



2021 Tennessee Infrastructure Report

(January 1, 2021 – December 31, 2021)

May 2022

This report reflects information for the portion of Tennessee within the PJM service territory.

1. Planning

- Generation Portfolio Analysis
- Transmission Analysis
- Load Forecast

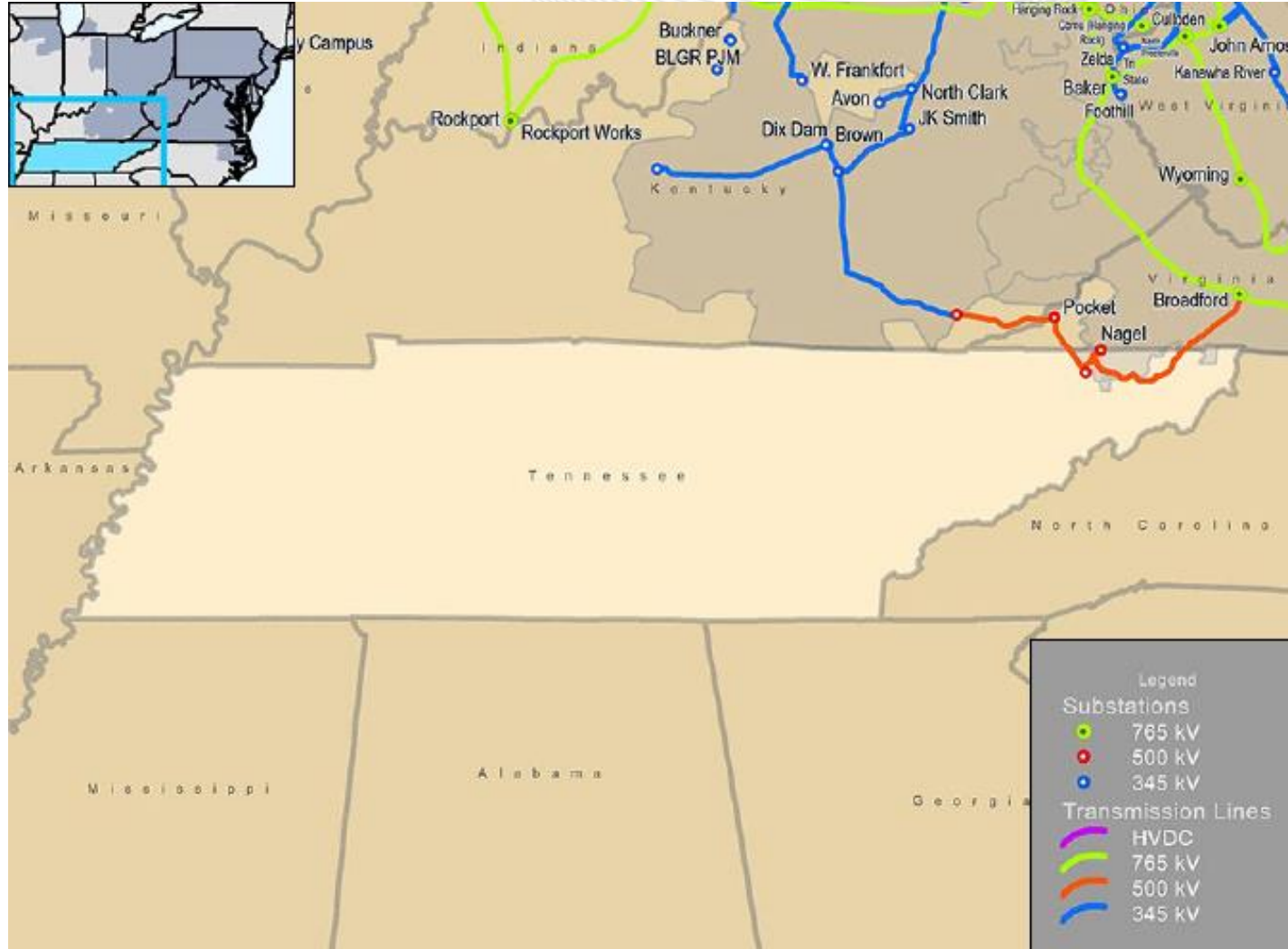
2. Markets

- Capacity Market Results
- Market Analysis
- Net Energy Import/Export Trend

3. Operations

- Emissions Data

- **Interconnection Requests:** 94 MW of solar are seeking interconnection in in Tennessee portion of PJM.
- **Deactivations:** 45 MW of generation in Tennessee gave a notice of deactivation in 2021.
- **RTEP 2021:** Tennessee's 2021 RTEP project total represents approximately \$72.9 million in investment.
- **Load Forecast:** Tennessee's summer peak load is projected to increase by 0.1 percent annually over the next ten years, while the winter peak is projected to increase by 0.3 percent.
- **1/1/21 – 12/31/21 Market Performance:** Tennessee's average hourly LMPs generally aligned with the PJM average hourly LMP.



The PJM service area in Tennessee is represented by the shaded portion of the map.

