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Challenges to Baseload Generation

Lopa Parikh, Edison Electric Institute

LSU Energy Summit 2016: Managing Through Energy Challenges
Baton Rouge, Louisiana
October 26, 2016

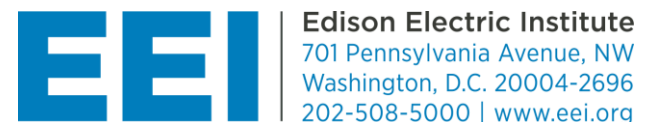
The Edison Electric Institute (EEI) is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for 220 million Americans, operate in all 50 states and the District of Columbia, and directly employ more than 500,000 workers.

With \$100 billion in annual capital expenditures, the electric power industry is responsible for millions of additional jobs. Reliable, affordable, and sustainable electricity powers the economy and enhances the lives of all Americans.

EEI has 70 international electric companies as Affiliate Members, and 270 industry suppliers and related organizations as Associate Members.

Organized in 1933, EEI provides public policy leadership, strategic business intelligence, and essential conferences and forums.

For more information, visit our Web site at www.eei.org.



The Electric Power Industry: Vital to America's Economy

\$990 billion
INDUSTRY

 **1 MILLION⁺**
DIRECT & INDIRECT JOBS

\$120.8 billion
TOTAL CAPEX
PROJECTED FOR 2016

1/3 OF
U.S. POWER GENERATION
COMES FROM ZERO-EMISSIONS
SOURCES (NUCLEAR AND RENEWABLES)

POWER PLANT CO₂ EMISSIONS
ARE NEARLY

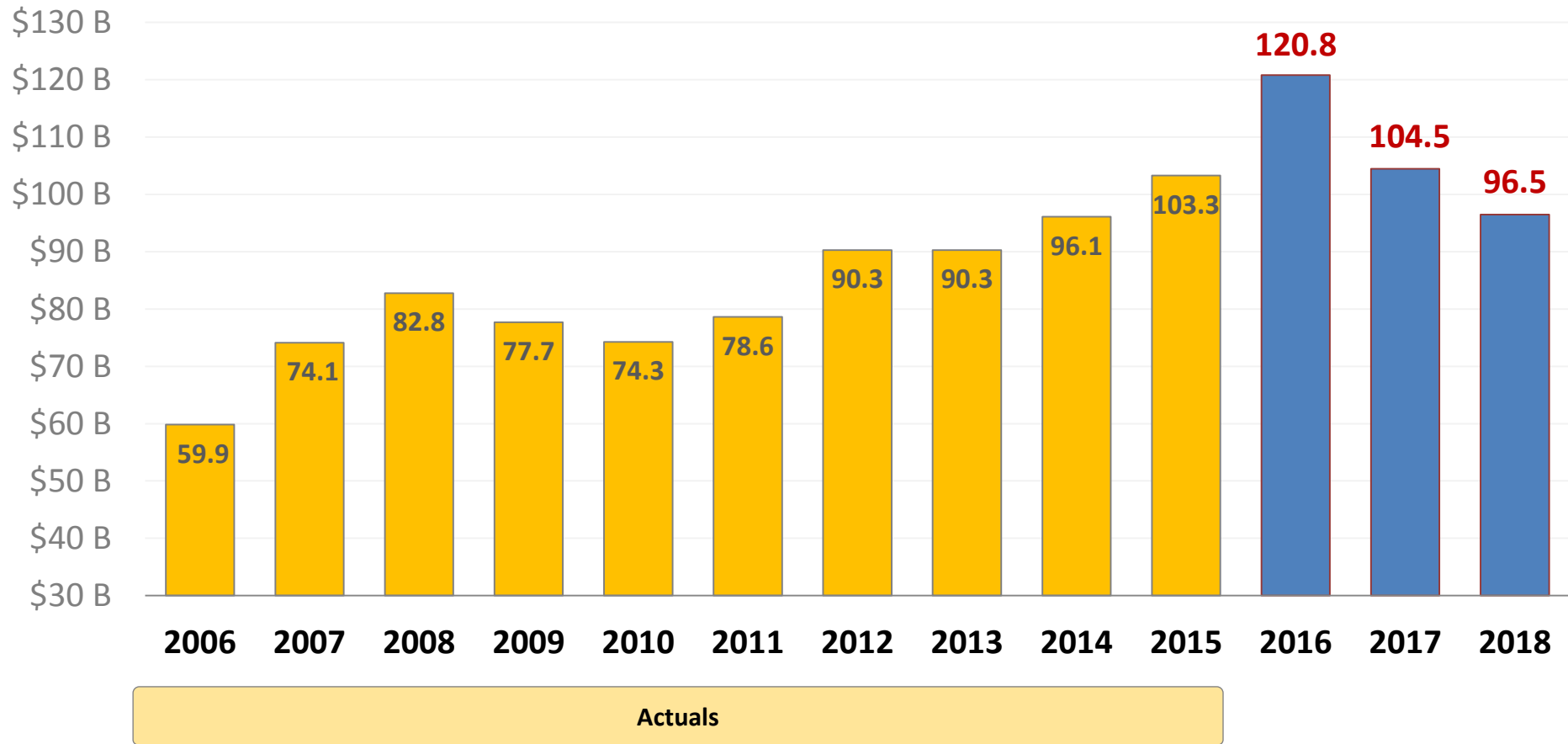
21% BELOW ↓
2005 LEVELS
(AS OF 2015)

