

## Section 8: State RTEP Overview



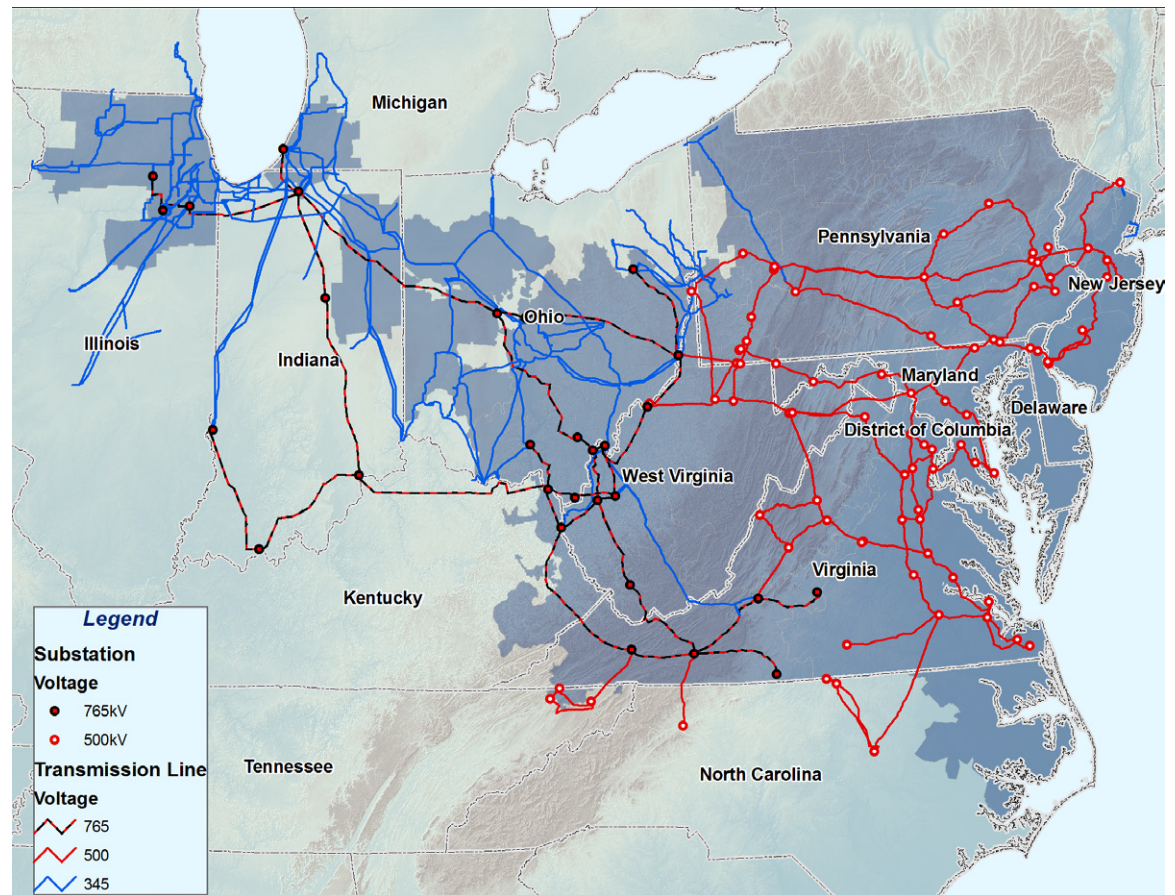
### 8.0: State RTEP Overviews

#### 8.0.1 - PJM Overview

PJM Interconnection is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. Map 8.1 shows PJMs' footprint and high voltage backbone electrical transmission system.

