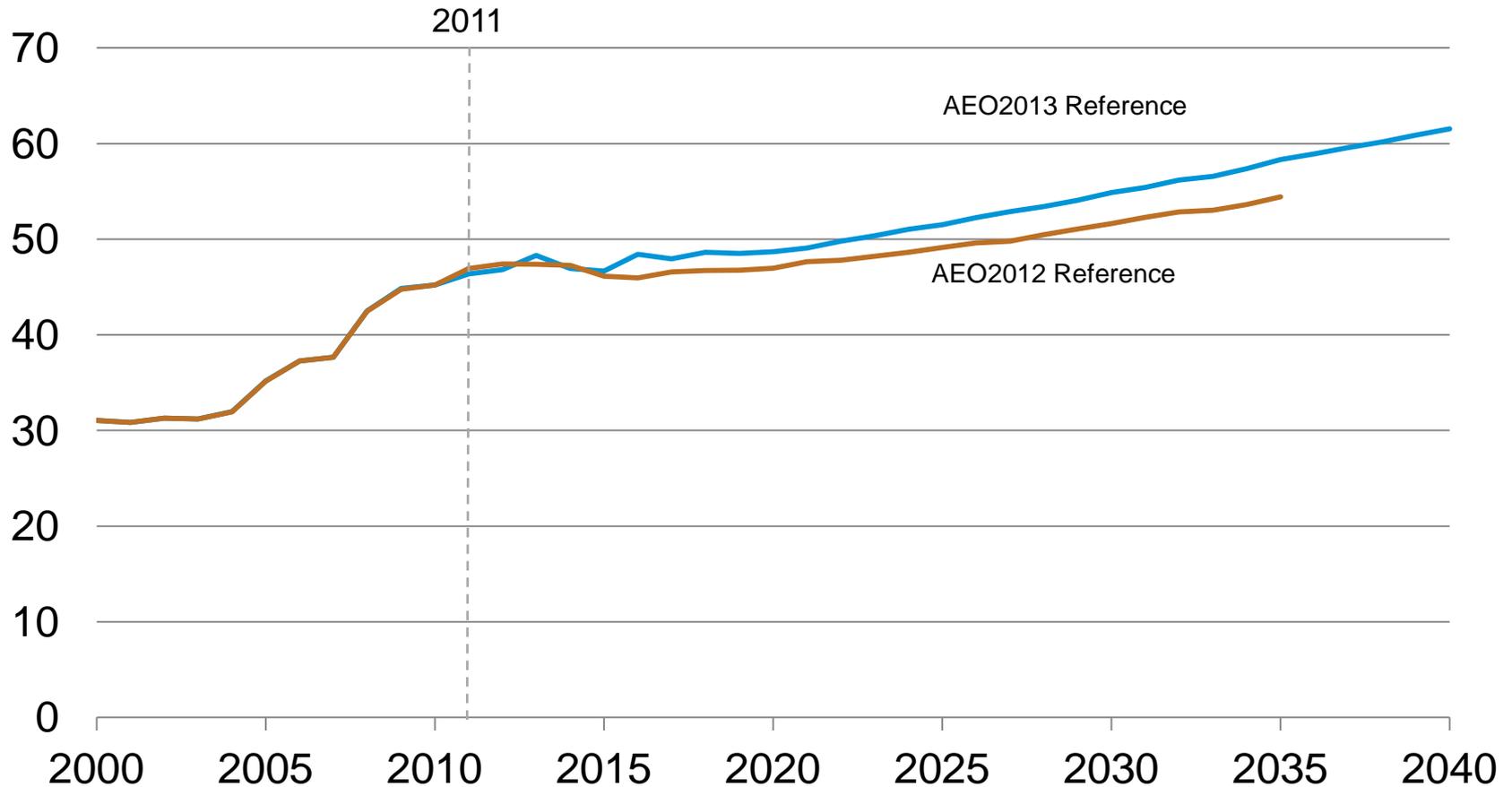
# Average capacity utilization of natural gas combined cycle and coal generating capacity, 2008-2040



