

# Long Term Reliability Challenges and Considerations: A Bulk Power System Perspective

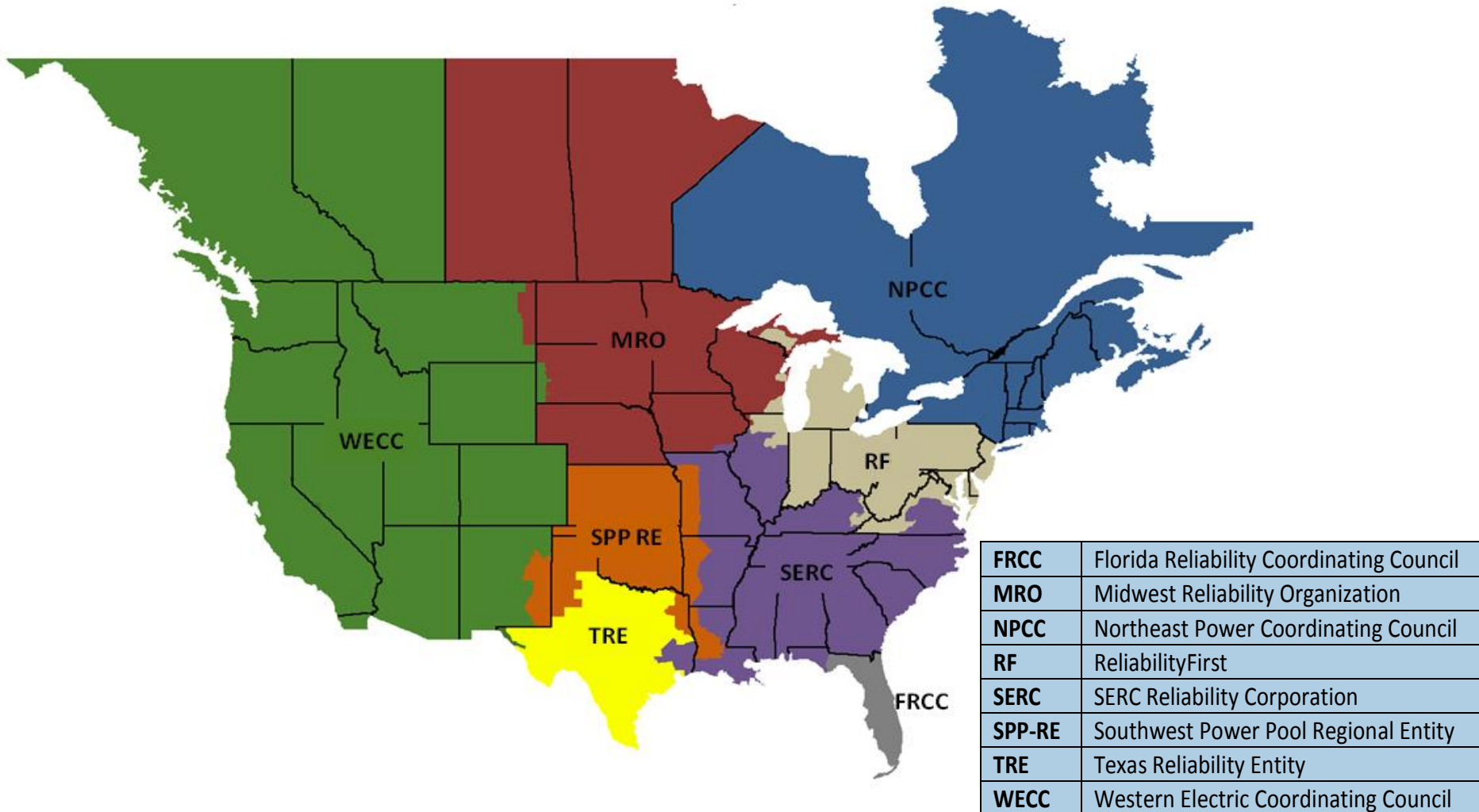
Thomas Coleman, Director, Reliability Assessments

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STB Rail Energy Transportation Advisory Committee, Washington D.C.

