



Advancing Wind Power in Illinois Conference 2011

David Schweizer

PJM Interconnection

Curtailment of Wind Farms Output

Breakout Session

Friday, July 22, 2011, 1:30 PM



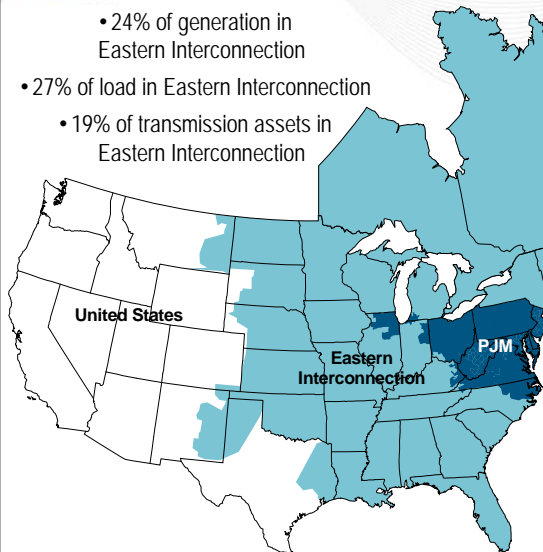
Wind Farm Operational Issues

Illinois Wind Working Group
Annual Conference
July 22, 2011



PJM as Part of the Eastern Interconnection

- 24% of generation in Eastern Interconnection
- 27% of load in Eastern Interconnection
- 19% of transmission assets in Eastern Interconnection



KEY STATISTICS	
PJM member companies	700+
millions of people served	58
peak load in megawatts	158,448
MW of generating capacity	180,400
miles of transmission lines	61,200
GWh of annual energy	794,335
generation sources	1,365
square miles of territory	211,000
area served	13 states + DC
Internal/external tie lines	142

**20% of U.S. GDP
produced in PJM**

As of 6/1/2011



PJM States with RPS

State Renewable Portfolio Standards (RPS) require suppliers to utilize wind and other renewable resources to serve an increasing percentage of total demand.

State RPS Targets:



- ☀ NJ: 22.5% by 2021
- ☀ MD: 20% by 2022
- ☀ DE: 25% by 2026 [^]
- ☀ DC: 20% by 2020
- ☀ PA: 18%^{**} by 2020
- ☀ IL: 25% by 2025
- ☀ OH: 25%^{**} by 2025
- ☀ NC: 12.5% by 2021 (IOUs)
- MI: 10% + 1,100 MW by 2015 [^]
- VA: 15% by 2025 [^]
- WV: 25%^{**} by 2025 [^]

DSIRE: www.dsireusa.org January 2011

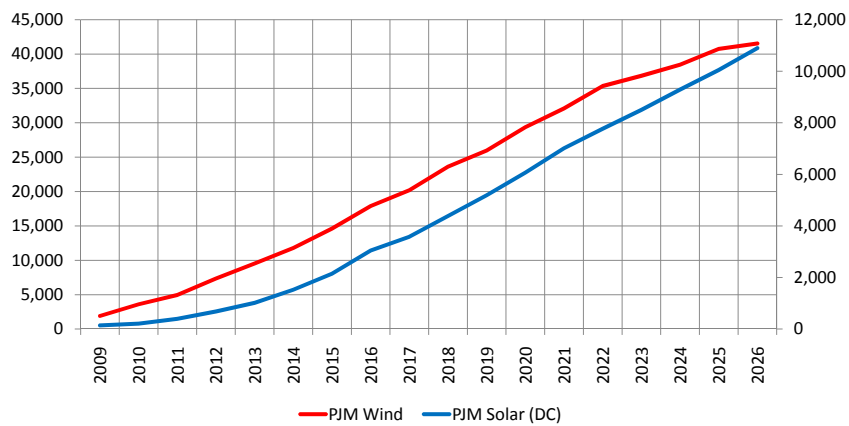
☀ Minimum solar requirement
[^] Extra credit for solar or customer-sited renewables
^{**} Includes separate tier of "alternative" energy resources

