2019 Michigan State Infrastructure Report
(January 1, 2019 – December 31, 2019)

May 2020

This report reflects information for the portion of Michigan within the PJM service territory.
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   • Generation Portfolio Analysis
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• **Existing Capacity:** Nuclear represents approximately 66.7 percent of the total installed capacity in the Michigan service territory while natural gas represents approximately 32.9 percent. This differs from PJM where natural gas and nuclear are at 42.4 and 17.7 percent of total installed capacity.

• **Interconnection Requests:** Natural gas represents 70.9 percent of new interconnection requests in Michigan, while solar represents approximately 19.3 percent of new requests.

• **Deactivations:** No generation in Michigan gave a notification of deactivation in 2019.

• **RTEP 2019:** Michigan’s 2019 RTEP projects total approximately $34.8 million in investment. Approximately 64.7 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least $5 million.
• **Load Forecast:** Michigan’s load served within the AEP portion of PJM’s footprint is projected to grow at about 0.5 annually over the next ten years. Comparatively, the overall PJM RTO projected load growth rate is 0.3 percent.

• **2022/23 Capacity Market:** No Base Residual Auction was conducted in 2019. For most recent auction results, please see the 2018 Michigan State Infrastructure Report.

• **1/1/19 – 12/31/19 Market Performance:** Michigan’s average hourly LMPs generally aligned with PJM average hourly LMPs.
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, 2019)

- Coal, 52,838 MW
- Nuclear, 32,653 MW
- Natural Gas, 78,047 MW
- Waste, 849 MW
- Solar, 791 MW
- Oil, 9,424 MW
- Hydro, 8,332 MW
- Wind, 1,239 MW
Michigan – Existing Installed Capacity
(CIRs – as of Dec. 31, 2019)

- Nuclear, 2,154 MW
- Solar, 2 MW
- Hydro, 12 MW
- Natural Gas, 1,063 MW

Total: 3,231 MW
PJM – Queued Capacity (MW) by Fuel Type
(Requested CiRs – as of Dec. 31, 2019)

- Solar, 35,759 MW
- Other, 40 MW
- Nuclear, 169 MW
- Oil, 27 MW
- Natural Gas, 34,990 MW
- Storage, 3,920 MW
- Wind, 6,240 MW
- Wood, 66 MW
- Coal, 96 MW
- Diesel, 4 MW
- Methane, 1 MW
- Hydro, 520 MW
Michigan – Queued Capacity (MW) by Fuel Type
(Requested CIRs – as of Dec. 31, 2019)

Natural Gas, 1,230 MW
Nuclear, 38 MW
Solar, 335 MW
Storage, 131 MW
Methane, 1 MW

MI
1,735 MW

*Note: Nameplate Capacity represents a generator’s rated full power output capability.
Michigan – Percentage of MW in Queue by Fuel Type

(Dec. 31, 2019)

- Natural Gas
- Solar
- Storage
- Methane
- Nuclear
- Wind
- Coal
- Other
- RTO
- Hydro
- Oil
- Wood
- Diesel
- Methane
Michigan – Interconnection Requests
(Unforced Capacity – as of Dec. 31, 2019)

<table>
<thead>
<tr>
<th>Non-Renewable</th>
<th>In Queue</th>
<th>Complete</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Projects</td>
<td>Capacity (MW)</td>
<td>No. of Projects</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1</td>
<td>145.0</td>
<td>1</td>
</tr>
<tr>
<td>Nuclear</td>
<td>1</td>
<td>38.0</td>
<td>0</td>
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<tr>
<td>Other</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
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<tr>
<td>Storage</td>
<td>3</td>
<td>131.3</td>
<td>0</td>
</tr>
<tr>
<td>Renewable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methane</td>
<td>1</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td>Solar</td>
<td>4</td>
<td>334.8</td>
<td>1</td>
</tr>
<tr>
<td>Wind</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>10</strong></td>
<td><strong>649.9</strong></td>
<td><strong>2</strong></td>
</tr>
</tbody>
</table>

Note: The "Under Construction" column includes both “Engineering and Procurement” and “Under Construction” project statuses.
Michigan – Progression History of Interconnection Requests