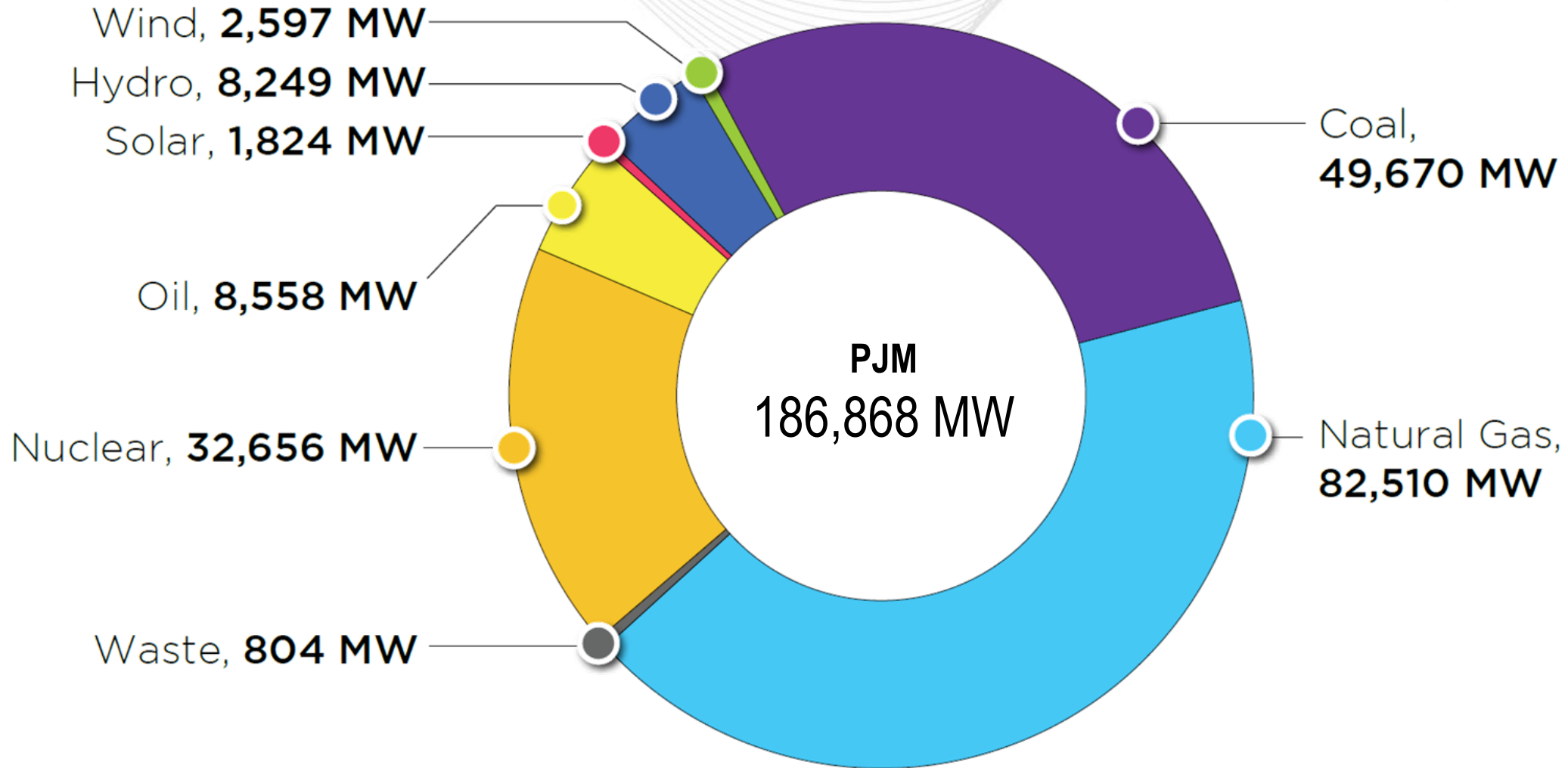
PJM operates transmission lines that extend beyond the service territory.

Planning

Generation Portfolio Analysis

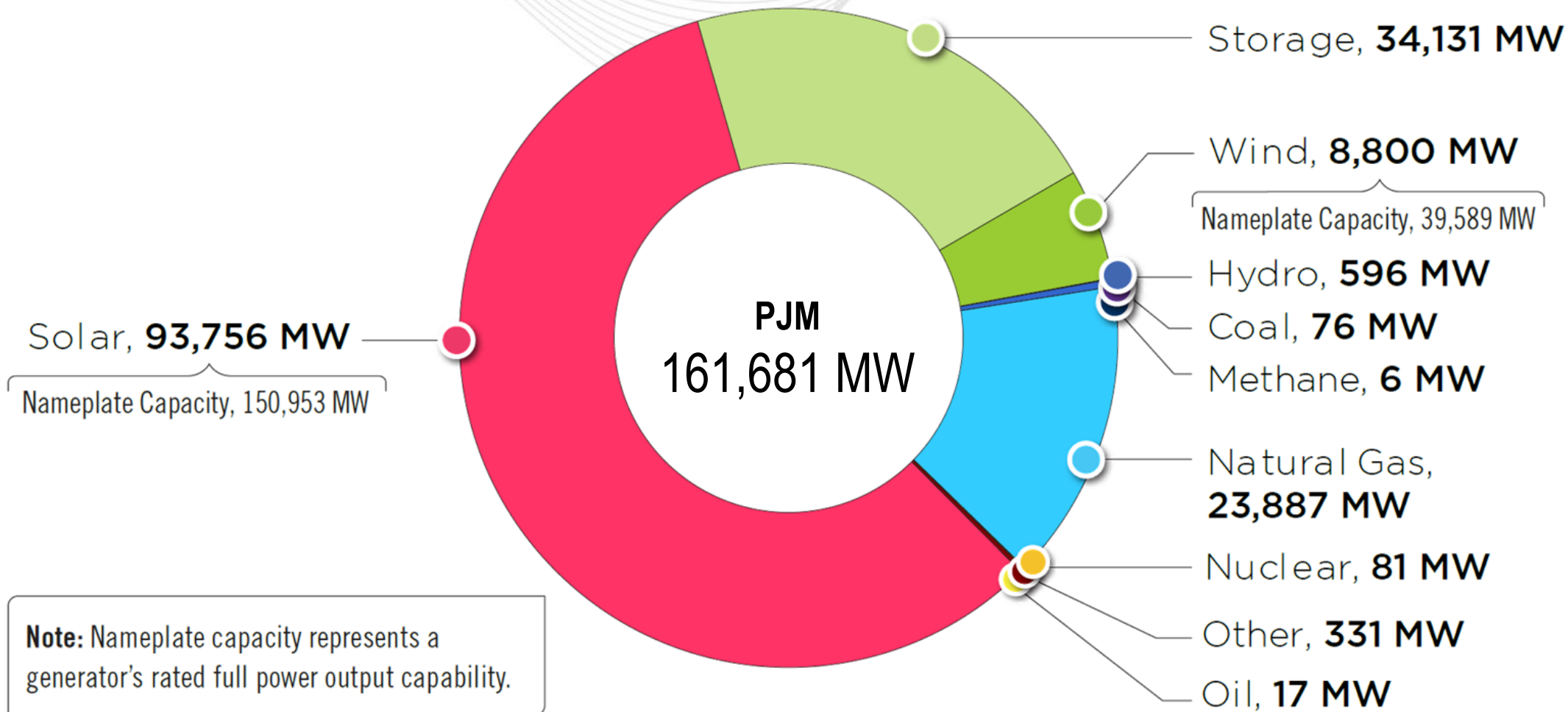
PJM – Existing Installed Capacity

(CIRs – as of Dec. 31, 2021)



