

Table of Contents



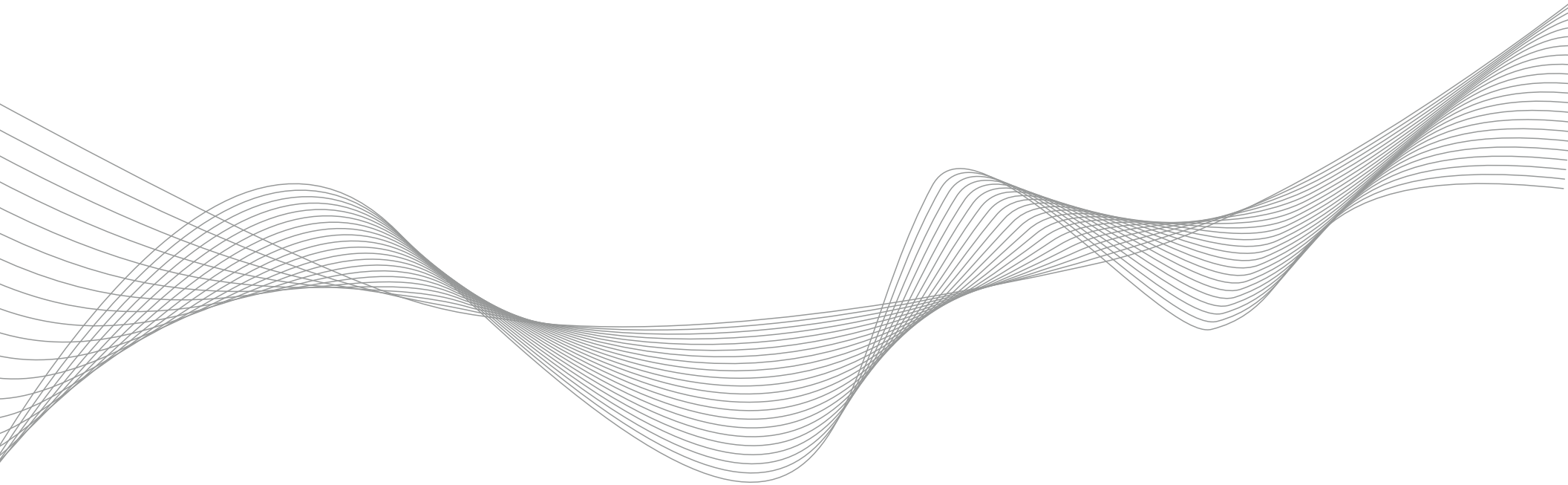
Preface: What This Document Conveys	vii		29
<i>Audience</i>	vii	2.2.5 – Small Generator Interconnection Requests	29
<i>Order 890 Compliance</i>	vii	2.2.6 – Behind-the-Meter Generator Interconnection Requests	30
<i>Scope of Upgrades Discussed</i>	viii	2.2.7 – Distributed Generation	30
<i>Queued Interconnection Requests</i>	viii	2.3: Generator Deactivations	31
<i>RTEP Process information...</i>	viii	2.4: Merchant Transmission Interconnection Requests	33
		2.5: Operational Performance	35
		2.5.1 – Post-Contingency Line Load Relief Warnings (PCLLRW)	35
		2.5.2 – Mount Storm Congestion	35
		2.6: Long-Term Firm Transmission Service Requests	37
		2.7: Long-Term Auction Revenue Rights (ARRs)	39
		2.8: Demand Side Response (DSR)	41
		2.8.1 – DSR as Load Forecast Input	41
		2.8.2 – Demand Response and ILR	41
		2.8.3 – DSR Alternative to System Expansion	41
		2.9: Interregional Planning	43
		2.9.1 – PJM / Midwest ISO (MISO)	44
		2.9.2 – PJM / NYISO / ISO-NE	44
		2.9.3 – PJM / Progress Energy	44
		2.10: Baseline Reliability Sensitivity Analysis	45
Section 1: Executive Summary	1		
1.0: Executive Summary	1		
Section 2: PJM Transmission System and Expansion Drivers	9		
2.0: Introduction	9		
2.0.1 – System Description	10		
2.1: Load Growth	13		
2.2: Generation Interconnection Requests	19		
2.2.1 – Queue Activity	20		
2.2.2 – Fuel Mix of Generators Seeking Interconnection	24		
2.2.3 – Renewable Fuel Technology	26		
2.2.4 – Wind-Powered Generating Resources	26		

