Generation and Transmission Planning

Overview

Planned Generation and Retirements

- **Planned Generation.** At June 30, 2013, 72,537 MW of capacity were in generation request queues for construction through 2024, compared to an average installed capacity of 195,000 MW in the first six months of 2013. Wind projects account for 18,612 MW of nameplate capacity or 25.7 percent of the capacity in the queues and combined-cycle projects account for 42,925 MW of capacity or 59.2 percent of the capacity in the queues.
- **Generation Retirements.** As shown in Table 11-12, 768.2 MW are planning to deactivate by the end of calendar year 2019. A total of 7,195.7 MW of generation capacity retired from January 1, 2012 through June 30, 2013, and it is expected that a total of 22,160.4 MW will have retired from 2011 through 2019, with most of this capacity retiring by the end of 2015. Retirements from January 1, 2011 through June 30, 2013, account for 8,392.2 MW, or 37.9 percent of retirements during this period. Units planning to retire in 2013 account for 2,402.6 MW, or 10.8 percent of retirements during this period. Overall, 3,508.1 MW, or 28.7 percent of all MW planned for deactivation from 2013 through 2019, are expected in the AEP zone.
- **Generation Mix.** A potentially significant change in the distribution of unit types within the PJM footprint is likely as a combined result of the location of generation resources in the queue and the location of units likely to retire. In both the EMAAC and SWMAAC LDAs, the capacity mix is likely to shift to more natural gas-fired combined cycle (CC) and combustion turbine (CT) capacity. Elsewhere in the PJM footprint, continued reliance on steam (mainly coal) seems likely, despite retirements of coal units.

Generation and Transmission Interconnection Planning Process

- Any entity that requests interconnection of a generating facility, including increases to the capacity of an existing generating unit, or that requests interconnection of a merchant transmission facility, must follow the process defined in the PJM tariff to obtain interconnection service.[1] The process is complex and time consuming as a result of the nature of the required analyses. The cost, time and uncertainty associated with interconnecting to the grid may create barriers to entry for potential entrants.
- The queue contains a substantial number of projects that are not likely to be built, including 19,043.7 MW that should already be in service based on the original queue date, but that is not yet even under construction. These projects may also create barriers to entry for projects that would otherwise be completed by taking up queue positions, increasing interconnection costs and creating uncertainty.

Key Backbone Facilities

- PJM baseline transmission projects are implemented to resolve reliability criteria violations. PJM backbone transmission projects are a subset of significant baseline projects. The backbone projects are intended to resolve a wide range of reliability criteria violations and congestion issues and have substantial impacts on energy and capacity markets. The current backbone projects are: Mount Storm – Doubs; Jacks Mountain; and Susquehanna – Roseland.

Economic Planning Process

- **Transmission and Markets.** As a general matter, transmission investments have not been fully incorporated into competitive markets. The construction of new transmission facilities can have significant impacts on energy and capacity markets, but there is no market mechanism in place that would require direct competition between transmission and generation to meet loads in an area. PJM has taken a first step towards

1 OATT Parts IV & VI.

integrating transmission investments into the market through the use of economic evaluation metrics.[2] The goal of transmission planning should be the incorporation of transmission investment decisions into market driven processes as much as possible.

Conclusion

The goal of PJM market design should be to enhance competition and to ensure that competition is the driver for all the key elements of PJM markets. But transmission investments have not been fully incorporated into competitive markets. The construction of new transmission facilities has significant impacts on energy and capacity markets. But when generating units retire, there is no market mechanism in place that would require direct competition between transmission and generation to meet loads in that area. In addition, despite Order No. 1000, there is not yet a robust mechanism to permit competition between transmission developers to build transmission projects.[3] The addition of a planned transmission project changes the parameters of the capacity auction for the area, changes the amount of capacity needed in the area, changes the capacity market supply and demand fundamentals in the area and effectively forestalls the ability of generation to compete. There is no mechanism to permit a direct comparison, let alone competition, between transmission and generation alternatives. There is no evaluation of whether the generation or transmission alternative is less costly or who bears the risks associated with each alternative. Creating such a mechanism should be a goal of PJM market design.

Planned Generation and Retirements

Planned Generation Additions

Net revenues provide incentives to build new generation to serve PJM markets. While these incentives operate with a significant lag time and are based on expectations of future net revenue, the amount of planned new generation in PJM reflects investors' perception of the incentives provided by the combination of revenues from the PJM Energy, Capacity and Ancillary Service Markets. At June 30, 2013, 72,537 MW of capacity were in generation request queues for construction through 2020, compared to an average installed capacity of 195,000 MW in 2013. Although it is clear that not all generation in the queues will be built, PJM has added capacity annually since 2000 (Table 11-1).[4] Overall, 535 MW of nameplate capacity were added in PJM in the first six months of 2013.

Table 11-1 Year-to-year capacity additions from PJM generation queue: Calendar years 2000 through the first six months of 2013[5]

	MW
2000	505
2001	872
2002	3,841
2003	3,524
2004	1,935
2005	819
2006	471
2007	1,265
2008	2,777
2009	2,516
2010	2,097
2011	5,008
2012	2,669
2013	535

PJM Generation Queues

Generation request queues are groups of proposed projects. Queue A was open from February 1997 through January 1998; Queue B was open from February 1998 through January 1999; Queue C was open from February 1999 through July 1999 and Queue D opened in August 1999. After Queue D, a new queue was opened every six months until Queue T, when new queues began to open annually. Queue Z was active through June 30, 2013.

2 *See* 126 FERC ¶ 61,152 (2009) (final approval for an approach with predefined formulas for determining whether a transmission investment passes the cost-benefit test including explicit accounting for changes in production costs, the costs of complying with environmental regulations, generation availability trends and demand-response trends), *order on reh'g*, 123 FERC ¶ 61,051 (2008).

