

Update from DC

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Congress

- **Tax legislation**
- 2015 renewable tax credit phase-out deal appears to be safe
- A reduction in the corporate tax rate could reduce the value of renewable tax credits for tax equity investors
- Immediate expensing (instead of interest deductibility) could benefit capital-intensive renewables
- **Infrastructure legislation**
- Congress may not get to it
- In theory could drive transmission, although tax credit proposal offers little benefit for most utilities

Federal Trade Commission

- **Suniva case**
- FTC unanimously found harm, FTC's proposed remedy (early November) and Trump decision still TBD
- Proposed module price floor and tariffs could harm US solar installations
- MAKE estimates Suniva's proposed \$0.78/W module floor price would double utility solar 2018 LCOE to \$60/MWh

DOE Grid Study Report

The report correctly finds:

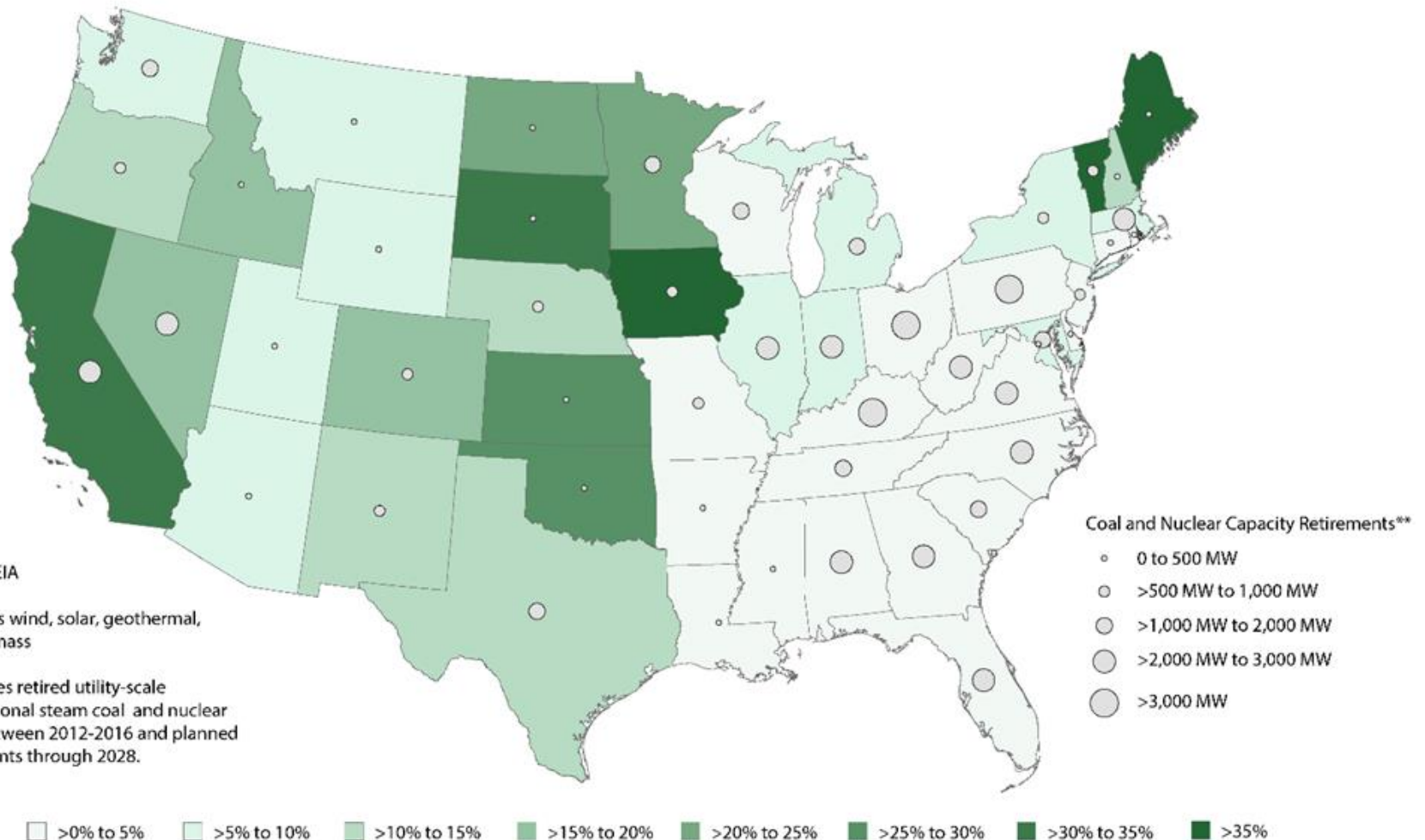
- Reliability is good.
- The primary factor causing coal and nuclear plant retirements is low gas prices.
- Wind energy now provides the reliability services offered by existing resources.

