Overview of AEO2018 Coal Projections

For:

The National Academies of Sciences, Engineering, and Medicine

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Presented by:

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Agenda

- Overview of Reference and key sensitivity case definitions
- Discussion of current laws and regulations affecting markets for electric power and coal production
- Overview of AEO2018 key assumptions and trends affecting coal
- Capacity and generation results with emphasis on coal
- Coal disposition, production, pricing, employment, and export projections
- Q&A

What is the Reference case?

- The Reference case projection assumes trend improvement in known technologies along with a view of economic and demographic trends reflecting the current views of leading economic forecasters and demographers.

- The Reference case generally assumes that current laws and regulations affecting the energy sector, including sunset dates for laws that have them, are unchanged throughout the projection period.

- The potential impacts of proposed legislation, regulations, and standards are not included.

- EIA addresses the uncertainty inherent in energy projections by developing side sensitivity cases with different assumptions of macroeconomic growth, world oil prices, technological progress, and energy policies.

- Projections in the AEO should be interpreted with a clear understanding of the assumptions that inform them and the limitations inherent in any modeling effort.

AEO2018 sensitivity cases examine impacts of alternative market assumptions

Selected Sensitivity Cases	Description
Reference	Assumes trend improvement in known technologies along with expectations of the continuation of current economic and demographic trends.
High Oil and Natural Gas Resource and Technology (HRT)	Applies lower oil and gas extraction costs and higher resource availability than in the Reference case, which allows for higher levels of oil and natural gas production at lower delivered prices
Low Oil and Natural Gas Resource and Technology (LRT)	Applies higher oil and gas extraction costs and lower resource availability than in the Reference case, which results in lower levels of oil and natural gas production at higher delivered prices
Carbon Fee with $15 and $25 per ton CO2 (2 cases)	Modifies the Reference case by including a cost for CO2 emissions from utility-scale electricity generation at either $15 or $25 per ton CO2 ($2017) starting in 2020 and escalating at 5% per year in real terms

AEO2018 Reference case reflects current laws and regulations

- EPA's Clean Power Plan (CPP) not included in AEO2018 Reference case
  - Reference and core side cases including the CPP are available in the AEO data browser
  - All cases include EPA's New Source Performance Standards limiting CO2 emissions from new plants
  - A 3% adder is applied to the cost of capital for new coal units or upgrades to existing units without maximum sequestration options (90% removal) included to account for risk of future tightening of CO2 emissions standards and other policies affecting coal
- EPA's Cross State Air Pollution Rule (CSAPR) and Mercury and Air Toxics Standards (MATS) are included in the Reference case
- Other EPA regulations assume compliance is reflected in survey Form EIA-860 filings as each plant takes action to comply
  - Regional Haze compliance follows from State Implementation Plans due 7/31/21 with implementation by 2028 (EPA announced it is revisiting the 2017 revision)
  - EPA had projected minimal coal retirements from previously-finalized Coal Combustion Residuals, Cooling Water Intakes, and Effluent Limitation Guidelines
  - Effluent Limitation Guidelines for Best Available Technology (BAT) are under review by EPA
  - The 2015 Coal Combustion Residual regulations are also under review by EPA

State-level programs are also included in the AEO2018 Reference case

- California
  - State law under AB 398 Global Warming Solutions Act requires statewide greenhouse gas emissions to return to the 1990 level by 2020 and be 40% below the 1990 level by 2030
  - Cap-and-trade program under AB 32
  - State law under SB-1368 that prohibits CA utilities from entering into long-term financial commitments for base load generation, unless in compliance with the CO2 emissions performance standard of 1,100 lbs/MWh
    - Reduce firm imports to represent expiration of contracts with the Four Corners, Navajo, Reid Gardner, San Juan, and Boardman plants and retire Intermountain in 2025
    - Adjust carbon emission rate for firm imports in accordance with the expiration of contracts
- The Northeast's Regional Greenhouse Gas Initiative (RGGI) program
- Renewable Portfolio Standard (RPS) and Nuclear Zero Emission Credit (ZEC) programs
- New York and Illinois Zero Emission Credit (ZEC) programs

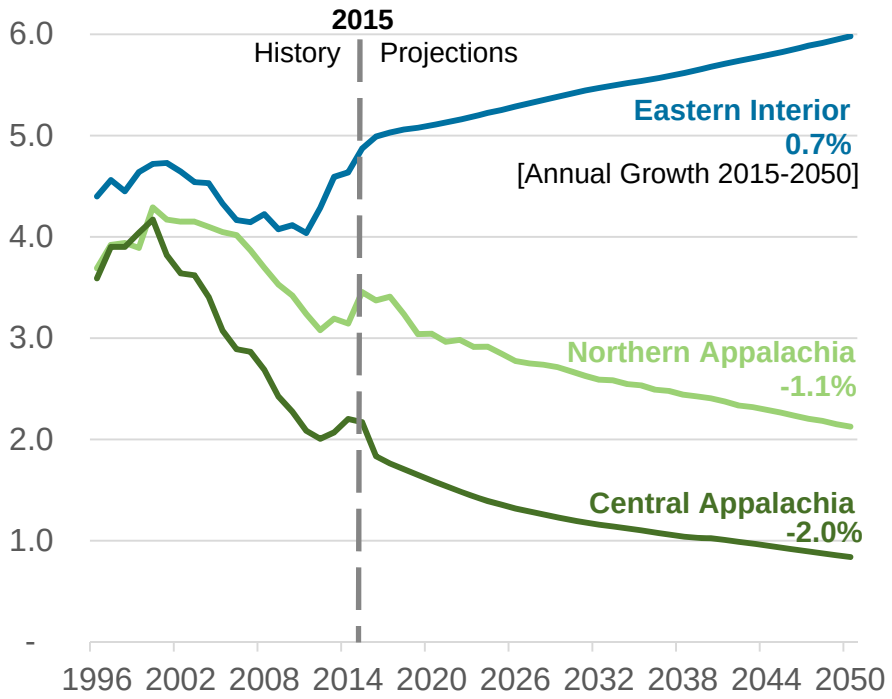
Limited pending regulatory changes applicable to coal mining in the Reference case

- Coal excise tax rates for the Black Lung Disability Trust Fund are scheduled to decline January 1, 2019 From $1.10 to $0.50 per ton for underground, and from $0.55 to $0.25 for surface-mined coal (not applicable to lignite coal and coal intended for export)

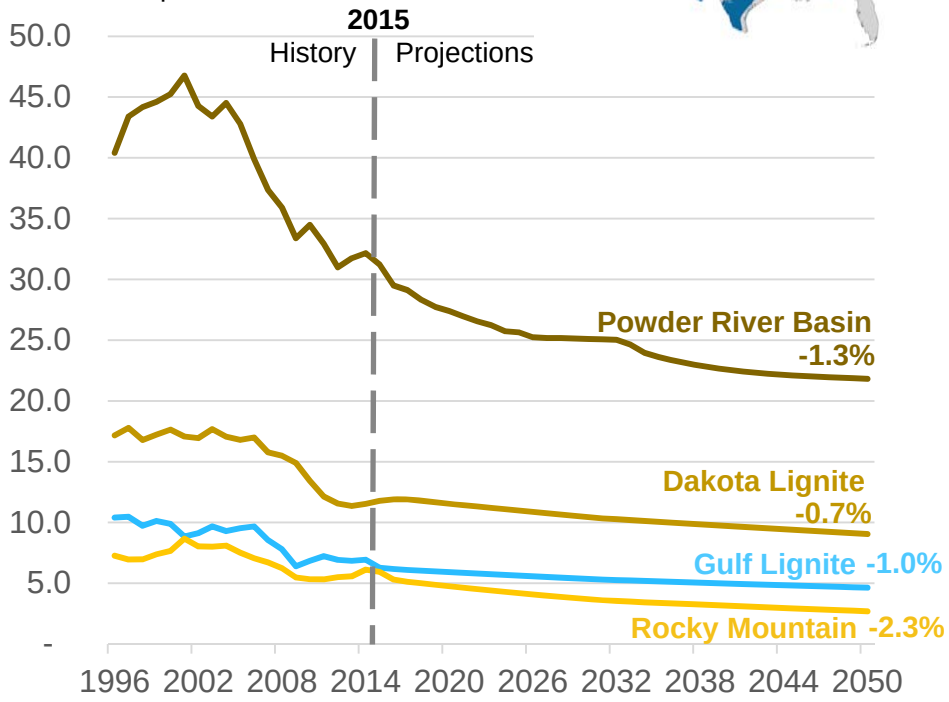
- Other pending federal regulatory actions affecting coal mining are under review and were not included in the AEO2018 Reference case
  - Office of Surface Mining's Stream Protection Rule was nullified and formal programmatic consultation reinitiated
  - Dept. of Interior's Royalty Policy Committee expressed no recommended changes for coal leasing at its Feb. 2018 meeting and continues to evaluate recommendations for determining fair market value for third party transactions and the bonus bid payment schedule
  - Waters of the U.S. (WOTUS) delayed 2 years to February 2020; EPA proposing rule to change definition; recent District Court rulings may result in enforcement of 2015 definition in many states

Coal productivities projected to continue declining with the exception of Eastern Interior