3 *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities*, Order No. 1000, FERC Stats. & Regs. ¶ 31,323 (2011), *order on reh'g*, Order No. 1000-A, 139 FERC ¶ 61,132 (2012).

4 The capacity additions are new MW by year, including full nameplate capacity of solar and wind facilities and are not net of retirements or deratings.

5 The capacity described in this table refers to all installed capacity in PJM, regardless of whether the capacity entered the RPM auction.

Capacity in generation request queues for the twelve year period beginning in 2013 and ending in 2024 decreased by 3,850 MW from 76,387 MW in 2012 to 72,537 MW on June 30, 2013, or 5.0 percent (Table 11-2).[6] Queued capacity scheduled for service in 2013 decreased from 22,120 MW to 16,359 MW, or 26.0 percent. Queued capacity scheduled for service in 2014 decreased from 8,086 MW to 7,386 MW, or 8.7 percent. The 72,537 MW include generation with scheduled in-service dates in 2013 and units still active in the queue with in-service dates scheduled before 2013, listed at nameplate capacity, although these units are not yet in service.

Table 11-2 Queue comparison (MW): June 30, 2013 vs. December 31, 2012

	MW in the Queue 2012	MW in the Queue 2013	Year-to-Year Change (MW)	Year-to-Year Change
2013	22,120	16,359	(5,762)	(26.0%)
2014	8,086	7,386	(701)	(8.7%)
2015	22,295	17,769	(4,526)	(20.3%)
2016	11,788	13,470	1,681	14.3%
2017	8,932	12,662	3,730	41.8%
2018	3,165	2,952	(213)	(6.7%)
2019	0	0	0	NA
2020	0	346	346	NA
2024	0	1,594	1,594	NA
Total	76,387	72,537	(3,850)	(5.0%)

Table 11-3 shows the amount of capacity active, in-service, under construction or withdrawn for each queue since the beginning of the Regional Transmission Expansion Plan (RTEP) Process and the total amount of capacity that had been included in each queue.[7]

Table 11-3 Capacity in PJM queues (MW): At June 30, 2013[8,9]

Queue	Active	In-Service	Under Construction	Withdrawn	Total
A Expired 31-Jan-98	0	8,103	0	17,347	25,450
B Expired 31-Jan-99	0	4,646	0	14,957	19,602
C Expired 31-Jul-99	0	531	0	3,471	4,002
D Expired 31-Jan-00	0	851	0	7,182	8,033
E Expired 31-Jul-00	0	795	0	8,022	8,817
F Expired 31-Jan-01	0	52	0	3,093	3,145
G Expired 31-Jul-01	0	1,116	0	17,934	19,050
H Expired 31-Jan-02	0	703	0	8,422	9,124
I Expired 31-Jul-02	0	103	0	3,728	3,831
J Expired 31-Jan-03	0	40	0	846	886
K Expired 31-Jul-03	0	218	80	2,345	2,643
L Expired 31-Jan-04	0	257	0	4,034	4,290
M Expired 31-Jul-04	0	505	300	3,556	4,360
N Expired 31-Jan-05	0	2,399	38	8,090	10,527
O Expired 31-Jul-05	10	1,688	825	5,069	7,592
P Expired 31-Jan-06	183	3,065	463	4,928	8,638
Q Expired 31-Jul-06	120	2,248	2,694	9,472	14,534
R Expired 31-Jan-07	1,296	1,216	728	19,514	22,755
S Expired 31-Jul-07	1,640	3,281	452	11,769	17,142
T Expired 31-Jan-08	3,704	1,275	631	21,936	27,545
U Expired 31-Jan-09	2,514	776	789	29,278	33,357
V Expired 31-Jan-10	4,850	264	1,617	10,275	17,005
W Expired 31-Jan-11	7,464	352	1,701	14,714	24,232
X Expired 31-Jan-12	14,184	216	3,638	12,335	30,373
Y Expired 30-Apr-13	21,740	28	191	4,364	26,324
Z through 30-Jun-13	687	0	0	0	687
Total	58,391	34,727	14,147	246,680	353,944

Data presented in Table 11-4 show that through the first six months of 2013, 36.7 percent of total in-service capacity from all the queues was from Queues A and B and an additional 6.3 percent was from Queues C, D and E.[10] As of June 30, 2013, 9.8 percent of all queued capacity has been placed in service, and 13.8 percent of all queued capacity is either complete or under construction.

The data presented in Table 11-4 show that for successful projects there is an average time of 835 days between entering a queue and the in-service date,

6 See the *2012 State of the Market Report for PJM*: Volume II, Section 11, pp. 318-323, for the queues in 2012.

7 Projects listed as active have been entered in the queue and the next phase can be under construction, in-service or withdrawn. At any time, the total number of projects in the queues is the sum of active projects and under-construction projects.

8 The *2013 Quarterly State of the Market Report for PJM: January through June* contains all projects in the queue including reratings of existing generating units and energy only resources.

9 Projects listed as partially in-service are counted as in-service for the purposes of this analysis.

10 The data for Queue Z include projects through June 30, 2013.

an increase of 4 days over the 2012 average. The data also show that for withdrawn projects, there is an average time of 569 days between entering a queue and exiting. For each status, there is substantial variability around the average results.

