

Electricity-Renewables Analysis Working Group: Market Review, Policy Assumptions, Key Model Updates



For

EIA Electricity Working Group

May 27, 2021

By Office of Long-Term Energy Modeling

AEO2022 Electric Sector-Renewables Working Group: Overview of first teleconference

- Review of Annual Energy Outlook 2021 (*AEO2021*) results
- Proposed modeling enhancements for AEO2022
- Preliminary changes to laws and regulations
- Considerations for future long-term domestic modeling

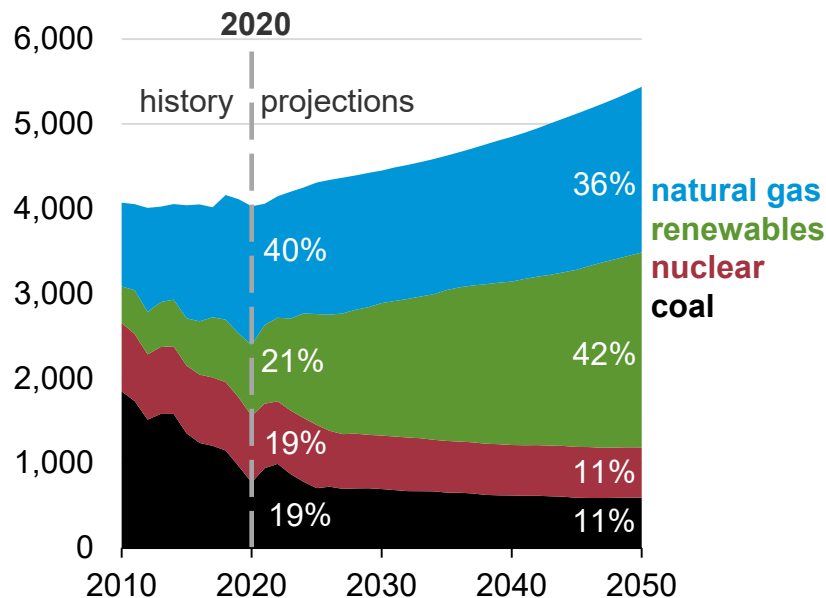
Review of AEO2021 results

Electricity generation from natural gas and renewables increases as a result of lower natural gas prices and declining costs of solar and wind capacity

