

Electric Power in the *Annual Energy Outlook*

AEO2014 results and status updates for the AEO2015



For
AEO Electricity Working Group
July 31, 2014, 1:00 PM

Electricity Analysis Team
Office of Electricity, Coal, Nuclear, and Renewables Analysis

Working group presentation for discussion purposes. Do not quote or cite, as preliminary AEO2015 data and results are subject to change.

Agenda

- Review of AEO2014
 - Changes made for AEO2014
 - Review of Results
- Status of AEO2015
- Updates planned for AEO2015

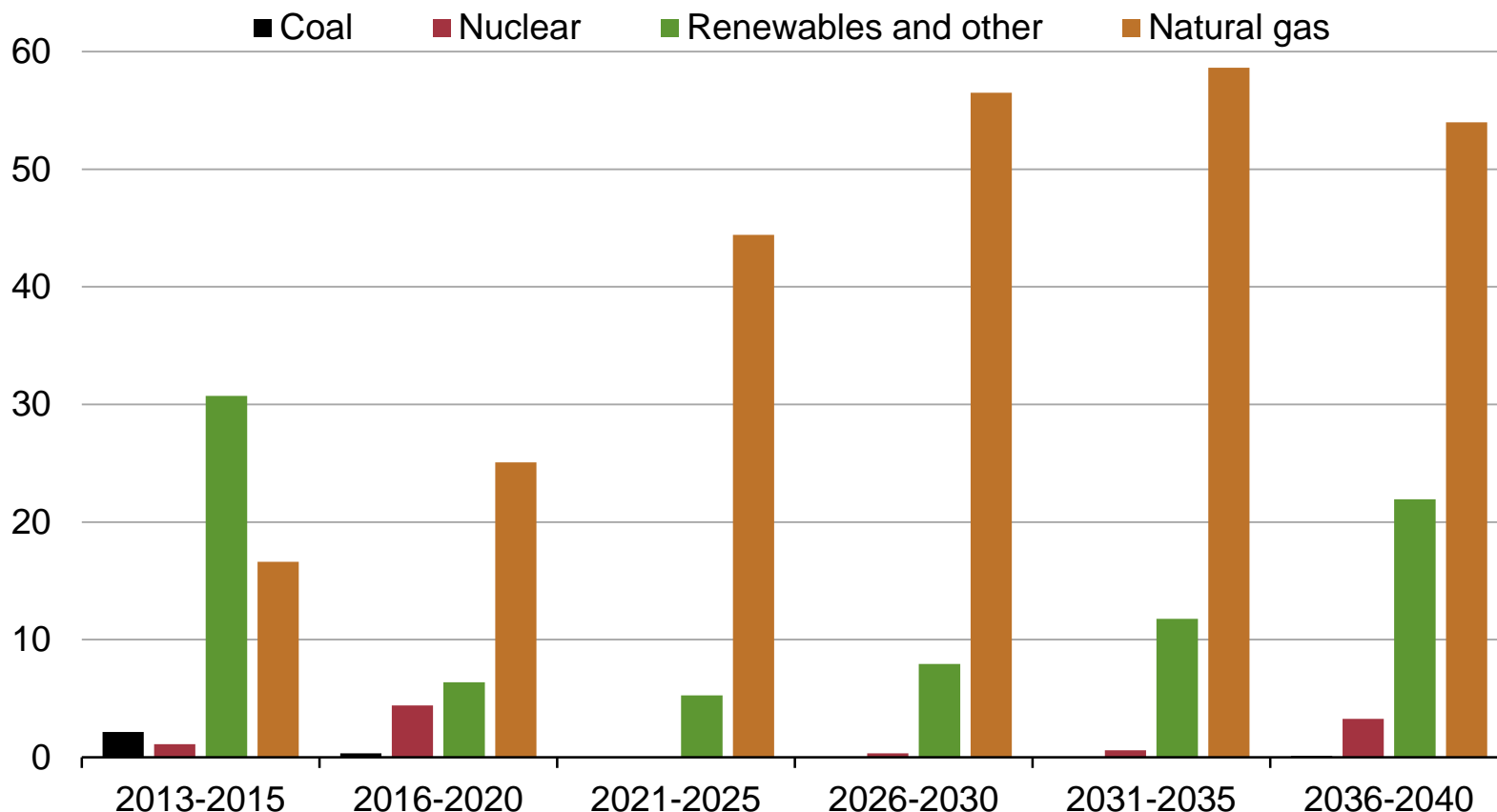
Review of *Annual Energy Outlook 2014*

Updates included in *AEO2014*

Model Updates	Data Updates
Regional Greenhouse Gas Initiative (RGGI) cap tightened to reflect February 2013 MOU	Updates of planned capacity builds and retirements based on updated Form EIA-860 data
Updates to NEMS modeling of Mercury and Air Toxics Standards (MATS)	Operations and maintenance cost updates
Reserve margin and capacity payments changes	Municipal utility pricing data updates
Operating reserves modeling changes	

AEO2014 Reference case: Electricity generation capacity additions by fuel type mainly natural gas after 2015

