



# **Lignite Energy Council Fall Conference 2017**

# **Time To Act**

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# Recent Challenges

- Externalities
- MATS
- Next Gen Act
- Regional Haze
- Clean Power Plan


**PRIORITY**



# Can we say the War on Coal is Over

- **We can either act or be acted upon**
- Competition from other energy resources
- Uncertainty surrounding future regulations
- Public perception of lignite and coal in general

How do we act?

- 
- **We can either act or be acted upon**
  - Engage Grassroots
  - Pro-Coal Messages
  - Link the coal industry to people's lives
    - Three new videos



# Act or be acted upon

- Continue R&D
  - Expand R&D Away from solving regulatory challenges to creating new opportunities
  - CO2
  - Rare Earth
  - Combined Heat and Power
  - Other Value-added projects
- Engage Federal Policy Makers
  - Grid Study Opportunity



# Current R&D Projects

- Transformational Technologies - Pathway to Low-Carbon Lignite Utilization - Allam Cycle
- Technologies for Enhancement of the Existing Fleet with Carbon Solutions
- Suite of CCUS technology development projects
- Rare Earth Element Extraction from North Dakota Coal-Related Feedstocks
- Advanced Reclamation Strategies for North Dakota Coal Mine Lands



# Rare Earth Elements Project

- Evaluating options for recovery of rare earth elements associated with ND lignite deposits
- First phase shows promise as potential business opportunity in ND
- Proposal for second phase of work has been received
- DOE providing 80% of funding

# Secretary Perry requested a grid study in April 2017

## The memo asked staff to examine:

- The evolution of wholesale electricity markets
- Compensation for resilience in wholesale energy and capacity markets
- Premature baseload power plant retirements





# Process and report framework



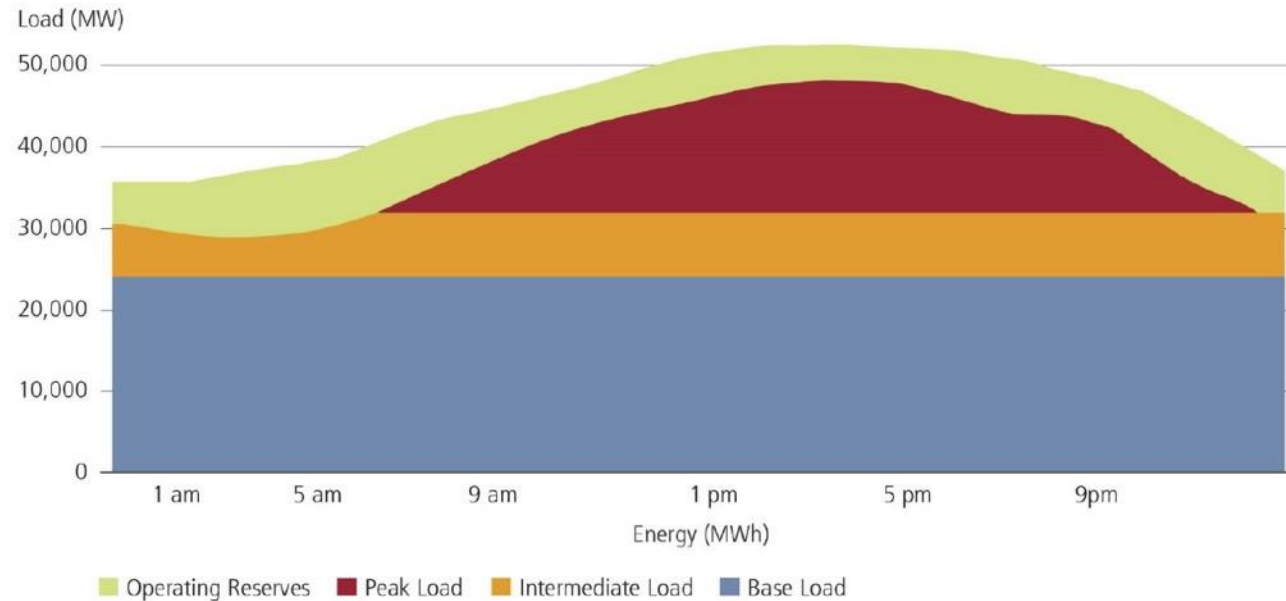
# Study scope: 2002-2017

## **EIA data from this period captures several important trends:**

- Merchant generation competing in centrally-organized markets beginning in the mid-2000s
- The shale revolution and a significant increase in natural gas supply
- The drop in electricity demand in 2008 following the recession and subsequent flat demand growth
- Higher variable renewable energy (VRE) penetration beginning to impact grid operations in certain areas
- The expanded participation of demand response in wholesale markets starting around 2010