Section 3: PJM 2011 Retool Analysis	47	Section 5: 2013 Baseline Analysis	71
3.0: PJM 2011 Retool Analysis	47	5.0: Summary of 2008 Baseline Analysis	71
3.1: Why a 2011 Retool?	49	5.0.1 – Scope of the 2008 Baseline Analysis	72
3.1.1 – Load Growth Trends	49	5.0.2 – Summary of Key Modeling Assumptions	72
3.1.2 – Generation Trends	50	5.0.3 – Compliance with NERC Criteria	76
3.1.3 – Load Management Trends	51	5.0.4 – Summary of 2008 Baseline Results	76
3.1.4 – Network Topology	51	5.1: Deliverability - Long-Term Reactive Planning	79
3.2: Need for TrAIL Validated	53	5.1.1 – Scope of PJM Reactive Studies	79
3.2.1 – Summary of relevant results	53	5.1.2 – Deliverability Studies	80
3.2.2 – Summary of Greene County Settlement	54	5.1.3 – Next Steps	82
3.2.3 – Next Steps	54	5.2: Possum Point – Salem 500 kV line Mid-Atlantic Power Pathway (MAPP)	83
3.3 - Hudson Reliability Must Run (RMR)	55	5.2.1 – Chesapeake Bay Crossing AC and DC Alternatives	84
		5.2.2 – Assessing Proposed Backbone Alternatives	88
		5.2.3 – Sensitivity Study: Indian River Retirement	91
Section 4: PJM 2012 Retool Analysis	57	5.3: Amos-Kemptown 765 kV Line (PATH) Validation for 2013	93
4.0: PJM 2012 Retool Analysis	57	5.4: Branchburg – Roseland – Hudson 500 kV Line	95
4.1: 2012 Baseline Retool Drivers	59	5.4.1 – Two Alternative Solutions Identified	96
4.1.1 – Load Growth Trends	59	5.4.2 – Comparison of Alternatives to Address Need	98
4.1.2 – Generation Interconnection Trends	59	5.5: 2013 BES Baseline Upgrades	101
4.1.3 – Load Management Trends	61	5.5.1 – NERC Reliability Criteria	101
4.1.4 – Network Topology	61	5.5.2 – Summary of Upgrades	102
4.2: Susquehanna - Roseland 500 kV Line	63	5.5.3 – Mount Storm Operational Performance	104
4.2.1 – 2012 Required In-service Date Validated	63	5.6 Transient Stability Assessment	105
4.3: Amos-Kemptown (PATH) 765 kV Line	67	5.7: Additional Backbone Facilities Under Consideration	107
4.3.1 – New 2013 Required In-Service Date	67		
4.3.2 – New Configuration	67		
4.3.3 – Additional TrAIL Validation in 2012 Retool	70		

