



PJM Wholesale Market Participant Agreement Construction Guide

PJM Interconnection

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PJM WMPA Construction Information Sheet

For projects interconnecting to PJM through a Wholesale Market Participant Agreement (WMPA), primary responsibility for interconnection activities will be handled through the Transmission Owner. However, there are several areas in which PJM does require involvement, such as modeling, metering, markets and initial synchronization/initial operation.

The purpose of this document is to highlight the points where Project Developers need the involvement of PJM to ensure that the project is accurately modeled, that successful grid synchronization occurs and that PJM market setup is in place.

This is not intended to be a complete list but rather a high-level document for key areas of project development. If at any time a Project Developer has questions or concerns related to WMPA project development, they should contact their assigned PJM Construction Engineer (PJM CE). If a Project Developer is not aware who their PJM CE is, they should contact the PJM Project Manager who assisted in the writing of the WMPA.

The [Generator Onboarding FAQ](#) can provide answers to some common items needed to participate in the PJM market.

WMPA Milestone Dates

WMPA documents contain a list of key milestones that are required to be met in order to keep the project in good standing. The milestone list can be found in Article 3 of the WMPA. If a Project Developer feels that the dates cannot be met, then immediate contact must be made to their PJM CE. Furthermore, generation developers of WMPA projects should provide timely and regular (monthly) project updates via email to their PJM CE.

PJM Manual Requirements

It is strongly recommended that Project Developers read and understand, at a minimum, [PJM's Manual 14D](#) and [Manual 01](#). Specific focus should be given to the Market Operations Center (MOC) and Telemetry/SCADA requirements. In addition, if a project has requested Capacity Injection Rights, additional requirements may apply. These [manuals](#) and others can be found on PJM's website under "documents."

Modeling

All projects that participate in PJM wholesale markets are required to be modeled in PJM's Energy Management System (EMS). The modeling of generating facilities serves multiple roles, including the transmission system monitoring and generator payment. Therefore, reliable operational models are paramount. To this end, it is the responsibility of the Project Developer to ensure that PJM is provided with the most accurate modeling information.

PJM requires up to one year lead time to model a new facility. Therefore, Project Developers must submit single-line drawings to their PJM CE in a timely manner to allow the facility to be modeled in PJM's EMS.

A “Model Build Schedule” displaying the modeling cycle can be found on PJM’s website at [PJM.com](https://www.pjm.com) under the [Data Management Subcommittee webpage](#).

Typically, a single line with operational designations is acceptable. Equipment names should be finalized and the generator commercial name must meet the requirements in PJM Manual 14D, Section 1.2. Please remember that equipment and facility names will be eternalized once committed to PJM’s EMS. Therefore, please ensure careful consideration is made when determining names, as this is how both PJM and the Transmission Owner will refer to station equipment when making dispatch orders. Transmission Owners may be required to provide additional drawings from the point of interconnection to the nearest modeled transmission-level bus, especially if the point of interconnection is some distance from a transmission-level substation. It is the responsibility of the Project Developer to ensure that PJM receives this information prior to Model Build Schedule deadline.

Equipment Modifications

It is recognized that projects may need to install different equipment than what PJM and the respective Transmission Owner studied. If either of these applies to a project, immediate contact must be made to the PJM CE, as a restudy may be necessary to determine if a material modification has occurred. Failure to report project changes, as appropriate, could result in significant delay in initial operation and/or breach of the WMPA and possibly lead to termination and/or withdrawal from the interconnection queue.

Some examples of these types of changes are:

- Changing turbine model or type
- Changing photo voltaic modules and inverters
- Changing Generator Step-Up Transformer, adding Generator Step-Up Transformer(s) or any change that impacts transformer impedance

PJM will study the changes with a Necessary Study as detailed in [PJM’s Manual 14G](#), Section 4.5. A Necessary Study Agreement will need to be executed by the Project Developer and PJM. The data will need to be entered in [Queue Point](#) (use a new Impact Study form) and a \$25,000 deposit must be provided. The dynamic model, model report and checklist must be provided to PJM as detailed in Section 8 of the [Dynamic Model Development Guidelines](#) on PJM.com.

Telemetry/Metering

In addition to PJM’s [manuals](#) on PJM’s website under [PJM Tools](#), information can be found to assist Project Developers in meeting their metering and telemetry requirements.