The report also provides a number of valuable policy recommendations:

- Valuing essential reliability services, such as those increasingly provided by renewables.
- Minimizing regulatory barriers to energy production and transmission.
- Accelerating transmission development.

Renewables not primary factor affecting coal and nuclear

Recent and Planned Coal and Nuclear Retirements
and 2016 U.S. Renewable Energy* Share of Electricity Generation, by State



Source: EIA

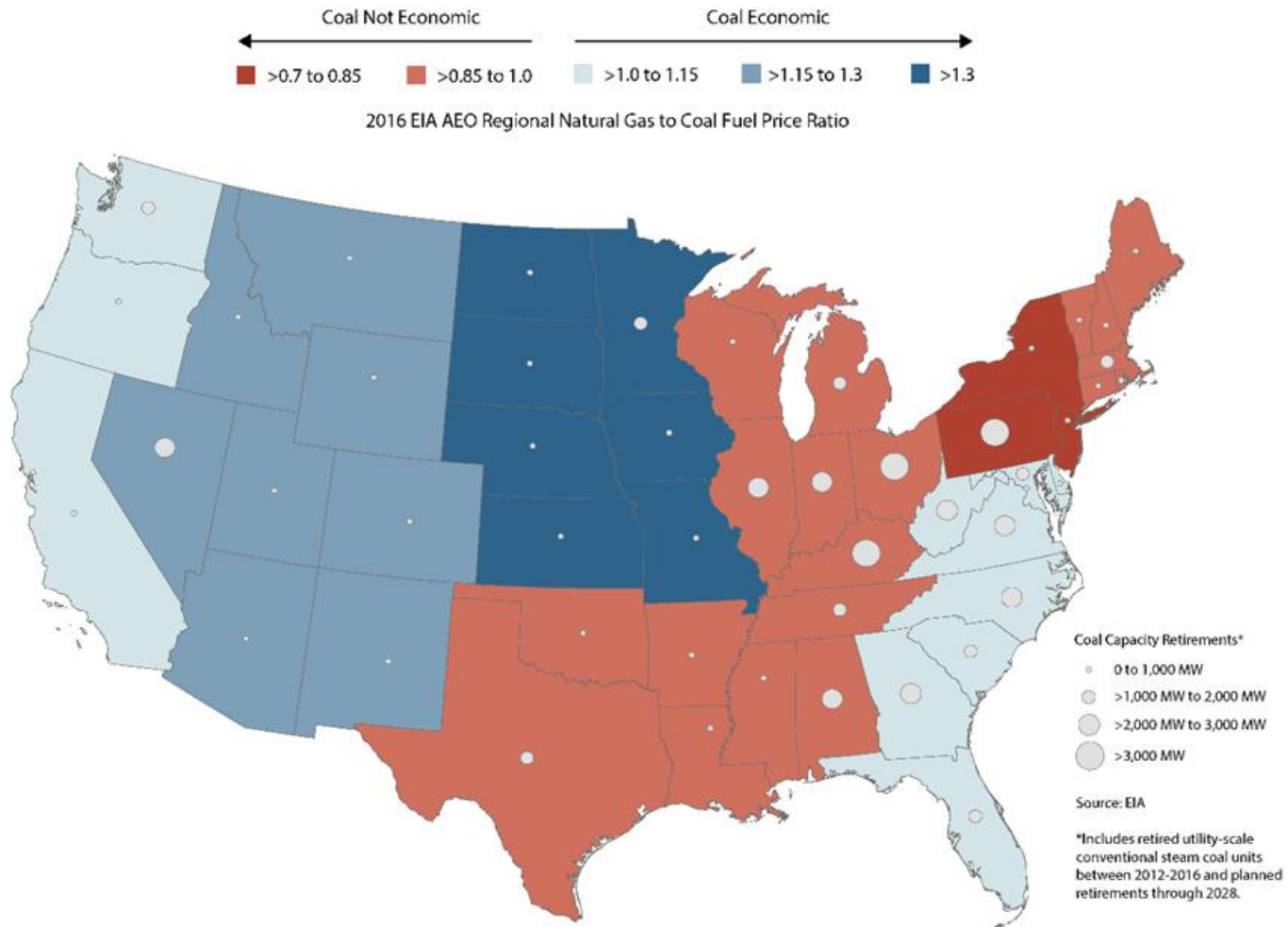
*Includes wind, solar, geothermal, and biomass

