Transmission Expansion Advisory Committee Meeting

2010 Market Efficiency Analysis Preliminary Results

July 14, 2010

2009 Historical Market Congestion

- Review 2009 Historical Congestion
- Review Preliminary Results
- Review Future Market Efficiency Runs and Next Steps

2009 Historical Market Congestion

- Total market Congestion for 2009 about $719 million
- Top 20 congestion causing events account for about 81% of total congestion
- Future reliability RTEP upgrades will help relieve most constraints associated with 2009 historical congestion

2009 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	3501	$ 206.5	28.7%	- TrAIL (6/2011)
							- PATH (6/2015)
2	West	Interface	500	504	$ 43.7	6.1%	- Build Jack Mtn 500 kV substation and 1000 MVAR capacitors (6/2012)
							- TrAIL (6/2011)
							- PATH (6/2015)
3	5004/5005 Interface	Interface	500	776	$ 43.6	6.1%	- TrAIL (6/2011)
							- PATH (6/2015)
							- MAPP (6/2015)
4	East Frankfort - Crete	Line	Comed	2134	$ 41.6	5.8%	
5	Pleasant Valley - Belvidere	Line	Comed	3648	$ 34.2	4.8%	
6	Kammer	Transformer	500	3674	$ 34.0	4.7%	- Replace Kammer 765/500 kV transformer (11/2009)
							- PATH (6/2015)
7	Doubs	Transformer	AP	429	$ 25.1	3.5%	Congestion mainly due to maintenance outages in Doubs area.
8	Mount Storm - Pruntytown	Line	AP	525	$ 20.5	2.9%	- TrAIL (6/2011)
							- PATH (6/2015)
9	Blackoak-Bedington	Interface	500	645	$ 19.8	2.8%	- TrAIL (6/2011)
							- PATH (6/2015)
10	Dunes Acres - Michigan City	Flowgate	MISO	2949	$ 16.7	2.3%	

2009 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
11	Cloverdale-Lexington	Line	AEP	1015	$ 15.6	2.2%	- TrAIL (6/2011)
							- PATH (6/2015)
12	Crete - St Johns Tap	Flowgate	MISO	1565	$ 14.4	2.0%	
13	AEP-DOM	Interface	500	325	$ 9.2	1.3%	- TrAIL (6/2011)
							- PATH (6/2015)
14	Pana North	Flowgate	MISO	986	$ 8.9	1.2%	
15	Graceton - Raphael Road	Line	BGE	527	$ 8.8	1.2%	Congestion mainly due to maintenance outages in Doubs area.
16	Tiltonsville - Windsor	Line	AP	1449	$ 8.6	1.2%	Congestion mainly due to maintenance outages for Kammer 765/500 KV transformer replacement
17	Ruth - Turner	Line	AEP	704	$ 8.0	1.1%	- Congestion mainly due to outages on Culloden-Wyoming 765 and Kanawha River-Matt Funk 345 KV lines
18	Sammis - Wylie Ridge	Line	AP	1389	$ 7.8	1.1%	- PATH (6/2015)
19	Kanawha River	Transformer	AEP	163	$ 6.5	0.9%	- Congestion mainly due to outages on Culloden-Wyoming 765 and Kanawha River-Matt Funk 345 KV lines
20	Kammer-Ormet	Line	AEP	552	$ 6.2	0.9%	Congestion mainly due to maintenance outage for Kammer-George Washington 138 KV line
				Top 20	$ 580	80.6%	

Transmission Topology and Constraints

- Preliminary Power flow Cases
  - 2010 power flow case to represent today's "as-is" system
  - 2014 RTEP power flow case to represent future system
    - Branchburg-Roseland-Hudson project removed from 2014 RTEP power flow case
- Thermal Constraints
  - monitor/contingency pairs
  - NERC Book of Flowgates
  - Planning study results
  - Historical PJM congestion events
- Voltage Constraints
  - PJM reactive interface limits
  - MW limits based on historical values for "as-is" case adjusted for future upgrade impacts in 2014 case