3

USE OF
ELECTRICITY
INCREASED

↑ **36%**
(1990-2015)

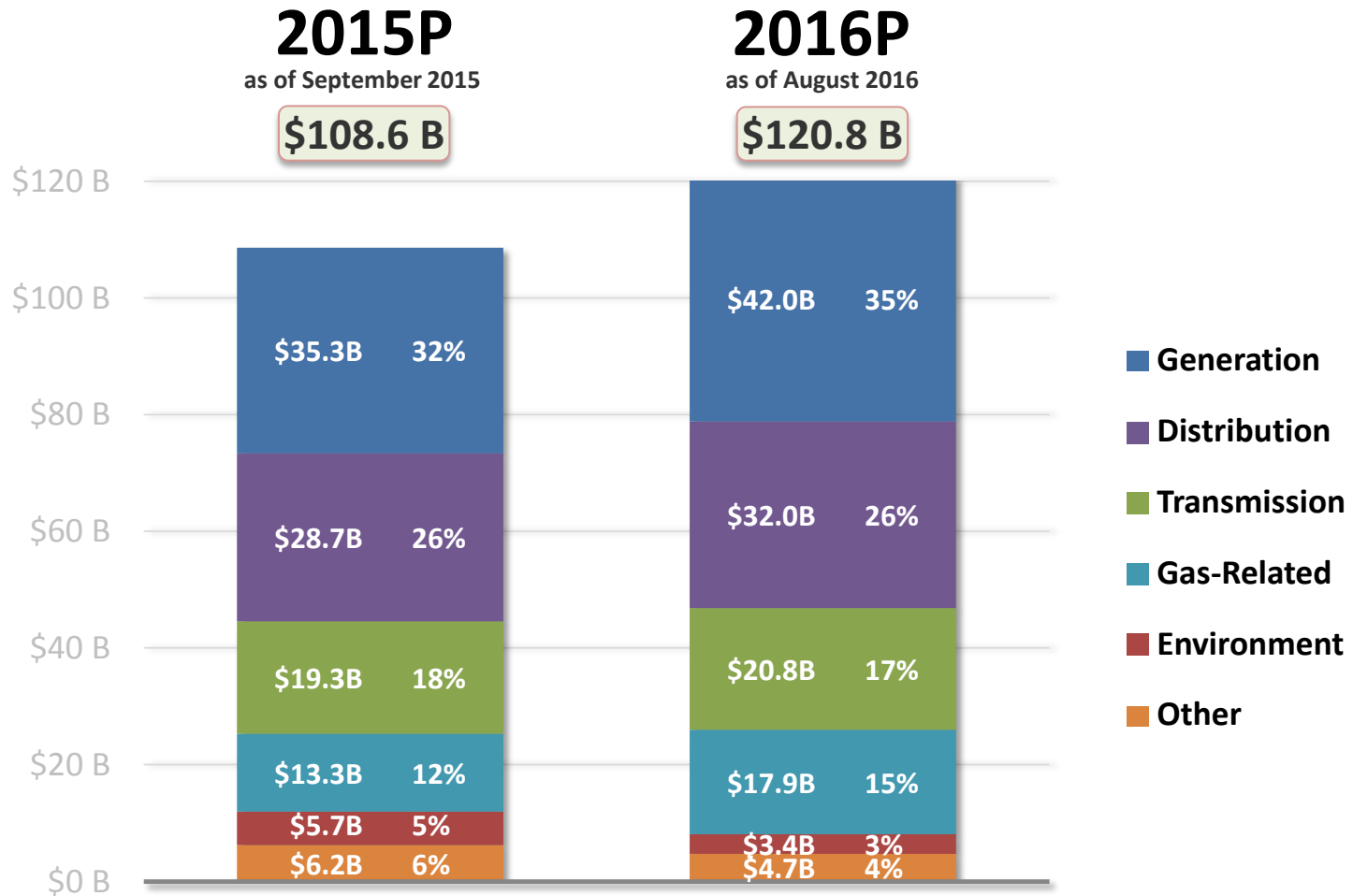
Industry Capital Expenditures



Notes: Total company spending of U.S. Investor-Owned Electric Utilities, consolidated at the parent or appropriate holding company. Projections based on publicly available information and extrapolated for companies reporting fewer than three projected years (11% and 15% of industry for 2017 and 2018).