Applications Received by PJM

3,643 MW

2,345 MW

Feasibility Studies Issued

Impact Studies Issued

Facilities Studies Issued

ISA/WMPA Executed

Facilities Constructed

In Service

2,319 MW

1,234 MW

Projects withdrawn after final agreement

0

Interconnection Service Agreements

0

Wholesale Market Participation Agreements

Percentage of planned capacity and projects that have reached commercial operation

34%

Requested capacity megawatt

47%

Requested projects

This graphic shows the final state of generation submitted in all PJM queues that reached in-service operation, began construction, or was suspended or withdrawn as of Dec. 31, 2019.
Michigan had no generation deactivation notifications in 2019.
Planning
Transmission Infrastructure Analysis
Please note that PJM historically used $5 million as the threshold for listing projects in the RTEP report. Beginning in 2018, it was decided to increase this cutoff to $10 million. All RTEP projects with costs totaling at least $5 million are included in this state report. However, only projects that are $10 million and above are displayed on the project maps.

For a complete list of all RTEP projects, please visit the “RTEP Upgrades & Status – Transmission Construction Status” page on pjm.com.

Michigan – RTEP Baseline Projects
(Greater than $10 million)

Legend
- Identified Reinforcement
- Transmission System Enhancement
- Substations >= 345 kV
- Transmission Lines >= 345 kV

Note: Baseline upgrades are those that resolve a system reliability criteria violation.
Michigan – RTEP Baseline Projects
(Greater than $5 million)

<table>
<thead>
<tr>
<th>Map ID</th>
<th>Project</th>
<th>Description</th>
<th>Projected In-Service Date</th>
<th>Project Cost ($M)</th>
<th>TO Zone</th>
<th>TEAC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>b3132</td>
<td>Rebuild 3.11 miles of the LaPorte Junction-New Buffalo 69 kV line with 795 ACSR.</td>
<td>6/1/2022</td>
<td>$12.3</td>
<td>AEP</td>
<td>6/17/2019</td>
</tr>
</tbody>
</table>
Michigan had no network project upgrades in 2019.

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
(Greater than $5 million)

<table>
<thead>
<tr>
<th>Map ID</th>
<th>Project</th>
<th>Description</th>
<th>Projected In-Service Date</th>
<th>Project Cost ($M)</th>
<th>TO Zone</th>
<th>TEAC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>s2090</td>
<td>Rebuild 6.7 miles of the 34.5 kV circuit Main Street-Hickory Creek circuit using 556 ACSR conductor. Rebuild 0.5 miles of the Langley-Main Street 34.5 kV branch starting from the Langley station, using 556 ACSR conductor.</td>
<td>2/3/2023</td>
<td>$22.5</td>
<td>AEP</td>
<td>10/25/2019</td>
</tr>
</tbody>
</table>
Planning
Load Forecast
PJM Annual Load Forecasts
(January 2020)

PJM RTO Summer Peak Demand Forecast

Load (MW)

- 190,000
- 180,000
- 170,000
- 160,000
- 150,000
- 140,000

Years:
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020

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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. 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.

The Load Forecast was produced prior to COVID-19 and will be updated before the next Base Residual Auction to reflect changes in load patterns.
Markets
Market Analysis
Note: The price spike in early July reflects several binding constraints that occurred on the transmission system. The spike in October reflects the Performance Assessment Interval event that occurred on October 2nd.
Michigan’s average hourly LMPs generally aligned with the PJM average hourly LMP.

<table>
<thead>
<tr>
<th>Load (MW)</th>
<th>PJM Average RT Hourly LMP</th>
<th>MI Average RT Hourly LMP</th>
<th>MI Average RT Hourly Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<tr>
<td>125</td>
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<td>250</td>
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<td>375</td>
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<td>48</td>
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<td>72</td>
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<td>96</td>
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<td>120</td>
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<td>144</td>
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<td>168</td>
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<tr>
<td>288</td>
<td>22</td>
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</tr>
</tbody>
</table>
This chart reflects the portion of Michigan that PJM operates. Positive values represent exports and negative values represent imports.
Operations
Emissions Data