Michigan State Report

July 2017

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Executive Summary

(July 2017)

- **Existing Capacity:** Natural gas represents approximately 33 percent of the total installed capacity in Michigan while coal represents approximately 0 percent. This differs from PJM where natural gas and coal are relatively even at 35 and 34 percent respectively.
- **Interconnection Requests:** Natural gas represents 100 percent of new interconnection requests in Michigan.
- **Deactivations**: No generation units retired in Michigan in 2016. This compares to 392 MW of capacity retirements PJM-wide in 2016.
- **RTEP 2015:** Michigan did not have any RTEP 2016 projects.
- **Load Forecast:** Michigan load growth is nearly flat, averaging between .4 and .5 percent per year over the next 10 years. This aligns with PJM RTO load growth projections.

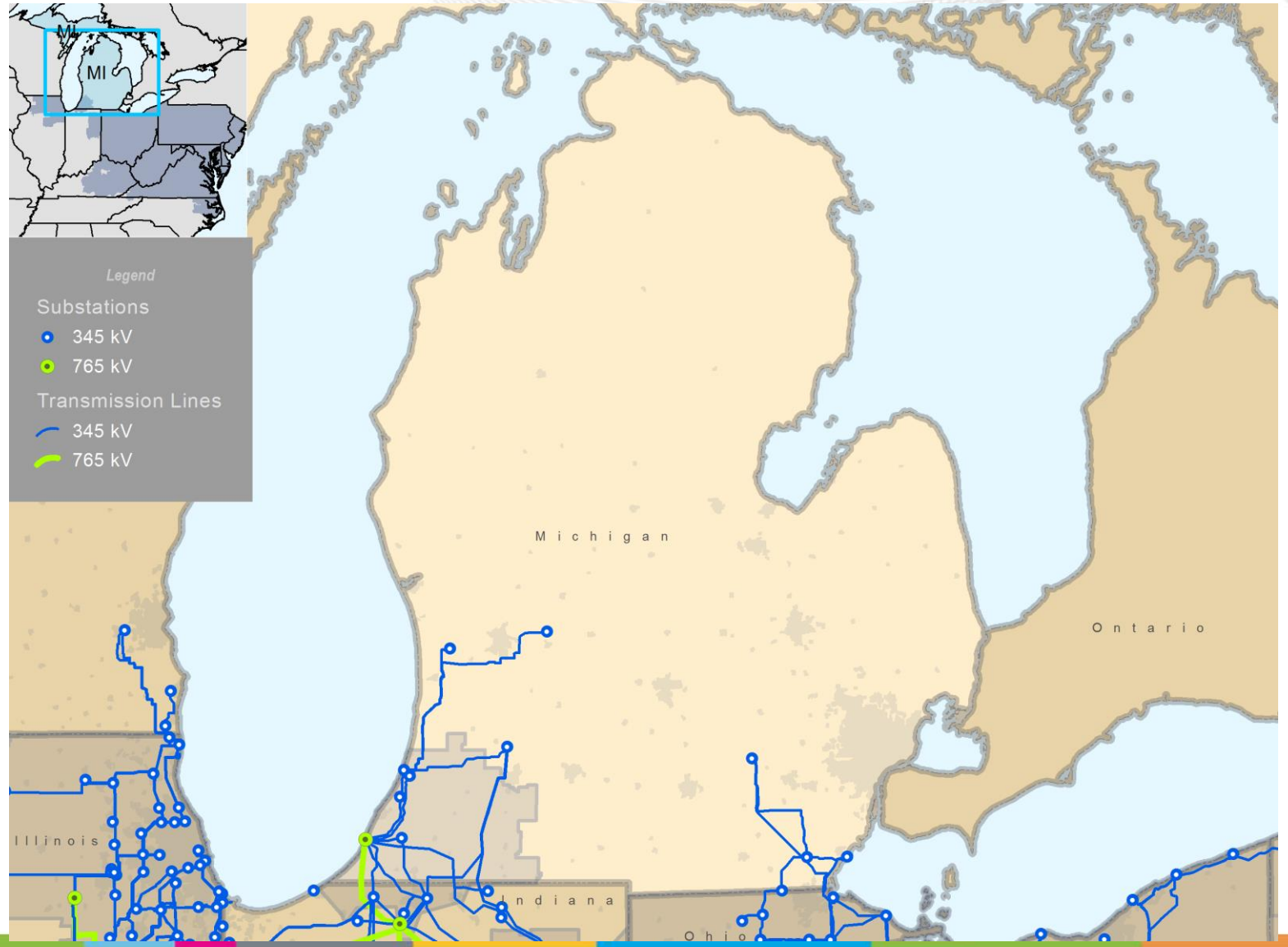
Executive Summary

(July 2017)

- **2020/21 Capacity Market:** Compared to the PJM footprint, Michigan's distribution of generation, demand response and energy efficiency is similar.
- **6/1/14 – 5/31/17 Performance:** Michigan's average daily locational marginal prices were consistent with PJM average daily LMPs. Nuclear resources represented 89 percent of generation produced in Michigan while other gas averaged 10 percent.
- **Emissions:** Due to the high percentage of nuclear within Michigan, carbon dioxide, nitrogen oxide, and sulfur dioxide emissions have been flat for the past decade.

