Congestion and the PJM Regional Transmission Expansion Plan

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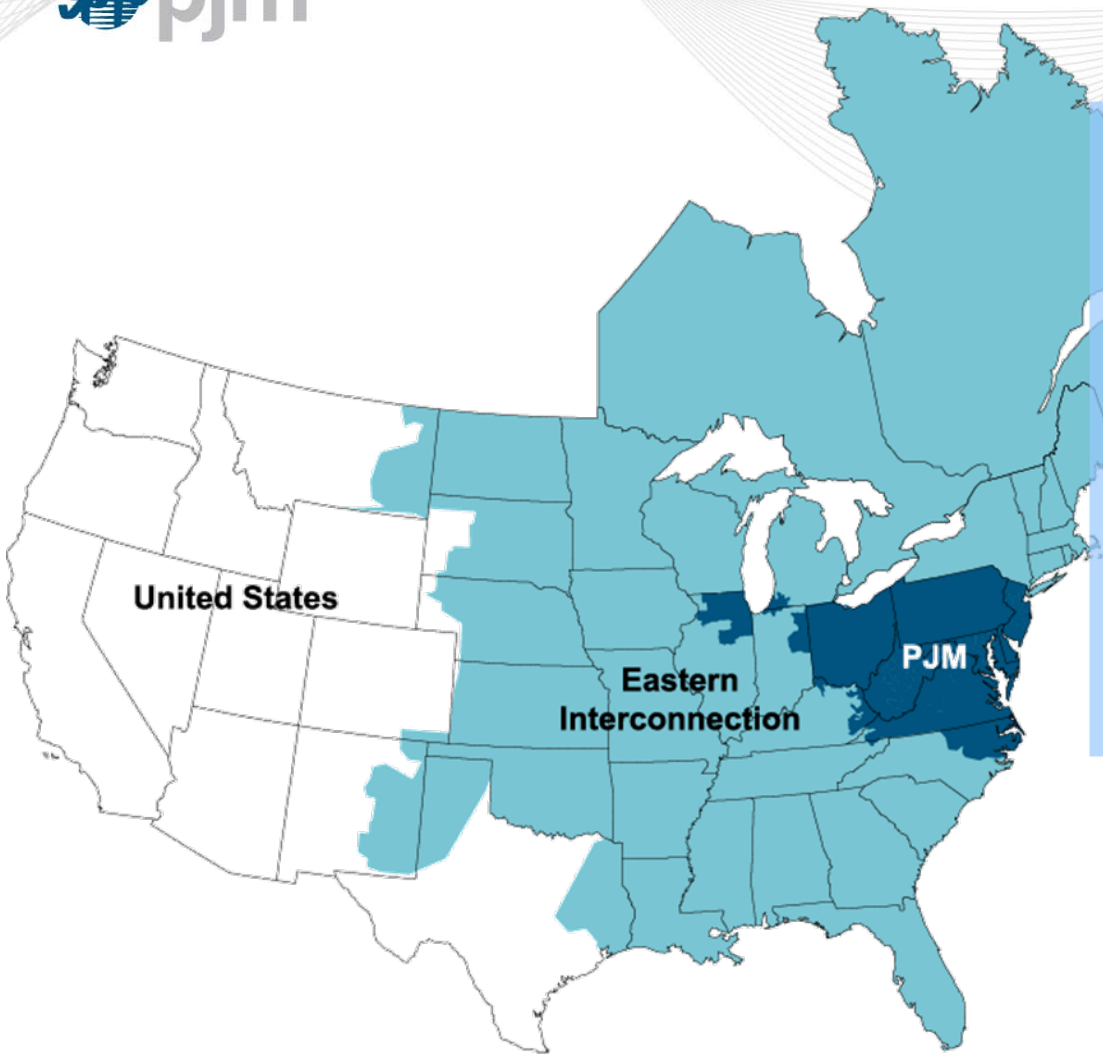
PJM as Part of the Eastern Interconnection with ATSI & Duke Integration



KEY STATISTICS	
PJM member companies	750+
millions of people served	61
peak load in megawatts	162,230
MWs of generating capacity	184,992
miles of transmission lines	62,214
GWh of annual energy	832,331
generation sources	1,340
square miles of territory	213,900
area served	13 states + DC
Internal/external tie lines	247

- 26% of generation in Eastern Interconnection
- 28% of load in Eastern Interconnection
- 19% of transmission assets in Eastern Interconnection

21% of U.S. GDP produced in PJM

Historical Total annual PJM congestion ($, Millions) Calendar years 2003 to 2010

	Congestion Charges	Percent Change	Total PJM Billing	Percent of PJM Billing
2003	$464	NA	$6,900	7%
2004	$750	62%	$8,700	9%
2005	$2,092	179%	$22,630	9%
2006	$1,603	(23%)	$20,945	8%
2007	$1,846	15%	$30,556	6%
2008	$2,117	15%	$34,306	6%
2009	$719	(66%)	$26,550	3%
2010	$1,428	99%	$34,771	4%
Total	$9,591		$185,358	5%