Major Eastern Producing Regions
Short Tons per Miner Hour



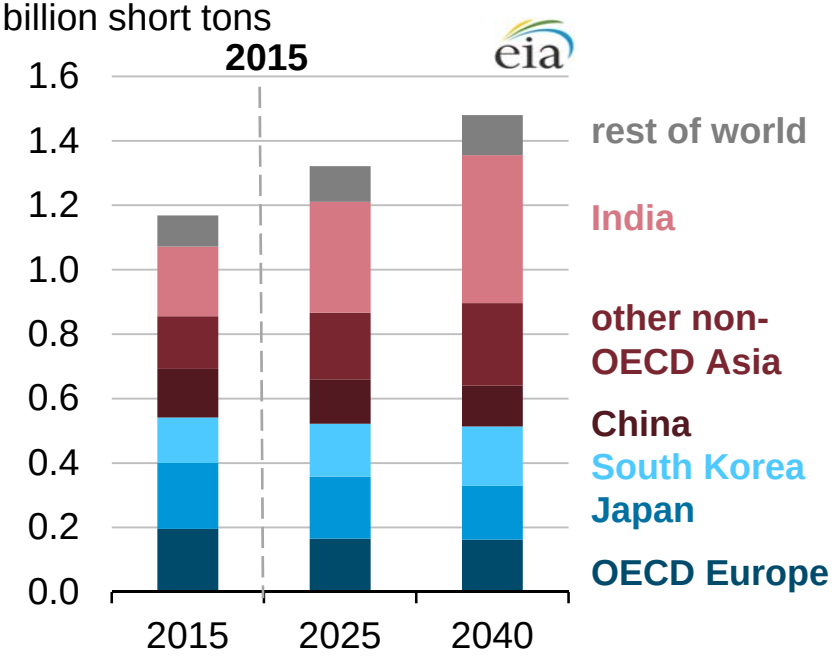
Major Western Producing Regions
Short Tons per Miner Hour



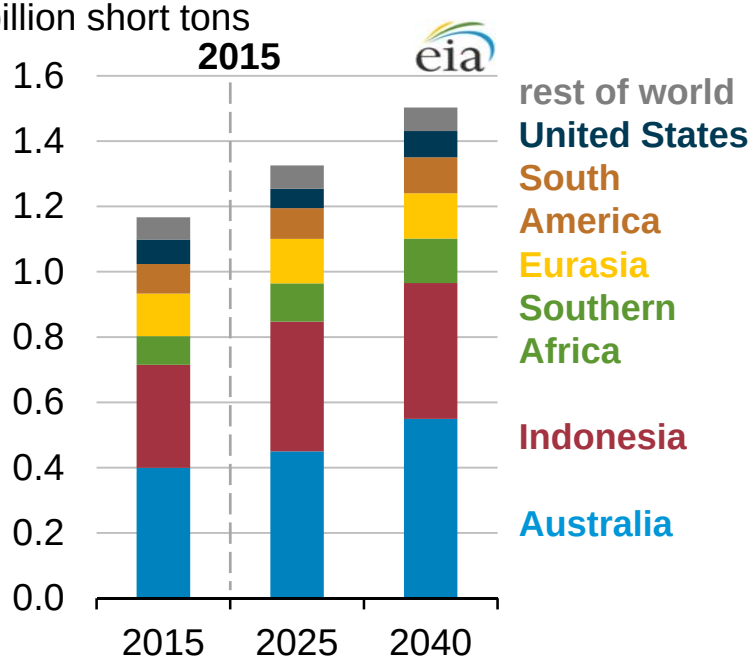
Source: U.S. Energy Information Administration, Annual Energy Outlook 2018, Reference Case.

International seaborne coal trade projected to increase 30% (350 million short tons) in IEO2017 (2015-2040)

Coal imports
billion short tons

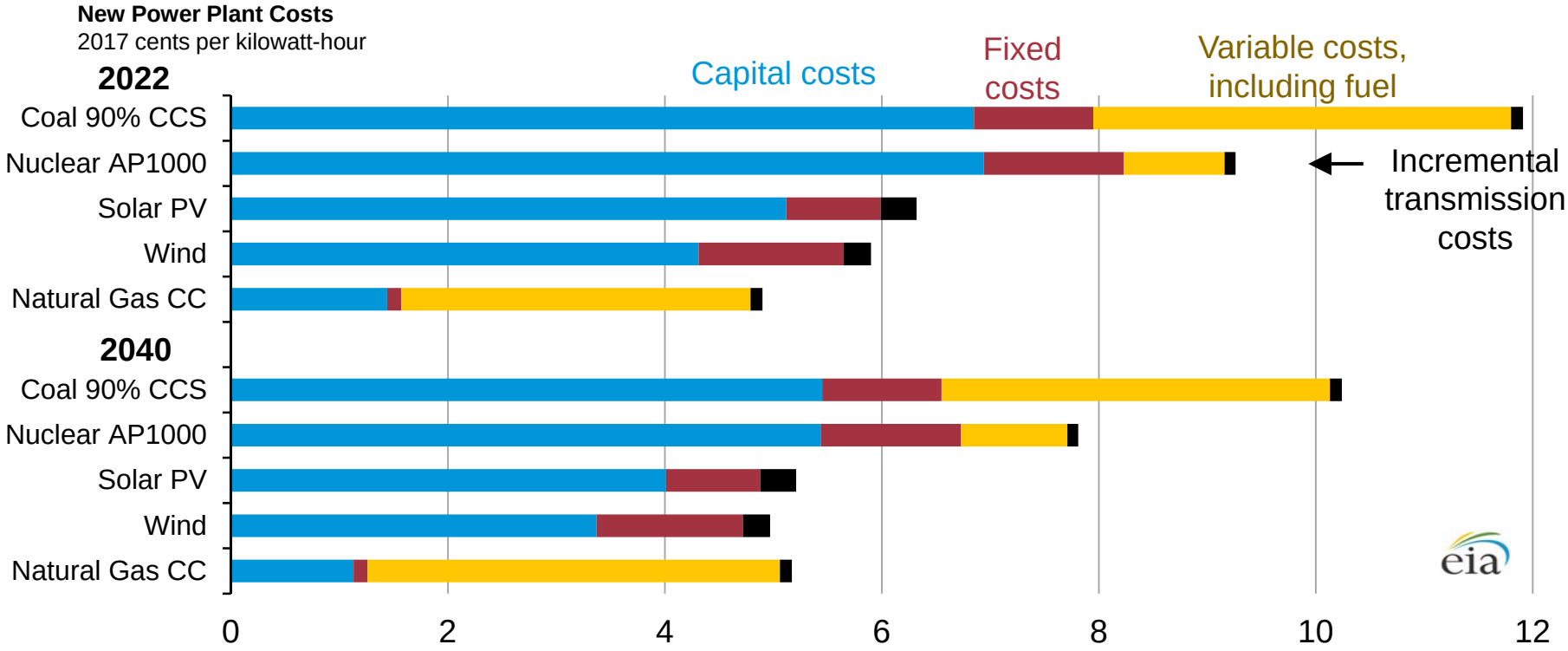


Coal exports
billion short tons



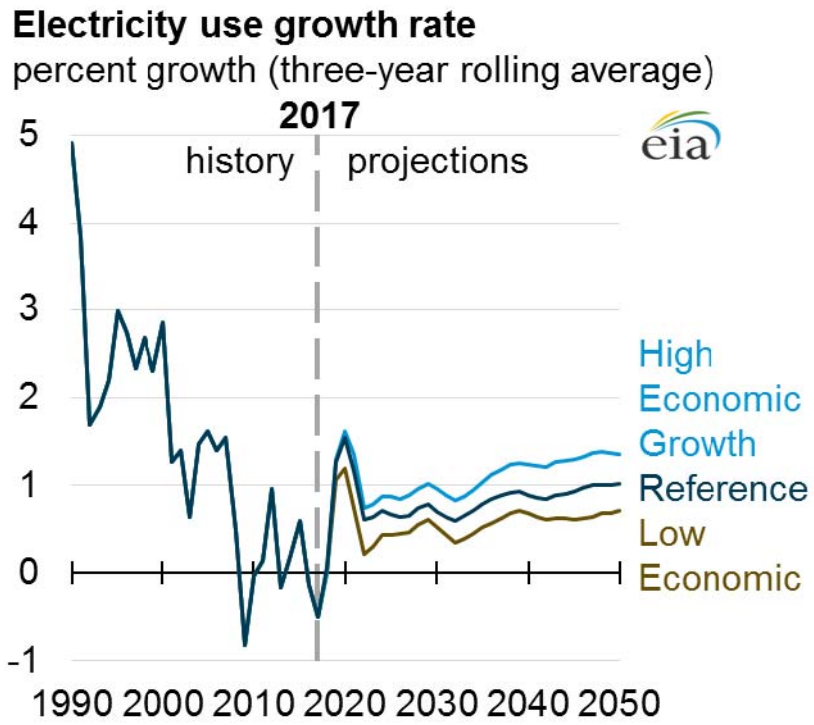
Source: U.S. Energy Information Administration, International Energy Outlook 2017, Reference Case.

