Generation and Transmission Planning

Overview

Planned Generation and Retirements

- **Planned Generation.** At September 30, 2013, 63,765 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 nine months of 2013. Wind projects account for 16,442 MW of nameplate capacity or 25.7 percent of the capacity in the queues and combined-cycle projects account for 37,634 MW of capacity or 59.0 percent of the capacity in the queues.
- **Generation Retirements.** As shown in Table 12-10, 22,070.4 MW is planned to be retired between 2011 and 2019, with all but 614.5 MW retired by June, 2015. The AEP zone accounts for 3,560 MW, or 32.7 percent of all MW planned for deactivation from 2013 through 2019. Since January 1, 2013, 1,437 MW that were scheduled to be deactivated have withdrawn their deactivation notices, and are planning to continue operating, including the Avon Lake and New Castle generating units in the ATSI zone.
- **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 Eastern MAAC (EMAAC) and Southwestern MAAC (SWMAAC) locational deliverability areas (LDAs), the capacity mix is likely to shift to more natural gas-fired combined cycle (CC) and combustion turbine (CT) capacity.[1] 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.[2] 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 15,726 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.

Regional Transmission Expansion Plan (RTEP)

- On October 3, 2013, the PJM Board of Managers authorized $1.2 billion in transmission upgrades and improvements that were identified as part of PJM's continued regional planning process.

1 EMAAC consists of the AECO, DPL, JCPL, PECO and PSEG Control Zones. SWMAAC consists of the BGE and Pepco Control Zones. See the *2012 State of the Market Report for PJM*, Volume II, Appendix A, "PJM Geography" for a map of PJM LDAs.

2 OATT Parts IV & VI.

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 integrating transmission investments into the market through the use of economic evaluation metrics.[3] 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 among transmission developers to build transmission projects.[4] 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.

The PJM queue evaluation process needs to be enhanced to ensure that barriers to competition are not created. There appears to be a substantial amount of non-viable MW in the queues, which increase interconnection costs for projects behind them. The MMU recommends the establishment of a PJM review process to ensure that projects are removed from the queue, if they are not viable.

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. On September 30, 2013, 63,765 MW of capacity were in generation request queues for construction through 2024, 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 12-1).[5] Overall, 731 MW of nameplate capacity were added in PJM in the first nine months of 2013.

3 *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).

4 *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).

5 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.

Table 12-1 Year-to-year capacity additions from PJM generation queue: Calendar years 2000 through the first nine months of 2013[6]

	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	731

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 is currently open.

Table 12-2 shows how yearly scheduled capacity has shifted from to 2012 to 2013. The total MW in the queue decreased by 12,622 MW or 16.5 percent from 76,387 MW in 2012 to 63,765 MW as of September 30, 2013. A large portion of that decrease (9,899 MW) was the result of the capacity going into service in 2013.

Table 12-2 Queue comparison (MW): September 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	12,221	(9,899)	(44.8%)
2014	8,086	7,474	(613)	(7.6%)
2015	22,295	12,998	(9,297)	(41.7%)
2016	11,788	12,836	1,048	8.9%
2017	8,932	14,505	5,573	62.4%
2018	3,165	1,791	(1,374)	(43.4%)
2019	0	0	0	NA
2020	0	346	346	NA
2024	0	1,594	1,594	NA
Total	76,387	63,765	(12,622)	(16.5%)

Table 12-3 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] Through the first nine months of 2013, 37.9 percent of total in-service capacity from all the queues was from Queues A-C. As of September 30, 2013, withdrawn projects made up, at 257,781 MW or 72.2 percent of the total queue entries. As of September 30, 2013, 9.8 percent of all queued capacity had been placed in service, and 14.0 percent of all queued capacity was either complete or under construction. The MW in queue or under construction is 63,765, about twice what has been completed from the beginning of the process.

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

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.

