

Annual Energy Outlook 2022 (AEO2022)

Working Group for Electricity, Coal, and Renewables Analysis: Preliminary Results



For

*EIA Joint Working Group for Electricity, Coal, and Renewables
September 21, 2021*

By

Office of Long-Term Energy Modeling—Electricity, Coal, and Renewables Modeling

Overview of Second Working Group

- Review of current laws and regulations and key model developments
- Preliminary results for AEO2022 Reference case
 - Only case being discussed at this working group
- Additional core side cases to be published:
 - High and Low Oil Price
 - High and Low Economic Growth
 - High and Low Oil and Gas Supply
 - High and Low Renewables Cost
 - Side cases for Issues In Focus articles (to be determined)

Review of current laws and regulations and key model developments

Updated Legislation and Regulations

- Updated renewable portfolio standards
 - Oregon Clean Energy Standard: 80% carbon-free generation by 2030, 90% carbon-free generation by 2035, 100% carbon-free generation by 2040 for investor-owned utilities (IOUs), 50% carbon-free generation by 2040 for all others
 - Delaware increased its renewable portfolio standard target to 40% by 2035.
- Added extension of the production tax credit (PTC) and investment tax credit (ITC) (December 2020)
- Removed Affordable Clean Energy (ACE) rule (January 2021)
- Updated Cross-State Air Pollution Rule (CSAPR) (March 2021)
 - Updates to seasonal nitrogen oxides budgets for 12 states for 2021–2024
- Removed Ohio's zero energy credit (ZEC) program for nuclear power plants

Other Policy and Regulatory Considerations

- We are actively tracking reconciliation and infrastructure bills. We are assessing some features, but the complexity of incorporating them and the timing for enactment of the legislation will influence our approach for AEO2022.
 - Clean Electricity/Energy Payment Plan (CEPP)
 - Tax credit extensions for PTC, ITC, and bonus credits
- Illinois's zero emissions credit (ZEC) payments to nuclear power plants will be available to other reactors in the state. Dresden and Byron will remain online throughout the program, and retirement is determined by model economics after the reactors retire.

Key Developments for AEO2022 in Electric Sector Modeling

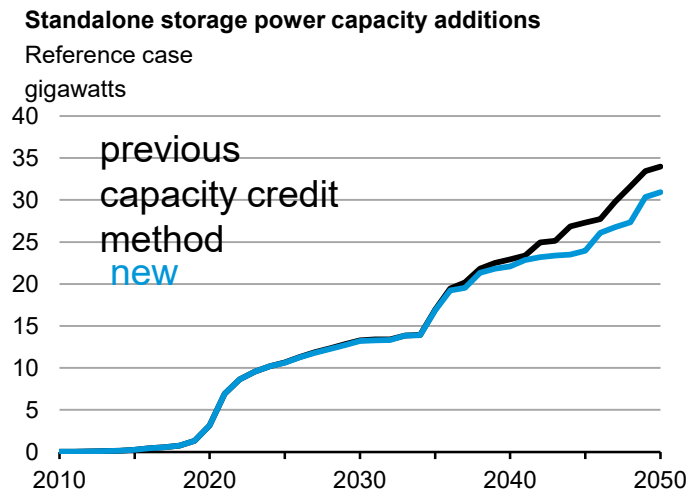
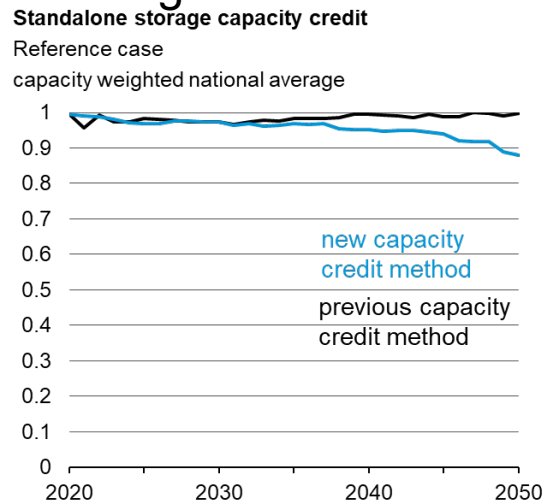
- Electricity and nuclear
 - Improved market sharing algorithm (adjusts ECP build decisions among competitive technologies)
 - Previously acted only on unsubsidized technologies. Now the model checks if subsidy is present before entering the algorithm
 - If the emissions tax is present, the model allows market sharing within dispatchable and non-dispatchable technologies
 - Revised operating modes available for baseload technologies so that they can operate more flexibly by responding to changes in net load based on intermittent electricity generation in a region