# Key definitions

Figure 1.2. Schematic of Typical Daily Load Curve Showing Base Load<sup>13</sup>



- **Baseload power plants:** *defined by their operation*
  - High, sustained output levels
  - High capacity factors
  - Limited cycling or ramping
- **Premature retirement:** *subjective term*

# Key findings

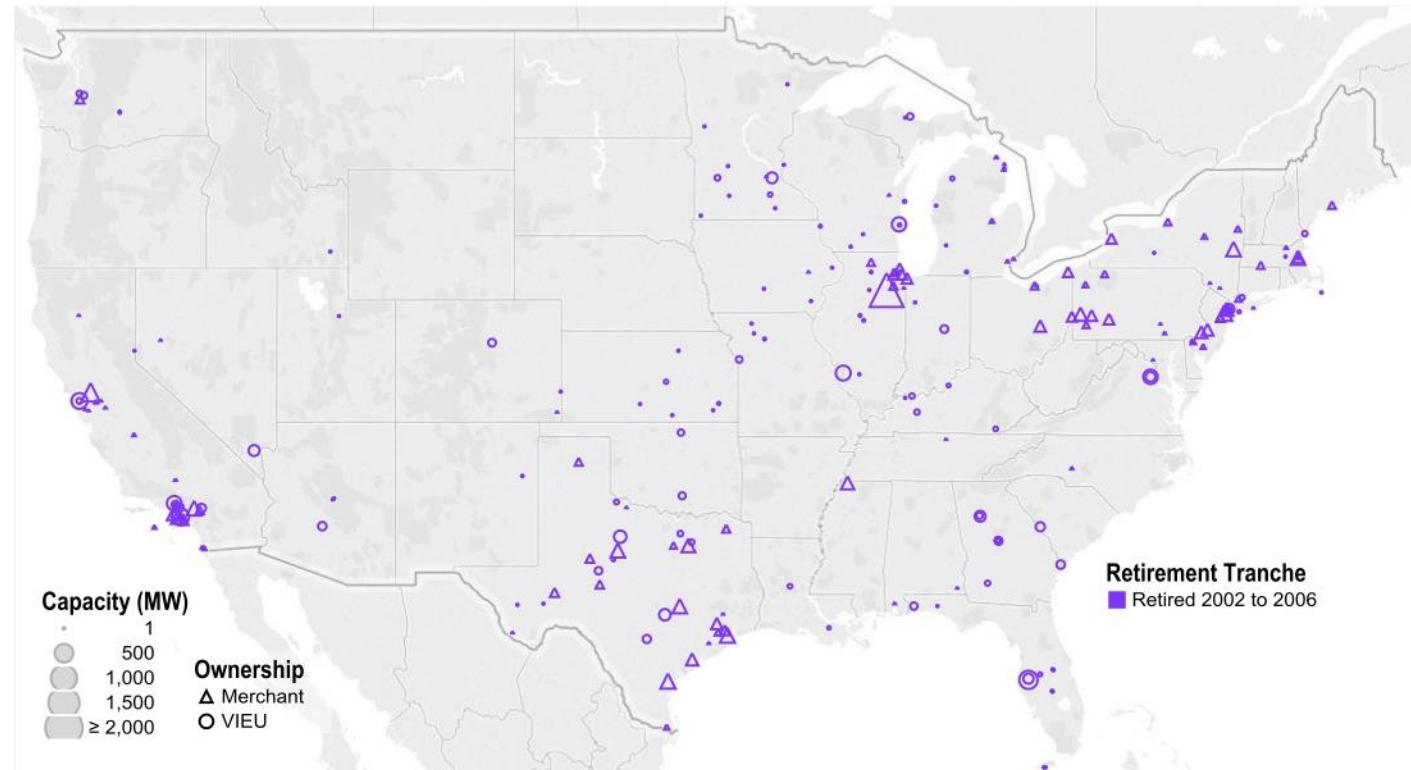
## Wholesale Markets and Affordability

- Changing circumstances are challenging electricity markets
  - The “missing money” problem
  - Negative pricing in certain areas
- Markets do not currently value all attributes of electricity provision
  - Examples: jobs, local economic development, national security



