Analysis of PJM Interconnection Queue Projects with Signed ISAs

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Objectives of this analysis

- Learn more about the characteristics of projects in PJM’s queue that have signed ISAs but are not yet built, using PJM’s online queue dataset
  - Data downloaded on June 20, 2023
- Highlight any patterns or trends around project type (technology, location, etc.) that might point towards causes of delayed commercial operations date (COD)
- Tee up questions for qualitative analysis (survey of project owners in collaboration with Columbia University) to more fully understand the reasons why these projects might be struggling to come online
Executive Summary – Project Status

RMI analysis of PJM’s publicly available queue data found 38 GW* of projects in PJM’s queue with signed ISAs that are not yet in service

• 7% of these projects are suspended**

• 93% remain in development (Engineering, Procurement, or Construction)

*Note: 38 GW is nameplate capacity.

** Suspended projects are those placed on hold but may ultimately still be built. Data in this deck was downloaded on June 20, 2023 from the PJM website.
Executive Summary – Project Technologies

Of the 38 GW of projects in PJM’s queue with signed ISAs:

- The most common technologies are solar (60%) and natural gas (24%)
- Compared to the overall queue, natural gas and solar are overrepresented while offshore wind and storage are underrepresented

*Includes all active projects in the queue
Executive Summary – Project Locations

Of the 38 GW of projects in PJM’s queue with signed ISAs:

- The top five states where these projects are located are
  - Ohio (25%)
  - Virginia (17%)
  - Illinois (12%)
  - New Jersey (11%)
  - Pennsylvania (10%)

Percentages are on a nameplate capacity basis.
Projects are not uniformly distributed across PJM

- **Natural gas** projects are few in number but large in size.
- **Solar** projects are clustered mainly in Ohio and Virginia.
- The coastline hosts several **offshore wind** projects.

Legend:
- Solar
- Storage
- Natural Gas
- Wind
- Oil
- Offshore Wind
- Coal
- Hydro
- Nuclear

Nameplate capacity (MW):
- > 1,270
- 600
- 1,000
- 300

Link to map
Top states by volume of projects with signed ISAs include OH, VA, PA, IL, and NJ

Top 5 States

1. Ohio (9.7 GW)
2. Virginia (6.6 GW)
3. Illinois (4.4 GW)
4. New Jersey (4.3 GW)
5. Pennsylvania (3.9 GW)

Includes Engineering & Procurement, Under Construction, Partially In Service—Under Construction, and Suspended projects
Among the projects with signed ISAs, suspension rates vary by project technology.

Note that projects can experience delays in any status category, not just “Suspended”
Projects with signed ISAs mainly entered the queue between 2017 and 2019

Median queue date: Sept. 2018
Mean queue date: July 2018

Interquartile range shown in red
Most of these projects expect to come online between 2023 and 2026

Median projected in-service date: Feb. 2024
49% of capacity to come online by end of 2023
There is significant variation by technology of when projects expect to come online

<table>
<thead>
<tr>
<th>Technology</th>
<th>March 2024</th>
<th>September 2023</th>
<th>August 2024</th>
<th>March 2024</th>
<th>September 2027</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td>n = 437</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Natural Gas</td>
<td>n = 29</td>
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<td></td>
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<tr>
<td>Wind</td>
<td>n = 14</td>
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<td>Storage</td>
<td>n = 36</td>
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</tr>
<tr>
<td>Offshore Wind</td>
<td>n = 6</td>
<td></td>
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</tr>
</tbody>
</table>

Median: Date of signed ISA is preliminary from scraping ISA PDFs and was obtained by Devan Samant (Columbia University) only for projects that entered the queue in 2017 or later.

Data on this slide was downloaded on May 16, 2023.
Whether projects are on track with their in-service dates varies by project technology, with some more likely to be past due.

**Key Takeaways**
- On average, 17% of project nameplate capacity is past its projected in-service date.
- There is significant variation by fuel type, with 34% of natural gas project capacity past its in-service date compared to 20% of clean energy projects (averaged).

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**Legend**
- **Light blue** bar represents the percent of capacity by technology that is past its projected in-service date.
- **Dark blue** bar represents the percent of capacity that has yet to pass its projected in-service date.
Projects took about **4 years** to get their signed ISAs compared to **<1 year** since receiving ISA.

Date of signed ISA is preliminary from scraping ISA PDFs and was obtained by Devan Samant (Columbia University) only for projects that entered the queue in 2017 or later.

Data on this slide was downloaded on May 16, 2023.
Natural gas projects received signed ISAs 24-30 months before clean energy projects, on average.

Date of signed ISA is preliminary from scraping ISA PDFs and was obtained by Devan Samant (Columbia University) only for projects that entered the queue in 2017 or later.

Data on this slide was downloaded on May 16, 2023.
Clean energy experienced 60% higher wait times to receive an ISA

<table>
<thead>
<tr>
<th>Technology</th>
<th>Median ISA Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>December 2020</td>
</tr>
<tr>
<td>Offshore Wind</td>
<td>October 2022</td>
</tr>
<tr>
<td>Solar</td>
<td>October 2022</td>
</tr>
<tr>
<td>Storage</td>
<td>March 2023</td>
</tr>
<tr>
<td>Wind</td>
<td>April 2023</td>
</tr>
</tbody>
</table>

Note: Almost all natural gas projects analyzed were uprates to existing facilities, which can lead to shorter wait times for ISAs due to the less extensive analysis required for interconnection.

Date of signed ISA is preliminary from scraping ISA PDFs and was obtained by Devan Samant (Columbia University) only for projects that entered the queue in 2017 or later.

Data on this slide was downloaded on May 16, 2023.
For projects that came online in 2022, completion rates vary by technology.

- **Natural Gas**: 63% completion rate
  - Projects with signed ISAs projected to be in service in 2022 or earlier
  - Projects that came into service in 2022

- **Solar**: 38% completion rate

Legend:
- Projects with signed ISAs projected to be in service in 2022 or earlier
- Projects that came into service in 2022
Throughout queue history, projects with signed ISAs have faced withdrawals

Withdrawn projects make up anywhere from 4% to 39% of total capacity with a signed ISA.

The ratio of in service and in progress projects varies. More mature technologies (natural gas, wind) have higher portions in service while more novel ones (solar, storage) are largely still in progress.

In progress includes the following statuses: Engineering & Procurement, Under Construction, Suspended, or Partially In Service — Under Construction.

Percentages are based on nameplate capacity and include all projects with signed ISAs for the entire queue dataset.
Analysis Conclusions

- 93% of projects with signed ISAs are still in some phase of development.
- The top technologies represented among these projects with signed ISAs are solar (60%) and natural gas (24%).
- The top five states are Ohio, Virginia, Illinois, New Jersey, and Pennsylvania.
- 17% of project nameplate capacity is past its projected in-service date.
  - 34% of natural gas capacity vs. 20% clean energy capacity.
  - ~50% of capacity expects to be in service by the end of 2023.
- Projects took, on average, four years to get their signed ISAs.
  - 2.5 years for natural gas vs. 4 years for clean energy, on average.
- Solar projects had lower completion rates in 2022 compared to natural gas.