

# PJM Telemetry Data Exchange Summary



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# EXCHANGING TELEMETERED DATA WITH PJM INTERCONNECTION

Secure and reliable data communications is essential to the reliability services and market services centered at PJM. Data sent by a member to PJM may include real-time power flows and voltages, breaker statuses, revenue-grade accumulators, weather data, and regulation positions. Data sent by PJM to a member may include regulation setpoints, market values, and event notices. The data exchange between PJM and members is scalable to the size and reliability required.

This document describes the different tiers of communication methods, which are chosen based on the power capacity of the connecting asset and other factors. Configurations range from enterprise-class private network links to small Internet links. Each data link is uniquely configured to meet the needs of PJM and the member. The reference methods illustrated and described in this document are the starting point for design and development.

This document is a reference complimentary most directly to PJM Manual 1 and Manual 14D. All information in this document is subject to and superseded by PJM Manuals. Any information in this document that explicitly or implicitly adds to subjects covered in PJM Manuals should not be considered binding or authoritative as expected of a formal PJM Manual. This document is for reference only and is intended to help new and existing members understand data links with PJM.

Provided is a graph and description of communication methods. A frequently asked questions section is included for both over and under one-hundred megawatt assets. Definitions of technical terms are provided below.

## Technical Definitions:

**Demand Response** refers to load response assets and operations within PJM.

**DCS** is a Distributed Control System that often operates a power plant.

**DNP3** is a common data-level protocol to tie utility devices together. Less sophisticated.

**EMS** is an Energy Management System that can monitor and control generation or T&D.

**ICCP** is a common network-level protocol to tie control centers together. More sophisticated.

**Internet** is the worldwide public network. Not inherently secure and lower cost.

**PJMnet** is PJM's private wide area network. Inherently very secure. Higher regular cost.

**SCADA** is a Supervisory Control and Data Acquisition system.

**TCP/IP** is a set of ubiquitous protocols that form the basis for almost all modern network communications.

**Description of Standard Data Paths:**



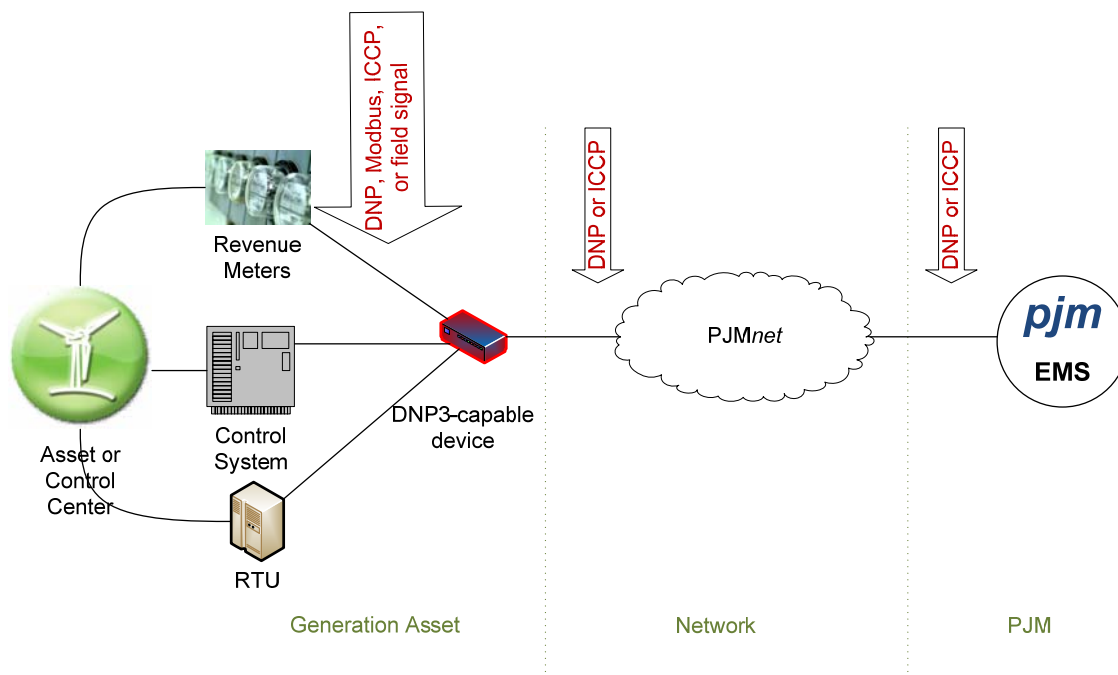
*PJM supports small and mid-sized asset data exchanges such as Methods 4, 5, and 6. These connections are generally less complex and less costly than larger-scale alternatives such as Methods 1, 2, and 3.*

	TOTAL CAPACITY	CONNECTING ASSET	PROTOCOL	COM DEVICE	NETWORK
Method 1	> 500 MW	 Control Center	ICCP	SCADA System	PJMnet (dual router)
Method 2		 Gen			
Method 3	100-500 MW	 Control Center	ICCP	SCADA System	PJMnet (single router)
Method 4		 Gen			
Method 5	< 100 MW Demand Response	 Gen	DNP3 Encrypted	Protocol Gateway w/ Encrypted DNP3 Support	Internet
Method 6		 Demand Response			

