

# Regulation of Reliability

Gulf Coast Electricity Transmission Summit

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# Roadmap

- ◆ Potential Grid Destabilizers
- ◆ Technological Options to Enhance Reliability
- ◆ Corresponding Regulatory and Jurisdictional Tensions

# Potential Grid Destabilizers



# Destabilizer #1: Extreme Weather Events

## Hazards

## Brief overview

## Effect of climate change

### Wind related damage



- **Damage can occur across the Gulf Coast region** and in areas further inland

- **Potential increase in wind speed of 1.4-2.9% in 2030** (2.1 - 10.2% in 2100) due to warmer sea surface temperatures

### Sea level rise (gradual)



- **Key risk is along the coastline**
- The Louisiana gulf coast already experiences significant deltaic land loss/subsidence<sup>1</sup>

- **Relative sea level may rise by 5-6 inches in 2030** (2.5 - 5 feet by 2100)<sup>2</sup>



### Storm surge

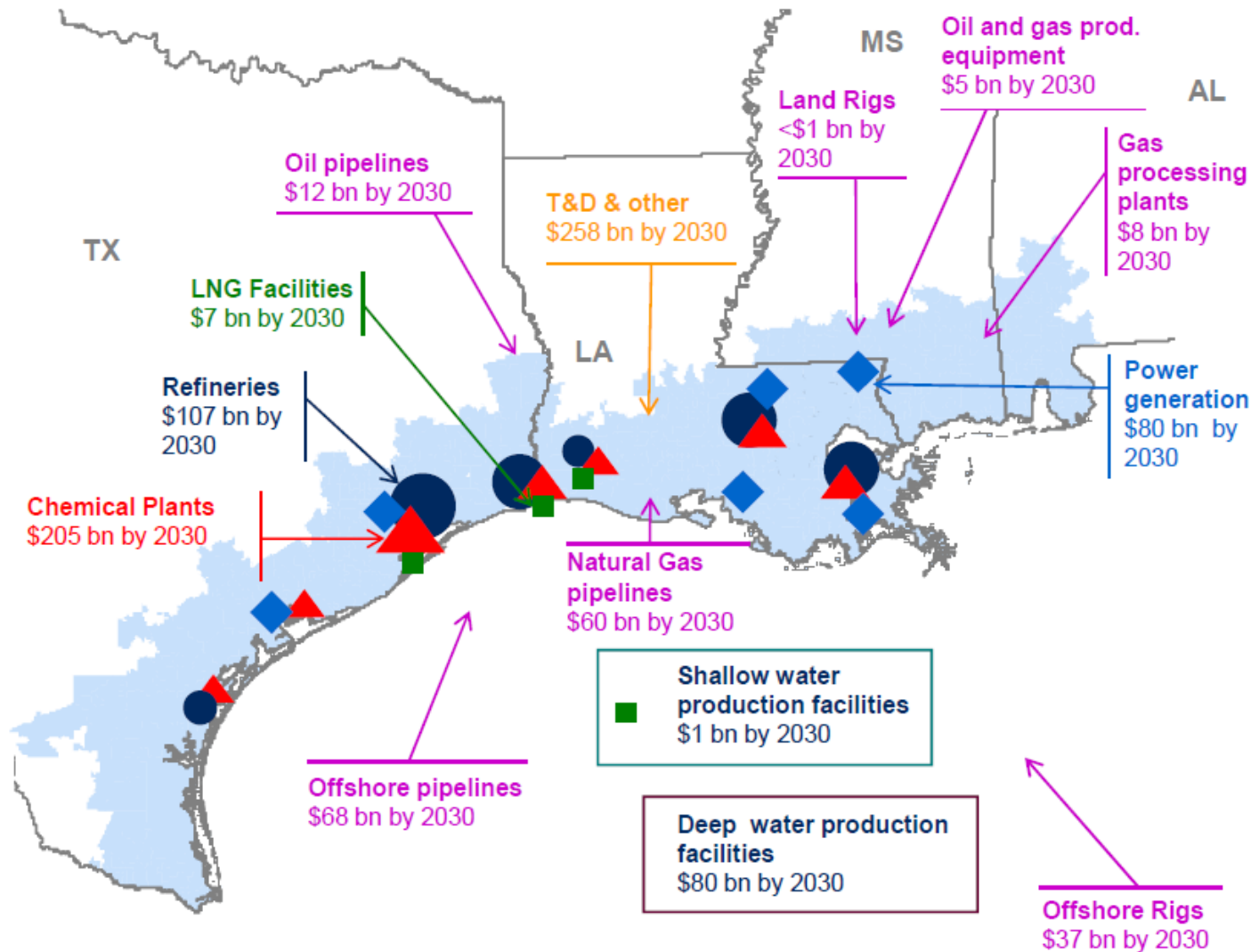
- **Risk is along the coastline,** linked to hurricane events

- **Storms can increase the impact of even modest levels of sea level rise**
- Could lead to more frequent/severe flooding of coastal zones

<sup>1</sup> Estimates for subsidence vary significantly along the coastline; e.g., 8-31 inches per century

<sup>2</sup> Based on Vermeer and Rahmstorf. "Global sea level linked to global temperature." 2009.

## View of Gulf Coast Energy assets, 2030



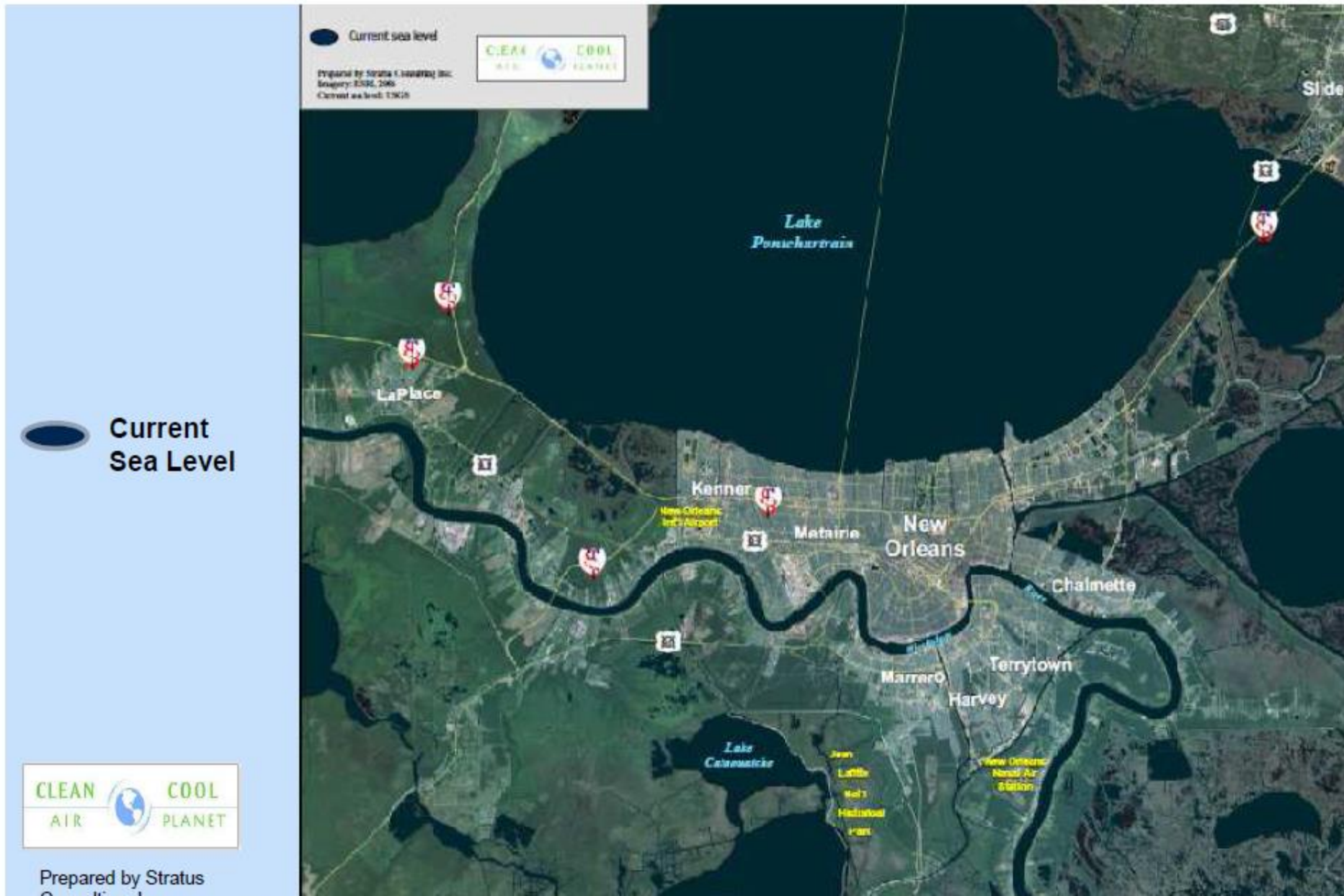
- Refineries
- ▲ Petrochemical plants
- LNG facilities
- ◆ Power generation
- Shallow water production facilities
- Deep water production facilities
- Other Oil and Gas<sup>2</sup>
- Other Utility<sup>2</sup>

