2020 Indiana State Infrastructure Report
(January 1, 2020 – December 31, 2020)

April 2021

This report reflects information for the portion of Indiana within the PJM service territory.
1. Planning
   • Generation Portfolio Analysis
   • Transmission Analysis
   • Load Forecast

2. Markets
   • Market Analysis
   • Net Energy Import/Export Trend

3. Operations
   • Emissions Data
• **Existing Capacity:** Coal represents approximately 56.4 percent of the total installed capacity in the Indiana service territory while natural gas represents approximately 35.6 percent. Comparatively across PJM, natural gas and coal represent approximately 43.4 and 27.5 percent of capacity.

• **Interconnection Requests:** Solar represents 74.3 percent of interconnection requests in Indiana, while natural gas represents approximately 11.4 percent.

• **Deactivations:** Indiana had no generators give notice of deactivation in 2020.

• **RTEP 2020:** Indiana’s 2020 RTEP projects total approximately $279.3 million in investment. Approximately 52 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least $5 million.
• **Load Forecast:** Indiana’s load served within the AEP portion of PJM’s footprint is projected to grow at about 0.4 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 2020. For the most recent auction results, please see the 2018 Indiana State Infrastructure Report.

• **1/1/20 – 12/31/20 Market Performance:** Indiana’s average hourly LMPs generally aligned with the PJM average hourly LMP.

• **Emissions:** 2020 carbon dioxide, sulfur dioxide, and nitrogen oxide emissions are all down from 2019.
The PJM service area in Indiana 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, 2020)

Nameplate Capacity, 10,367 MW

Wind, 2,184 MW
Hydro, 8,275 MW
Solar, 1,015 MW
Nameplate Capacity, 3,700 MW
Oil, 8,629 MW

Coal, 50,689 MW
Natural Gas, 80,115 MW

PJM 184,396 MW

*Note: Nameplate capacity represents a generator’s rated full power output capability.
Indiana – Existing Installed Capacity
(CIRs – as of Dec. 31, 2020)

- Coal, 3,779 MW
- Natural Gas, 2,386 MW
- Wind, 531 MW
- Hydro, 5 MW
- Solar, 5 MW

Total: 6,705 MW
PJM – Queued Capacity (MW) by Fuel Type
(Requested CIRs – as of Dec. 31, 2020)

PJM
104,837 MW

Solar, 58,845 MW
Storage, 10,877 MW
Wind, 6,560 MW
Coal, 76 MW
Hydro, 559 MW
Diesel, 4 MW
Natural Gas, 27,804 MW
Nuclear, 81 MW
Oil, 31 MW
Indiana – Queued Capacity (MW) by Fuel Type
(Requested CIRs – as of Dec. 31, 2020)

IN
10,056 MW

Solar, 7,469 MW
Nameplate Capacity, 12,458 MW

Storage, 976 MW

Wind, 460 MW
Nameplate Capacity, 2,976 MW

Natural Gas, 1,150 MW

*Note: Nameplate capacity represents a generator’s rated full power output capability.
## Indiana – Interconnection Requests by Fuel Type
(Unforced Capacity – as of Dec. 31, 2020)

<table>
<thead>
<tr>
<th></th>
<th>Active</th>
<th>Under Construction</th>
<th>In Service</th>
<th>Withdrawn</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Projects</td>
<td>Capacity (MW)</td>
<td>Projects</td>
<td>Capacity (MW)</td>
<td>Projects</td>
</tr>
<tr>
<td>Non-Renewable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Coal</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>4</td>
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<tr>
<td>Natural Gas</td>
<td>2</td>
<td>1,100.0</td>
<td>1</td>
<td>50.0</td>
<td>5</td>
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<tr>
<td>Storage</td>
<td>14</td>
<td>976.3</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
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<tr>
<td>Renewable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methane</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
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<tr>
<td>Solar</td>
<td>78</td>
<td>7,469.4</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
</tr>
<tr>
<td>Wind</td>
<td>16</td>
<td>433.9</td>
<td>1</td>
<td>26.0</td>
<td>10</td>
</tr>
<tr>
<td>Grand Total</td>
<td>110</td>
<td>9,979.6</td>
<td>2</td>
<td>76.0</td>
<td>24</td>
</tr>
</tbody>
</table>

