


RIC 2009

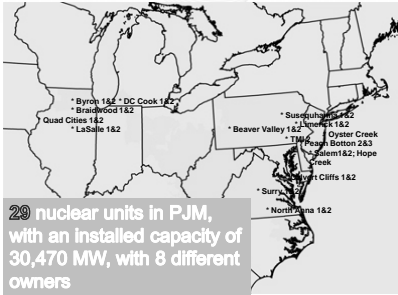
Nuclear Power Plant/Electric Grid Regulatory Coordination and Cooperation Transmission Operator's Perspective

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PJM Overview



29 nuclear units in PJM,
with an installed capacity of
30,470 MW, with 8 different
owners

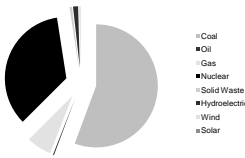
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PJM Energy Market

PJM Generation by Fuel Source (GWh) in 2008		
	GWh	Percent
Coal	40564	55.7
Oil	1917	2.6
Gas	48029	66.0
Nuclear	25507	35.0
Solid Waste	492	0.7
Hydroelectric	971	1.3
Wind	332	0.5
Solar	4	0.0
Total	72852	100

- 91% of PJM's energy comes from coal and nuclear generation, with nuclear providing 35% of the total
- PJM supplies about 15% of the total United States load



- Coal
- Oil
- Gas
- Nuclear
- Solid Waste
- Hydroelectric
- Wind
- Solar

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pjm Objective

Simultaneously, with zero error tolerance, at all times,

- Preserve transmission system reliability – NERC and Regional Standards
- Support nuclear owner/licensee requirements to ensure nuclear safety – USNRC requirements
- Operate fair and impartial wholesale energy markets – FERC requirements and NAESB Business Practices

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pjm Example: Voltage Control

PJM BASE LINE VOLTAGE LIMITS

Limit	PJM Base Line Voltage Limits			
	500 kV	345 kV	230 kV	138 kV 115 kV 69 kV
High	500	362	242	145 121 72.5
	(1.0%)	(1.0%)	(1.0%)	(1.0%) (1.0%) (1.0%)
Normal Low	500	326	219	
	(1.0%)	(1.0%)	(1.0%)	
Emergency Low*	485	317	212	
	(1.0%)	(1.0%)	(1.0%)	
Load Dump**	475	310	207	
	(1.0%)	(1.0%)	(1.0%)	
Voltage Drop Warning	4.5%	4.5%	4.5%	
Voltage Drop Violation*	5.5%**	5.5%**	5.5%**	

* Refer to PJM Manual for Emergency Procedures (M) -- The voltage drop violation percentage may vary due to the following chart based on PJM's Voltage Operating Guidelines for a Post-Contingency Simulated Operation.

Voltage Limit Exceeded	If post contingency simulated voltage limits are violated	Time to correct (minutes)
High Voltage	Use all effective non-cost and cost actions.	30 minutes
Normal Low	Use all effective non-cost actions.	Not applicable
Emergency Low	Use all effective non-cost actions, official actions, and emergency procedures except load shed.	15 minutes
Load Dump Low	Use all effective non-cost actions for 3 minutes.	3 minutes
Voltage Drop Warning	Use all effective non-cost actions.	Not applicable
Voltage Drop Violation	Use all effective non-cost actions, official actions, and emergency procedures except load shed.	15 minutes

Exhibit S: PJM Base Line VOLT

NERC Standards require PJM to operate within thermal, voltage, and stability limits; and implement corrective action on a timely basis, as shown here for voltage limits.

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pjm Voltage Control for Nuclear Plants

- Some nuclear power plants (NPPs) in PJM have more restrictive post-contingency voltage limits than the default limits for the unit trip
 - PJM Energy Management System (EMS) is calculating post-contingency voltages every minute, via a simulation (real time contingency analysis -- RTCA)
 - If the simulation shows an violation of the limit, then the nuclear plant is notified and options are discussed
 - Nuclear plant can opt for: (1) generation redispatch or (2) take corrective action inside the plant


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 Market Operations

- PJM required to operate fair and open energy markets
 - Day Ahead Energy (DA)
 - Real Time Energy (RT)
 - Ancillary Services
 - Synchronized Reserves
 - Regulation


Market operations are subject to **FERC Office of Enforcement** oversight and are to be operated in accordance with **North American Energy Standards Board (NAESB) Business Practices**

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 Market Operations Summary


- Over 1500 generators participating in PJM Markets
- Total production cost in 2008 = **\$21-Billion!**
- NPPs are “price takers”, they are the lowest cost producers in the market, and only tangentially involved with real time market operations

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 PJM Participation with the Regulatory Entities

- NERC
 - Standards development
 - Event investigation
 - Technical committee participation
- NAESB
 - Business Practice development
- PJM Nuclear Owners/Operators Users Group
 - Develop processes to support NPP needs and support mutual understanding of grid and NPP design and operational requirements
- USNRC
 - Assist PJM licensees on grid issues
- FERC –
 - Provide real time information for monitoring

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 NERC Standard NUC-001

- Goal: Ensure nuclear safety objectives are met by incorporating nuclear-identified requirements into transmission planning and operations
- PJM and licensee activities
 - Standard development (PJM and PJM licensees participated)
 - Develop procedures and processes for the communication of NUC-001 Nuclear Plant Interface Requirements (NPIRs) to the transmission entities (Nuclear Owners/Operators Users Group)

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