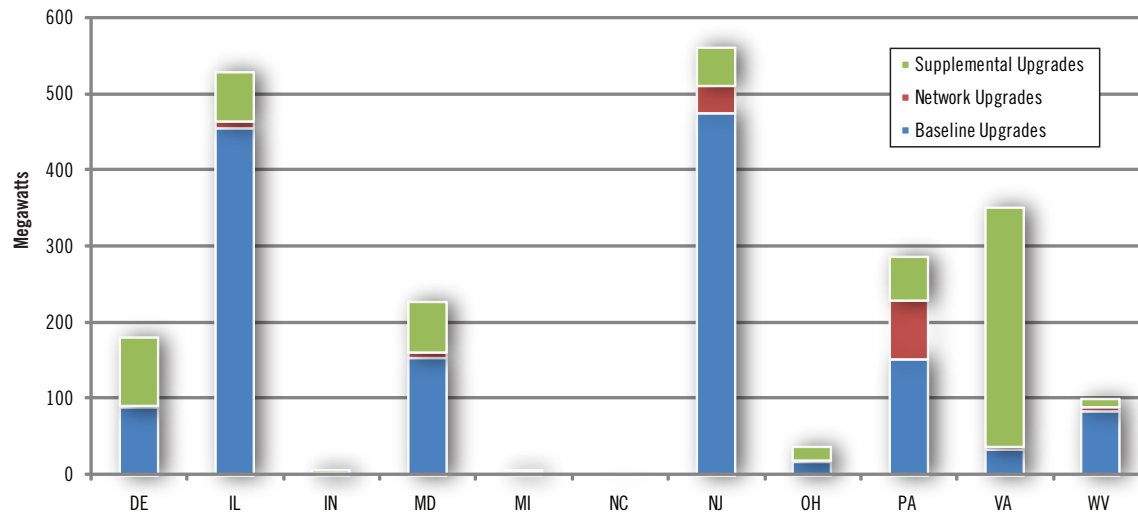
Serving approximately 51 million people, PJM encompasses major U.S. load centers from the Illinois western border to the Atlantic coast including the metropolitan areas in and around Baltimore, Chicago, Columbus, Dayton, Newark and northern New Jersey, Norfolk, Philadelphia, Pittsburgh, Richmond and Washington, D.C. Collaborating with more than 500 members, PJM dispatches more than 165,000 megawatts of generation capacity over 56,000 miles of transmission lines – a system that serves nearly 20 percent of the U.S. economy. PJM's footprint includes many key transmission arteries of the U.S. Eastern Interconnection, as Map 8.1 shows. PJM's unique interstate geography and electrical topography provide its members access not only to PJM's regional power markets but to those of

Map 8.1: PJM Backbone Transmission



adjoining systems west, northeast and south of PJM's borders as well.

Figure 8.1: Cost of In-Service System Reinforcements by State



To date, more than \$13.2 billion of transmission expansions have been planned to meet the challenges of many system drivers: load growth, generation and merchant transmission interconnection requests, congestion, generator deactivations and operational performance. Figure 8.1 contains a summary of the cost of in-service system reinforcements by state.

Since the inception of its open, non-discriminatory planning process in 1997, PJM has received more than 277,000 MW of new generation interconnection requests. To date, the system enhancements planned by PJM have accommodated more than 24,000 MW of new in-service generation, representing more than 240 projects. These generation additions enhance system reliability, supply adequacy and competitive markets for PJM's market participants and the

customers they serve. Importantly, the generation additions represent various fuel types, including natural gas, wind and coal. Figure 8.2 contains a summary of in-service projects by state.