- Modeled ~ 50,000 oil and gas structures including 90,000 miles of pipelines, 2000 offshore platforms and 27,000 wells
- Considered over 500,000 miles of T&D, and ~300 generation facilities
- Consolidated information across 10-15 key databases, including EIA, MMS, Energy Velocity, OGJ, Tecnon, HPDI, Wood Mackenzie, Ventyx, Energy Velocity, Entergy



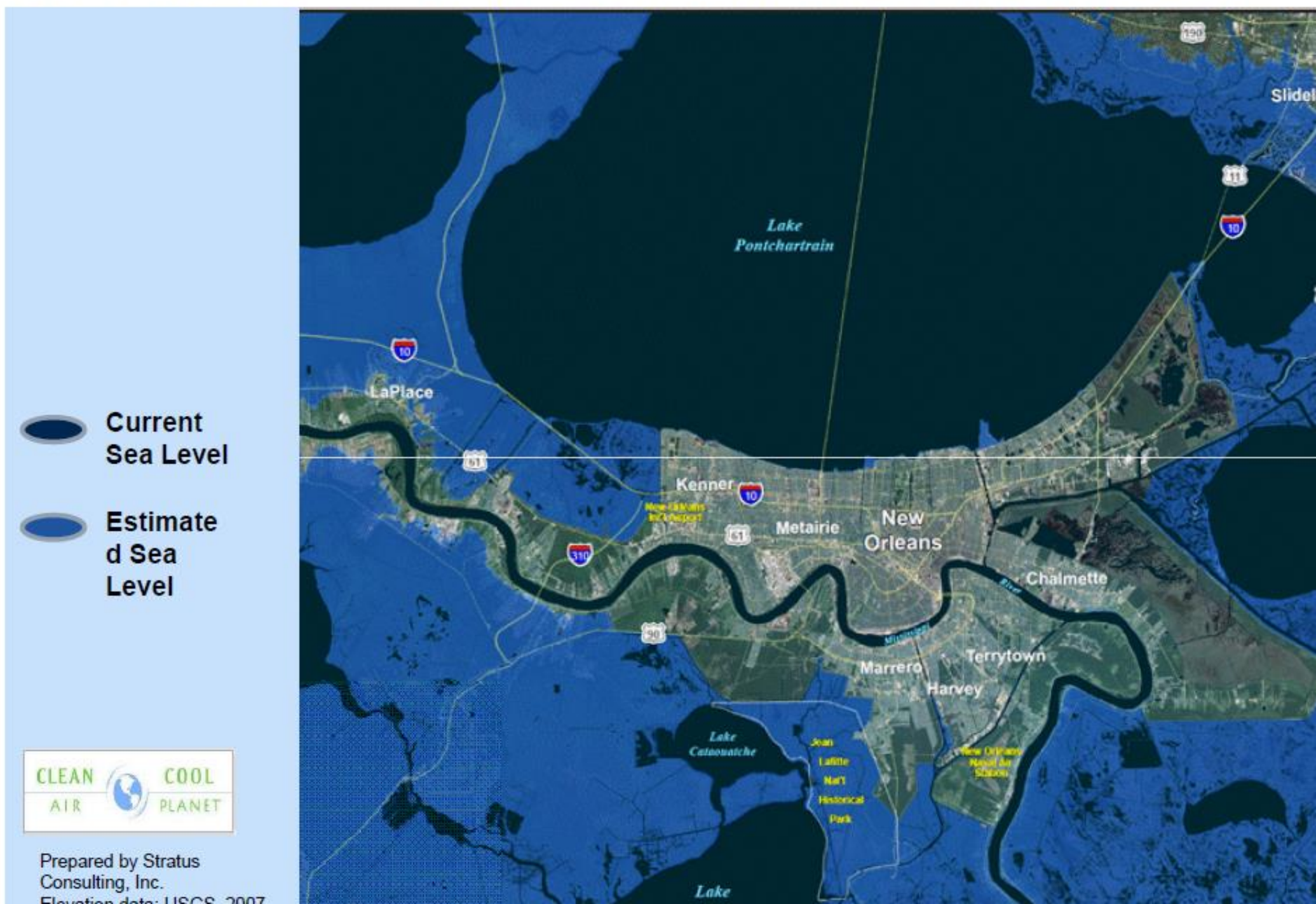
# New Orleans has large water bodies surrounding it today