PJM Service Area – Michigan

(December 31, 2015)



PJM operates bulk electric system facilities (and others monitored at lower voltages) in southwestern Michigan, including those of American Electric Power (AEP). Southwestern Michigan's transmission system delivers power to customers from native generation resources and those throughout the RTO – arising out of PJM market operations – as well as power imported interregionally from systems outside PJM.

Planning

Generation Portfolio Analysis

Michigan – Existing Installed Capacity

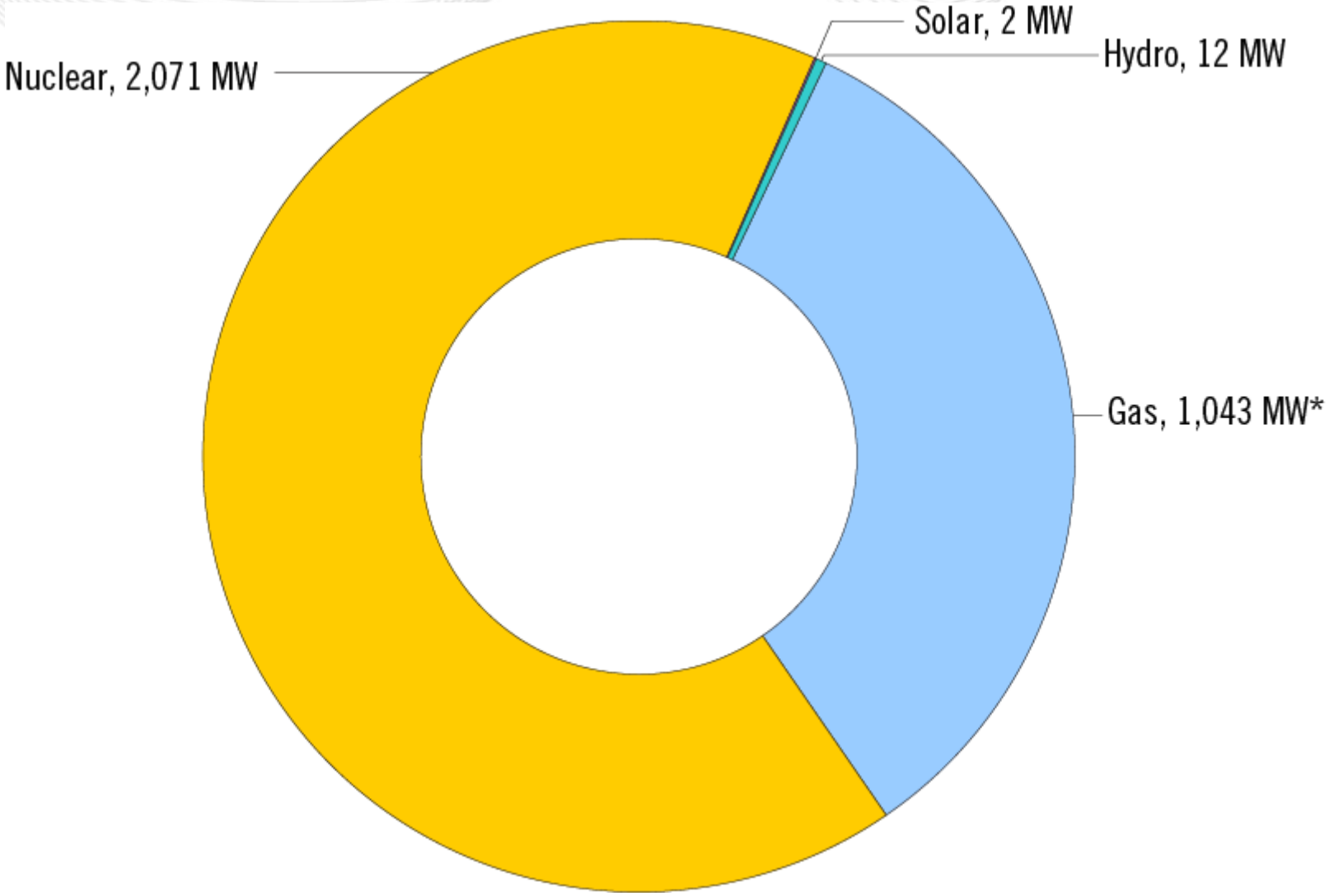
(Capacity Rights, December 31, 2016)

Summary:

Natural gas represents approximately 33 percent of the total installed capacity in Michigan while coal represents 0 percent.

Overall in PJM, natural gas and coal are relatively even at 35 percent and 34 percent respectively.