**Relationship between reliability criteria violation and location of upgrade**

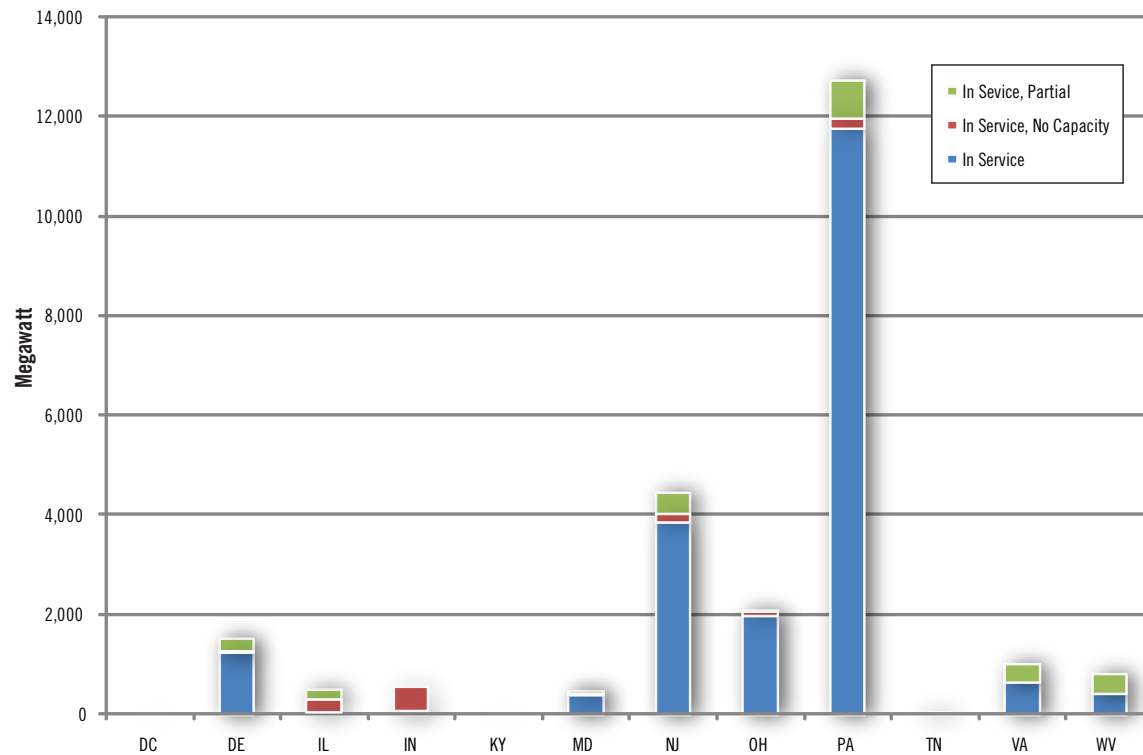
The PJM RTEP process assesses system reliability issues and viable solutions from a regional perspective, essentially ignoring internal TO zonal and state boundaries within the PJM footprint. Consequently, PJM is able to analyze and discern the true electrical nature of reliability criteria violations and the optimal solutions within PJM to resolve them. The relationship between reliability criteria violation and upgrade location generally takes the form of one of the following scenarios.

1. Reliability criteria violations in a given TO zone may be driven by a local issue in that same zone. For example, local load growth may drive local transformer loadings and, thus be the potential cause of a future overload on that facility.
2. Reliability criteria violations in one or more TO zones may be driven by or contributed to by some combination of system factors in another, potentially more distant, part of the PJM system. For example, voltage criteria violations in western portions of the PJM system may not be caused by a local problem but rather caused by some set of compounding factors contributing to heavier west-to-east transfers to more distant eastern load centers.

From a regional perspective, PJM can identify more economical and optimal global solutions that consider all reliability criteria violations and congestion constraints that could be mitigated by one comprehensive set of expansion plans. Otherwise, consideration of reliability criteria violations individually, mutually exclusive of one another, can lead to economically inefficient resolution of those violations. Further, as scenario two above would imply, specific upgrades, especially, new backbone upgrades, are justified not only to meet local reliability requirements but, regionally, to mitigate the reliability issues of delivering needed power to more distant load centers as well. That is the regional nature of PJM planning.

This concept is key to understanding the nature of each PJM reliability issue and its relationship to the location and type of upgrade required to resolve that issue.

**Figure 8.2: In-service Generating Resource Projects by State**



First, though, before describing specific upgrades, each section summarizes key load growth, generation deactivation and generation and merchant transmission system information.

For the sake of reporting, generating resources that are fully in-service (designated “IS”) are included in summary tabulation.

A status code of “IS-NC” (in-service, no capacity) indicates a generator that is in-service for energy only. Such units have not requested consideration for capacity status.

A status code of “ISP” (in-service, partial) denotes a generating resource that is only partially in-service and has not reached full capacity status.

A generating unit is ineligible for capacity status until all transmission upgrades needed to ensure deliverability are completed. Only then will PJM grant capacity status designation.

**8.0.2 – Load Growth**

Load forecasts are a key component of power flow modeling in transmission expansion studies, including studies associated load deliverability analyses. Accurate zonal load forecasts are essential if transmission expansion studies are to yield plans that will continue to ensure reliable and economic system operations. This is described more fully in PJM Manual 14B, accessible from PJM’s Web site via the following URL link: <http://www.pjm.com/documents/manuals.aspx>.

The PJM Load Forecast Model incorporates three classes of variables: 1) calendar effects such as day of the week, month, and holidays 2) a forecast of baseline economic conditions and 3) weather conditions across the RTO.