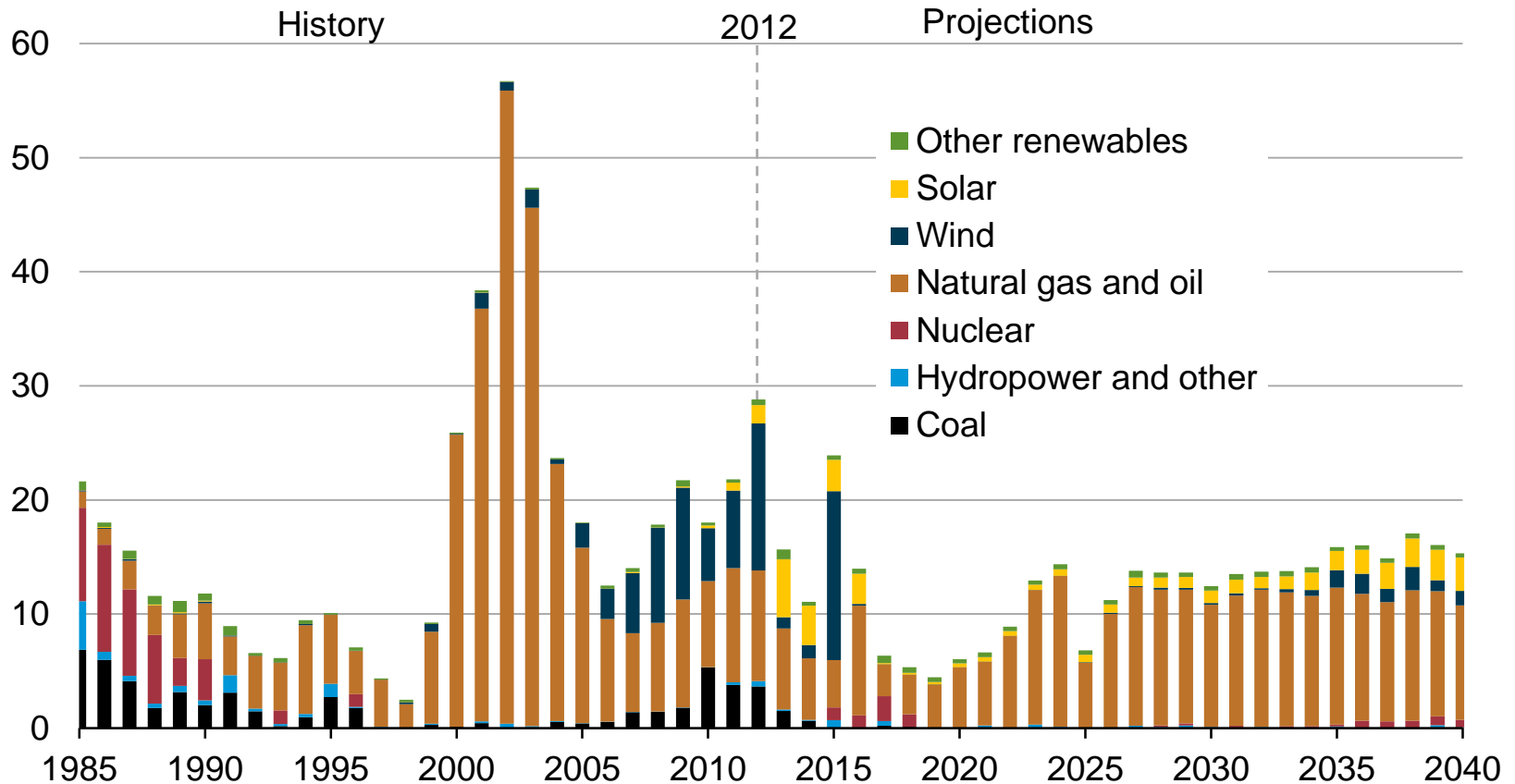
capacity additions
gigawatts



Source: EIA, Annual Energy Outlook 2014

AEO2014: projected annual capacity additions moderate relative to post-2000 levels

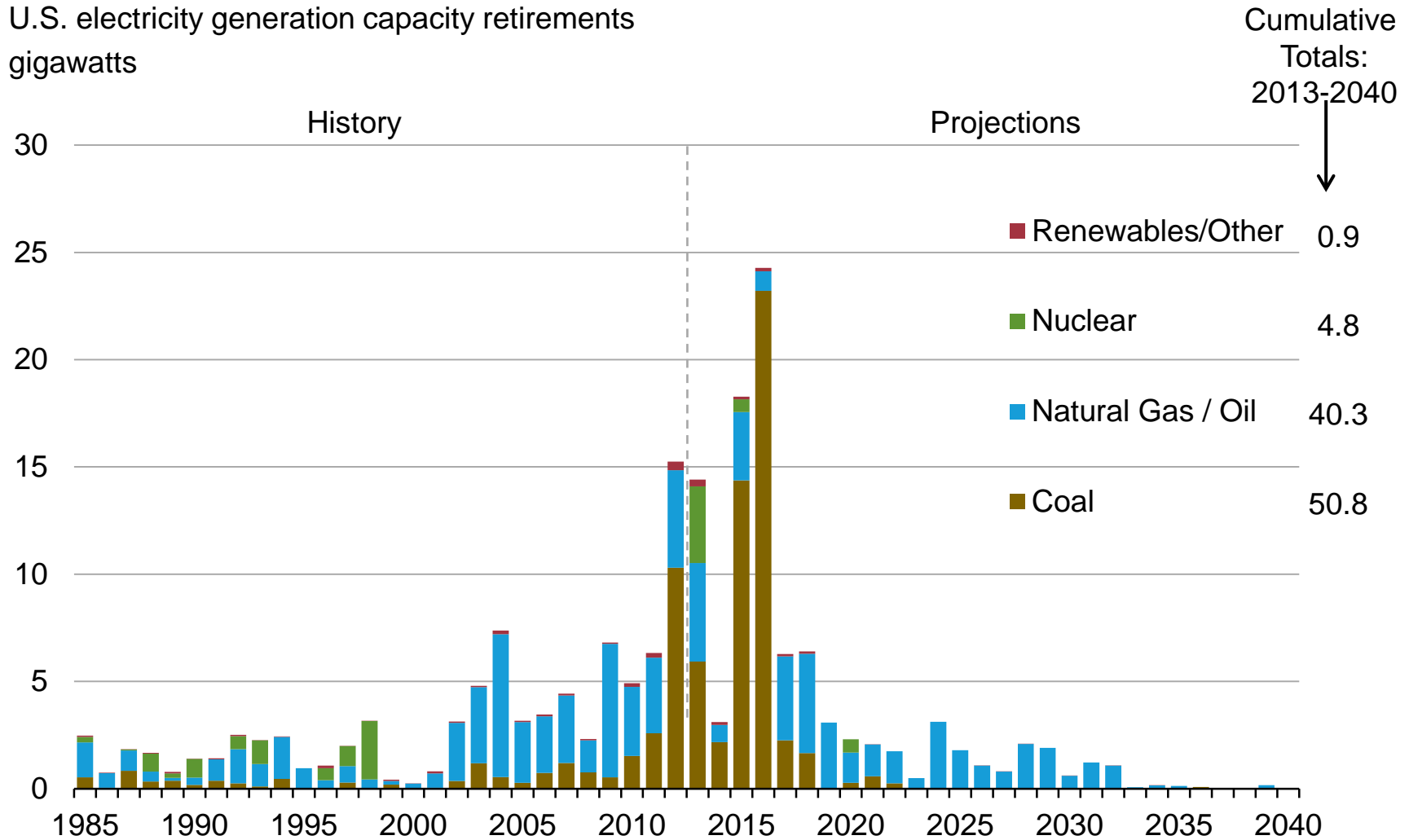
Additions to electricity generating capacity in the AEO2014 Reference case, 1985-2040
gigawatts



Source: EIA, Annual Energy Outlook 2014

Coal accounts for more than half of the projected capacity retirements in the AEO2014 Reference case