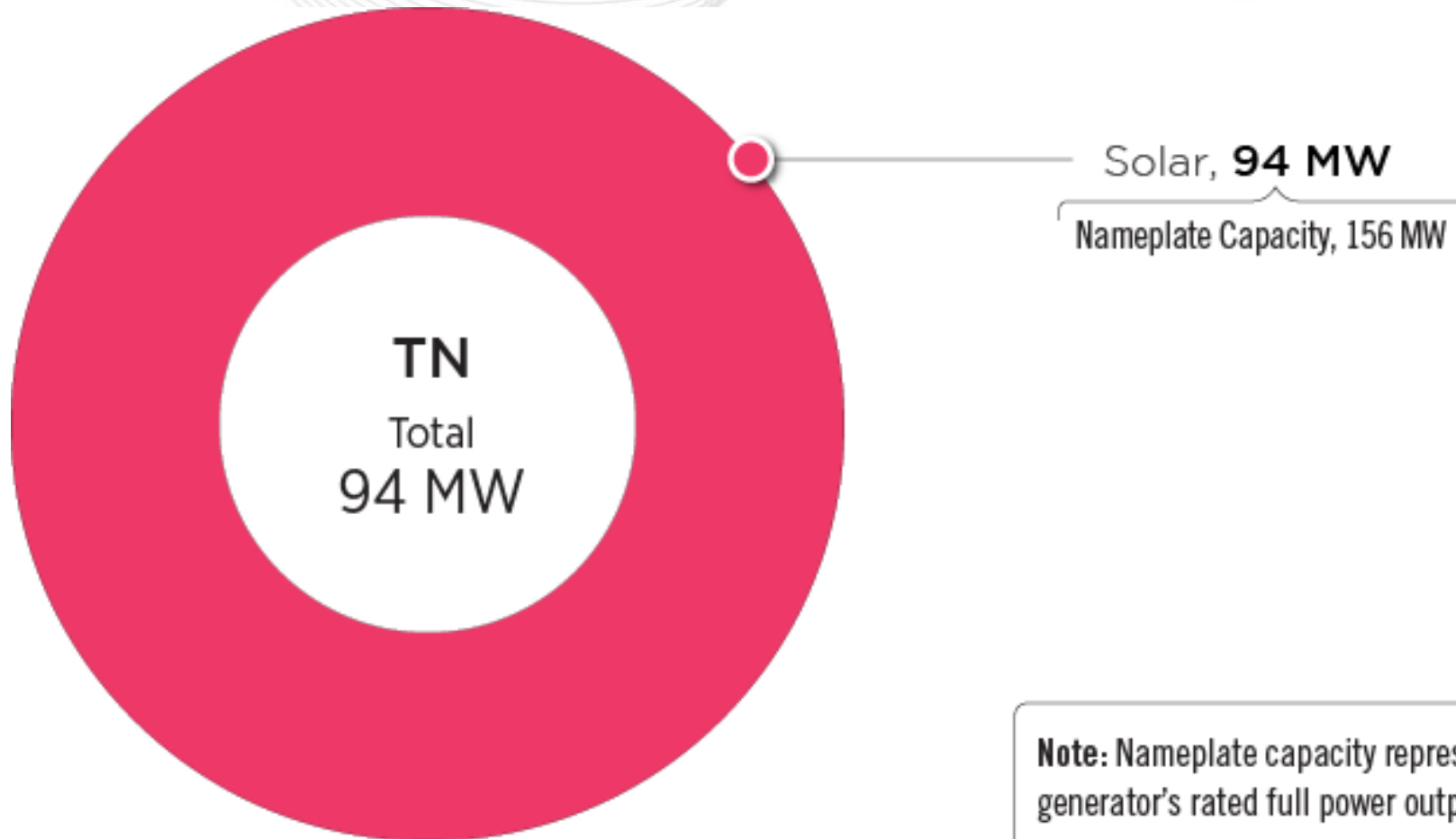
PJM – Queued Capacity (MW) by Fuel Type

(Requested CIRs – as of Dec. 31, 2021)



Tennessee – Queued Capacity (MW) by Fuel Type

(Requested CIRs – as of Dec. 31, 2021)



Note: Nameplate capacity represents a generator's rated full power output capability.



Tennessee – Historical Interconnection Requests by Fuel Type

(as of Dec. 31, 2021)

		In Queue		Complete				Grand Total	
		Active		In Service		Withdrawn			
		Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)
Non-Renewable	Coal	0	0.0	0.0	0.0	1	75.0	1	75.0
Renewable	Biomass	0	0.0	2	90.0	0	0.0	2	90.0
	Solar	2	93.8	0	0.0	0	0.0	2	93.8
Grand Total		2	93.8	2	90.0	1	75.0	5	258.8

Note: The "Under Construction" column includes both "Engineering and Procurement" and "Under Construction" project statuses.