Source: EEI Finance Department, company reports, S&P Global Market Intelligence (August 2016).

Projected Functional CapEx



Notes: Total company functional spending of U.S. Investor-Owned Electric Utilities. 2015P total does not sum to 100% due to rounding. Projections based on publicly available information and extrapolated for companies not reporting functional detail (1.3% and 0.7% of the industry for 2015 and 2016, respectively).

Source: EEI Finance Department, company reports, S&P Global Market Intelligence (August 2016).

Industry Goal

**Strike a Balance Among Reliability,
Sustainability, and Affordability**

**Attain
Customers'
Desired Level
of Electric
Reliability ...**

Reliability

**... And
Society's
Clean Energy
Policy Goals ..
.**

Sustainability

**... At as Low
a Cost to
Electricity
Customers as
Possible.**

Affordability

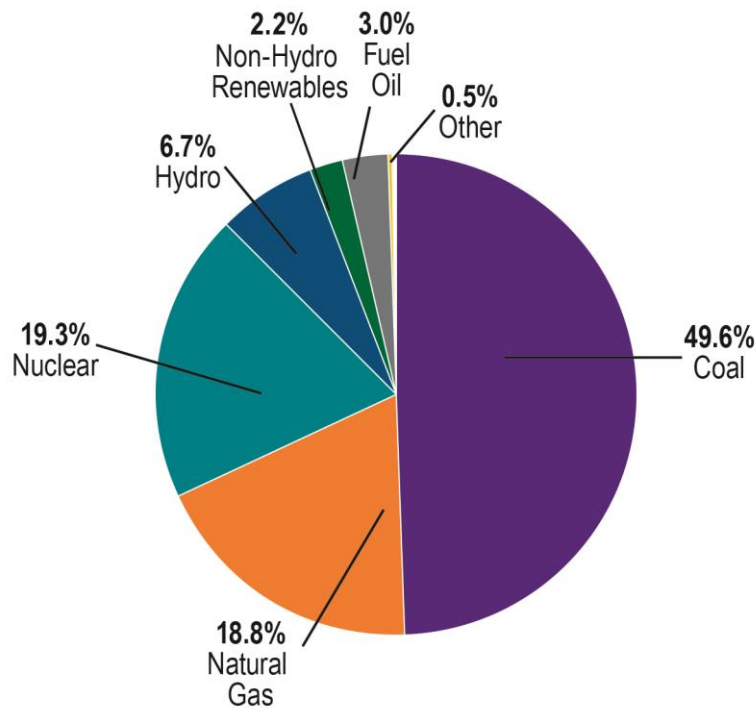


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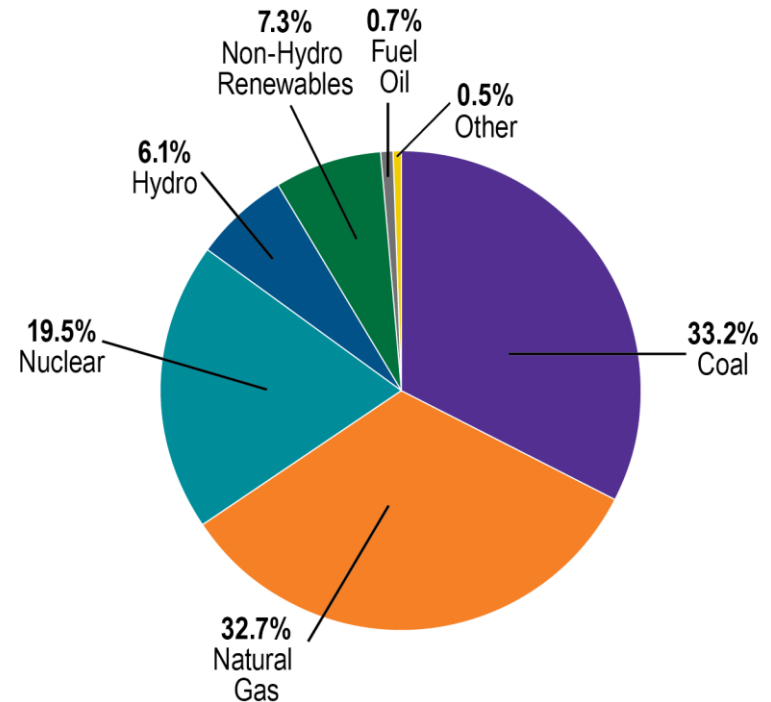
Times they are...a changing

The Mix of Resources Used to Generate Electricity Is Changing Dramatically

2005 National Energy Resource Mix



2015 National Energy Resource Mix



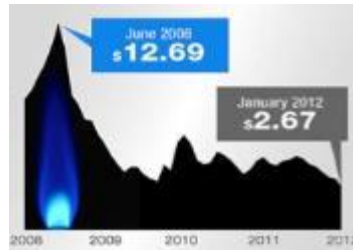
Source: Department of Energy, Energy Information Administration