Table 11-4 Average project queue times (days): At June, 2013

Status	Average (Days)	Standard Deviation	Minimum	Maximum
Active	915	688	0	4,636
In-Service	835	717	0	3,964
Suspended	2,006	906	704	3,849
Under Construction	1,486	828	0	6,380
Withdrawn	569	581	0	4,249

Table 11-5 shows queued capacity with an "active" status that is planned to be in service by January 1, 2015. This indicates there is a substantial amount of queued capacity, 19,043.7 MW, that should already be in service or under construction based on the original queue date, but has not progressed far enough in the development process to begin construction. The MMU recommends that a review process be created to ensure that projects are removed from the queue, if they are no longer viable or no longer planning to complete the project.

Table 11-5 Active capacity queued to be in service prior to January 1, 2015

	MW
2007	27.0
2008	190.0
2009	285.0
2010	1,199.8
2011	2,449.4
2012	2,907.0
2013	7,467.6
2014	4,518.0
Total	19,043.7

Table 11-6 shows queued capacity with an "active" status that is planned to be in service by January 1, 2015, by zone. Projects that have yet to start construction by July 1, 2013, yet are expected to be complete by January 1, 2015, are defined as non-viable. Currently, 63.2 percent of all generation that appears to be non-viable is located in the AEP and ComEd control zones. Further, certain owners appear to have significant MW positions in generation queues that appear non-viable. There are six owners with more than 500 MW of non-viable queue positions. Additionally, a significant number of queue positions are lacking an identifiable interconnection customer.

Table 11-6 Active capacity queued to be in service prior to January 1, 2015, by zone

	2007	2008	2009	2010	2011	2012	2013	2014	Total
AECO	0	0	4	103	332	67	8	350	864
AEP	0	0	0	750	1,047	426	4,938	1,391	8,552
AP	0	0	70	0	32	209	91	1,021	1,422
ATSI	0	0	0	0	175	200	536	212	1,123
BGE	0	0	0	0	0	0	4	0	4
ComEd	27	166	141	220	616	1,394	881	40	3,486
DAY	0	0	0	0	0	200	412	0	612
DEOK	0	0	0	0	0	0	50	4	54
DLCO	0	0	0	0	0	0	0	0	0
Dominion	0	0	0	5	20	20	41	0	86
DPL	0	0	0	20	112	40	35	150	357
EKPC	0	0	0	0	0	0	0	0	0
JCPL	0	0	0	0	0	4	7	6	16
Met-Ed	0	24	0	0	0	3	17	150	194
PECO	0	0	0	2	2	73	5	0	82
PENELEC	0	0	70	0	14	84	144	167	479
Pepco	0	0	0	0	0	0	0	36	36
PPL	0	0	0	100	100	0	0	235	435
PSEG	0	0	0	0	0	188	300	756	1,244
Total	27	190	285	1,200	2,449	2,907	7,468	4,518	19,044

Distribution of Units in the Queues

A more detailed examination of the queue data permits some additional conclusions. The geographic distribution of generation in the queues shows that new capacity is being added disproportionately in the west, and includes a substantial amount of wind capacity. At June 30, 2013, 72,537 MW of capacity were in generation request queues for construction through 2024, compared to an average installed capacity of 195,000 MW in 2013. Wind projects account for 18,612 MW of nameplate capacity or 25.7 percent of the capacity in the queues and combined-cycle projects account for 42,925 MW

of capacity or 59.2 percent of the capacity in the queues.[11] On June 30, 2013, there were 42,925 MW of capacity from combined cycle units in the queue, compared to 42,724 MW in 2012, an increase of 0.5 percent. At June 30, 2013, there was queued combined cycle capacity in nearly every zone in PJM, and after accounting for the derating of wind and solar resources, combined cycle capacity comprises 78.0 percent of the MW in the queue able to offer into RPM auctions.

Table 11-7 shows the projects under construction or active as of June 30, 2013, by unit type and control zone. Most of the steam projects (99.3 percent of the MW) and most of the wind projects (92.5 percent of the MW) are outside the Eastern MAAC (EMAAC)12 and Southwestern MAAC (SWMAAC)13 locational deliverability areas (LDAs).14 Of the total capacity additions, only 14,605 MW, or 20.1 percent, are projected to be in EMAAC, while 4,240 MW or 5.8 percent are projected to be constructed in SWMAAC. Of total capacity additions, 27,720 MW, or 38.2 percent of capacity, is being added inside MAAC zones.

Overall, 74.0 percent of capacity is being added outside EMAAC and SWMAAC, and 61.7 percent of capacity is being added outside MAAC zones. Wind projects account for 2,565 MW of capacity in MAAC LDAs, or 9.3 percent. While there are no wind projects in the SWMAAC LDA, in the EMAAC LDA wind projects account for 1,387 MW of capacity, or 9.5 percent. Of non-steam, non-wind projects, 65.6 percent of capacity is being added outside EMAAC and SWMAAC zones.

Table 11-7 Capacity additions in active or under-construction queues by control zone (MW): At June 30, 2013

	CC	CT	Diesel	Hydro	Nuclear	Solar	Steam	Storage	Wind	Total
AECO	2,849	71	9	0	0	493	0	0	1,069	4,491
AEP	5,682	40	20	70	0	44	2,124	98	8,510	16,588
AP	1,999	48	50	75	0	142	199	0	497	3,012
ATSI	3,475	1,020	6	7	0	15	135	0	849	5,507
BGE	678	256	4	0	0	22	0	0	0	960
ComEd	2,691	441	46	23	473	64	0	42	4,837	8,616
DAY	0	0	2	112	0	23	12	12	600	761
DEOK	20	0	0	0	0	0	50	4	0	74
DLCO	285	0	0	0	48	0	460	0	0	793
Dominion	6,593	60	11	0	1,594	65	219	0	505	9,046
DPL	1,223	2	16	0	0	238	22	8	318	1,826
EKPC	170	0	0	0	0	0	0	0	250	420
JCPL	1,755	0	30	0	0	800	0	20	0	2,605
Met-Ed	1,818	0	2	0	39	3	0	0	0	1,862
PECO	1,609	7	4	45	330	0	0	4	0	1,998
PENELEC	879	43	28	0	0	32	3	0	675	1,661
Pepco	3,245	0	20	0	0	15	0	0	0	3,280
PPL	4,671	0	7	3	100	29	0	40	503	5,352
PSEG	3,284	172	9	0	50	170	0	0	0	3,685
Total	42,925	2,160	264	335	2,634	2,156	3,224	228	18,612	72,537