Table 12-3 Capacity in PJM queues (MW): At September 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	0	2,425	2,643
L Expired 31-Jan-04	0	257	0	4,034	4,290
M Expired 31-Jul-04	0	505	150	3,706	4,360
N Expired 31-Jan-05	0	2,399	88	8,040	10,527
O Expired 31-Jul-05	10	1,688	225	5,669	7,592
P Expired 31-Jan-06	43	3,065	463	5,068	8,638
Q Expired 31-Jul-06	120	2,248	2,524	9,642	14,534
R Expired 31-Jan-07	1,296	1,366	748	19,344	22,755
S Expired 31-Jul-07	1,050	3,281	402	12,409	17,142
T Expired 31-Jan-08	3,715	1,275	631	21,936	27,556
U Expired 31-Jan-09	2,151	776	649	29,782	33,358
V Expired 31-Jan-10	3,802	264	2,642	10,298	17,005
W Expired 31-Jan-11	5,089	463	1,978	16,692	24,222
X Expired 31-Jan-12	13,387	219	3,738	13,019	30,363
Y Expired 30-Apr-13	15,029	55	702	10,501	26,286
Z through 30-Jun-13	3,134	0	0	217	3,351
Total	48,825	35,017	14,940	257,781	356,563

The data presented in Table 12-4 show that for successful projects, there is an average time of 2,864 days between entering a queue and the in-service date while for withdrawn projects, there is an average time of 590 days between entering a queue and exiting.

8 The *2013 Quarterly State of the Market Report for PJM: January through September* 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.

Table 12-4 Average project queue times (days): At September, 2013

Status	Average (Days)	Standard Deviation	Minimum	Maximum
Active	1,266	685	125	4,636
In-Service	2,864	1,354	257	6,027
Suspended	2,059	912	844	3,849
Under Construction	1,583	743	203	6,380
Withdrawn	590	606	0	4,249

Projects with an active status that did not begin construction by October 1, 2013, yet are expected to be complete by January 1, 2015, are defined as non-viable. Such projects are shown in Table 12-5, by expected completion year. There are currently 15,726 MW of non-viable MW in the queues. Non-viable MW decreased by 3,317 MW since last quarter due to withdrawals and project completions. Currently, 61.4 percent of all non-viable generation is located in the AEP and ComEd control zones.

The MMU recommends the establishment of a PJM review process to ensure that projects are removed from the queue, if they are not viable.

Table 12-5 Non-viable MW: 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	100	274	47	8	350	783
AEP	0	0	0	750	1,047	89	3,115	1,321	6,322
AP	0	0	0	0	32	0	14	1,014	1,060
ATSI	0	0	0	0	175	200	536	212	1,123
BGE	0	0	0	0	0	0	0	0	0
ComEd	27	166	141	220	616	1,390	741	40	3,341
DAY	0	0	0	0	0	200	100	0	300
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	70	0	115
DPL	0	0	0	20	112	40	27	152	351
EKPC	0	0	0	0	0	0	0	0	0
JCPL	0	0	0	0	0	0	0	0	0
Met-Ed	0	35	0	0	0	3	15	150	203
PECO	0	0	0	2	2	71	5	0	80
PENELEC	0	0	70	0	14	84	125	78	370
Pepco	0	0	0	0	0	0	0	16	16
PPL	0	0	0	0	0	0	2	361	362
PSEG	0	0	0	0	0	178	313	756	1,247
Total	27	201	215	1,097	2,292	2,321	5,120	4,454	15,726

Distribution of Units in the Queues

A more detailed examination of the queue data permits some additional conclusions. Table 12-6 shows the projects under construction or active as of September 30, 2013 by unit type and control zone and LDA.[10] 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.[11] As of September 30, 2013, 63,765 MW of capacity were in generation request queues for construction through 2024, compared to 72,537 MW at July 1, 2013. Of the 10,883 MW withdrawn from the queues in the past quarter, 6,009 MW were natural gas projects, 2,133 MW were wind projects, and 1,811 MW were coal projects.

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 12-6) 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. The replacement of older steam units by units burning natural gas could significantly affect future congestion, the role of firm and interruptible gas supply, and natural gas supply infrastructure.

Table 12-6 Capacity additions in active or under-construction queues by control zone and LDA (MW) at September 30, 2013