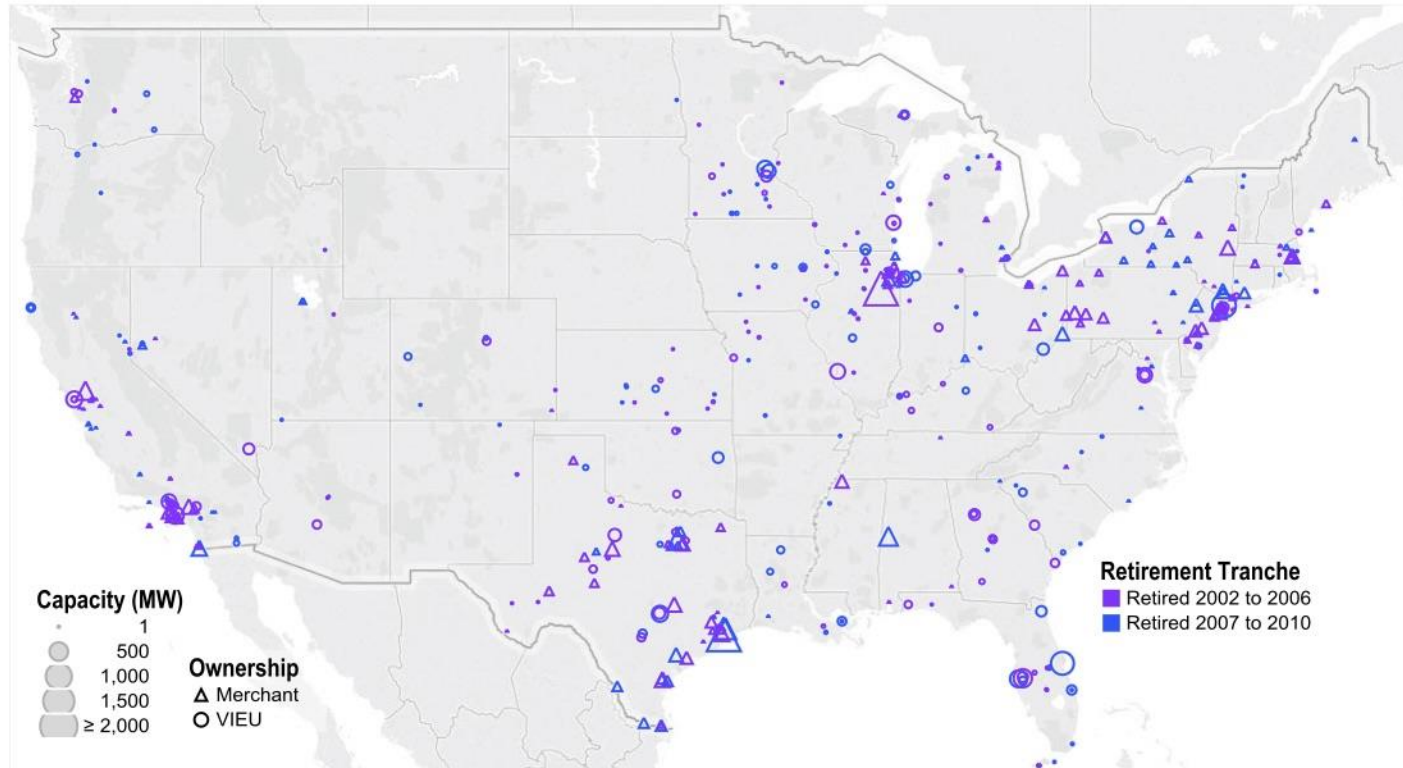
# Power Plant Retirements

# Retirement tranches by size, ownership



- **2002-2006: restructuring. Majority of retirements are smaller, older merchant plants**