There are potentially significant implications for future congestion, the role of firm and interruptible gas supply and natural gas supply infrastructure, if older steam units are replaced by units burning natural gas. (Table 11-8)

Table 11-8 Capacity additions in active or under-construction queues by LDA (MW): At June 30, 2013[15]

	CC	CT	Diesel	Hydro	Nuclear	Solar	Steam	Storage	Wind	Total
EMAAC	10,719	251	67	45	380	1,702	22	32	1,387	14,605
SWMAAC	3,923	256	24	0	0	37	0	0	0	4,240
WMAAC	7,368	43	36	3	139	64	3	40	1,178	8,874
Non-MAAC	20,915	1,609	136	287	2,115	353	3,199	156	16,047	44,817
Total	42,925	2,160	264	335	2,634	2,156	3,224	228	18,612	72,537

11 Since wind resources cannot be dispatched on demand, PJM rules previously required that the unforced capacity of wind resources be derated to 20 percent of installed capacity until actual generation data are available. Beginning with Queue U, PJM derates wind resources to 13 percent of installed capacity. PJM derates solar resources to 38 percent of installed capacity. Based on the derating of 18,612 MW of wind resources and 2,156 MW of solar resources, the 72,537 MW currently active in the queue would be reduced to 55,008 MW.

12 EMAAC consists of the AECO, DPL, JCPL, PECO and PSEG Control Zones.

13 SWMAAC consists of the BGE and Pepco Control Zones.

14 See the *2012 State of the Market Report for PJM*, Volume II, Appendix A, "PJM Geography" for a map of PJM LDAs.

15 WMAAC consists of the Met-Ed, PENELEC, and PPL Control Zones.

Table 11-9 shows existing generation by unit type and control zone. Existing steam (mainly coal and residual oil) and nuclear capacity is distributed across control zones.

A potentially significant change in the distribution of unit types within the PJM footprint is likely as a combined result of the location of generation resources in the queue (Table 11-7) and the location of units likely to retire. In both the EMAAC and SWMAAC LDAs, the capacity mix is likely to shift to more natural gas-fired combined cycle (CC) and combustion turbine (CT) capacity. The western part of the PJM footprint is also likely to see a shift to more natural gas-fired capacity due to changes in environmental regulations and natural gas costs, but likely will maintain a larger amount of coal steam capacity than eastern zones.

Table 11-9 Existing PJM capacity: At June 30, 2013[16] (By zone and unit type (MW))

	CC	CT	Diesel	Fuel Cell	Hydroelectric	Nuclear	Solar	Steam	Storage	Wind	Total
AECO	164	706	21	0	0	0	40	1,087	0	8	2,025
AEP	4,900	3,682	63	0	1,072	2,071	0	21,145	0	1,753	34,686
AP	1,129	1,215	48	0	80	0	36	7,358	27	999	10,892
ATSI	685	1,661	74	0	0	2,134	0	6,540	0	0	11,094
BGE	0	835	22	0	0	1,716	0	2,996	0	0	5,569
ComEd	1,770	7,244	100	0	0	10,438	0	5,417	5	2,454	27,428
DAY	0	1,369	48	0	0	0	1	3,180	0	0	4,597
DEOK	0	842	0	0	0	0	0	4,154	0	0	4,996
DLCO	244	15	0	0	6	1,777	0	784	0	0	2,826
Dominion	4,030	3,762	171	0	3,589	3,581	3	8,419	0	0	23,554
DPL	1,125	1,820	96	30	0	0	4	1,800	0	0	4,876
EKPC	0	774	0	0	70	0	0	1,882	0	0	2,726
External	0	111	0	0	0	13	0	3,819	0	0	3,942
JCPL	1,693	1,233	27	0	400	615	42	15	0	0	4,024
Met-Ed	2,051	408	41	0	20	805	0	844	0	0	4,168
PECO	3,209	836	3	0	1,642	4,547	3	979	1	0	11,220
PENELEC	0	344	46	0	513	0	0	6,831	0	931	8,663
Pepco	230	1,092	12	0	0	0	0	3,649	0	0	4,983
PPL	1,808	617	49	0	582	2,520	15	5,537	0	220	11,346
PSEG	3,091	2,838	12	0	5	3,493	105	2,050	2	0	11,597
Total	26,128	31,402	832	30	7,978	33,709	249	88,484	35	6,364	195,211

16 The capacity described in this section refers to all installed capacity in PJM, regardless of whether the capacity entered the RPM auction.

Table 11-10 shows the age of PJM generators by unit type.

