

# **Advanced Technology Pilot Program**

## **Project Guidelines**

**PJM Interconnection, L.L.C.**





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# 1 Introduction

## 1.1 Goal of pilot projects

PJM is well-positioned as a credible organization with a solid reputation to provide insight and analysis that fosters innovation and transformation of the industry. PJM's Advanced Technology Pilot program ("Pilots") represent our continuous effort to open PJM's markets to a new and diverse set of valuable resources that complement existing generation. The Pilots will help emerging new energy resources to explore all opportunities to fully participate into PJM's markets.

The Pilots will provide PJM with experience to learn technology impacts, enabling us to better manage and influence our future. Any potential technology advancement from the Pilots will provide PJM an opportunity to further enhance market efficiency, system reliability and operational control.

## 1.2 PJM's role and responsibility

The Pilots will be conducted in a collaborative manner, among PJM, members, and/or external vendors. With no financial interest in any project, PJM will open to all project proposals and fairly treat all project candidates.

As a neutral party, PJM will fill the role of Educator, Facilitator, and Coordinator in the Pilots. PJM believes each pilot project may experience 3 phases: Initiation, Planning and Implementation. The corresponding responsibilities by PJM are defined in the table below.

Phase Name	Phase description	PJM Responsibilities
Initiation	Discussion Phase	<ul style="list-style-type: none"> <li>Facilitate project initiation and information exchange</li> <li>Host or participate market discussion and help market selection</li> <li>Provide education or get education on technology</li> <li>Provide guidelines to pilot project (training session can be set up)</li> </ul>
Planning	Action Phase	<ul style="list-style-type: none"> <li>Processing in Planning queue (if applicable)</li> <li>Help processing NDA and Membership application</li> <li>Share public data and support data analysis</li> </ul>
Implementation*	Pilot Activation Phase	<ul style="list-style-type: none"> <li>Support joint testing of communication links with PJM system</li> <li>Set up and activate interfaces for control signals or real-time data</li> <li>Provide training and guidance on market participation</li> </ul>
Executing	Resource is actively participating in the markets	<ul style="list-style-type: none"> <li>Manage the data connection</li> <li>Provide support for any questions that may arise</li> </ul>

\*Note: Resources that are going directly into production are handled by PJM's Customer Service department. In these instances, the pilot program team will monitor the progress, but will not be directly involved in the actual implementation.

## 1.3 Pre-requisites

### 1.3.1 NDA Process

The Pilots candidates are required to sign PJM's None Disclosure Agreement (NDA) if there is any exchange of proprietary company information. Without the NDA, only the information that can be accessed on the public domain (i.e. [www.pjm.com](http://www.pjm.com)) is allowed to share with a project candidate.

PJM members are not obligated to PJM NDA by default. They would only be required to sign the NDA if PJM are exchanging proprietary company information in preparation to possibly procure product or services from the member.

To start the NDA process and look for more details, a pilot project candidate can directly contact PJM Customer Service (610-666-8980) for help.

### 1.3.2 Membership

PJM membership is NOT required to participate in Pilots.

PJM membership is required as long as an external party intends to

- Participate in any of PJM markets and pursue financial benefits from PJM market(s); OR
- View and use any data/information that PJM treats confidential to members only.

The details for membership application can be found in Section 3.2 below.

