



# Illinois Generation Retirement Study

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**PJM's sensitivity study encompassed analysis of two study scenarios:**

- **2030**
- **2031–2045**

**This is a very initial snapshot of the system based upon what PJM knows today, and PJM will iterate on this analysis over time.**

The study **includes** in its modeling: (i) units that will be leaving the system as a result of already issued retirement notices; (ii) phaseout requirements as set forth in the Climate and Equitable Jobs Act (CEJA); and (iii) generation additions based on the current PJM generation interconnection queue.

The study **does not include** in its modeling: new renewable generation that is expected to be added to the system in the future as contemplated and incentivized under CEJA.

- The cost estimates identified in this study will not actually be charged to consumers today; as the system evolves with retirements and additions, we will have a better sense of the necessary transmission that will be needed to alleviate any reliability violations.
- New generation located at the same points where units are retiring or in similarly favorable locations could decrease the transmission cost estimates outlined in our findings.
- In addition, we will combine this analysis with an analysis from MISO to determine whether any interregional transmission planning can assist in optimizing the systems to further reduce costs in the PJM (and MISO) footprint.

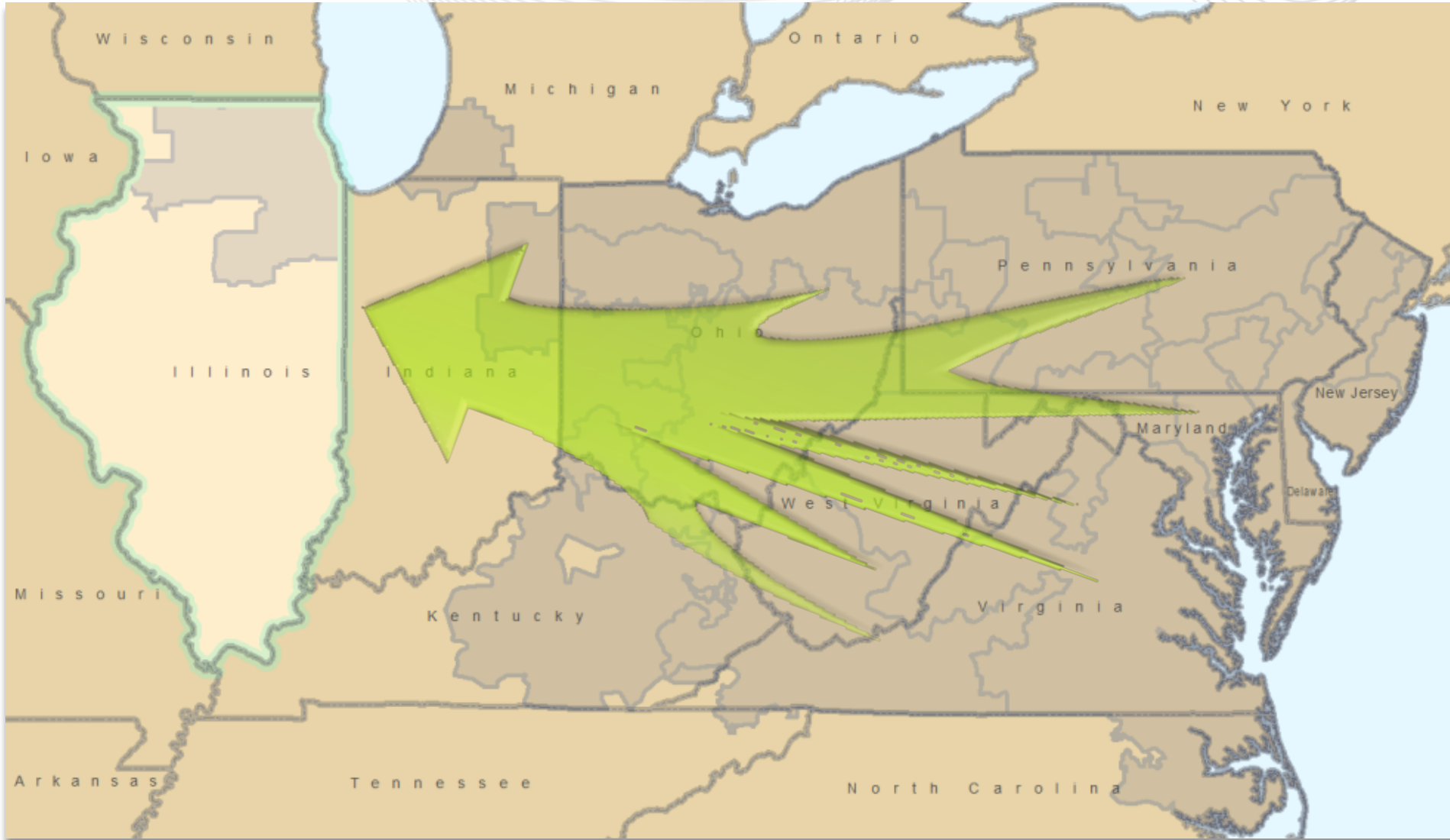
- PJM identified several transmission upgrades that will be needed (slide 14) as IL generation retires/is phased out.
- Initial estimated costs for transmission upgrades are approximately \$0.7 B by 2030 and an additional \$1.3 B by 2045.
- Potential to partially mitigate transmission upgrades if new generation connects at favorable locations and if transmission solutions can be further optimized.
- Risk of acceleration of upgrades if existing generators retire earlier than modeled.
- PJM may need to request that certain units operate beyond their desired deactivation dates pursuant to Part V of the PJM Tariff.