New Orleans as it is today



# By 2100, New Orleans may potentially be surrounded by water

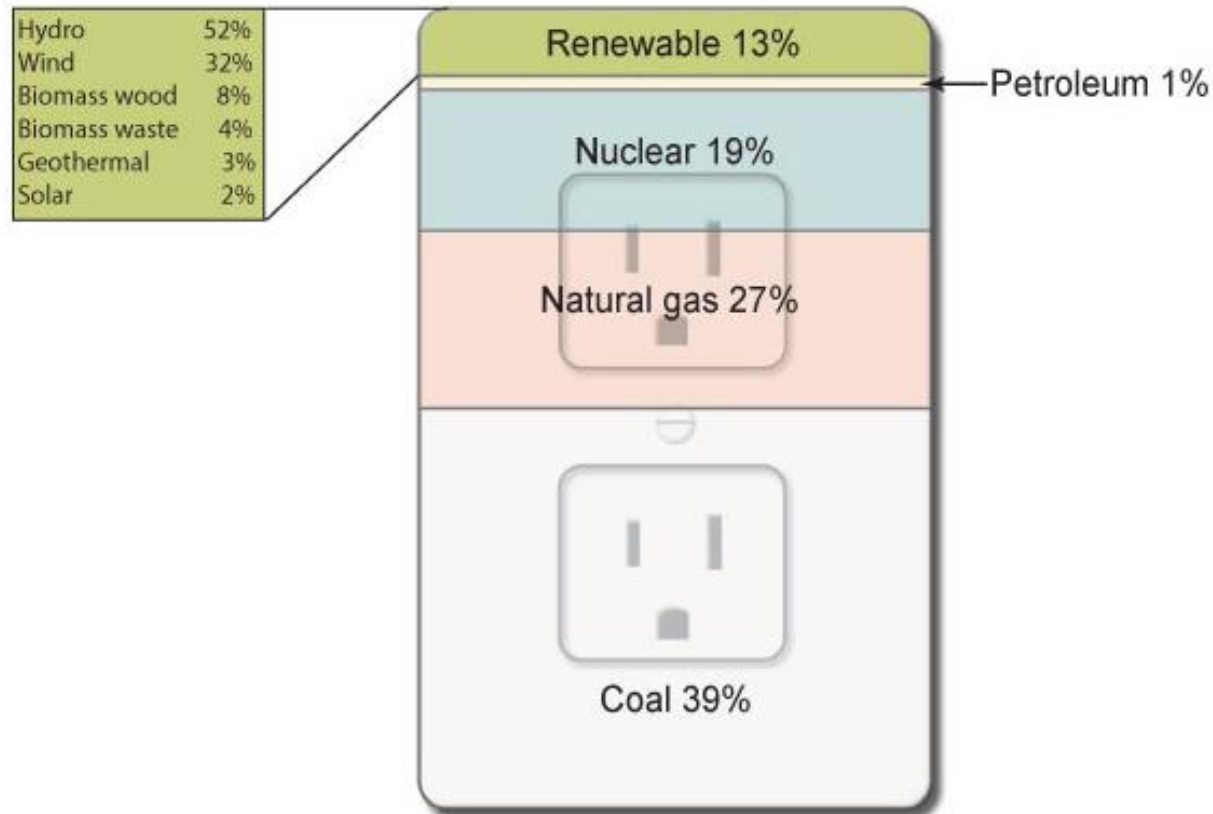
Area at risk of inundation from 1-meter (3.3 ft) rise in sea level with 1-meter (3.2 ft) relative sea level rise





# Destabilizer #2: Changing Resource Mix

## Sources of U.S. electricity generation, 2013



Source: U.S. Energy Information Administration, *Electricity Power Monthly* (February 2014). Percentages based on Table 1.1 and 1.1a; preliminary data for 2013

Note: Sum of components may not equal 100% due to independent rounding.

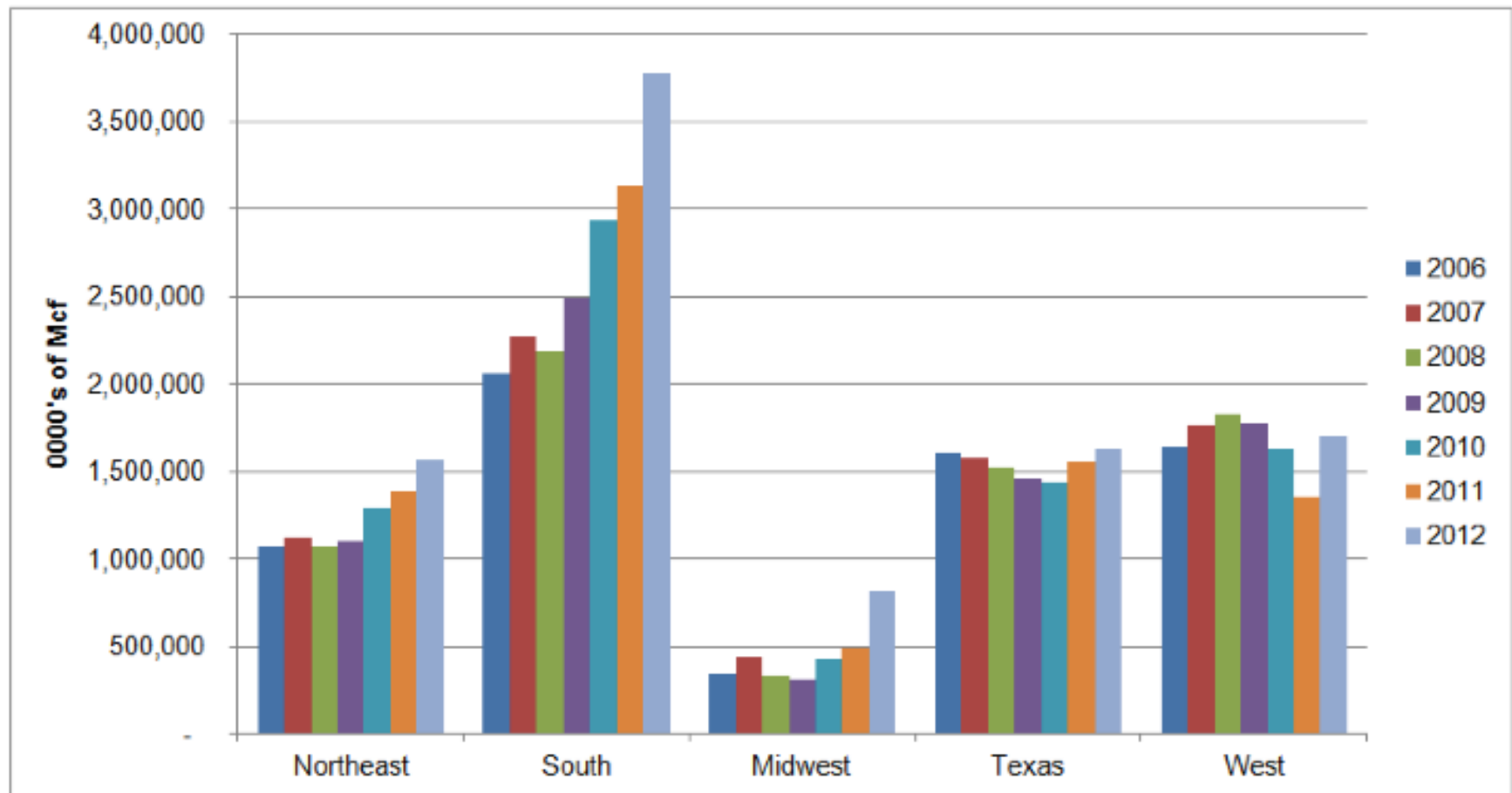


# Increased Intermittent Renewables

- ◆ Although nonhydropower renewable generation more than doubles between 2012 and 2040..., [renewable energy's] contribution to U.S. total electricity generation is still just 16 percent.” EIA Annual Energy Outlook 2014