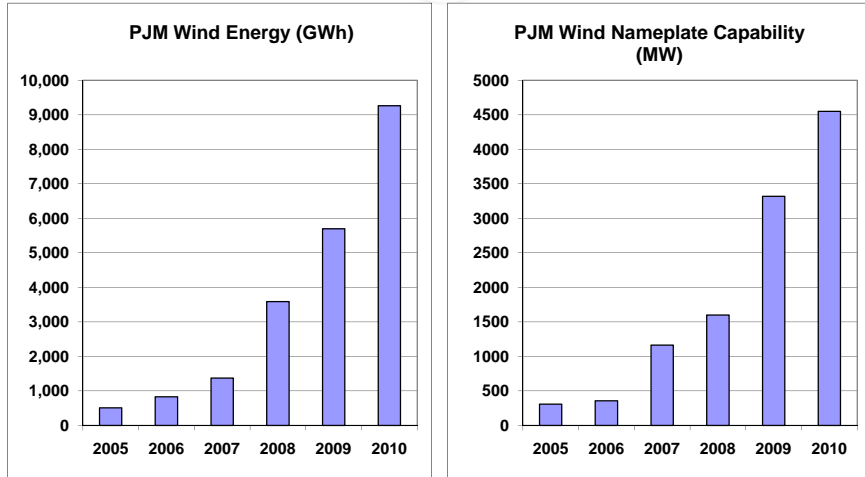


Projected Renewable Energy Requirements in PJM

By 2026: 135,000 GWh of renewable energy, 14% of PJM annual net energy (41 GW of wind and 11 GW of solar)