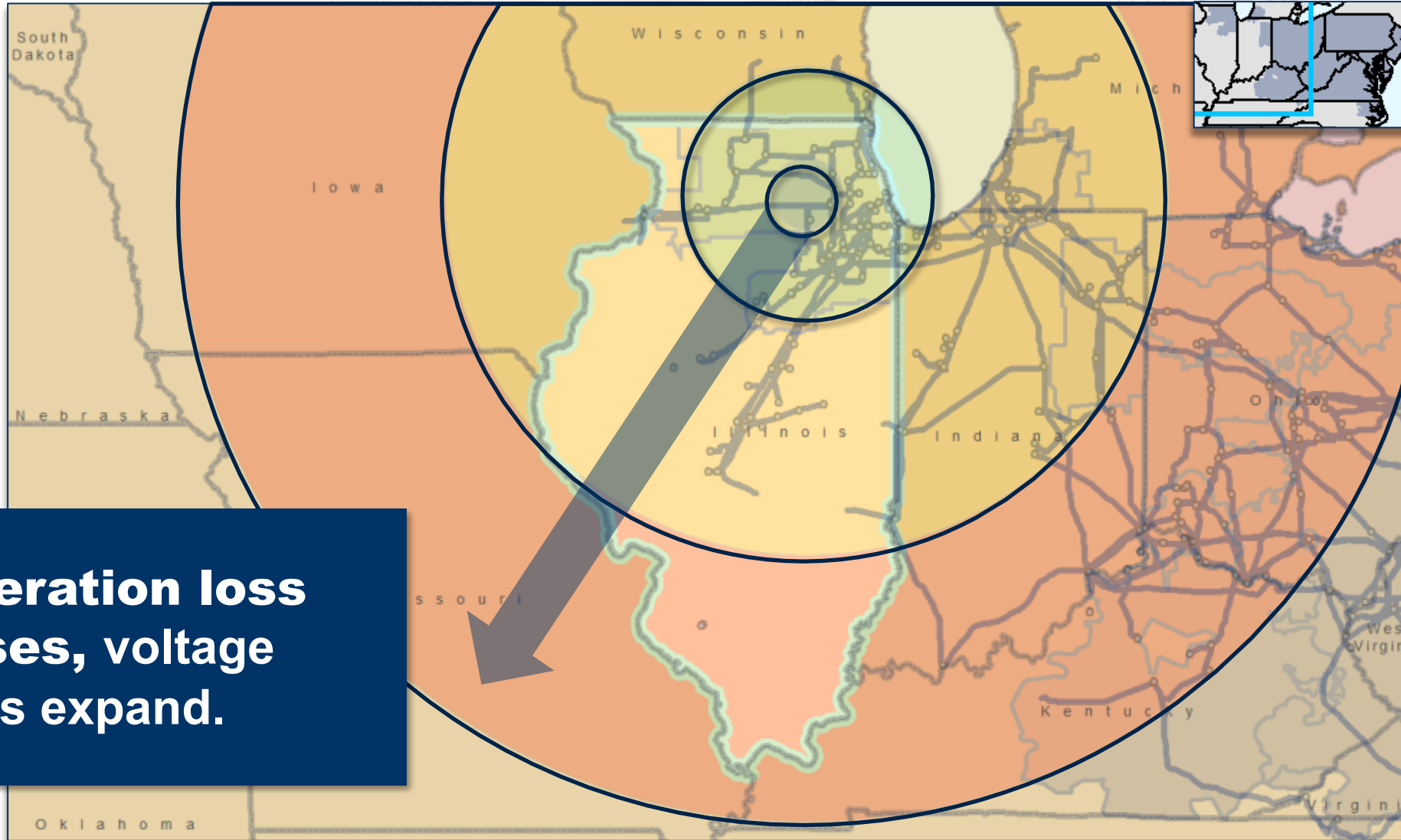
- Again, new renewable generation contemplated or incentivized by CEJA has not been modeled in this analysis.
- PJM will iterate on this study as we gain more clarity on renewable build-out through the CEJA Illinois Renewable Energy Access Plan (REAP) and the projects that advance in our queue.
- Our generation interconnection queue consists of ~200,000 MW of which approximately 95% is solar, wind or hybrid; we expect this trend to continue.

