



# **2012 National Electric Transmission Congestion Study**

## **Preliminary Findings**

**Stakeholder Consultation Webinars  
August 2012**



**David Meyer  
Office of Electricity Delivery  
and Energy Reliability  
U.S. Department of Energy**



# Background

- **The Energy Policy Act of 2005 amended the Federal Power Act to require DOE to conduct a transmission congestion study every three years, in consultation with the states.**
- **DOE published a study in 2006, and a second for 2009 (in early 2010). We are now preparing the 2012 study.**
- **Statutory text directs DOE to seek to identify “geographic areas experiencing ... transmission capacity constraints or congestion that adversely affects consumers ....”**
- **Statute also authorizes (but does not require) the Secretary to designate areas pertinent to such congestion as “national interest electric transmission corridors” [National Corridors].**
- **At present, we are focusing only on the Congestion Study.**



# Congestion Study Process

## August 2012

- DOE is hosting three webinars to discuss its preliminary findings with stakeholders. Two of the webinars will be oriented toward state officials. DOE will hold additional meetings or conference calls with states if requested.

## Fall 2012

- DOE will release a *draft* Congestion Study for public and stakeholder comment on its substance and conclusions.

## Next Steps

- DOE will review and consider comments received, and publish a final version of the 2012 Congestion Study.
- DOE may hold public workshops in areas that may be experiencing constraints or congestion adversely affecting consumers. These workshops would focus on options for congestion relief.



# Changes from Earlier DOE Congestion Studies

- **More granularity**
  - Focus on specific evidence of transmission constraints and congestion and their consequences.
  - Focused time frame (recent historical trends, forward only a few years) and look at changes in conditions over time.
  - No broad conclusions about large geographic areas (i.e., DOE will not identify “Critical Congestion Areas,” “Congestion Areas of Concern,” or “Conditional Congestion Areas”).
- Results are presented for four mega-regions (West, Midwest, Northeast, Southeast), looking for evidence of persistent, problematic congestion.
- Study relies entirely on public data and analyses, no DOE modeling.



# Definitions of Transmission Constraints and Congestion

- **Transmission Constraint:**
  - An element of a transmission system that physically limits power flow;
  - An operational flow limit imposed upon an element or a group of related elements to protect reliability; or
  - A lack of transmission capacity needed to deliver electricity from existing or potential sources of generation without violating reliability rules.
- **Transmission Congestion:**
  - Occurs when a user desires to increase throughput on a given transmission path, but higher utilization is thwarted by one or more constraints. Congestion can increase electricity supply costs, impede achievement of public policy goals, and signal future reliability problems.



# Economics of Reducing Congestion

**DOE will not analyze the economics of alternative ways to address specific congestion problems, or prescribe solutions. That said,**

- **There are three traditional means of reducing congestion, often used in combination:**
  - **Build more generation close to load centers.**
  - **Reduce load through energy efficiency and demand reduction programs.**
  - **Build more transmission capacity in appropriate locations.**
- **All strategies for reducing congestion require capital investment. Mitigation of all congestion would not be economic or appropriate for other reasons.**



# Indicators of Transmission Constraints and Congestion - 1

- **Frequent high utilization of a line or path:**
  - Is necessary but not sufficient for congestion to occur.
  - Some lines or paths are *designed* for high utilization.
  - Congestion occurs only when a fully-loaded line or path cannot accommodate requests or expectations for additional use. Would-be users must turn to less desirable alternatives.
- **Empirical indicators of congestion:**
  - Frequent usage by grid operators of transmission loading relief (TLR) procedures.
  - Frequent or recurrent disparities in wholesale electricity prices across regional markets, as seen in
    - RTOs' reported congestion costs.
    - Differentials in locational marginal prices (LMPs).
    - Differentials in forward capacity prices.
    - Differentials in prices at wholesale electricity "hubs."