**Includes retired utility-scale conventional steam coal and nuclear units between 2012-2016 and planned retirements through 2028.



Cheap gas is primary factor

Recent and Planned Coal Retirements and Economics of Coal versus Natural Gas, by Region





Data on negative prices

- AWEA analyzed 2016 price data at all retiring power plants in wind-heavy ISOs.
- Out of 1.8 million data points, only 55 prices were in the range set by PTC wind projects.
- Removing incentives would have trivial impact on prices, at a fraction of a penny per MWh, particularly for the Day-Ahead markets where coal and nuclear sell their output.

Market prices at retiring generators, by ISO	Real-Time or Day-Ahead Market	Share of prices that are negative	Prices between -\$20 and -\$40 /MWh (offer range for PTC + REC wind project)	Average market price	Average price if all -\$20 to -\$40/MWh prices were \$0/MWh	Price change if wind offered \$0/MWh
PJM	Real-Time	0.88%	0.12%	\$26.41	\$26.44	\$0.03
	Day-Ahead	0.18%	0.003%	\$26.8811	\$26.8818	\$0.0007
ERCOT	Real-Time	1.62%	0.03%	\$21.7825	\$21.7888	\$0.0063
	Day-Ahead	0.08%	0.06%	\$22.635	\$22.649	\$0.014
SPP	Real-Time	2.04%	0.54%	\$21.32	\$21.49	\$0.17
	Day-Ahead	0.59%	0.0017%	\$21.9965	\$21.9969	\$0.0004
MISO	Real-Time	1.20%	0.14%	\$25.413	\$25.451	\$0.038
	Day-Ahead	0.22%	0.003%	\$25.6803	\$21.6810	\$0.0007



Renewables provide reliability services

Reliability Service	Wind	Solar PV	Gas	Coal	Nuclear
Disturbance ride-through	Green	Yellow	Yellow	Yellow	Yellow
Note: For the following reliability services, yellow means the resource can provide the service but during many hours it may not be the most economic choice to do so.					
Reactive and voltage control	Green	Green	Yellow	Yellow	Green
Frequency regulation	Yellow	Yellow	Green	Yellow	Red
Flexibility	Yellow	Yellow	Green	Yellow	Red
Primary frequency response and inertial response to disturbances	Yellow	Yellow	Yellow	Yellow	Yellow
Resilience Service	Wind	Solar PV	Gas	Coal	Nuclear
Note: For the following resilience services, score reflects risk of common mode unavailability reducing fleetwide output below capacity value during challenging time period.					
Cold weather resilience	Green	Yellow	Yellow	Yellow	Green
Hot weather resilience	Yellow	Green	Yellow	Green	Green
Fuel delivery resilience	Green	Green	Red	Yellow	Green
Cooling water resilience	Green	Green	Yellow	Red	Red
Impact on System Variability	Wind	Solar PV	Gas	Coal	Nuclear
Impact on operating reserves and flexibility needs of other generators	Yellow	Yellow	Yellow	Red	Red
Key: Green is positive, yellow is medium value, red indicates that in most cases the resource does not offer that service.					