Key Developments for AEO2022 in Electric Sector Modeling

- Renewables
 - Added capacity for standalone battery storage
 - Implemented new declining credit algorithm energy
 - Enabled wind retirements
 - Updated solar inverter loading ratio for standalone solar PV from 1.20 to 1.30 (implemented for hybrid solar PV with its inclusion in AEO2021)
 - Updated biomass supply curve and improved its interaction with oil prices
- Coal
 - Reconciled U.S. exports with the International Coal Market Module
 - Revised U.S. coal transportation rates based on 2017–19 EIA survey data
 - Updated Coal Market Module base year for coal supply to 2020

Implementation of New Declining Capacity Credit Algorithm for standalone energy storage

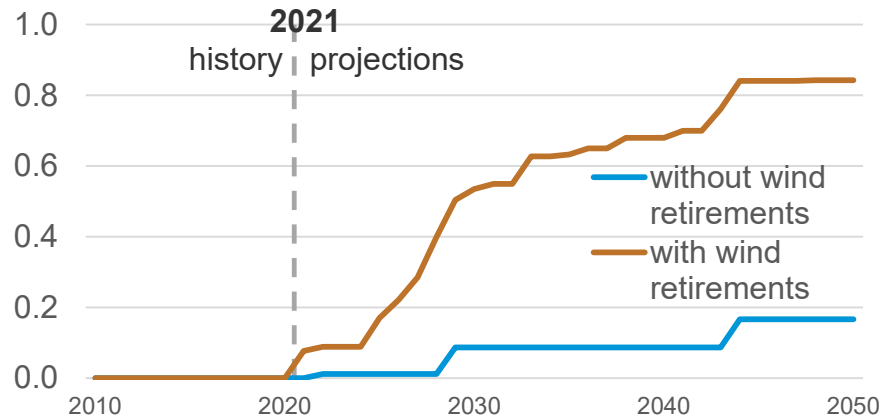
- Storage is most valuable in hours with high net load and is less valuable as the ratio of available storage to net load increases in those hours.
- The new algorithm calculates the storage capacity credit based on the ratio of storage level to net load in the top 1% of hours.



Enabled retirement options for wind generators

- We used the methodology similar to the approach used to evaluate nuclear retirements to:
 - Add operations and maintenance costs of \$2.50 per kilowatt per year after age 30 and \$5.00 per kilowatt per year after age 40
 - Calculate that 0.84 gigawatts of wind capacity retires by 2050