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

Applications Received by PJM

Projects withdrawn after final agreement

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>Nameplate Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Interconnection Service Agreements</td>
<td>71 MW, 420 MW</td>
</tr>
</tbody>
</table>

Percentage of planned capacity and projects that have reached commercial operation

- 14% Requested capacity megawatts
- 23% Requested projects

This graphic shows the final state of generation submitted to the PJM queue that completed the study phase as of Dec. 31, 2020, 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, 2020.
Indiana had no generators give notice of deactivation in 2020.
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.

https://www.pjm.com/planning/project-construction
Indiana – 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.
<table>
<thead>
<tr>
<th>Map ID</th>
<th>Project</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>b3151</td>
<td>Rebuild the ~30 mile Gateway-Wallen 34.5 kV circuit as the ~27 mile Gateway-Wallen 69 kV circuit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Retire the ~3 mile Columbia-Whitley 34.5 kV line.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>At Gateway station, remove all 34.5 kV equipment and install one 69 kV circuit breaker for the new Whitley line entrance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rebuild Whitley as a 69 kV station with two line and one bus tie circuit breakers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replace the Union 34.5 kV switch with a 69 kV switch structure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replace the Eel River 34.5 kV switch with a 69 kV switch structure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Install a 69 kV Bobay switch at Woodland Station.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replace Carroll and Churubusco 34.5 kV stations with the 69 kV Snapper station. Snapper will have two line circuit breakers, one bus tie circuit breaker and a 14.4 MVAR cap bank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remove 34.5 kV circuit breaker AD at Wallen station.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rebuild the 2.5 mile Columbia-Gateway 69 kV line.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rebuild Columbia station in the clear as a 138/69 kV station with two 138/69 kV transformers and four-breaker ring buses on the high and low side. Station will reuse 69 kV breakers J and K and 138 kV breaker D.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rebuild the 13 mile Columbia-Richland 69 kV line.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rebuild the 0.5 mile Whitley-Columbia City No. 1 line as 69 kV.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rebuild the 0.5 mile Whitley-Columbia City No. 2 line as 69 kV.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rebuild the 0.6 mile double-circuit section of the Rob Park-South Hicksville / Rob Park-Diebold Road as 69 kV.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required In-Service Date</th>
<th>Project Cost ($M)</th>
<th>TO Zone</th>
<th>TEAC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/1/2024</td>
<td>$113.00</td>
<td>AEP</td>
<td>11/22/2019</td>
</tr>
<tr>
<td>Map ID</td>
<td>Project</td>
<td>Description</td>
<td>Required In-Service Date</td>
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<tr>
<td>--------</td>
<td>---------</td>
<td>-------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>b3149</td>
<td>Rebuild the 2.3 mile Decatur – South Decatur 69 kV line using 556 ACSR in order to alleviate the overloads.</td>
<td>6/1/2024</td>
<td>$9.30</td>
</tr>
<tr>
<td>b3270</td>
<td>Install 1.7 miles of 795 ASCR 138kV conductor along the other side of Dragoon Tap 138 kV line, which is currently double circuit tower with one position open. Additionally, install a 2nd 138/34.5 kV transformer at Dragoon, install a high side circuit switcher on the current transformer at Dragoon Station, and install 2-138 kV line breakers on the Dragoon-Jackson 138 kV and Dragoon-Twin Branch 138 kV lines. Replace Dragoon 34.5 kV Breakers &quot;B&quot;, &quot;C&quot; and &quot;D&quot; with 40 kA breakers.</td>
<td>6/1/2025</td>
<td>$6.89</td>
</tr>
<tr>
<td>b3150</td>
<td>Rebuild Ferguson 69/12 kV station in the clear as the 138/12 kV Bear station and connect it to a ~1 mile double circuit 138 kV extension from the Aviation – Ellison Rd 138 kV line to remove the load from the 69 kV line.</td>
<td>6/1/2024</td>
<td>$6.40</td>
</tr>
</tbody>
</table>
Indiana – RTEP Network Projects
(Greater than $5 million)

Indiana had no network project upgrades in 2020.