## 2022 PJM IL STUDY

		2030			2031–2045			Overall		
		*MISO	PJM	*Total	*MISO	PJM	*Total	*MISO	PJM	*Total
<b>Assumptions (MW)</b>	<b>IL Deactivations</b>	1,933	9,661	<b>11,594</b>	6,070	5,227	<b>11,297</b>	8,003	14,888	<b>22,891</b>
	<b>Replacement Power</b>	7,240	14,848	<b>22,088</b>	same	same	<b>same</b>	7,240	14,848	<b>22,088</b>
	<b>Load**</b>	37,772	157,089	<b>194,861</b>	same	same	<b>same</b>	37,772	157,089	<b>194,861</b>
<b>Violations</b>	<b>Thermal</b>	-	34	<b>34</b>	46	12	<b>58</b>	46	46	<b>92</b>
	<b>Voltage Drop</b>	-	5	<b>5</b>	84	58	<b>142</b>	84	63	<b>147</b>
	<b>Voltage Magnitude</b>	-	10	<b>10</b>	29	155	<b>184</b>	29	165	<b>194</b>
<b>Upgrade Costs (\$M)</b>	<b>Thermal</b>	-	662	<b>662</b>	125	520	<b>645</b>	125	1,181	<b>1,307</b>
	<b>Voltage</b>	19	53	<b>72</b>	174	473	<b>646</b>	193	525	<b>718</b>
	<b>Total</b>	<b>19</b>	<b>714</b>	<b>733</b>	<b>299</b>	<b>992</b>	<b>1,291</b>	<b>318</b>	<b>1,706</b>	<b>2,025</b>


\*Note: PJM did not study for impacts on all of MISO. Results focused on NIPSO and PJM-MISO interfaces only. \*\* MISO load is for MISO Central only.






**As generation loss increases, voltage concerns expand.**



A green downward-pointing triangle icon.

PJM will work with MISO and its long-term transmission plan; and

A blue downward-pointing triangle icon.

IL assumptions will inform future RTEP and PJM Grid of the future analyses.

1. Case Assumption Details 2030 and 2031–2045 for PJM & MISO
2. Thermal Violation Totals
3. Voltage Violation Totals
4. 2030 and 2031–2045 Cost Breakdowns
5. 2030 PJM Interconnection Service Agreement Replacement Generation Map
6. 2031–2045 PJM Facilities Study Phase Replacement Generation Map

## DEACTIVATIONS (MW)

ILLINOIS PJM		
PJM	2030	2031–2045
Subtotals	9,661.1	5,227.2
Totals	<b>14,888.3</b>	

ILLINOIS MISO		
MISO	2030	2031–2045
Subtotals	1,933.0	6,069.6
Totals	<b>8,002.6</b>	

ILLINOIS	TOTAL
<b>2030</b> <b>11,594</b>	<b>2031–2045</b> <b>11,297</b>
<b>22,891</b>	