Cumulative wind retirements, 2010–2050



Source: ref2021.1018a, ref2022.0918d

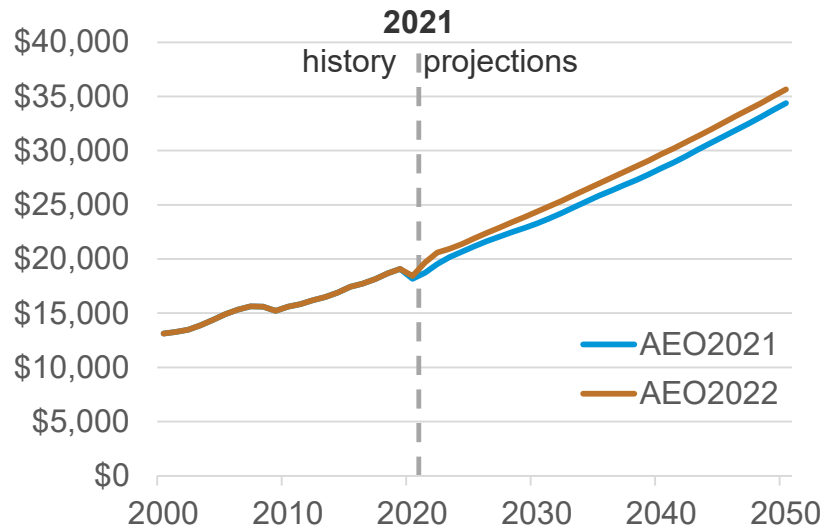
Preliminary Results for AEO2022

Summary of Preliminary Results

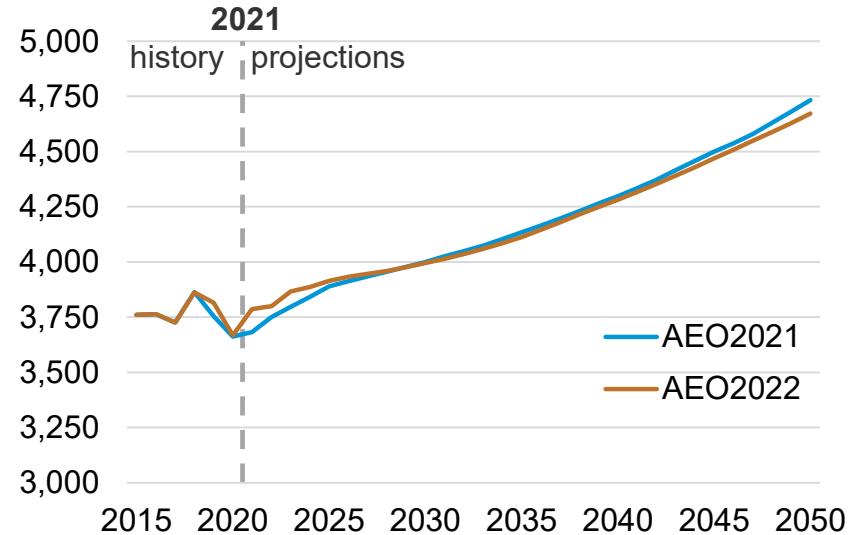
- Demand is lower due to updates in the commercial sector as well as increased self-generation.
- The level of capacity additions is higher compared with AEO2021—nearly 50 gigawatts more from planned additions and nearly 38 gigawatts more from unplanned additions.
- We expect more capacity to retire from coal power plants and older, less efficient peakers because of expected lower electricity prices, lower demand, and higher renewables capacity additions.
- Solar PV continues to make up the majority of capacity additions for renewables, leading to higher standalone energy storage capacity additions than expected in AEO2021.
- Wind capacity additions are lower (despite a PTC extension) due to competition from solar and natural gas.
- Natural gas-fired generation is higher in the near term, but it stays around the same level as in AEO2021 despite lower natural gas prices.

Short-Term Economic Outlook Improves Relative to AEO2021 Although Electricity Demand From End-Users is Lower