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.
Indiana – TO Supplemental Projects
(Greater than $10 million)

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.
## 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>s2273</td>
<td>Rebuild the 1.25 mile long Anchor Hocking-Winchester 69 kV circuit. Expand and upgrade Anchor Hocking 69 kV station to a five-breaker ring bus to accommodate five elements (two transmission lines and three distribution transformers). Replace circuit breakers A and B at Winchester 69 kV station. At Modoc station, replace 138/69 kV Transformer No. 1. Install a three-breaker ring bus eliminating the three-terminal line. At Randolph station, replace 138/69/12 kV Transformer No. 1 with a 138/69 kV 90 MVA unit. Move the distribution load to a new 138/12kV transformer and install a 138 kV bus tie circuit breaker. Replace cap switcher AA. At Lynn station, install two 69 kV switches for sectionalizing. Replace the Huntsville (REMC) switch structure on the Modoc-Winchester 69 kV line. Rebuild the 13.4 mile Modoc-Winchester 69 kV line with 11.3 miles as single circuit and 2.1 miles as double circuit. Rebuild the 5.7 mile Buena Vista-Lynn 69 kV line as double circuit. Retire Lobdell station. Move the load from 69 kV to 12 kV. Retire Buena Vista Switch 69 kV.</td>
<td>8/1/2025</td>
<td>$68.50</td>
<td>AEP</td>
<td>5/22/2020</td>
</tr>
<tr>
<td>Map ID</td>
<td>Project</td>
<td>Description</td>
<td>Projected In-Service Date</td>
<td>Project Cost ($M)</td>
<td>TO Zone</td>
<td>TEAC Date</td>
</tr>
<tr>
<td>-------</td>
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</tr>
<tr>
<td>2</td>
<td>s2274</td>
<td>Rebuild a 4.17 mile portion of the Madison-Pendleton 138 kV single circuit line with DRAKE 795 ACSR 26/7. At Meadowbrook station, install two 138 kV circuit breakers to eliminate the three-terminal line.</td>
<td>5/1/2023</td>
<td>$10.50</td>
<td></td>
<td>5/22/2020</td>
</tr>
<tr>
<td>3</td>
<td>s2280</td>
<td>Replace Rockport CBs B, B2, C and C2 with 765kV SFMT 4000A CBs.</td>
<td>10/1/2024</td>
<td>$18.50</td>
<td></td>
<td>6/2/2020</td>
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<tr>
<td>4</td>
<td>s2344</td>
<td>Rebuild the ~5.8 mile 69 kV line from Colony Bay to the McKinley-Bass line. Add a 69 kV bus tie CB to Hadley station.</td>
<td>4/3/2023</td>
<td>$15.60</td>
<td>AEP</td>
<td>7/17/2020</td>
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<tr>
<td></td>
<td>s2196</td>
<td>Cut into the existing South Bend-New Carlisle 138kV line and install tap structures for the Ameriplex extension. Install 1.75 miles of double circuit 138kV, 795 ACSR, off of the New Carlisle-South Bend 138kV line between New Carlisle and Pine road to serve new Ameriplex station. Install new greenfield station Ameriplex on new greenfield Ameriplex 138kV tap off of the New Carlisle-South Bend 138kV line. The transmission through path consists of one 138kV breaker, one MOAB and one 138kV bus.</td>
<td>6/1/2021</td>
<td>$9.60</td>
<td></td>
<td>2/21/2020</td>
</tr>
</tbody>
</table>
### Indiana – 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>s2194</td>
<td>Rebuild the high side of Adams 138/69kV station as a 3 breaker ring bus, re-using the existing breaker “C,” and replace 69kV Breaker “D”</td>
<td>1/2/2026</td>
<td>$8.00</td>
<td>AEP</td>
<td>2/21/2020</td>
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<tr>
<td>s2194</td>
<td>Rebuild the through-path of Pennville 138kV station with 2 MOABS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s2212</td>
<td>Sullivan 765/345kV Station: Replace Sullivan CB A2 765kV CB and associated equipment.</td>
<td>2/1/2023</td>
<td>$7.10</td>
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<td>3/10/2020</td>
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<tr>
<td>s2193</td>
<td>Replace 69kV CB’s A and B and add a low side 69kV CB. Add 2 138kV CB’s on the line exits.</td>
<td>11/10/2021</td>
<td>$5.90</td>
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<td>2/21/2020</td>
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</table>
Indiana – Merchant Transmission Project Requests