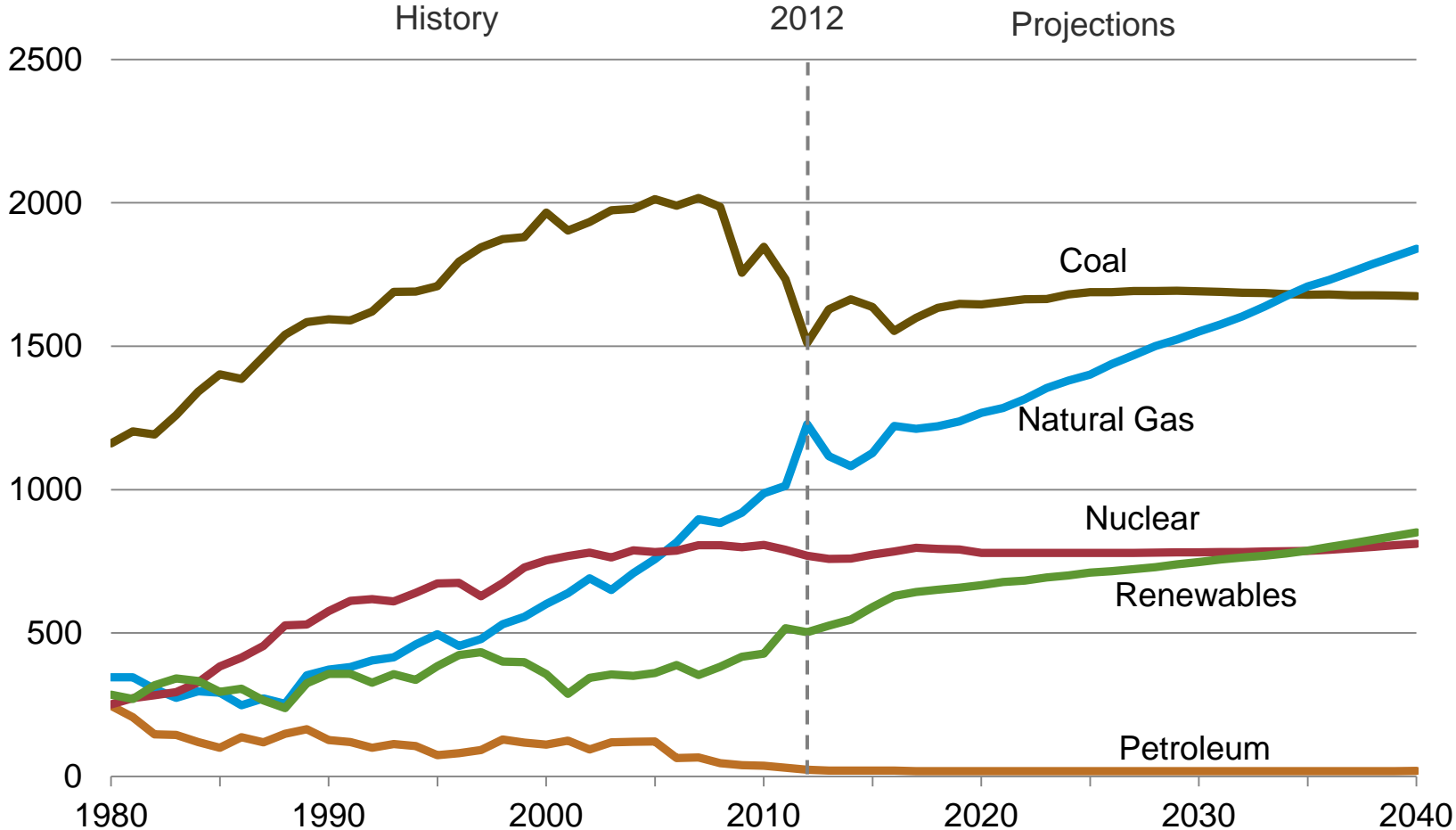
U.S. electricity generation capacity retirements
gigawatts



Source: Form EIA-860 and AEO2014 Reference Case (April 2014)

Natural gas is projected to surpass coal as the leading generating fuel type by 2035 in the AEO2014 Reference case

billion kilowatthours



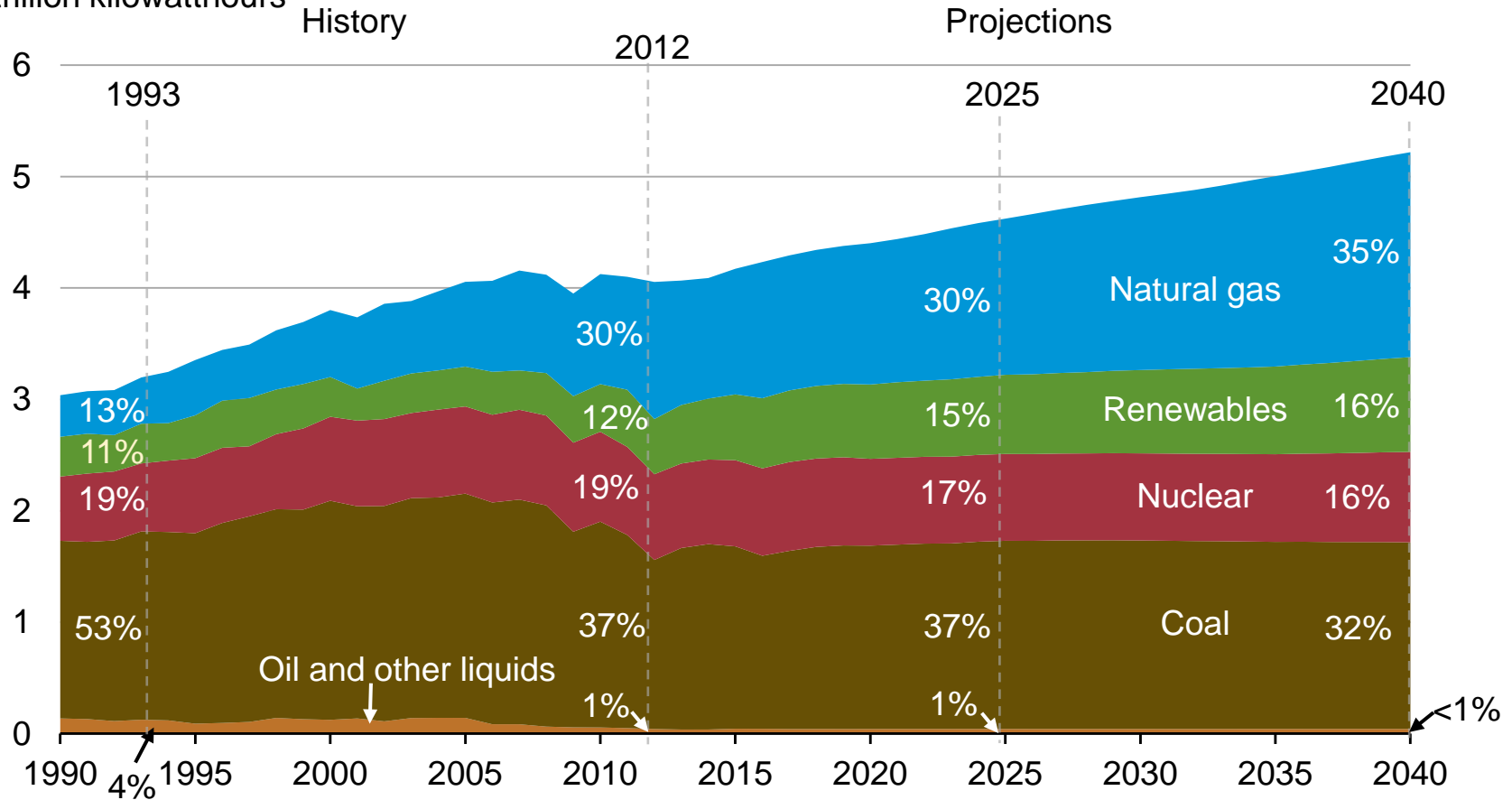
Note: Includes generation from plants in both the electric power and end-use sectors.