U.S. electricity generation from selected fuels

AEO2021 Reference case

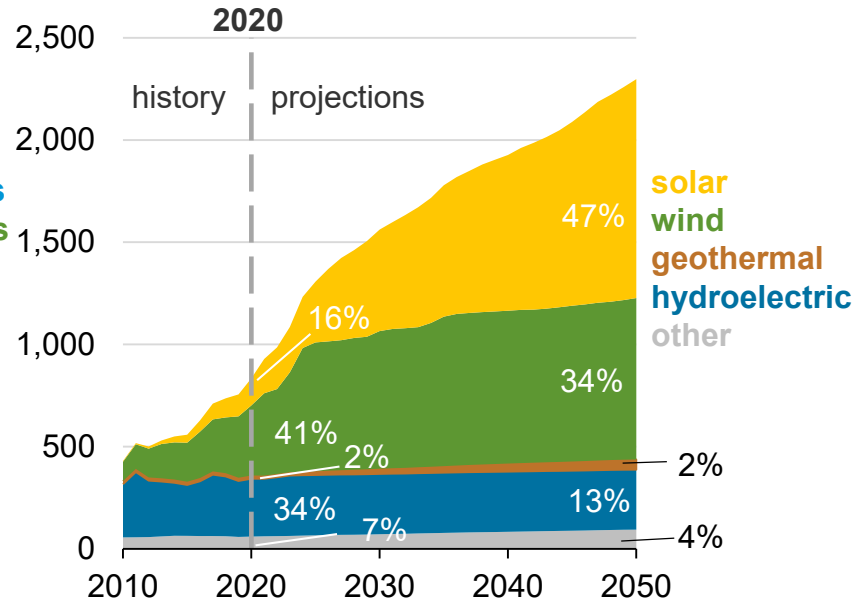
billion kilowatthours



U.S. renewable electricity generation, including end use

AEO2021 Reference case

billion kilowatthours

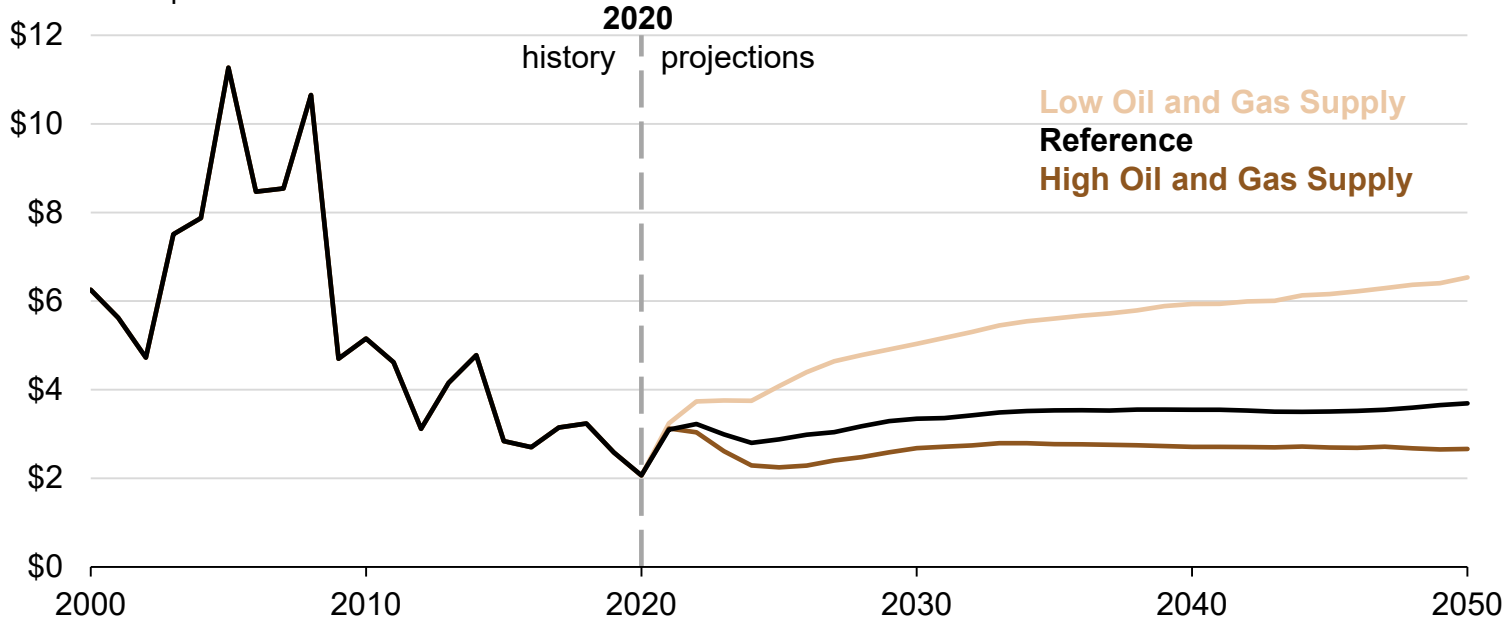


Source: U.S. Energy Information Administration, Annual Energy Outlook 2021

Natural gas prices continue to range between \$3.50 and \$4 per million British thermal units

Natural gas spot price at Henry Hub AEO2021 oil and gas supply cases

2020 dollars per million British thermal units



Source: U.S. Energy Information Administration, Annual Energy Outlook 2021

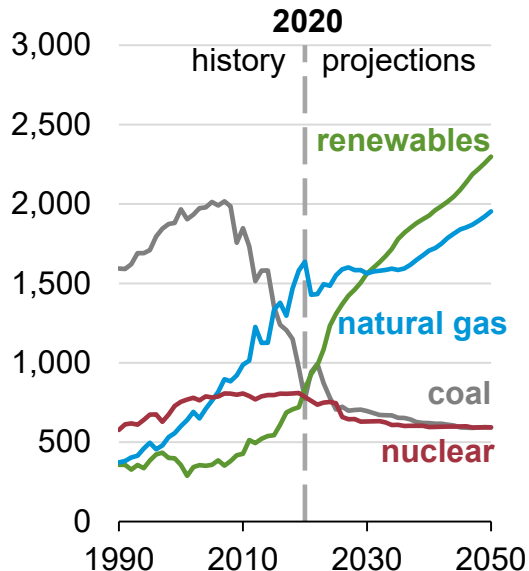
Natural gas-fired generation and renewables substitute for each other; coal and nuclear generation declines in Low Renewables Cost case