Table 11-10 PJM capacity (MW) by age: at June 30, 2013

Age (years)	Combined Cycle	Combustion Turbine	Diesel	Fuel Cell	Hydroelectric	Nuclear	Solar	Steam	Storage	Wind	Total
Less than 11	13,883	4,452	456	30	8	0	249	3,385	6,264	35	28,761
11 to 20	9,287	16,969	131	0	51	0	0	2,738	100	0	29,276
21 to 30	2,517	2,753	56	0	3,316	12,605	0	7,708	0	0	28,955
31 to 40	244	1,415	24	0	241	16,075	0	25,201	0	0	43,199
41 to 50	198	5,813	151	0	2,915	5,029	0	31,721	0	0	45,827
51 to 60	0	0	15	0	112	0	0	14,609	0	0	14,736
61 to 70	0	0	0	0	267	0	0	2,973	0	0	3,240
71 to 80	0	0	0	0	215	0	0	95	0	0	310
81 to 90	0	0	0	0	614	0	0	54	0	0	668
91 to 100	0	0	0	0	108	0	0	.	0	0	108
101 and over	0	0	0	0	131	0	0	0	0	0	131
Total	26,128	31,402	832	30	7,978	33,709	249	88,484	6,364	35	195,211

Table 11-11 shows the effect that the new generation in the queues would have on the existing generation mix, assuming that all non-hydroelectric generators in excess of 40 years of age retire by 2024. The expected role of gas-fired generation depends largely on projects in the queues and continued retirement of coal-fired generation. New gas-fired capability would represent 89.0 percent of all new capacity in EMAAC when the derating of wind and solar capacity is reflected.

In 2012, a planned addition of 1,640 MW of nuclear capacity to Calvert Cliffs in SWMAAC was withdrawn from the queue. Without the planned nuclear capability in SWMAAC, new gas-fired capability represents 98.6 percent of all new capability in the SWMAAC. In 2020, this would mean that CC and CT generators would comprise 54.9 percent of total capability in SWMAAC.

In Non-MAAC zones, if older units retire, a substantial amount of coal-fired generation would be replaced by wind generation if the units in the generation queues are constructed.[17] In these zones, 88.2 percent of all generation 40 years or older is steam (primarily coal). With the retirement of these units in 2020, wind farms would comprise 15.4 percent of total MW ICAP in Non-MAAC zones, if all queued MW are built.

17 Non-MAAC zones consist of the AEP, AP, ATSI, ComEd, DAY, DEOK, DLCO, and Dominion Control Zones.

Table 11-11 Comparison of generators 40 years and older with slated capacity additions (MW): Through 2024[18]

Area	Unit Type	Capacity of Generators 40 Years or Older	Percent of Area Total	Capacity of Generators of All Ages	Percent of Area Total	Additional Capacity through 2024	Estimated Capacity 2024	Percent of Area Total
EMAAC	Combined Cycle	198	2.4%	9,282	27.5%	10,719	19,803	48.5%
	Combustion Turbine	2,229	27.5%	7,433	22.0%	251	5,456	13.4%
	Diesel	48	0.6%	159	0.5%	67	178	0.4%
	Fuel Cell	0	0.0%	30	1.6%	0	30	1.8%
	Hydroelectric	2,042	25.2%	2,047	6.1%	45	665	1.6%
	Nuclear	615	7.6%	8,654	25.6%	380	8,420	20.6%
	Solar	0	0.0%	194	0.6%	1,702	1,896	4.6%
	Steam	2,981	36.7%	5,931	17.6%	22	2,972	7.3%
	Storage	0	0.0%	3	0.0%	32	35	0.1%
	Wind	0	0.0%	8	0.0%	1,387	1,395	3.4%
	EMAAC Total	8,112	100.0%	33,741	100.0%	14,605	40,848	100.0%
SWMAAC	Combined Cycle	0	0.0%	230	2.2%	3,923	4,153	39.4%
	Combustion Turbine	542	12.8%	1,927	18.3%	256	1,640	15.6%
	Diesel	0	0.0%	34	0.3%	24	58	0.6%
	Hydroelectric	0	0.0%	0	0.0%	0	0	0.0%
	Nuclear	0	0.0%	1,716	16.3%	0	1,716	16.3%
	Solar	0	0.0%	0	0.0%	37	37	0.4%
	Steam	3,702	87.2%	6,645	63.0%	0	2,943	27.9%
	SWMAAC Total	4,244	100.0%	10,552	100.0%	4,240	10,548	100.0%
WMAAC	Combined Cycle	0	0.0%	3,859	16.0%	7,368	11,227	45.4%
	Combustion Turbine	558	6.1%	1,368	5.7%	43	854	3.4%
	Diesel	46	0.5%	136	0.6%	36	126	0.5%
	Hydroelectric	887	9.7%	1,114	4.6%	3	1,117	4.5%
	Nuclear	0	0.0%	3,325	13.8%	139	3,464	14.0%
	Solar	0	0.0%	15	0.1%	64	79	0.3%
	Steam	7,702	83.8%	13,211	54.6%	3	5,513	22.3%
	Storage	0	0.0%	0	0.0%	40	40	0.2%
	Wind	0	0.0%	1,151	4.8%	1,178	2,328	9.4%
	WMAAC Total	9,193	100.0%	24,178	100.0%	8,874	24,747	100.0%
Non-MAAC	Combined Cycle	0	0.0%	12,758	10.1%	20,915	33,673	24.5%
	Combustion Turbine	942	2.7%	20,674	16.3%	1,609	21,342	15.5%
	Diesel	53	0.1%	503	0.4%	136	587	0.4%
	Hydroelectric	1,433	4.1%	4,818	3.8%	287	5,104	3.7%
	Nuclear	1,751	5.0%	20,013	15.8%	2,115	20,378	14.8%
	Solar	0	0.0%	40	0.0%	353	393	0.3%
	Steam	31,118	88.2%	62,697	49.5%	3,199	34,778	25.3%
	Storage	0	0.0%	32	0.0%	156	188	0.1%
	Wind	0	0.0%	5,206	4.1%	16,047	21,253	15.4%
	Non-MAAC Total	35,295	100.0%	126,741	100.0%	44,817	137,696	100.0%
All Areas	Total	56,844		195,211		72,537	213,839	

18 Percentages shown in Table 11-11 are based on unrounded, underlying data and may differ from calculations based on the rounded values in the tables.

