



2021 Michigan State Infrastructure Report

(January 1, 2021 – December 31, 2021)

May 2022

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

1. Planning

- Generation Portfolio Analysis
- Transmission Analysis
- Load Forecast

2. Markets

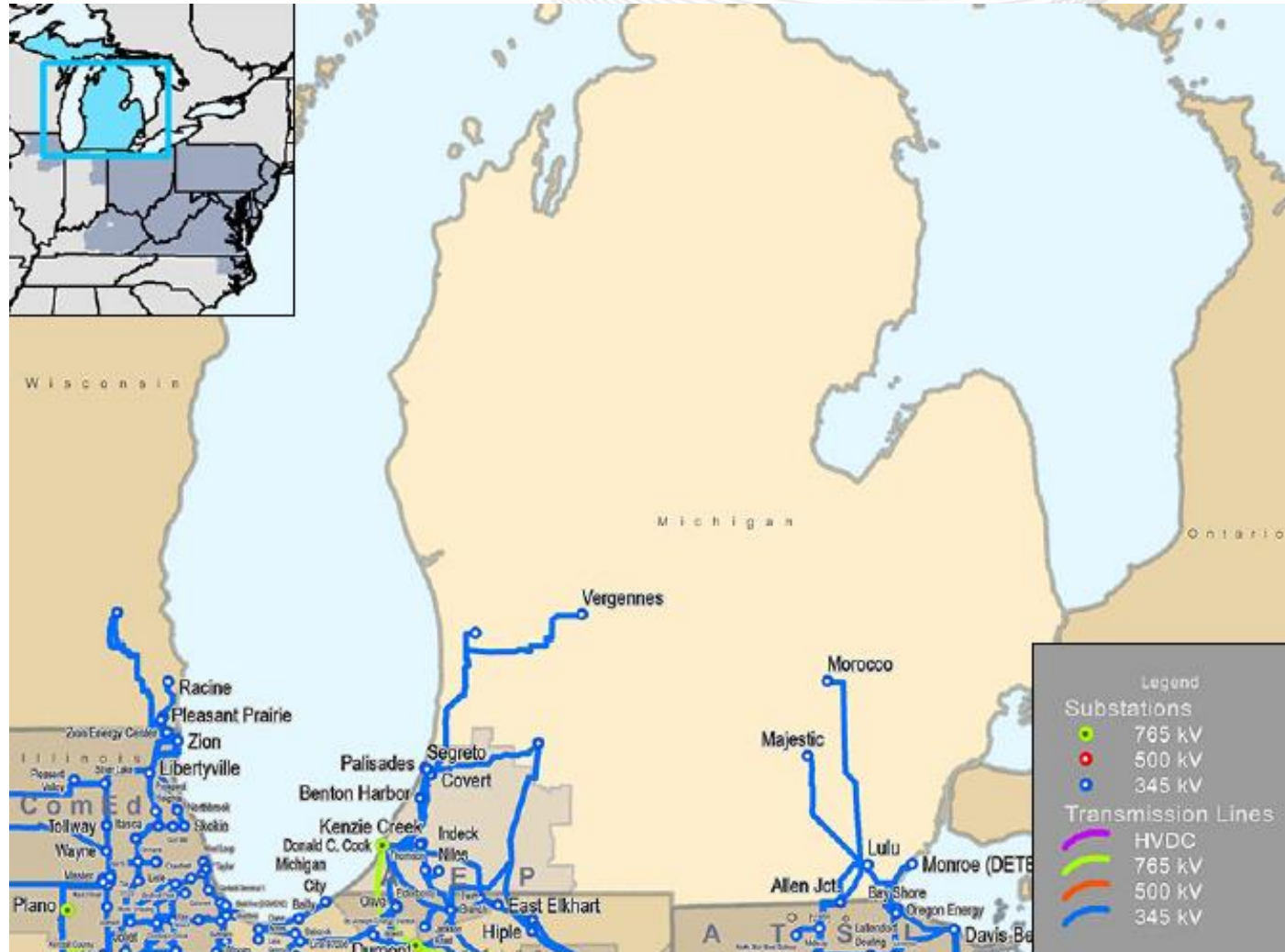
- Capacity Market Results
- Market Analysis
- Net Energy Import/Export Trend

3. Operations

- Generator Production
- Emissions Data

- **Existing Capacity:** Nuclear represents approximately 67.1 percent of the total installed capacity in the Michigan service territory while natural gas represents approximately 32.7 percent. This differs from PJM where natural gas and nuclear are 44.2 and 17.5 percent of total installed capacity.
- **Interconnection Requests:** Natural gas represents 50.1 percent of new interconnection requests in Michigan, while solar represents approximately 46.6 percent of new requests.
- **Deactivations:** No generation in Michigan gave a notification of deactivation in 2021.
- **RTEP 2021:** Michigan's 2021 RTEP project total represents approximately \$203.75 million in investment.

- **Load Forecast:** Michigan's summer peak load served within the AEP portion of PJM's footprint is projected to grow at about 0.1 annually over the next ten years. Comparatively, the overall PJM RTO projected load growth rate is 0.4 percent.
- **1/1/21 – 12/31/21 Market Performance:** Michigan's average hourly LMPs generally aligned with the PJM average hourly LMP.
- **2022/23 Capacity Market:** The portion of Michigan within the PJM footprint cleared at the RTO price of \$50/MW-day in the 2022/2023 Base Residual Auction.



The PJM service area in Michigan is the AEP zone and is represented by the shaded portion of the map.