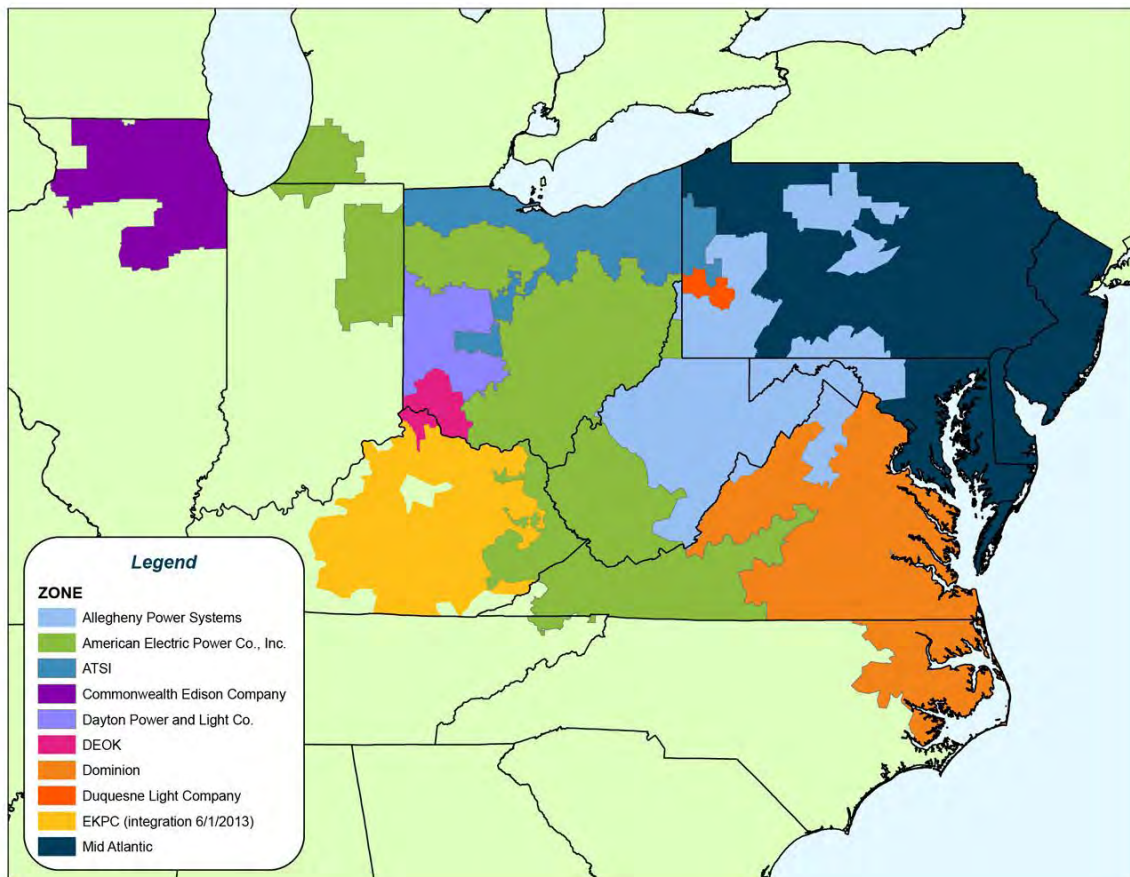
## 2 PJM Markets

PJM’s competitive wholesale electricity market began operating in 1997. Based on its success, PJM has led a dynamic process that has expanded the number and kinds of markets available to its members.

In developing new markets for wholesale electricity services, PJM employs a collaborative process to establish systems and rules that ensure that the markets operate fairly and efficiently. The market rules endorsed by the collaborative (stakeholder) process or deemed essential by PJM’s independent Board of Managers are subject to review and approval of the Federal Energy Regulatory Commission.

Using sophisticated information technology, PJM offers a variety of online resources and eTools to assist market participants in conducting business. The independent external market monitor evaluates PJM’s operations and markets to detect design flaws in the operating rules, standards and practices or structural problems in the markets that may need to be addressed.

Figure 1: PJM Control Zones



## 2.1 Capacity Market

PJM Capacity Market, Reliability Pricing Model (RPM), is designed to ensure long-term resource adequacy and competitively priced delivered energy. Through locational capacity pricing to recognize and quantify the locational value of capacity, RPM aligns the price paid for capacity with overall system reliability requirements.

RPM provides forward investment signals to all existing or potential members. The higher auction clearing prices in the constrained areas provide incentive to:

- Build new resources (generation, DR, or EE resources) in the constrained region
- Either not retire a unit, or to re-activate an existing unit that had been mothballed
- Build new transmission from the unconstrained to the constrained region (increasing the import limit)

RPM training materials can be found at PJM Training Material (<http://www.pjm.com/training/training-material.aspx>). PJM also provides training classes on RPM and other markets on a regular basis. The training events and registration are accessible at PJM Training Events (<http://www.pjm.com/training/training-events.aspx>.)

## 2.2 Energy Market

PJM coordinates the continuous buying, selling, and delivery of wholesale electricity through its day-ahead and real-time energy markets. In its role as market operator, PJM balances the needs of suppliers, wholesale customers, and other market participants while analyzing market activities to ensure open, fair, and equitable access.

PJM's energy markets operate much like a stock exchange with market participants establishing a price for electricity by matching supply and demand. The market uses locational marginal pricing that reflects the value of the energy at the specific location and time it is delivered. If the lowest-priced electricity can reach all locations, prices are the same across the entire grid. When there is transmission congestion, energy cannot flow freely to certain locations. In that case, more expensive electricity is required to meet that demand. As a result, the locational marginal price (LMP) is higher in those locations.