Sources: Projections: EIA, Annual Energy Outlook 2014

History: EIA, Annual Energy Review;

Changing roles of natural gas and renewables in the U.S. electricity generation mix

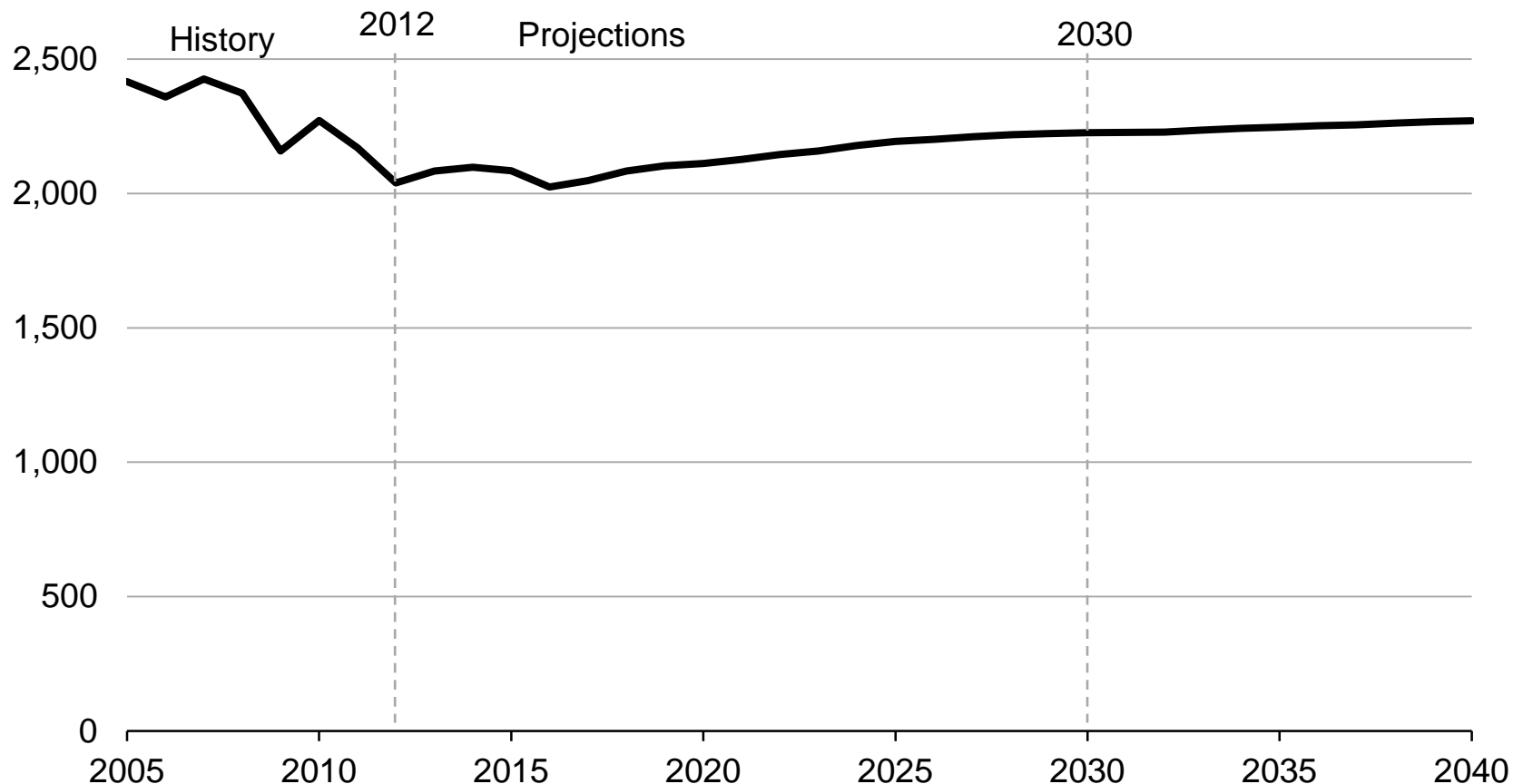
U.S. electricity net generation in the AEO2014 Reference case
trillion kilowatthours



Source: EIA, Annual Energy Outlook 2014

Carbon dioxide emissions from the electric power sector in 2030 are 7.9% below 2005 levels in the AEO2014 Reference case

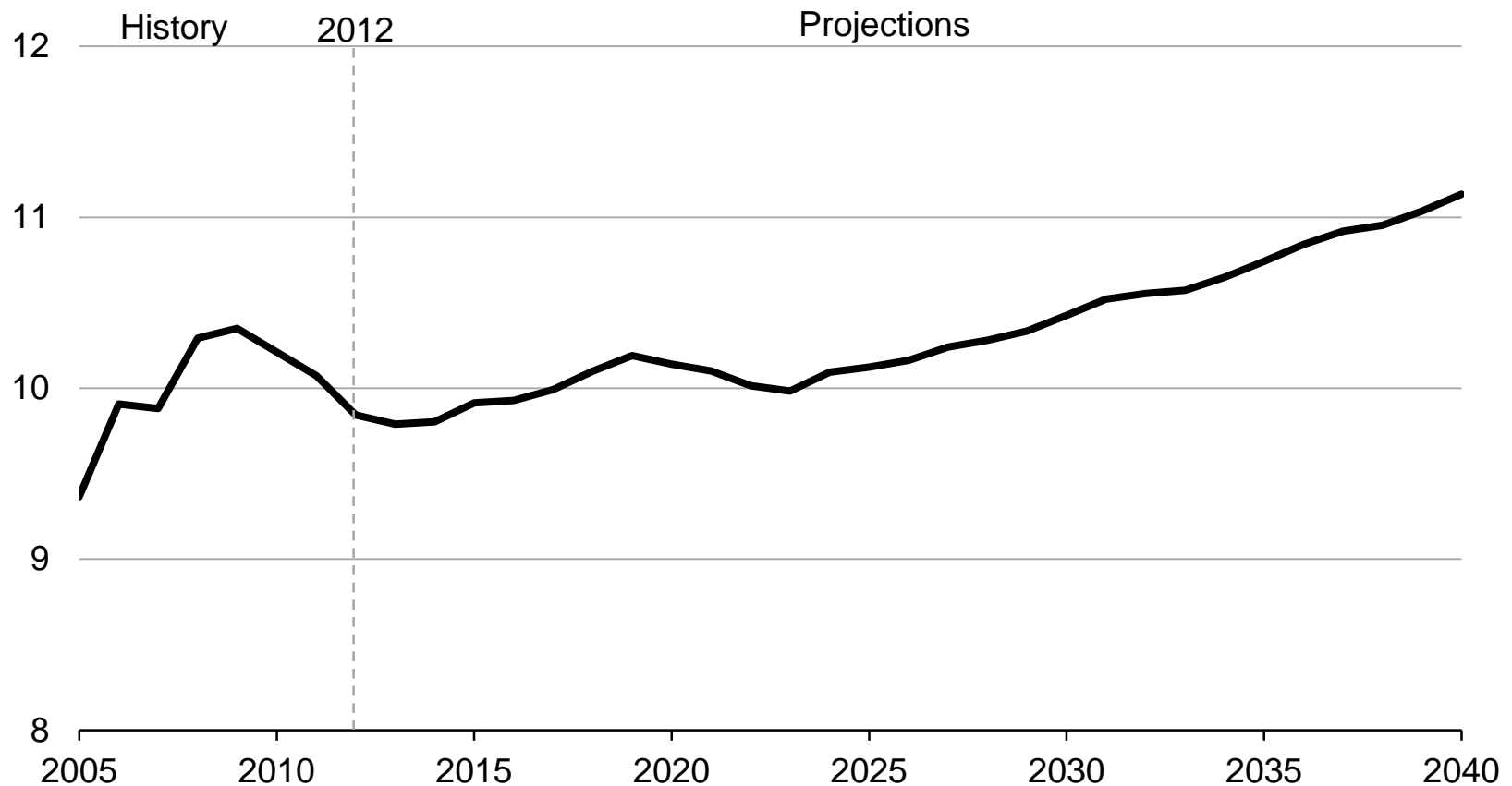
carbon dioxide emissions
million metric tons