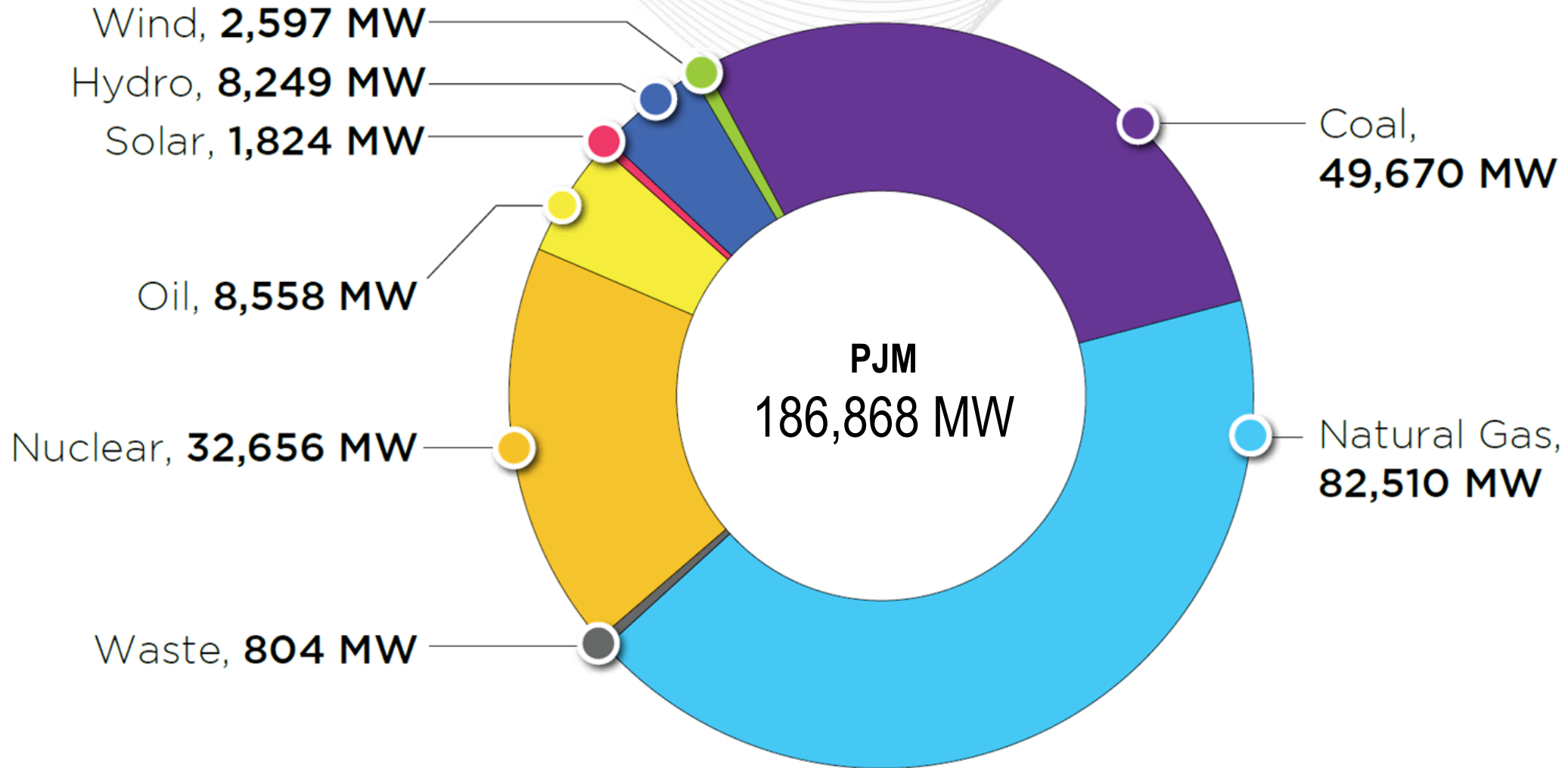
PJM operates transmission lines that extend beyond the service territory.

Planning

Generation Portfolio Analysis

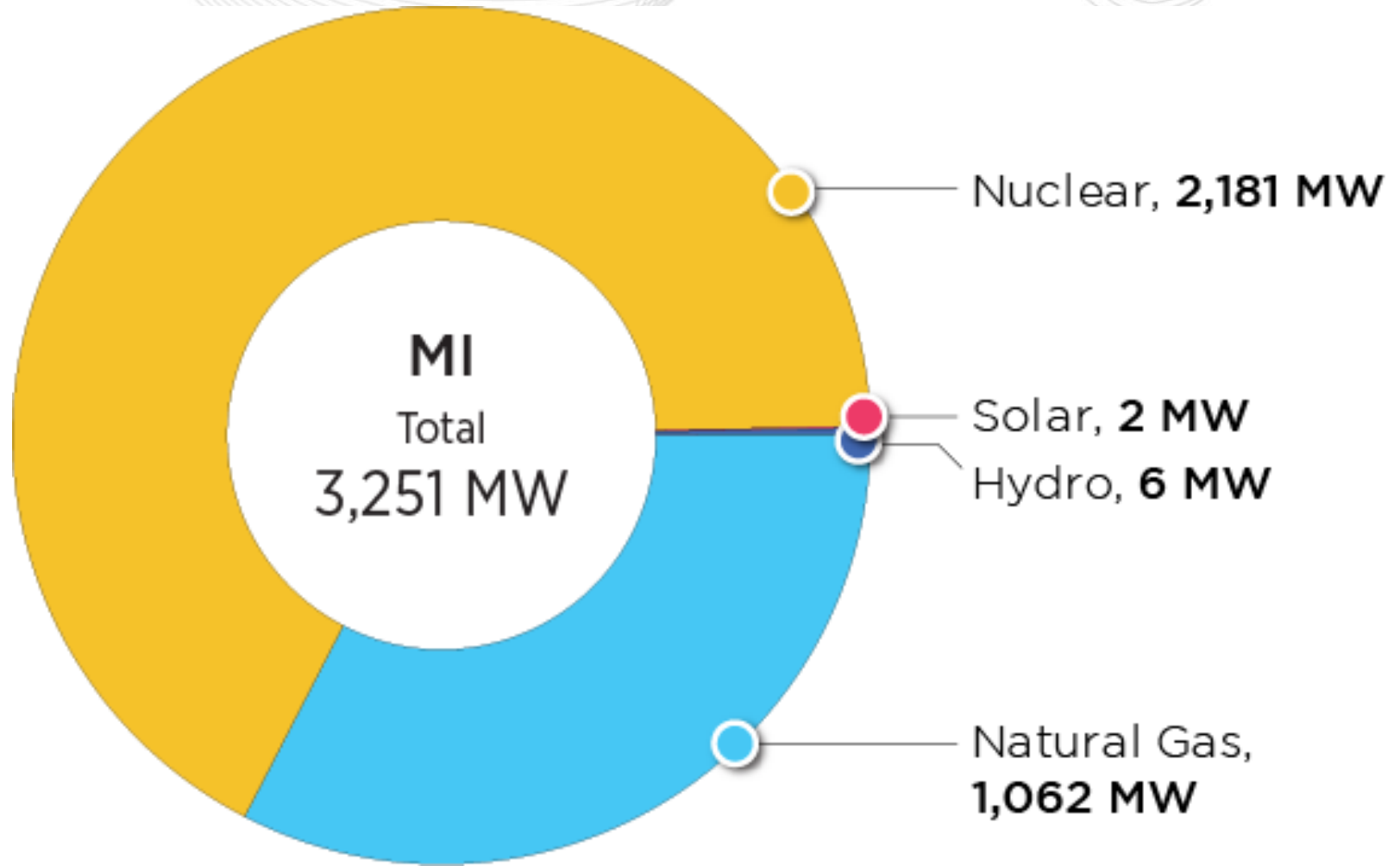
PJM – Existing Installed Capacity

(CIRs – as of Dec. 31, 2021)