* Gas Contains	
Natural Gas	1,035 MW
Other Gas	8 MW

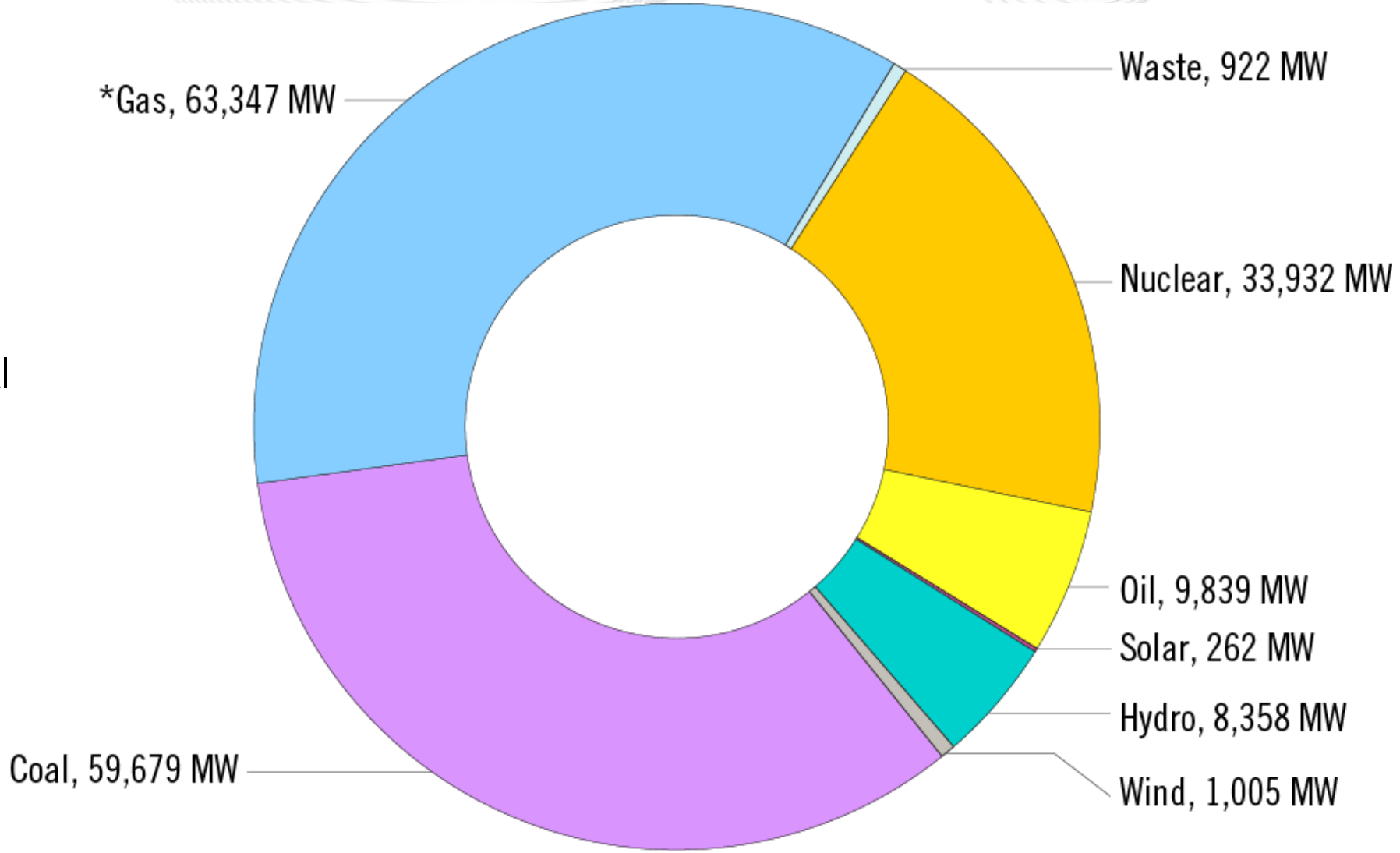


PJM – Existing Installed Capacity

(Capacity Rights, December 31, 2016)

In PJM, natural gas and coal make up nearly 70 percent total installed capacity.