Tennessee – Progression History of Interconnection Requests

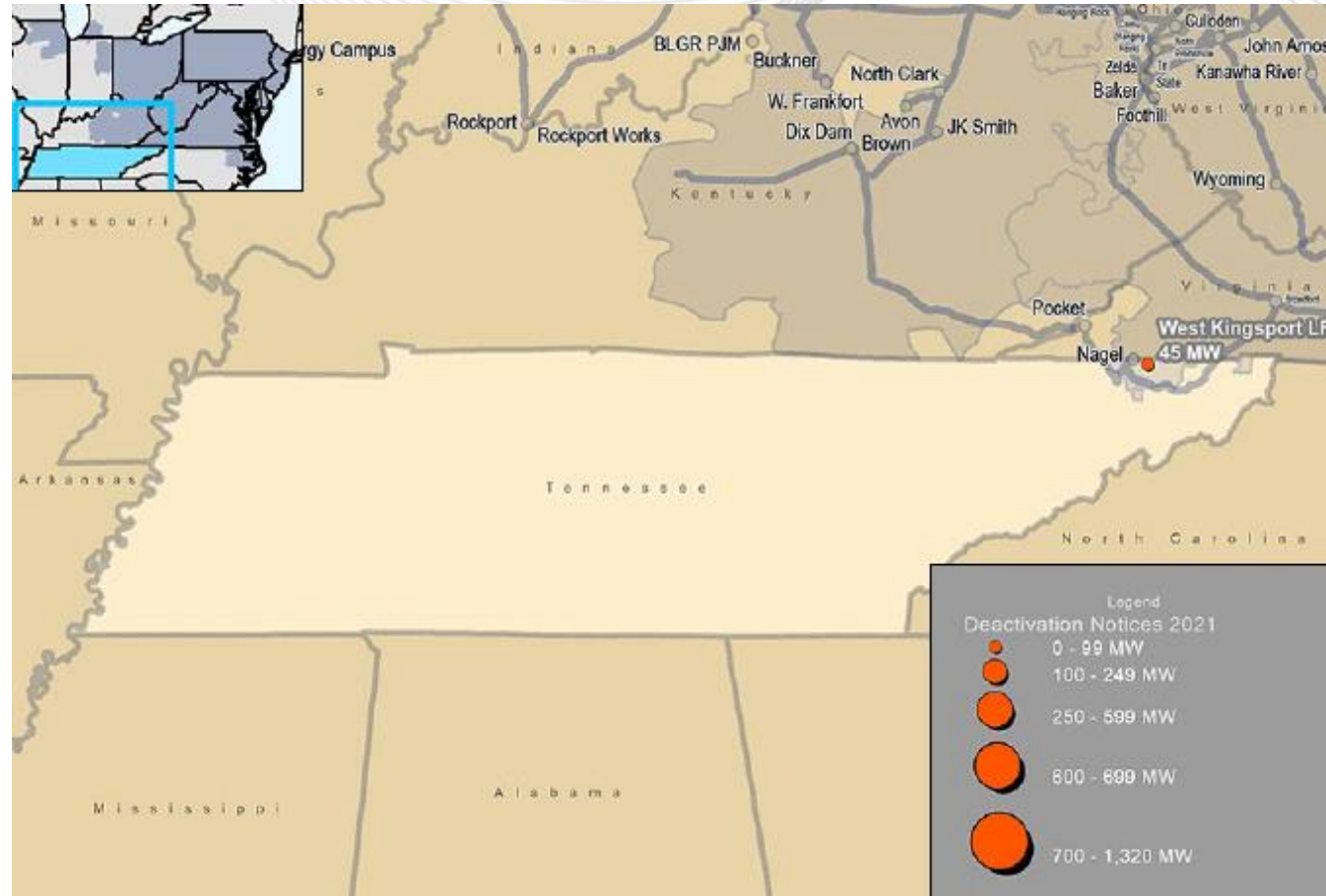


Percentage of planned capacity and projects that have reached commercial operation

- 54.5%** Requested capacity megawatts
- 66.7%** Requested projects

This graphic shows the final state of generation submitted to the PJM queue that completed the study phase as of Dec. 31, 2021, meaning the generation reached in-service operation, began construction, or was suspended or withdrawn. It does not include projects considered active in the queue as of Dec. 31, 2021.

Tennessee – Generation Deactivation Notifications Received in 2021



Unit	TO Zone	Fuel Type	Request Received to Deactivate	Actual or Projected Deactivation Date	Age (Years)	Capacity (MW)
West Kingsport LF	AEP	Biomass	1/8/2021	5/31/2021	15	45

Planning

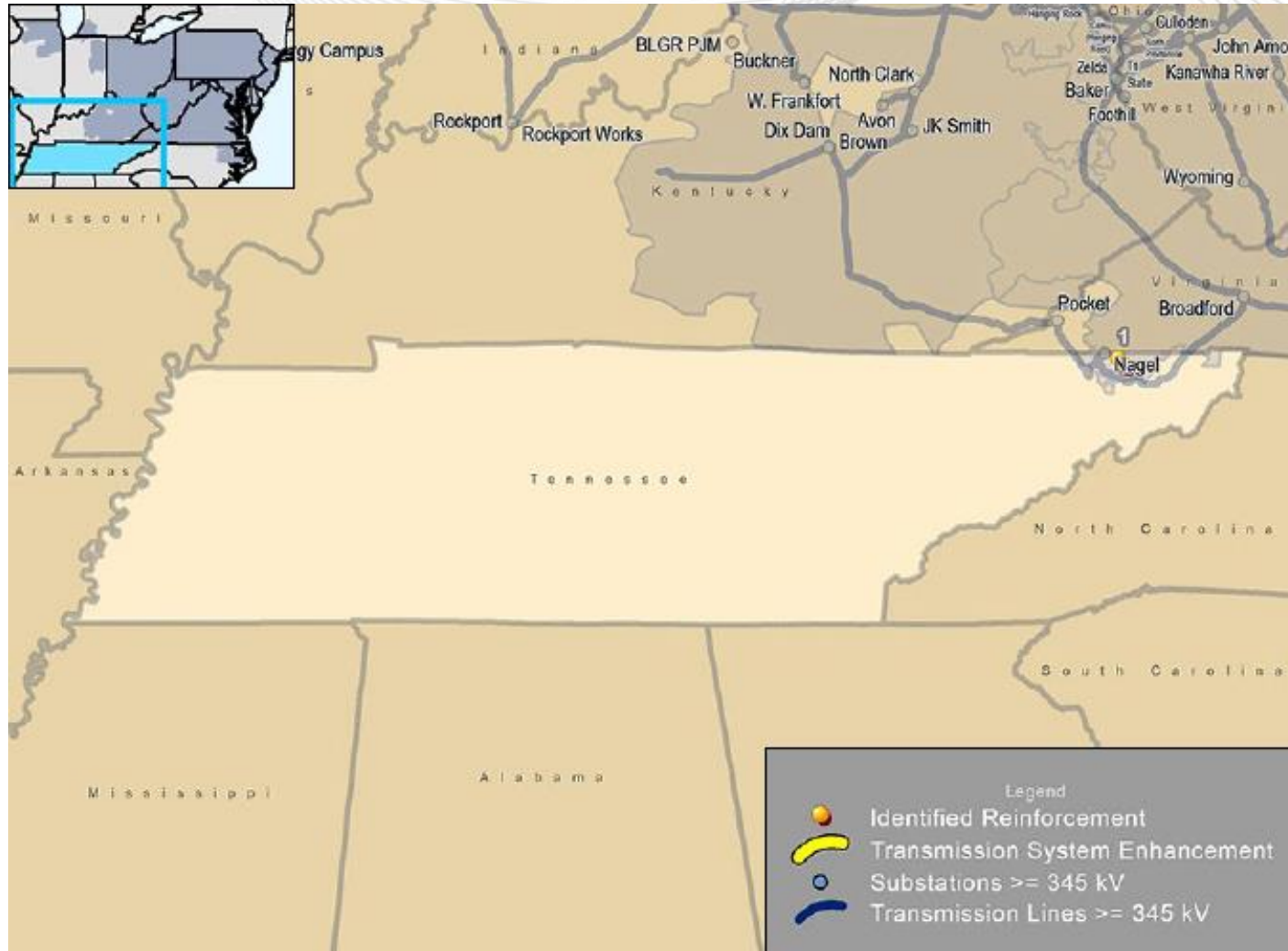
Transmission Infrastructure Analysis



Please note that PJM is now listing all transmission projects in its Annual RTEP and state infrastructure reports, beginning with this year's 2021 Annual RTEP. In previous years only projects above a \$10 million threshold were listed in the Annual RTEP Report and projects above a \$5 million threshold were listed in the state infrastructure reports. This change may increase the amount of projects listed in these reports going forward now that smaller projects below the previous \$5 million cutoff are being included.

The complete list of all RTEP projects in PJM, including those from prior years, can be found at the “RTEP Upgrades & Status – Transmission Construction Status” page on [pjm.com](https://www.pjm.com).

<https://www.pjm.com/planning/project-construction>



Note: Baseline upgrades are those that resolve a system reliability criteria violation.