Source: AEO2014 (April 2014)

Average retail electricity prices in the AEO2014 Reference case, 2005-2040

average electricity prices
2012 cents per kilowatthour



Source: EIA, Annual Energy Outlook 2014

Annual Energy Outlook 2015

The *AEO2015* will be abridged compared to *AEO2014*

- The U.S. Energy Information Administration is revising the schedule for production of the *International Energy Outlook (IEO)* and *Annual Energy Outlook (AEO)*. The *IEO* and *AEO* will alternate annually between full and interim versions.
- The *AEO2015* will be the first interim version of the Annual Energy Outlook.
- The shorter version will include an abbreviated discussion and results from select cases.

	2014	2015
<i>International Energy Outlook</i>	Interim Edition to be released summer 2014	Full Edition will be released in spring 2015
<i>Annual Energy Outlook</i>	Full Edition released in spring 2014	Interim Edition will be released by early 2015

Limited modeling updates for AEO2015

- Modeling changes planned for AEO 2015
 - Cross State Air Pollution Rule (Transport Rule/CSAPR) – U.S. Supreme Court overturned D.C. Circuit Court's decision vacating the rule.
 - EPA has filed to have the stay lifted and we are actively monitoring the status in order to restore CSAPR modeling when appropriate.
 - Updates to NEMS modeling of California SB1368 to remove firm contractual arrangements for coal plants upon expiration.
- EIA only models current laws and policies
 - EPA's proposed greenhouse gas regulations for new and existing plants (under Clean Air Act sections 111(b) and 111(d)) are not final rules
 - *Not* included in *AEO2015*; we are actively monitoring the status of the proposed rules

Changes to legislative and regulatory assumptions in *AEO2015*

- Cross-State Air Pollution Rule (CSAPR) to replace Clean Air Interstate Rule (CAIR) in *AEO2015* if reinstated timely to EIA model development schedule
 - Requires states to reduce emissions that contribute to ozone and fine particle pollution in other states
 - U.S. Supreme Court upheld EPA's approach to CSAPR on April 29, 2014
 - EPA filed to lift stay on CSAPR on June 26, 2014
 - Previously incorporated in *AEO2012* cycle prior to D.C. Circuit court stay

Changes to legislative and regulatory assumptions in *AEO2015* (2)

- Updates to NEMS modeling of California SB1368 to remove firm contractual arrangements for coal plants upon expiration
 - Law prohibits CA utilities from entering into long-term financial commitments for base load generation, unless it complies with the CO2 emissions performance standard.
 - The CO2 emissions level must be equal, or below the emissions performance standard of 1,100 lbs. per megawatt-hour (MWh).
- EIA modeling changes
 - Reduce firm imports to represent expiration of contracts with the Four Corners, Navajo, Reid Gardner, San Juan, and Boardman plants
 - Adjust carbon emission rate for firm imports in accordance with the expiration of contracts
 - Retire Intermountain plant in 2025.

EPA 111(b) proposed rule – *Not Included*

- The proposed rule imposes GHG controls on new generation units.
- Limits for new coal plants designed with the assumption that plants are built with carbon capture and sequestration (CCS)
- EPA proposed two standards for natural gas-fired stationary combustion units, depending on size
- Proposed limits are based on the performance of modern natural gas combined cycle (NGCC) units
- Final rule expected in January, 2015
- Anticipate representing the final rule in *AEO2016*

EPA 111(d) proposed rule – *Not Included*

- The proposed rule issued by EPA on June 2 establishes state-level targets to reduce CO₂ emissions from existing generating plants that burn fossil fuels to produce electricity. The targets for each state, applied over 2020-2030, reflect four “building blocks”:
 - heat rate improvement at existing coal units
 - increased dispatch of existing natural gas plants
 - expanded use of renewable resources
 - load reduction through energy efficiency programs
- These building blocks comprise EPA’s proposed ‘Best System of Emission Reductions’ (BSER) under the Clean Air Act Section 111(d), but the states have broad flexibility in their specific compliance measures, including the option to engage in regional compliance partnerships
- EIA is actively monitoring the status of this proposed rule