All-sector electricity generation from selected fuel by case, 2010–50

billion kilowatthours

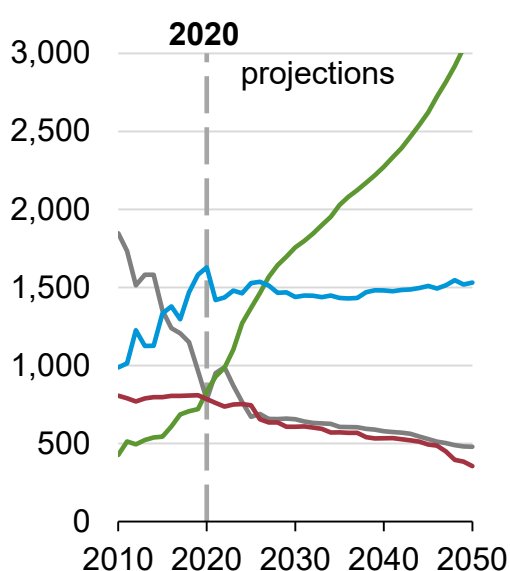
Reference case

billion kilowatthours



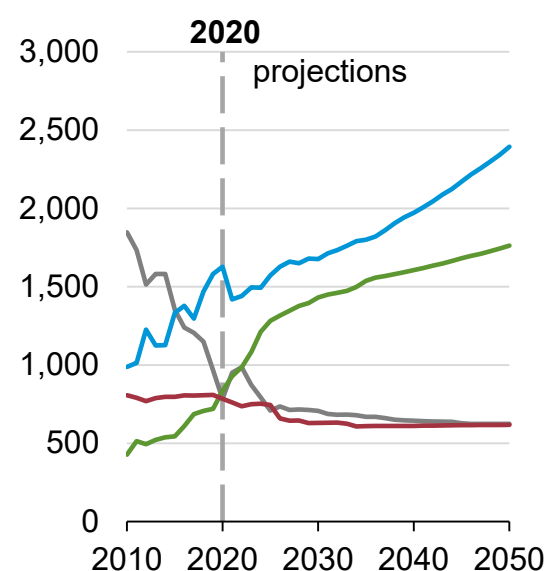
Low Renewables Cost case

billion kilowatthours



High Renewables Cost case

billion kilowatthours



Source: U.S. Energy Information Administration, Annual Energy Outlook 2021

Proposed modeling enhancements for AEO2022

Planned AEO2022 modeling enhancements

- Revise dispatch operating modes to account for net load
- Implementation of renewable capacity credit foresight
- Retire or repowering of wind and solar plants
- Analyze solar diurnal capacity factor to improve capacity credit
- Reexamine solar inverter loading ratio
- Reevaluate market-sharing algorithm for technologies with substantially non-overlapping duty cycles

Planned model developments for AEO2022 (continued)