# Indicators of Transmission Constraints and Congestion - 2

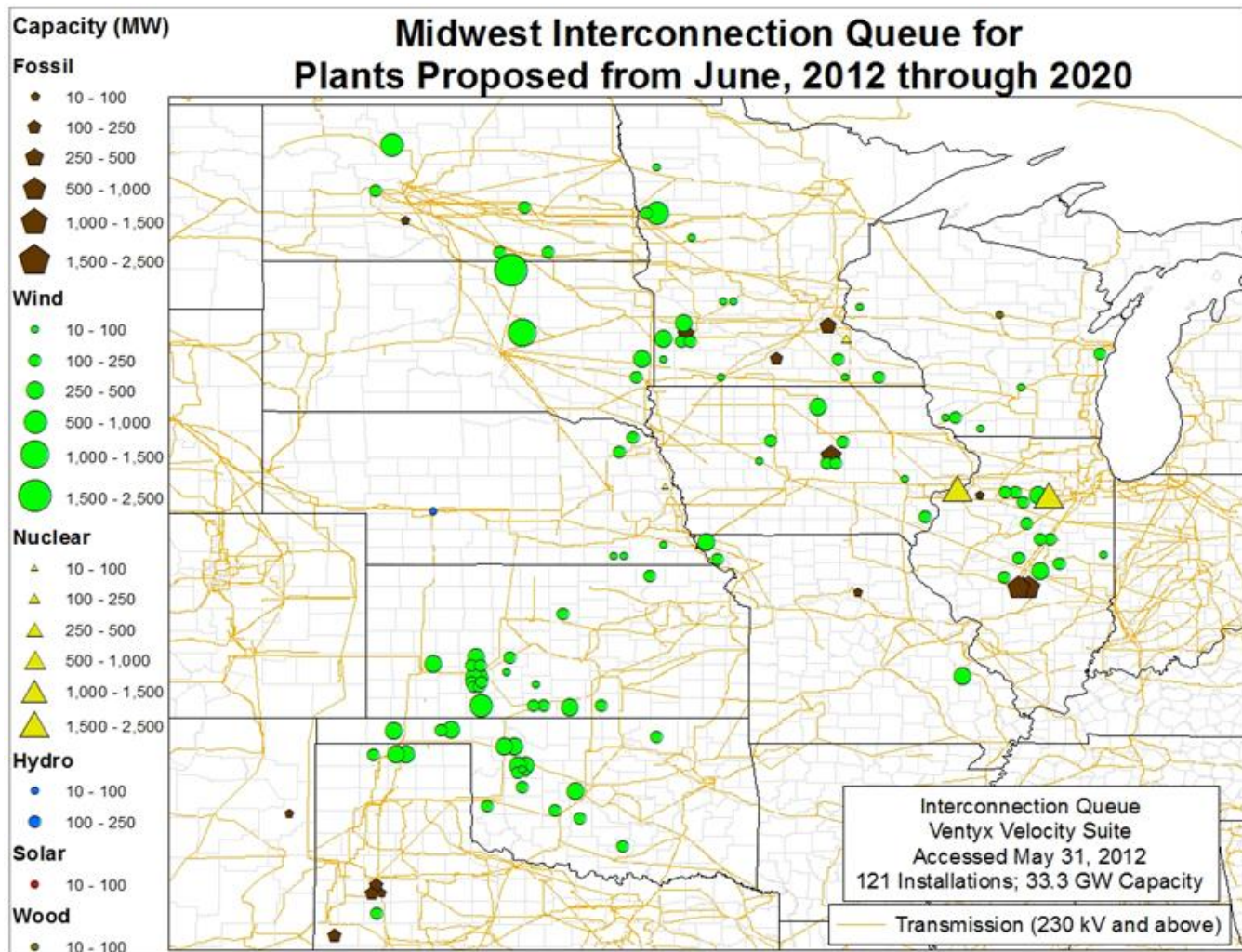
## Resource-Related Constraints:

- As of 2012, 37 states and DC have established policies to support development of renewables through portfolio standards (RPSs) or goals for utilities they regulate.
- The industry's responses to the RPSs, in combination with the physical distribution of preferred potential renewable resources, can lead to the clustering of renewable resource development activity in certain areas.
- In some of these areas, large queues of proposed renewable projects are seeking interconnection with the transmission system. Even though some of these projects are more likely to be built than others, the queues nonetheless often exceed available or projected transmission capacity.
- Thus, the queues indicate likely resource-related transmission constraints, and the need for continued transmission planning.