* Gas Contains	
Natural Gas	62,941 MW
Other Gas	405 MW



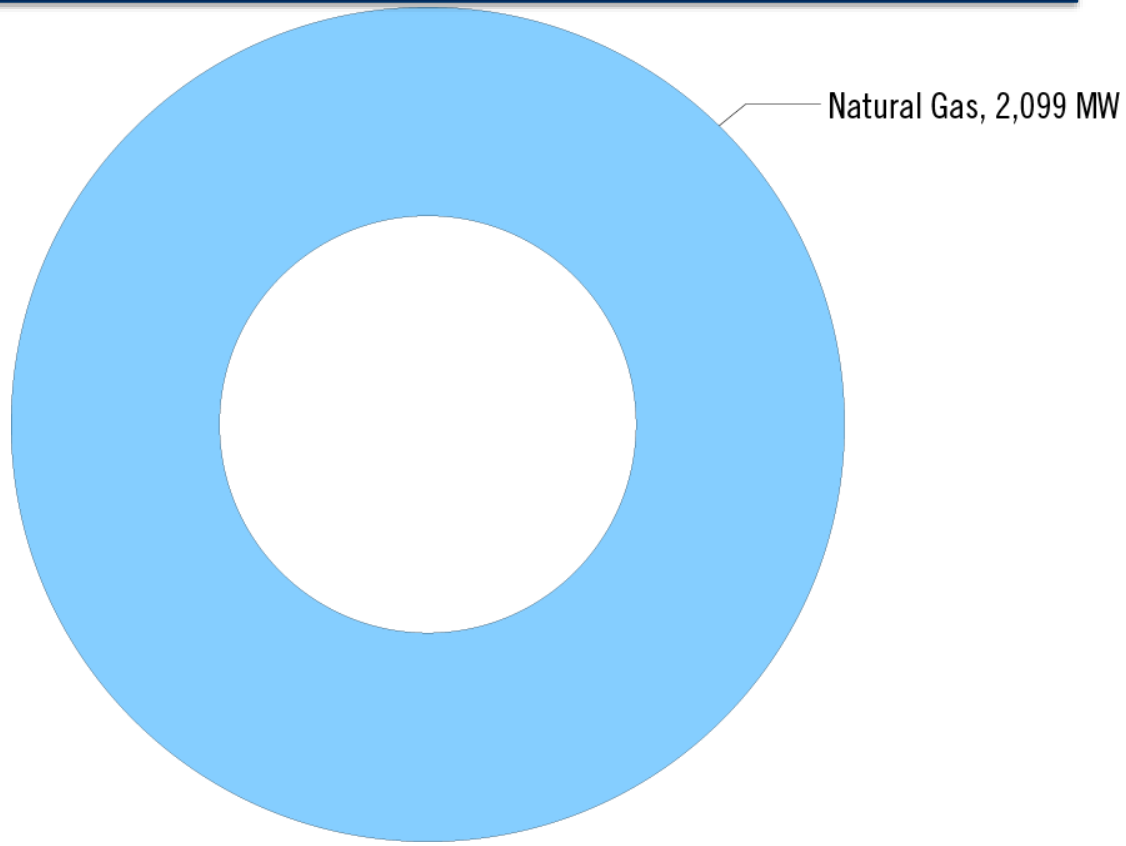
Michigan – Interconnection Requests

(Requested Capacity Rights, December 31, 2015)

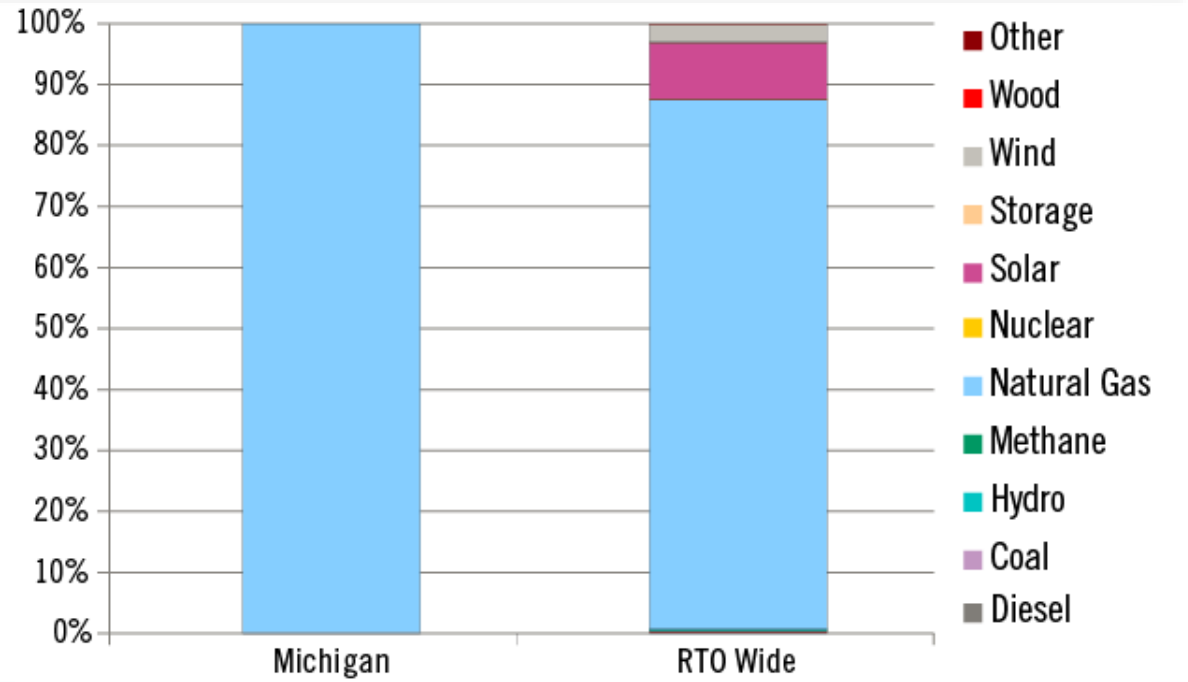
Natural gas represents 100 percent of new interconnection requests in Michigan.

	MW	# of Projects
Active	8,296	62
Under Construction	7,142	29
Suspended	232	17
Total	**15,670**	**108**