Tennessee – RTEP Baseline Projects

Map ID	Project	Description	Required In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
1	b3344.1	Install two 138 kV circuit breakers in the M and N strings in the breaker-and-a half configuration in West Kingsport station 138 kV yard to allow the Clinch River-Moreland Dr. 138 kV to cut in the West Kingsport station.	11/1/2026	\$2.10	AEP	11/2/2021
	b3344.2	Upgrade remote end relaying at Riverport 138 kV station due to the line cut in at West Kingsport station.				

Tennessee had no network project upgrades in 2021.

Note: Network upgrades are new or upgraded facilities required primarily to eliminate reliability criteria violations caused by proposed generation, merchant transmission or long term firm transmission service requests, as well as certain direct connection facilities required to interconnect proposed generation projects.



Note: Supplemental projects are transmission expansions or enhancements that are not required for compliance with PJM criteria and are not state public policy projects according to the PJM Operating Agreement. These projects are used as inputs to RTEP models, but are not required for reliability, economic efficiency or operational performance criteria, as determined by PJM.



Tennessee – TO Supplemental Projects

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
1	s2407.1	Station highside at Lovedale – Replace existing 34.5 kV circuit breakers A, B and G with new 69 kV-rated, 3000A 40 kA circuit breakers.	11/15/2023	\$4.20		
	s2407.2	Required T-line entrance work is necessary to relocate to the new station site (Highland-Lovedale, Fort Rob-Lovedale, Lovedale-Waste Water).				
	s2407.3	Acquire required right of way (Lovedale-Waste Water).				
	s2407.4	Perform remote end work (Highland, Reedy Creek, Fort Robinson).				
2	s2408.1	Rebuild ~12.7 miles of the existing Fort Robinson-Hill 69 kV line between Fort Robinson and Hill stations.	7/1/2023	\$46.80	AEP	10/16/2020
	s2408.2	At Fort Robinson station – Replace existing 69 KV circuit breaker E with a new 3000A 40 kA circuit breaker. Replace existing 34.5 kV circuit breaker D with a new 69 kV-rated, 3000A 40 kA circuit breaker. Replace existing ground bank at transformer No. 1 with new ground bank. Replace existing ground MOAB for transformer No. 1 with H.S. circuit switcher. Replace existing line MOABs Y and W with 138 kV circuit breakers. Replace 34.5 kV disconnects on breaker J. Install new low-side 34.5 kV circuit breaker at transformer No. 1.				
	s2408.3	At Hill station – Replace existing 69 kV circuit breaker H with new 40 kA 3000A circuit breaker. Replace existing 69 kV circuit breaker E with new 40 kA 3000A circuit breaker for constructability and flexibility. Existing breaker E can be used as a capital spare. Replace existing 69 kV cap bank circuit switcher AA with new circuit breaker. Replace existing 138/69 kV, 40 MVA transformer No. 1 with new 138/69 kV, 40 MVA transformer No. 1. Add H.S. circuit switcher to the new transformer. Replace existing 138 kV line MOABs W and Y with new 138 kV circuit breakers. Replace ground MOAB switches on 138/12 KV T2 with circuit switcher.				
	s2408.4	Perform remote end relaying work at Clinch River, Wolf Hills, Lovedale, Holston, West Kingsport.				



Tennessee – TO Supplemental Projects

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
3	s2435.1	West Kingsport Station – Install five 138 kV, 40 kA 3000A circuit breakers and reconfigure existing bus No. 2 to a breaker-and-a-half arrangement. Note that the replacement of breaker E was accelerated due to a customer request and constrained outages and is currently in service to feed Industry Drive. Replace existing 34.5 kV circuit breakers A, C and F with three new 69 kV-rated, 3000A 40 kA breakers to be energized at 34.5 kV. Replace existing 34.5 kV bus structures with new box bays built to 69 kV. Remove existing 34.5 kV, 14.4 MVAR cap bank and cap bank switcher.	7/20/2023	\$13.40	AEP	12/18/2020
	s2435.2	Line work and right of way are required to relocate the North Bristol and Industry Drive 138 kV lines at West Kingsport station into the new configuration. This includes installing three structures (two tower structures and one custom steel pole) to bring North Bristol circuit in and relocate the Industrial Drive circuit to final string of breakers. This also includes re-terminating the Ft. Robinson-West Kingsport 34 kV line, Cumberland-West Kingsport 34.5 kV line, and the Waste Water-West Kingsport 34 kV line into new station bays.				
4	s2437.1	Eden’s Ridge station – Expand the station to install a 138 kV box bay replacing the phase-over-phase switching structure, and replace line switches with motor-operated switches and CCVTs.	4/30/2023	\$4.00		
	s2437.2	Line work on the North Bristol-West Kingsport 138 kV circuit will terminate onto the Eden's Ridge station new 138 kV box bay.				
5	s2443	Cumberland Station – Replace existing 34.5 kV circuit breakers A, B and N with three new 69 kV, 3000A 40 kA breakers operated at 34.5 kV. Replace existing capacitor switcher AA with a new 34.5 kV capacitor switcher.	7/20/2023	\$2.40		