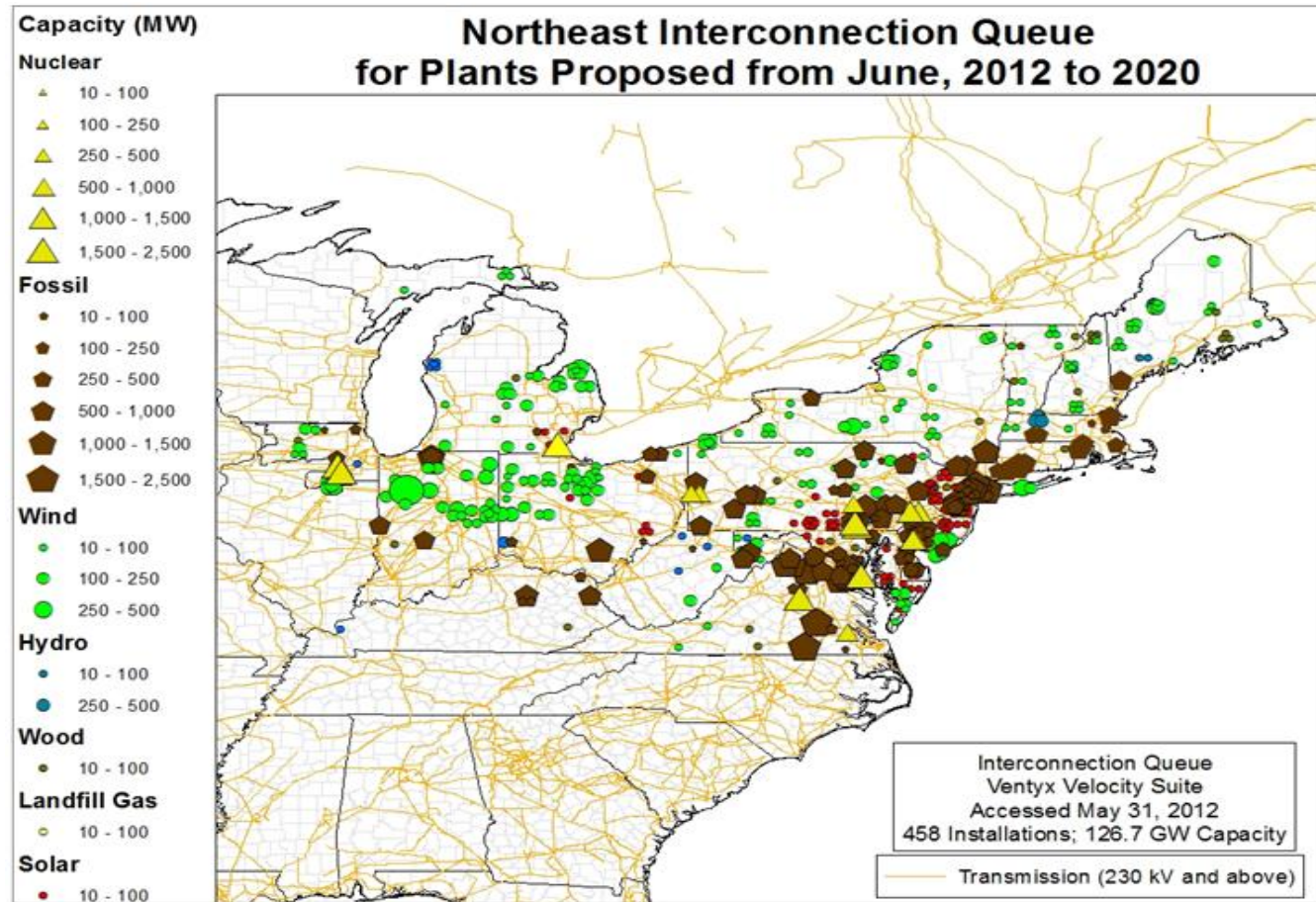


# Midwest Queue Map – Plants Proposed for June 2012 through 2020





# Northeast Queue Map – Plants Proposed for June 2012 through 2020





# Pause

**Any questions so far?**



# Five Major Congestion-Related Changes Since 2009

Since 2009, five broad trends or changes have affected transmission usage and congestion patterns. Most, but not all, of these changes are reducing congestion and its costs:

1. Although the economy has been in recovery since the recession of 2008, the modest economic growth has reduced the rate of electricity demand growth. All else equal, lower electricity demand frequently means less congestion.
2. Abundant supplies of natural gas at low prices have two effects:
  - Gas-fired generators are used more intensively, and because they are often sited closer to load centers than the capacity being displaced, transmission usage and congestion are reduced.
  - Lower natural gas costs mean somewhat lower fuel costs for electricity generation, leading to lower congestion costs.