Real gross domestic product
billion 2012 dollars

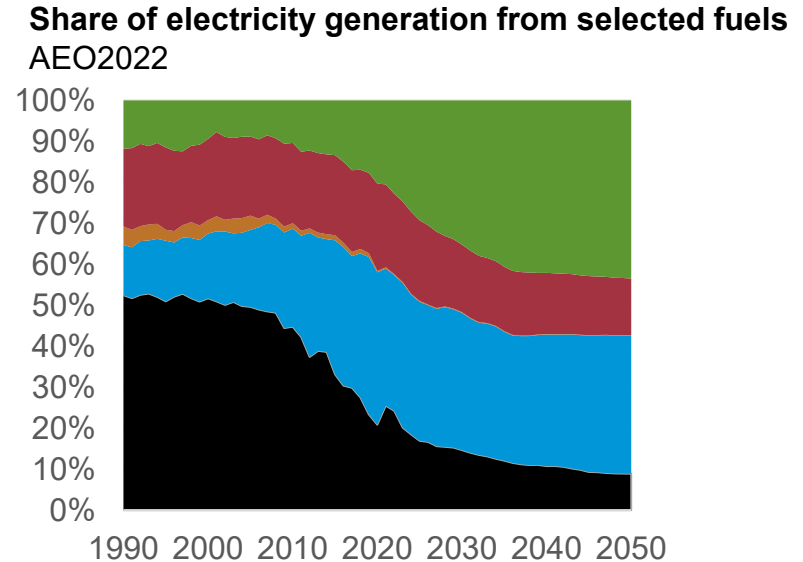
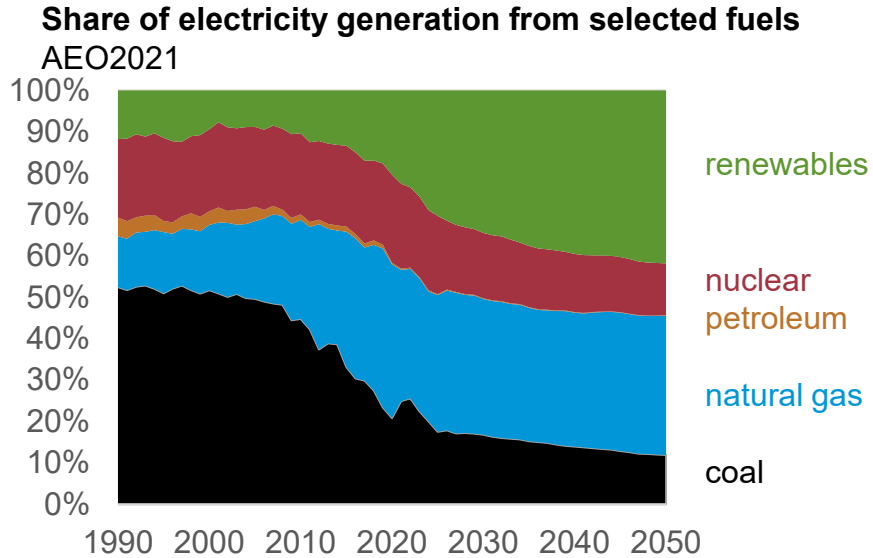


Total electricity sales
billion kilowatthours



Source: ref2021.1018a, ref2022.0918d

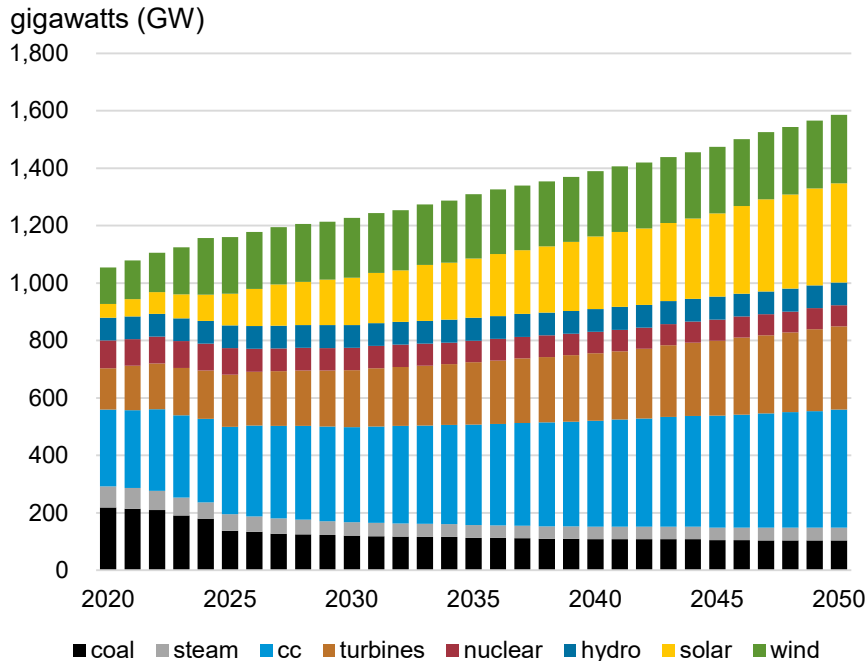
Projected Shares of Electricity Generation by Fuel