Drivers of Change/Investment

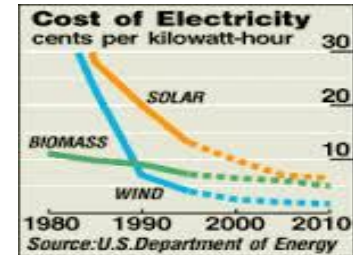
Environmental regulations



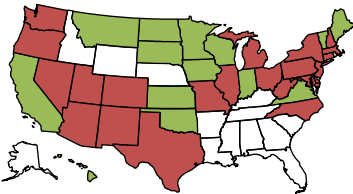
Low natural gas prices



Declining technology costs



Public policies



Financial incentives



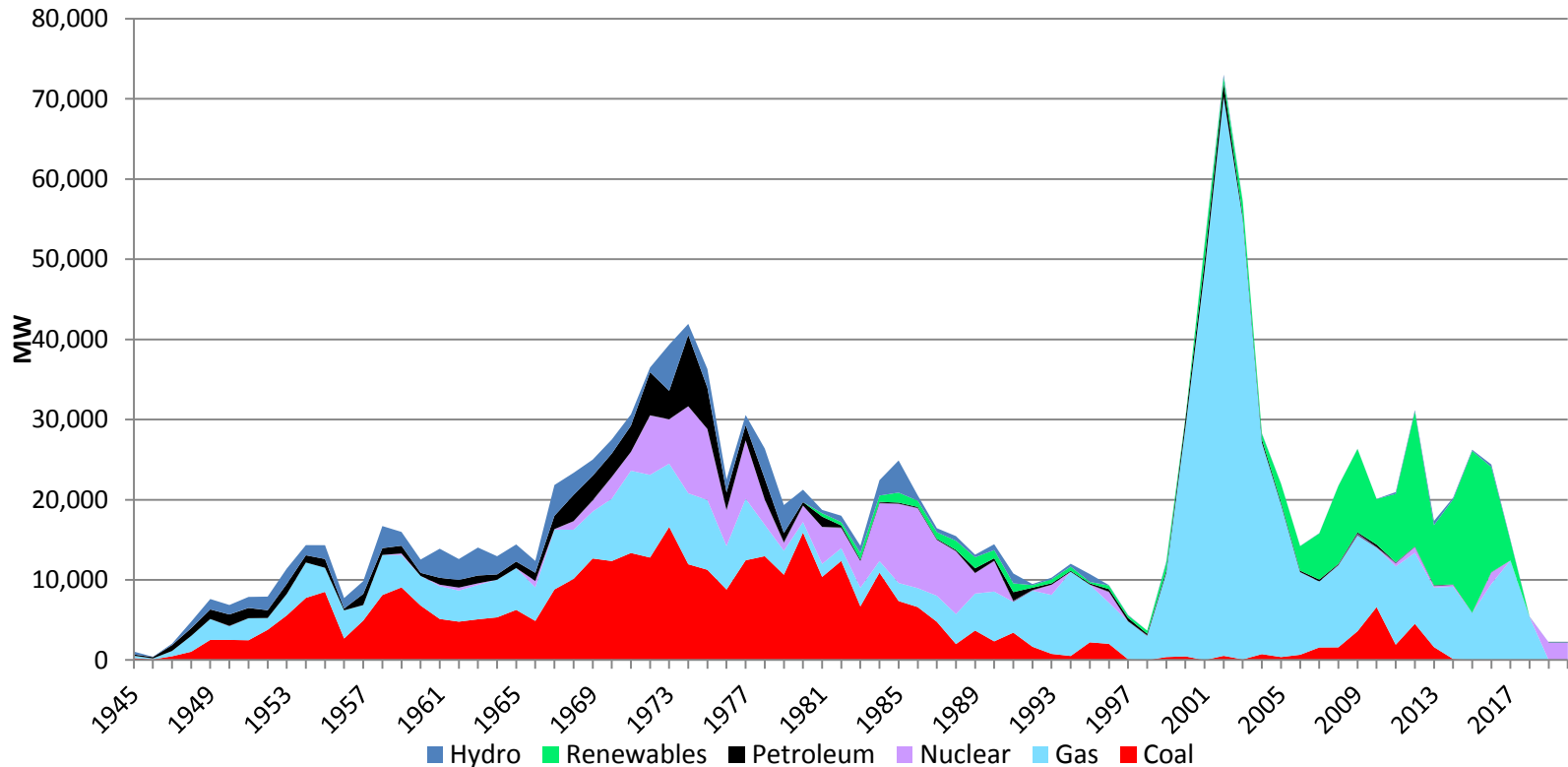