**RELIABILITY | ACCOUNTABILITY**

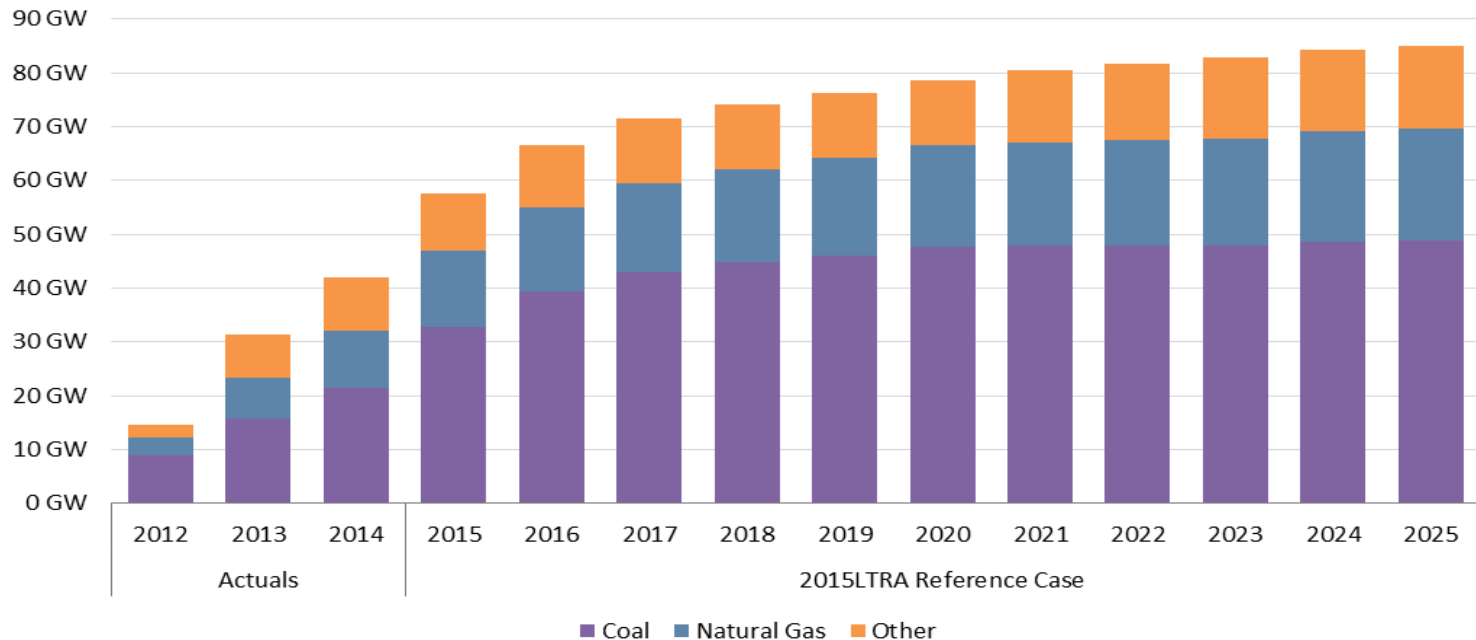




# Reliability Trends and Emerging Issues

- **Reliability Finding:** A changing resource mix requires additional measures and approaches for assessing future reliability
- 21 GW of coal-fired units were retired between 2012 and 2014
- An additional 27 GW are scheduled to retire by 2025
- (excludes impacts of EPA’s proposed Clean Power Plan)