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

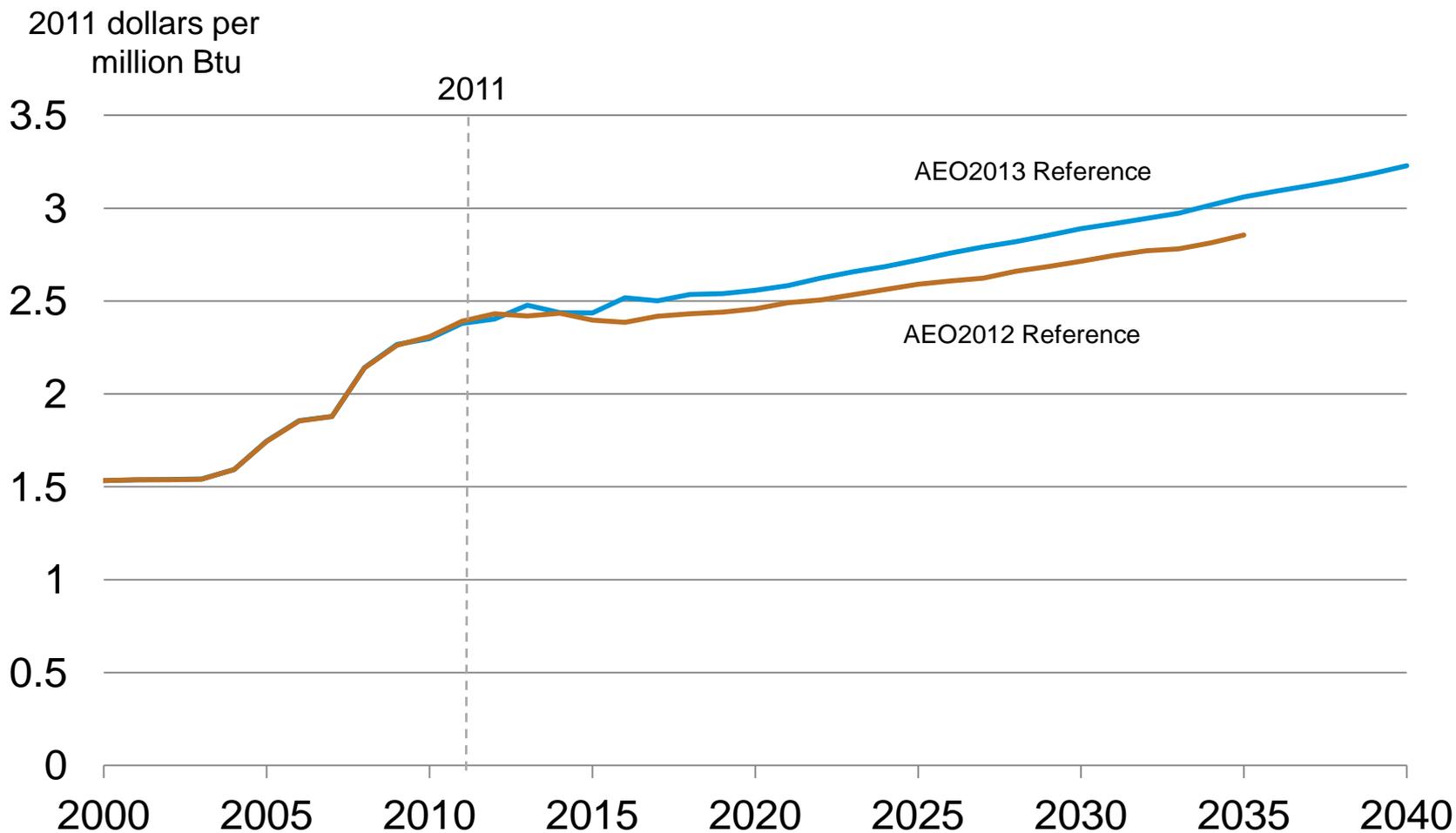
# Average delivered price of coal to electricity sector, 2000-2040

2011 dollars short ton



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

# Average delivered price of coal to electricity sector, 2000-2040



Source: EIA, preliminary Annual Energy Outlook 2013 (NEMS run ref2013.d100212a) and Annual Energy Outlook 2012

# For more information

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