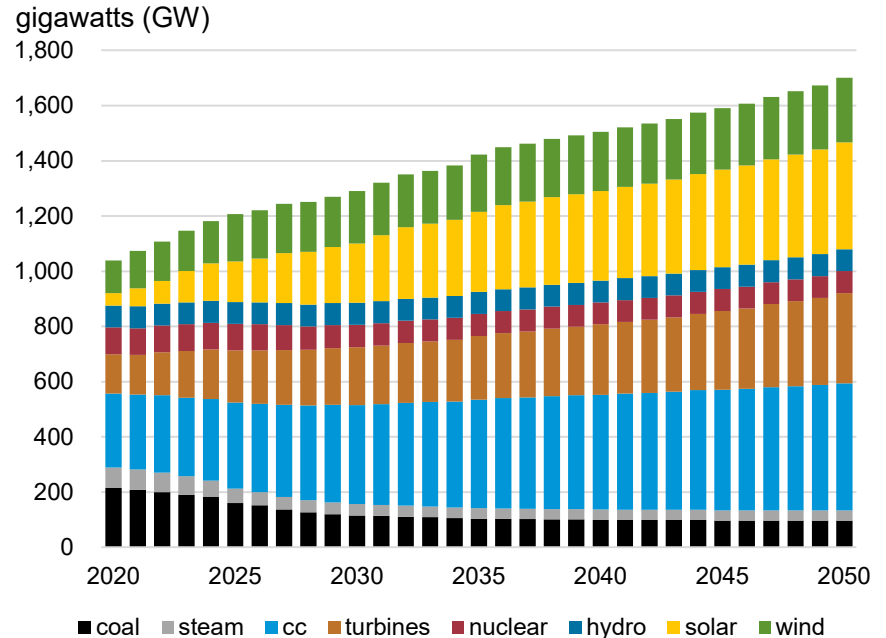
Source: ref2021.1018a, ref2022.0918d

Installed Capacity by Fuel Type, 2010–2050

Cumulative installed capacity by fuel type, 2010–2050 AEO 2021



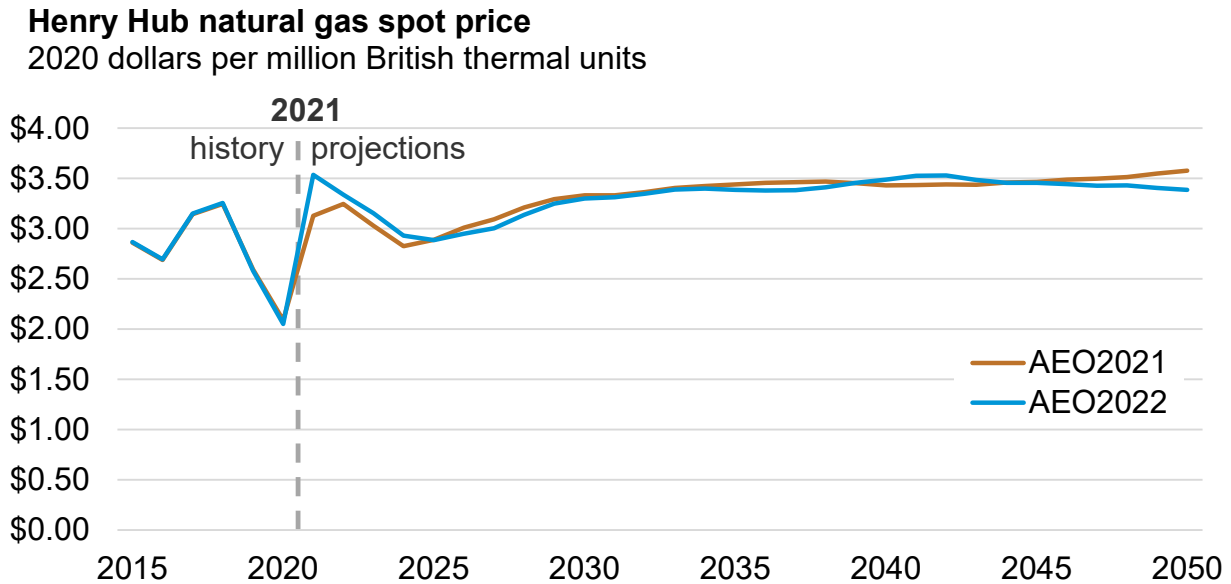
Cumulative installed capacity by fuel type, 2010–2050 AEO2022