# Five Major Congestion-Related Changes Since 2009 (cont.)

3. Establishment of state renewable portfolio standards (RPSs):
  - Increased generation from renewables in remote locations, though generally beneficial, is increasing congestion in some areas (between prime resources and load centers).
4. Recent environmental and other considerations – in combination with low natural gas prices relative to coal prices – affect generator availability for dispatch and in turn affect congestion.
  - As coal-fired and other plants are retired or retrofitted, grid operators will modify dispatch patterns according to the economics of available generation and transmission capacity relative to loads. Appropriate actions will be taken to maintain grid reliability, but congestion may increase in some locations.
  - The combined congestion effects of the environmental considerations, plant availability, and fuel price changes will not be known for several years.





# Five Major Congestion-Related Changes Since 2009 (cont.)

5. Construction of major new transmission projects in many areas has also helped to reduce congestion.

## Looking ahead:

- Congestion is lower – but remains volatile. Will it stay down as the economy recovers and the generation fleet evolves?
- Much of our existing transmission infrastructure is aging and will need replacement before 2030.
- In many areas, simply replacing “like with like” may not be appropriate. Deciding what the system should look like by 20XX, however, is a challenging assignment -- electric system planners face more technological and other uncertainties than ever before.
- As a result, investments to sustain robust, adaptable transmission networks are more important than ever.

# Congestion Costs as a Fraction of Total Electricity Costs

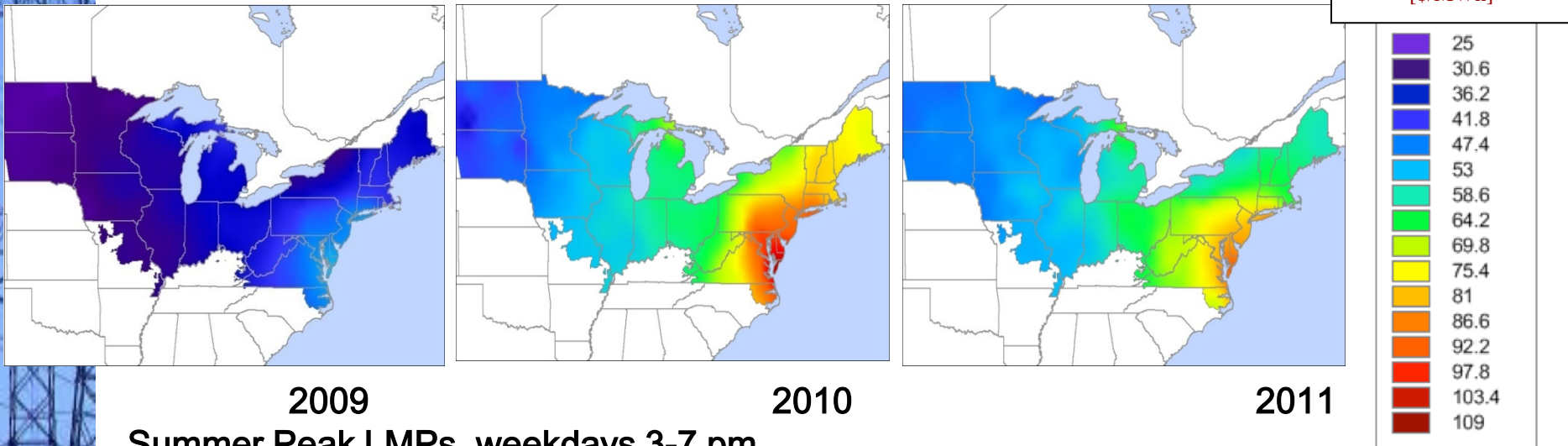
- Across most of the nation, congestion costs have declined since 2008, both in total dollar cost and in proportion to wholesale electricity market transactions.
- The results of data provided by RTOs and market monitors in New England, New York, and PJM, are shown below.
- For reasons that are not clear, New York's total congestion costs, as a percentage of its total electricity costs, have been appreciably higher than those for PJM and New England:

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>
New England	1.0%	0.4%	0.5%	0.3%
New York	NA	10.8%	11.3%	NA
PJM	6.2%	2.7%	4.1%	2.8%

NA = not available



# LMP Differentials Show Congestion Variations Across Northeast



2009

2010

2011

Summer Peak LMPs, weekdays 3-7 pm

2009: Minimal price disparities, reflecting low economic activity. Highest prices were concentrated in the eastern population centers, reflecting limited local low-cost generation and long-standing transmission constraints to the west (across the Appalachians).

2010: Economic activity increased (slowly), natural gas prices were somewhat higher, and temperatures were consistently higher. Result: Price disparities increased, but the locations of the congested areas were the same.

2011: Slow economic growth continued, natural gas prices moved lower, and temperatures were more moderate. Result: Price differentials narrowed relative to 2010, but the fundamental pattern was still similar to 2009 and 2010.

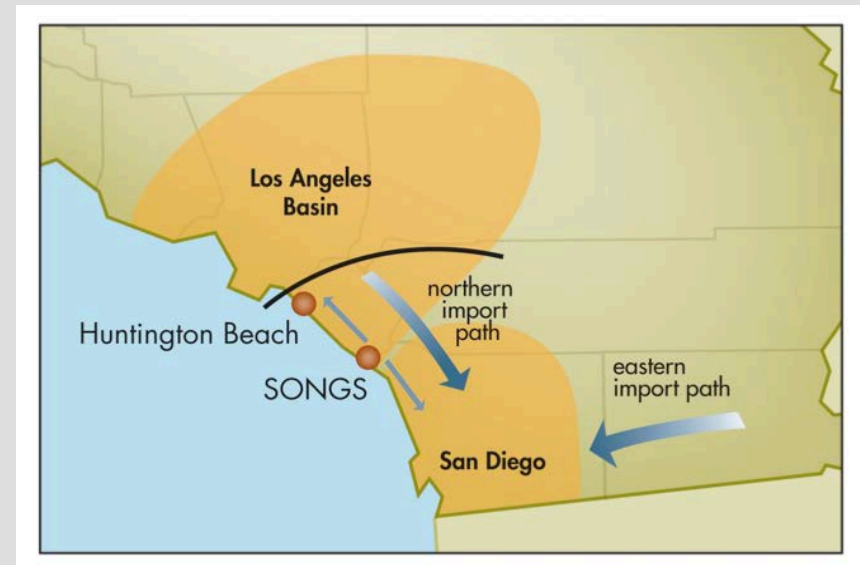




# Southern California (SONGS)

The unexpected and prolonged outage of the San Onofre Nuclear Generating Station (SONGS) has made the Los Angeles and San Diego areas vulnerable to potential reliability problems under high demand conditions.

**SONGS = 2240 MW; plus, by providing local voltage support, it enabled imports of 2850 MW. Without SONGS, if demand is high, LA could be short 240 MW and SD 337 MW. (Source: CAISO)**



Recent completion of the Sunrise Powerlink transmission project in the SD area, however, has had unanticipated reliability benefits, by making the area less dependent on its two pre-existing high-voltage transmission connections with external supply sources.