- **Method 1**
  - Large control centers, such as used by Transmission Owners, often connect their EMS to PJM with ICCP over a dual-router *PJMnet* network.
- **Method 2**
  - Large generating stations may have a dedicated SCADA connection to PJM similar in scope to a large control center.
- **Method 3**
  - Mid-sized control centers, which have aggregated more than one generating asset, may use ICCP over a single-router *PJMnet* network. Many power-plant-specific SCADA systems will natively support ICCP.
- **Method 4**
  - A mid-sized generating station may use the DNP3 protocol over *PJMnet*. Many providers and devices available to members will support DNP3 over TCP/IP (Ethernet) communications. A DNP3 over TCP/IP enabled device can connect directly to the *PJMnet* router. The communicating device may be as complex as the station DCS or as simple as a stand-alone protocol gateway.
- **Method 5**
  - A generating station with less than one-hundred megawatts of capacity can connect directly to PJM. PJM supports links over the public-domain Internet using specially encrypted DNP3 as the data protocol. This encryption method is not a published open-standard like DNP3 or ICCP. However PJM will provide details, guidance and resources for establishing this link.
- **Method 6**
  - Demand response assets, individually or aggregated to a control center, may receive signals for synchronized reserve events, regulation, or other market data through a dedicated encrypted DNP3 link similar to how a generating station would.

**FAQ for greater-than 100 MW Capacity Generation or Demand Response:**

- What devices can I use to connect to PJM?
  - PJMnet is a secure private network leased by PJM from Verizon or AT&T or both. Any device that supports DNP3 is highly likely to interoperate with the PJM system. Because DNP3 is a widely-known open-standard protocol, there are many manufacturers and device families that can be successfully employed. The possible device types include RTUs, individual protocol gateways, revenue meters, and power plant control systems.
  - It is the Member’s responsibility to ensure the device supports the DNP3 objects called for in Manual 14D.
- How do I get a PJMnet connection?
  - The process starts with the member filling out the PJMnet Telecommunications Request Form. See Manual 14D for details. The internal PJM review and Service Provider setup can take as long as four months to complete.
  - During the installation of PJMnet, a PJM router will be installed at the Member’s facility. The Member will connect their DNP3 device to the router.
- Who supports and maintains the link?
  - PJM will support the PJMnet network in conjunction with the network service provider. The Member is responsible for the DNP3 device and the quality, accuracy and completeness of the source data. PJM has startup and continuing 24/7 technical support for cooperative troubleshooting and maintenance of the link. The Member should likewise be prepared for 24/7 support.
- What costs are involved?
  - PJMnet is a service from PJM; no regular cost to the member is expected. Each full PJM member is entitled to one PJMnet link. Therefore, if the member operates more than one asset, PJMnet is usually established at the member’s control center or market operation center. The procurement and maintenance of the DNP3 slave device and all upstream data processes is the Member’s responsibility.



## FAQ for less-than 100 MW Capacity Generation or Load Response:

- What devices can I use to connect to PJM?
  - Because the Internet is not inherently secure and no clear standard for encrypted DNP3 links yet exists, PJM has a unique data encryption method for these links. PJM will provide guidance and resources necessary to develop an encrypted DNP3 link with PJM.
- What are the requirements for an encrypted Internet link?
  - Generally, a protocol gateway device with software features to establish and maintain an encrypted tunnel for DNP3 communications needs to be installed onsite.
  - Internet access is required. Satellite and cellular service have consistently underperformed land-lines. Landlines and static IP addresses are strongly recommended where available. The member is responsible for improving a network found to be insufficient.
- How would I connect my source equipment?
  - A protocol gateway can generally be configured to receive combinations of DNP3, Modbus and field-signals. For example, this enables communication directly to revenue meters or indirectly through an intermediary local control device. The gateway can compile the source data into one DNP3 slave for communication to PJM.
  - When there is a customer-owned and preferred RTU or other DNP3-capable device onsite, the gateway can be configured to be a 'pass-through'. In this mode PJM would talk DNP3 directly to the preferred device. The gateway transparently handles encryption.
- Who supports and maintains the link?
  - The Member is responsible for activities and costs associated with:
    - The protocol gateway and associated hardware: including maintenance, repair, and PJM-required upgrades
    - Source data: including the quality, accuracy and completeness
    - The site Internet service
  - Cooperative troubleshooting of DNP3 communications is supported by PJM. The member should likewise be prepared for 24x7 support of the link.
- What costs are involved?
  - A turnkey contract to procure, configure, install and commission a link may total around \$10,000. This will vary by geographic region and complexity of the installation. The cost may be reduced for Members who are able to install and configure a gateway device using in-house resources.
  - The data link requires only existing Internet Service and in most cases only requires moderate firewall adjustments.