Total MW Capacity by Fuel Type



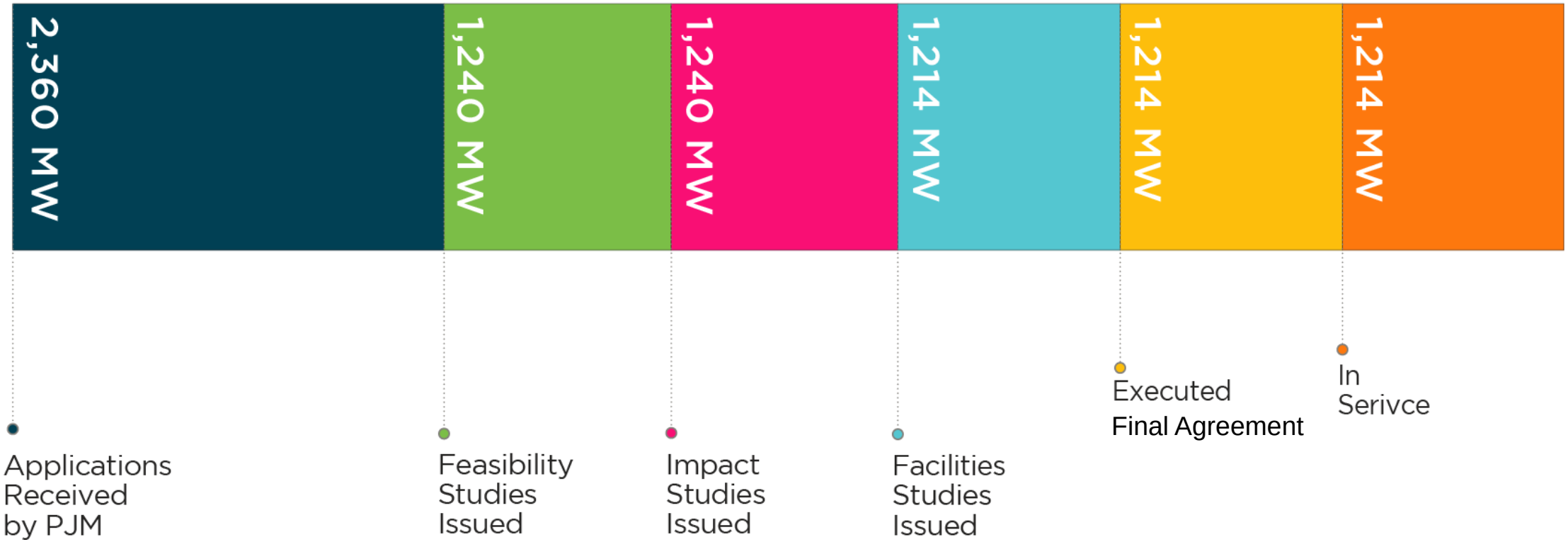
Fuel as a Percentage of Projects in Queue



Michigan – Interconnection Requests

	Active		In Service		Suspended		Under Construction		Withdrawn		Total Sum	
	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects
Biomass											0.0	0
Coal											0.0	0
Diesel											0.0	0
Hydro											0.0	0
Methane			9.6	2							9.6	2
Natural Gas	2,099.0	3	1,035.0	1					1,120.0	1	4,254.0	5
Nuclear			167.0	2							167.0	2
Oil											0.0	0
Solar			2.3	1							2.3	1
Storage											0.0	0
Other									0.0	1	0.0	1
Wind									26.0	1	26.0	1
Total	**2,099.0**	**3**	**1,213.9**	**6**	**0.0**	**0**	**0.0**	**0**	**1,146.0**	**3**	**4,458.9**	**12**

Michigan – Progression History Interconnection Requests (Requested Capacity Rights, 1999 - 2016)



Following Final Agreement execution 0 MW of capacity with ISAs withdrew from PJM's interconnection process. Another 0 MW have executed agreements but were not in service as of December 31, 2016. Overall, 51% of requested capacity MW reaches commercial operation.

Michigan – 2016 Actual Generation Deactivations

(Capacity, As of December 31, 2016)

Unit	MW Capacity	TO Zone	Age	Actual Deactivation Date
	none			

Summary:

- No generating units in Michigan deactivated in 2016
- Across PJM, 11 generating units totaling 392 MW of capacity deactivated in 2016

Planning

Transmission Infrastructure Analysis

Michigan – RTEP Baseline Projects

Map ID	Project ID	Project	Michigan Baseline Project Driver: Baseline Load Growth/ Deliverability & Reliability	Michigan Baseline Project Driver: Congestion Relief - Economic	Michigan Baseline Project Driver: Operational Performance	Michigan Baseline Project Driver: Generator Deactivation	Michigan Baseline Project Driver: TO Criteria Violation	Required Date	Cost ($M)	Designated Entity*	2016 TEAC Review
		None									

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

Michigan – RTEP Network Projects

Map ID	Project ID	Project	Michigan Network Project Drivers: Generation Interconnection	Michigan Network Project Drivers: Merchant Transmission Interconnection	Michigan Network Project Drivers: Long-term Firm Transmission Service	Required Date	Cost ($M)	TO Zone(s)	2016 TEAC Review
		None							

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.

Michigan – TO Supplemental Projects

			Michigan Supplemental Project Driver			
Map ID	Project ID	Project	Required Date	Cost ($M)	TO Zone(s)	2016 TEAC Review
		None				

Note: Supplemental projects are transmission expansions or enhancements that are used as inputs to RTEP models, but are not required for reliability, economic efficiency or operational performance criteria, as determined by PJM.