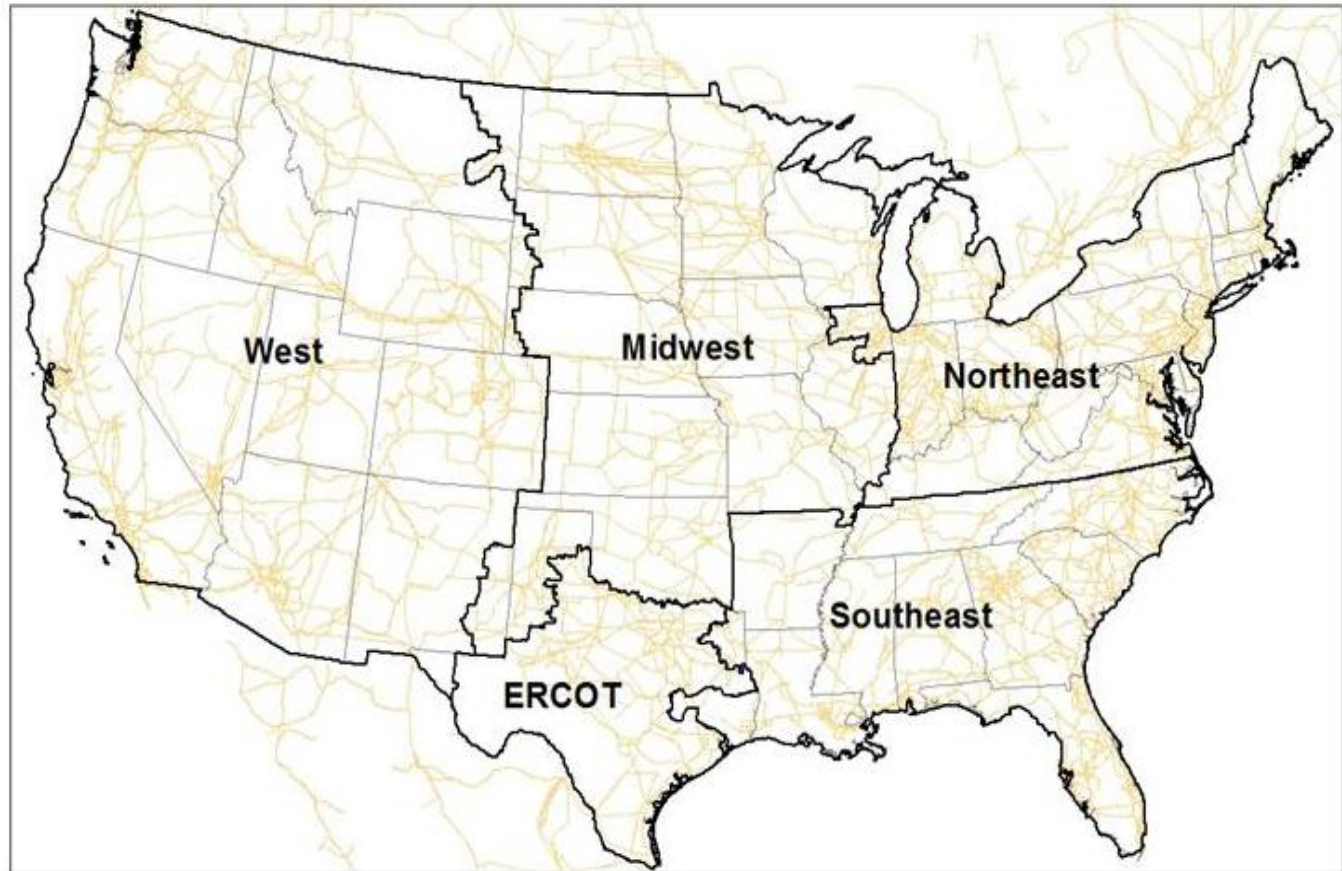


# Pause

**More questions?**



# Regional Boundaries Used for This Study



Note : ERCOT is by law excluded from this study.