# Retirement tranches by size, ownership

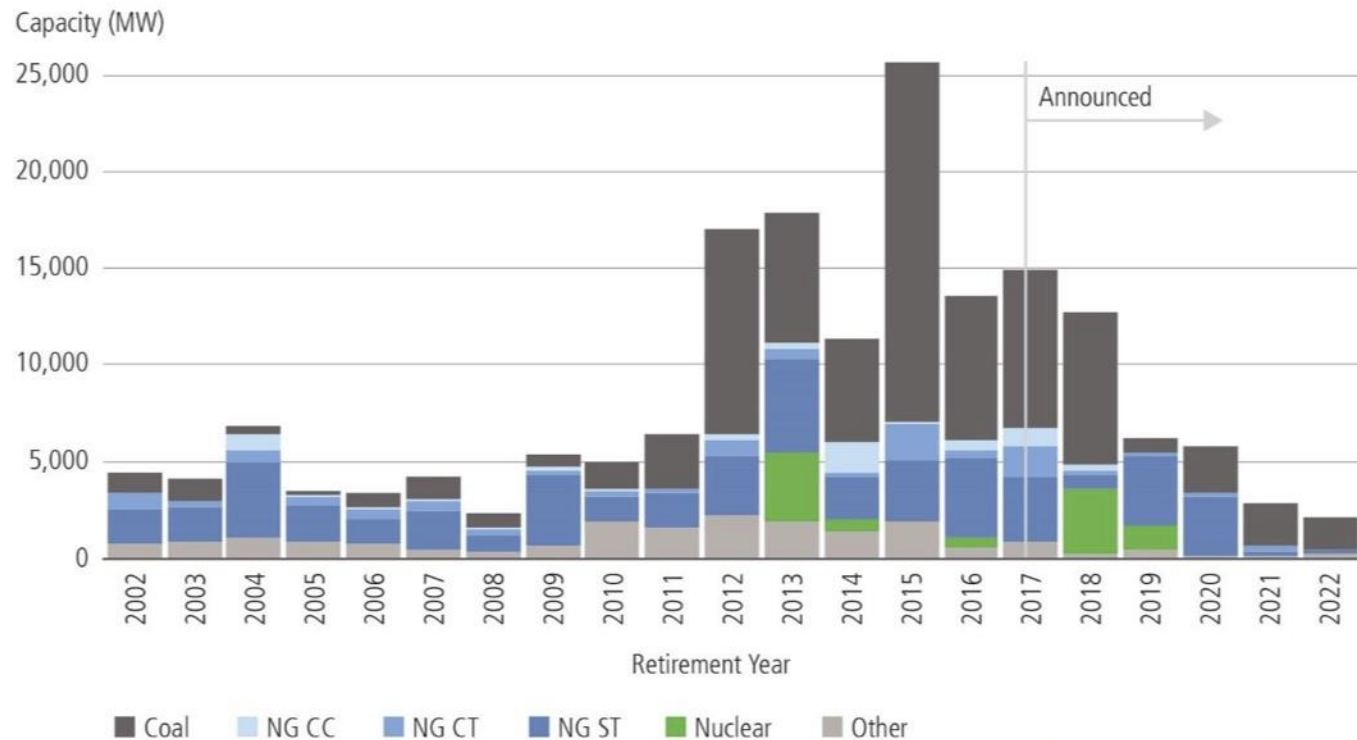


- 2002-2006: restructuring. Majority of retirements are smaller, older merchant plants
- 2007-2010: economic recession, shale gas, *Mass v. EPA*, strong utility-scale wind growth