Reactive Interface Limit Values

- Values used for as-is 2010 system model based on historical averages
- Historical averages increased by anticipated effect of RTEP reactive reinforcements to develop future 2014 system values

	As-Is 2010 System	Future 2014 System
WESTERN	5850	6100
WESTERN (POST)	6100	6350
CENTRAL	4050	4300
EASTERN	6250	6350
BO-BED (POST)	2800	2800
APS (PRE)	3900	3900
APS (POST)	4600	4600
50045005 (POST)	3350	3600
AEP-DOM (POST)	4650	4650

Market Simulation Results

- Simulation using 2010 as-is system topology was benchmarked to 2009 historical congestion.
  - Benchmark case shows consistent results to 2009 historical congestion
  - Total simulated congestion comparable to actual congestion

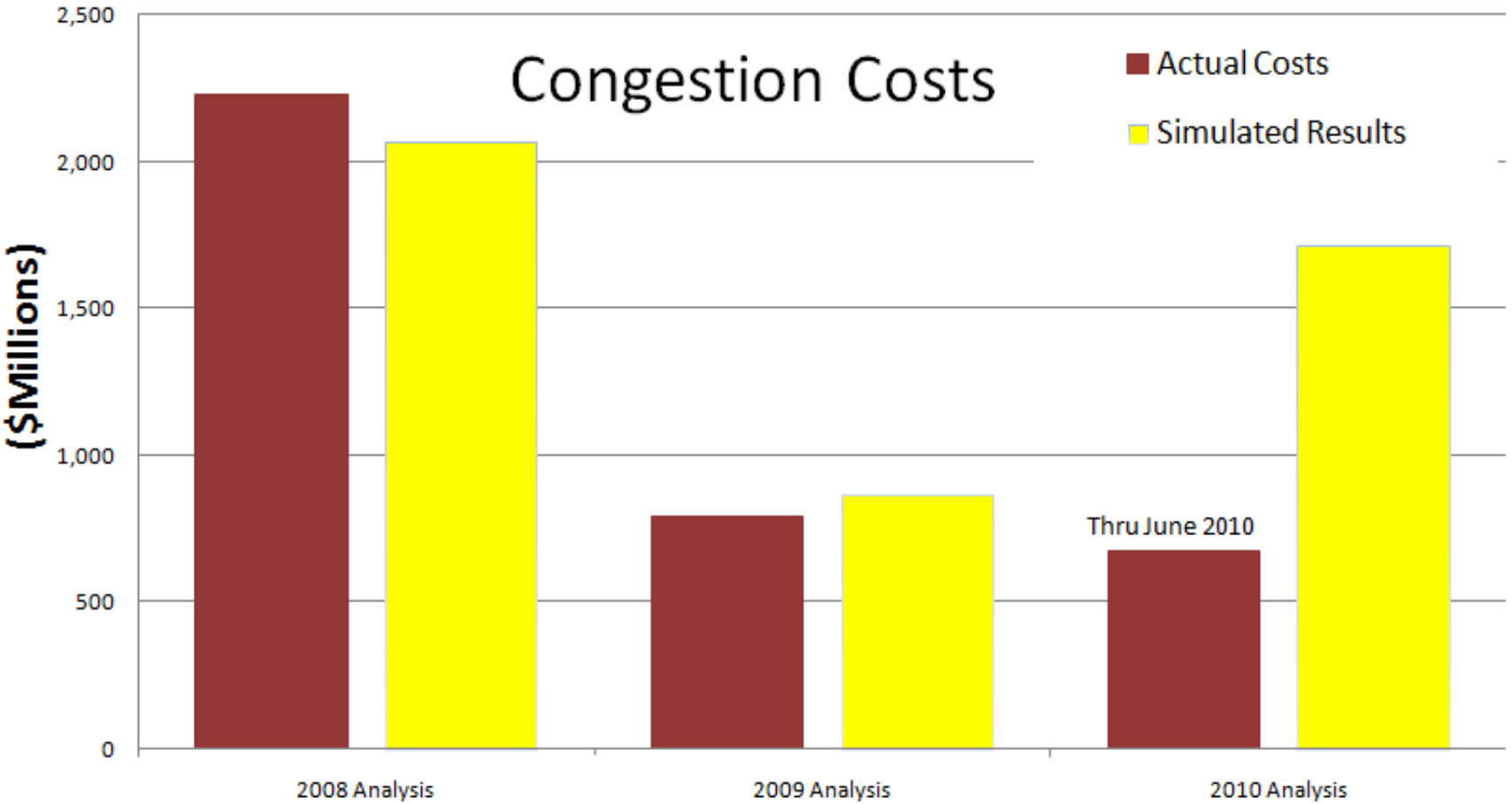
Preliminary Market Simulation Results – 2010 Generation and Load Scenario