Locational marginal pricing (LMP) reflects the value of the energy at the specific location and time it is delivered. LMPs are calculated by PJM's computer systems and posted on [www.pjm.com](http://www.pjm.com) every five minutes. This enables market participants to factor the information into their decision-making. (The current system demand, forecast demand, and zonal LMPs are shown on the PJM home page, and additional LMP information is available by choosing "Operational Data" or "eData Guest Login" from the Quick Links on the home page.)

## 2.3 Ancillary Service Market

Ancillary services support the reliable operation of the transmission system as it moves electricity from generating sources to retail customers.

Currently, PJM operates markets for the following ancillary services: Regulation, Synchronized Reserve, and Day-ahead Scheduling Reserve.

**Regulation service** corrects for short-term changes in electricity use that might affect the stability of the power system. It helps match generation and load and adjusts generation output to maintain the desired frequency. Load-serving entities (LSEs) can meet their obligation to provide regulation to the grid by using their own generation, by purchasing the required regulation under contract with another party, or by buying it in the Regulation Market.

- Performance-based Regulation (PBR) is a new market structure that PJM implemented on October 1, 2012 as part of compliance with FERC's Order 755. This new structure is designed to align compensation with actual performance for resources that provide regulation service to PJM. The previous market structure made uniform payments to resources that qualify at a minimum threshold. Unlike the old market structure, PBR aligns compensation with the actual performance and benefits each resource provides to the system. Resources are provided correlated compensation for their accuracy, speed, and precision of response in providing Regulation service to the system. The overall intent of this new market structure is to incentivize better performance in response to PJM's Regulation signal. It is believed that this better performance will ultimately lower the total number of Megawatts needed to provide Regulation, and thereby lower system costs for all PJM customers.

**Synchronized Reserve service** supplies electricity if the grid has an unexpected need for more power on short notice. The power output of generating units supplying synchronized reserve can be increased quickly to supply the needed energy to balance supply and demand. Demand resources also can bid to supply synchronized reserve by reducing their energy use on short notice. LSEs can meet their obligation to provide synchronized reserve to the grid by using their own generation, by purchasing it under contract with another party, or by buying it in the Synchronized Reserve Market.

**Day-Ahead Scheduling Reserve service** is required to obtain supplemental 30-minute reserves that may be needed to deal with unanticipated system conditions during the actual operating day. LSEs can meet their obligation to provide day-ahead scheduling reserve to the grid by using their own generation, by purchasing it under contract with another party, or by buying it in the Day-ahead Scheduling Reserve Market.

## 2.4 Demand Response

Demand response means a reduction in the consumption of electric energy by customers from their expected consumption in response to an increase in the price of electric energy or to incentive payments designed to induce lower consumption of electric energy. While future demand response will expand to include customers reducing demand by responding to dynamic rates that are based on wholesale prices (price-responsive demand), the current PJM DR structure focuses on resources that can provide demand response that acts as a resource in wholesale markets to balance supply and demand.

## 3 Participation Requirements: Regulation Market

This document is to help Demand Response resources (or other demand-side aggregated resources) to know how to participate into PJM Regulation market. We will expand this section to cover other markets and resource types in the near future.

### 3.1 Membership requirements and application

Under the general principles mentioned in Section 1.3.2, a resource owner who will receive real-time regulation signals from PJM, requires PJM membership. The PJM Operating Agreement (<http://www.pjm.com/about-pjm/member-services/~media/documents/agreements/oa.ashx>) outlines the rights and responsibilities of PJM members. Section 11 of the agreement also describes the requirements a party must meet to qualify for membership.

PJM has a credit policy that applies to all new applicants, members, market participants and transmission service customers who use services or participate in the PJM markets. The policy may be viewed in attachment Q of the PJM Tariff (<http://www.pjm.com/about-pjm/member-services/~media/documents/agreements/tariff.ashx>).

Unless otherwise discussed, pilot candidates are not required to be PJM member before starting the project. It is really up to what the pilot project targets and what role the pilot candidate will play in the project. For example, if a pilot candidate provides technical solutions to an existing member to improve the resource control efficiency or allow the member owned resources to enter more markets than before, the pilot candidate is not required to be a PJM member.