# Retirements by fuel type

## Coal, total retirements peaked in 2015

- MATS deadline
- Clean Power Plan finalization

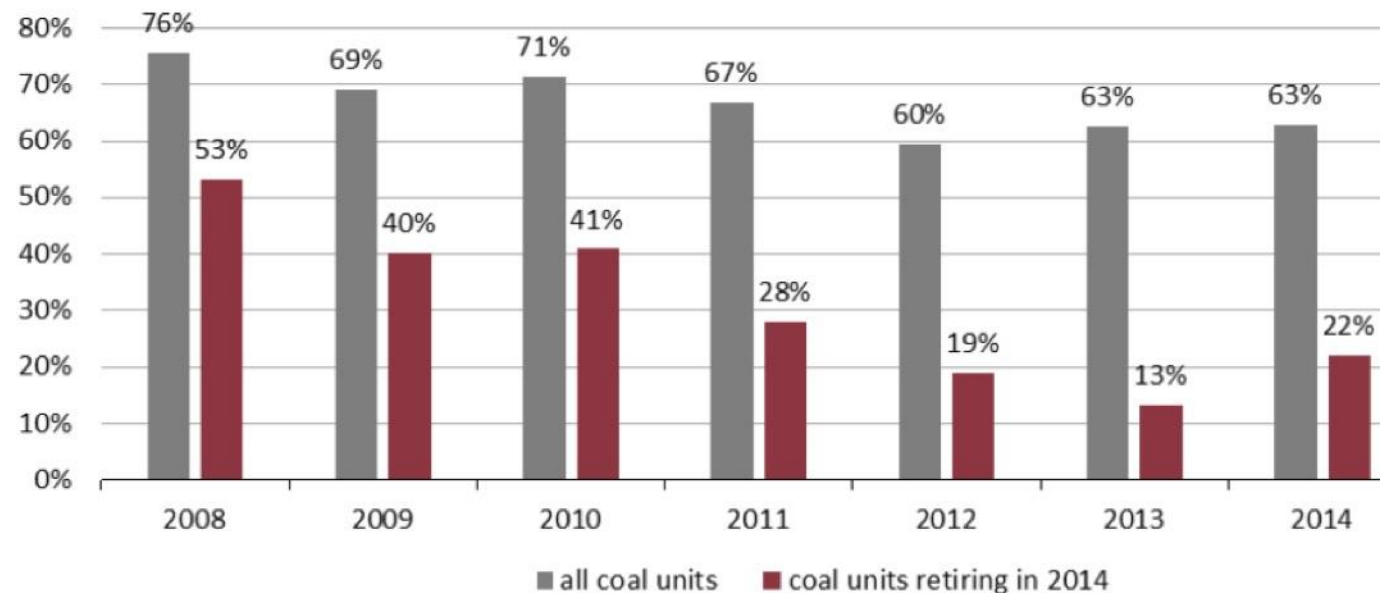




# Retirements: Coal

- Net retirement of 36,000 MW or 12% of 2002 coal fleet
- Coal plants that retired recently did not operate as baseload
  - Retired plants were smaller, older, had higher heat rates, and therefore were dispatched less often and ran at lower capacity factors

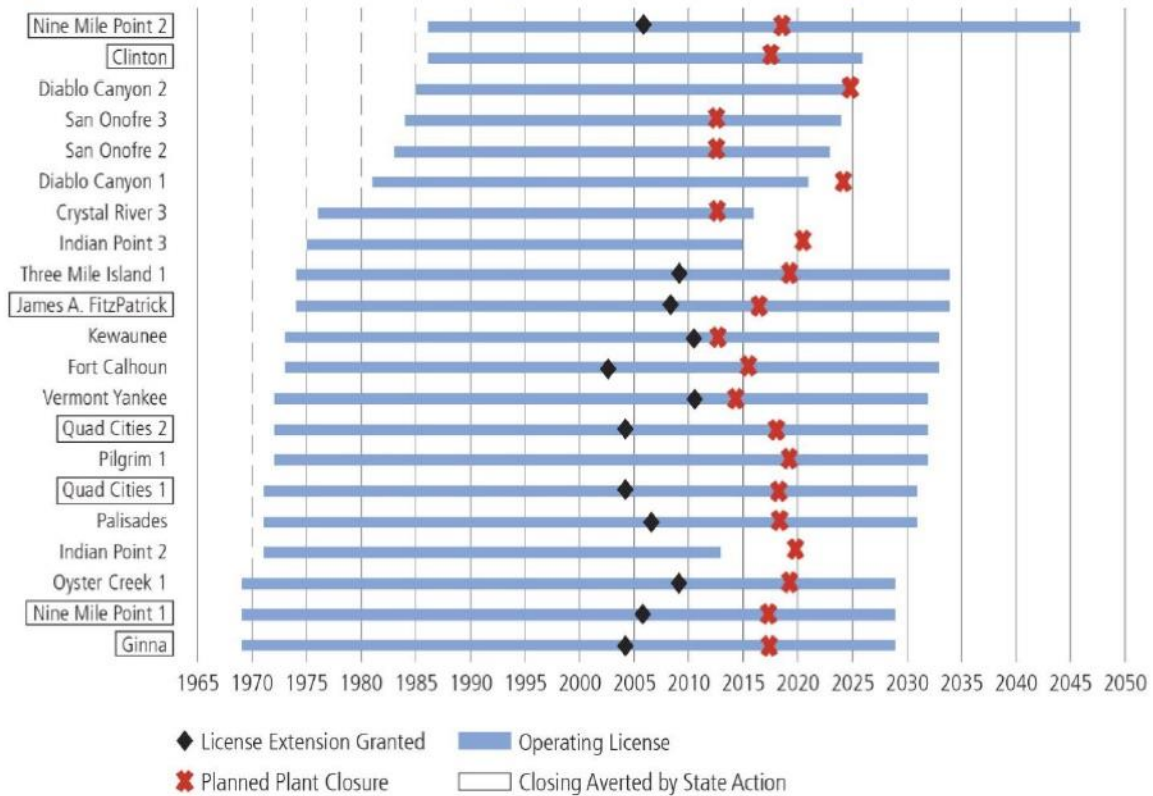
Figure 3.23. Average Coal Plant Capacity Factors, 2008–2014<sup>148</sup>