Section 6: PJM Sub-Regional RTEP Key Issues	109	Section 8: State RTEP Overview	141
6.0: PJM Sub-Regional RTEP Key Issues	109	8.0: State RTEP Overviews	141
6.0.1– Order 890 Compliance	111	8.0.1 - PJM Overview	141
6.1: PJM Mid-Atlantic Sub-Region	113	8.0.2 – Load Growth	143
6.1.1 – Key Issues	113	8.0.3 – New Generator Interconnection Requests	145
6.1.2 – Summary of Transmission Upgrades	114	8.0.4 – PJM RTEP Summaries by Jurisdiction	145
6.2: PJM Western Sub-Region	121	8.0.5 – State Summaries of Generation Powered by Renewable Fuels	146
6.2.1 – Key Issues	122	8.1: Delaware/Delmarva Peninsula RTEP Overview	147
6.2.2 – Summary of Transmission Upgrades	122	8.1.1 – Load Growth and Existing Generation	149
6.3: PJM Southern Sub-Region	126	8.1.2 – Generation Interconnection Requests	150
6.3.1 – Key Issues	127	8.1.3 – Anticipated Generation Deactivations	153
6.3.2 – Summary of Upgrades	129	8.1.4 – Merchant Transmission Interconnection Requests	153
		8.1.5 – Transmission Expansion Plans on the Delmarva Peninsula	154
		8.1.6 – Interconnection Requests for Generation Powered by Renewable Resources	156
Section 7: Market Efficiency Studies	131	8.2: Northern Illinois RTEP Overview	157
7.0: Introduction	131	8.2.1 – Load Growth and Existing Generation	159
7.1: Simulation Methodology and Assumptions	133	8.2.2 – Generator Interconnection Requests	159
7.2: 2008 RTEP Market Efficiency Analysis	135	8.2.3 – Generation Deactivations	167
7.2.1 – Summary of Results	135	8.2.4 – Merchant Transmission Interconnection Requests	169
7.2.2 – 2008 and 2011 Study Year Results	135	8.2.5 – Transmission Expansion Plans in Northern Illinois	169
7.2.3 – 2014 and 2017 Study Results	137	8.2.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	171
7.3: Market Simulation Model Input Assumptions	139	8.3: Indiana RTEP Overview	177
		8.3.1 – Load Growth and Existing Generation	178
		8.3.2 – Generator Interconnection	180
		8.3.3 – Generation Deactivations	181
		8.3.4 – Merchant Transmission Interconnection Requests	181
		8.3.5 – Transmission Expansion Plans in Indiana	183
		8.3.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	184
		8.4: Eastern Kentucky RTEP Overview	187
		8.4.1 – Load Growth and Existing Generations	188

8.4.2 – Generator Interconnection Requests	190	8.8: Northeastern North Carolina RTEP Overview	229
8.4.3 – Generation Deactivations	190	8.8.1 – Load Growth and Existing Generation	230
8.4.4 – Merchant Transmission Interconnection Requests	190	8.8.2 – Generator Interconnection Requests	232
8.4.5 – Transmission Expansion Plans	190	8.8.3 – Generation Deactivations	232
8.4.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	190	8.8.4 – Merchant Transmission Interconnection Requests	232
8.5: Maryland and District of Columbia RTEP Overview	191	8.8.5 – Transmission Expansion Plans	233
8.5.1 – Load Growth and Existing Generation	193	8.8.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	233
8.5.2 – Generator Interconnection Requests	194	8.9: Ohio RTEP Overview	235
8.5.3 – Generation Deactivations	198	8.9.1 – Load Growth and Existing Generation	236
8.5.4 – Merchant Transmission Interconnection Requests	199	8.9.2 – Generator Interconnection Requests	238
8.5.5 – Transmission Expansion Plans in Maryland and Washington, D.C.	199	8.9.3 – Generation Deactivations	241
8.5.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	203	8.9.4 – Merchant Transmission Interconnection Requests	241
8.6: Southwestern Michigan RTEP Overview	205	8.9.5 – Transmission Expansion Plans in Ohio	241
8.6.1 – Load Growth and Existing Generation	206	8.9.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	243
8.6.2 – Generator Interconnection Requests	208	8.10: Pennsylvania RTEP Overview	245
8.6.3 – Generation Deactivations	208	8.10.1 – Load Growth and Existing Generation	247
8.6.4 – Merchant Transmission Interconnection Requests	208	8.10.2 – Generator Interconnection Requests	248
8.6.5 – Transmission Expansion Plans in Southwestern Michigan	208	8.10.3 – Generation Deactivations	255
8.6.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	208	8.10.4 – Merchant Transmission Interconnection Requests	257
8.7: New Jersey RTEP Overview	209	8.10.5 – Transmission Expansion Plans in Pennsylvania	258
8.7.1 – Load Growth and Existing Generation	211	8.10.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	263
8.7.2 – Generator Interconnection Requests	212	8.11: Northeastern Tennessee RTEP Overview	269
8.7.3 – Generation Deactivations	217	8.11.1 – Load Growth and Existing Generation	271
8.7.4 – Merchant Transmission Interconnection Requests	220	8.11.2 – Generator Interconnection Requests	271
8.7.5 – Transmission Expansion Plans in New Jersey	222	8.11.3 – Generation Deactivations	271
8.7.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	226	8.11.4 – Merchant Transmission Interconnection Requests	271
		8.11.5 – Transmission Expansion Plans in Northeastern Indiana	271
		8.11.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	271