Besides, as described in Section 1.2, at the initiation phase of a pilot project, a pilot candidate can work with PJM to exchange information and get desired training on technology and project guidelines. The candidate does not have to be a member at this phase.

### 3.2 Training requirements

Demand Response resources must complete initial training on Regulation and Synchronize Reserve markets as detailed in Manual 01 (<http://www.pjm.com/~media/documents/manuals/m01.ashx>) and Manual 40 (<http://www.pjm.com/~media/documents/manuals/m40.ashx>). Online training can be found at <http://www.pjm.com/training/~media/training/core-curriculum/ip-dsr/dsr-in-the-ancillary-service-markets.ashx>.

More specifically, Demand Response resources wishing to participate in PJM's Regulation or Synchronized Reserve Market must meet the following training requirements:

- Attendance by a representative of each Curtailment Service Provider (CSP, either in-person, or Internet-based self study) at initial training on the requirements and business rules of the Regulation and Synchronized Reserve Markets and the PJM All-Call responses.
- Curtailment Service Providers are responsible for ensuring the Demand Response customers understand their obligations if providing Regulation or Synchronized Reserve.



- Upon verification of completion of this training and that other requirements are met, PJM will enable the ability of those companies to submit offer data into the Regulation and Synchronized Reserve Markets.

Demand Response resources don't have to be PJM member before taking the initial training mentioned above. But the training has to be done before participating in the regulation market. They would need to contact PJM State and Member Training group to identify themselves and their operators. PJM then would set them up with the online course so that PJM can track the completion.

### 3.3 Control data requirements

Each NERC Balancing Authority is responsible to maintain balance within their respective territory. PJM maintains its balance by a security constrained economic dispatch which sends price signals indicating a raise or lower in the generation or consumption of individual resources to match demand on the system.

Regulating resources must be electrically located within PJM RTO. More specifically, a regulating resource must:

- have real-time telemetry
  - Internet SCADA for Demand up to 100 MW or PJMNet connection for larger than 100 MW
  - Internet SCADA installed at customer expense
- be able to receive regulation signal (REGA OR REGD)
- be able to respond automatically to regulation signal with Power Flow, REGAFB, TREG, and Base Point
- demonstrate minimum performance standards
- exhibit satisfactory performance on dynamic evaluations
- adequately telemeter MW output to PJM control center
- telemeter total regulation MW to PJM control center

#### 3.3.1 AGC regulation signal

Automatic Generation Control (AGC) provides an important function in balancing supply and demand on the bulk electric grid. The AGC calculates the balance of supply and demand using real-time telemetry, and the balancing difference is the Area Control Error (ACE).

Each Balancing Authority is required<sup>1</sup> to maintain a pool of regulating resources controlled by an AGC. In PJM, the AGC generates signals to participating resources to raise or lower their real-time output or consumption to minimize the ACE.

PJM's AGC allows aggregation of individual resources into "fleets" to minimize telemetry requirements. PJM communicates regulation signals via telemetry to the participating companies, who in turn relay the signals to the regulating resources. The participating resources incorporate the regulation signal into their control algorithms to adjust the energy injected or withdrawn from the grid, and telemeter those values back to PJM for compliance verification.

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<sup>1</sup> See NERC Standard BAL-005, Automatic Generation Control, <http://www.nerc.com/docs/standards/rs/retired/BAL-005-0.pdf>

### 3.3.1.1 Resource aggregation

- The Pilot candidates will need to define the geographic areas within PJM for which they will be aggregating their resources so that PJM can handle the regional AGC signal accuracy requirements.

The regulation market currently clears on an individual resource level (generating unit, demand side resource). PJM currently supports aggregating multiple generators into a single dispatchable generating unit for market purposes. Demand side aggregation is currently limited by business rules that require separating resources into distinct registration identifiers.

PJM's implementation of AGC requires that resources that reside in the same PJM Control Zones are grouped into "fleets", regardless of the type of regulation signal.

### 3.3.1.2 Signal type

- The Pilot candidates will need to specify the regulation signal type requirements for their resources.

The traditional regulation signal that is used for steam and other slower responding units is derived from the ACE which has both frequency and a tie error component. The frequency error is calculated from the filtered actual frequency and the scheduled frequency. The interchange error is calculated from the actual net interchange and the scheduled interchange. The scheduled interchange is the sum of the EES schedule, the total dynamic schedule and the total shared reserve schedule. The frequency and interchange errors are summed and then filtered using a standard proportional – integral (PI) controller. The PI controller output is then filtered using a first order exponential filter to produce the standard REGA signal. This filtered signal is used to accommodate the slower ramp rates of the steam units.