CC is combined cycle natural gas generators

Source: ref2021.1018a, ref2022.0918d

Natural Gas Prices Continue to Trend Lower Over the Long Term

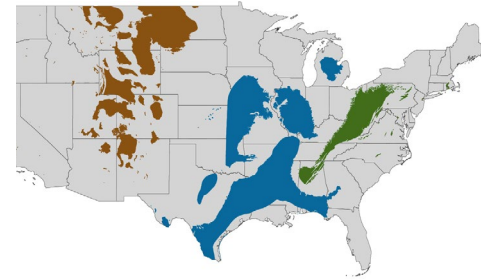
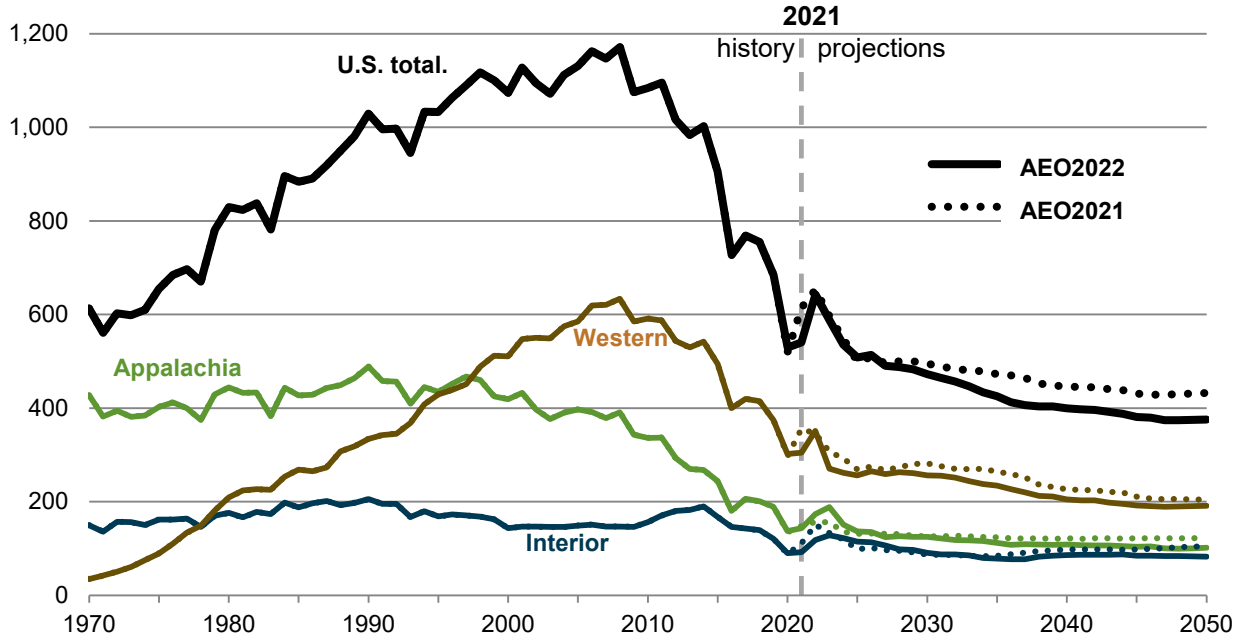