[Source: 2010 State of the Market Report for PJM, Section 7, Table 7.1]

2010 Historical Market Congestion

- **Total PJM congestion costs:** increased by $709.1 M (99%), from $719.0 million in 2009 to $1,428.1 M in 2010.
- **Interface congestion:** 50 percent of PJM total.
- **AP South interface:** 30 percent of total; highest % in PJM.
- **Transmission line congestion:** 35 percent of PJM total.
- **Transformers:** 13 percent of the PJM total congestion costs

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[Source: 2010 State of the Market Report for PJM, Section 7]

2010 Historical Market Congestion

- **Total congestion costs:** $1,428.1 million.
- Top 20 congestion events account for ~76% of PJM total congestion.
- Future RTEP upgrades will help reduce congestion associated with most 2010 historical constraints

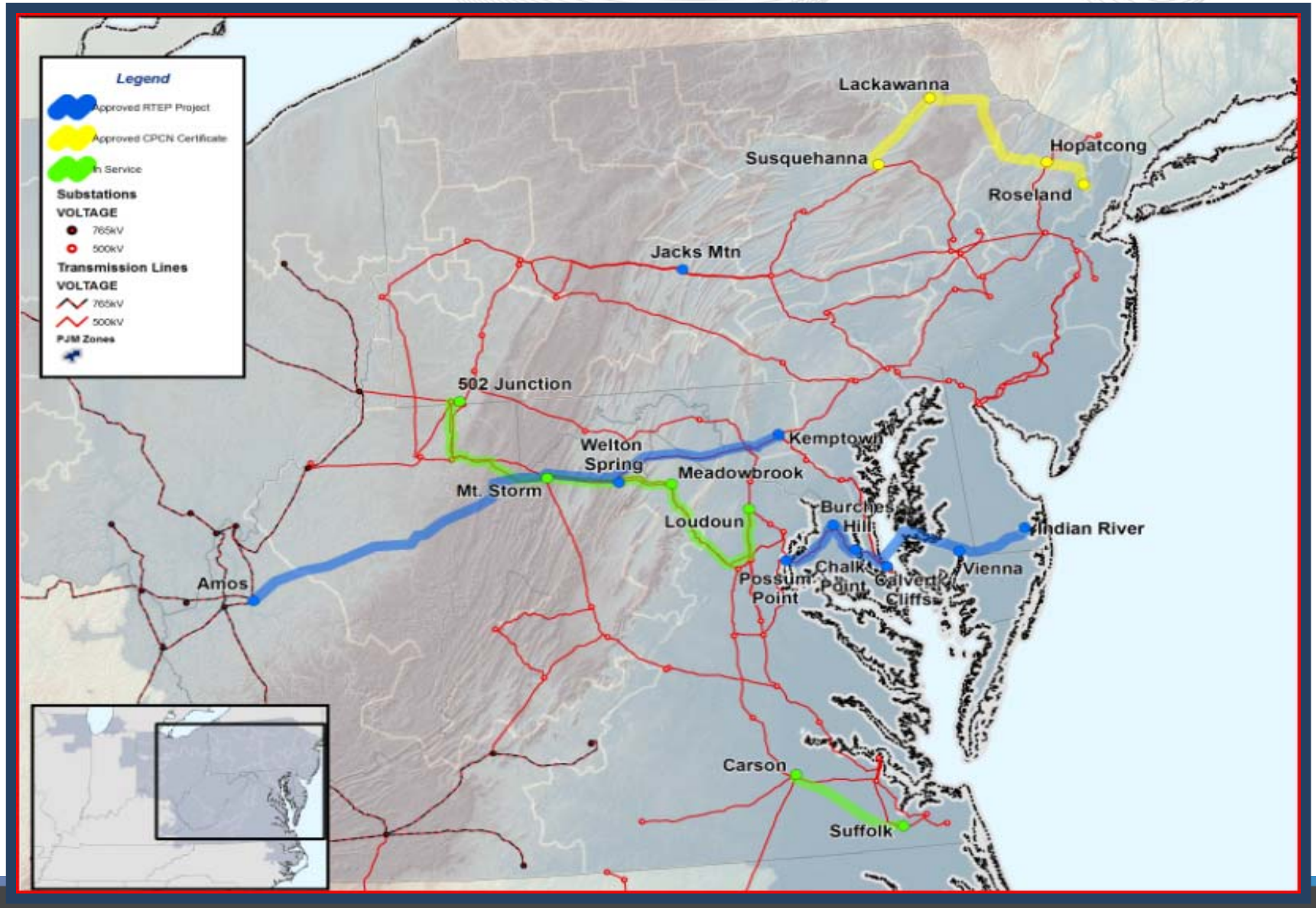
Source: 6/9/11 TEAC Market Efficiency Presentation]