The Dynamic regulation signal that is used for fast-responding resources is derived from the ACE, which has both frequency error and a tie error component. The frequency error is calculated from the filtered actual frequency and the scheduled frequency. The tie error is calculated from the actual net interchange and the scheduled interchange. The scheduled interchange is the sum of the EES schedule, the total dynamic schedule and the total shared reserve schedule. The frequency and interchange errors are summed and then filtered using a standard proportional – integral (PI) controller. This signal is then normalized and RTO Treg limited. This regulation signal takes into account the RTO frequency and tie error.

**Figure 2: Resource Type and Corresponding Signal (EXAMPLE AND SUGGESTION)**

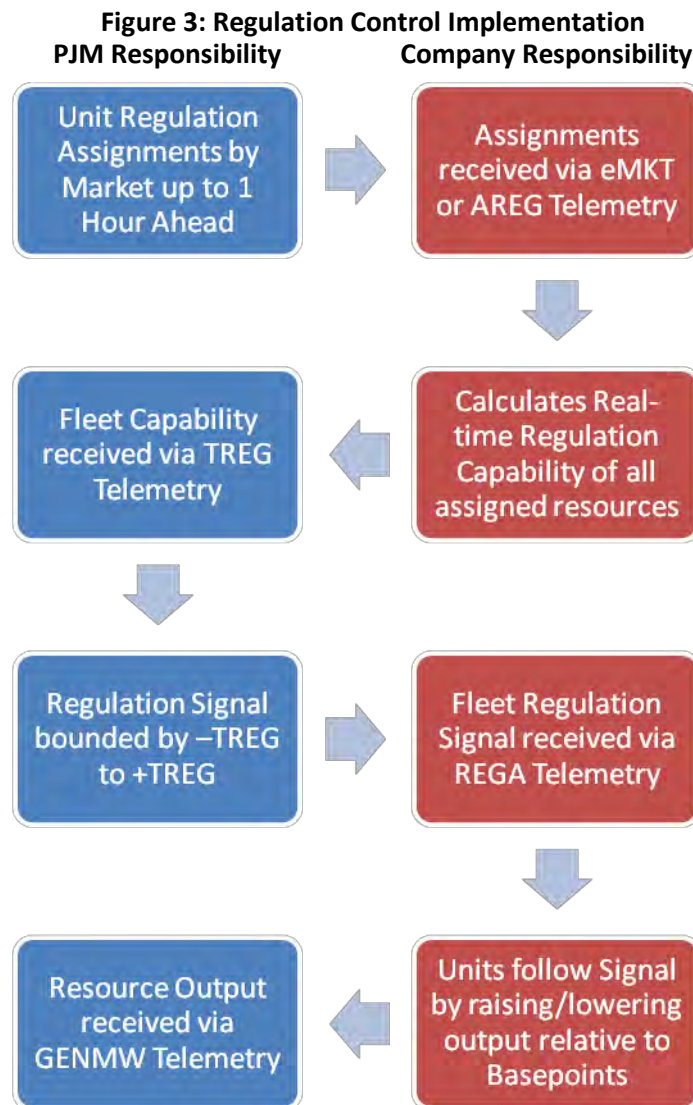
A Resource like a ...	Will want to use a ...	A Raise will mean ...	A Lower will mean ...
<b>Fossil Generator (Steam, Combined Cycle, Combustion Turbine)</b>	Traditional Signal	Increasing Generation Output	Decreasing Generation Output
<b>Hydroelectric Generator</b>	Traditional Signal	Increasing Generation Output	Decreasing Generation Output
<b>Battery</b>	Dynamic Signal	Discharge Energy	Charge Energy
<b>Flywheel</b>	Dynamic Signal	Spin Down / Inject	Spin Up / Withdrawal
<b>Demand Side Resource</b>	Traditional or Dynamic Signal	Decrease Consumption	Increase Consumption

Note: Traditional/Frequency-only Signals are defined in Section 3.3.1.2 below.

### 3.3.2 AGC interfacing

After regulation assignments are generated by PJM ancillary service market and validated by dispatch, the assignments are transferred from the market to the AGC. Real-time regulation assignments (AREG) on a resource level can be communicated to the company via ICCP if desired. It is expected that the company communicates with its resources to determine the capability to provide regulation service; there are many instances where real-time conditions may impact the ability to raise/lower output. The company will telemeter a total regulation capability back to PJM in the form of a single MW value per fleet, called Total Regulation (TREG). Ideally, the fleet TREG should equal the sum of assignments over all resources in the fleet.