Specifically, PJM uses Gross Metropolitan Product (GMP) in the econometric component of its forecast model, which allows for a localized treatment of economic effects within a zone. PJM has contracted with an outside economic services vendor to provide economic forecasts for all areas within the PJM footprint on an ongoing basis. To account for weather conditions across the RTO, PJM calculates a weighted average of temperature, humidity and wind speed as the weather drivers. PJM has access to weather data from 30 weather stations across the PJM footprint.

The PJM RTO weather normalized summer peak is forecasted to grow at an average rate of 1.5% annually over the next 10 years – from 137,948 MW in 2008 to 160,107 MW in 2018 – an increase of 22,159 MW over the decade. Individual geographic zone growth rates vary from 0.9 % to 2.6 %, as shown in Table 8.1. For the 15-year period ending 2023, the PJM RTO weather normalized summer peak will grow at an average rate of 1.4%, reaching 170,367 MW, a 15-year

increase of 32,419 MW. The PJM RTO weather normalized winter peak is forecasted to grow at an average rate of 1.1 % per year for the next ten years – from 113,565 MW in 2006/07 to 127,250 MW in 2017/18 – an increase of 13,685 MW over the decade. Individual geographic zone growth rates vary from 0.3% to 2.3%, also shown in Table 8.1.

The existing PJM transmission system is currently planned to be reinforced to meet expected 2013 peak load conditions as discussed in **Section 5** earlier in this report.

PJM’s ongoing RTEP process continues to study anticipated needs for additional transmission expansion plans to meet load growth requirements beyond 2013 as well.

**Table 8.1: 2008 PJM RTO and T.O. Load Forecast**

T. O.	2008 Load Forecast Report					
	Summer Peak (MW)			Winter Peak (MW)		
	2008	2018	Growth Rate (%)	2007/08	2017/18	Growth Rate (%)
Atlantic City Electric Company	2,829	3,673	2.6	1,846	2,314	2.3
Baltimore Gas and Electric Company	7,344	8,118	1.0	6,009	6,400	0.6
Delmarva Power and Light	4,192	5,047	1.9	3,397	3,908	1.4
Jersey Central Power and Light	6,478	7,897	2.0	4,013	4,699	1.6
Metropolitan Edison Company	2,929	3,432	1.6	2,575	2,906	1.2
PECO Energy Company	8,759	10,085	1.4	6,602	7,449	1.2
Pennsylvania Electric Company	2,850	3,157	1.0	2,820	3,100	1.0
PPL Electric Utilities Corporation	7,292	8,379	1.4	7,232	7,939	0.9
Potomac Electric Power Company	7,057	8,046	1.3	5,381	6,019	1.1
Public Service Electric and Gas Company	10,967	12,622	1.4	7,070	7,996	1.2
Rockland Electric Company	435	486	1.1	241	249	0.3
UGI	197	219	1.1	201	217	0.8
Diversity - Mid-Atlantic	-594	-689		-736	-886	
<b>Mid-Atlantic</b>	<b>60,735</b>	<b>70,472</b>	<b>1.5</b>	<b>46,651</b>	<b>52,310</b>	<b>1.2</b>
American Electric Power Company	23,939	26,736	1.1	22,588	24,420	0.8
Allegheny Power	8,688	9,475	0.9	8,523	9,156	0.7
Commonwealth Edison Company	23,654	28,524	1.9	16,129	18,952	1.6
Dayton Power and Light	3,597	3,962	1.0	3,012	3,235	0.7
Duquesne Light Company	2,942	3,241	1.0	2,153	2,268	0.5
Diversity - Western	-1,413	-1,618		-1,300	-1,512	
<b>Western</b>	<b>61,407</b>	<b>70,320</b>	<b>1.4</b>	<b>51,105</b>	<b>56,519</b>	<b>1.0</b>
Dominion Virginia Power	19,353	23,157	1.8	16,861	19,422	1.4
<b>Southern</b>	<b>19,353</b>	<b>23,157</b>	<b>1.8</b>	<b>16,861</b>	<b>19,422</b>	<b>1.4</b>
Diversity - RTO	-3,547	-3,842		-1,052	-1,001	
<b>PJM RTO</b>	<b>137,948</b>	<b>160,107</b>	<b>1.5</b>	<b>113,565</b>	<b>127,250</b>	<b>1.1</b>

**8.0.3 – New Generator Interconnection Requests**

PJM has received interconnection requests for numerous new generation facilities throughout PJM, since 1999, summarized in the table below through the close of Queue U4 on January 31, 2009.