Source: EIA Form 860 and Form 923

# Retirements: Nuclear

Figure 3.15. Nuclear Plant Retirements Compared to NRC Plant Operating License Terms<sup>84 85 86</sup>

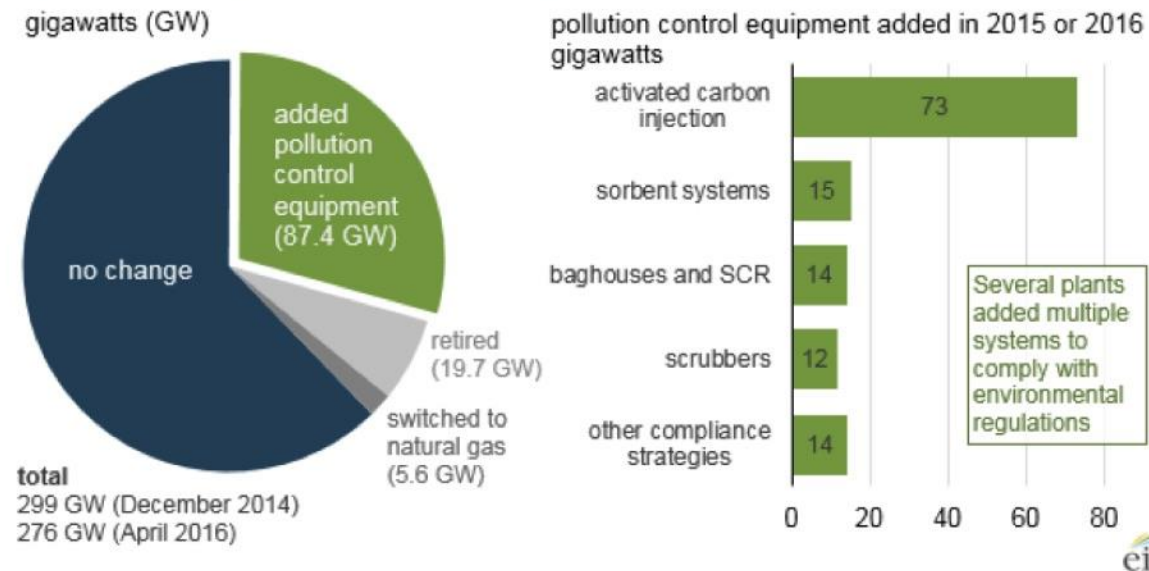


- **Between 2002-2016, 4.6 GW or 4.7% of the total nuclear fleet announced retirement**
- **BNEF estimates that 34 of the total 60 plants are operating in the red**
- **Many plants closing well before their operating licenses expire**