Customer demand



New technologies, models and uses



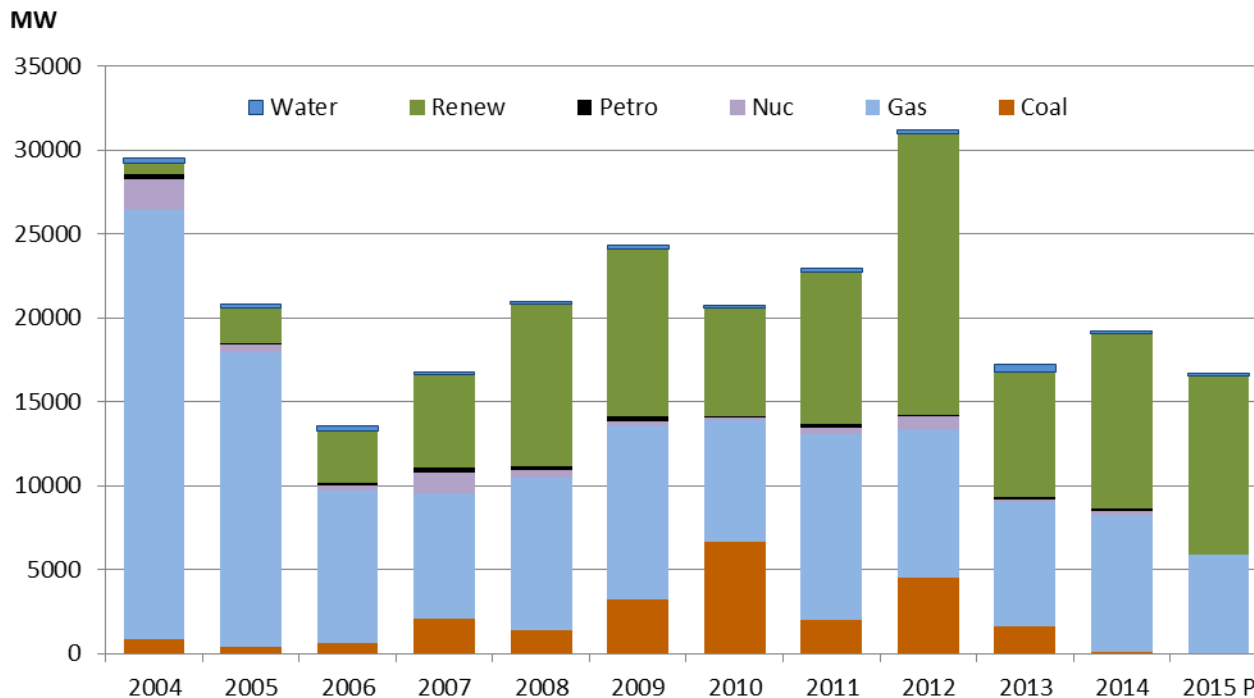
Capacity Additions



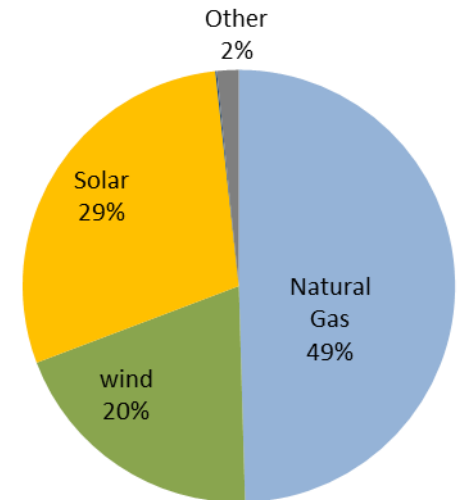
This chart includes historical capacity additions by fuel since 1945 as well as generation under construction as of **May 30, 2016**.