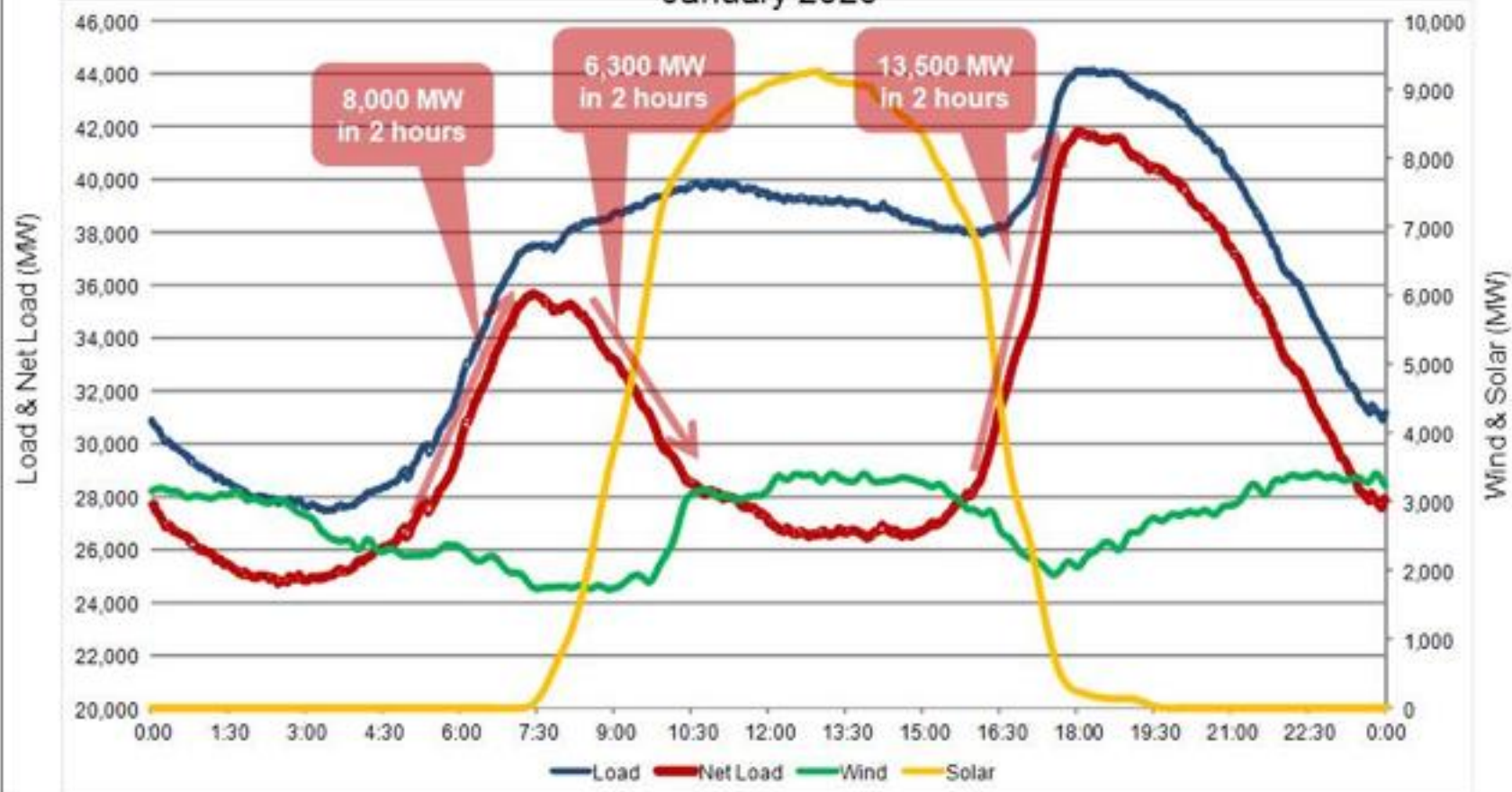
# Increased Reliance on Natural Gas

**Figure 4- 7. Historic trends in natural gas by U.S. region: natural gas consumed to produce electricity**



Source: Data from Ventyx Velocity Suite, accessed November 2013.

Load, Wind & Solar Profiles – High Load Case  
January 2020

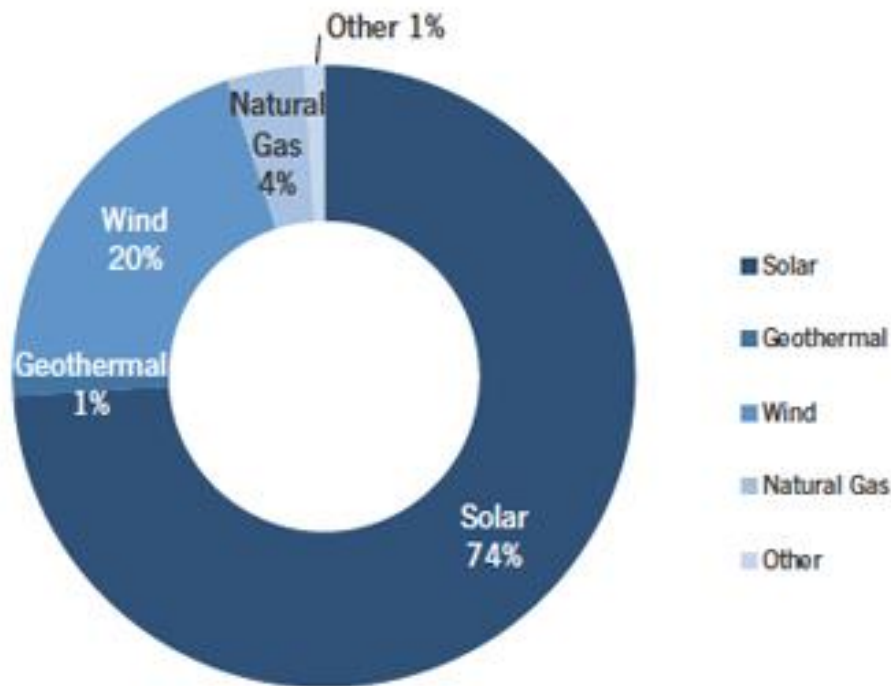


Source: CPUC,

<http://www.caiso.com/Documents/FlexibleResourceAdequacyCriteria-MustOfferObligation-ISOPresentation.pdf>