## 2030 & 2031–2045 REPLACEMENT GENERATION

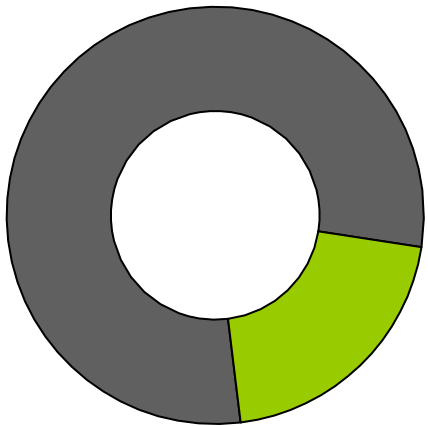
	AP	ATSI	AEP	DLCO	COMED	All Other PJM	PJM Total	MISO Total	Overall Total
Wind	27	26	66	-	308	876	1,303	1,650	2,953
Solar	394	415	2,624	-	431	5,042	8,906	4,420	13,326
Other	710	40	1,422	22	984	1,461	4,639	1,170	5,809
Totals	1,131	481	4,112	22	1,723	7,379	14,848	7,240	22,088

## 2030 & 2031–2045 LOAD

	AP	ATSI	AEP	DLCO	COMED	All Other PJM
Loads	8,864	12,545	23,091	3,017	19,055	90,517
<b>PJM Total: 157,089</b>						
<b>MISO Central: 37,772</b>						

## Test Identifying Thermal Violation

Generation Deliverability, 77,



**N-1-1 Thermal, 20,**

AREA	2030				2031–2045				COMBINED TOTAL	
	69 kV	138 kV	345 kV	Total	69 kV	138 kV	345 kV	Total	PJM	PJM & MISO*
FE	-	15	1	16	-	12	-	12	<b>80</b>	<b>92</b>
AEP	1	8	-	9	-	18	8	26		
DLCO	-	6	-	6	-	-	-	0		
ComEd	-	3	-	3	-	5	3	8		
NIPSCO	-	-	-	0	-	7	5	12		
<b>Subtotal</b>	<b>1</b>	<b>32</b>	<b>1</b>	<b>34</b>	<b>0</b>	<b>42</b>	<b>16</b>	<b>58</b>		

\*Note: PJM did not study for impacts on all of MISO. Results focused on NIPSCO and PJM-MISO interfaces only.

N-1-1 Voltage Magnitude	AREA	2030				2031–2045			
		138 kV	345 kV	765 kV	Total	138 kV	345 kV	765 kV	Total
	AEP	3	-	-	3	40	3	2	45
ComEd	7	-	-	7	74	33	3	110	
NIPSCO	-	-	-	0	28	1	-	29	
Subtotal	10	0	0	10	142	37	5	184	

COMBINED TOTAL	
PJM <b>165</b>	PJM & MISO* <b>194</b>

N-1-1 Voltage Drop	AREA	2030				2031–2045			
		138 kV	345 kV	765 kV	Total	138 kV	345 kV	765 kV	Total
	AEP	-	-	-	0	9	1	-	10
ComEd	5	-	-	5	13	32	3	48	
NIPSCO	-	-	-	0	69	15	-	84	
Subtotal	5	0	0	5	91	48	3	142	

COMBINED TOTAL	
PJM <b>63</b>	PJM & MISO* <b>147</b>

\*Note: PJM did not study for impacts on all of MISO. Results focused on NIPSCO and PJM-MISO interfaces only.