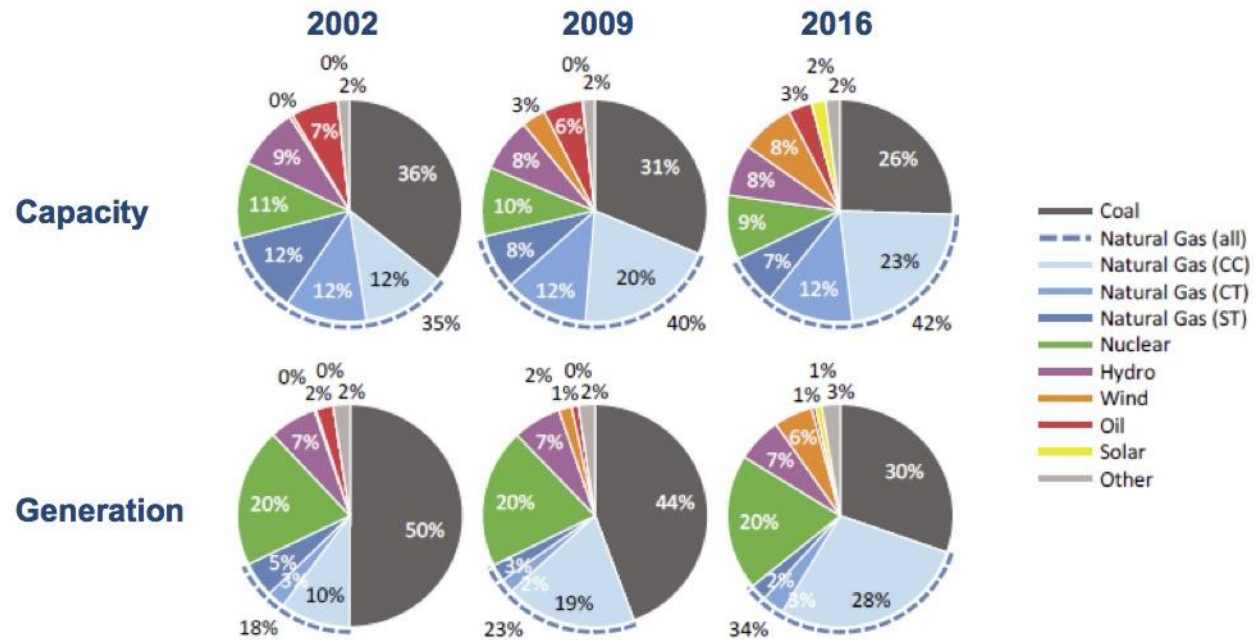
# Retirements: Environmental regulations

- Reported planned retirements suggest that approximately 27,000 MW or 8.5 percent of 2011 coal-fired capacity was rendered uneconomic under the combination of regulatory compliance costs, low demand growth, and low natural gas prices
- Difficult to tease out relative impact of regulations on retirements in isolation

Figure 3.22. Changes in U.S. Coal Capacity, December 2014–April 2016<sup>141</sup>



# Reliability vs. Resilience



- **Greater diversity doesn't always mean greater system reliability or resilience**
- **PJM simulation: when subjected to a polar vortex event, only 34 of the 98 portfolios which were classified as desirable in terms of *reliability* were also *resilient***

# Resilience: Withstanding and recovering from extreme weather events

## Polar Vortex (Jan 2014)

- Fuel-gelling in natural gas generators in the Northeast
- Frozen gas fields and compressors in Texas
- Frozen conveyer belts and coal piles

## Superstorm Sandy (Oct 2012)

- Three nuclear reactors shut down
- Two key natural gas compressor stations downed in northern New Jersey

**Hurricane Irma (as of 9/13/17): 3,515,268 customer outages in Florida (35% of total state customers)**

# Key policy recommendations



## Department of Energy

- Support industry efforts and focus R&D to enhance system resilience (for example, OE awards)
- Accelerate and reduce costs for re/licensing and permitting
- Facilitate programs for workforce development
- Prioritize energy dominance and EO 13783
- Increase coordination of electric and natural gas industries

## Federal Energy Regulatory Commission (FERC)

- Expedite efforts to reform energy price formation
- Value new/existing essential reliability services

## Environmental Protection Agency (EPA)

- Allow coal-fired power plants to improve efficiency and reliability without triggering new regulatory approvals and associated costs

## Nuclear Regulatory Commission (NRC)

- Revisit nuclear safety rules
- Ensure safety without unnecessarily adding costs

# Further research areas

Market Structure and Pricing	Reliability and Resilience	Cost and Affordability	Regulatory
Study mechanisms to enable equitable, value-based remuneration for desired grid attributes	Develop policy metrics and tools for evaluating system-wide provision of these attributes	Estimate system-wide costs of different generation mixes and sensitivities to fuel price fluctuations	Explore potential to utilize existing authorities to ensure system reliability and resilience
Evaluate ongoing capacity market reforms	Examine ways to improve power generator fuel delivery data collection	Update analysis of subsidies and support for electricity production	Explore costs and benefits of states applying cost-of-service regulation to at-risk plants