LDA	Zone	CC	CT	Diesel	Hydro	Nuclear	Solar	Steam	Storage	Wind	Total
EMAAC	AEC	2,136	71	9	0	0	413	0	0	1,069	3,698
	DPL	1,223	4	16	0	0	218	22	0	297	1,779
	JCPL	1,016	0	30	0	0	766	0	0	0	1,812
	PECO	861	7	4	0	330	0	0	3	0	1,204
	PSEG	3,284	162	9	0	0	157	0	0	0	3,612
	EMAAC Total	**8,520**	**243**	**67**	**00**	**330**	**1,554**	**22**	**03**	**1,366**	**12,105**
SWMAAC	BGE	678	256	4	0	0	22	0	0	0	960
	PEPCO	2,524	0	0	0	0	15	0	0	0	2,540
	SWMAAC Total	**3,202**	**256**	**4**	**0**	**0**	**37**	**0**	**0**	**0**	**3,500**
WMAAC	ME	1,818	0	2	0	50	3	0	0	0	1,873
	PENELEC	879	43	41	20	0	32	0	0	706	1,722
	PPL	4,671	0	7	3	0	9	0	40	399	5,128
	WMAAC Total	**7,368**	**43**	**50**	**23**	**50**	**44**	**0**	**40**	**1,105**	**8,723**
Non-MAAC	AEP	5,682	40	20	0	102	44	313	86	7,653	13,940
	APS	2,009	1,406	49	49	0	2	49	0	408	3,973
	ATSI	2,425	1,484	0	7	0	15	135	0	867	4,933
	ComEd	1,530	216	46	23	120	64	0	41	3,919	5,959
	DAY	0	0	2	112	0	23	12	0	600	749
	DEOK	20	0	0	0	0	0	50	4	0	74
	DLCO	285	0	0	0	48	0	460	0	0	793
	DOM	6,592	60	11	0	1,594	65	172	0	374	8,868
	EKPC	0	0	0	0	0	0	0	0	150	150
	Non-MAAC Total	**18,544**	**3,206**	**129**	**191**	**1,864**	**213**	**1,190**	**131**	**13,971**	**39,438**
Total		**37,634**	**3,748**	**250**	**214**	**2,244**	**1,847**	**1,212**	**174**	**16,442**	**63,765**

10 Unit types designated as reciprocating engines are classified here as diesel.

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 until there is operational data to support a different conclusion. PJM derates solar resources to 38 percent of installed capacity. Based on the derating of 16,442 MW of wind resources and 1,847 MW of solar resources, the 63,765 MW currently active in the queue would be reduced to 45,476 MW.

Table 12-7 Existing PJM capacity: At September 30, 2013[12] (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	73	0	0	2,134	0	6,540	0	0	11,093
BGE	0	835	18	0	0	1,716	0	2,996	0	0	5,565
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	154	0	3,589	3,581	3	8,356	0	0	23,474
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	4,329	0	0	4,452
JCPL	1,693	1,233	16	0	400	615	42	10	0	0	4,008
Met-Ed	2,051	407	41	0	19	805	0	601	0	0	3,924
PECO	3,209	836	3	0	1,642	4,547	3	979	1	0	11,220
PENELEC	0	344	46	0	513	0	0	6,825	0	931	8,657
Pepco	230	1,092	10	0	0	0	0	3,649	0	0	4,981
PPL	1,808	616	49	0	582	2,520	15	5,529	0	220	11,338
PSEG	3,091	2,838	12	0	5	3,493	105	2,050	2	0	11,597
Total	26,128	31,400	797	30	7,978	33,709	249	88,669	35	6,364	195,359

Table 12-8 shows the age of PJM generators by unit type.

Table 12-8 PJM capacity (MW) by age: at September 30, 2013

Age (years)	CC	CT	Diesel	Fuel Cell	Hydroelectric	Nuclear	Solar	Steam	Storage	Wind	Total
Less than 11	13,883	4,450	421	30	7	0	249	3,374	35	6,264	28,712
11 to 20	9,287	16,969	131	0	51	0	0	2,738	0	100	29,276
21 to 30	2,517	2,753	56	0	3,316	12,605	0	7,637	0	0	28,884
31 to 40	244	1,415	24	0	241	16,075	0	25,711	0	0	43,709
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	14,528	0	0	14,655
61 to 70	0	0	0	0	267	0	0	2,811	0	0	3,078
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	0	108
101 and over	0	0	0	0	131	0	0	0	0	0	131
Total	26,128	31,400	797	30	7,978	33,709	249	88,669	35	6,364	195,359

Table 12-9 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 95.4 percent of all new capacity in EMAAC when the derating of wind and solar capacity is reflected. In SWMAAC, this value is 99.8 percent. The 79.3 percent of existing capacity in SWMAAC which is steam or nuclear would be reduced, by 2024, to 46.3 percent, and CC and CT generators would comprise 52.9 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.[13] 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 account for 15.1 percent of total ICAP MW in Non-MAAC zones, if all queued MW are built.