Current Generation Focus on Renewables and Natural Gas

Generating Capacity Additions



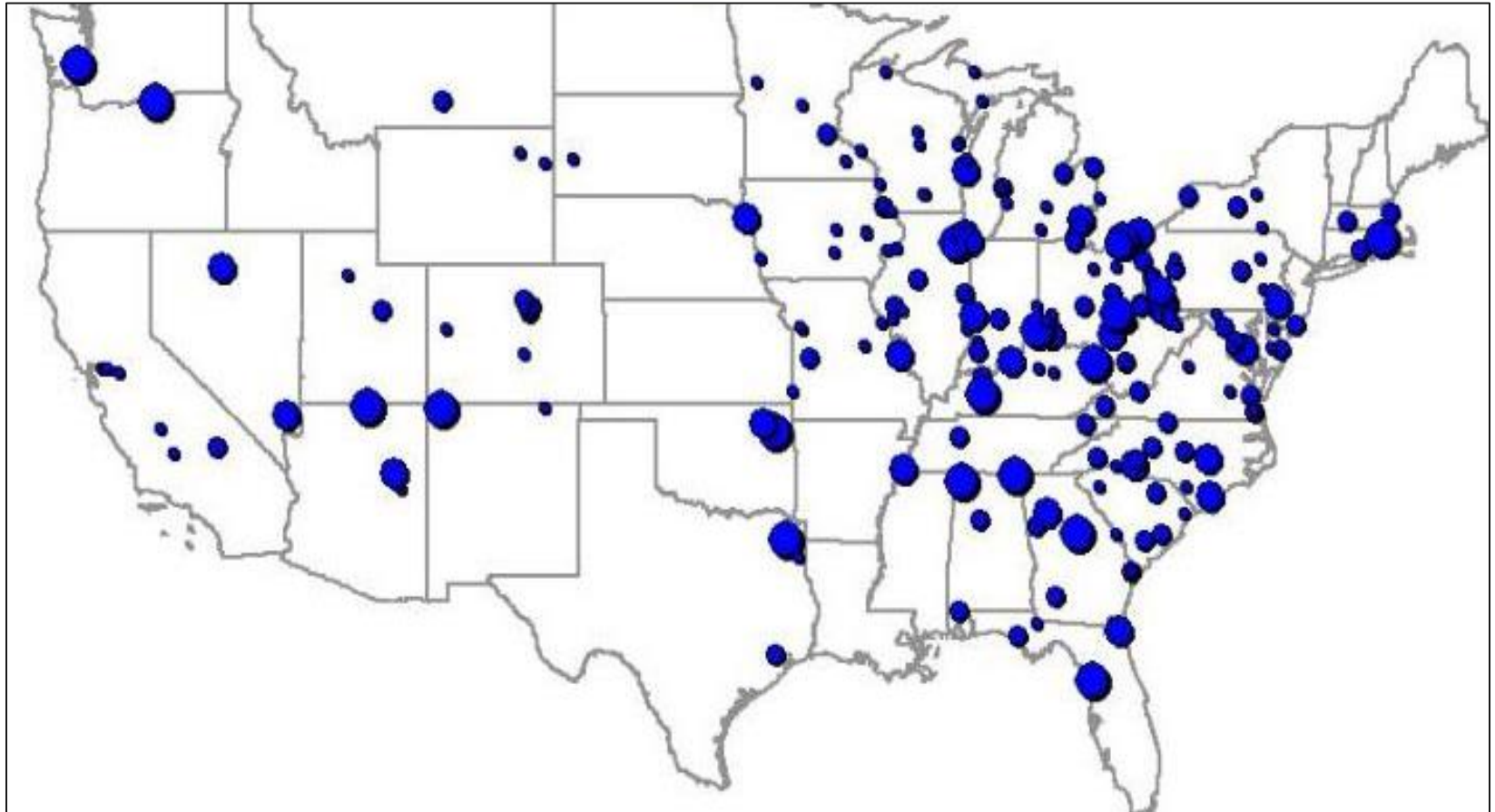
Announcements of New Generating Capacity (2015P)



What's Going on With Coal

- 82,000 MW of generation capacity will be retired or repowered between 2010 and 2025
- This is 24% of the 339 GW of total coal-fired generation capacity in operation in 2010
- No new coal units are forecasted to be built

Coal Retirements 2010-2025



What About Nuclear

- 19% of fuel mix and 63% of carbon free electricity
- April 2014 EIA forecast that 10,800 MW will retire by 2020
- CPP – does not categorize existing nuclear plants under its “best system of emission reduction,” thereby excluding these existing units from being counted towards clean energy mandates.
- 5 reactors expected to come online by 2020