Specifically, be sure to review the telemetry information below:

- [PJM’s Manual 01](#)
- [PJM’s Manual 14D](#)
- [Jetstream](#)

Marketing

All processes related to PJM market participation and PJM Tools will be set up by the PJM Client Manager Team. Please contact CMProjectTeam@pjm.com with any questions. The PJM CE and Client Manager Project Team need understanding with respect to the following general information:

- Who will be the PJM Market Participant representing the generator in PJM's market for:
 - Energy Markets (Day-Ahead/Real-Time)
 - Capacity (RPM; Ref: [PJM Manual 18](#)). Capacity resources have different telemetry obligations.
 - Other Markets (such as www.pjm-eis.com tracking of green energy credits)
- If the generator wants to become the Market Participant and PJM Member, they must apply for PJM Membership on the [Membership Enrollment page](#) of PJM.com.
- PJM Membership applications can take up to one year to complete and can be started on the PJM website. The [Membership Application Checklist](#) is a good resource to see the necessary steps.
- Will multiple units be marketed (multiple owners and/or off-takers) with separate billing requirements?
- Who will have the responsibility to send PJM operational and revenue data once operational (i.e., How will PJM receive real-time telemetry data? Who owns the telemetry link and what telemetry protocol will be used)?

Initial Start-up/Synchronization Procedures

Before a project synchronizes to the transmission system for the first time, coordination with PJM needs to be made. As the new facility does not appear in any PJM market, PJM has no formal indication of when and how much energy to expect on the system from the new facility. Therefore, in order for PJM to accurately account for initial injection energy, the Project Developer is required to supply PJM with a test energy schedule no later than one (1) week prior to initial synchronization. The PJM CE will share the test energy spreadsheet template, which indicates the maximum projected MW output to the transmission system for each generator for each hour of planned operation (or collective output for aggregated generation, such as wind or solar). The following instructions will be followed to successfully complete test energy:

- 1 |** At least three (3) business days prior to synchronizing, please send a test energy schedule using the test energy form (spreadsheet) received from your PJM CE. All fields must be filled in. This should consist of expected hours of operation and estimated output as seen to the transmission system. PJM will use this to begin notifying internal parties that you will be coming online, and appropriate preparation steps can be made.
- 2 |** Twenty (20) minutes prior to synchronization, the Generator (or Market Operations Center) must contact the PJM generation dispatcher, per standard operating procedure (PJM Manual 14D Section 6.3.3 & 7.4) to obtain approval to come online. The generation dispatch desk can be reached at 610.666.8807. Provide the generation dispatcher with the PJM Queue ID. Have your test energy form available for reference.
 - (a) PJM Manual 14D: "The Generator must obtain approval from PJM at least 20 minutes prior to synchronizing the facility to, or disconnecting the facility from, the PJM electrical system."

- 3 | Upon initial and stable operation (and generating 1 MW or more), the facility should call the Reliability Engineer’s desk at 610.666.4507 to verify real-time data and to allow PJM to start logging data.
 - (a) If there is an issue with metering, it is the project’s responsibility to facilitate troubleshooting.
 - (b) If after contacting the Reliability Engineer and telemetry is verified/accurate, the project should request to have the Reliability Engineer verify the unit is outputting in PJM's State Estimator correctly. This will begin logging data to PJM.
- 4 | A couple hours after you are outputting in PJM's State Estimator, the project will need to send an email with your hourly integrated output (revenue data) to Market Settlement Operations (mrkt_settlement_ops@pjm.com). This is to verify revenue data and link the telemetry to your billing account.
- 5 | Twenty (20) minutes prior to the unit coming offline, the Generator (or Market Operations Center) must contact the PJM generation dispatcher, per standard operating procedure (PJM Manual 14D Section 6.3.3 & 7.4), to obtain approval to come offline. The generation dispatch desk can be reached at 610.666.8807.

As-Built Drawings

After PJM determines a facility as Commercial Operation, it is required that PJM receive the final drawings for the installed equipment. Electronic copies of stamped drawings should be uploaded to Queue Point.

The PJM engineers reviewing the data will use the procedures outlined in the PJM [Dynamic Model Development Guidelines](#), which can be found on the [Applications & Forms page](#) on PJM.com. The data requirements are similar as would be done for a Necessary Study.

Revision History	
Revision 0	Document created. Final review completed December 2014.
Revision 1	Revised web links, Modeling, Telemetry and Marketing sections. Updated the Test Energy and initial sync instructions. Final review completed February 2024.