• **Cumulative Actual and Forecast Confirmed Retirements between 2012 and 2025**

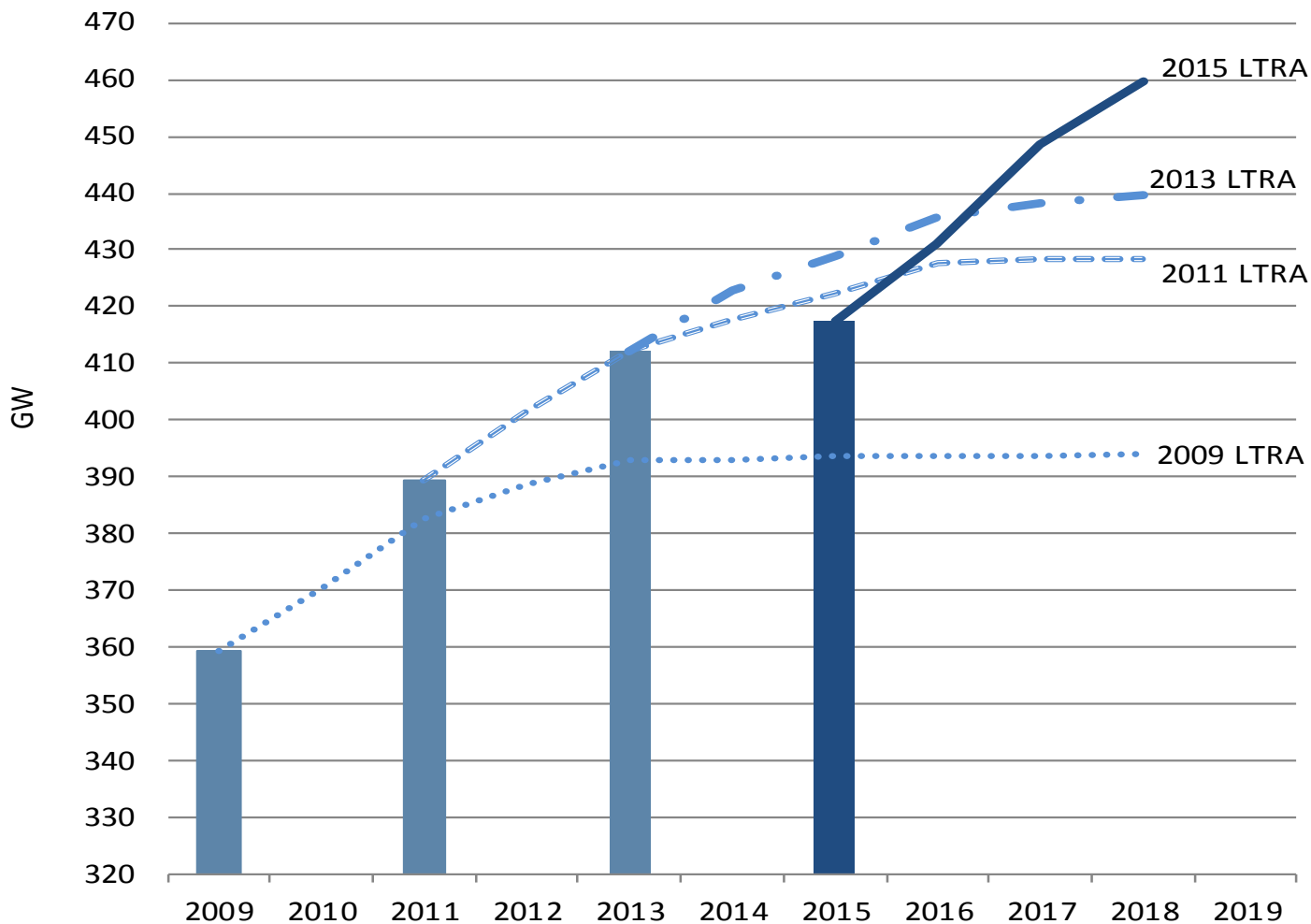


*An increased dependence on natural gas for generating electricity can amplify the bulk power system's exposure to interruptions in fuel supply, transportation, and delivery.*

- Gas pipeline reliability impacts electric generation
- Electric system reliability impacts gas pipeline operations
- Pipeline planning and expansion are different from the electric equivalent
- Communications between pipeline operators and electric Reliability Coordinators are generally weak—though improving!

- Results of NERC study show that with a 90/10 operational risk assessment reserve margins are still attained
- However, a single point of disruption such as Aliso Canyon can have significant effects
- Aliso Canyon directly affects 9800 MWs of gas fired capacity
- Lack of firm transportation and adequate storage provide additional concerns

**Total NERC-Wide On-Peak Gas-Fired Capacity**



## Gas-Fired Capacity as a Percent of Total Capacity (Eastern)

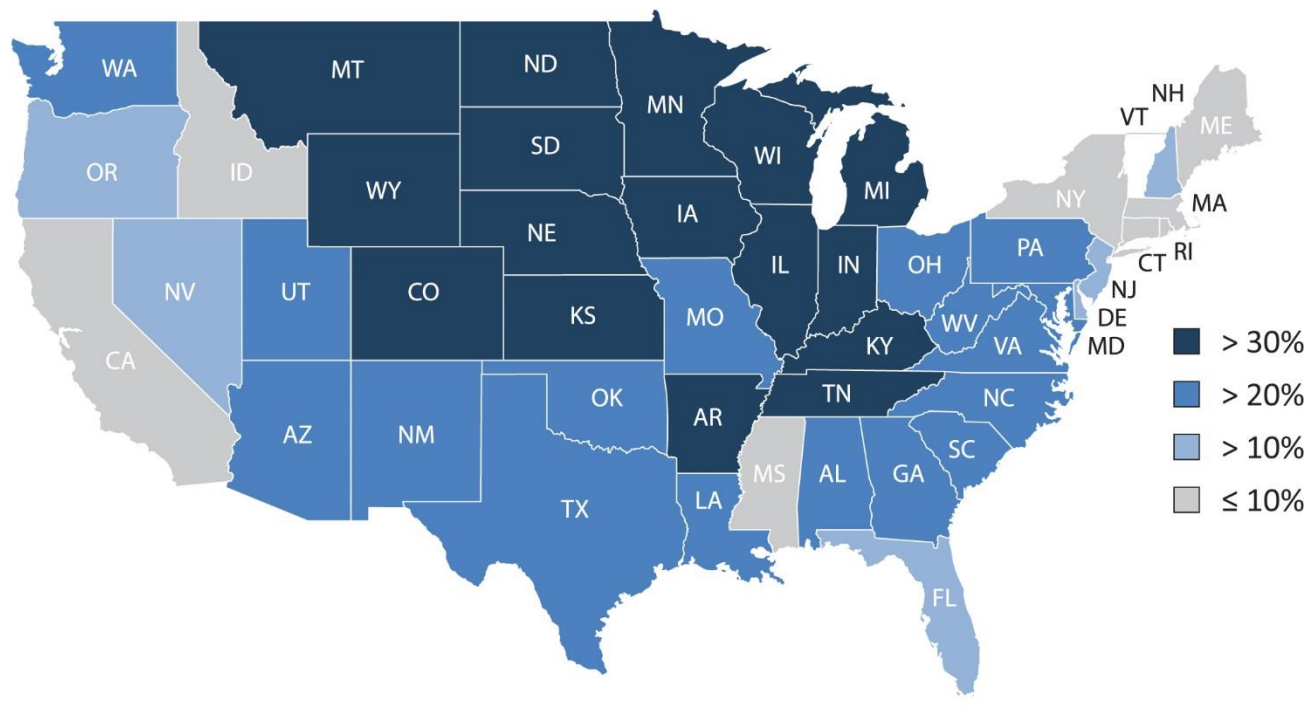
| MISO | New York<br>(NYISO) | New England<br>(ISO-NE) | PJM |
|------|---------------------|-------------------------|-----|
| 39%  | 55%                 | 54%                     | 43% |