Status	MW	# of projects
In-Service	24,187	242
Under Construction	6,595	60
Active	85,543	408
Withdrawn	157,865	486
Suspended	2,866	22
Total	277,056	1,218

The state RTEP overviews which follow summarize interconnection requests on an individual state basis.

**8.0.4 – PJM RTEP Summaries by Jurisdiction**

The individual RTEP overview sections that follow are arranged in the sequence outlined below. Where appropriate, specific market integration dates have also been noted so that data and results throughout **Section 8** can be understood within appropriate time frames. Each section summarizes key aspects of PJM's RTEP for that particular jurisdiction.

- Section 8.1:** Delaware and the Delmarva Peninsula
- Section 8.2:** Northern Illinois (includes ComEd integration in 2004)
- Section 8.3:** Indiana (includes AEP integration in 2004)
- Section 8.4:** Eastern Kentucky (includes AEP integration in 2004)
- Section 8.5:** Maryland and the District of Columbia (includes AP integration in 2002)
- Section 8.6:** Southwestern Michigan (includes AEP integration in 2004)
- Section 8.7:** New Jersey
- Section 8.8:** Northeastern North Carolina (includes Dominion integration in 2005)

- Section 8.9:** Ohio (includes AP integration in 2002, AEP in 2004, and Dayton in 2004)
- Section 8.10:** Pennsylvania (includes AP integration in 2002, and DLCO in 2005)
- Section 8.11:** Northeastern Tennessee (includes AEP integration in 2004)
- Section 8.12:** Virginia (includes AP integration in 2002, and Dominion integration in 2005)
- Section 8.13:** West Virginia (includes AP integration in 2002, and AEP integration in 2004)

**8.0.5 – State Summaries of Generation Powered by Renewable Fuels**

PJM’s queues include over 50,000 MW of generation powered by renewable fuel technologies associated with interconnection requests that are active, under construction or in-service. PJM’s Interconnection process offers a structure that assures consistent opportunity for development across fuel types, while providing the flexibility to adapt to specific technical realities and market challenges. The state RTEP overviews which follow summarize renewable activity on a state basis.

Presently, PJM’s queues include interconnection requests for plants fueled by wind, hydro, biomass, wood, waste and methane, as summarized in Table 8.2.

The non-discriminatory nature of PJM’s RTEP process has permitted significant growth in renewables in recent years. Interconnection request queue activity totals through January 31, 2009,

include more than 56,000 MW of wind generation, 600 MW of methane, 500 MW of biomass and 2,700 MW of hydro. The individual state subsections of this report which follow summarize interconnection requests these renewable for generation powered by fuels.

While some renewable resources can operate in a manner similar to the traditional fossil fueled power plants, other renewable energy sources, such as wind, are recognized as intermittent resources. Their ability to generate power is directly determined by the immediate availability and/or magnitude of their specific fuel. For example, wind turbines can generate electricity only when wind speed is within a range consistent with the physical specifications of the related turbines. This presents challenges with respect to real-time operational dispatch and specific capacity value. To address the latter issue, PJM has established a set of business rules unique to intermittent resources that provides for the determination of credible capacity values.

**Table 8.2: PJM interconnection Requests by Renewable Fuel Type**

Fuel Type	Active		Under Construction		In-Service		Withdrawn		Suspended		TOTAL	
	MW	# of projects	MW	# of projects	MW	# of projects	MW	# of projects	MW	# of projects	MW	# of projects
Biomass	160	7	240	6	51	2	50	3	19	2	519	20
Hydro	1,573	25	143	3	572	7	458	6	0	0	2,746	41
Methane	149	26	69	13	199	34	210	29	0	0	627	102
Solar	71	7	3	1	0	0	0	0	0	0	74	8
Wind	43,165	185	1,552	13	1,886	30	8,382	101	1,120	16	56,106	345
Wood	178	2	0	0	4	1	50	1	0	0	232	4
Total	45,296	252	2,006	36	2,713	74	9,150	140	1,139	18	60,305	520