Source: ref2021.1018a, ref2022.0918d

Coal Production and exports

Coal Production by Region, 1970–2050

Regional coal production, 1970–2050
million short tons

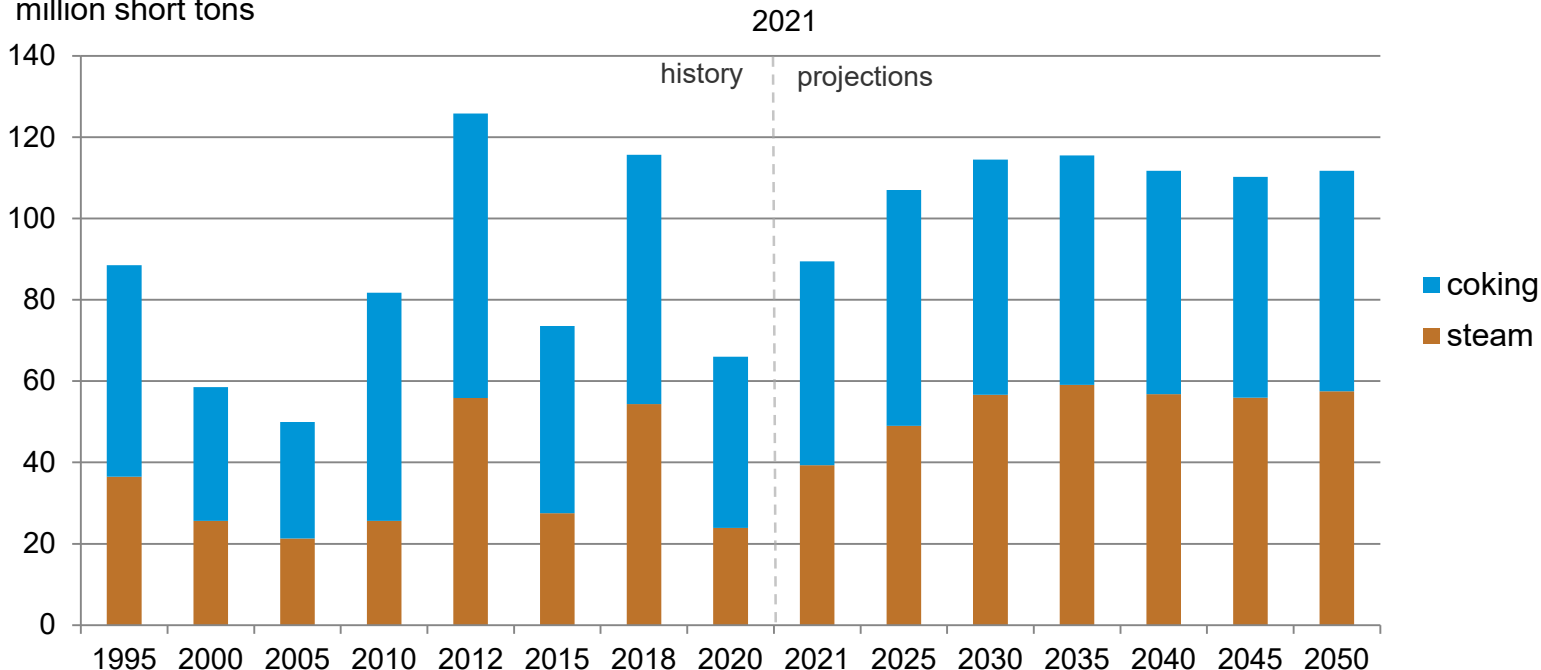


Source: *ref2022.d091921b, ref2021.113020a* *2021–2022 data are estimated based on the Short-Term Energy Outlook forecasts.

U.S. Continues Its Role as a World Swing Producer of Coal With Continued Exports

U.S coal exports, 1995–2050

million short tons



Source: ref2022.091921b Projection based on forthcoming EIA International Energy Outlook 2021

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For More Information

U.S. Energy Information Administration homepage | www.eia.gov

Annual Energy Outlook | www.eia.gov/aeo

Short-Term Energy Outlook | www.eia.gov/steo

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

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U.S. Energy Mapping System | www.eia.gov/state/maps.php?v=Coal

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U.S. Energy Mapping System