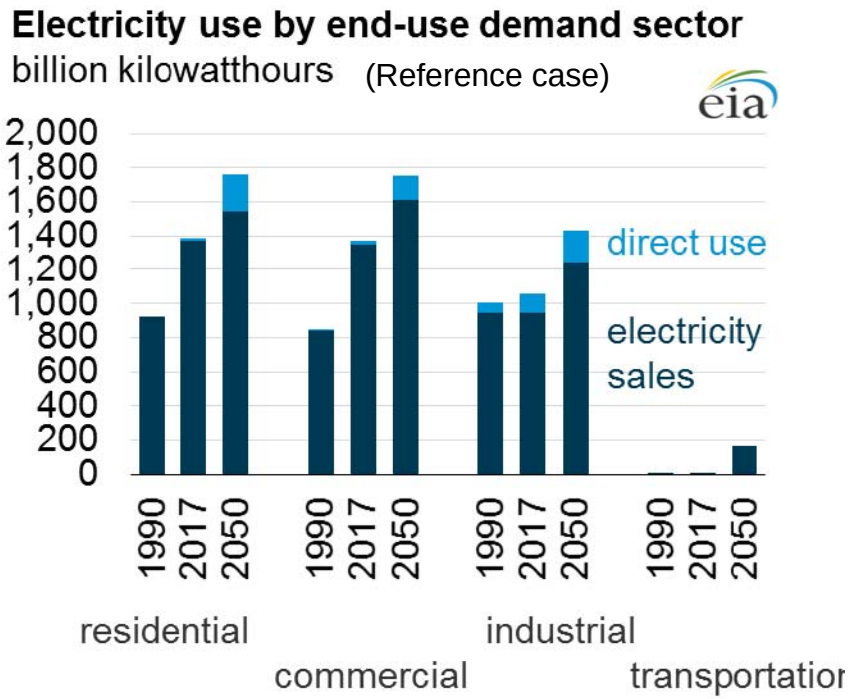
Relatively high levelized cost of electricity a contributing factor to the lack of additional coal or nuclear capacity in the AEO2018 Reference case



Source: "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the AEO2018", March 2018, Excerpted from Table 1b (2022) and Table B1b (2040)

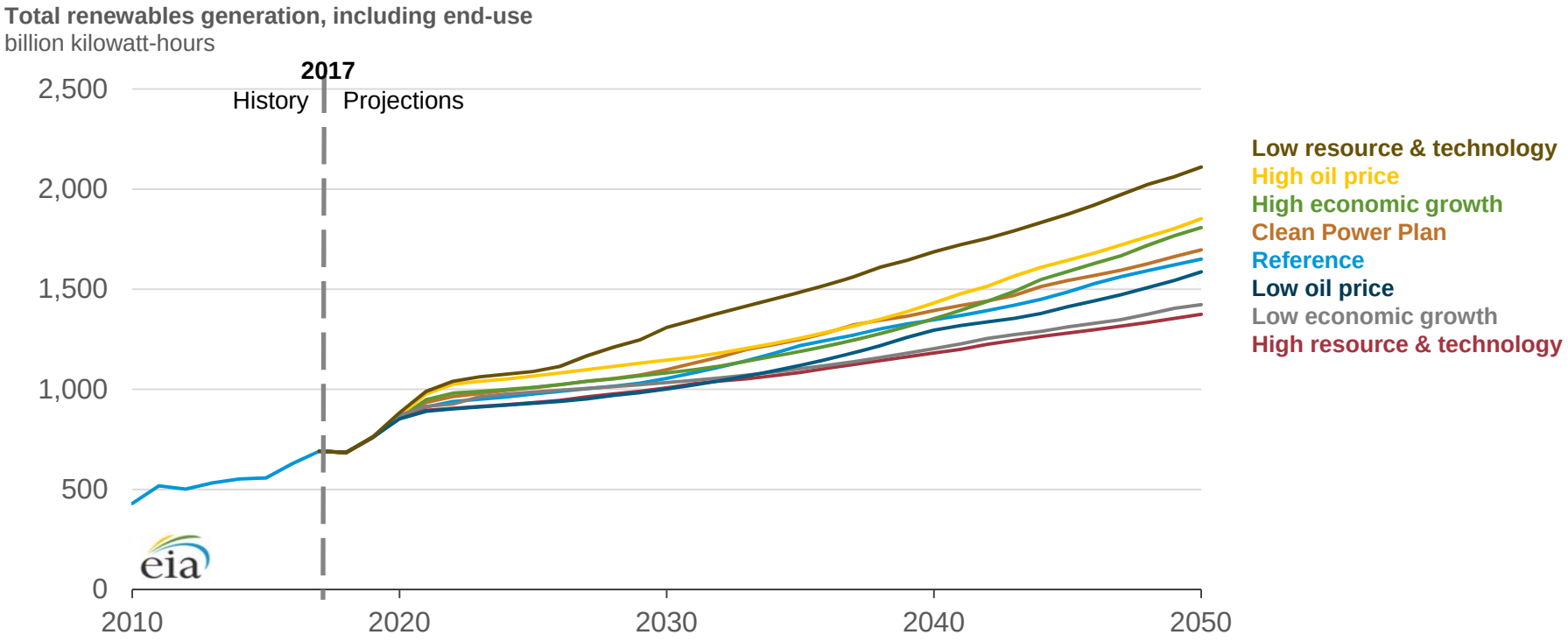
After decades of slowing growth, electricity consumption is expected to grow gradually through 2050





Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

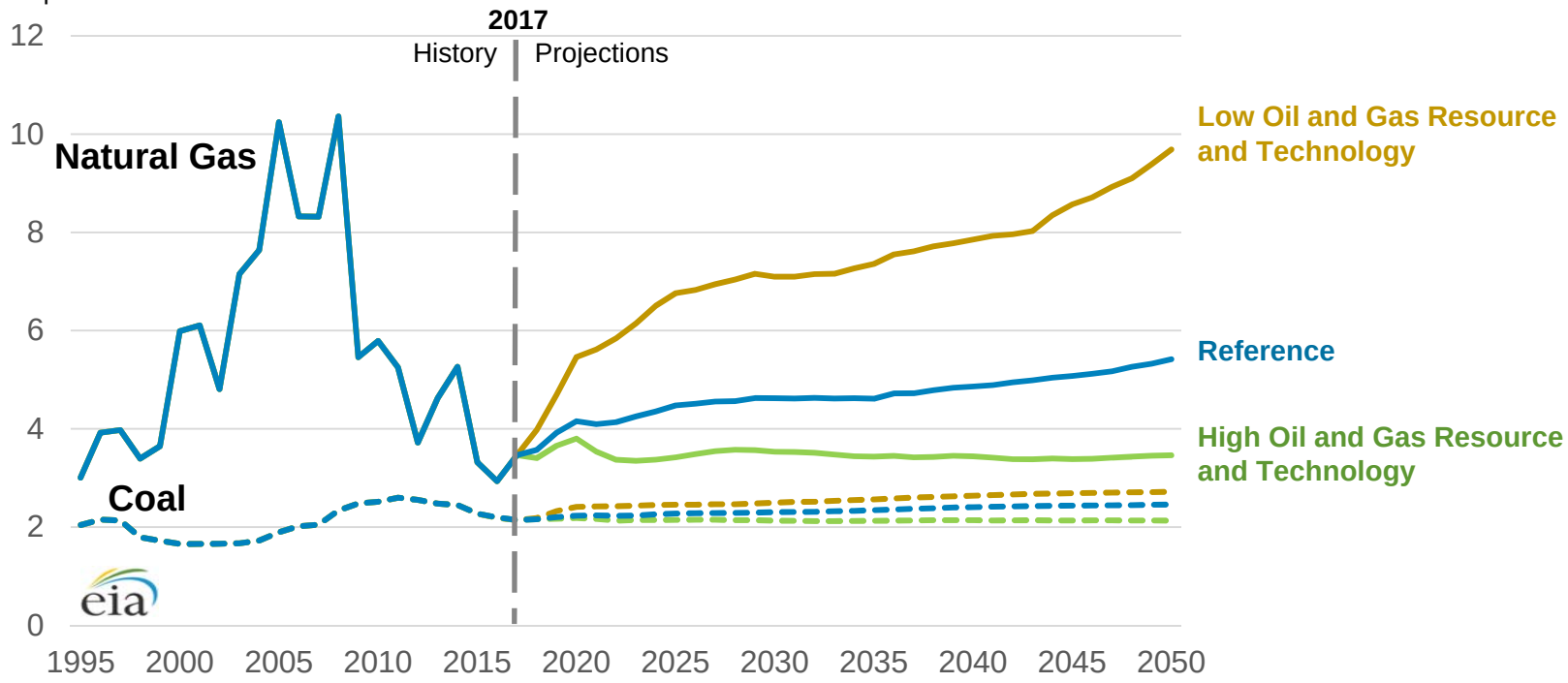
Increasing cost competitiveness of renewables leads to growth in generation even with projection for low electricity demand and low natural gas prices



Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

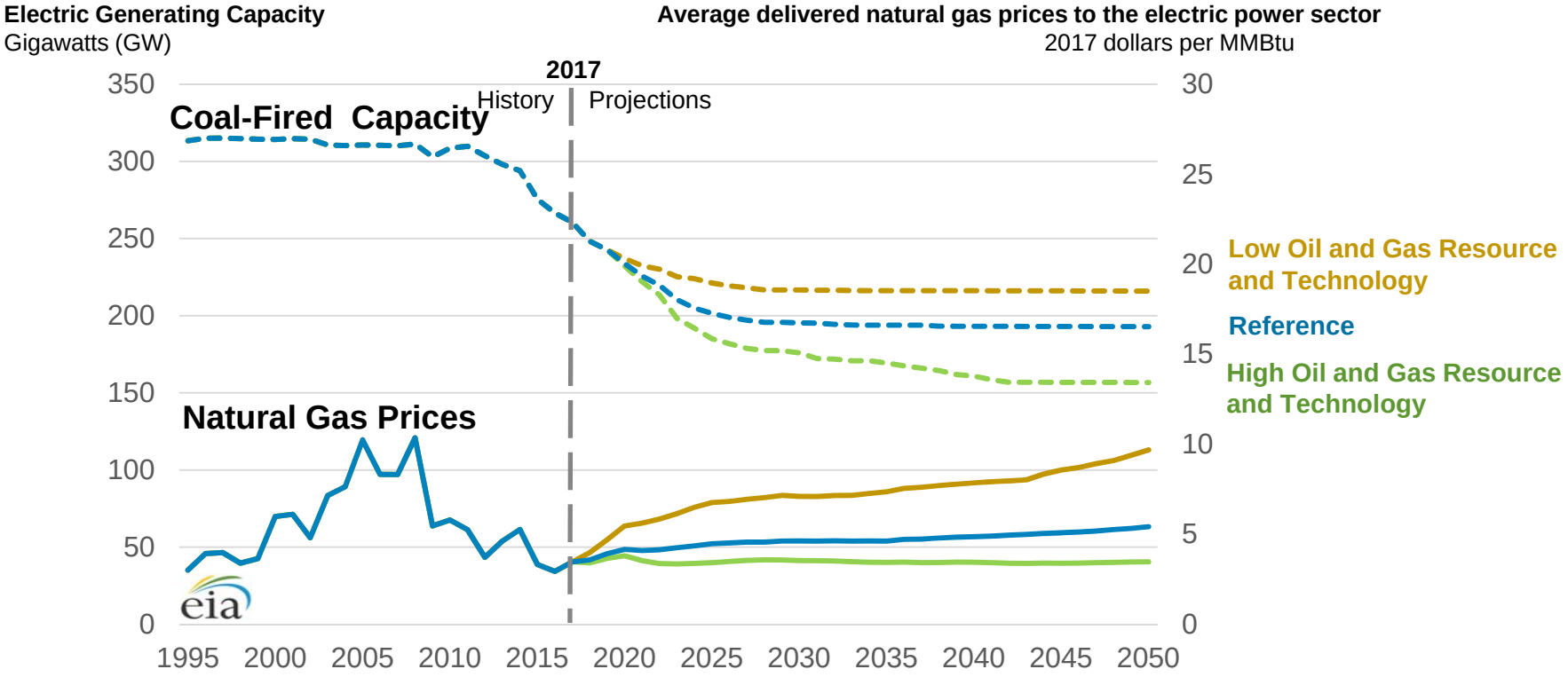
Average delivered coal and natural gas prices to the electric power sector indicate limited competitive opportunity for coal

Average delivered fuel prices to the electric power sector
2017 dollars per MMBtu



Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

Generating capacity decreases through 2030 in all AEO side cases and is sensitive to the projection for natural gas prices

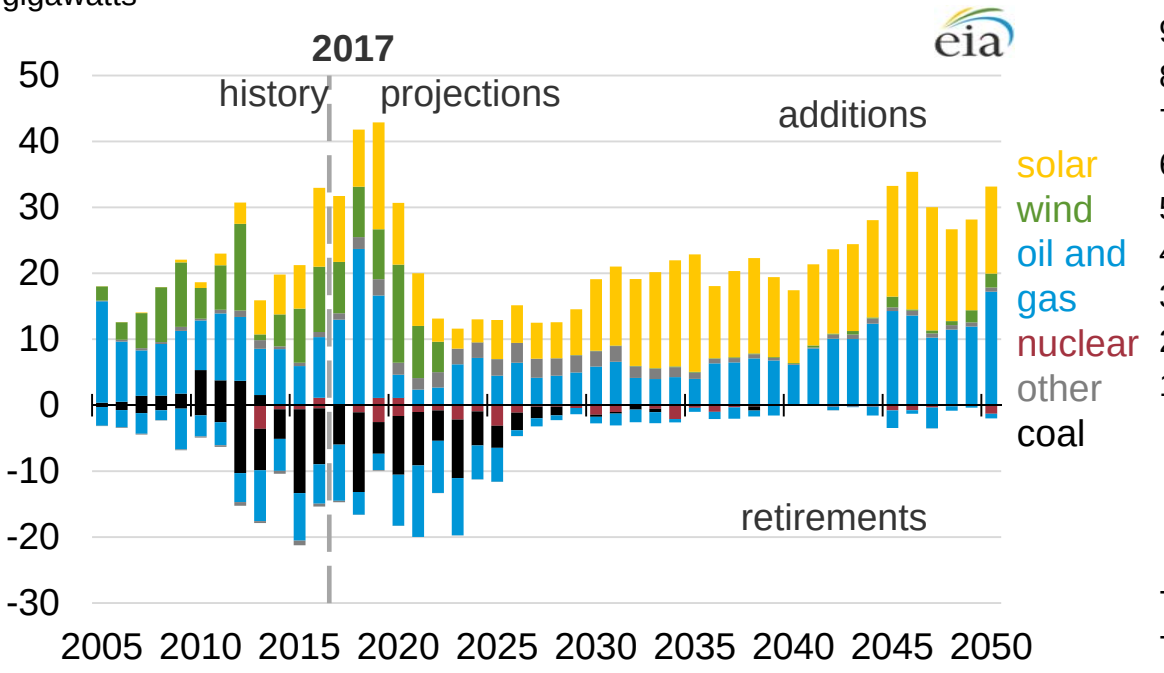


Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

Economics and policy drive changes to electric generation capacity

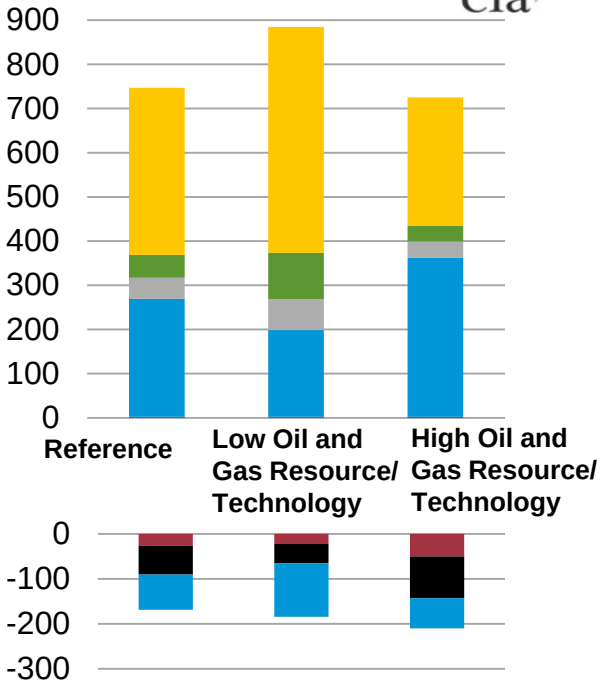
Annual electricity generating capacity additions and retirements (Reference case)

gigawatts



Cumulative generating capacity additions and retirements (2018-50)

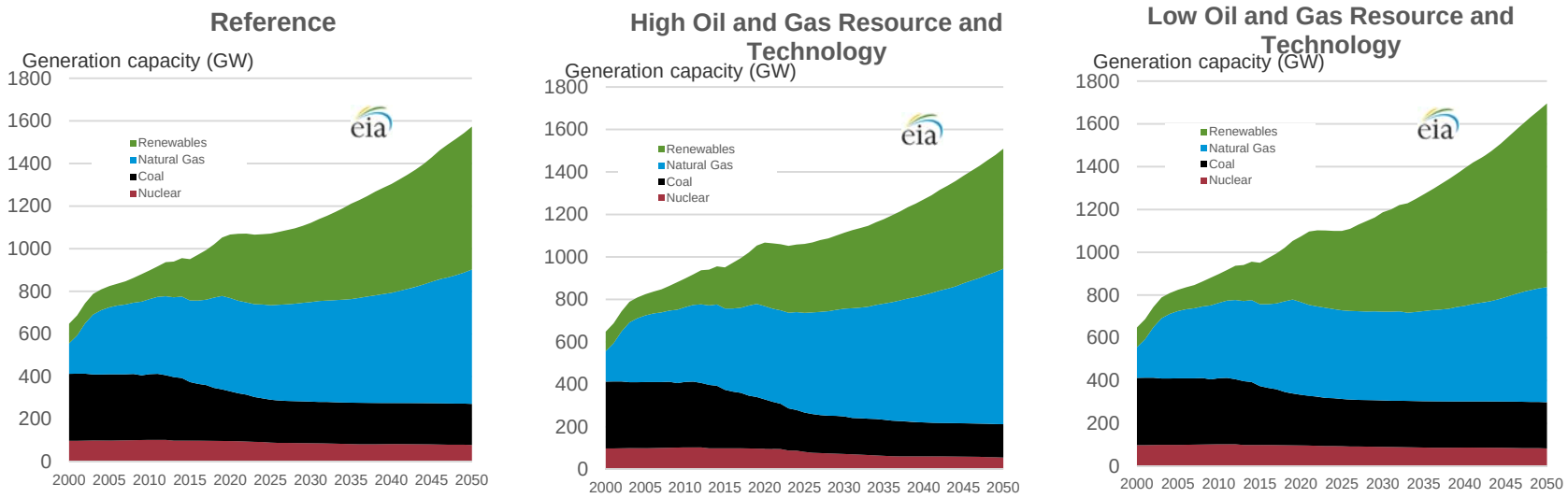
gigawatts



Renewables and natural gas comprise most of the capacity additions throughout the projection period in the Reference case.

Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

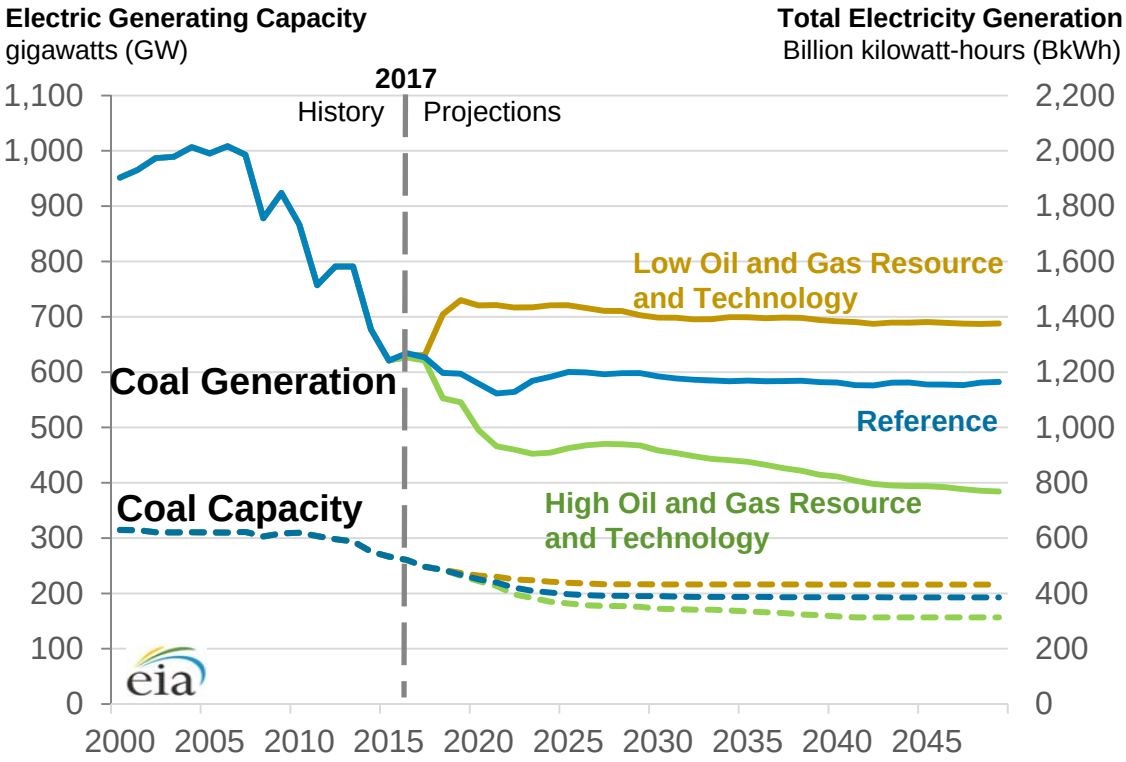
Comparison of electric generating capacity across the Reference and High/Low Oil and Natural Gas Resource and Technology cases

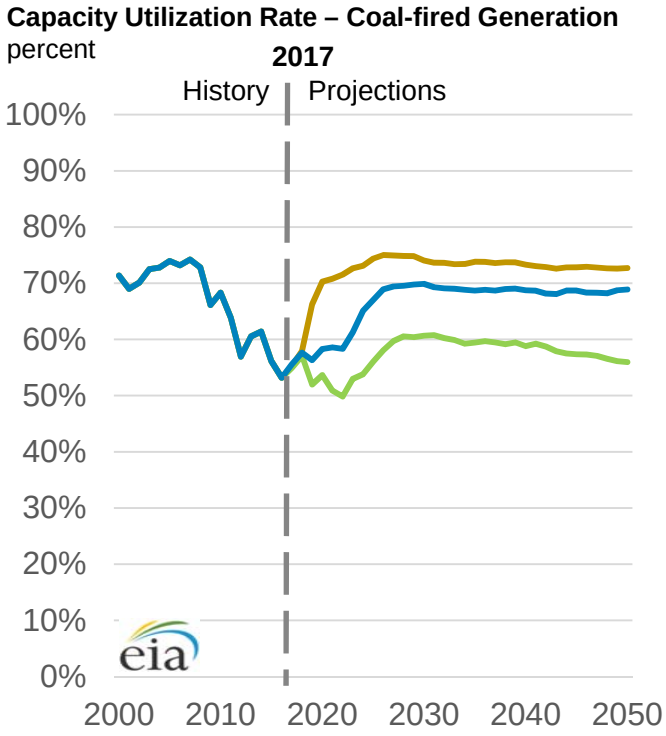


- In the High Oil and Natural Gas Resource and Technology case, coal-fired capacity declines by an additional 36 GW to 157 GW as plentiful low-cost natural gas dominates with 102 GW of additional capacity. Nuclear also declines by an additional 24 GW.
- In the Low Oil and Natural Gas Resource and Technology case, the decline in coal-fired capacity is reduced by 23 GW declining to 216 GW through 2050. Nuclear declines are reduced by 4 GW and renewables increase by and additional 188 GW.

Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

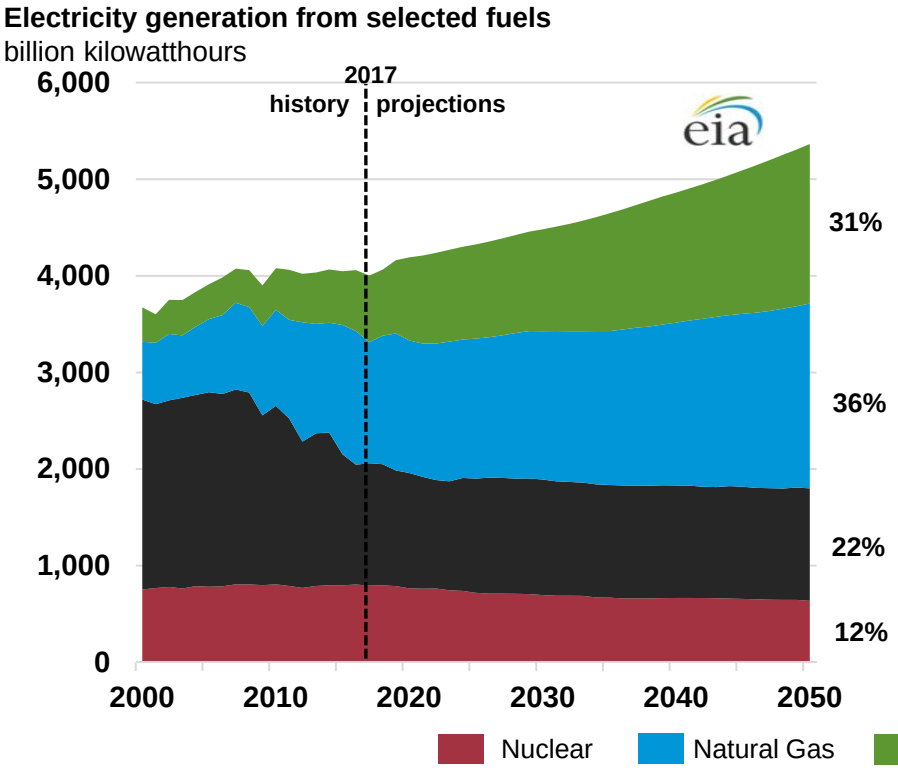
Although coal-fired generating capacity declines, capacity factors for remaining coal units recover as natural gas prices allow