Announced Retirements

Fort Calhoun – NE – 12/2016

*Fitzpatrick – NY – 1/2017

*Ginna - NY - 3/2017

*Clinton – IL – 6/2017

*Three Mile Island 1 - PA – 5/2018

*Quad Cities 1 &2 – IL – 6/2018

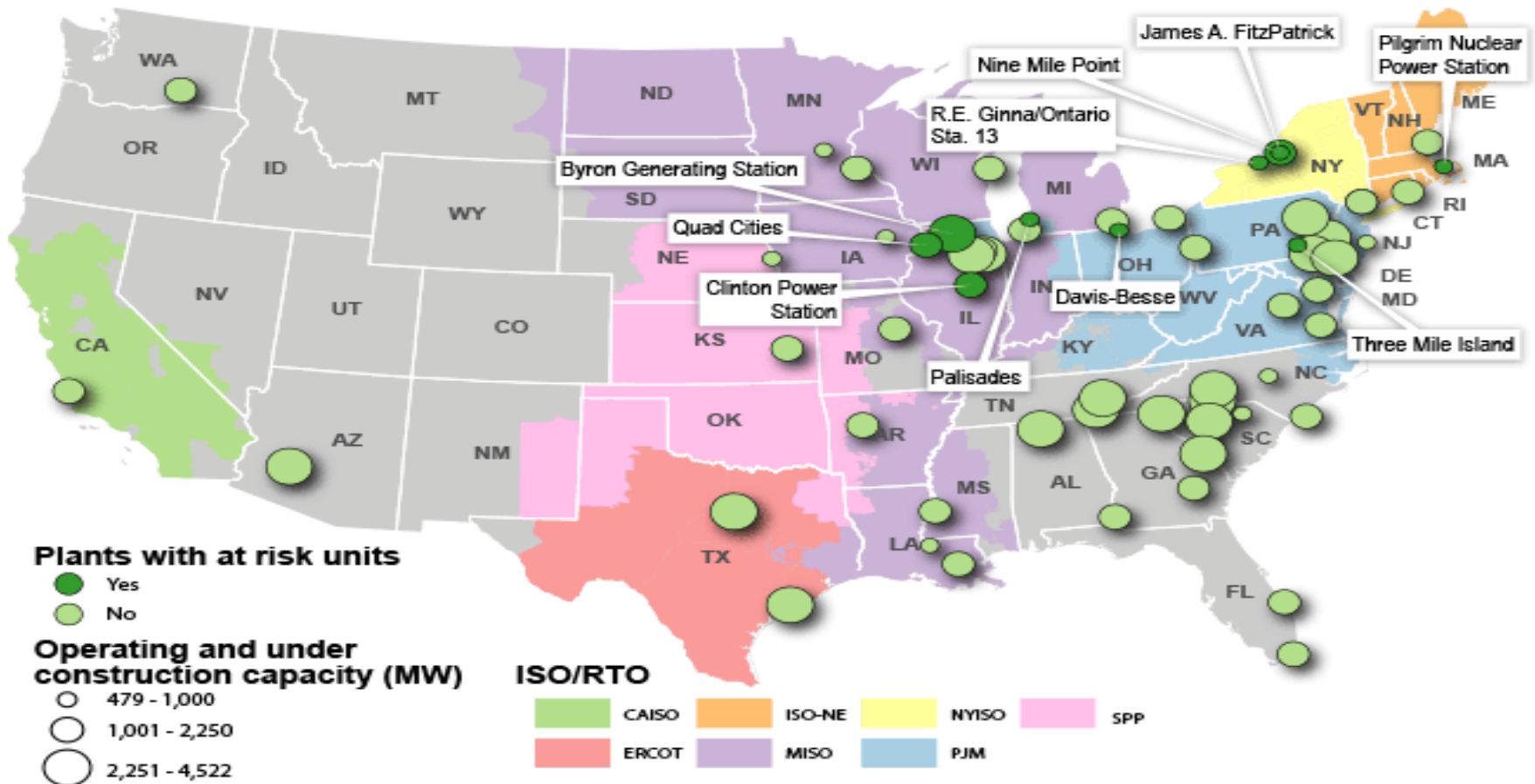
Oyster Creek – NJ – 12/2019

Pilgrim – MA – 6/2019

Diablo Canyon 1&2 – CA – 11/2024 and 8/2025

Nuclear at Risk

Operating and under construction US nuclear power plants



Includes under construction plants with year in service up to 2020.

As of Sept. 15, 2015.

Source: SNL Energy

Map credit: Whit Varner

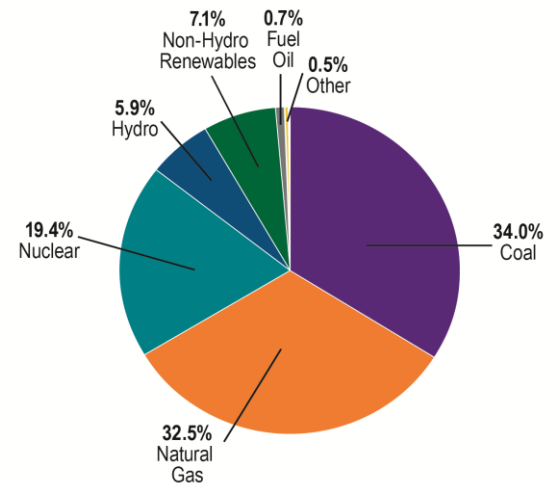
Diversity is Still Needed

Electric companies rely on many fuels to generate electricity – coal, natural gas, nuclear energy, hydropower and other renewables, and other fuel sources. Fuel diversity is needed to:

- ❑ Provide affordable electricity: Respond to fuel price fluctuations
- ❑ Maintain reliability and energy security: Respond to extreme events and/or supply constraints
- ❑ Improve resiliency: Respond to outages and security threats
- ❑ Integrate renewables: Respond to weather and resources variability
- ❑ Meet electricity demand

2015 National Fuel Mix

(estimate)