Planning Load Forecast

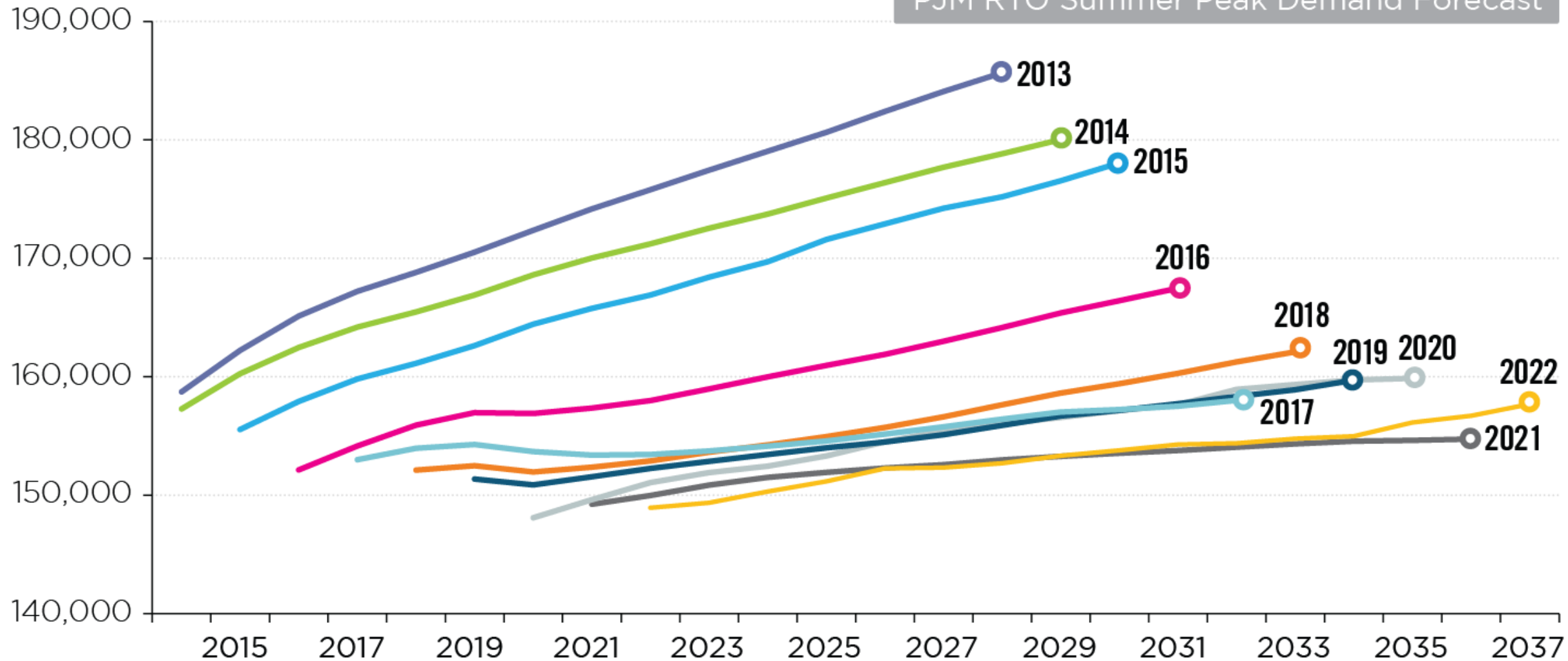


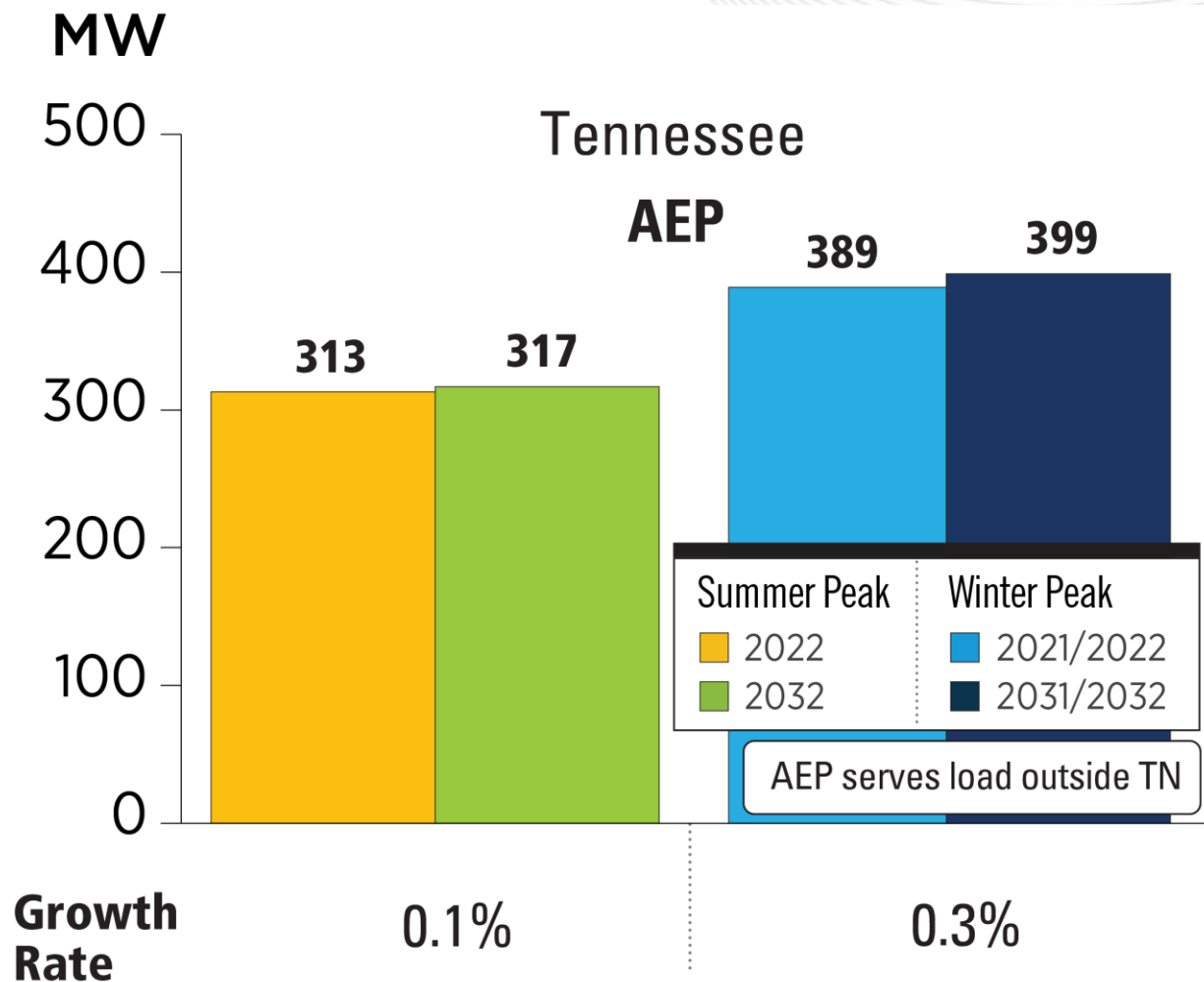
PJM Annual Load Forecasts

(Jan. 2022)

Load (MW)

PJM RTO Summer Peak Demand Forecast





PJM RTO Summer Peak		PJM RTO Winter Peak	
2022	2032	2021/2022	2031/2032
149,938 MW	154,381 MW	132,102 MW	141,516 MW
Growth Rate 0.4%		Growth Rate 0.7%	