Michigan – Merchant Transmission Project Requests

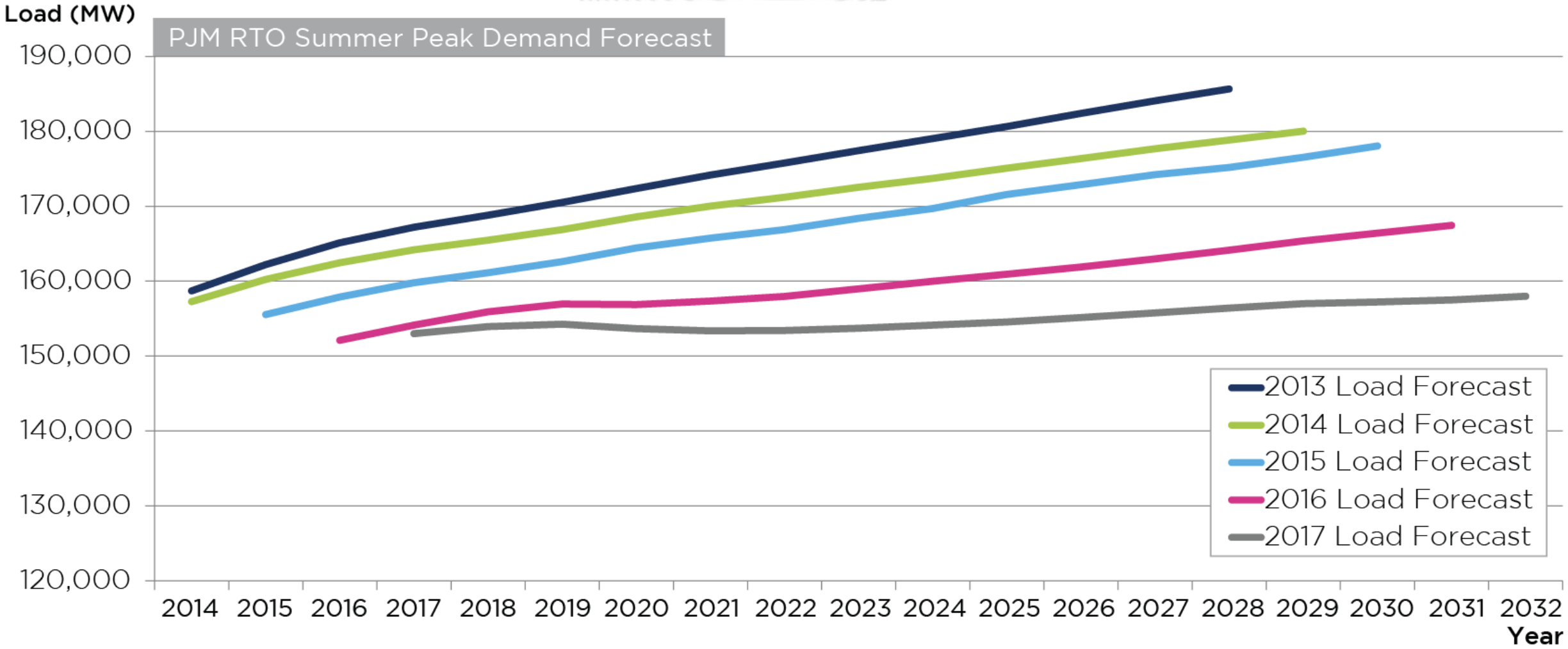
Queue	Project Name	MFO	Status	In Service Date	TO
	None				

Planning

Load Forecast

PJM Annual Load Forecasts

(January 9, 2017)



Michigan – 2017 Load Forecast Report

Transmission Owner	Summer Peak (MW)			Winter Peak (MW)		
	2017	2027	Growth Rate (%)	2016/17	2026/27	Growth Rate (%)
American Electric Power Company *	938	977	0.4%	682	719	0.5%
PJM RTO	**152,999**	**155,773**	**0.2%**	**131,391**	**134,915**	**0.3%**

***Note:** American Electric Power Company serves load other than in Michigan. The Summer Peak and Winter Peak MW values in this table each reflect the estimated amount of forecasted load to be served by American Electric Power Company solely in Michigan. Estimated amounts were calculated based on the average share of American Electric Power Company's real-time summer and winter peak load located in Michigan over the past five years.