	2010 As-Is System Topology	
Constraint	Frequency (Hours)	Market Congestion ($Millions)
AP-South Interface	4632	407.2
01BLACKO - 01BEDNGT	3779	369.0
50045005 Interface	3537	279.2
01DOUBS - 01DOUBS	456	199.8
8LEXNGTN - 8DOOMS	591	130.3
01PRNTY - 8MT STM	1512	61.6
ALTOONA - BEAR RCK	2180	52.6
BELVI; R - MAREN;RT	813	44.2
05CLOVRD - 8LEXNGTN	1182	43.8
E FRA; B - CRETE;BP	1618	29.2
8MT STM - 01DOUBS	137	18.5
15ELRM 5 - 01MITCHL	1750	13.0
Eastern Interface	276	12.1
WATER;3B - W DEK;3T	47	9.9
6CLOVER - 8CLOVER	196	7.1
01BEDNGT - 01HARMNY	44	4.7
CAYUGA; - PONTI; B	38	4.1
Central Interface	164	4.1
SLINE; R - 17WOLFLK	478	2.3

Preliminary Market Simulation Results – 2010 Generation and Load Scenario (cont)

	2010 As-Is System Topology	
Constraint	Frequency (Hours)	Market Congestion ($Millions)
FAIRLWN1 - SADDLBK	1109	2.2
ATHENIA - SADDLBRK	1848	2.1
EDDYSTN3 - ISLANDR6	14	1.4
01WYLIE - 01WYLIE	65	1.3
ALTOONA - RAYSTOWN	202	1.3
Western Interface	39	1.2
BAY0NDUM - PVSC	2114	1.2
SOLPT 44 - RIV2339	97	0.9
CDR GV F - CLIFTN K	1939	0.8
05EUGENE - 05DEQUIN	5	0.8
01MAHNSL - 05TIDD	166	0.7
02SENECA - 01KRENDL	73	0.6
JUNI BU2 - DAUP TR2	6	0.5
01CABOT - 01CABOT	9	0.4
GRACETON - RAPHAEL	14	0.4
BRIS - YORKANA	8	0.4
HOMER CY - HOMER CT	187	0.3
01MITCHL - 15ELRM 5	63	0.2
3HALIFAX - 3MT LREL	3	0.2
LEWISTWN - JUNI BU2	24	0.1
KEYSTONE - CONEM-GH	7	0.1
BRADFRD2 - PLANBRK1	2	0.1
		1710.1

Market Simulation Results – Actual vs. Simulated Congestion



Next Steps

- Future Runs

Study Year	2010	2013	2016	2019	2024
System Topology	2010 As-Is Model	2014 topology without MAPP, PATH, Branchburg-Roseland-Hudson	2014 topology Without Branchburg-Roseland-Hudson	2014 topology Without Branchburg-Roseland-Hudson	2014 topology Without Branchburg-Roseland-Hudson

- Feedback on Posted Event Files