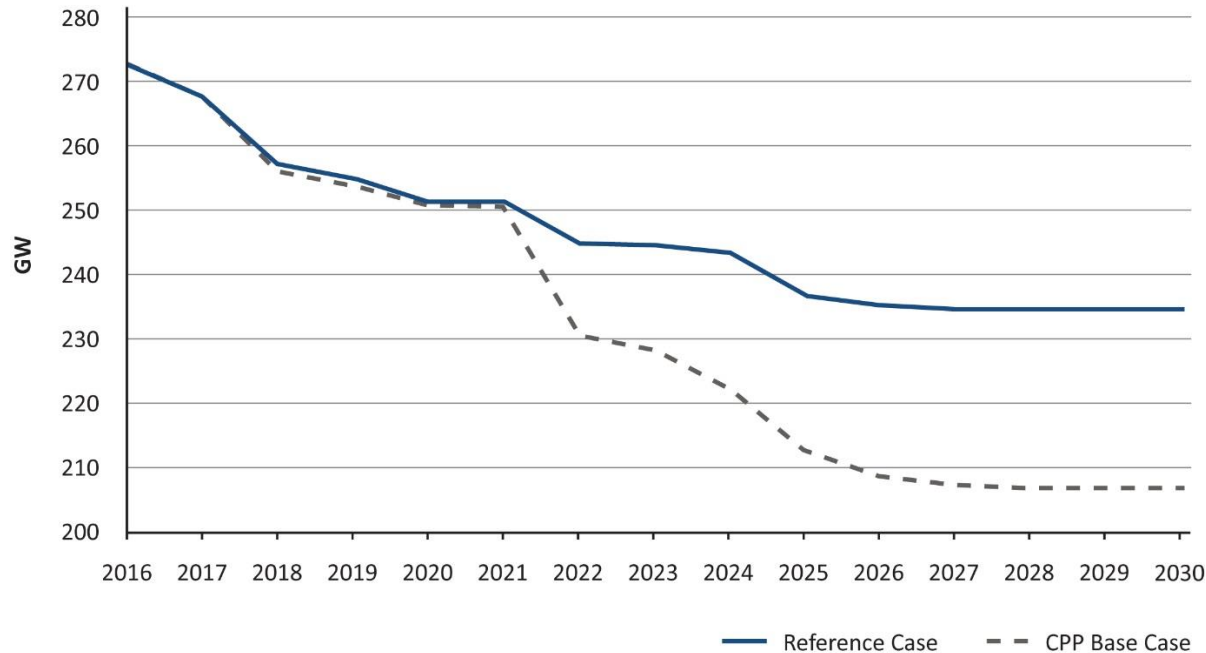
- The final rule extended compliance to
- 2022 from 2020
- Increased total reduction from 30% to
- 32% of 2005 levels
- Envisions Significant Increase in Renewables and Energy Efficiency – Clean Energy Incentive Plan
- Trading is projected by EPA to be a large mitigating factor for attainment of compliance goals