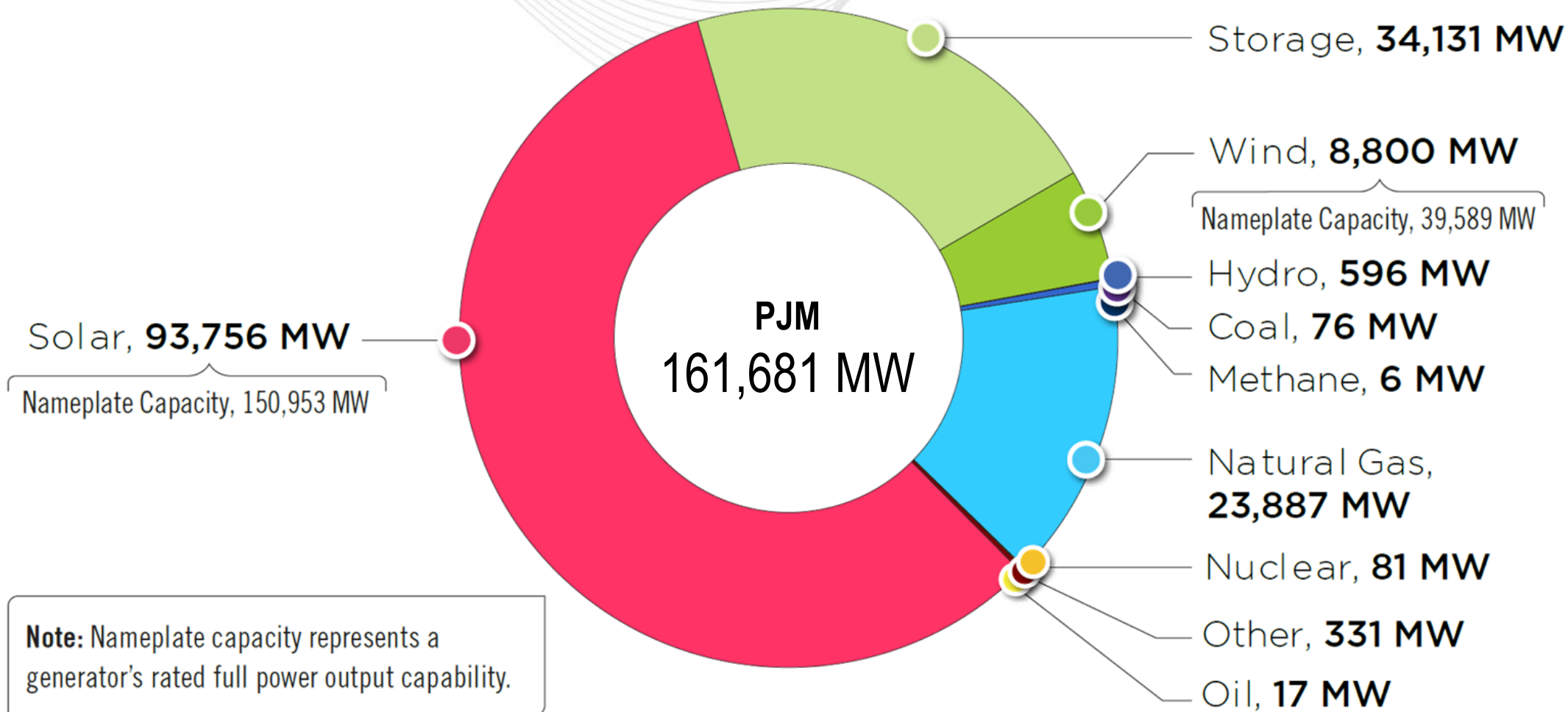
Michigan – Existing Installed Capacity

(CIRs – as of Dec. 31, 2021)



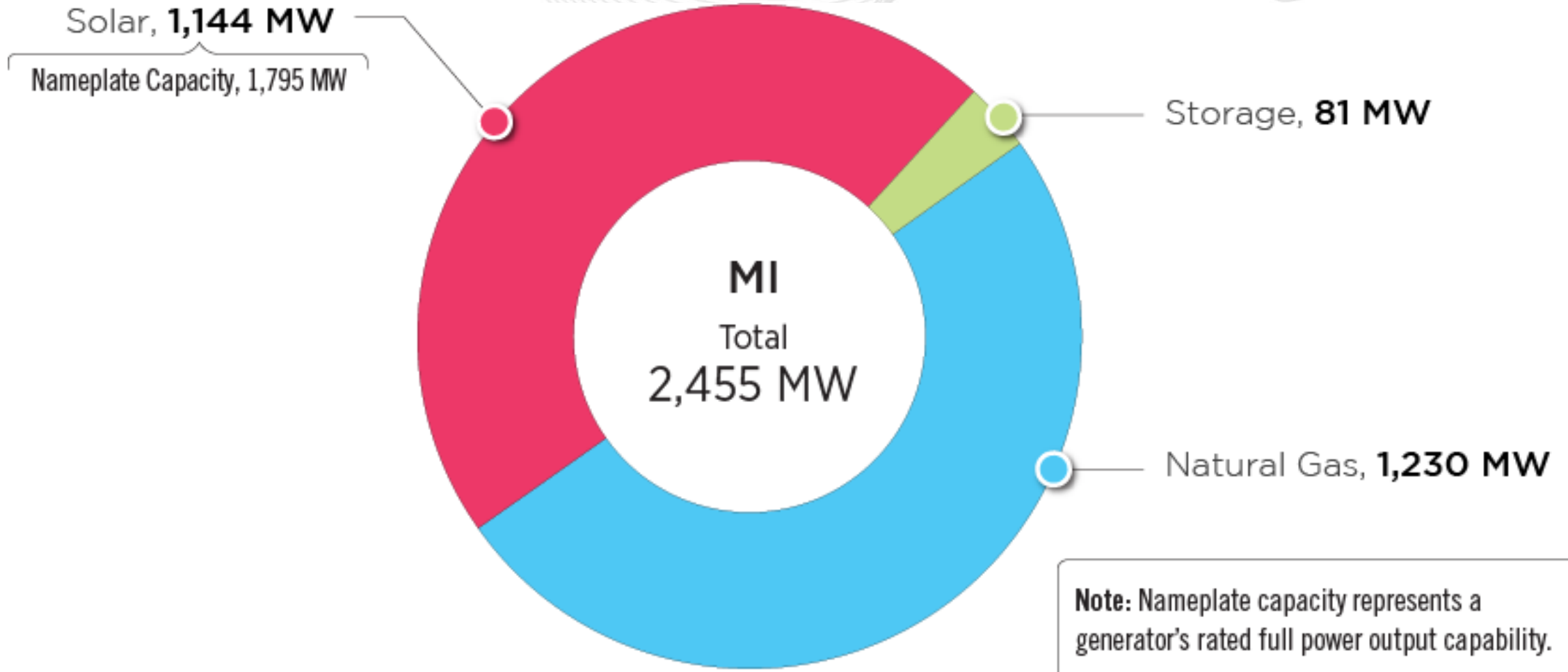
PJM – Queued Capacity (MW) by Fuel Type

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



Michigan – Queued Capacity (MW) by Fuel Type

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





Michigan – Historical Interconnection Requests by Fuel Type

(as of Dec. 31, 2021)

		In Queue				Complete				Grand Total	
		Active		Under Construction		In Service		Withdrawn			
		Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)
Non-Renewable	Natural Gas	1	145.0	2	1,085.0	2	1,055.0	1	1,120.0	6	3,405.0
	Nuclear	0	0.0	0	0.0	3	205.0	0	0.0	3	205.0
	Other	0	0.0	0	0.0	0	0.0	2	0.0	2	0.0
	Storage	3	81.3	0	0.0	0	0.0	1	75.0	4	156.3
Renewable	Methane	0	0.0	0	0.0	3	10.4	0	0.0	3	10.4
	Solar	15	1,143.7	0	0.0	1	2.3	4	237.8	20	1,383.8
	Wind	0	0.0	0	0.0	0	0.0	1	26.0	1	26.0
Grand Total		19	1,370.0	2	1,085.0	9	1,272.7	9	1,458.8	39	5,186.5

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



Michigan – Progression History of Interconnection Requests



Percentage of planned capacity and projects that have reached commercial operation

- 33.3%** Requested capacity megawatts
- 42.9%** 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.