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

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

Table 12-9 Comparison of generators 40 years and older with slated capacity additions (MW): Through 2024[14]

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	2.2%	9,282	27.5%	8,520	17,604	47.0%
	Combustion Turbine	3,132	34.7%	7,433	22.0%	243	4,544	12.1%
	Diesel	48	0.5%	148	0.4%	67	167	0.4%
	Fuel Cell	0	0.0%	30	1.6%	0	30	2.1%
	Hydroelectric	2,042	22.7%	2,047	6.1%	0	620	1.7%
	Nuclear	615	6.8%	8,654	25.7%	330	8,370	22.4%
	Solar	0	0.0%	194	0.6%	1,554	1,747	4.7%
	Steam	2,981	33.1%	5,926	17.6%	22	2,967	7.9%
	Storage	0	0.0%	3	0.0%	3	6	0.0%
	Wind	0	0.0%	8	0.0%	1,366	1,374	3.7%
	EMAAC Total	9,015	100.0%	33,725	100.0%	12,105	37,429	100.0%
SWMAAC	Combined Cycle	0	0.0%	230	2.2%	3,202	3,432	37.3%
	Combustion Turbine	748	15.4%	1,927	18.3%	256	1,434	15.6%
	Diesel	0	0.0%	28	0.3%	4	32	0.4%
	Hydroelectric	0	0.0%	0	0.0%	0	0	0.1%
	Nuclear	0	0.0%	1,716	16.3%	0	1,716	18.7%
	Solar	0	0.0%	0	0.0%	37	37	0.4%
	Steam	4,099	84.6%	6,645	63.0%	0	2,546	27.7%
	SWMAAC Total	4,847	100.0%	10,546	100.0%	3,500	9,198	100.0%
WMAAC	Combined Cycle	0	0.0%	3,859	16.1%	7,368	11,227	47.4%
	Combustion Turbine	714	7.2%	1,366	5.7%	43	696	2.9%
	Diesel	46	0.5%	136	0.6%	50	139	0.6%
	Hydroelectric	887	9.0%	1,113	4.7%	23	1,136	4.8%
	Nuclear	0	0.0%	3,325	13.9%	50	3,375	14.3%
	Solar	0	0.0%	15	0.1%	44	59	0.2%
	Steam	8,214	83.3%	12,954	54.2%	0	4,741	20.0%
	Storage	0	0.0%	0	0.0%	40	40	0.2%
	Wind	0	0.0%	1,151	4.8%	1,105	2,256	9.5%
	WMAAC Total	9,860	100.0%	23,919	100.0%	8,723	23,668	100.0%
Non-MAAC	Combined Cycle	0	0.0%	12,758	10.0%	18,544	31,302	24.6%
	Combustion Turbine	1,220	3.0%	20,674	16.3%	3,206	22,660	17.8%
	Diesel	72	0.2%	485	0.4%	129	542	0.4%
	Hydroelectric	1,433	3.5%	4,818	3.8%	191	5,008	3.9%
	Nuclear	4,415	10.8%	20,013	15.7%	1,864	17,463	13.8%
	Solar	0	0.0%	40	0.0%	213	253	0.2%
	Steam	33,916	82.6%	63,144	49.7%	1,190	30,418	24.0%
	Storage	0	0.0%	32	0.0%	131	163	0.1%
	Wind	0	0.0%	5,206	4.1%	13,971	19,177	15.1%
	Non-MAAC Total	41,055	100.0%	127,169	100.0%	39,438	126,986	100.0%
All Areas	Total	64,777		195,359		63,765	197,281	

14 Percentages shown in Table 12-9 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 12-10, 22,070.4 MW is planned to be retired between 2011 and 2019, with all but 614.5 MW retired by June, 2015. The AEP zone accounts for 3,560 MW, or 32.7 percent of all MW planned for deactivation from 2013 through 2019. Since January 1, 2013, 1,437 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 12-10 Summary of PJM unit retirements (MW): 2011 through 2019

	MW
Retirements 2011	1,196.5
Retirements 2012	6,961.9
Retirements 2013	2,433.8
Planned Retirements 2013	424.6
Planned Retirements 2014	1,870.0
Planned Retirements 2015	8,569.1
Planned Retirements Post-2015	614.5
Total	22,070.4