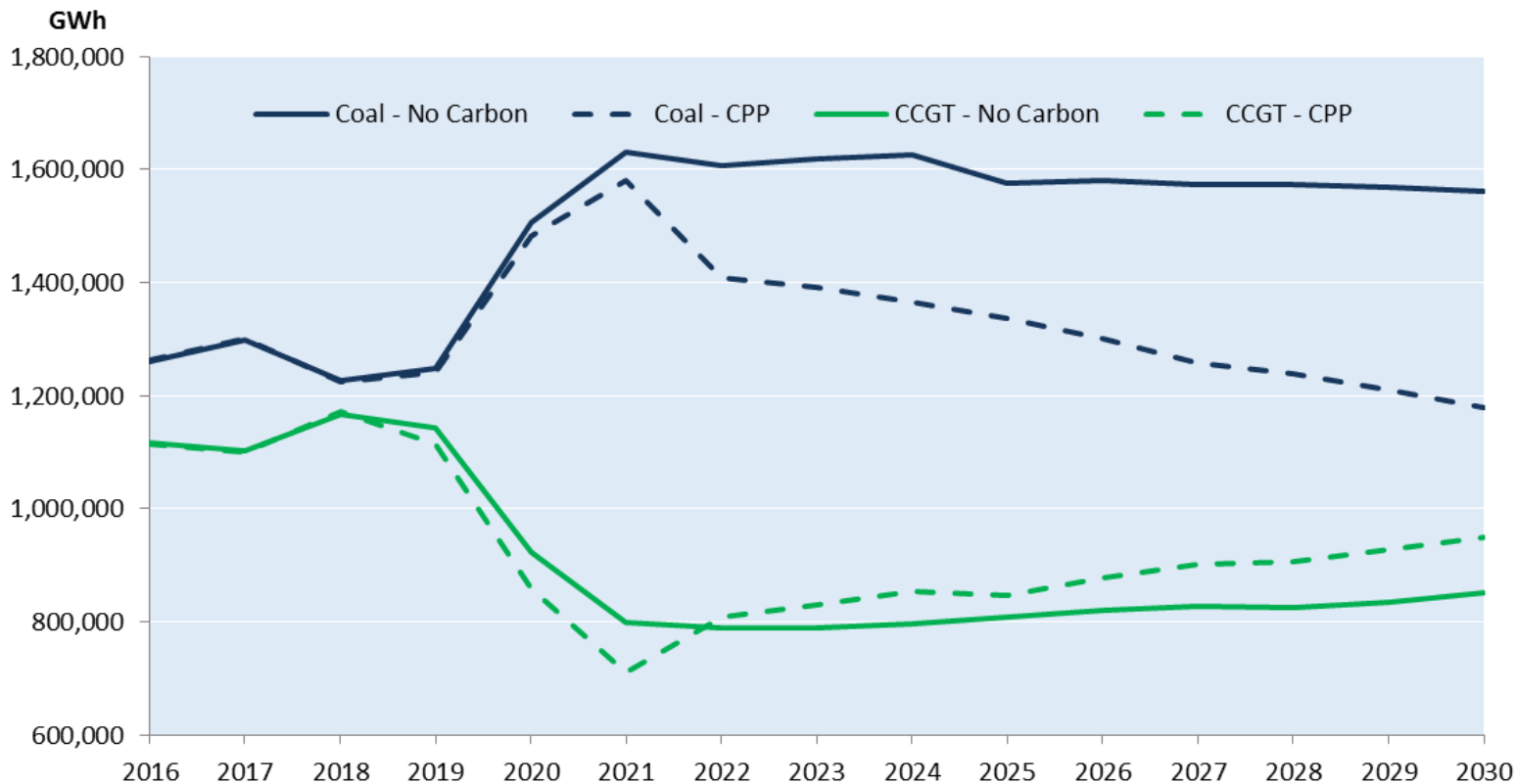


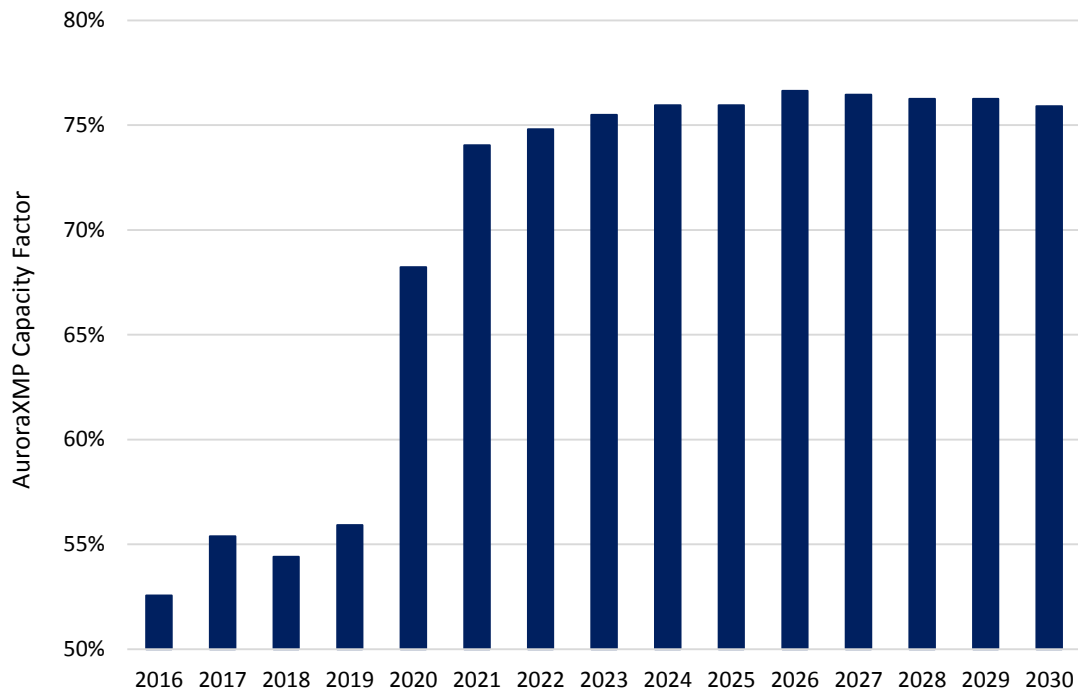
- The CPP is expected to accelerate a fundamental change in the electricity generation mix in the United States and transform grid level reliability services, diversity, and flexibility.