Michigan – Generation Deactivation Notifications Received in 2021

Michigan had no generators give notice of deactivation in 2021.

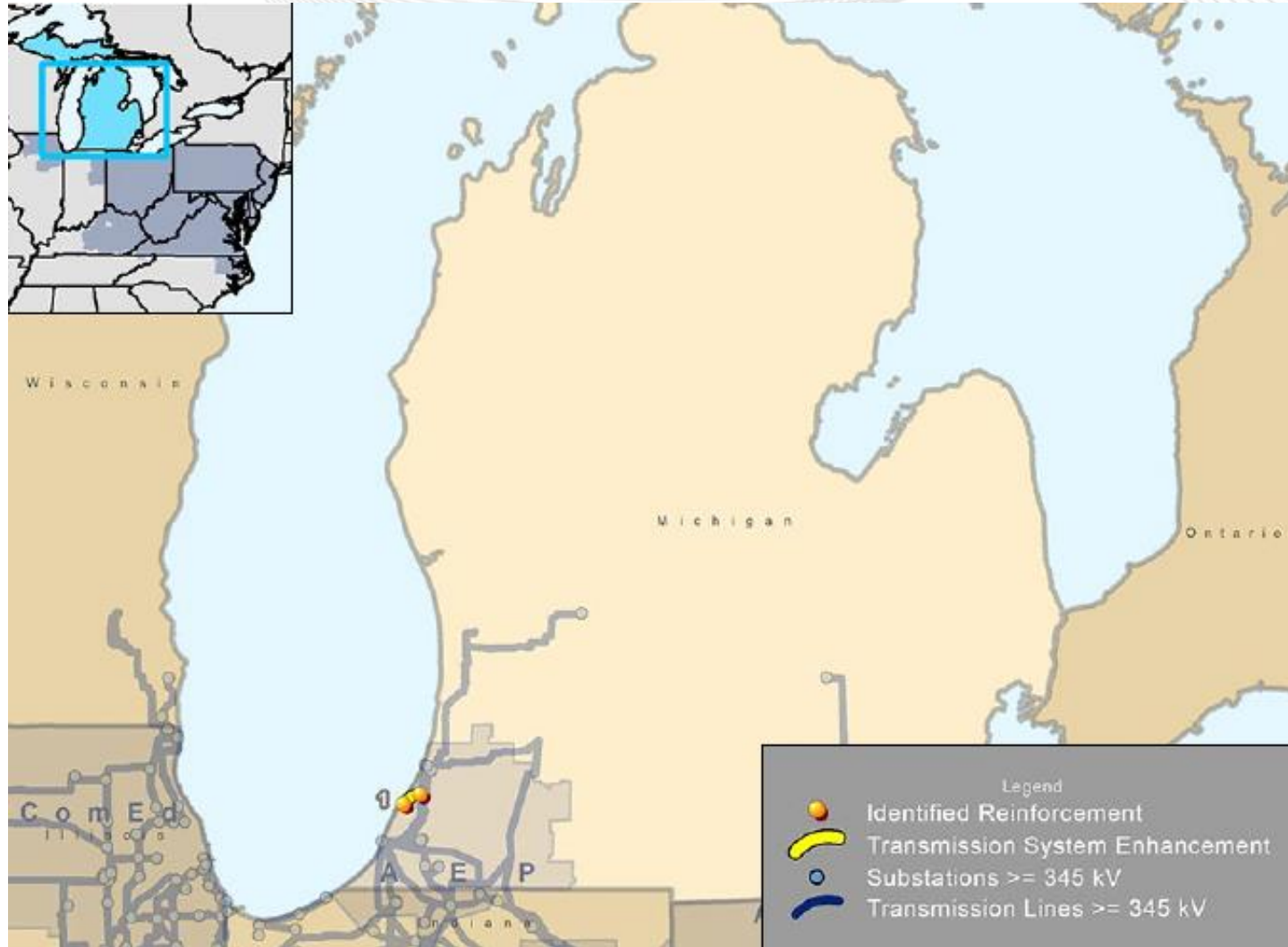
Planning

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/planning/project-construction).