<table>
<thead>
<tr>
<th>Queue Number</th>
<th>Queue Name</th>
<th>TO Zone</th>
<th>Status</th>
<th>Actual or Requested In-Service Date</th>
<th>Maximum Output (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE2-240</td>
<td>Olive-Reynolds 1 &amp; 2 345 kV</td>
<td>AEP</td>
<td>Active</td>
<td>6/1/2019</td>
<td>3,170</td>
</tr>
<tr>
<td>AFI-088</td>
<td>Sullivan 345 kV</td>
<td>AEP</td>
<td>Active</td>
<td>12/31/2025</td>
<td>1,000</td>
</tr>
<tr>
<td>AF2-008</td>
<td>Sullivan 345 kV</td>
<td>AEP</td>
<td>Active</td>
<td></td>
<td>2,000</td>
</tr>
</tbody>
</table>

Legend
- Merchant Projects
  - Under Study
  - Substations >= 345 kV
  - Transmission Lines >= 345 kV
Planning
Load Forecast
PJM Annual Load Forecasts

(PJM RTO Summer Peak Demand Forecast)

Load (MW)

- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021

Years: 2014 to 2036

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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/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
Market Analysis
### Indiana – Average Daily LMP and Load

<table>
<thead>
<tr>
<th>Date</th>
<th>PJM Average RT Daily LMP</th>
<th>IN Average RT Daily LMP</th>
<th>IN Average RT Daily Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mar 1</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>May 1</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Jul 1</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Sep 1</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Nov 1</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Jan 1</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

**Notes:**
- PJM Average RT Daily LMP
- IN Average RT Daily LMP
- IN Average RT Daily Load

**Graph:**
- The graph shows the trend of LMP ($/MWh) and Load (MW) over the period from Jan. 1, 2020, to Dec. 31, 2020.
- The graph includes lines for PJM Average RT Daily LMP, IN Average RT Daily LMP, and IN Average RT Daily Load.
- The y-axis represents LMP ($/MWh) ranging from 0 to 90, and the x-axis represents dates from Jan 1 to Jan 1 of the next year.
Indiana’s average hourly LMPs generally aligned with the PJM average hourly LMP.
This chart reflects the portion of Indiana that PJM operates. Positive values represent exports and negative values represent imports.
Operations
Emissions Data
2005 – 2020 PJM Average Emissions

**CO₂ (lbs/MWh)**

- 1300
- 1200
- 1100
- 1000
- 900
- 800
- 700

**SO₂ and NOₓ (lbs/MWh)**

- 9.0
- 7.5
- 6.0
- 4.5
- 3.0
- 1.5
- 0.0

- Carbon Dioxide
- Sulfur Dioxide
- Nitrogen Oxides

Years: 2005 to 2020
Indiana – Average Emissions (lbs/MWh)

(Feb. 2021)

CO₂ (lbs/MWh)

SO₂ and NOₓ (lbs/MWh)

- Carbon Dioxide
- Sulfur Dioxide
- Nitrogen Oxides