# 74% of all new generating capacity installed during Q1 2014 was solar

Figure 1.1 New U.S. Electric Generation Capacity, Q1 2014

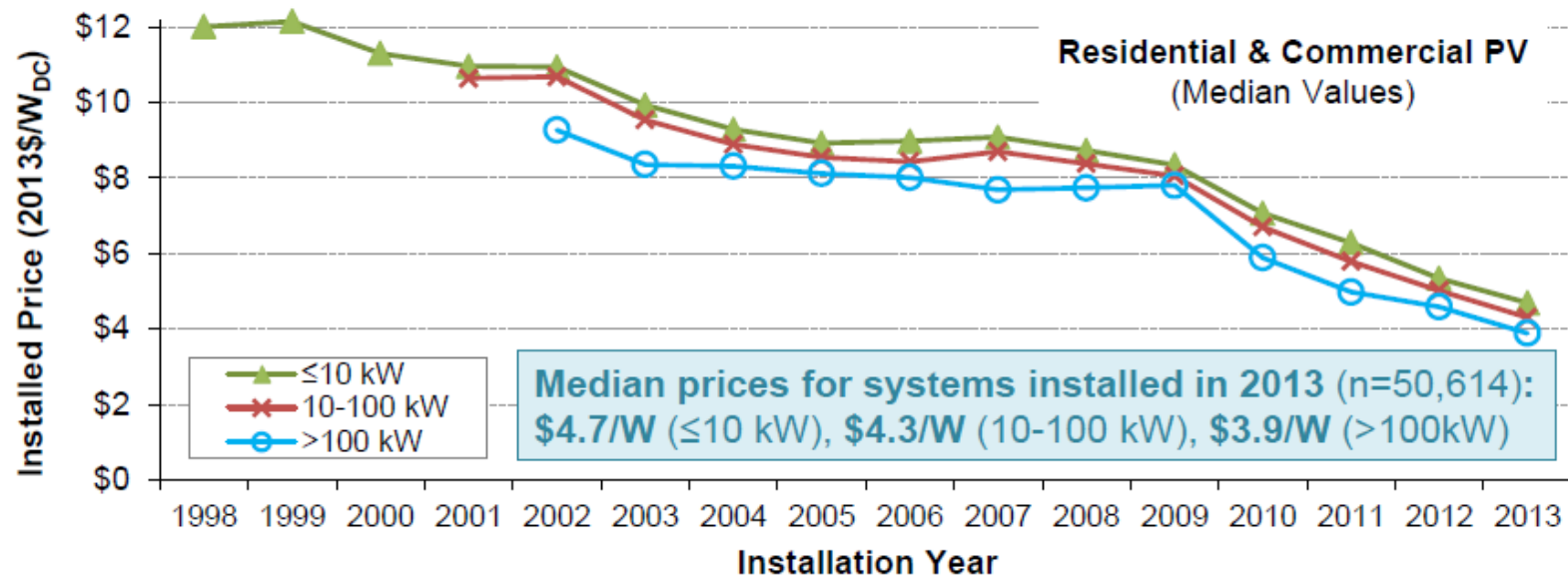


Source: GTM Research, FERC Energy Infrastructure Update, March 2014. Note: FERC Energy Infrastructure Update report used for all technologies other than solar. SMI data on PV and CSP used for solar and converted to MWac using a 0.87 DC-to-AC derate factor for distributed solar and a 0.77 factor for utility solar.



# Installed prices continued their precipitous decline in 2013

Median installed prices fell by \$0.7/W (12-15%) from 2012-2013, across the three size ranges shown, and have fallen by an average of \$0.5/W (6-8%) annually over the full historical period



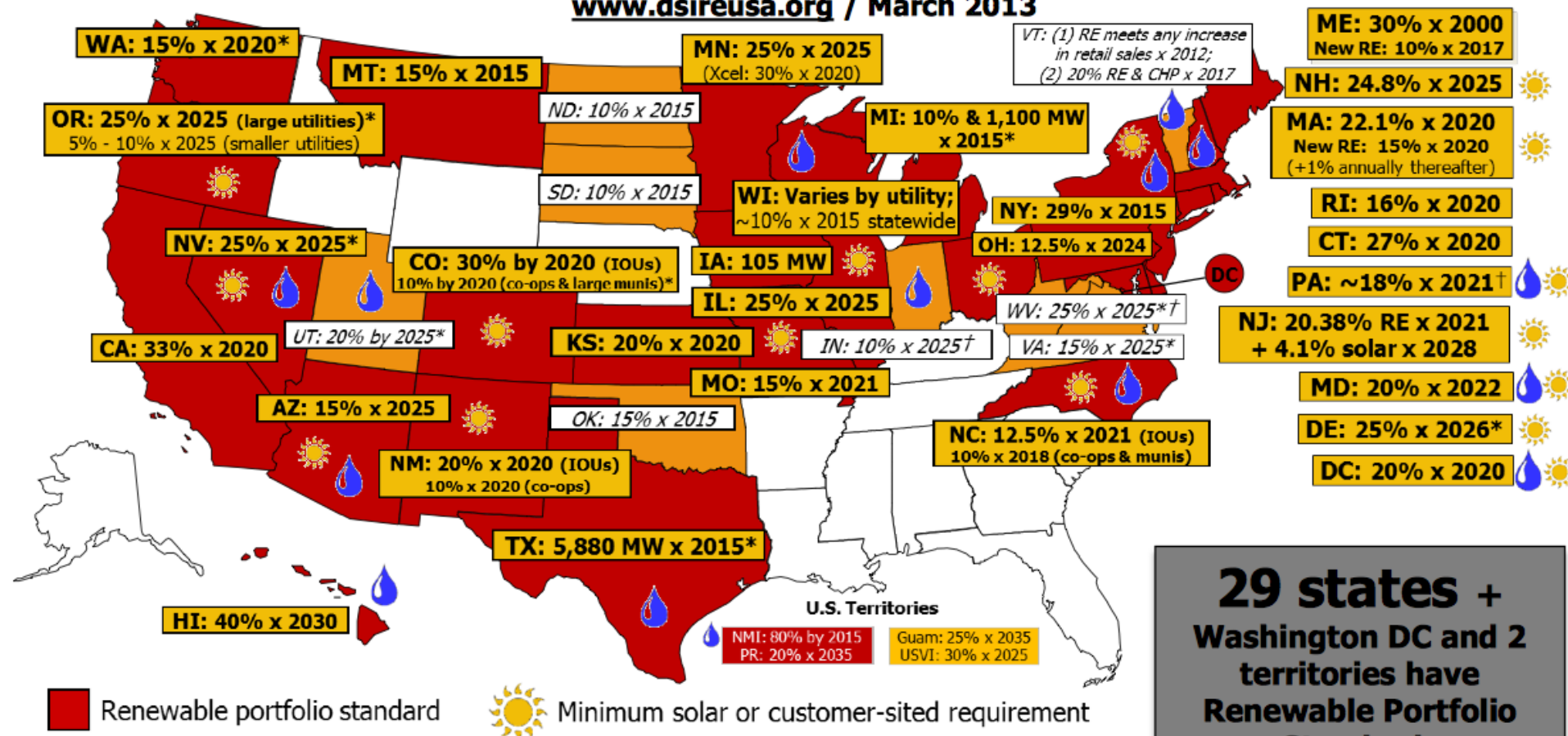
Note: Median installed prices are shown only if 15 or more observations are available for the individual size range

	Federal Regulation	Impacts	Status
Air	Cross-State Air Pollution Rule (CSAPR)	<p>Establishes pollution caps for SO<sub>2</sub>, annual NO<sub>x</sub> and seasonal NO<sub>x</sub> for 28 states in the eastern half of the U.S. to reduce transported pollution that significantly affects downwind nonattainment and maintenance problems with National Ambient Air Quality Standards (NAAQS).</p> <p>Following vacatur of the rule by the Court of Appeals, it is not clear how the rule will be revised or when a new regulation will go into effect. Per the Court's order, EPA's 2005 Clean Air Interstate Rule (CAIR) remains in place.</p>	Finalized 7.6.2011 supplemental rule finalized 12.15.2011; technical revisions finalized 2.7.2012 and 6.5.2012; stayed on 12.30.2011 and vacated 8.21.2012 by U.S. Court of Appeals, D.C. Circuit; vacatur reversed by the Supreme Court 4.29.2014, remanded to the D.C. Circuit.
	Mercury and Air Toxics Standards (MATS) Rule for Electric Generation Units	<p>Establishes national emission standards for hazardous air pollutants (HAPs), including mercury and acid gases</p> <p>Will affect existing and new coal- and oil-fired plants.</p>	Finalized 2.16.2012; updated standards for new plants finalized 4.24.2013. Compliance date of April 2015, with options to petition for extensions.
	Carbon Pollution Standards for New Power Plants	Establishes new source performance standards which set national limits on CO <sub>2</sub> emissions from new fossil fuel-fired power plants (electric utility steam generating units and natural gas-fired stationary combustion turbines).	New proposed rule for new plants released 9.20.2013 and published in the Federal Register for comment on 1.8.2014.
	Clean Power Plan for Existing Power Plants	Requires state plans with enforceable measures to limit CO <sub>2</sub> emissions from existing fossil fuel-fired power plants and sets rate-based emissions goals for each state.	Proposed rule released 6.2.2014; published in Federal Register for comment on 6.18.2014; final rule expected 6.1.2015
	Carbon Pollution Standards for Modified and Reconstructed Power Plants	Establishes national limits for CO <sub>2</sub> emissions from modified or reconstructed fossil fuel-fired plants.	Proposed rule released 6.2.2014
Waste	Coal Combustion Residuals (CCR) Rule	Regulates disposal of coal combustion wastes (e.g., fly ash, bottom ash, boiler slag, flue gas desulfurization materials) in existing and new landfills and surface impoundments. Addresses risks from leaching of contaminants to groundwater from disposal units and risks from fugitive dust.	Proposed options for the rule released 6.21.2010. Final rule expected 12.19.2014 (required by October 29, 2013 court memorandum <sup>1</sup> )
Water	CWA §316(b) – Cooling Water Intake	Establishes national standards for impingement mortality and a process for establishing site-specific	Finalized 5.19.2014.