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



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

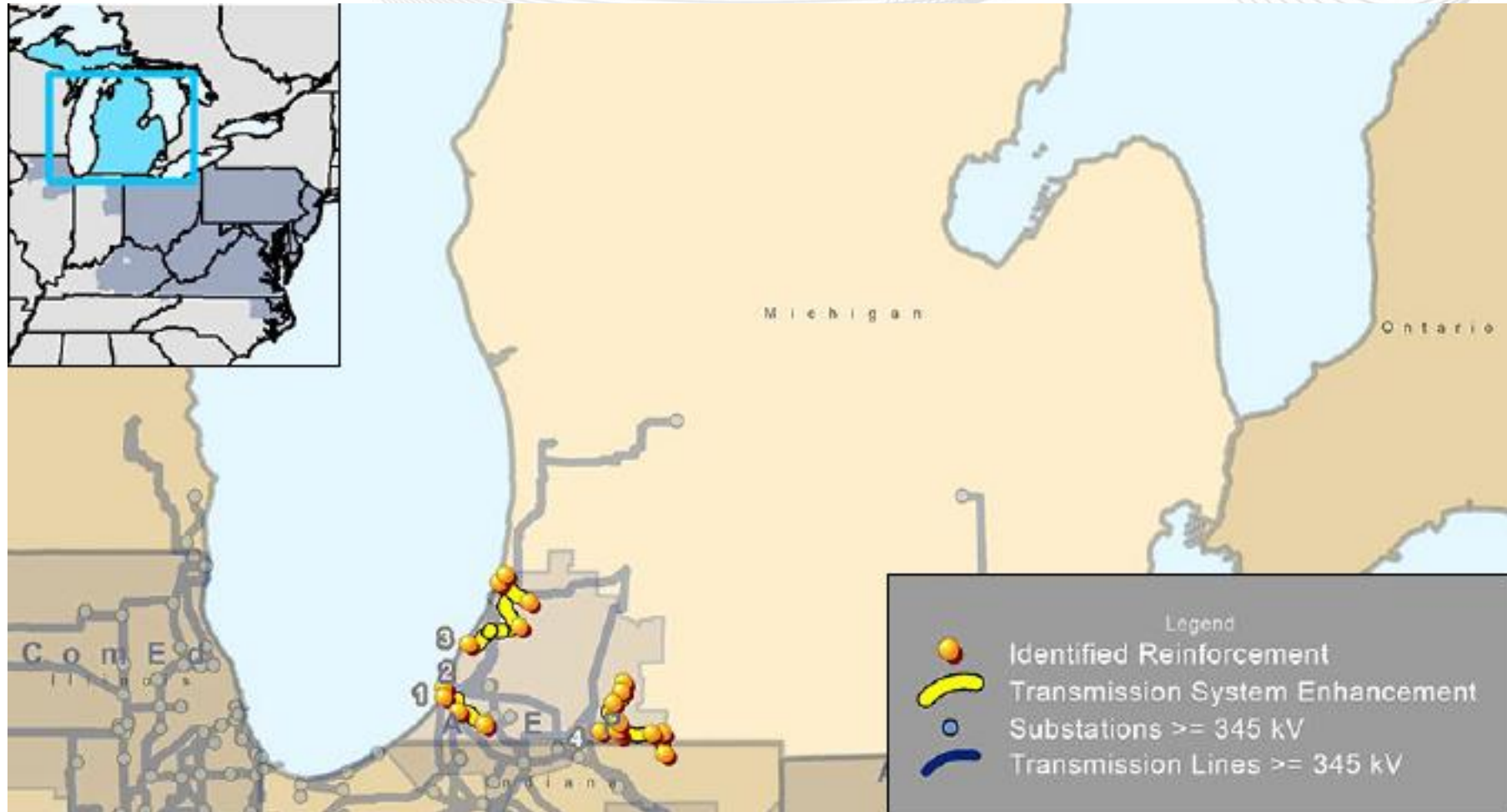


Michigan – RTEP Baseline Projects

Map ID	Project	Description	Required In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
1	b3336	Rebuild Benton Harbor-Riverside 138 kV double-circuit extension (6 miles).	6/1/2022	AEP	\$14.90	8/31/2021

Michigan 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.



Michigan – TO Supplemental Projects

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
1	s2390	Replace the failed 345 kV breaker N1 at DC Cook 765/345 kV station.	10/17/2020	\$0.30	AEP	9/11/2020
2	s2440.1	Rebuild the 7.7 mile Bridgman-Pletcher line with 556 ACSR conductor.	2/14/2024	\$32.00		12/18/2020
	s2440.2	Install new 69/34.5 kV Bucktown station to replace Buchanan Hydro station. Install new 69/34.5 kV transformer with two 34.5 kV line breakers and four 69 kV breaker ring bus.				
	s2440.3	Retire 1 mile of 4/0 copper conductor from Buchanan Hydro to Clark Equipment and Jack's Post customer. Construct 0.1 miles of 34.5 kV line from Jack's Post to new Bucktown station.				
	s2440.4	At Buchanan Hydro station – Retire the transmission and distribution equipment. Install one new 34.5 kV breaker for line protection to Bucktown to continue service to the hydro plant.				
3	s2571.1	Riverside-Hartford 138 kV – Rebuild ~14.7 miles of 1950s wood H-frame line with 795 Drake ACSR.	10/28/2024	\$65.40		7/16/2021
	s2571.2	South Haven-Hartford 69 kV – Rebuild ~18.7 miles of 1960s wood pole line with 795 Drake ACSR.				
	s2571.3	Phoenix Switch 69 kV – Replace the switch with a new phase-over-phase switch with line MOABs.				
	s2571.4	Bangor 69 kV – Install a bus tie breaker at Bangor 69 kV station.				



Michigan – TO Supplemental Projects

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
4	s2584.1	East Elkhart-Mottville Hydro 138 kV – Rebuild ~10 miles of 1950s wood on the East Elkhart-Mottville Hydro 138 kV line using 795 Drake ACSR.	3/25/2025	\$91.15	AEP	8/16/2021
	s2584.2	Mottville Hydro-Corey 138 kV – Retire the ~9 mile 138 kV line.				
	s2584.3	Moore Park 69 kV tap – Retire the ~9 mile 69 kV line.				
	s2584.4	Moore Park 69 kV SW – Retire the 69 kV phase-over-phase switch.				
	s2584.5	Moore Park 69 kV station – Install a 90 MVA, 138/69 kV XFR with a high-side switcher and low-side circuit breaker. 69 kV circuit breaker “C” will be replaced with the 69 kV circuit breaker “B”. Replace 69 kV cap switcher “BB”.				
	s2584.6	Retire Sturgis 69 kV station.				
	s2584.7	Stubey Rd 138/69 kV station – Expand station to include six 69 kV circuit breakers in a ring , four 138 kV circuit breakers in a ring, two 138/69 kV, 130 MVA XFRs and two 17.6 MVAR, 69 kV cap banks. Reterminate the Sturgis IP line into Stubey Road. Reterminate the Corey line into Stubey Road to energize the line at 138 kV.				
	s2584.8	Howe (Nipsco)-Sturgis 69 kV – Retire the ~2.9 mile 69 kV line.				
	s2584.9	Mottville Hydro-Stubey Rd. 138 kV – Re-energize the existing line from Mottville-Pigeon River to 138 kV and construct a new ~8.9 mile 138 kV line between Pigeon River and Stubey Road to reestablish the 138 kV through path to Corey station.				
	s2584.10	Pigeon River 69 kV station – Remove 69 kV circuit breaker “K” from Pigeon River to reuse at Stubey Rd.				
	s2584.11	Mottville Hydro 138/69 kV station – Remove 69 kV circuit breaker “D” from Mottville Hydro to reuse at Stubey Rd. E.				
	s2584.12	Corey 138/69 kV station – Remove 69 kV circuit breaker “C” from Corey to reuse at Stubey Rd. E.				
	s2584.13	White Pigeon 69 kV Ext – Build new 69 kV 0.2 mile extension from Corey-Pigeon River to the existing White Pigeon station.				
	s2584.14	Florence Rd. 69 kV station – Replace the line switches at Florence Rd.				