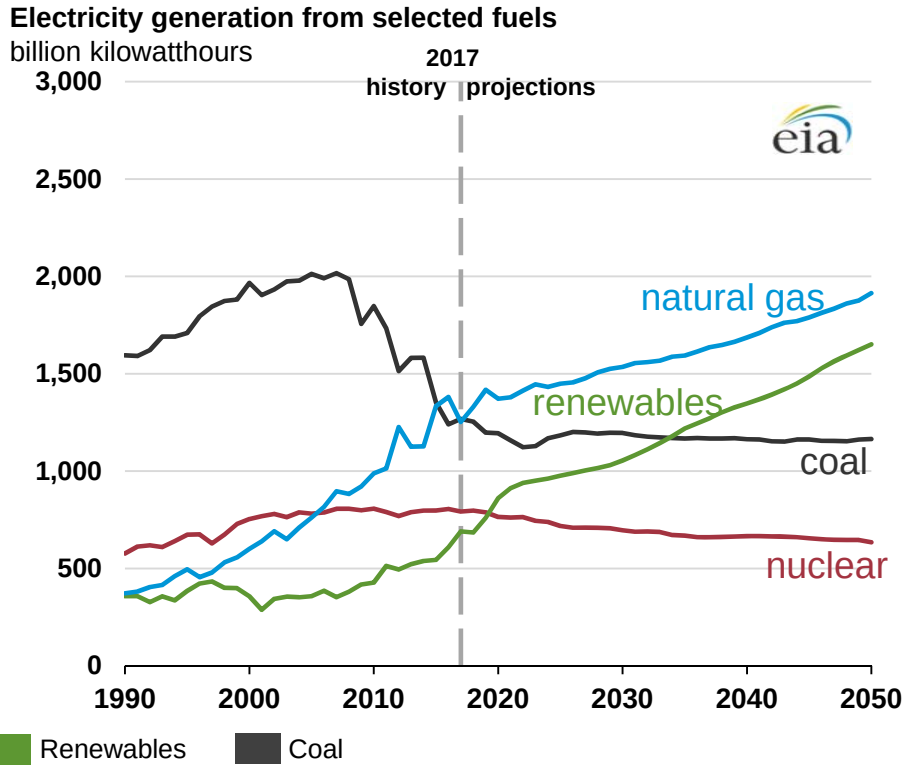




Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

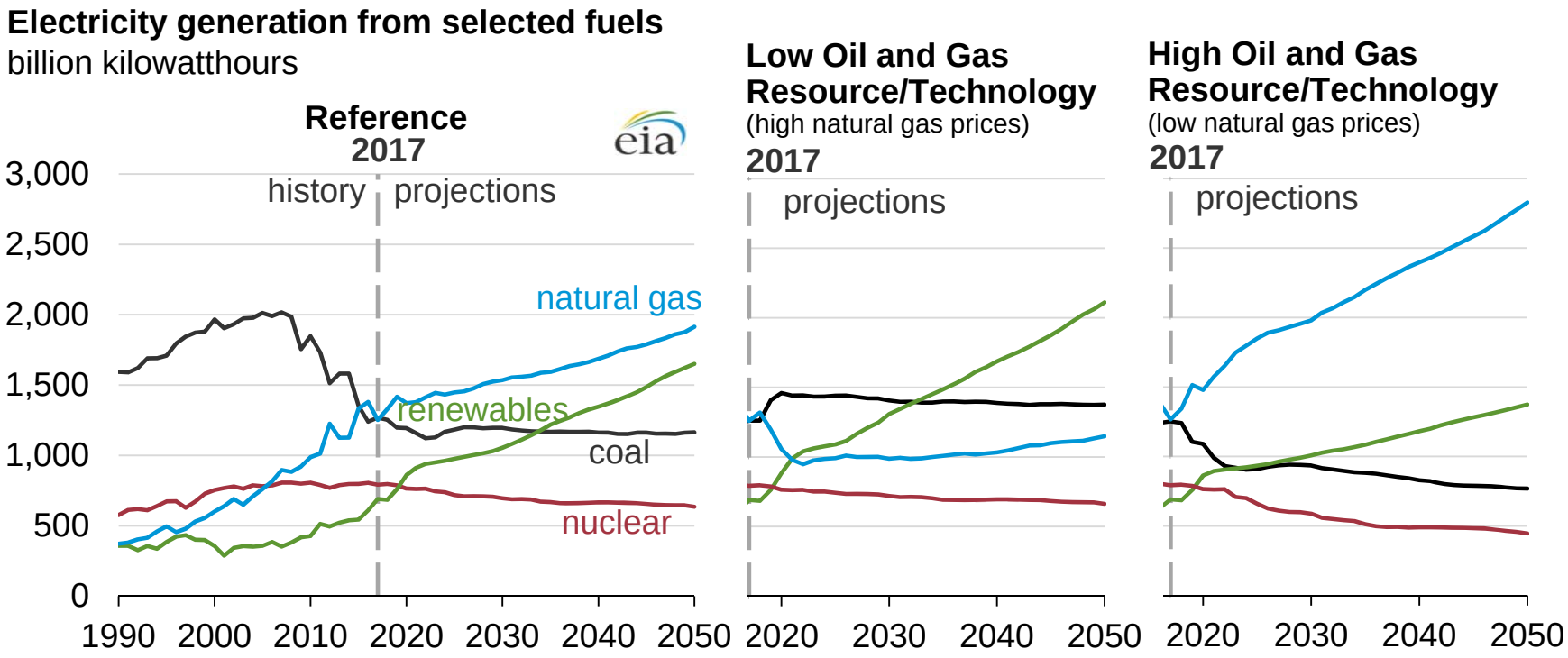
Electricity generation from natural gas and renewables increases steadily with coal and nuclear projected to remain relatively flat in the AEO2018 Reference case





Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

The projected mix of electricity generation varies widely across cases as differences in fuel prices result in significant substitution

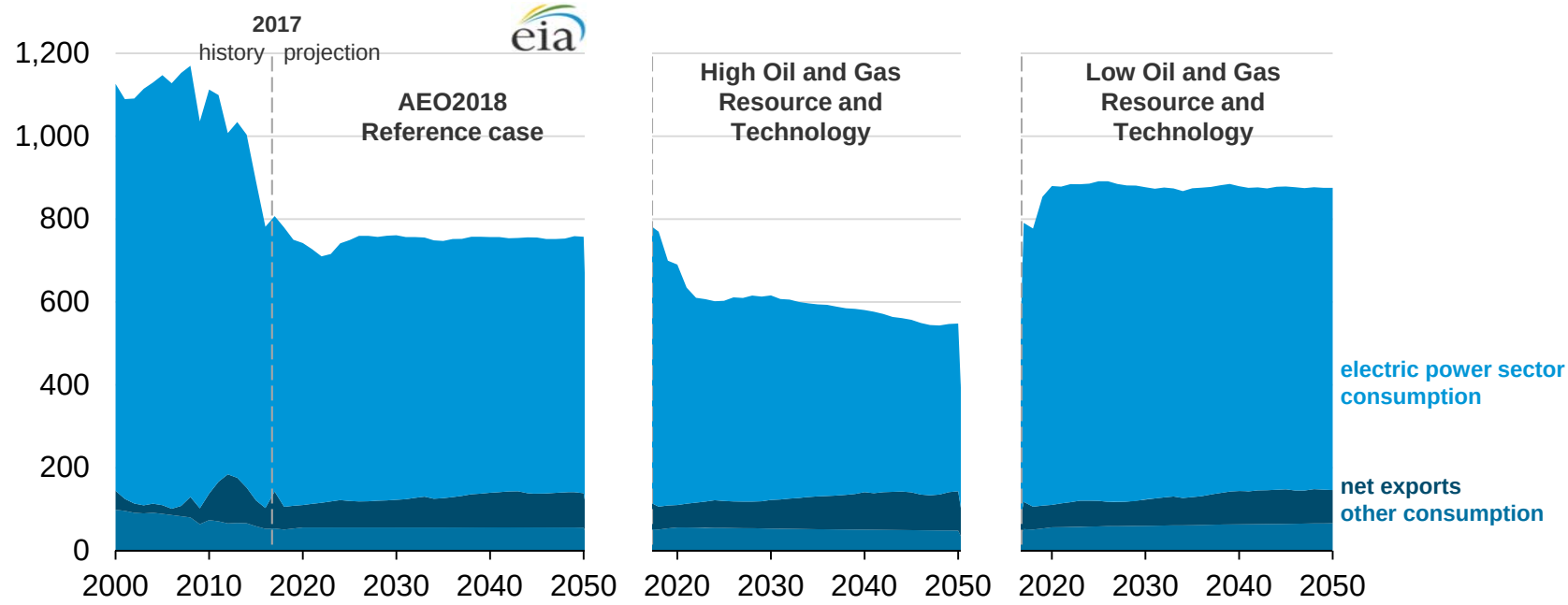


Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

Electricity sector consumption drives total U.S. coal disposition with stable industrial and slowly-increasing export demand

U.S. coal consumption and net exports

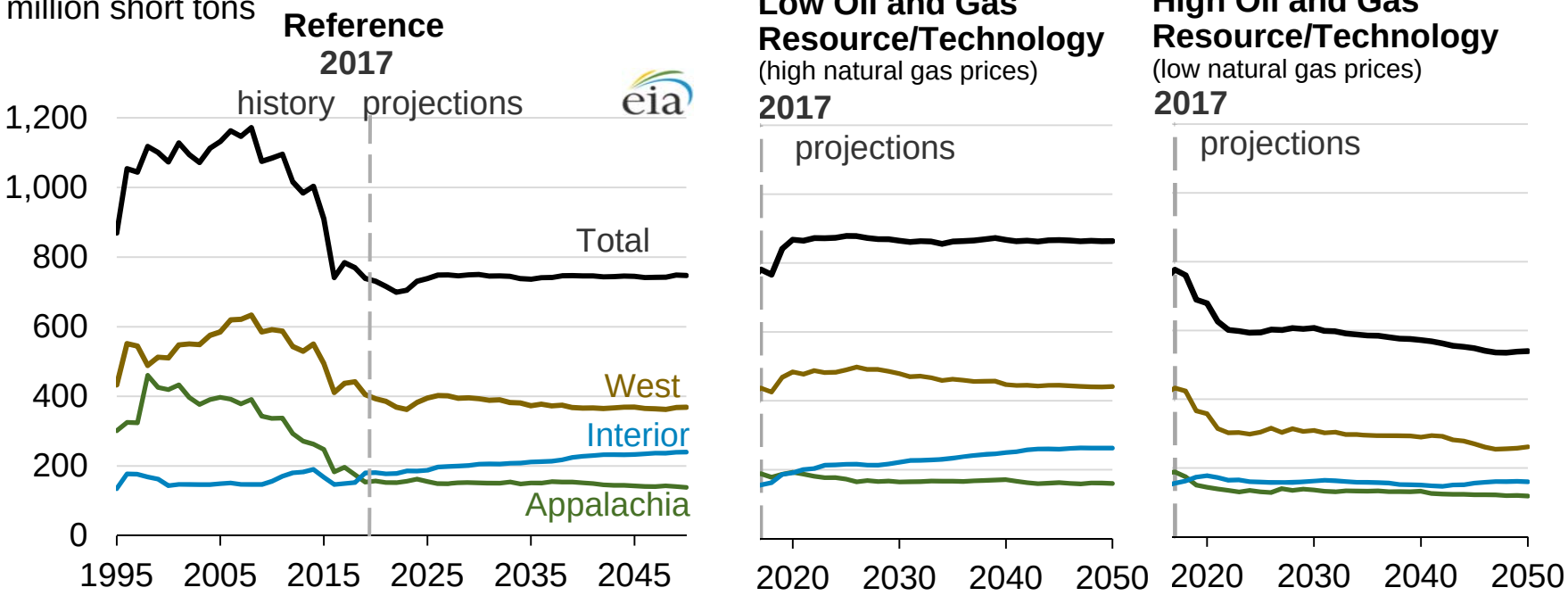
million short tons



Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

Interior region coal production is projected to increase at the expense of the West and Appalachia regions in the Reference case