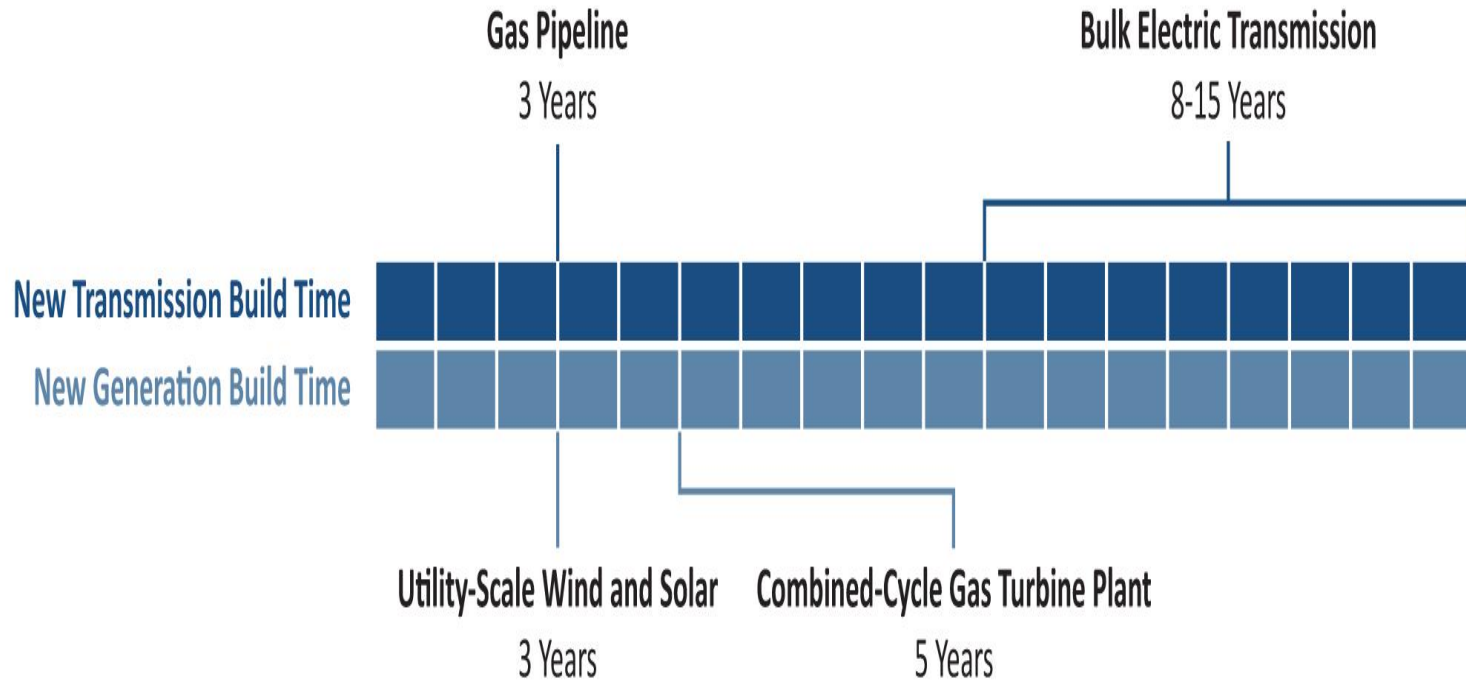


Coal Capacity declines by up to 27 GWs as a direct result of the CPP.