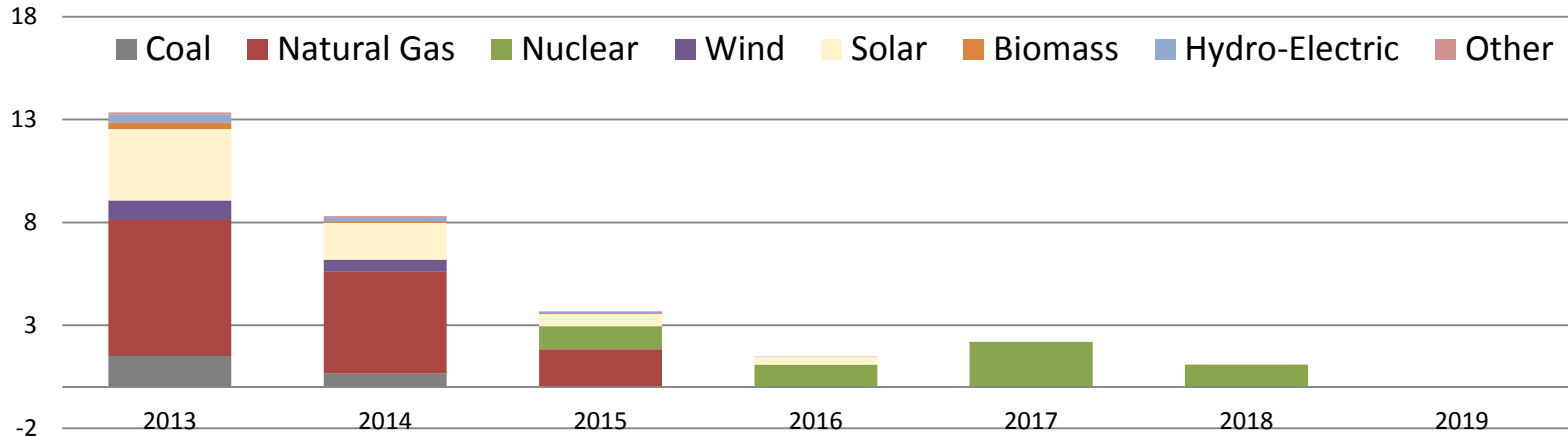
Limited data updates for *AEO2015*

- Capacity additions, retirements, and retrofits, based on updated Form EIA-860 data
- Historical data overwrites
- Updates to Canadian supply curves
- Calibration with the *Short Term Energy Outlook*

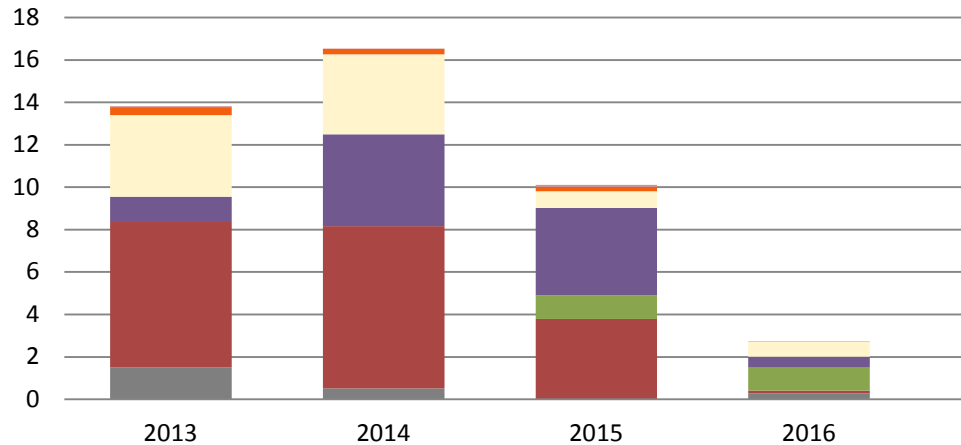
Planned New Plant Capacity Additions

gigawatts

AEO 2014



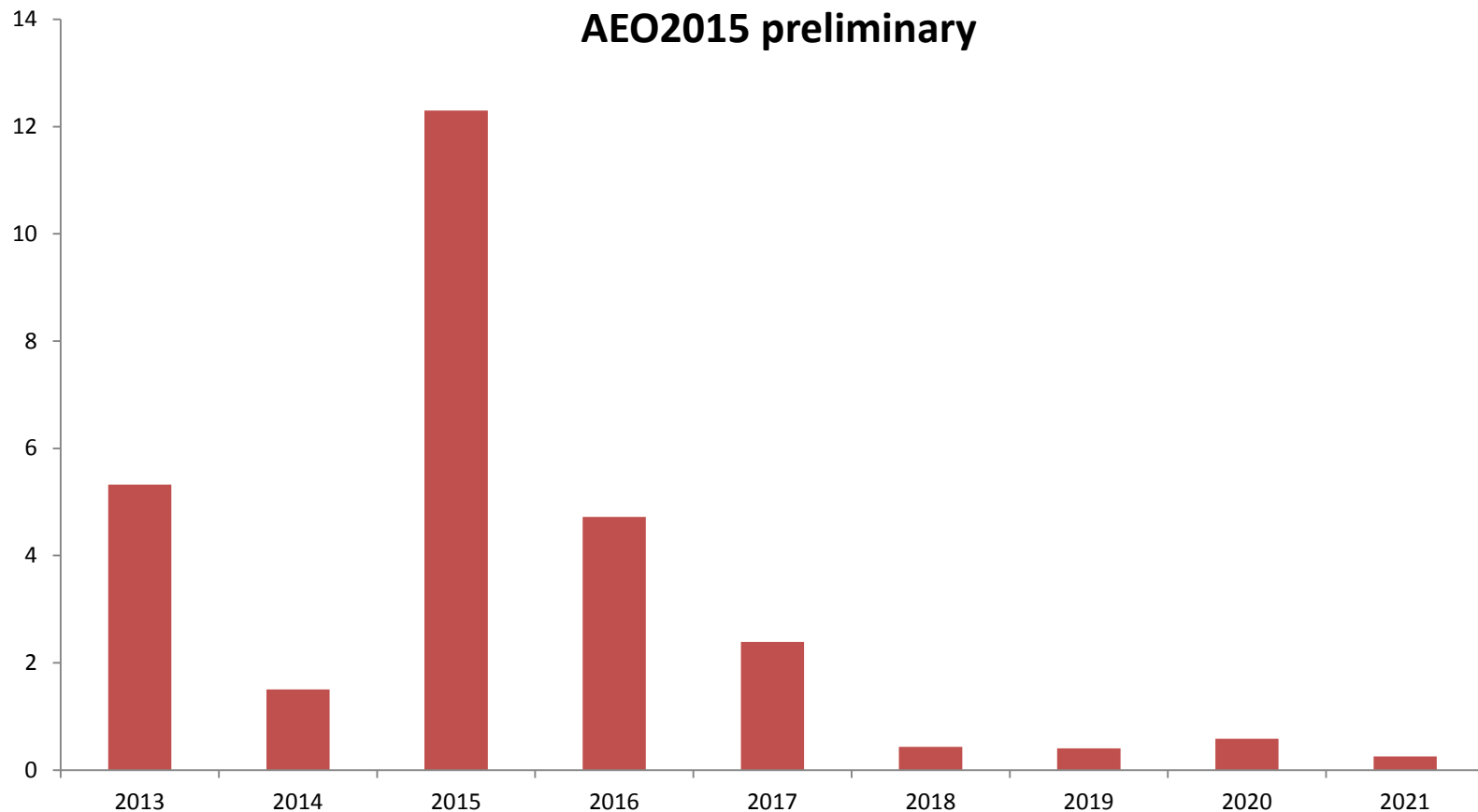
Preliminary AEO 2015



	AEO 2015	AEO 2014
Coal	2.30	2.16
Natural Gas	18.45	13.41
Nuclear	5.52	5.52
Wind	10.40	1.54
Solar	8.48	6.23
Biomass	0.65	0.44
Hydro-Electric	0.88	0.66
Other	0.15	0.15

Reported Coal Retirements By Year – Preliminary EIA-860 reporting

Gigawatts of Reported Coal Capacity Retirements



Preliminary Nuclear Power Assumptions for *AEO2015*

- New Plants – 5,500 MW
 - Watts Bar (2015)
 - Summer 2 & 3 (2017 & 2018)
 - Vogtle 3 & 4 (2016 & 2017)
- Upgrades
 - Only reported upgrades on the Form EIA-860 will be incorporated in the Reference case. ~100 MW reported.