8.12: Virginia RTEP Overview	273	Section 9: Addressing Long-Term Challenges	299
8.12.1 – Load Growth and Existing Generation	274	9.0: Addressing Long-Term Challenges	299
8.12.2 – Generator Interconnection Requests	275	9.1: RTEP Process Developments: PJM RTO / Stakeholder Sphere	301
8.12.3 – Generation Deactivations	278	9.1.1 – Load Forecasting Developments	301
8.12.4 – Merchant Transmission Interconnection Requests	280	9.1.2 – Demand Side Management Initiatives	301
8.12.5 – Transmission Expansion Plans in Virginia	281	9.1.3 – Cost Allocation Procedures	302
8.12.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	285	9.1.4 – Interconnection Request Process Improvements	303
8.13: West Virginia RTEP Overview	287	9.1.5 – Additional Queue Process Reforms	305
8.13.1 – Load Growth and Existing Generation	288	9.1.6 – RTEP Market Efficiency Planning	307
8.13.2 – Generator Interconnection Requests	289	9.2: External Sphere RTEP Planning Drivers	309
8.13.3 – Generation Deactivations	292	9.2.1 – Public Policy and Industry Response	309
8.13.4 – Merchant Transmission Interconnection Requests	293	9.2.2 – NERC Related Activities	312
8.13.5 – Transmission Expansion Plans in West Virginia	294	9.2.3 – Expanded Interregional Coordination	312
8.13.6 – Interconnection Requests for Generation Powered by Renewable Fuel Sources	296		
		Section 10: Glossary	315



Preface: What This Document Conveys



The report you are reading is published annually by PJM to convey the results of planning studies throughout the previous calendar year and to explain the rationale behind why transmission system upgrades are needed. The discussion in this document of system drivers, reliability criteria violations and upgrades themselves is for reporting purposes to facilitate greater RTEP understanding.

Fundamentally, the Regional Transmission Expansion Plan (RTEP) is that ongoing, body of PJM Transmission Expansion Advisory Committee (TEAC) presentation materials and published RTEP Baseline Assessment reports which remains PJM's authoritative source of RTEP information and data.

- PJM TEAC materials can be accessed online from PJM's Web site via the following URL link: <http://www.pjm.com/committees-and-groups/committees/teac.aspx>.
- PJM RTEP Baseline Assessment reports can also be accessed online from PJM's Web site via that following URL link: <http://www.pjm.com/planning/rtep-development/baseline-reports.aspx>.

Audience

PJM has crafted this report in particular with federal and state regulators and their staffs in mind to explain and emphasize the interrelationship among the following:

- system upgrade drivers (e.g., load growth, generation addition, generation deactivation)
- reliability criteria violations (e.g., thermal transmission constraints, voltage limits)
- system enhancements needed (e.g., new facilities, upgrades to existing facilities)

Readers of this report are encouraged to participate in the ongoing activities of the PJM Transmission Expansion Advisory Committee (TEAC). This forum provides opportunity for stakeholder participation and advice throughout the RTEP process and for remaining apprised of all evolving aspects of PJM's RTEP – plans and process alike.