Planning

Load Forecast

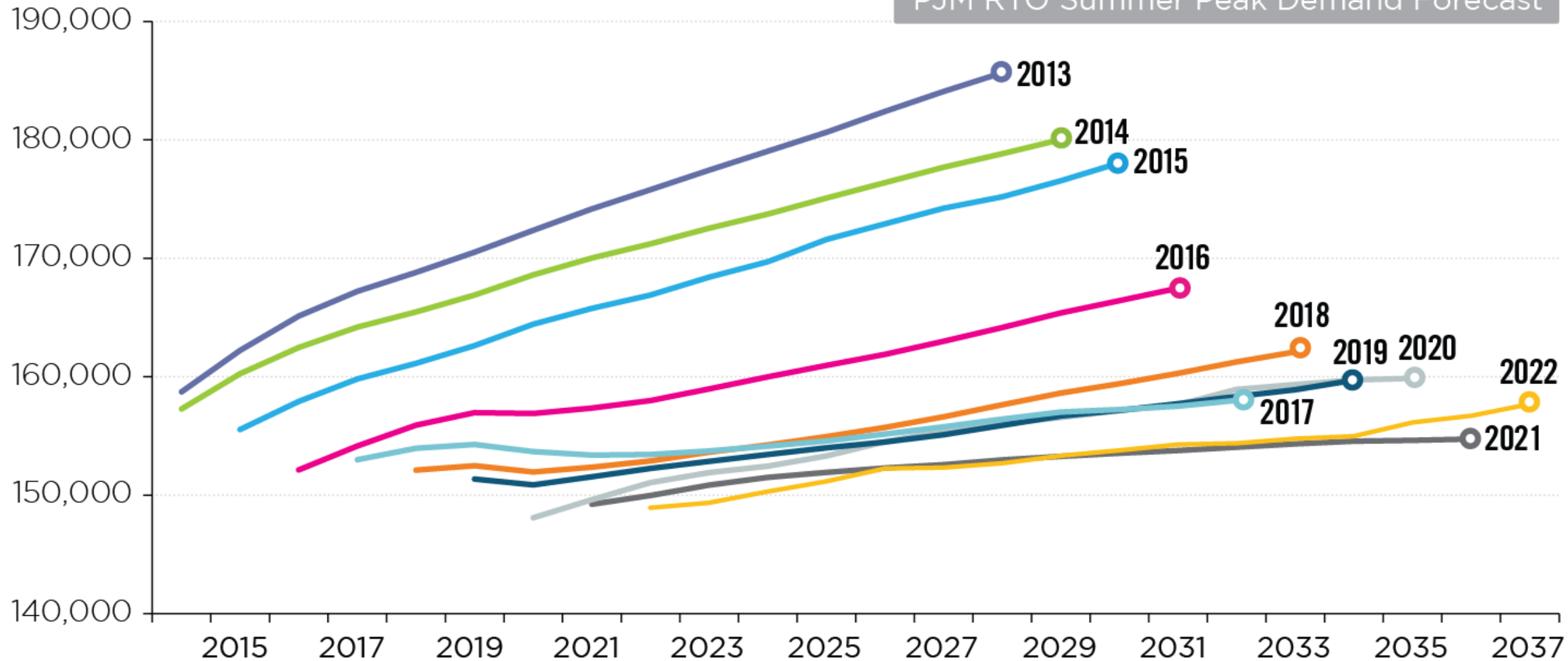


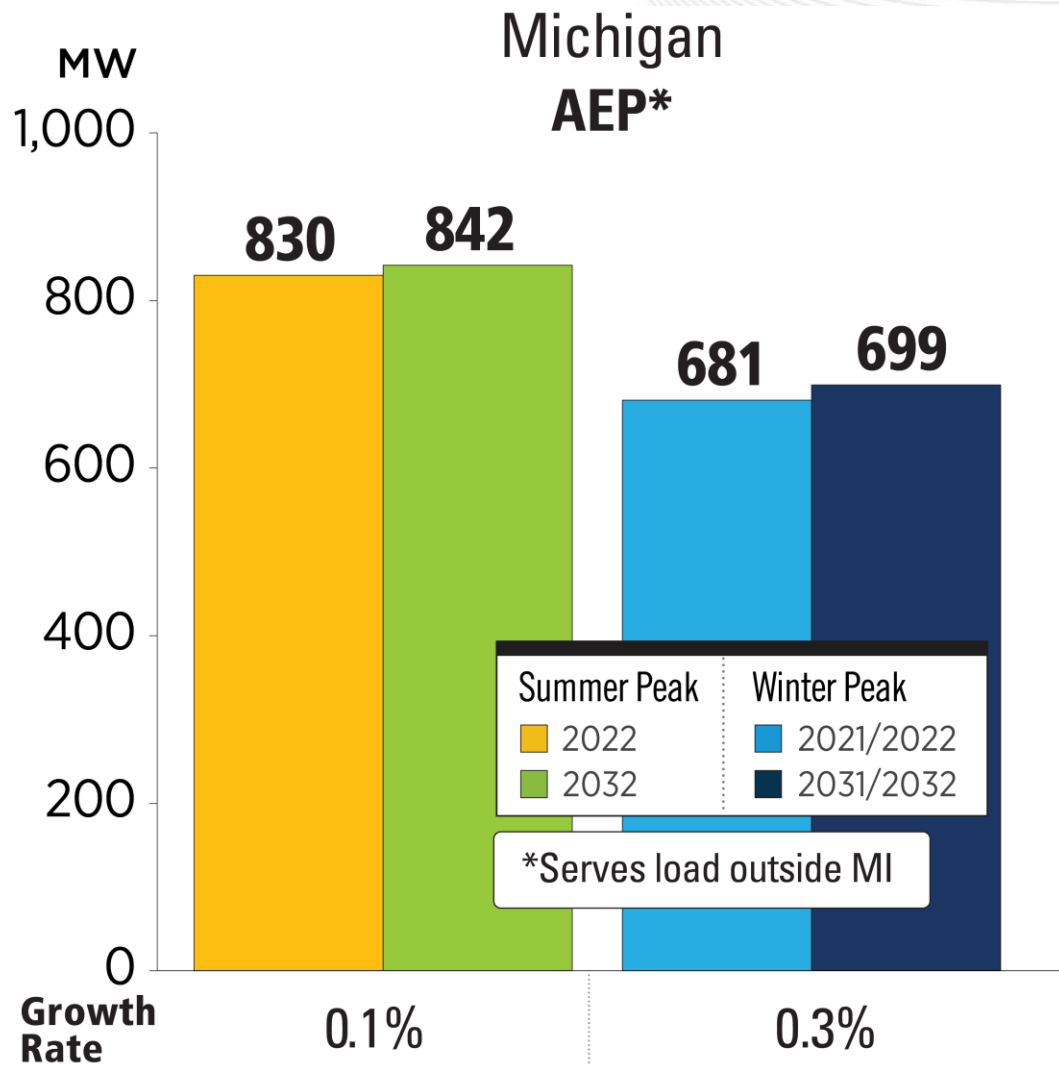
PJM Annual Load Forecasts

(Jan. 2022)

Load (MW)

PJM RTO Summer Peak Demand Forecast





PJM RT0 Summer Peak		PJM RT0 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%	