Preliminary Nuclear Power Assumptions for *AEO2015* (2)

- Planned Retirements – 1,219 MW
 - Vermont Yankee (2014)
 - Oyster Creek (2019)
- Unplanned Retirements
 - *AEO2014* assumed 5.7 GW of unplanned generic retirements
 - This assumption will be relaxed in *AEO2015*
- Evolving Issues
 - Potential post-Fukushima Operational Impacts

Future Enhancements

Ongoing modeling and data enhancements

- EIA staff are working with a contractor to develop cost estimates for added O&M and capital costs related to plant aging.
- EIA staff are working with a contractor to re-evaluate and performance estimates for small, distributed generation technologies in the Electricity Market Module of NEMS.

For more information

Eric Krall - Team Lead, Electricity Analysis Team

eric.krall@eia.gov

Jeff Jones – Operations Research Analyst, Electricity Analysis Team

jeffrey.jones@eia.gov

Laura Martin - Operations Research Analyst, Electricity Analysis Team

laura.martin@eia.gov

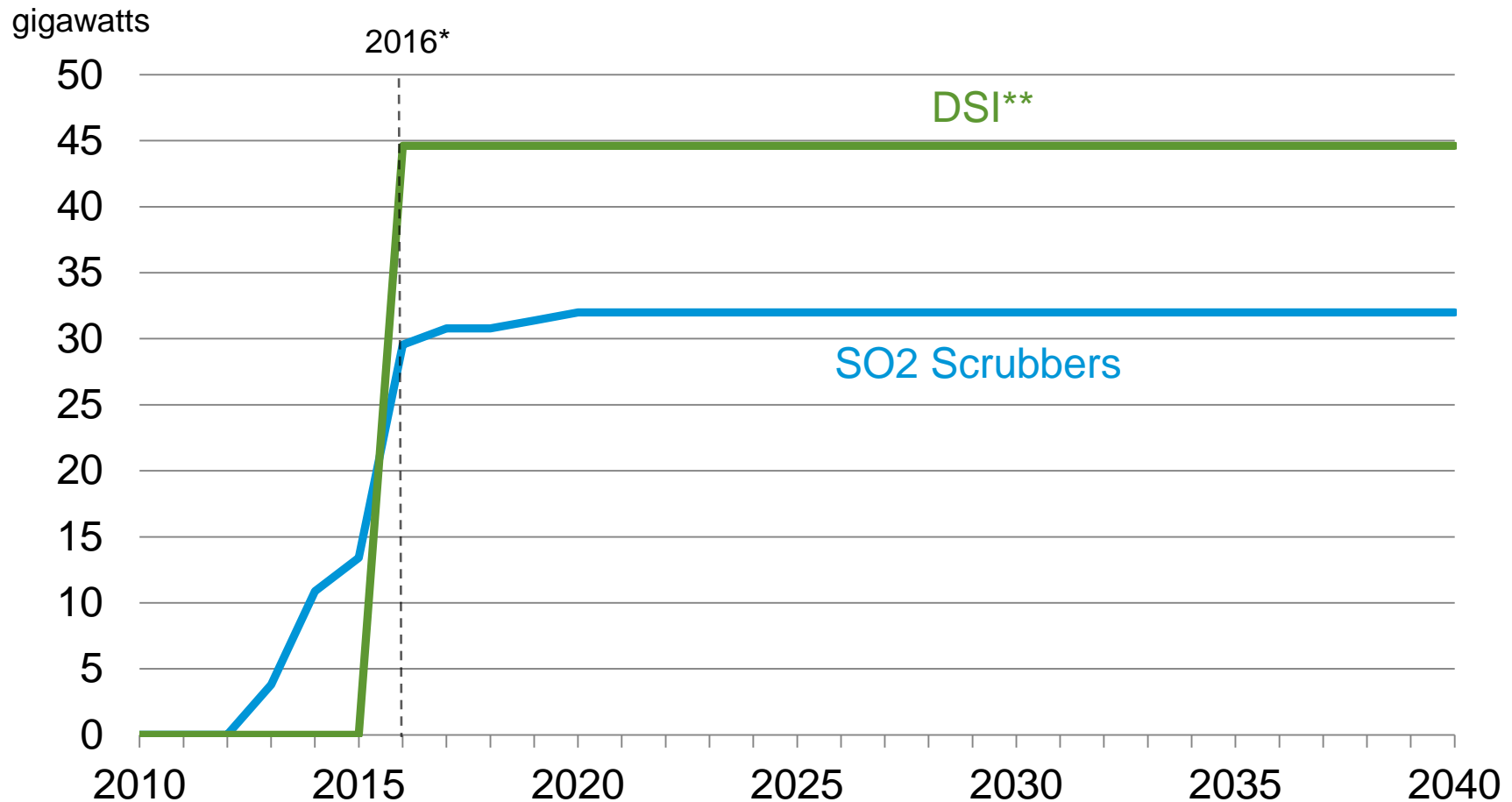
Lori Aniti – Industry Economist, Electricity Analysis Team