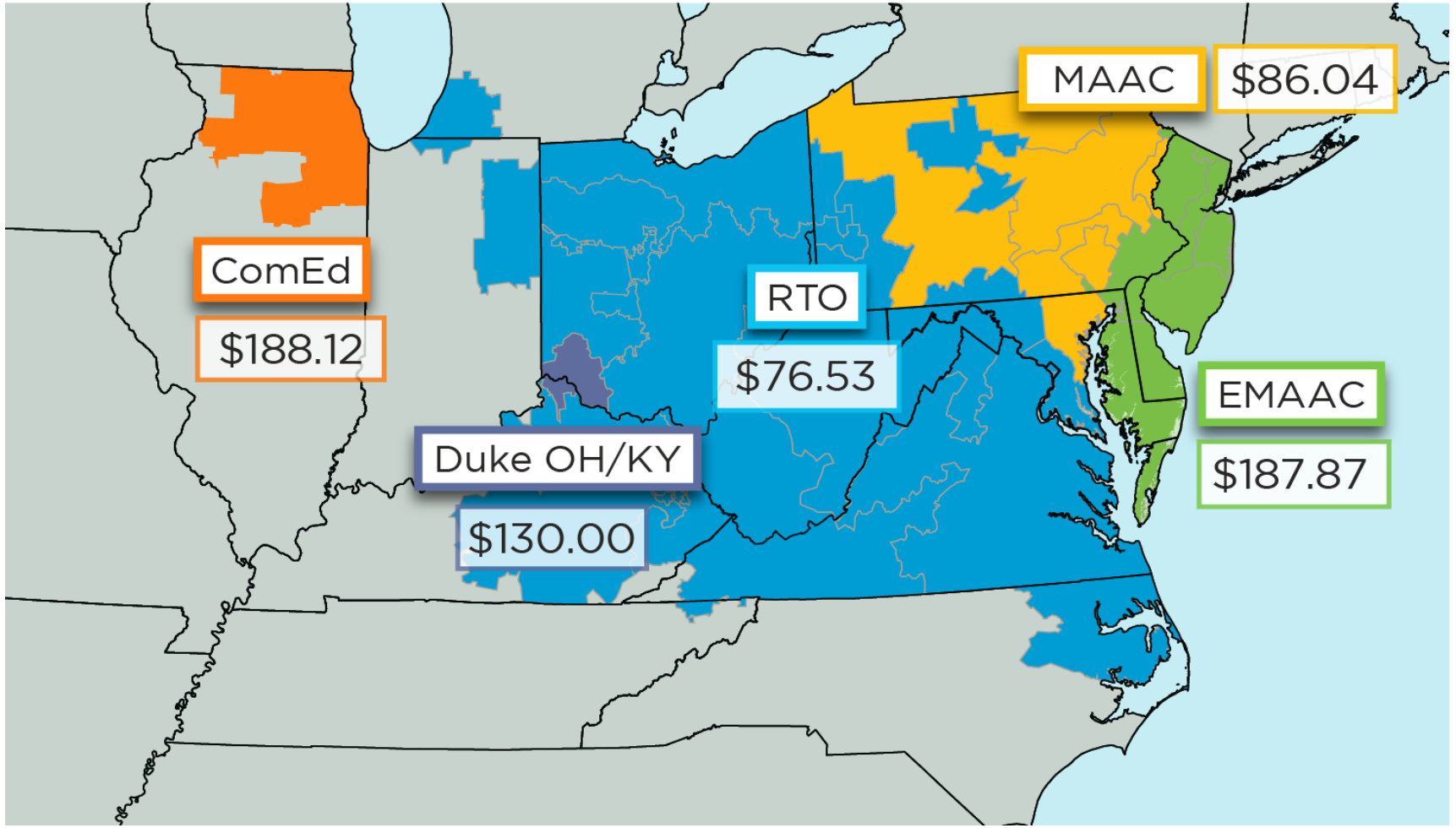
*PJM's 2017 forecast reflects methodology improvements implemented in 2016: variables to account for equipment and appliance saturation and efficiency, distributed solar generation adjustments and more refined treatment of weather data.

Markets

Capacity Market Results

PJM 2020/21 Auction Clearing Prices

(May 23, 2017)



Michigan - Cleared Resources in 2020/21 Auction

(May 23, 2017)

	Cleared MW (Unforced Capacity)	Change from 2019/20 Auction
Generation	1,192	219
Demand Response	28	(11)
Energy Efficiency	3	1
Total	1,223	209

RTO Locational Clearing Price
$76.53

NOTE: Demand Response and Energy Efficiency are reported to PJM by Transmission Zone. The numbers above reflect the state's pro-rata share of cross-state zones for illustrative purposes.

PJM - Cleared Resources in 2020/21 Auction

(May 23, 2017)

	Cleared MW (Unforced Capacity)	Change from 2019/20 Auction
Generation	155,976	882
Demand Response	7,820	(2,528)
Energy Efficiency	1,710	195
Total	165,506	(1,450)

Michigan – Offered and Cleared Resources in 2020/21 Auction

(May 23, 2017)

		Unforced Capacity
Generation	Offered MW	1,244
	Cleared MW	1,192
Demand Response	Offered MW	39
	Cleared MW	28
Energy Efficiency	Offered MW	5
	Cleared MW	3
Total Offered MW		1,288
Total Cleared MW		1,223

NOTE: Demand Response and Energy Efficiency are reported to PJM by Transmission Zone. The numbers above reflect the state's pro-rata share of cross-state zones for illustrative purposes.