Order 890 Compliance

PJM expanded its stakeholder process in 2008 in compliance with FERC's Order 890 to enhance coordinated, open and transparent planning at both a regional level and local level. PJM and stakeholders already conduct a compliant planning process filed with the Commission and incorporated in Schedule 6 of the PJM Operating Agreement (OA). Valuable stakeholder discussions culminated in the establishment of three Sub-Regional RTEP Committees – Mid-Atlantic, Western and Southern – commissioned to review proposed upgrades of more local concern.

Each Sub-Regional RTEP Committee increases the opportunity for direct stakeholder participation in the planning process from initial assumption setting stages through review of the planning analyses, violations, and alternative transmission expansions. The Subregional RTEP Committee provides a more local forum for gathering and considering planning issues. Interested parties can access Subregional RTEP Committee planning process information from PJM's web site via the following URL links:

- PJM Mid-Atlantic Sub-Regional RTEP Committee: <http://www.pjm.com/committees-and-groups/committees/srrtep-ma.aspx>.

- PJM Western Sub-Regional RTEP Committee: <http://www.pjm.com/committees-and-groups/committees/ssrtep-w.aspx>.
- PJM Southern Sub-Regional RTEP Committee: <http://www.pjm.com/committees-and-groups/committees/ssrtep-s.aspx>.

Through the activities of these committees, all PJM stakeholders have a forum to raise issues, propose solutions or alternatives and conduct other related discussions. These meetings are open to all stakeholders interested in the issues under consideration.

Scope of Upgrades Discussed

Through December 31, 2008, RTEP upgrades recommended by PJM and approved by the PJM Board since 1999 has exceeded 1,200. However, to put reasonable parameters around the scope and length of this report, the upgrades discussed here are generally those whose cost exceeds \$5 million. A complete list of all approved RTEP upgrades, a brief description of facility and driver as well as current status can be found on PJM's Web site via the following URL link: <http://www.pjm.com/planning/rtep-upgrades-status/construct-status.aspx>.

Queued Interconnection Requests

Generation and merchant transmission interconnection requests are a key part of PJM's RTEP Process. Network upgrades discussed in this report are for those queued interconnection requests that have completed System Impact Studies. From a "going-forward" RTEP power flow modeling perspective, PJM's RTEP process specifies that planning studies model all generation on-line that have a completed System Impact study. Of these generators, only those with executed Interconnection Service Agreements (ISAs) are permitted to back-off an identified transmission constraint. Over ten years experience with queue activity and generation withdrawal rates has demonstrated that, in this manner, PJM's interconnection process encompasses sound, consistent and reliable planning, minimizing the need for retooling studies that would otherwise be necessitated by those generator interconnection requests that withdraw from the planning process.

For reporting purposes and the queue activity interest of this report audience, please note that PJM has included in many tables statistical information about interconnection request activity through queue U4, the window for which closed on January 31, 2009.

RTEP Process information...

This report does not describe the RTEP Process itself in great detail. The reader is directed to a number of online resources, including those noted below, to pursue greater understanding of the RTEP Process. Detailed information on the RTEP Process itself can be found in the following resources, available on PJM's Web site, as noted further, following:

1. The M-14 series of PJM Manuals which describe the specific "business rules" under which PJM effects the entire RTEP Process. Specifically, Manual 14B addresses the details associated with the methodologies associated with the planning studies and upgrades derived from them as discussed in this report. PJM Manual 14B, "Regional Planning Process" can be found via the following URL link: <http://www.pjm.com/documents/manuals.aspx>.
2. The PJM Operating Agreement, Schedule 6, codifies the overall provisions under which PJM executes its Regional Transmission Expansion Planning Protocol, more familiarly known (and used throughout this document) as the "PJM RTEP Process." The PJM Operating Agreement can be found on PJM's Web site via the following URL link: <http://www.pjm.com/documents/agreements/pjm-agreements.aspx>.
3. The PJM Open Access Transmission Tariff (OATT) describes the interconnection request process for generating resource interconnection, merchant transmission interconnection as well as specific process provisions to address long-term firm transmission service and Auction Revenue Rights. The PJM OATT can be found via the following URL link: <http://www.pjm.com/documents/agreements/pjm-agreements.aspx>.