- Wind turbine power electronics provide excellent ride-through and voltage and reactive control
- ERCOT obtains much of its downward primary frequency response from wind plants
- Xcel Colorado often uses wind to regulate frequency
- All ISOs now fully dispatch wind under the same market rules as other resources
- Wind plants outperformed as many fossil plants faced forced outages in Polar Vortex and 2011 ERCOT cold snap
- Contingency reserves for large conventional plant failures more expensive than slow reserves for wind variability

DOE proposal to FERC

- “would bring an end to competitive power markets, is not clearly needed to ensure grid reliability and resiliency, and would be very expensive.” **Morgan Stanley**
- “Effectively re-regulating a major portion of the currently de-regulated organized markets via a cost-of-service system would presumably render any existing discernable market pricing mechanisms irrelevant.”
JP Morgan
- “DOE rulemaking threatens to destroy wholesale markets with no tangible benefit” **Energy Innovation**
- “a dreadful policy proposal” **Alison Silverstein, DOE consultant**
- “this proposed rule has something for everyone to dislike” **Advanced Energy Economy**
- “the proposal is an arbitrary backdoor subsidy to coal and nuclear plants that risks undermining electrical competition throughout the United States.” **conservative R Street Institute**
- “the proposal from the Department of Energy is an excessive and unnecessarily distortive means of pursuing a more appropriate valuation for secure baseload generation capacity. Like using a sledgehammer to swat a fly, this rule would end up causing enormous destruction even if it also managed to provide more resilient baseload capacity. Guaranteeing cost recovery for certain types of generation would destroy electricity markets.” **Koch front group IER**
- “I have never seen a credible argument — not one — that there is a problem with resiliency and reliability.” “The irony is that Republicans — which is supposed to be the party of fiscal responsibility and market solutions — have been the least supportive of markets in the electricity sector since they were developed.” **Republican former FERC Commissioner Nora Brownell**
- “Christmas turd” **Pat Wood III, Republican former FERC Chair, Chairman of coal-heavy Dynegy**

Broad Anti-NOPR Coalition

Process

- AWEA, SEIA, ELCON (large consumers), NRECA, APPA, EPSA, American Petroleum Institute, etc joint filing
- Argued 60 days for decision not enough, evidentiary record insufficient, etc
- Initial procedural filings rejected: Comments to FERC due October 23, reply comments November 7
- FERC must respond to DOE in some fashion, unlikely to accept order as drafted
- Last week, FERC staff posed dozens of questions for commenters to answer

Substantive comments

- Competitive providers filed letter in opposition yesterday: Dynegy, Invenergy, Tenaska, CPV, LS Power
- Many others are working on comments