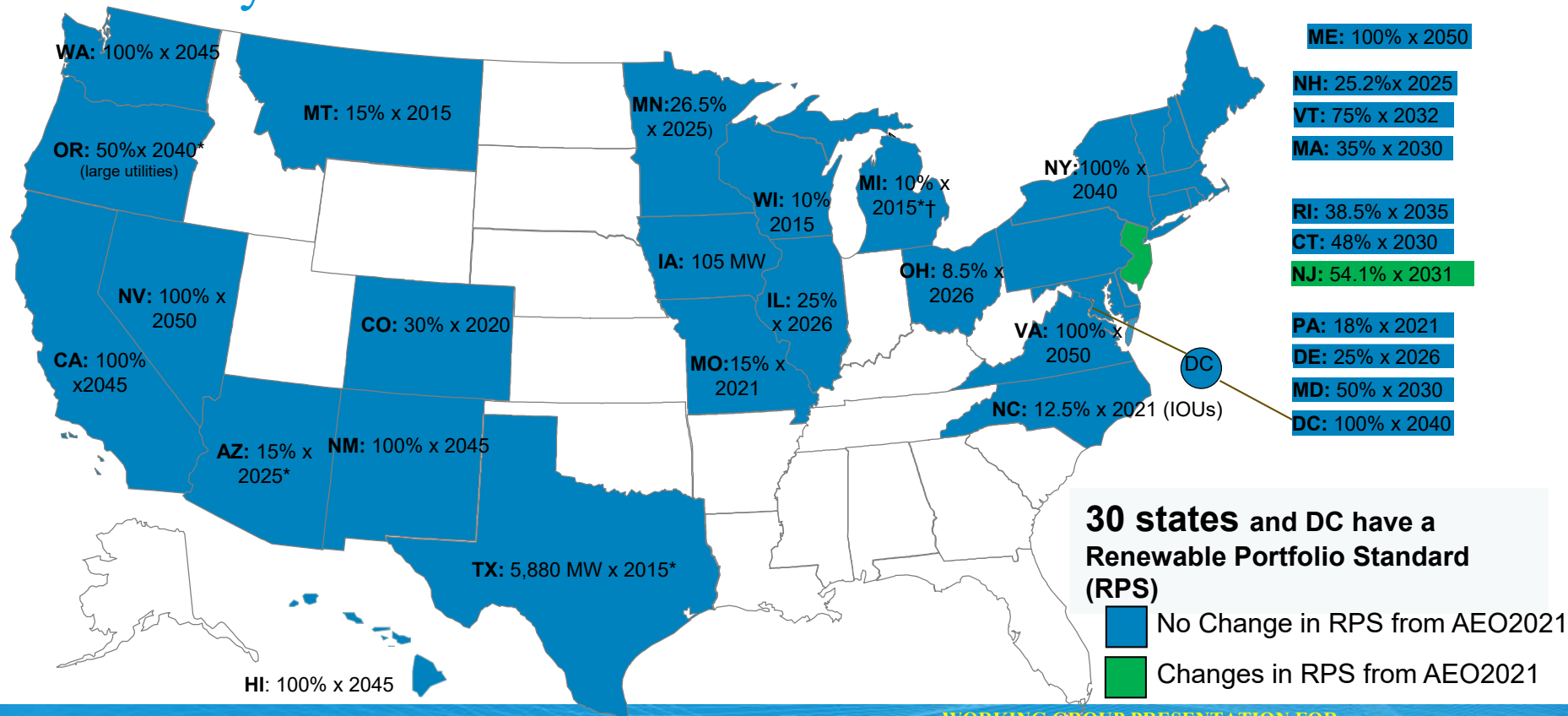
- Evaluate learning-based cost reductions for offshore wind with offshore oil drilling activity
- Implement algorithm to account for declining capacity credit of storage as a result of increased market penetration

Changes to laws and regulations

Changes to legislation and regulations

- Extension of the Production Tax Credit and Investment Tax Credit (December 2020)
- Cross-State Air Pollution Rule (CSAPR) update (March 2021)
 - Updates to seasonal nitrogen oxides budgets for 12 states for 2021-2024
- Affordable Clean Energy (ACE) rule has been removed (January 2021)

State RPS policies will be finalized toward the end of the AEO cycle



Considerations for future long-term domestic modeling

Long-term modeling enhancements

- Hydrogen production and use in the electric power sector
 - Enhancement to improve deep decarbonization scenario analysis by incorporating an option for seasonal storage and a carbon-free reliability fuel
- Biomass generation with carbon capture and sequestration (CCS)
 - Allow for a net negative carbon sink to improve ability to meet net-zero targets while maintaining gross positive fossil fuel-fired generation for reliability and seasonal use
- Non-fossil fuel spinning reserves
- Using a detailed (8760 hr) production cost model to inform long-term model inputs, structures, and results

AEO2022 Outlook Schedule

- Model development: June-October 2021
- Second Working Group Session: September-October 2021
- Expected AEO release: January-February 2022

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Questions or comments?