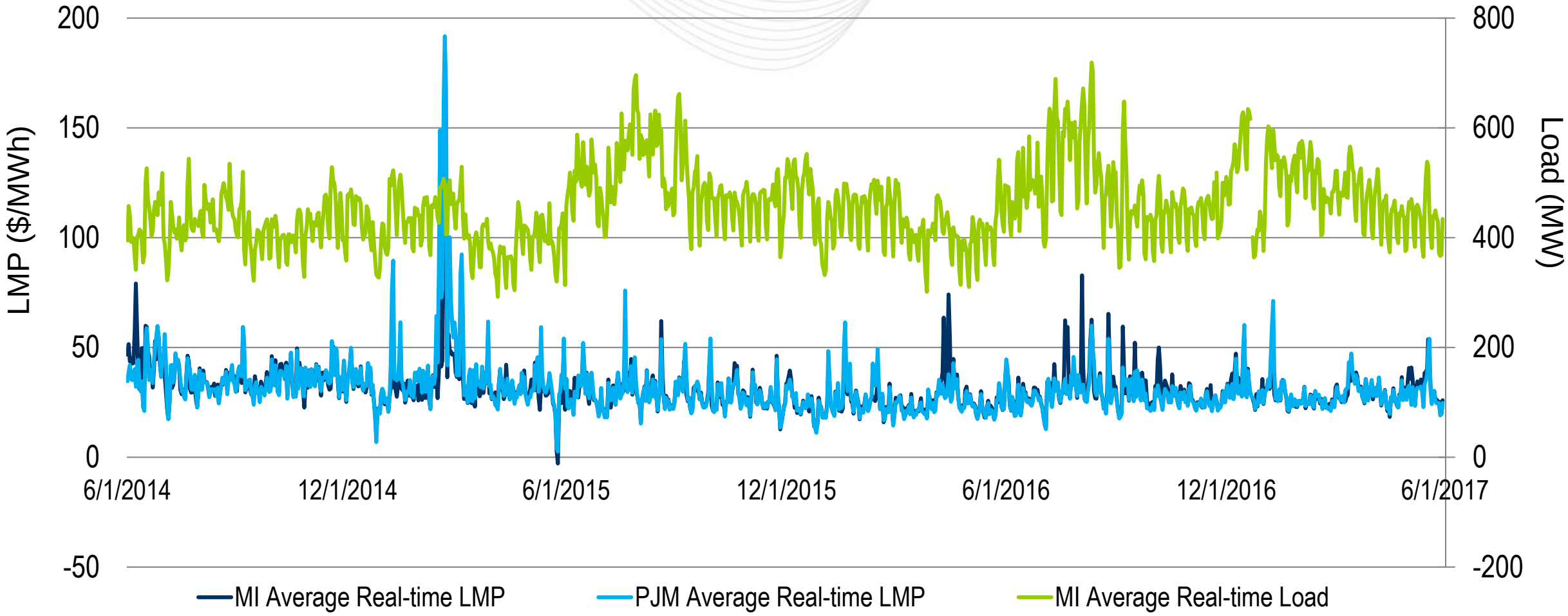
Markets

Market Analysis

Michigan - Average Daily Load and LMP

(June 1, 2014 - May 31, 2017)

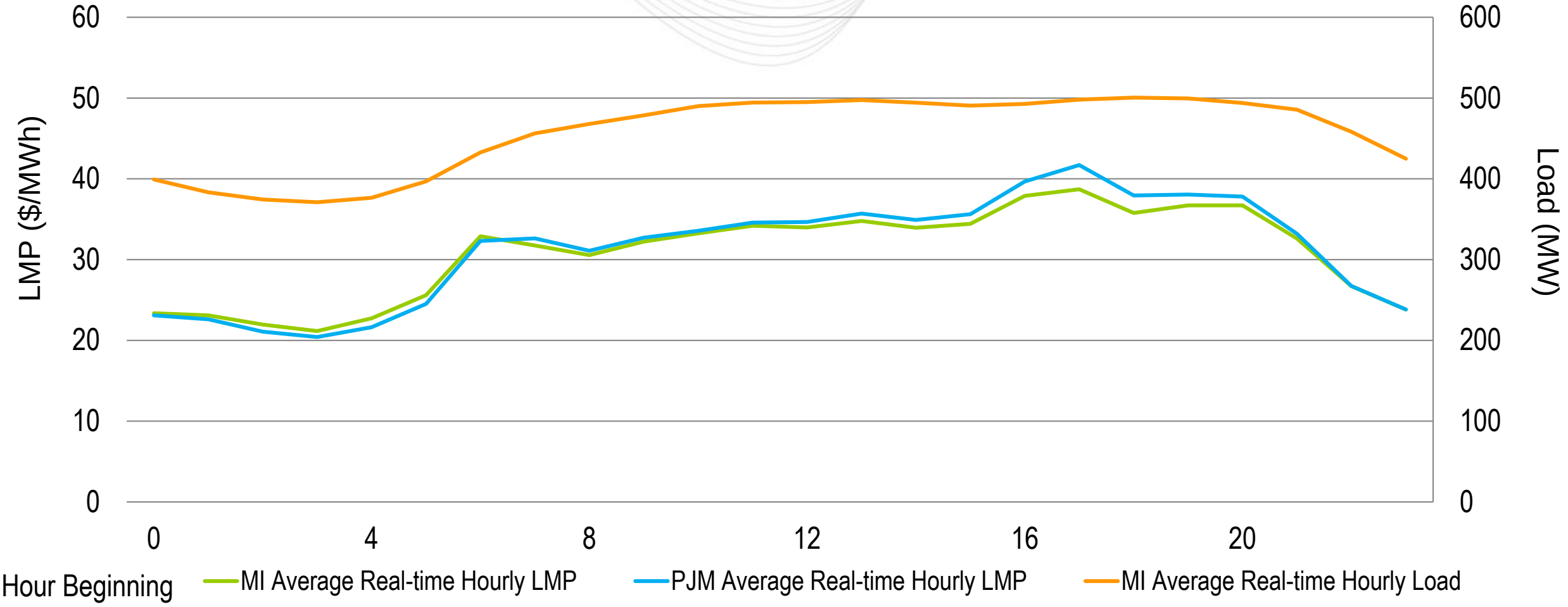
Michigan's average daily LMPs generally align with the PJM average daily LMP



Michigan – Hourly Average LMP and Load

(June 1, 2014 – May 31, 2017)

Michigan's hourly LMPs were similar to the PJM average.



Operations
Emissions Data

PJM - Average Emissions (lbs/MWh)

(December 31, 2016)