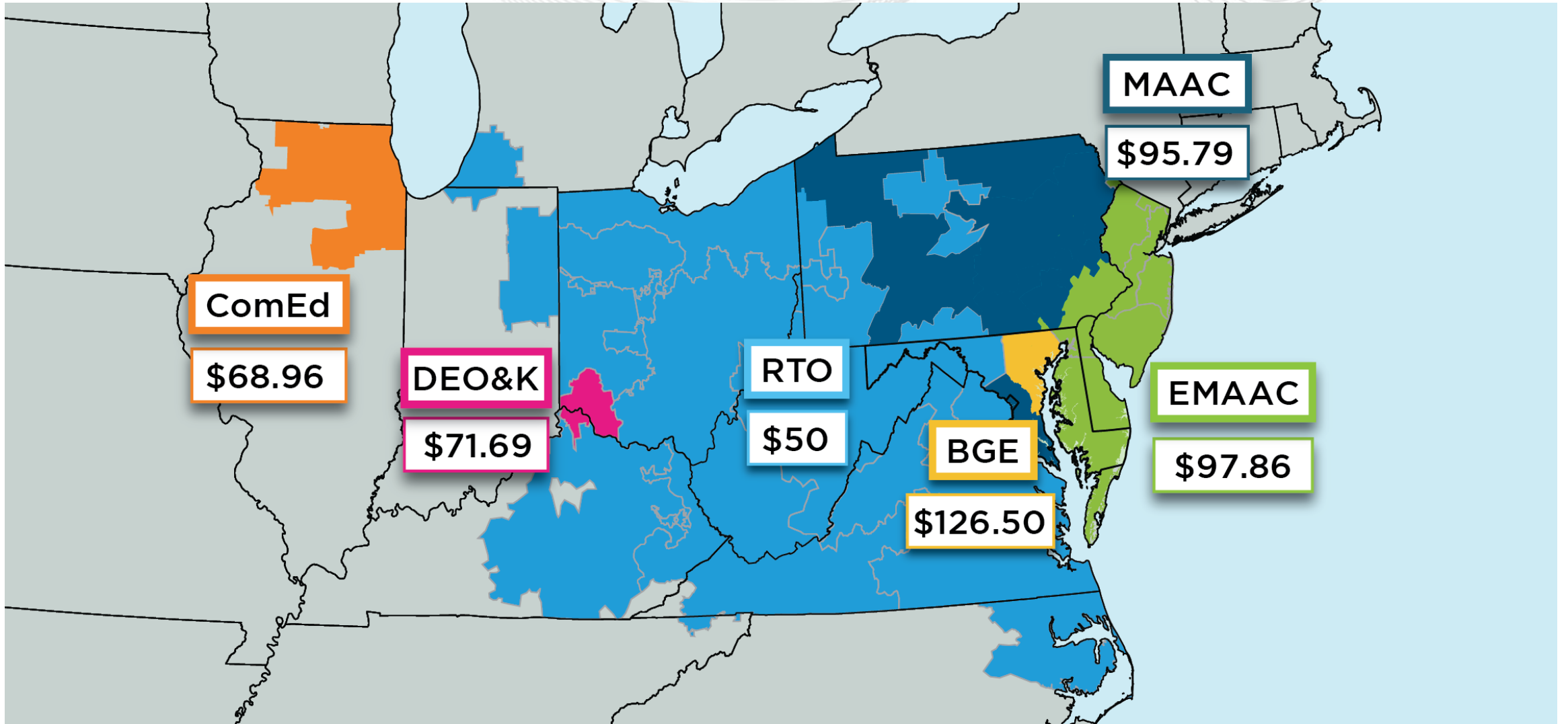
The summer and winter peak megawatt values reflect the estimated amount of forecasted load to be served by each transmission owner in the noted state/district. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load in those areas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

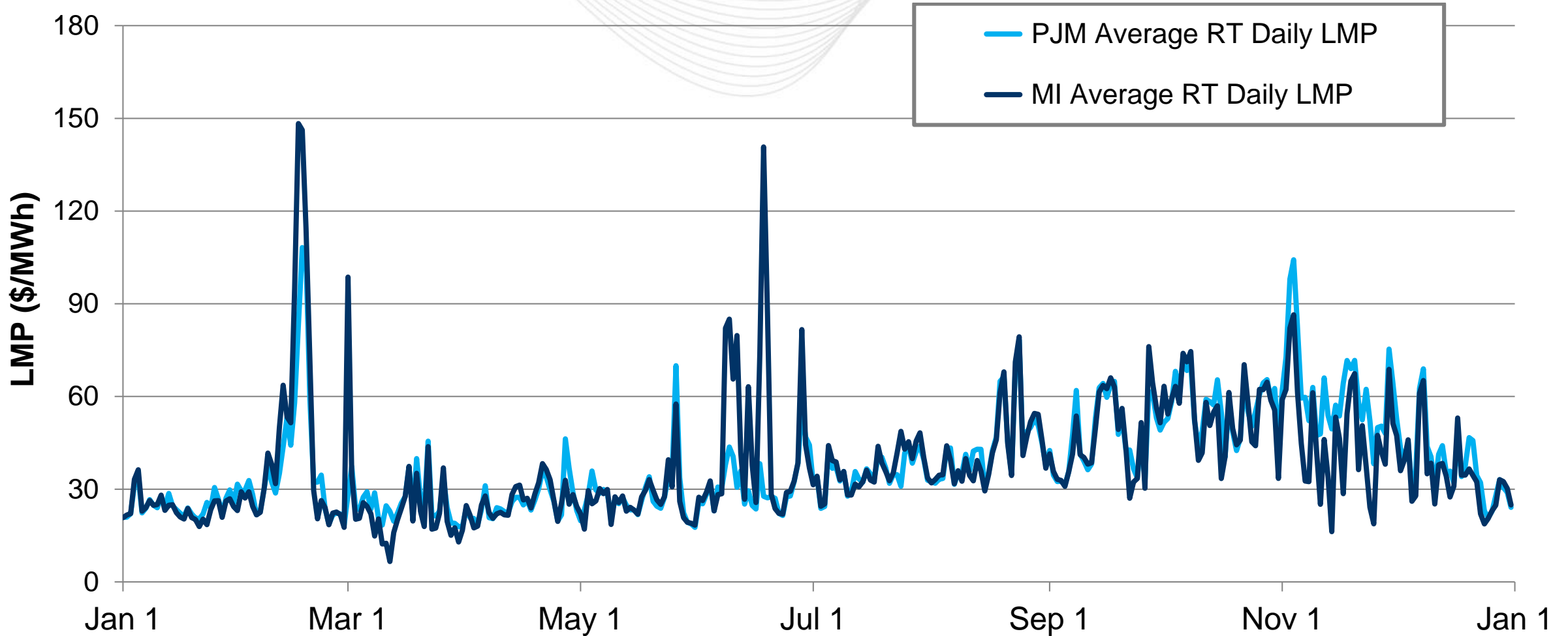
	ANNUAL	SUMMER	WINTER	Total (MW)
Generation	130,844.9	9.9	686.8	131,541.6
DR	8,369.9	442.0	0.0	8,811.9
EE	4,575.7	234.9	0.0	4,810.6
Total (MW)	143,790.5	686.8	686.8	