Planned Deactivations

As shown in Table 11-12, 13,768.2 MW are planning to deactivate by the end of calendar year 2019. A total of 7,195.7 MW of generation capacity retired from January 1, 2012, through June 30, 2013, and it is expected that a total of 22,160.4 MW will have retired from 2011 through 2019, with most of this capacity retiring by June, 2015. Retirements from January 1, 2011, through June 30, 2013, account for 8,392.2 MW, or 37.9 percent of retirements during this period. Units planning to retire in 2013 account for 2,402.6 MW, or 10.8 percent of retirements during this period. Overall, 3,508.1 MW, or 28.7 percent of all MW planned for deactivation from 2013 through 2019, are expected in the AEP zone. Since January 1, 2013, 1,340.5 MW that were scheduled to be deactivated have withdrawn their deactivation notices, and are planning to continue operating, including the Avon Lake and New Castle generating units in the ATSI zone.

Table 11-12 Summary of PJM unit retirements (MW): 2011 through 2019

	MW
Retirements 2011	1,196.5
Retirements 2012	6,961.9
Retirements 2013	233.8
Planned Retirements 2013	2,402.6
Planned Retirements 2014	1,712.0
Planned Retirements 2015	9,039.1
Planned Retirements Post-2015	614.5
Total	22,160.4