Figure 12-1 Map of unit retirements in PJM: 2012 through 2019

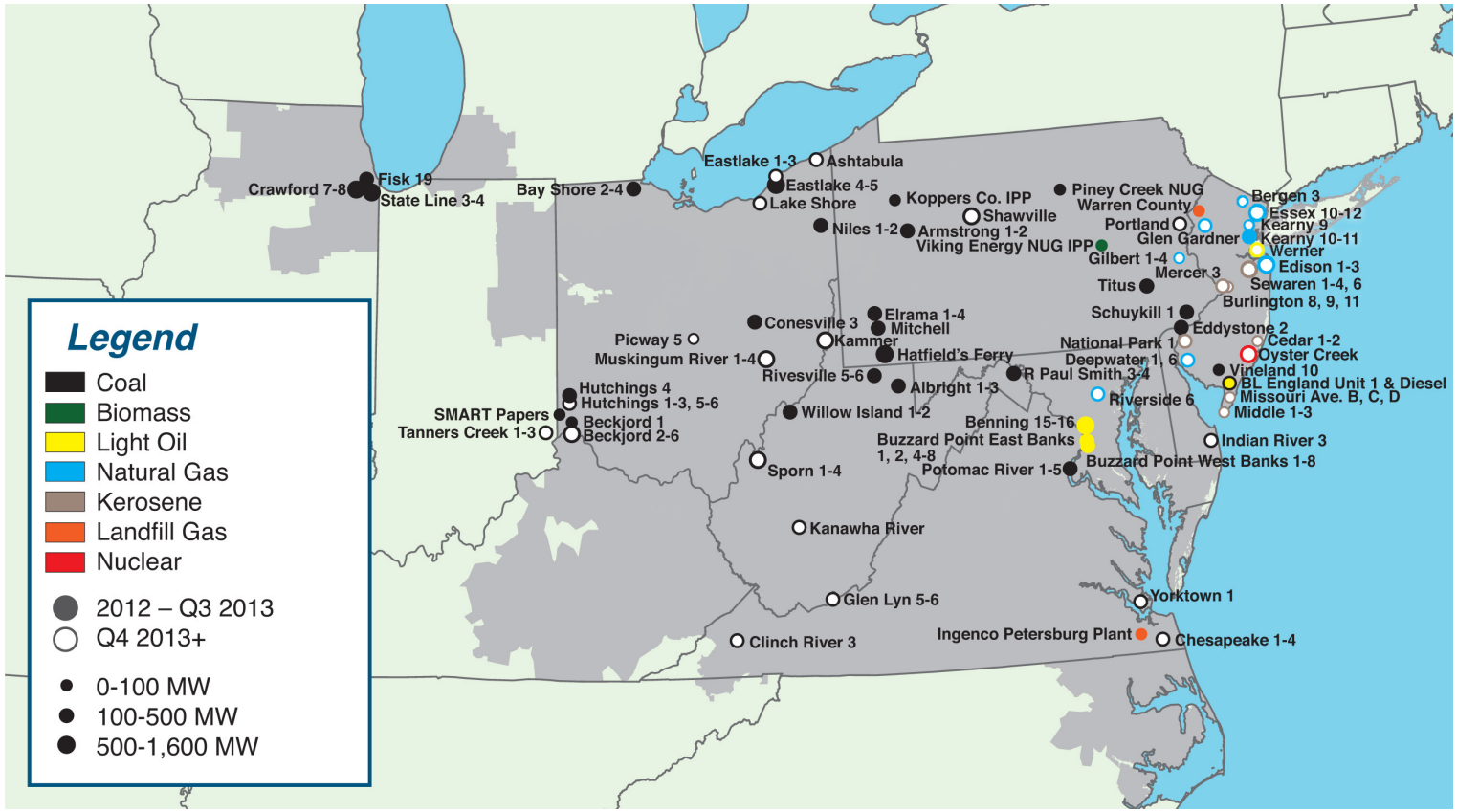

Table 12-11 Planned deactivations of PJM units, as of October 10, 2013

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
Walter C Beckjord 2-3	DEOK	222.0	Coal	Steam	21-Nov-13
Indian River 3	DPL	169.7	Coal	Steam	31-Dec-13
BL England 1	AECO	113.0	Coal	Steam	01-May-14
Deepwater 1, 6	AECO	158.0	Natural gas	Steam	31-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 4-6	DEOK	802.0	Coal	Steam	01-Apr-15
Shawville 1-7	PENELEC	603.0	Coal	Steam	16-Apr-15
Gilbert 1-4	JCPL	98.0	Natural gas	Combustion Turbine	01-May-15
Glen Gardner 1-8	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
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 1-3	AEP	600.0	Coal	Steam	01-Jun-15
Kanawha River 1-2	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 1-4	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		11,478.2			