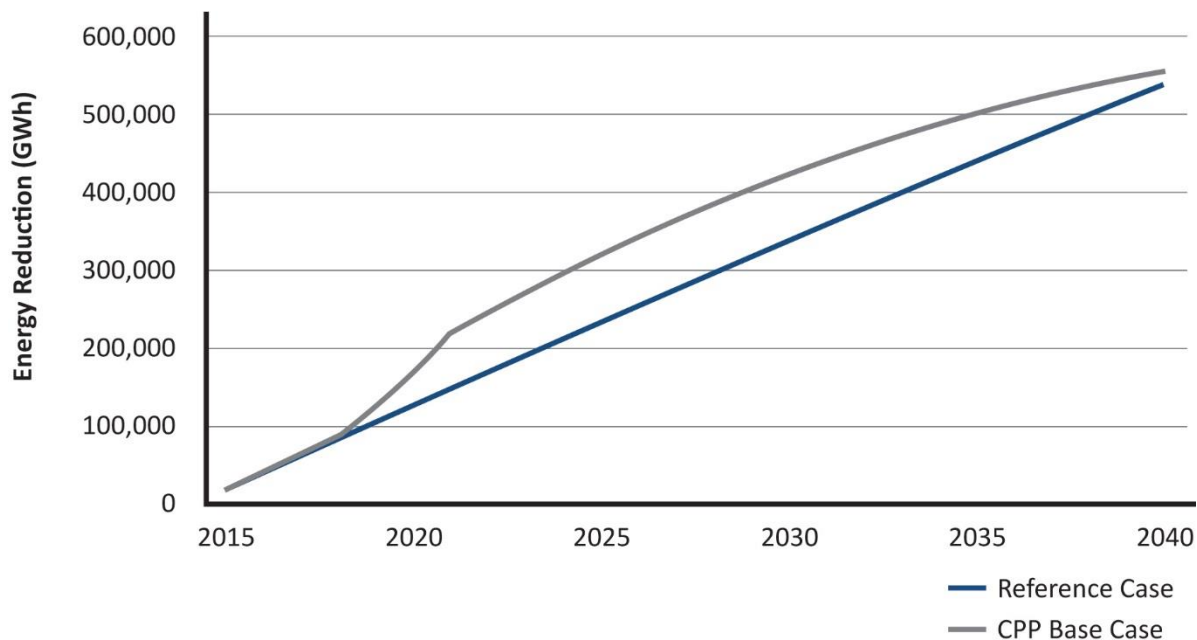


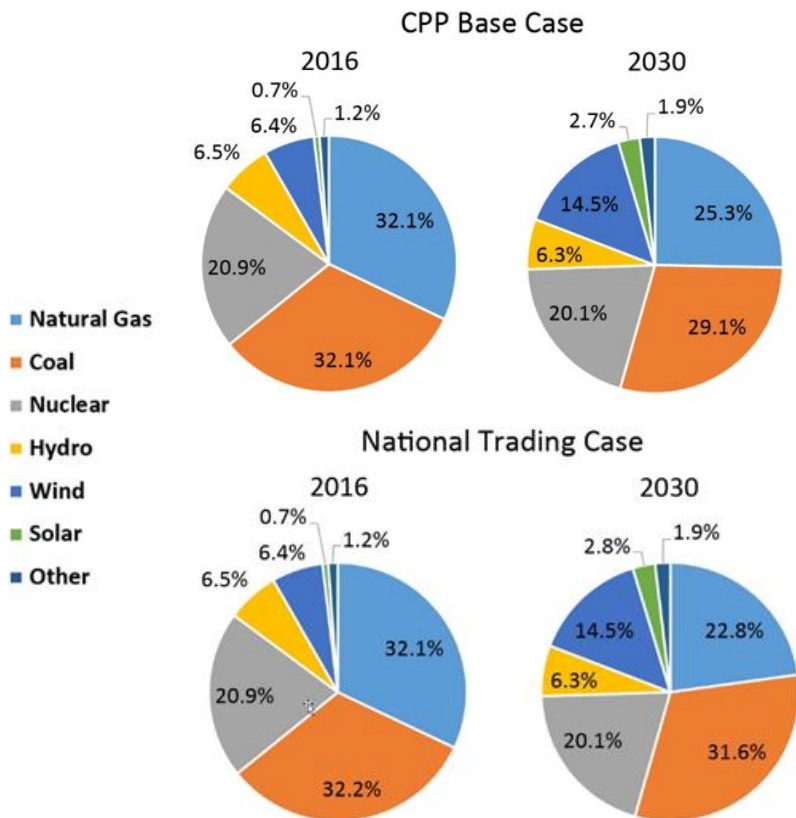






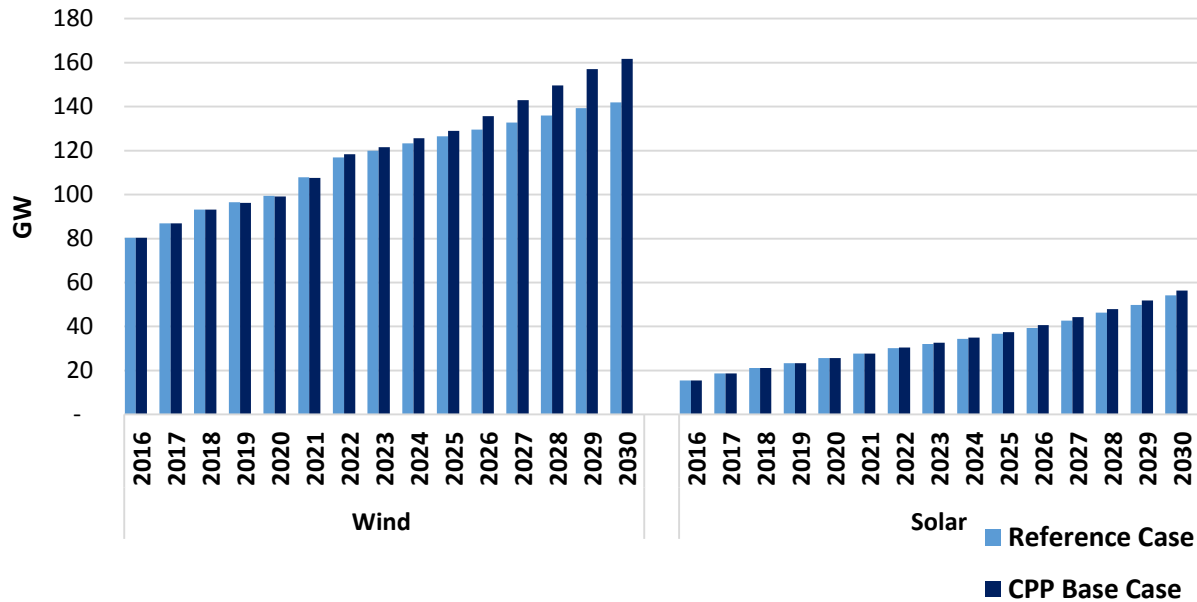
# CPP is Expected to Flatten Annual Energy Demand Growth