## Renewable Portfolio Standard Policies

[www.dsireusa.org](http://www.dsireusa.org) / March 2013



# Clean Power Plan



## FEDERAL REGISTER

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No. 117

June 18, 2014

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### Part II

### Environmental Protection Agency

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40 CFR Part 60

Carbon Pollution Emission Guidelines for Existing Stationary Sources:  
Electric Utility Generating Units; Proposed Rule



Building Block	Value Allocated in Goal-Setting Formula
<p><b>Make fossil fuel power plants more efficient</b></p> <ul style="list-style-type: none"> <li>• Improve equipment and processes to get as much electricity as possible from each unit of fuel</li> <li>• Using less fossil fuel to create the same amount of electricity means less carbon pollution.</li> </ul>	<p>Average heat rate improvement of 6% for coal steam electric generating units (EGUs)</p>
<p><b>Use low-emitting power sources more</b></p> <ul style="list-style-type: none"> <li>• Using lower-emitting power plants more frequently to meet demand means less carbon pollution.</li> </ul>	<p>Dispatch to existing and under-construction natural gas combined cycle (NGCC) units to up to 70% capacity factor</p>
<p><b>Use more zero- and low-emitting power sources</b></p> <ul style="list-style-type: none"> <li>• Expand renewable generating capacity, which is consistent with current trends.</li> <li>• Using more renewable sources, including solar and wind, and low-emitting nuclear facilities, means less carbon pollution.</li> </ul>	<p>Dispatch to new clean generation, including new nuclear generation under construction, moderate deployment of new renewable generation, and continued use of existing nuclear generation</p>
<p><b>Use electricity more efficiently</b></p> <ul style="list-style-type: none"> <li>• Reducing demand on power plants is a proven, low-cost way to reduce emissions, which will save consumers and businesses money and mean less carbon pollution.</li> </ul>	<p>Increase demand-side energy efficiency to 1.5% annually</p>

# Destabilizer #3: Increased Penetration of DG

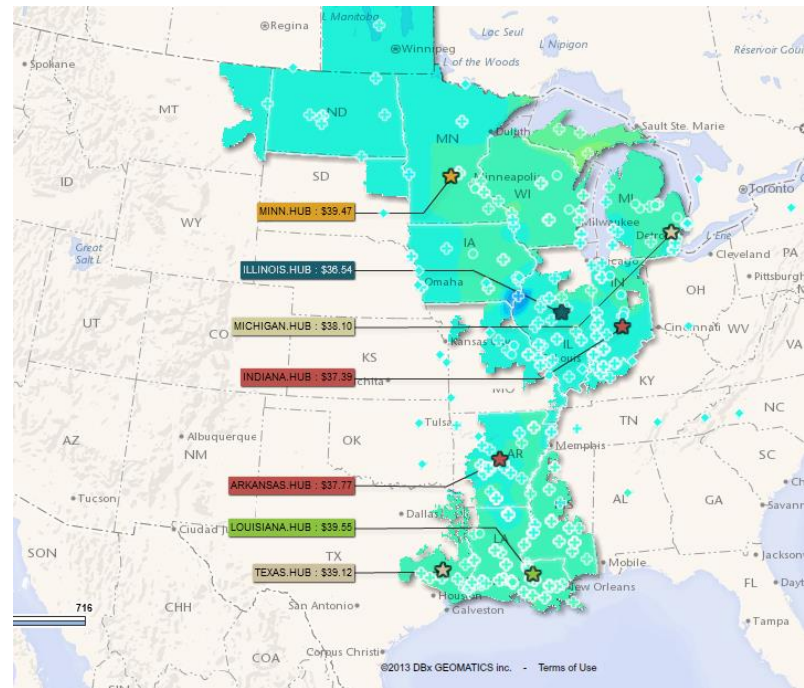
- ◆ As of 2011, 4 gigawatts (GW) of distributed capacity had been installed in the United States
- ◆ The amount of distributed capacity is expected to increase to approximately 9 GW by 2016, and to as much as 20 GW by 2020

# Technological Options to Enhance Reliability



# Option 1: Expand and/or upgrade Transmission

- 💧 Increase system flexibility
- 💧 Mitigate congestion and deliverability constraints
- 💧 Address “n-1” and above contingencies





# Option 2: Firm Intermittent Renewable Generators



# Option 3: Capitalize on Distributed Technological Innovation

- ◆ Demand Response
- ◆ DG
- ◆ Microgrids

# Evolving Reliability Responsibilities

## Historic

- ◆ Utilities

## Modern

- ◆ Utilities
- ◆ NERC (as electric reliability organization per EPAct 2005)
- ◆ FERC (as approver of NERC reliability standards)
- ◆ Balancing Authorities
- ◆ Transmission Operators
- ◆ Distribution Providers
- ◆ Generators

# Corresponding Regulatory and Jurisdictional Tensions





# Option 1: Expand and/or upgrade Transmission

- ◆ Transmission Planning
- ◆ Transmission Siting
- ◆ Transmission Cost Recovery
- ◆ Transfer of Transmission Assets

# Evolving Transmission Responsibilities

	Then...	Now...
Transmission Planning	State	RTOs, transcos, state/local (FERC Orders 890 and 1000)
Transmission Siting	State	State plus Section 216 Federal Backstop Authority
Transmission Cost Recovery	Federal (FPA § 201(b))	Federal (FPA § 201(b)) plus State for bundled retail transmission
Transfer of Transmission Assets	Federal and State	Federal and State

# Can Create Federalism Tensions

	Now...	Tensions...
Transmission Planning	RTOs, merchant, state/local (FERC Order 890 and 1000)	No uniformity across multiple jurisdictions on competitive bid process and more interstate lines
Transmission Siting	State plus Section 216 Federal Backstop Authority	Single state can block approval of interstate transmission
Transmission Cost Recovery	Federal (FPA § 201(b)) plus State for bundled retail transmission	Cost allocation issues
Transfer of Transmission Assets	Federal and State	States reluctant to lose jurisdiction over transmission assets to FERC and cost concerns