Figure 11-1 Map of unit retirements in PJM: 2012 through 2019

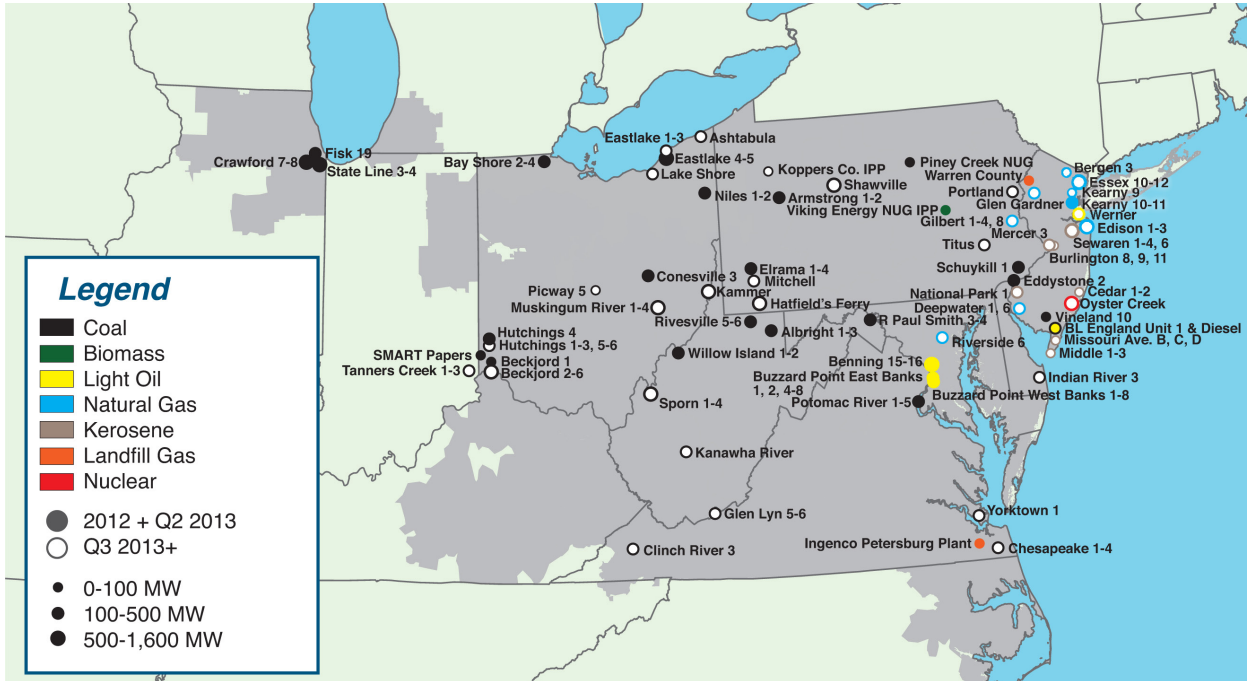

Table 11-13 Planned deactivations of PJM units, as of July 15, 2013

Unit	Zone	MW	Fuel	Unit Type	Projected Deactivation Date
Warren County Landfill	JCPL	1.9	Landfill Gas	Reciprocating engine	09-Jan-13
Piney Creek NUG	PENELEC	31.0	Waste Coal	Steam	12-Apr-13
Titus	Met-Ed	243.0	Coal	Steam	01-Sep-13
Koppers Co. IPP	PPL	8.0	Wood waste	Steam	30-Sep-13
Hatfield's Ferry	AP	1,590.0	Coal	Steam	09-Oct-13
Mitchell	AP	359.0	Coal	Steam	09-Oct-13
Indian River 3	DPL	169.7	Coal	Steam	31-Dec-13
BL England 1	AECO	113.0	Coal	Steam	01-May-14
Riverside 6	BGE	115.0	Natural gas	Combustion Turbine	01-Jun-14
Portland	Met-Ed	401.0	Coal	Steam	01-Jun-14
Burlington 9	PSEG	184.0	Kerosene	Combustion Turbine	01-Jun-14
Chesapeake 1-4	Dominion	576.0	Coal	Steam	31-Dec-14
Yorktown 1-2	Dominion	323.0	Coal	Steam	31-Dec-14
Beckjord 2-6	DEOK	1,024.0	Coal	Steam	01-Apr-15
Shawville	PENELEC	603.0	Coal	Steam	16-Apr-15
Gilbert 1-4, 8	JCPL	188.0	Natural gas	Combustion Turbine	01-May-15
Glen Gardner	JCPL	160.0	Natural gas	Combustion Turbine	01-May-15
Werner 1-4	JCPL	212.0	Light oil	Combustion Turbine	01-May-15
Kearny 9	PSEG	21.0	Natural gas	Combustion Turbine	01-May-15
Cedar 1-2	AECO	65.6	Kerosene	Combustion Turbine	31-May-15
Deepwater 1, 6	AECO	158.0	Natural gas	Steam	31-May-15
Middle 1-3	AECO	74.7	Kerosene	Combustion Turbine	31-May-15
Missouri Ave B, C, D	AECO	57.9	Kerosene	Combustion Turbine	31-May-15
Essex 12	PSEG	184.0	Natural gas	Combustion Turbine	31-May-15
Clinch River 3	AEP	230.0	Coal	Steam	01-Jun-15
Glen Lyn 5-6	AEP	325.0	Coal	Steam	01-Jun-15
Kammer	AEP	600.0	Coal	Steam	01-Jun-15
Kanawha River	AEP	400.0	Coal	Steam	01-Jun-15
Muskingum River 1-4	AEP	790.0	Coal	Steam	01-Jun-15
Picway 5	AEP	95.0	Coal	Steam	01-Jun-15
Sporn	AEP	580.0	Coal	Steam	01-Jun-15
Tanners Creek 1-3	AEP	488.1	Coal	Steam	01-Jun-15
Ashtabula	ATSI	210.0	Coal	Steam	01-Jun-15
Eastlake 1-3	ATSI	327.0	Coal	Steam	01-Jun-15
Lake Shore	ATSI	190.0	Coal	Steam	01-Jun-15
Hutchings 1-3, 5-6	DAY	271.8	Coal	Steam	01-Jun-15
Bergen 3	PSEG	21.0	Natural gas	Combustion Turbine	01-Jun-15
Burlington 8, 11	PSEG	205.0	Kerosene	Combustion Turbine	01-Jun-15
Edison 1-3	PSEG	504.0	Natural gas	Combustion Turbine	01-Jun-15
Essex 10-11	PSEG	352.0	Natural gas	Combustion Turbine	01-Jun-15
Mercer 3	PSEG	115.0	Kerosene	Combustion Turbine	01-Jun-15
National Park 1	PSEG	21.0	Kerosene	Combustion Turbine	01-Jun-15
Sewaren 1-4	PSEG	453.0	Natural gas	Steam	01-Jun-15
Sewaren 6	PSEG	105.0	Kerosene	Combustion Turbine	01-Jun-15
BL England Diesels	AECO	8.0	Diesel	Diesel	01-Oct-15
Oyster Creek	JCPL	614.5	Nuclear	Steam	31-Dec-19
Total		13,768.2			

Table 11-14 shows the capacity, average size, and average age of units retiring in PJM, from 2011 through 2019. The majority, 73.8 percent, of all MW retiring during this period are coal steam units. These units have an average age of 57 years, and an average size of 165 MW. This indicates that, on average, retirements have consisted of smaller sub-critical coal steam units, and those without adequate environmental controls to remain viable beyond 2015.

Table 11-14 Deactivations of PJM units, 2011 through 2019

	Number of Units	Avg. Size (MW)	Avg. Age at Retirement (Years)	Total MW
Coal	99	165.0	57.2	16,333.4
Diesel	3	5.6	43.3	16.9
Heavy Oil	1	166.0	55.0	166.0
Kerosene	20	41.4	45.5	828.2
LFG	1	1.9	7.0	1.9
Light Oil	19	64.0	43.8	1,216.0
Natural Gas	50	58.6	46.3	2,928.5
Nuclear	1	614.5	50.0	614.5
Waste Coal	1	31.0	20.0	31.0
Wood Waste	2	12.0	23.5	24.0

Table 11-15 HEDD Units in PJM as of June 30, 2013[19]

Unit	Zone	MW	Deactivation Date
Carlls Corner 1-2	AECO	72.6	NA
Cedar Station 1-3	AECO	66.0	31-May-15
Cumberland 1	AECO	92.0	NA
Mickleton 1	AECO	72.0	NA
Middle Street 1-3	AECO	75.3	31-May-15
Missouri Ave. B,C,D	AECO	60.0	31-May-15
Sherman Ave.	AECO	92.0	NA
Vineland West CT	AECO	26.0	01-Sep-12
Forked River 1-2	JCPL	65.0	NA
Gilbert 4-7, 9, C1-C4	JCPL	446.0	01-May-15
Glen Gardner A1-A4, B1-B4	JCPL	160.0	01-May-15
Lakewood 1-2	JCPL	316.1	NA
Parlin NUG	JCPL	114.0	NA
Sayreville C1-C4	JCPL	224.0	NA
South River NUG	JCPL	299.0	NA
Werner C1-C4	JCPL	212.0	01-May-15
Bayonne	PSEG	118.5	NA
Bergen 3	PSEG	21.0	01-Jun-15
Burlington 111-114, 121-124, 91-94, 8	PSEG	557.0	01-Jun-15
Camden	PSEG	145.0	NA
Eagle Point 1-2	PSEG	127.1	NA
Edison 11-14, 21-24, 31-34	PSEG	504.0	01-Jun-15
Elmwood	PSEG	67.0	NA
Essex 101-104, 111-114, 121,124	PSEG	536.0	01-Jun-15
Kearny 9-11, 121-124	PSEG	446.0	01-May-15
Linden 1-2	PSEG	1,230.0	NA
Mercer 3	PSEG	115.0	01-Jun-15
National Park	PSEG	21.0	01-Jun-15
Newark Bay	PSEG	120.2	NA
Pedricktown	PSEG	120.3	NA
Salem 3	PSEG	38.4	NA
Sewaren 6	PSEG	105.0	01-Jun-15
Total		6,663.5	

19 See "Current New Jersey Turbines that are HEDD Units," <http://www.state.nj.us/dep/workgroups/docs/apcrule_20110909turbinelist.pdf> (Accessed July 1, 2013)

Actual Generation Deactivations in 2013

Table 11-16 shows unit deactivations for 2013 through June 30, 2013.[20] A total of 233.8 MW retired from January 1, 2013, through June 30, 2013.