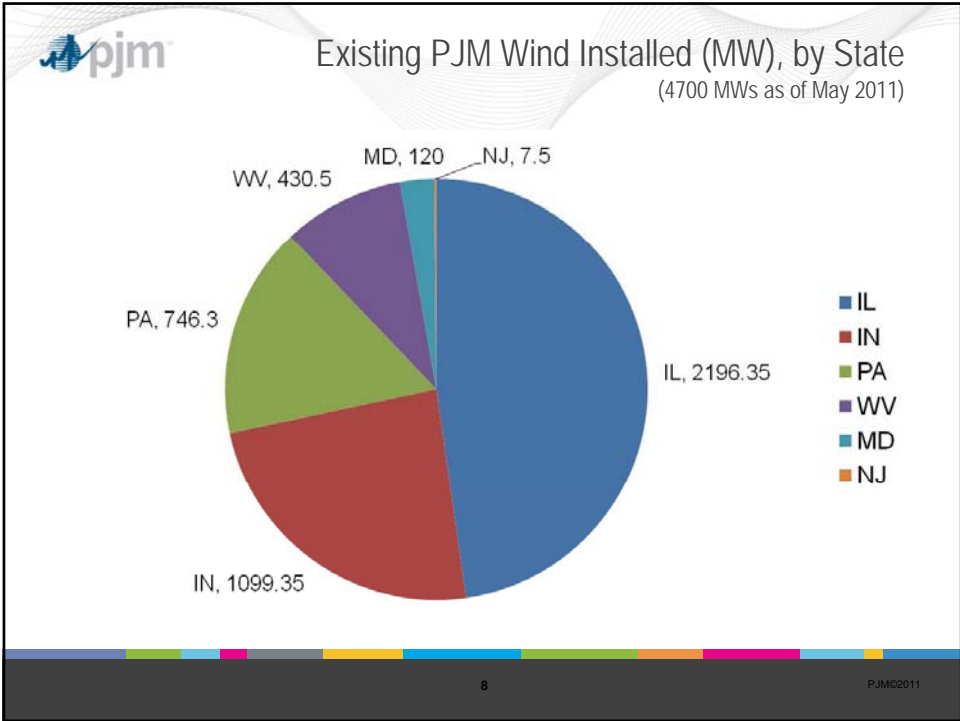
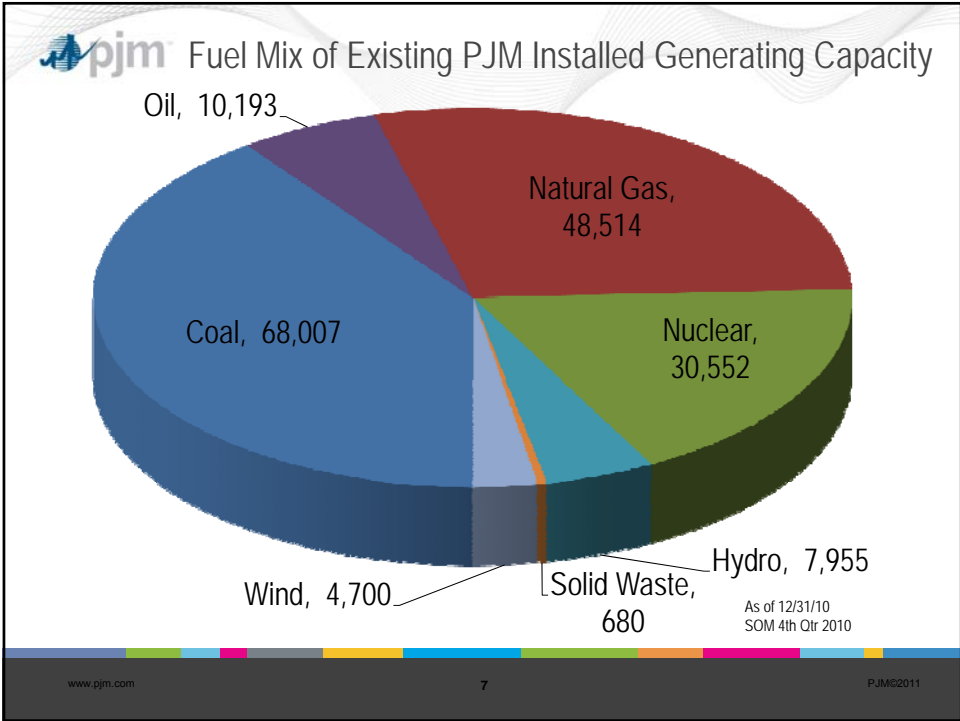
Wind and Solar Requirements in PJM (MW)