Coal production by major region
million short tons

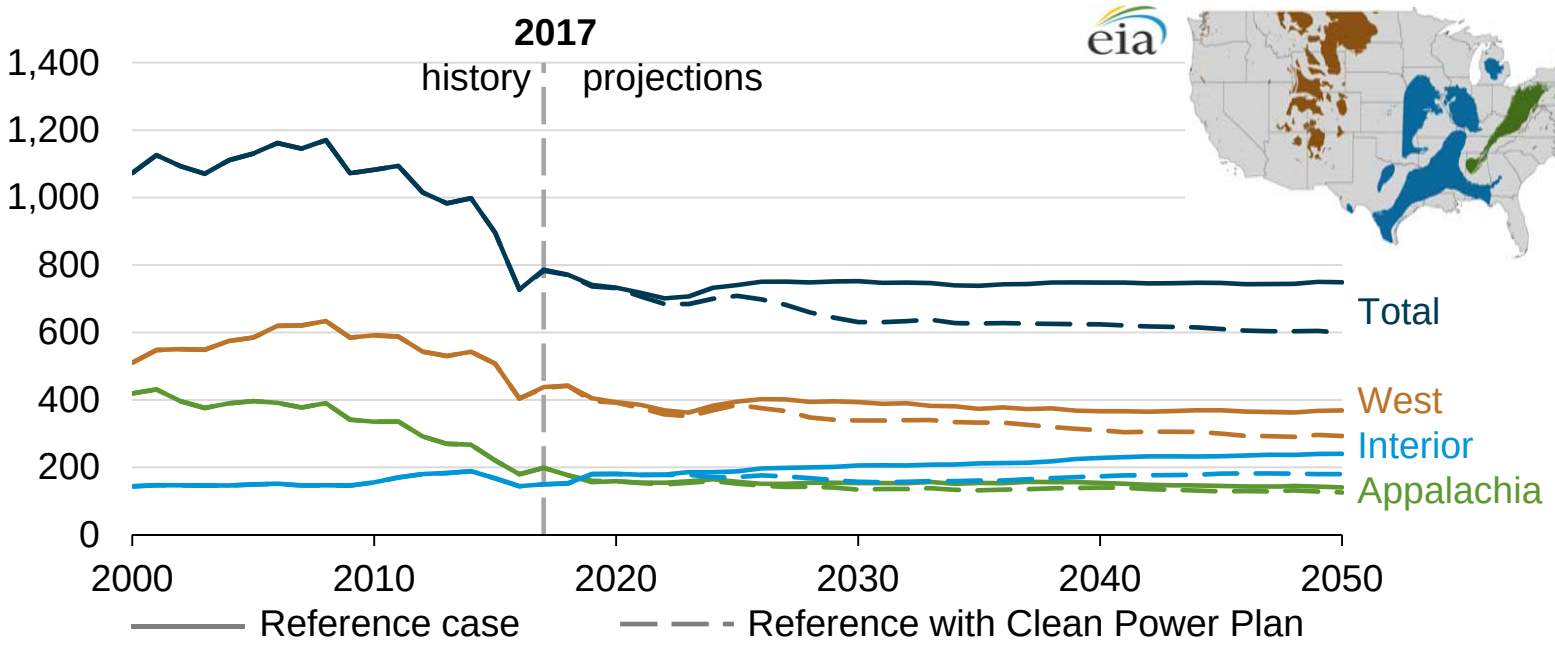


Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

Coal production remains flat through 2050 in the Reference case and declines slightly if the Clean Power Plan is assumed

U.S. Coal production by region – Reference Case with and without Clean Power Plan

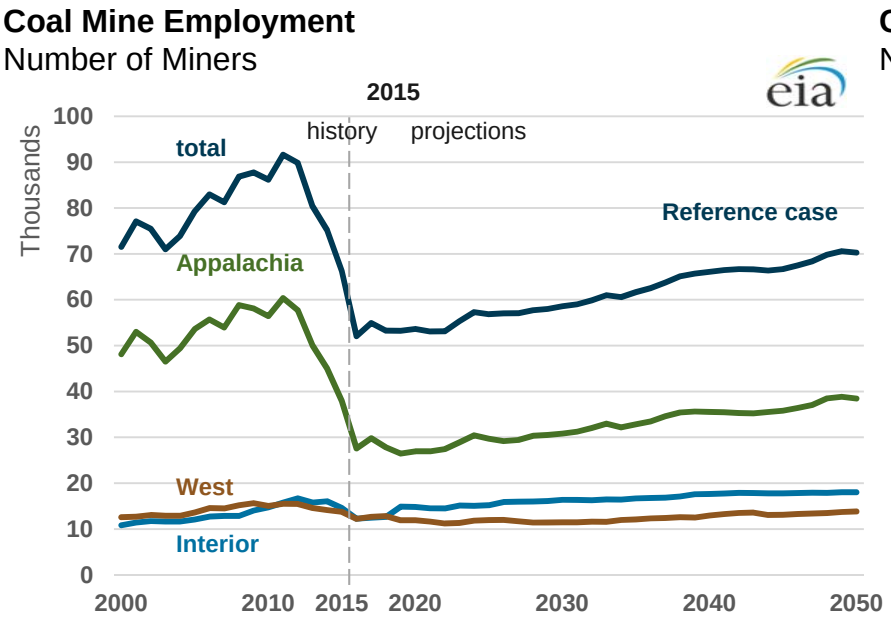
million short tons

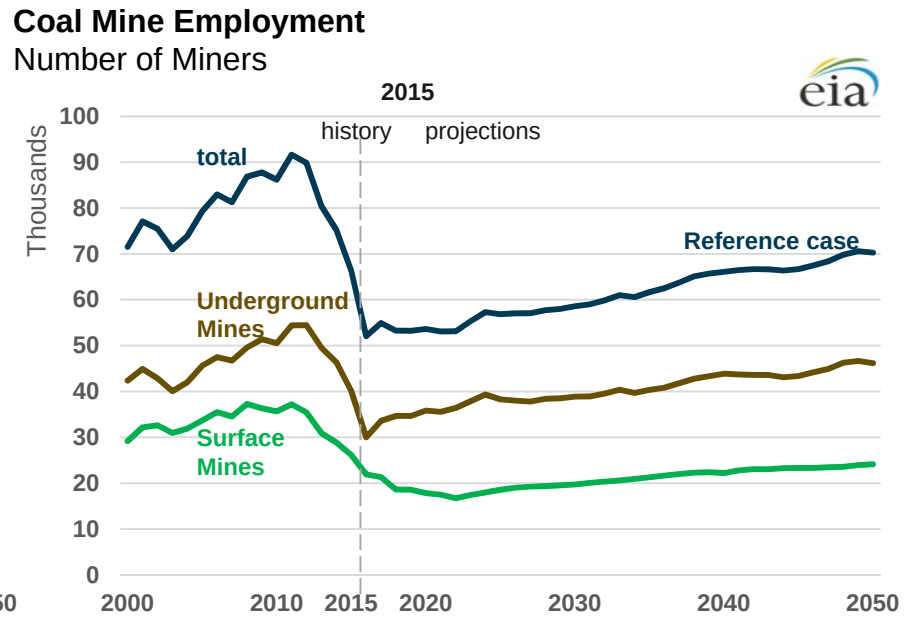


Coal production decreases through 2022 because of retirements of coal-fired electric generating capacity.

Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

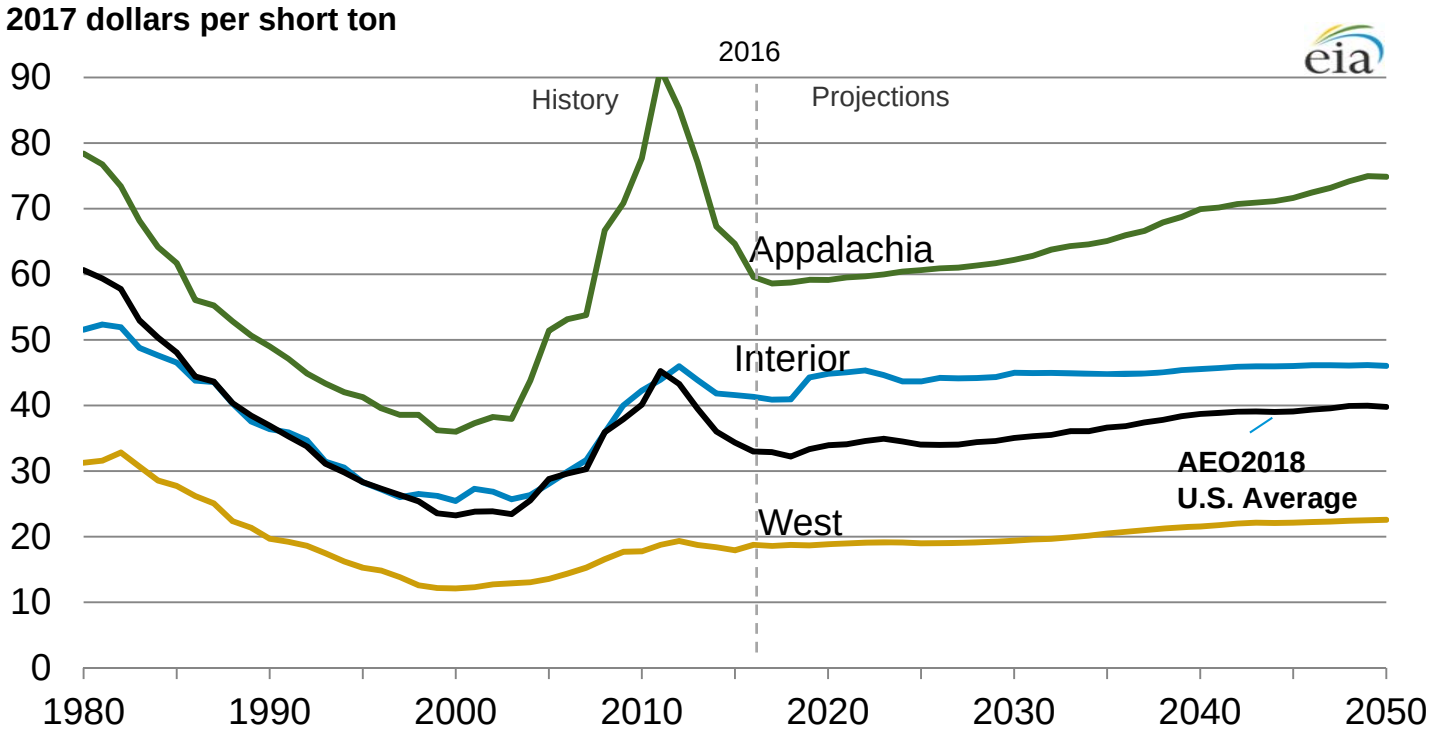
Coal mine employment trends reflect impact of declining labor productivity against backdrop of declining production





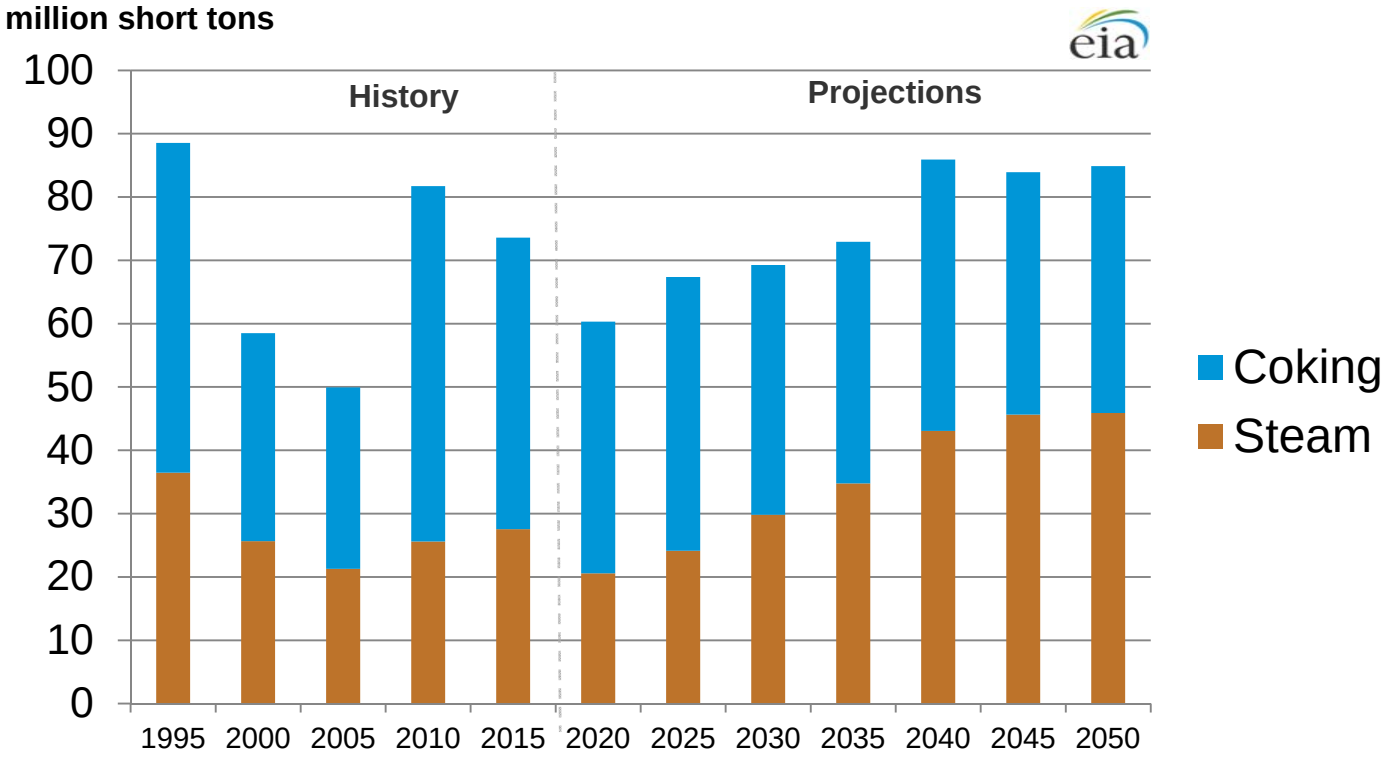
Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

Average minemouth coal prices increase gradually as productivity decreases over time in the Reference case



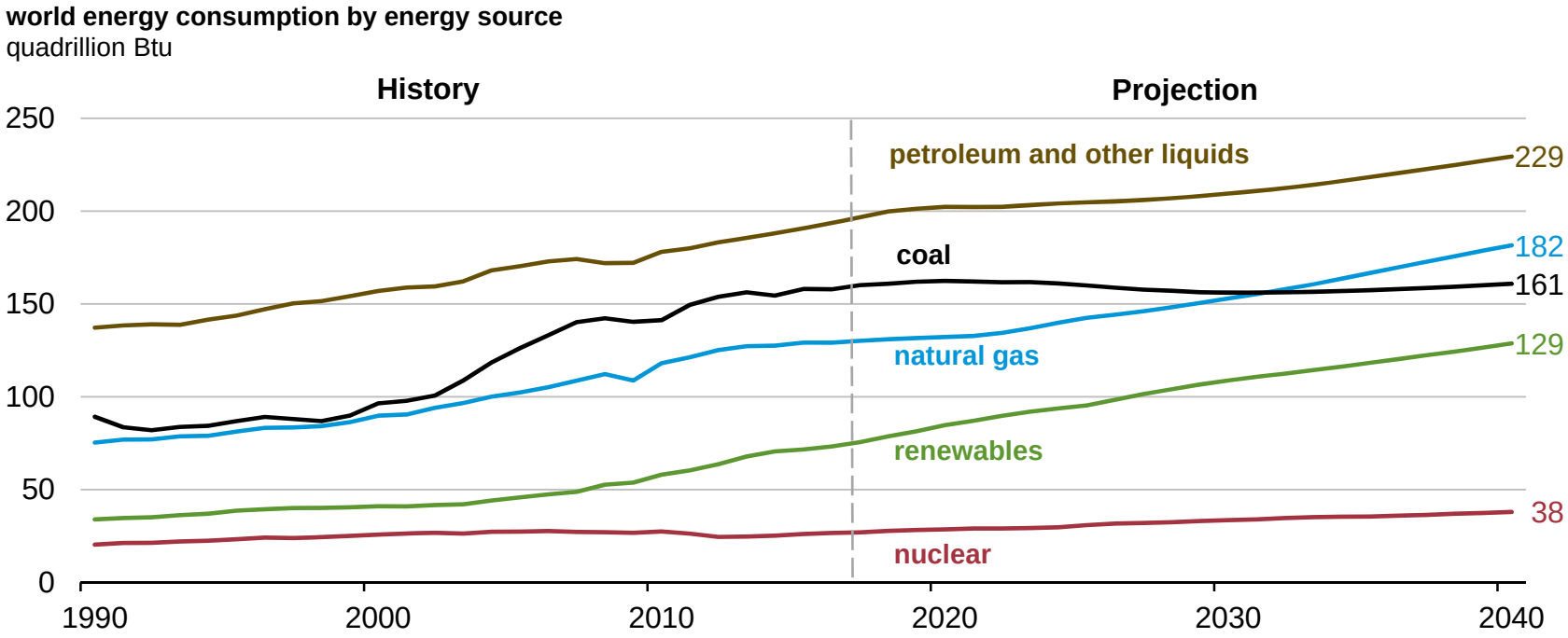
Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

U.S. coal exports are expected to recover only gradually through 2050 in the Reference case



Source: U.S. Energy Information Administration, Annual Energy Outlook 2018.

World coal consumption stabilizes around 2020 but is projected to increase slightly from a low in 2030 through 2040 in EIA's International Energy Outlook 2018



Source: U.S. Energy Information Administration, International Energy Outlook 2018, Reference Case.

For more information

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