Table 11-16 Unit deactivations: January 2013 through June 30, 2013

Company	Unit Name	ICAP	Primary Fuel	Zone Name	Age (Years)	Retirement Date
Exelon Corporation	Schuylkill 1	166.0	Heavy Oil	PECO	54	01-Jan-13
Exelon Corporation	Schuylkill Diesel	3.0	Diesel	PECO	45	01-Jan-13
Ingenco Wholesale Power, LLC	Ingenco Petersburg	2.9	Diesel	Dominion	22	31-May-13
The AES Corporation	Hutchings 4	61.9	Coal	DAY	62	01-Jun-13

Updates on Key Backbone Facilities

PJM baseline upgrade projects are implemented to resolve reliability criteria violations. PJM backbone projects are a subset of baseline upgrade projects that have been given the informal designation of backbone due to their relative significance. Backbone upgrades are on the EHV (Extra High Voltage) system and resolve a wide range of reliability criteria violations and market congestion issues. The current backbone projects are: Mount Storm – Doubs; Jacks Mountain; and Susquehanna – Roseland.

The Mount Storm – Doubs transmission line, that serves West Virginia, Virginia and Maryland, was originally built in 1966. The structures and equipment are approaching the end of their expected service life, and require replacement to ensure reliability in its service areas. "As of June, 2013, construction is proceeding ahead of schedule. All structure foundations are complete, approximately 70 percent of the structures have been erected, and more than 70 percent of the line is complete."[21]

The Jacks Mountain project is required to resolve voltage problems for load deliverability starting June 1, 2017. Jacks Mountain will be a new 500kV substation connected to the existing Conemaugh – Juniata and Keystone –

20 See "PJM Generator Deactivations," PJM.com <http://pjm.com/planning/generation-retirements/gr-summaries.aspx> (January 24, 2013).
21 See "*Mt. Storm – Doubs 500kV Rebuild Project*," Dom.com <https://www.dom.com/about/electric-transmission/mtstorm/index.jsp> (July 30, 2013).

Juniata 500kV circuits. The plans are for construction of the foundation in late 2013, construction in 2014 and completion in early 2015.

The Susquehanna – Roseland project is required to resolve reliability criteria violations starting June 1, 2012. Susquehanna – Roseland will be a new 500 kV transmission line connecting the Susquehanna – Lackawanna – Hopatcong – Roseland buses. On October 1, 2012, the Susquehanna – Roseland project received final approval from the National Park Service (NPS) for the project to be constructed on the route selected by PSEG and PPL.[22] The Susquehanna – Hopatcong portion of the project is currently expected to be in-service by June, 2014, with the remainder of the project to be completed by June, 2015.

Regional Transmission Expansion Plan (RTEP) Proposal Windows

On July 22, 2013, PJM made a second filing in compliance with Order No. 1000 and in compliance with the order on its first compliance filing issued March 22, 2013.[23] PJM's Order No. 1000 compliance filing addressed a number of procedural issues identified by the Commission in the March 22nd order. In the initial filing PJM proposed to expand the regional planning process to provide greater opportunity for non-incumbent transmission developers to submit solution proposals.[24] PJM's filing established proposal windows for competitive solicitations but limited the ability of competitors to make proposals within a defined time window.[25]

A test of whether PJM's new process can operate transparently and offer a meaningful opportunity for non-incumbents to compete involves Artificial Island, which includes the Salem and Hope Creek nuclear plants. On April 29, 2013, PJM submitted a request for proposal (RFP), seeking technical solutions to improve stability issues, operational performance under a range of anticipated system conditions, and to eliminate potential planning criteria violations in the Artificial Island Area. The RFP window closed on June 28, 2013. PJM received 26 individual proposals from 7 entities, including proposals from the incumbent transmission owner, PSEG, and a range of proposals from other non-incumbents. The costs of solutions proposed ranged from approximately $54 million to $1.4 billion.[26] These proposals are currently being evaluated by PJM.

22 See PSEG.com. "Susquehanna-Roseland line receives final federal approval," <http://www.pseg.com/info/media/newsreleases/2012/2012-10-02.jsp> (Accessed July 30, 2013).
23 PJM filing, Docket No. ER13-198-002 (July 22nd PJM Filing"); 142 FERC ¶ 61,214. PJM Transmission Owners made a separate filing addressing cost allocation issues, also on March 22, 2013.
24 PJM compliance filing, Docket No. ER13-198-001 (October 25, 2012).
25 Id.; see also "*RTEP Proposal Windows*," PJM.com <http://www.pjm.com/planning/rtep-development/expansion-plan-process/ferc-order-1000/rtep-proposal-windows.aspx> (Accessed July 30, 2013).
26 See "*PJM 2013 RTEP Proposal Window Tracking*," PJM.com <http://www.pjm.com/~/media/committees-groups/committees/teac/20130710/20130710-pjm-2013-rtep-proposal-window-tracking.ashx> (Accessed July 30, 2013).