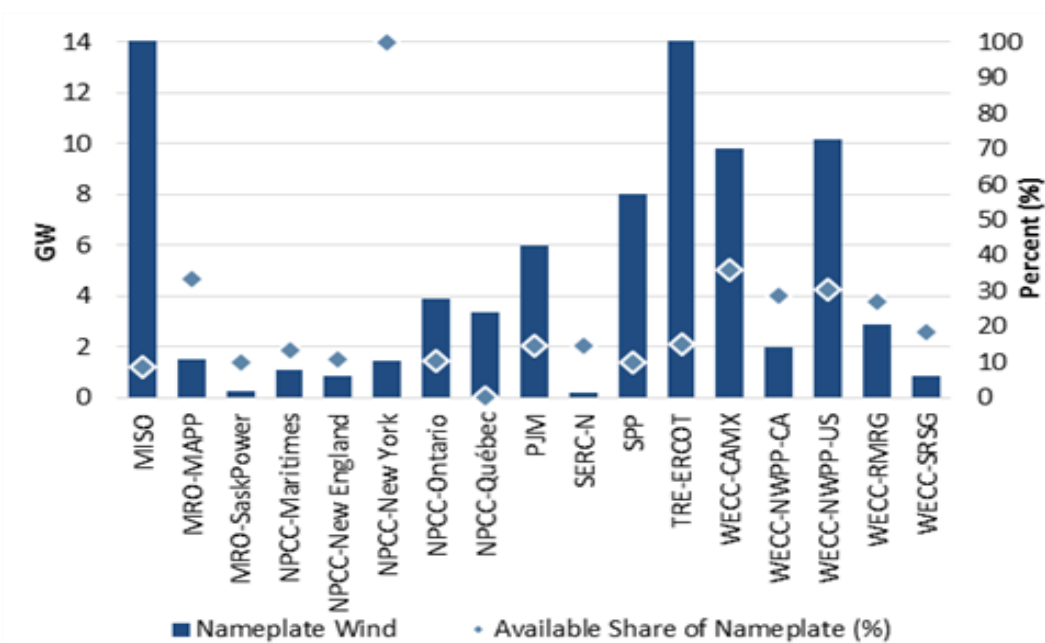
# Integration of Large Amounts of Renewables are Expected to Occur

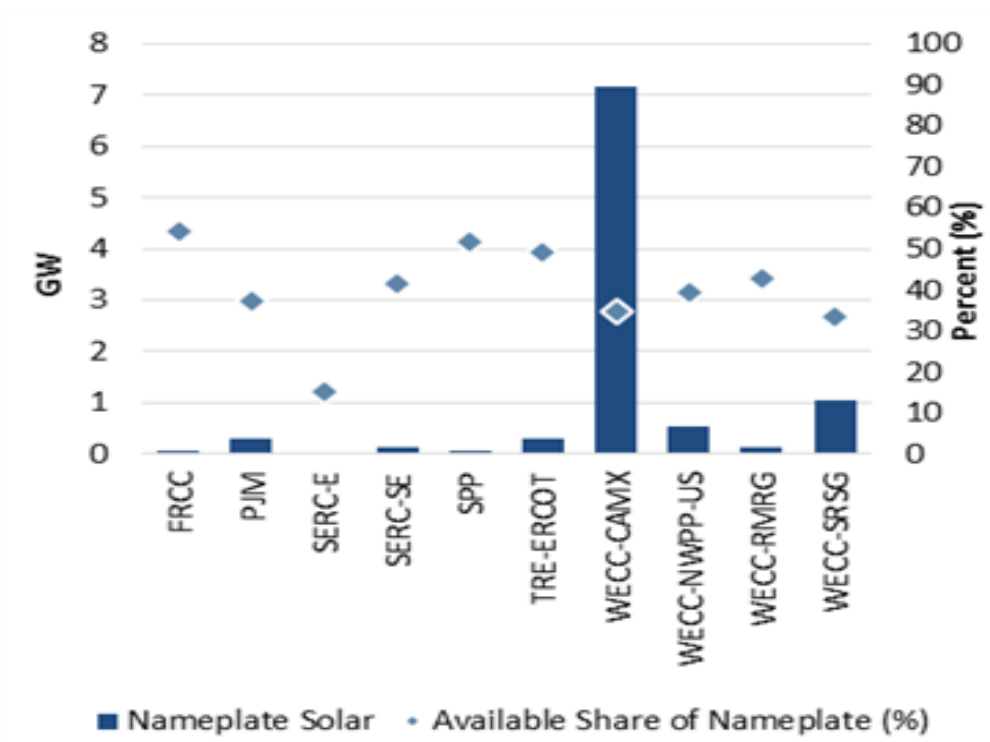
Tax credits and Renewable Portfolio Standards drive renewables.





# Nameplate Wind Capacity V Reserve Margins – 2015 LTRA





- Voltage
- Frequency Response
- Ramping Capability – Duck Curve
- Effects of increasing penetration of distributed energy resources
- Derates of wind for reserve margins

- Growth in the Southeast
- Decline in the Northeast, Midwest, and West
- Effect of natural gas prices on the nuclear equation



# Questions and Answers