Markets

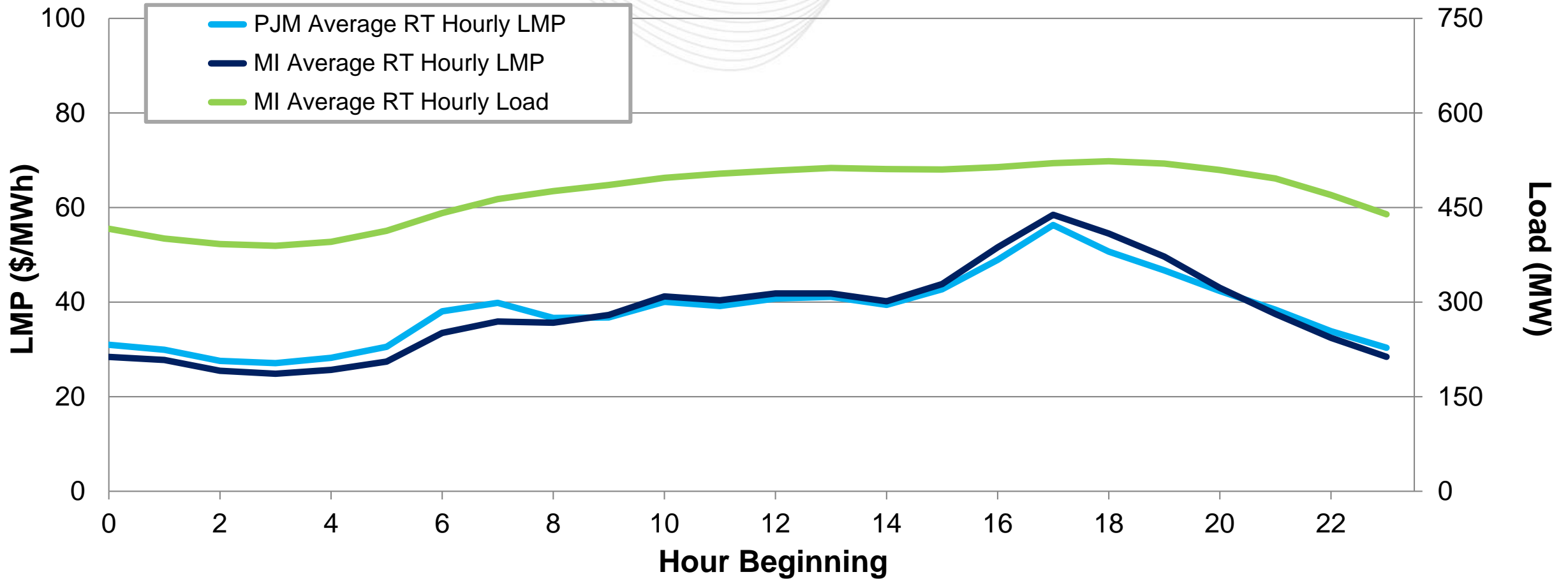
Market Analysis

Michigan – Average Daily LMP

(Jan. 1, 2021 – Dec. 31, 2021)



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



Michigan – Net Energy Import/Export Trend

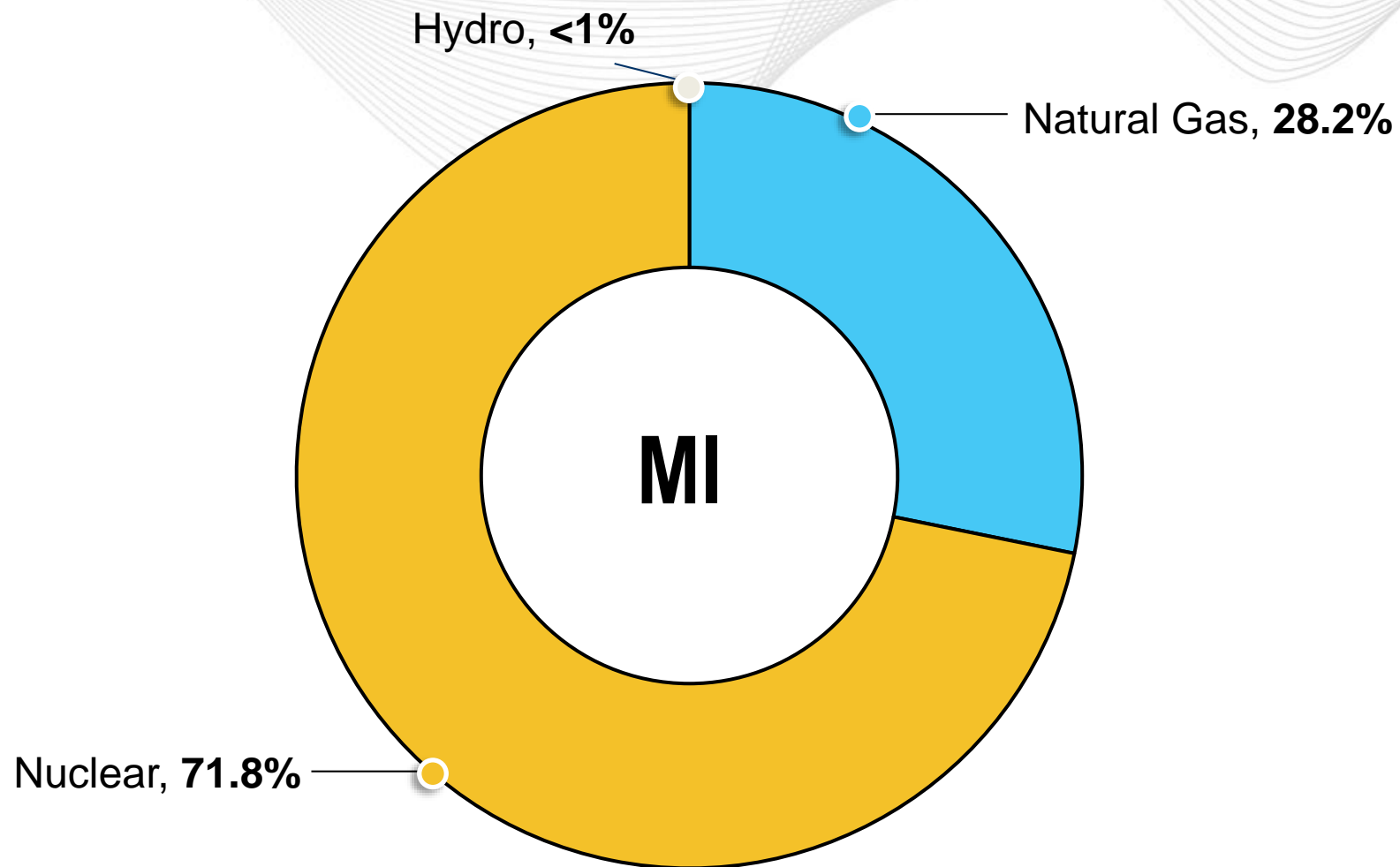
(Jan. 2021 – Dec. 2021)



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

Operations

Michigan – 2021 Generator Production



The data in this chart comes from EIA Form 923 (2021) and represents only generators within the PJM portion of MI.



2005 – 2021 PJM Average Emissions