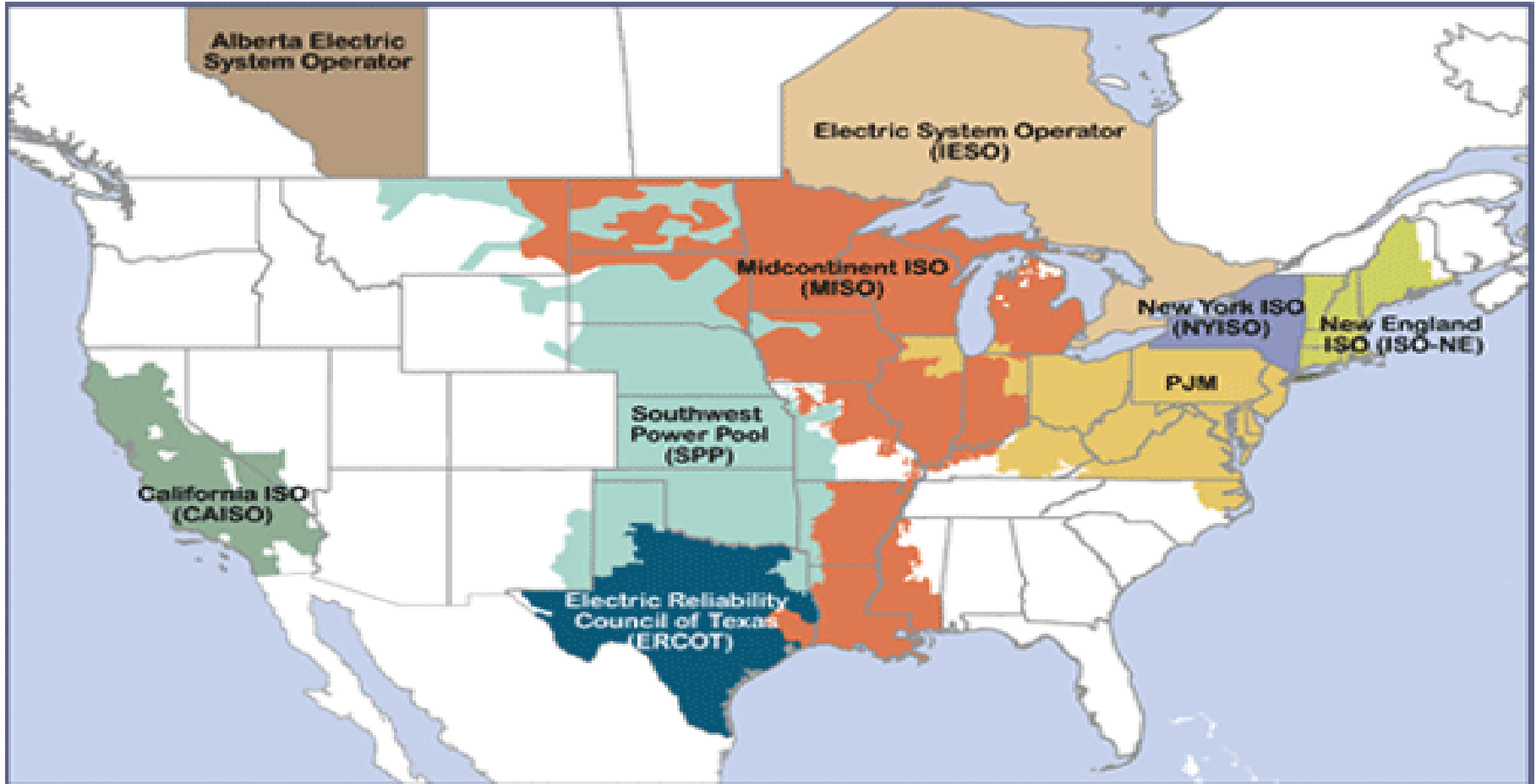




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Challenges in RTO/ISO Markets

Wholesale Markets



Market Challenges

- Low natural gas prices
- Out of market payments
- Incorporating state/federal public policies
- Energy and capacity market rules
- State and federal jurisdiction issues
- Reliability

Wholesale Markets vs. Public Policy

Current market structure is not achieving outcomes desired by policymakers:

- Over-reliance on gas
- Lack of merchant investment
- Loss of nuclear units
- No recognition of environmental stewardship objectives

Some states seeking outcomes via Out of Market Measures

- New York
- New England
- Ohio

Proposals Being Discussed

Carbon Price - Add shadow carbon price adder to offers in energy markets depending on carbon emitted by the resource

Capacity Market Reform - “Two tiered” capacity pricing

Clean Energy Market - Forward procurement of resources based on attributes via central auction

Keys to Realizing Market Structure Objectives

- **Accurate Energy Price Formation**
- **Fair and Competitive Capacity Market Design**
- **Compensating Valuable Resource Attributes**



Reliability

- Sufficient capacity the system can rely on
- Fuel diversity

Economic Sustainability

- Low cost/efficient system
- Reasonable return/sustained investments

Environmental Sustainability

- Achieve carbon targets
- Reduce other pollutants



- **Role of RTOs**
- **What, how and how much to build?**
- **Integration of DER and Storage technologies**
- **Adapt to market developments and changing public policies**
- **Reliability and Resiliency**
- **Affordability vs. Sustainability**



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Affordability



“Opportunity is missed by most people because it is dressed in overalls and looks like work.”

Thomas Alva Edison