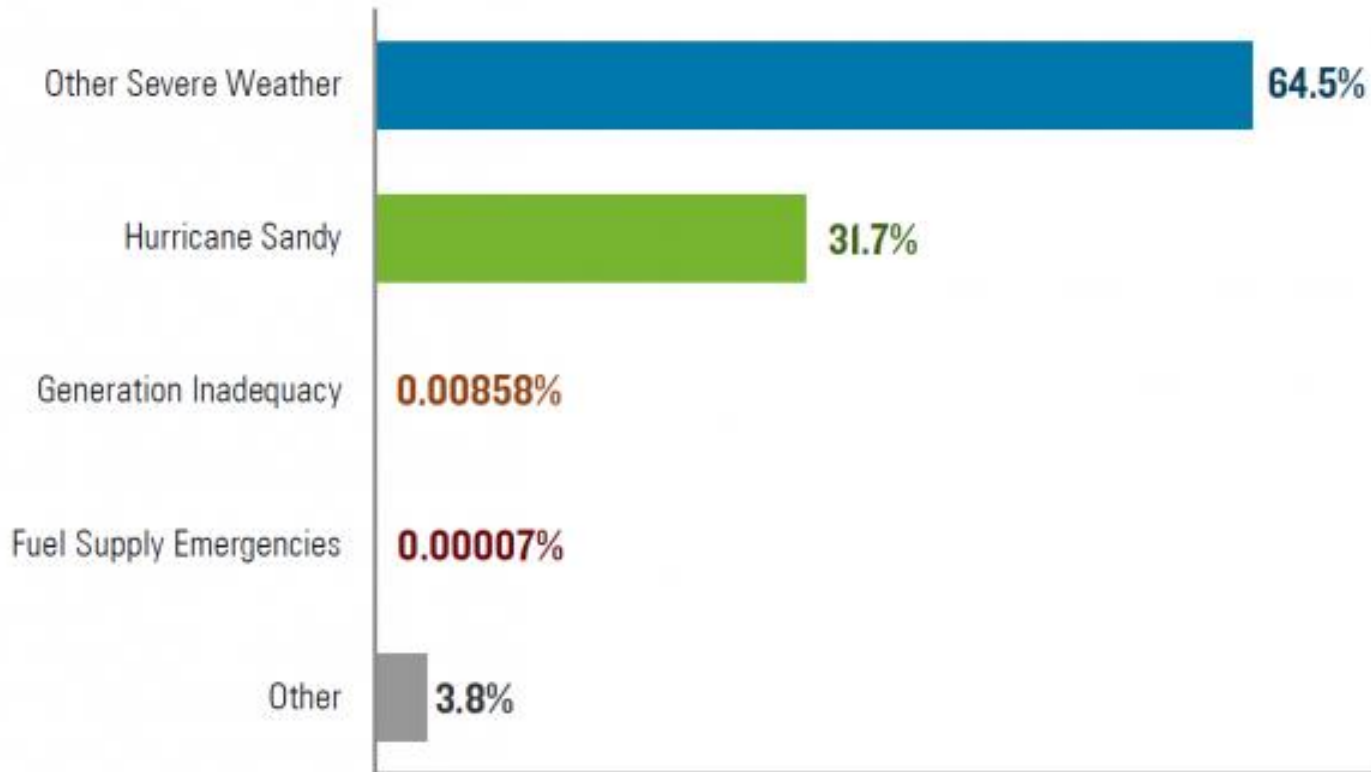
Primary points to be made

- No emergency: reliability and resilience is good and increasing per NERC, DOE, ISOs, etc
- No evidentiary record to support proposed order
- Proposed requirements (90 days onsite fuel, ability to provide “operating reserves” and “frequency services”) are arbitrary and many coal and nuclear plants do not meet them
- Need diversity of resources to provide diversity of needed services
- Cost-of-service per MWh payments will distort if not destroy electricity markets that provide reliability
- Proposal would add billions to consumers’ electric bills for no benefit
- Strengthening grid and markets will benefit consumers and reliability

Transmission builds resilience

Figure I: Cause of major electricity disturbances in the US, 2012-2016

Share of total customer-hours disrupted



Source: EIA and Rhodium Group analysis

- Fix cost allocation and planning, particularly for interregional transmission
- Streamline permitting of transmission

Price formation and market reforms

FERC should work with ISOs to explore market reforms that value needed services without favoring any particular resource or undertaking a risky overhaul of the wholesale markets.

Potential market reforms could include:

- Co-optimize energy and ancillary service markets to ensure that resources are adequately compensated for providing ancillary services.
- Expand ancillary services markets to fully compensate resources for the grid services they provide, including payment for reactive power service.
- Remove barriers to market participation for demand response and other innovative resources, including allowing end-use resources to see real-time price.
- Finalize NOPR on Primary Frequency Response and direct RTOs/ISOs to develop markets for procurement and compensation of the service including premium for fast product.
- Finalize the Fast-Start Pricing NOPR, and potentially expand to resources other than Fast-Start, to increase dispatch efficiency and minimize uplift costs.
- Bring self-scheduled resources into markets.
- Ensure capacity market rules are not discriminatory.
- Implement probabilistic unit commitment.
- Promote markets and efficient operating practices, particularly in the Western U.S.