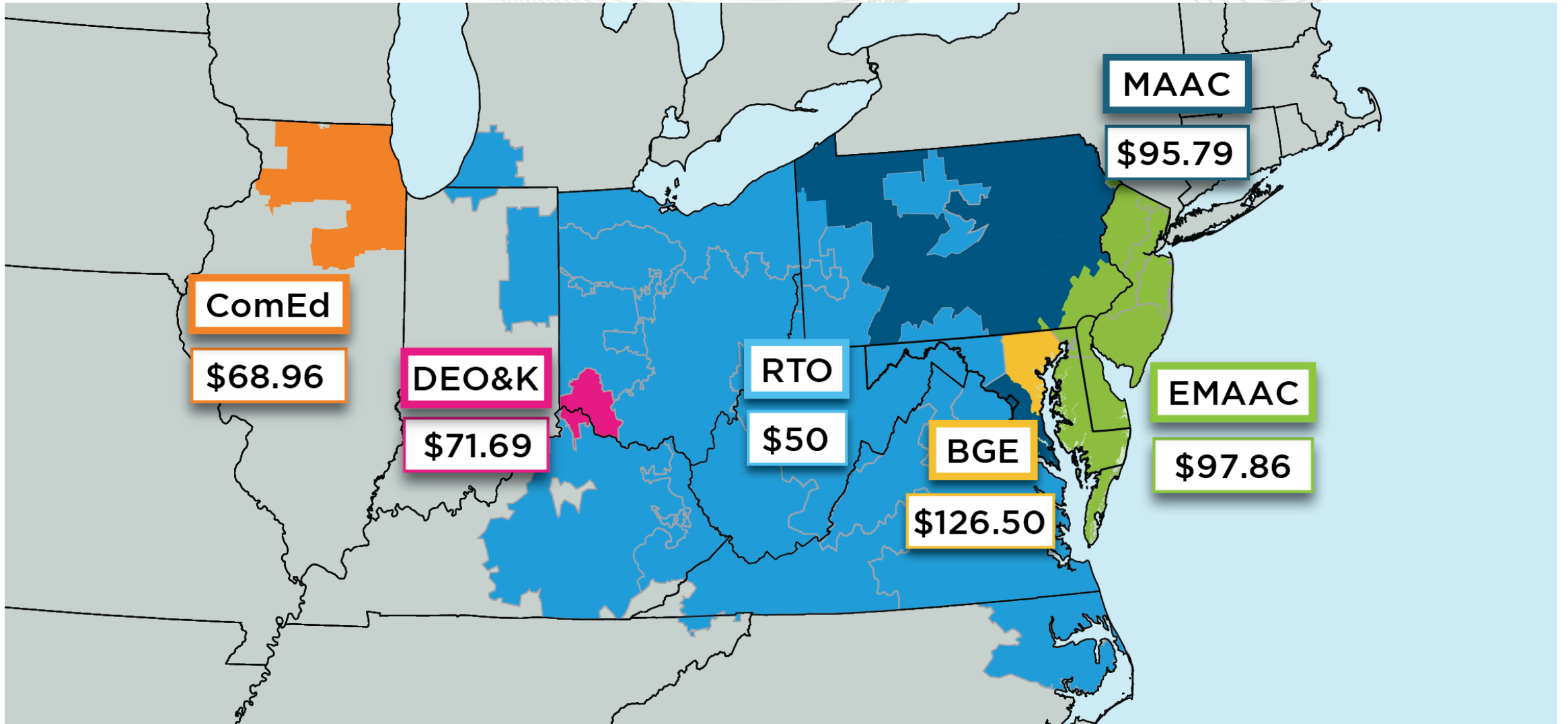
The summer and winter peak megawatt values reflect the estimated amount of forecasted load to be served by each transmission owner in the noted state/district. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load in those areas over the past five years.

Markets

Capacity Market Results



2022/2023 Base Residual Auction Clearing Prices (\$/MW-Day)





PJM – 2022/2023 Cleared MW (UCAP) by Resource Type

	ANNUAL	SUMMER	WINTER	Total (MW)
Generation	130,844.9	9.9	686.8	131,541.6
DR	8,369.9	442.0	0.0	8,811.9
EE	4,575.7	234.9	0.0	4,810.6
Total (MW)	143,790.5	686.8	686.8	