2010 Historical Market Congestion
Top 20 Congestion-Causing Constraints

Rank	Constraint	Type	Location	# of Hours	Market Congestion ($ Millions)	% of Total Congestion	Planned RTEP Upgrades expected to provide Congestion Relief
1	AP South	Interface	500	4645	$421.6	30%	- TRAIL (6/2011) - Some congestion due to maintenance outages of the Meadowbrook-Morrisville 500 KV and Mount Storm-Pruntytown 500 KV lines.
2	Bedington - Black Oak	Interface	500	2291	$105.3	7%	- TRAIL (6/2011) - Some congestion due to maintenance outages of the Meadowbrook-Morrisville 500 KV and Keystone-Juniata 500 KV lines.
3	5004/5005 Interface	Interface	500	1644	$91.9	6%	- TRAIL (6/2011) - Some congestion due to maintenance outages of the Meadowbrook-Morrisville 500 KV and Keystone-Juniata 500 KV lines.
4	Doubs	XFMR	AP	909	$64.7	5%	- Doubs XFMR replacement projects (6/2011) -Congestion mainly due to Doubs Transformer maintenance outages
5	AEP-DOM	Interface	500	691	$62.3	4%	- TRAIL (6/2011) -Some congestion due to maintenance outages of the Meadowbrook-Morrisville 500 kV and Kammer-Harrison 500 KV lines.
6	East Frankfort - Crete	Line	ComEd	3084	$39.9	3%	
7	Crete - St Johns Tap	Flowgate	MISO	2066	$29.5	2%	
8	Cloverdale - Lexington	Line	AEP	1127	$28.9	2%	- TRAIL (6/2011) -Some congestion due to maintenance outages of the Meadowbrook-Morrisville 500 KV and Mount Storm-Pruntytown 500 KV lines.
9	Belmont	XFMR	AP	1887	$26.6	2%	
10	Brandon Shores - Riverside	Line	BGE	344	$25.7	2%	Congestion mainly due to local outages

Source: 6/9/11 TEAC Market Efficiency Presentation]

Approved Backbone Transmission



Status of New PJM Backbone Transmission Lines

- **TrAIL 500 kV line:** In-service, May 2011.
- **Carson – Suffolk 500 kV line**: In-service, May 2011.
- **Susquehanna – Roseland 500 kV line:** Board approved; CPCN approved; awaiting Park Service action; federal fast track.
- **PATH:** Board-approved; in abeyance.
- **MAPP:** Board-approved; in abeyance.

Monthly PJM congestion charges ($, Millions) January through September, 2010 and 2011

	2010	2011	Change	Percent Change
Jan	$218.3	$241.8	$23.5	10.8%
Feb	$106.4	$74.0	($32.4)	(30.4%)
Mar	$20.4	$44.1	$23.7	116.4%
Apr	$42.5	$39.0	($3.6)	(8.4%)
May	$68.5	$35.5	($33.0)	(48.2%)
Jun	$188.5	$125.0	($63.5)	(33.7%)
Jul	$268.9	$161.1	($107.8)	(40.1%)
Aug	$105.1	$59.5	($45.6)	(43.4%)
Sep	$119.9	$66.5	($53.4)	(44.6%)
Total	$1,138.5	$846.4	($292.1)	(25.7%)

[Source: 2011 Quarterly State of the Market Report for PJM: January through September; Section 7; Table 7-3

PJM 2011 Market Efficiency Simulation Studies: 2011, 2014, 2017 and 2020

Constraints with at least $20 million of Simulated Future Congestion

Constraint Name	Observations
AP SOUTH	Future new generation and Mt.Storm-Doubs Reconductor slightly reduces congestion.
EASTERN	Susquehanna-Roseland 500kV upgrade significantly reduces congestion.
Cloverdale 500kV to Lexington 500 kV	Future new generation slightly reduces congestion.
Black Oak - Bedington Interface	Future new generation slightly reduces congestion.
5004/5005	Congestion increases each study year.
Krendale 138kV to Seneca 138kV	Congestion slightly increases each study year. Will monitor in future analysis.
WESTERN	Congestion increases each study year.
COOPER 230kV to Peach Bottom 230kV	Congestion slightly increases each study year. Will monitor in future analysis.
Mitchell 138kV to Elrama 138kV	Congestion goes down in 2020 study year.
Lexington 500kV to Dooms 500kV	Congestion goes down in 2020 study year.
Clover 230kV to Clover 500kV	Congestion goes down in 2020 study year.
N Meshoppen 230kV to N Meshoppen 115kV	Congestion remains constant in later study years.
Streator Cayuga Ridge Wind Warm 345kV to Wilton CTR 345kV	Congestion slightly increases each study year. Will monitor in future analysis.
CENTRAL	Congestion slightly increases each study year. Will monitor in future analysis.
Altoona 230kV to Bear Rock 230kV	Congestion slightly increases each study year. Will monitor in future analysis.

PJM Summary

- PJM system exhibits West to East and load center congestion throughout most of the year
- The Mid-Atlantic Corridor is still the most significant from a congestion perspective
- Congestion management through LMP broadly affects all down stream load
- PJM continues to monitor and evaluate the congestion issues
- New transmission is a key component to congestion solutions