lori.aniti@eia.gov

Annual Energy Outlook | <http://www.eia.gov/forecasts/aeo/>

Additional Information

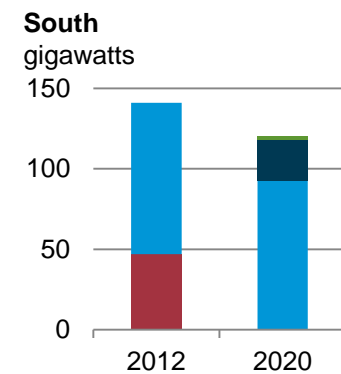
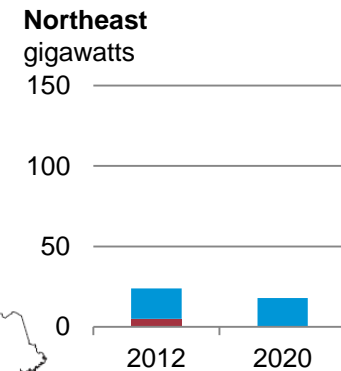
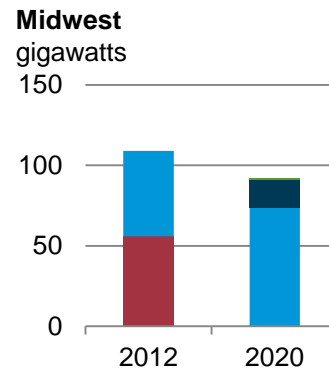
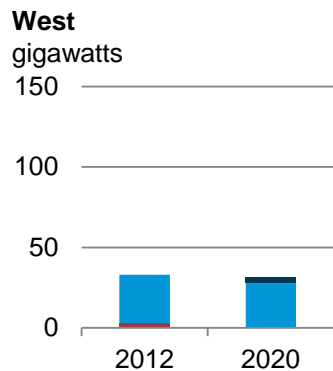
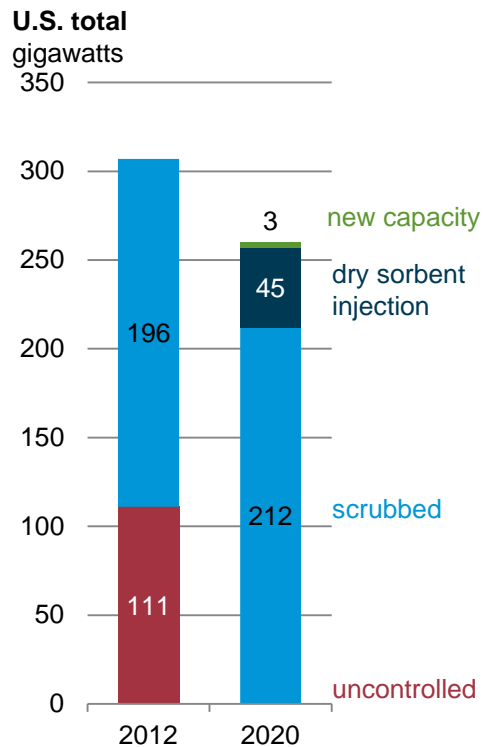
AEO2014 Reference case cumulative SO2 scrubber and DSI retrofits, 2013-2040



Source: AEO2014 Reference Case (April 2014)

*MATS compliance assumed to begin; **DSI: Dry Sorbent Injection

Electricity Sector Net Summer Generating Capacity by SO₂ Control Type and Region, 2012 and 2020 in AEO2014

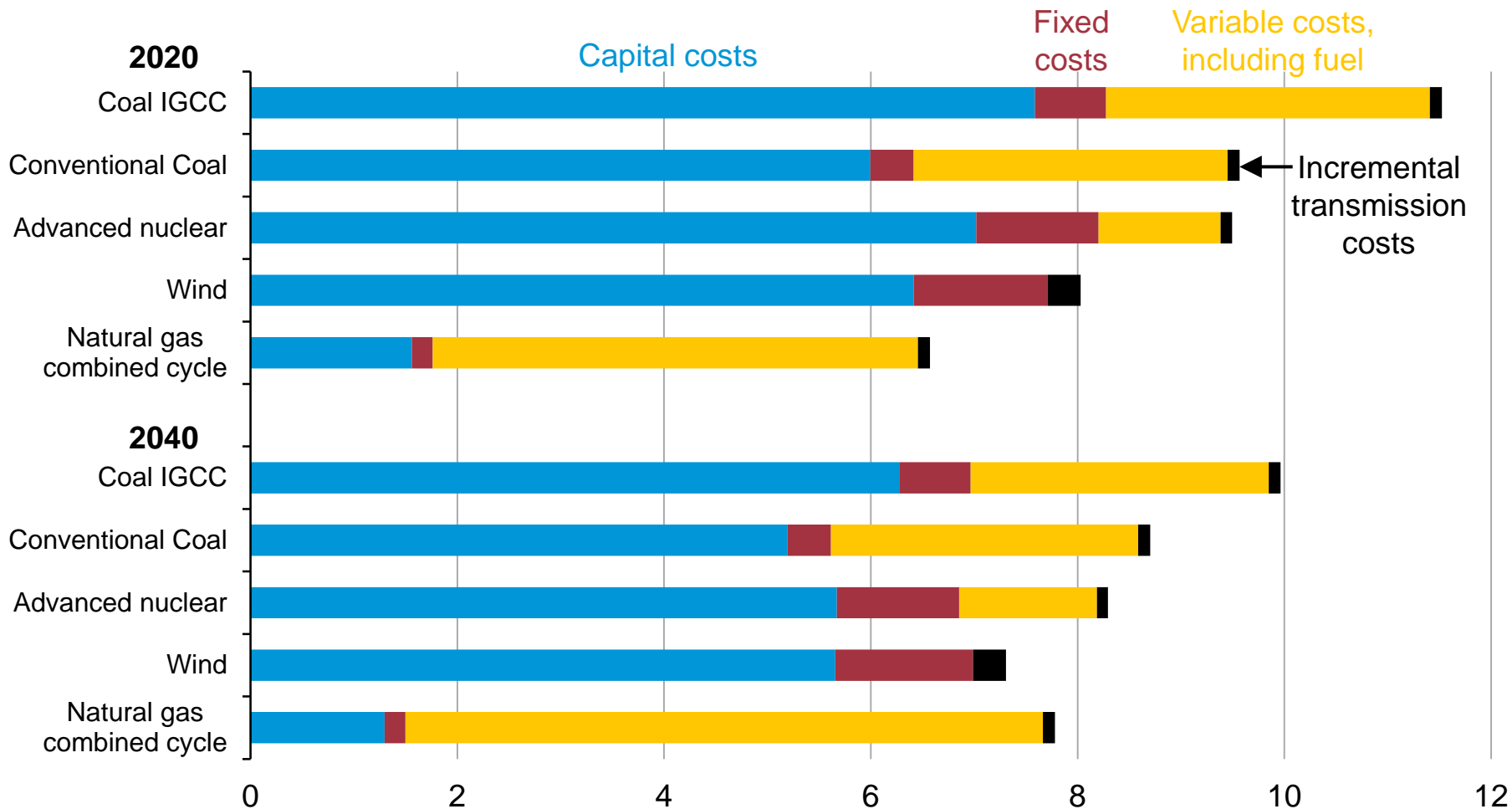


Note: Scrubbed capacity includes capacity equipped with flue gas desulfurization (FGD) equipment and coal plants employing integrated gasification combined (IGCC) cycle or circulating fluidized bed (CFB) combustion technologies.

Source: AEO2014 Reference Case (April 2014)

Average levelized electricity costs for new power plants, excluding subsidies, in the Reference case, 2020 and 2040

new power plant costs, 2012 cents per kilowatthour



Source: AEO2014 Reference Case (April 2014)