# May Mean Evolving Federalism Relationships

- ◆ Preemption
- ◆ Process Preemption
- ◆ Enhance Backstop Authority
- ◆ Cooperative Federalism
- ◆ Regional - Interstate Compacts



- ◆ Section 1221(a) of the Energy Policy Act of 2005, codified at 16 U.S.C. 824p(a), directs the Secretary of Energy to conduct an electric transmission congestion study every three years
- ◆ Draft issued in August, and public comment period ends on Monday



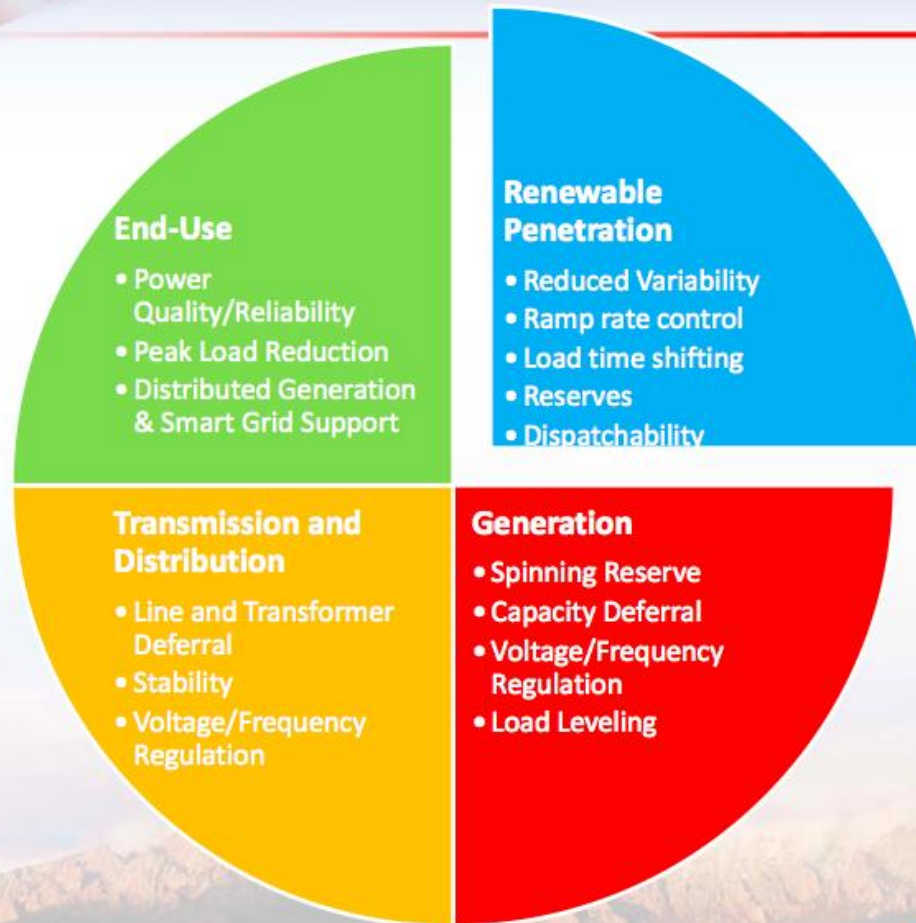
## **Draft for Public Comment**

# **National Electric Transmission Congestion Study**

**August 2014**

# Option 2: Firm Intermittent Renewable Generators

## What Energy Storage Provides



# Jurisdictional Issues

## FERC

- Regulates wholesale electricity market operations.
- Sets rules for ISO and Regional Transmission Organization (RTO) operations/procurement rules.
- Influences participation of energy storage and demand response in transmission grid operation and sale of ancillary services in wholesale markets.

## ISO

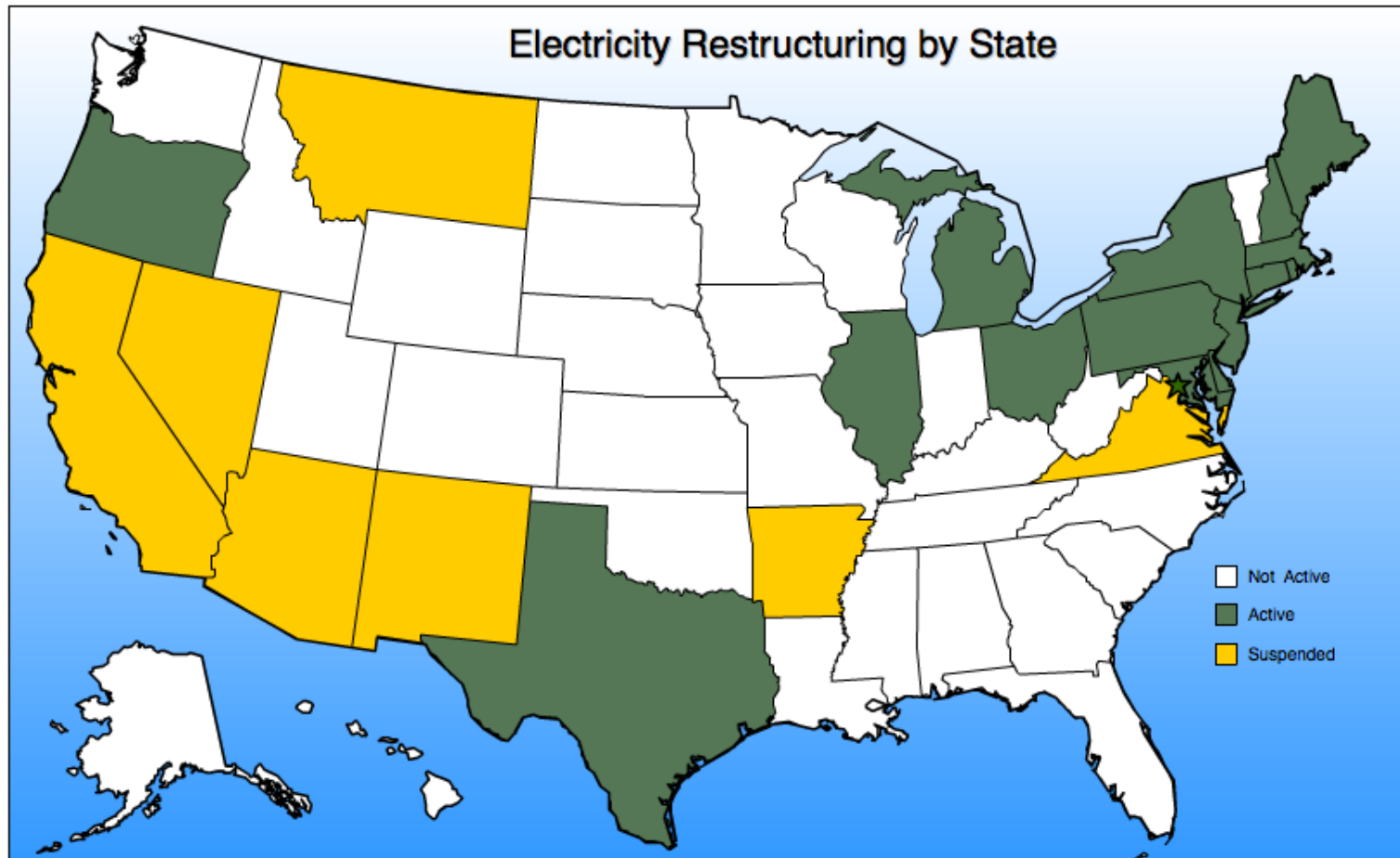
- Manages electric transmission in a geographic region, ensures access for all.
- Buys ancillary services to balance supply and demand on its transmission system.
- Establishes rules for procurement of resources (e.g. ancillary services, spinning reserves) to help maintain transmission grid stability.