# Data Used for This Study

	Transmission System Utilization	Congestion Management and Evidence of Congestion					Resource-Driven Transmission Constraints			
	%Utilization	Transmission Loading Relief	Operationally Limiting Constraints	Annual Congestion Cost	Locational Marginal Prices	Wholesale Electricity Price Indices	Local Reliability	Interconnection Queue	Renewable or Clean Energy Zone	
<b>West</b>										
Non-RTO	WECC/TEPPC	Not used	Not applicable	Not applicable	Not applicable	FERC	NERC	WECC	WGA	
CAISO	WECC/TEPPC	Not used	CAISO	CAISO	CAISO	FERC	NERC	WECC	WGA	
<b>Midwest</b>										
MISO	OATI	NERC	MISO	MISO	MISO	FERC	NERC	MISO	Not available; in progress	
SPP	OATI	NERC	SPP	SPP	SPP	FERC	NERC	SPP	Not available; in progress	
PJM	OATI	NERC	PJM	PJM	PJM	FERC	NERC	PJM	Not available; in progress	
Non-RTO	OATI	NERC	Not applicable	Not applicable	Not applicable	FERC	NERC	Not available from all utilities	Not available; in progress	
<b>Northeast</b>										
ISO-NE	OATI	Not used	ISO-NE	ISO-NE	ISO-NE	FERC	NERC	ISO-NE	Not available; in progress	
NYISO	OATI	NERC	NYISO	NYISO	NYISO	FERC	NERC	NYISO	Not available; in progress	
PJM	OATI	NERC	PJM	PJM	PJM	FERC	NERC	PJM	Not available; in progress	
<b>Southeast</b>										
SERC	OATI	NERC	Not applicable	Not applicable	Not applicable	FERC	NERC	Not available from all utilities	Not available; in progress	
FRCC	OATI	NERC	Not applicable	Not applicable	Not applicable	FERC	NERC	Not available from all utilities	Not available; in progress	



# Preliminary Regional Findings: West

- Many western paths are heavily utilized, but few represent challenges to reliability.
- Congestion cost data is available only from CAISO. The most frequently congested internal CAISO constraint limited trade during 8% of 2011. Overall, congestion in CAISO had small impacts on electricity prices.
- Mounting uncertainties make transmission planning more challenging than ever.
- Ensuring system flexibility is more important than ever.



# Preliminary Regional Findings: Midwest

- Data indicate no significant, persistent constraints, apart from those related to the development of remote renewable resources.
- Data do not indicate any areas with major reliability problems.
- The economic congestion that is occurring is small in relation to the total cost of wholesale electricity traded in organized spot markets.
- Inconsistent market designs and practices between RTOS – as distinct from lack of transmission capacity – are a significant impediment to economically beneficial electricity trade.



# Preliminary Regional Findings -- Northeast

- In general, since 2009 transmission constraints have limited flows across the Northeast to a diminishing extent (in hours per year).
- In general, the economic cost of congestion across the region has declined over the past three years, both in magnitude and in proportion to the value of total electricity trade.
- Congestion cost in New York, in relation to total electricity trade, remains greater than in neighboring PJM and New England.
- Increasingly, some low-cost wind generation is being curtailed due to insufficient transmission capacity.



# Preliminary Regional Findings – Southeast

**The available data about transmission usage and congestion in the Southeast are too thin to support meaningful conclusions.**





# Pause

**More questions?**



# Need for Better Transmission Data

Despite widespread agreement on the strategic importance of our transmission infrastructure, there is no comprehensive, consistent information on transmission usage and new transmission investment . In particular:

- There are no uniform reporting requirements. Substantial data are available from the regions with organized markets (CAISO, ISO-NE, MISO, PJM, NYISO, SPP), but much less are available from the non-market regions, which cover at least 1/3 of the nation geographically.
- Data from the regions with organized markets are often not comparable. Each RTO and ISO has its own definitions, practices, and formats for calculating and publishing LMPs and congestion costs.
- The RTOs and ISOs change their footprints and market designs from time to time, making trend assessment more difficult. *26*



# Ways to Improve Transmission Data

The Department seeks discussion with other government agencies, utilities, and others on several possible actions:

- Work with FERC, NERC, and EIA to define and collect consistent information on transmission construction, utilization, reliability, and operating practices, and make aggregated information publicly available.
- Work with FERC and utilities on methods for collecting consistent, aggregated information on the economic value of transmission usage in areas without organized markets.
- Work with FERC and RTOs/ISOs to better harmonize definitions and data reporting on transmission constraints and congestion.
- Work with FERC, PUCs, and utilities to make interconnection queue information more consistent and publicly available.



# Pause

**More questions?**



# Contact Information

**David Meyer**  
**Senior Advisor**  
**Office of Electricity Delivery and Energy**  
**Reliability**  
**U.S. Department of Energy**

**David.Meyer@hq.doe.gov**  
**phone: 202-586-1411**