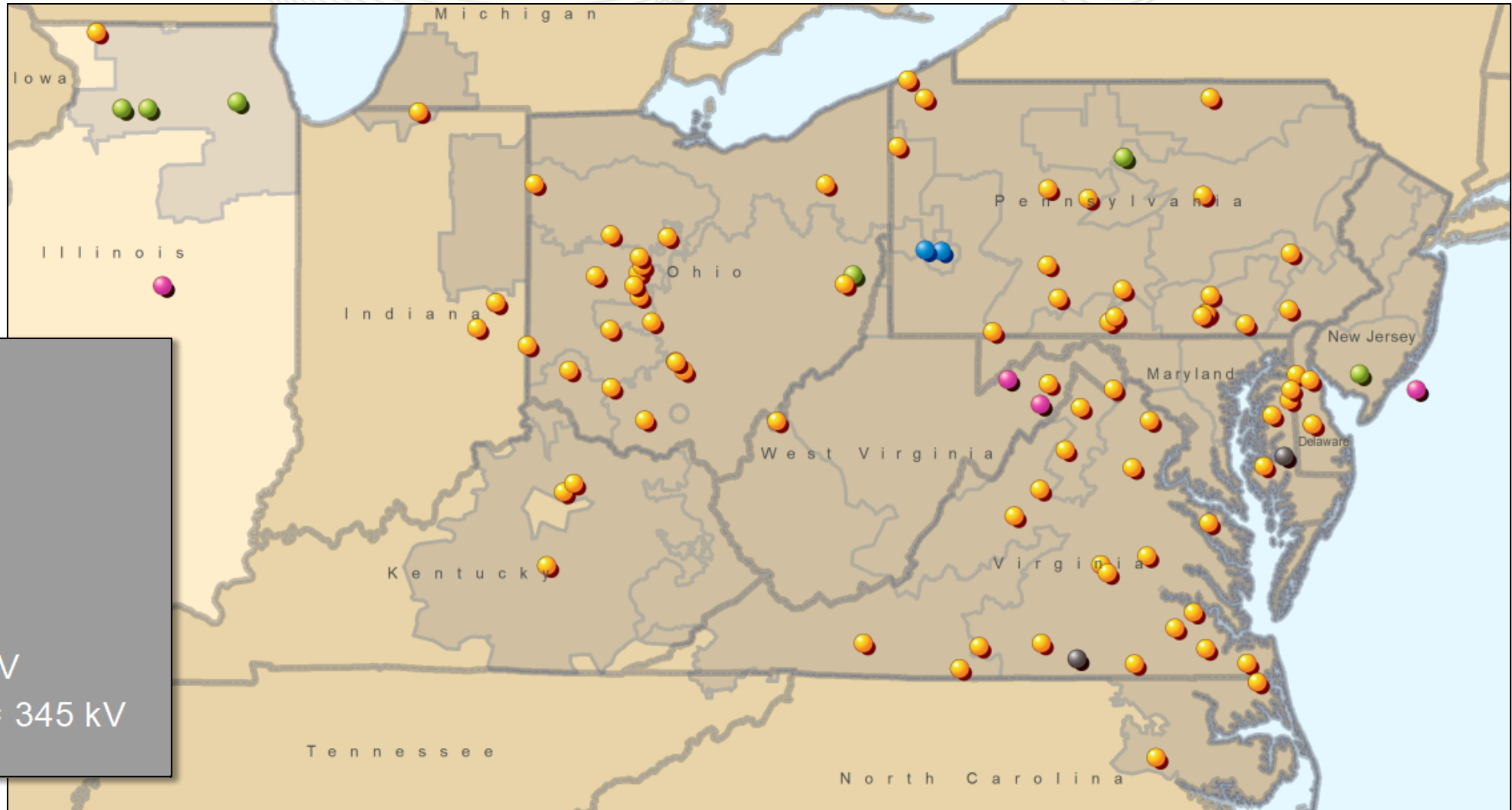
AREA	2030 (\$M)				2031–2045 (\$M)			
	69 kV	138 kV	345 kV	Total	69 kV	138 kV	345 kV	Total
FE	0.0	319.2	0.8	320.0	0.0	180.0	0.0	180.0
AEP	0.3	63.3	0.0	63.6	0.0	68.9	109.2	178.1
DLCO	0.0	180.0	0.0	180.0	0.0	0.0	0.0	0.0
ComEd	0.0	98.0	0.0	98.0	0.0	122.5	39.0	161.5
NIPSCO	0.0	0.0	0.0	0.0	0.0	52.8	72.6	125.4
Subtotal	0.3	660.5	0.8	661.6	0.0	424.2	220.8	645.0

COMBINED TOTAL (\$M)	
<b>PJM</b> <b>\$1,181.15</b>	<b>PJM &amp; MISO*</b> <b>\$1,306.55</b>

AREA	2030 (\$M)	2030+ (\$M)
	SVCs or Synchronous Condensers	SVCs or Synchronous Condensers
ComEd	52.5	472.5
NIPSCO	19.3	173.7
Subtotal	71.8	646.2

COMBINED TOTAL (\$M)
<b>PJM &amp; MISO*</b> <b>718</b>

*\*Note: PJM did not study for impacts on all of MISO. Results focused on NIPSCO and PJM-MISO interfaces only.*