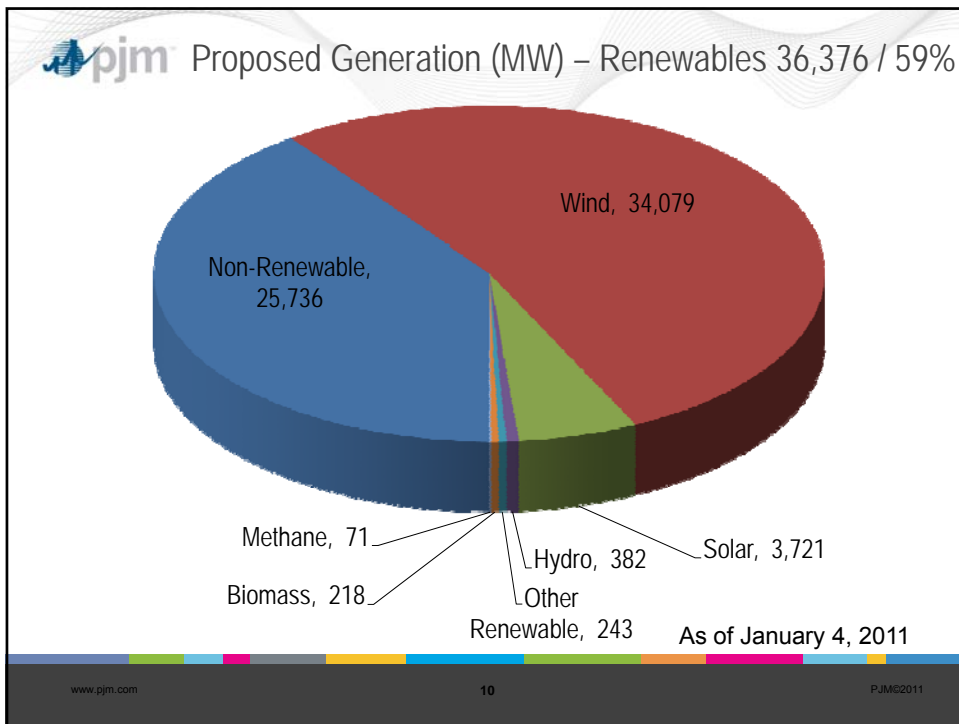
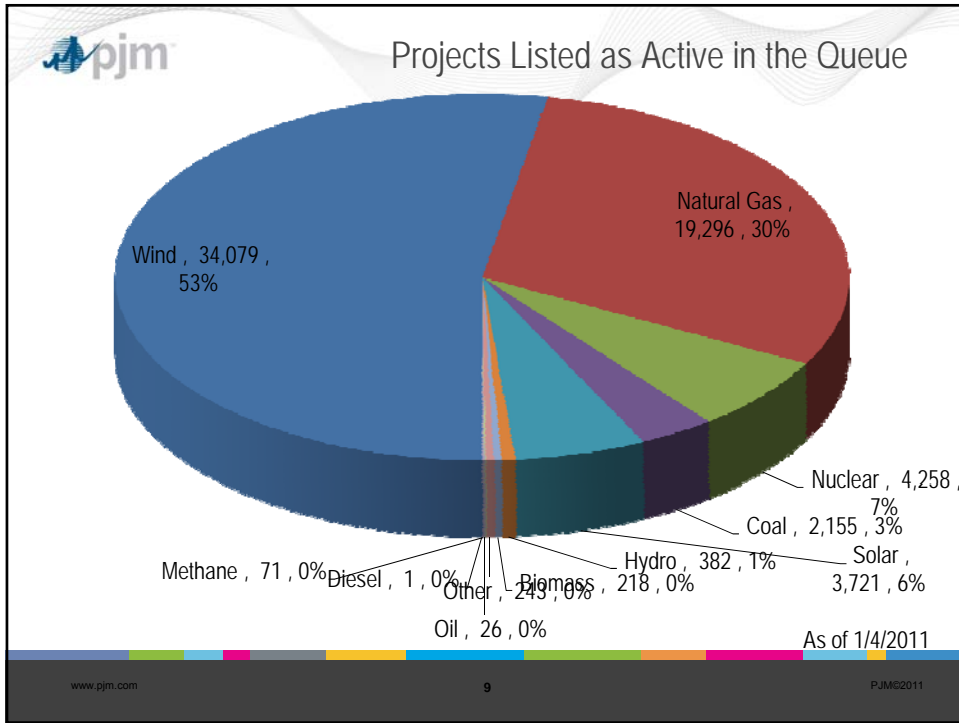