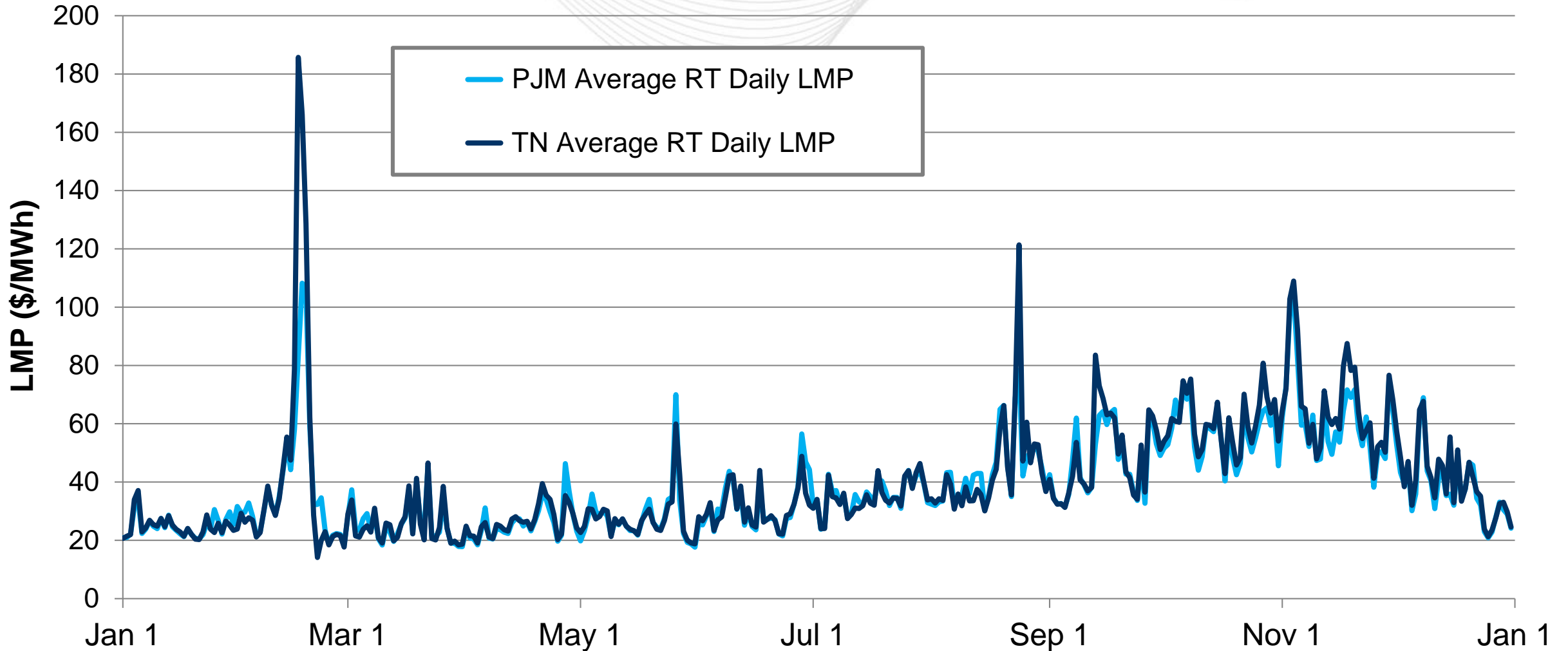
Markets

Market Analysis

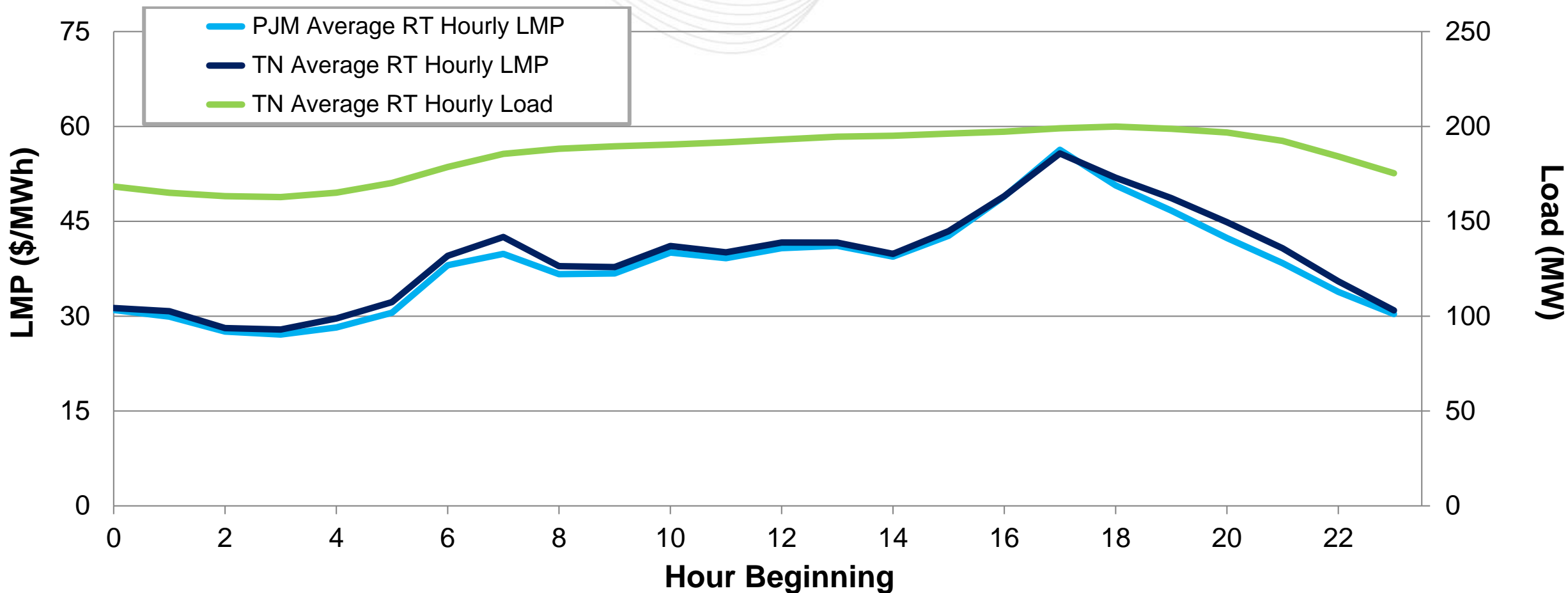


Tennessee – Average Daily LMP

(Jan. 1, 2021 – Dec. 31, 2021)



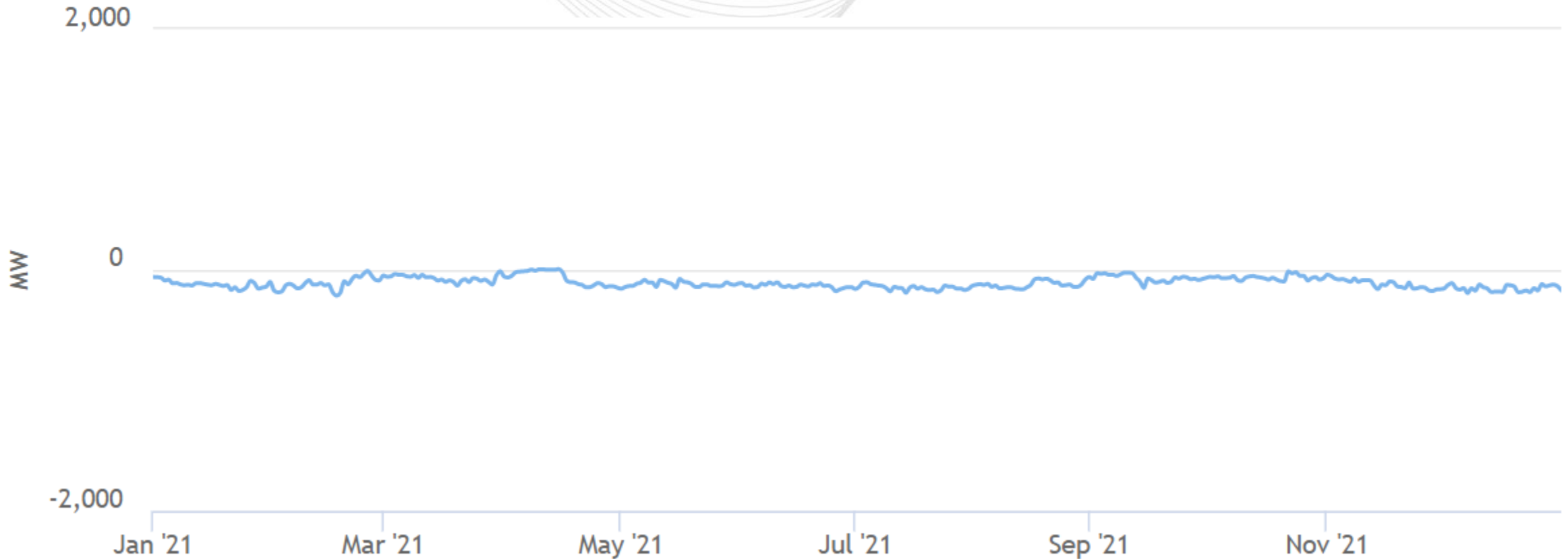
Tennessee's average hourly LMPs generally aligned with the PJM average hourly LMP.





Tennessee – Net Energy Import/Export Trend

(Jan. 2021 – Dec. 2021)



This chart reflects the portion of Tennessee that PJM operates. Positive values represent exports and negative values represent imports.

Operations Emissions Data



2005 – 2021 PJM Average Emissions