Table 12-12 shows the capacity, average size, and average age of units retiring in PJM, from 2011 through 2019. The majority, 74.2 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 162 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 12-12 Deactivations of PJM units, 2011 through 2019

	Number of Units	Avg. Size (MW)	Avg. Age at Retirement (Years)	Total MW
Coal	101	161.7	57.1	16,333.4
Diesel	03	5.6	43.3	16.9
Heavy Oil	01	166.0	55.0	166.0
Kerosene	20	41.4	45.5	828.2
LFG	01	1.9	7.0	1.9
Light Oil	15	76.6	43.8	1,148.7
Natural Gas	49	57.9	46.8	2,838.5
Nuclear	01	614.5	50.0	614.5
Waste Coal	01	31.0	20.0	31.0
Wood Waste	02	12.0	23.5	24.0

Table 12-13 HEDD Units in PJM as of September30, 2013[15]

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	

15 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 12-14 shows unit deactivations for 2013 through October 9, 2013.[16] A total of 2,433.8 MW retired from January 1, 2013, through October 9, 2013.

Table 12-14 Unit deactivations: January 2013 through October 9, 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
NRG Energy	Titus 1	81.0	Coal	MetEd	63	01-Sep-13
NRG Energy	Titus 2	81.0	Coal	MetEd	62	01-Sep-13
NRG Energy	Titus 3	81.0	Coal	MetEd	60	01-Sep-13
NextEra Energy	Koppers Co. IPP	08.0	Wood waste	PPL	24	30-Sep-13
First Energy	Hatfield's Ferry 1	530.0	Coal	AP	44	09-Oct-13
First Energy	Hatfield's Ferry 2	530.0	Coal	AP	43	09-Oct-13
First Energy	Hatfield's Ferry 3	530.0	Coal	AP	42	09-Oct-13
First Energy	Mitchell 2	82.0	Coal	AP	65	09-Oct-13
First Energy	Mitchell 3	277.0	Coal	AP	50	09-Oct-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, which 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 September, 2013, construction is proceeding ahead of schedule. All structure foundations are

16 See *"PJM Generator Deactivations,"* PJM.com <http://pjm.com/planning/generation-retirements/gr-summaries.aspx> (October 1, 2013).

complete, approximately 70 percent of the structures have been erected, and more than 70 percent of the line is complete."[17]

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 – 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 500kV 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.[18] 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)

On October 3, 2013, the PJM Board of Managers authorized $1.2 billion in transmission upgrades and improvements identified as part of PJM's continued regional planning process. Table 12-15 shows the upgrades by transmission owner.

17 See *"Mt. Storm – Doubs 500kV Rebuild Project,"* Dom.com <https://www.dom.com/about/electric-transmission/mtstorm/index.jsp> (October 11, 2013).

18 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).

Table 12-15 Estimated approved upgrade costs by transmission owner (dollars (Millions))

Transmission Owner	Cost Estimate
AEC	$60.1
AEP	$308.9
APS	$110.6
ATSI	$17.6
BGE	$69.5
DL	$17.6
Dominion	$73.8
DPL	$16.3
EKPC	$22.3
JCPL	$8.9
NRG Energy	$0.7
PECO	$5.8
PENELEC	$7.2
PEPCO	$16.0
PPL	$219.3
PSEG	$267.1
Total	$1,221.4

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.[19] PJM's Order No. 1000 compliance filing addressed a number of procedural issues identified by the Commission in the March 22 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.[20] PJM's filing established proposal windows for competitive solicitations but limited the ability of competitors to make proposals within a defined time window.[21]

A test of whether PJM's new process can operate transparently and offer a meaningful opportunity for non-incumbents to compete involves Artificial

19 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.

20 PJM compliance filing, Docket No. ER13-198-001 (October 25, 2012).

21 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).

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 seven 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.[22] These proposals are currently being evaluated by PJM.

22 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).