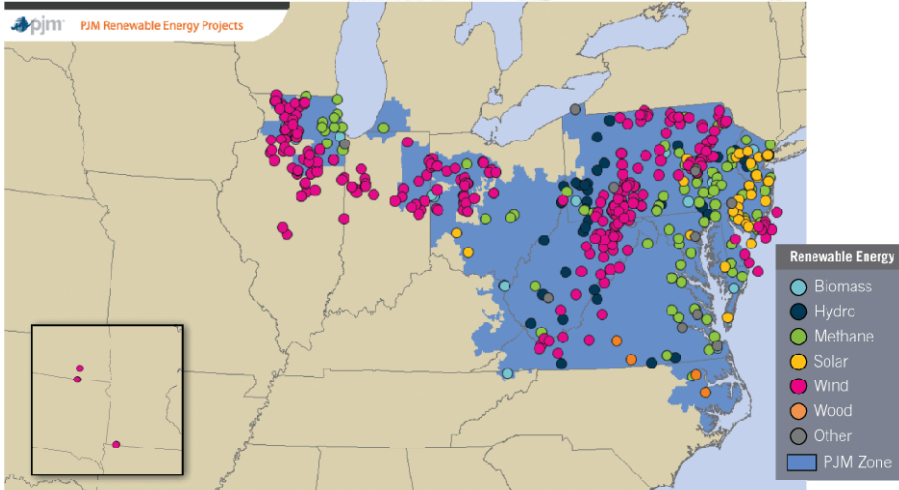


- 4700 MW's of wind turbines interconnected
- 1200 MW's of wind turbines interconnected in 2010
- 1100 MW's of wind turbines presently projected in 2011





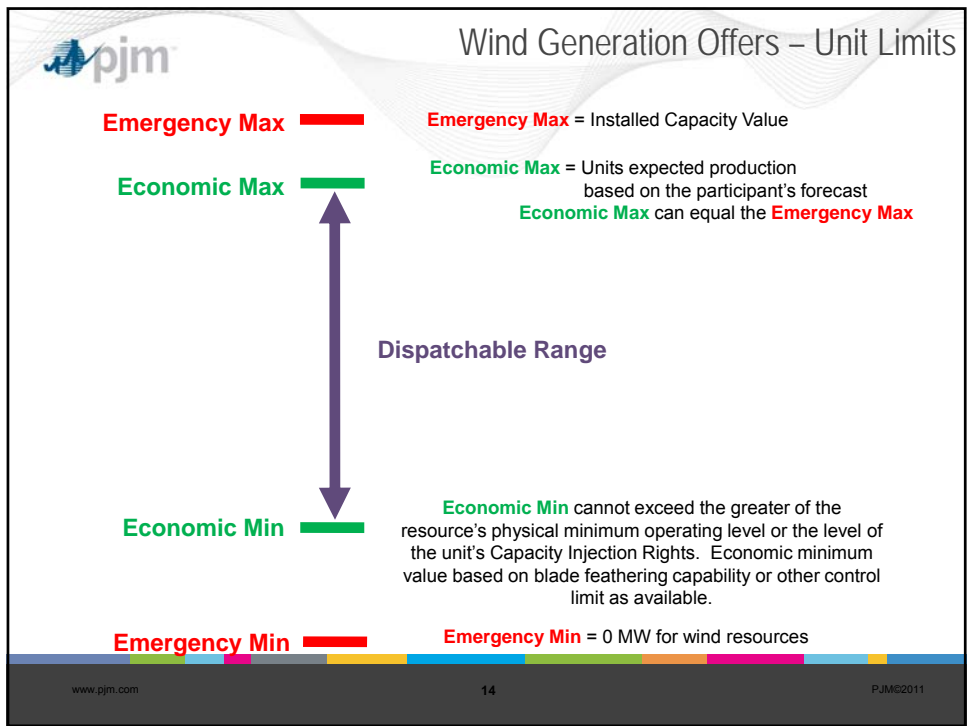
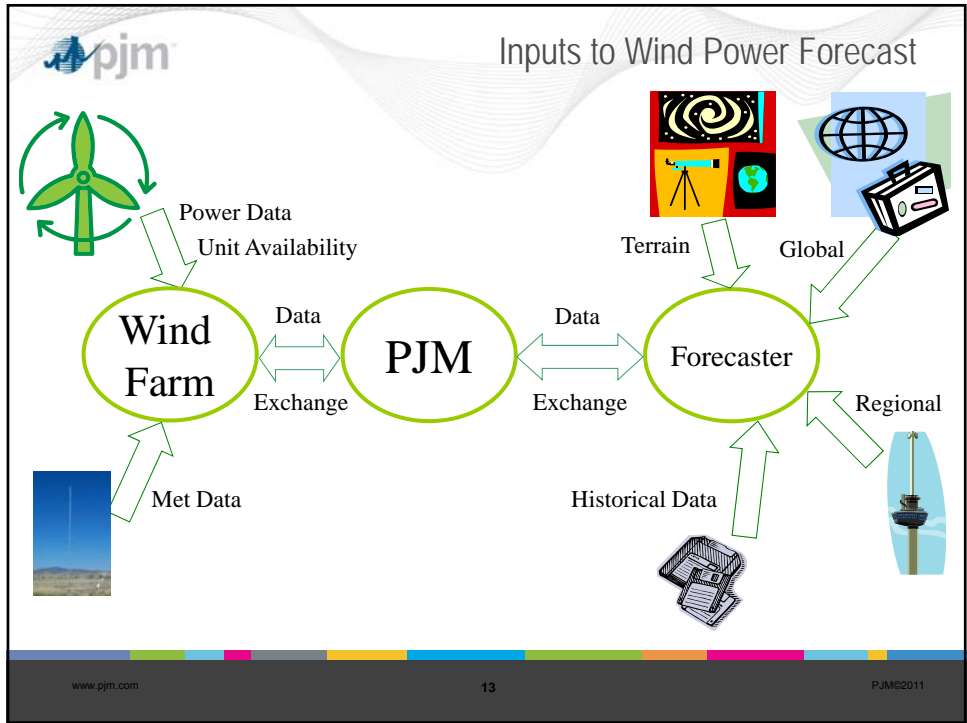