## PUC

- Regulates utilities' energy and capacity acquisition, management and operations.
- Sets retail electric rates, assesses cost-recovery and prudence of resource acquisition and operations. Can affect use, acquisition and mode of payment for energy storage at distribution level.

# Cost Recovery Issues

- The map below shows information on the electric industry restructuring. Click on a State for details.
- Restructuring means that a monopoly system of electric utilities has been replaced with competing sellers.



Source: Energy Information Administration



# May Mean More Focus on Flexibility

- ◆ Address cross-subsidization of value
- ◆ Adjust market design
- ◆ Be willing to shed adherence to strict categories

# Option 3: Capitalize on Distributed Technological Innovation

- ◆ Demand Response
- ◆ DG
- ◆ Microgrids

# FERC Order 745

134 FERC ¶ 61,187  
UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 35

[Docket No. RM10-17-000; Order No. 745]

Demand Response Compensation in Organized Wholesale Energy Markets

(Issued March 15, 2011)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Final Rule.

SUMMARY: In this Final Rule, the Federal Energy Regulatory Commission (Commission) amends its regulations under the Federal Power Act to ensure that when a demand response resource participating in an organized wholesale energy market administered by a Regional Transmission Organization (RTO) or Independent System

# D.C. Circuit Struck Down Order 745

## United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

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Argued September 23, 2013

Decided May 23, 2014

No. 11-1486

ELECTRIC POWER SUPPLY ASSOCIATION,  
PETITIONER

v.

FEDERAL ENERGY REGULATORY COMMISSION,  
RESPONDENT

MADISON GAS AND ELECTRIC COMPANY, ET AL.,  
INTERVENORS

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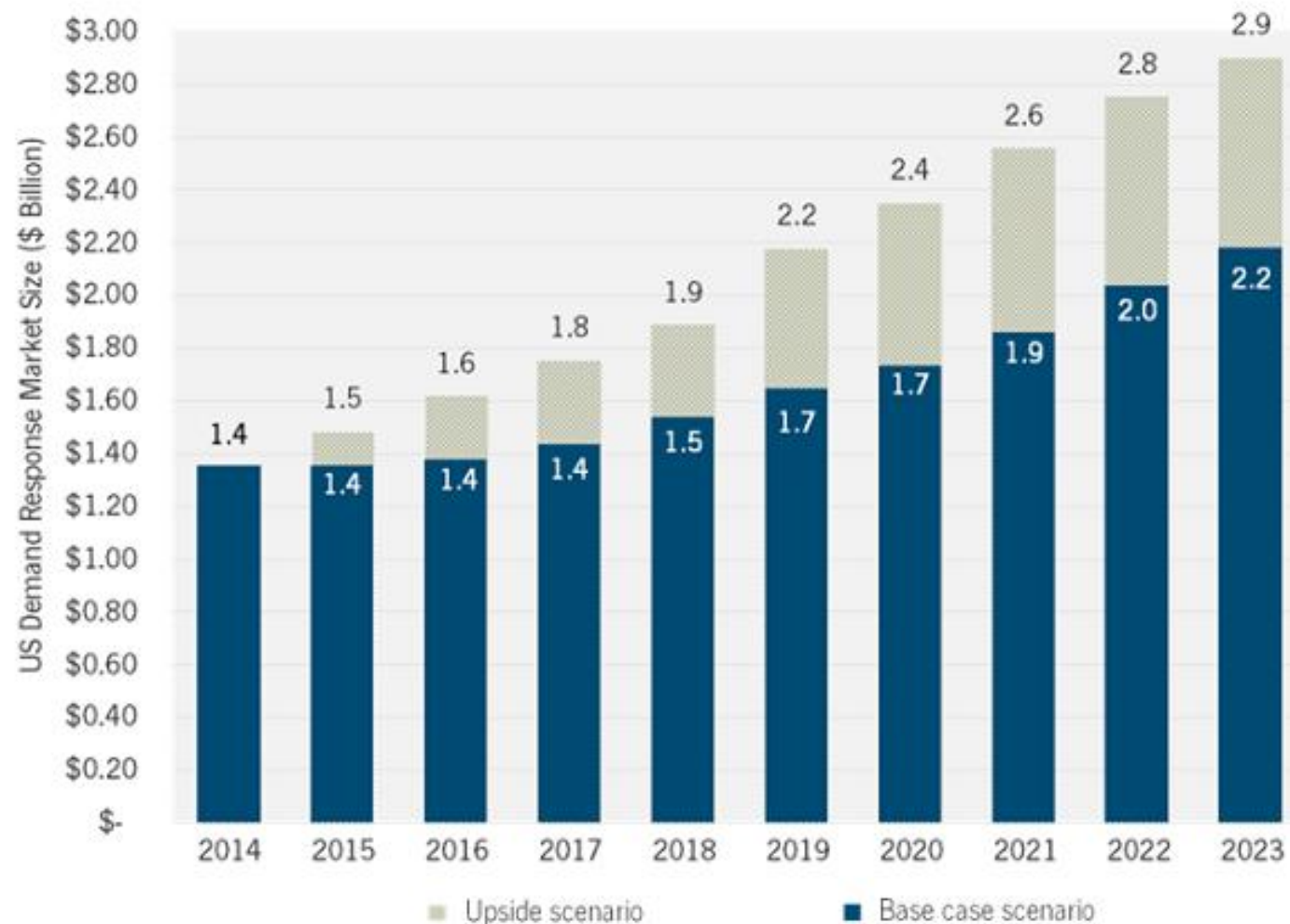
Consolidated with 11-1489, 12-1088, 12-1091, 12-1093

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On Petitions for Review of Orders of the  
Federal Energy Regulatory Commission



**FIGURE: U.S. Demand Response Forecast, With and Without FERC Order 745, 2014-2023**



*Source:* U.S. Demand Response Markets Outlook 2014

# May mean we need to reassess categories

- ◆ Take a functional approach to jurisdiction
- ◆ Gather more information
  - ◆ RTOs/ISOs are working with states, utilities and NESCOE to forecast growth of DG/PV resulting from state policies
  - ◆ Need to understand: amount, type, location, and timing

# Summary: Reliability in Perspective

## Historic

- ◆ Vertically integrated utility in charge of reliability
- ◆ Generally intrastate transmission
- ◆ Preference for incumbents
- ◆ Simpler system

## Modern

- ◆ Multiple stakeholders in charge of reliability
- ◆ More interstate transmission
- ◆ Creation of non-discriminatory RTOs/ISOs, competitive bids, and removal of ROFR
- ◆ Complex system with need to facilitate coordination and establish clear decision-makers

# Conclusions

- ◆ Tensions can result in underinvestment in technologies needed to “keep the lights on”
- ◆ Key Principles:
  - ◆ Explore evolving federalism relationships
  - ◆ Focus on flexibility
  - ◆ Be willing to reassess categorical determinations



# Thank you

💧 Comments or questions?



💧 [stein@law.ufl.edu](mailto:stein@law.ufl.edu)