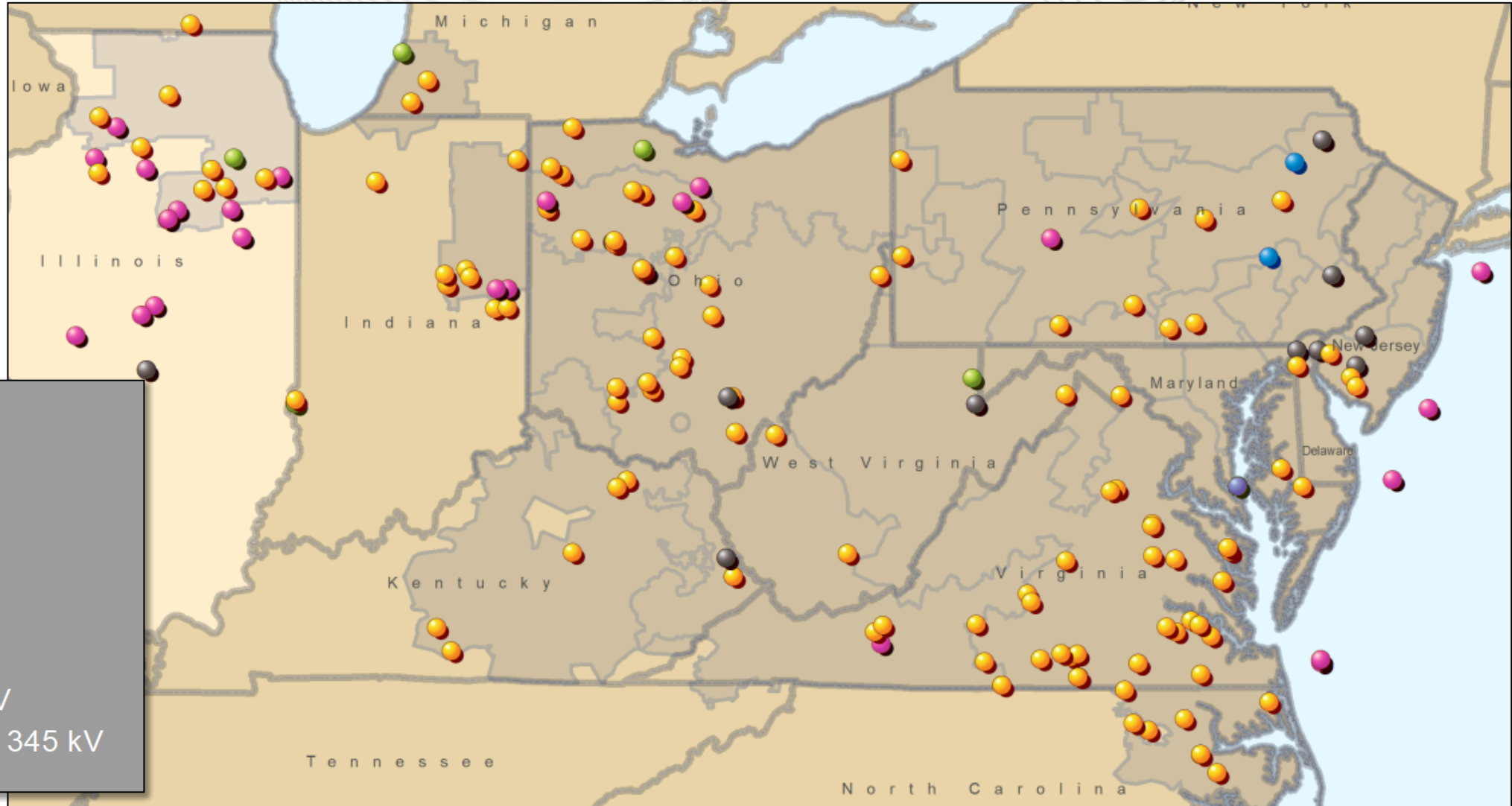


Legend

- ISA
- Hydro
- Natural Gas
- Wind
- Solar
- Storage
- Subs  $\geq$  345 kV
- Trans Lines  $\geq$  345 kV

# PJM Facilities Study Agreement Replacements\*

(\*applied 57% x queued capacity)



Legend

FSA

- Hydro
- Natural Gas
- Nuclear
- Wind
- Solar
- Storage
- Subs  $\geq$  345 kV
- Trans Lines  $\geq$  345 kV



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## Illinois Generation Retirement Study



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