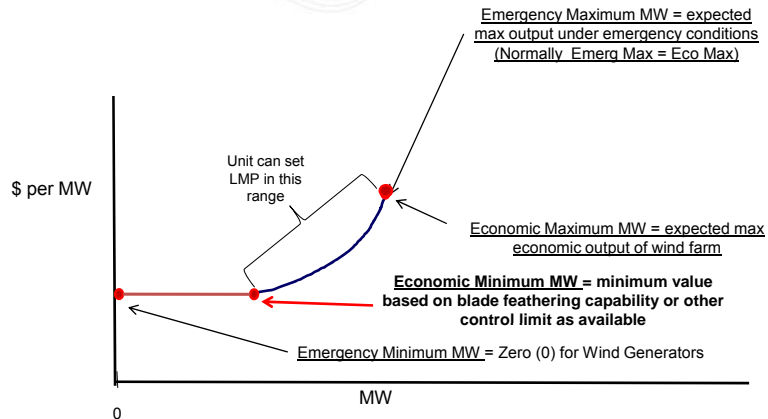


As of February, 2011

- Agreements
- Modeling / Telemetry / Metering
- Outage Coordination
- Testing activities
- Transition into Operations and Markets
- Wind Forecasting
- Curtailments due to light load or transmission constraints







Wind Generator Operators adjust Wind Turbine Control Systems or manually adjust turbine output to achieve the desired Security Constrained Economic Dispatch (SCED) basepoint.

- **Background:**
 - Existing PJM thermal and reactive criteria – peak load
 - Increasing system stress levels at off-peak periods
 - NERC TPL Standards
- **Light Load Criteria includes:**
 - Test methodology applied
 - Ramping limits for generator deliverability
 - Generation participation from neighboring systems
- **Result:**
 - Possible network upgrades due to light load criteria violations

- Formed the Intermittent Resource Task Force (IRTF) to address market, operational, and reliability issues specific to variable resources
- Implemented a centralized wind power forecasting service for use in PJM reliability assessments
- Implemented multiple changes to improve wind resource management
- Initiated a PJM Renewable Integration Study to assess impacts to planning, markets, and operations

- For more information about PJM's initiatives:
 - Exploring Tomorrow's Grid: New developments and technologies to advance the grid:
<http://www.pjm.com/about-pjm/exploring-tomorrows-grid/smart-grid.aspx>
 - Renewables Dashboard: See how PJM is working to bring renewable energy to the grid:
<http://www.pjm.com/about-pjm/newsroom/renewable-dashboard.aspx>



PJM
Integrating
Grids & Markets

**Focus on
three things**

1. Keeping the Lights On
2. Fair and Efficient Markets
3. Infrastructure for the future