PJM will generate a fleet regulation signal (REGA, in MW) for the company based on the signal type above, but bound the signal by +TREG/-TREG. PJM will not ask your resources to raise or lower for more energy than what the company informs PJM as their capability, so real-time support of TREG is critical. The company will receive the fleet REGA, and will split regulation service among the assigned resources in the fleet. The company will telemeter the real-time energy output of the individual resources back to PJM for compliance validation to validate service participation.



### 3.3.3 Meter Standards

Production metering requirements for Regulation participation are defined in Manual 12 Section 4.4.2 Regulation Signals (<http://www.pjm.com/~media/documents/manuals/m12.ashx>). The following signals will not necessarily be exchanged for Pilots.

Resource owners will receive from PJM:

- AReg – Assigned Regulation. This is the assigned hourly regulation quantity (MW) that is cleared from the regulation market system. It is assigned for each individual resource that is qualified to regulate in the PJM market. This value, although typically static for the hour, will be sent on a 10 second scan rate.
- RegA or RegD – Real-time instantaneous resource owner fleet regulation signal (+/- MW). This signal is used to move regulating resources in the owner’s fleet within the fleet capability (+/- TReg). This value will be sent on a 2 second scan rate.

Resource owners will send to PJM:

- TReg – Total Regulation. This is the real-time fleet regulation capability (MW) that represents the active resource owner’s ability to regulate. Ideally the value of this quantity should be the sum of the resource owner’s non-zero AReg quantities for the majority of the hour, but must reflect any reductions in regulating capability as they occur (unit LFC limit restrictions, resource “off control” conditions, etc.). This value shall be calculated every 2 seconds and sent on a 2-second scan rate.
- CReg – Current Regulation. This is the real-time fleet regulation feedback (+/- MW) that represents the active position of the fleet with respect to the +/- TReg capability. Ideally the value of this quantity will track the RegA or RegD signal if the regulating fleet is responding as prescribed. This value shall be calculated every 2 seconds and sent on a 2-second scan rate.

## 3.4 Regulation Testing

After a resource has installed metering and completed its communication pathways to PJM, the resource is ready to begin testing its regulation performance.

Detailed descriptions of Regulation Testing can be found in Manual 12 Section 4.5 Qualifying Regulation Resources (<http://www.pjm.com/~media/documents/manuals/m12.ashx>).

The Regulation Testing process tests two important factors for regulating resources, response time and sustainability. A regulating resource is expected to be able to adjust its output to match the regulation signal in 5 minutes, and sustain that match for an additional 5 minutes.

**Figure 4: Resource Type and Testing**

A Resource like a ...	Needs to test ...
<b>Fossil Generator (Steam, Combined Cycle, Combustion Turbine)</b>	Response rate, to determine maximum regulation offer
<b>Hydroelectric Generator</b>	Response rate, to determine maximum regulation offer
<b>Battery</b>	Sustainability, maintaining output at extreme raise/lower conditions
<b>Flywheel</b>	Sustainability, maintaining output at extreme raise/lower conditions
<b>Demand Side Resource</b>	Response rate, to determine maximum regulation offer

Testing is also important, in that it is used as a tie-breaker for clearing resources with equal merit order prices in the Regulation Market. Scores are generated

The generation of test signals is handled automatically by the AGC. Tests are performed on the fleet level, and it is the company's responsibility to block any basepoint changes on the resources for the duration of the test.

Resource owners are encouraged to communicate a desire to test to the Regulation Testing email group ([regulationtesting@pjm.com](mailto:regulationtesting@pjm.com)) at least a day in advance, and again on the testing day, communicate with PJM Dispatch at least 30 minutes in advance to set up the test. PJM will set up the test in AGC, and at the agreed-upon time, the AGC will send the test signal to the company on the REGA telemetry path.

**Figure 5: PJM Regulation Control Sequence**



PJM will use the telemetered resource output to score the resource using the rules defined in Manual 12, Section 4.5.1, Regulation Test. A successful test will have a test score of greater than 75% compliance.

## 3.5 Market data requirement

Regulating resources must be electrically located within PJM RTO. Other than real-time telemetry, a regulating resource needs access to PJM market user interface to get the necessary market information.

### 3.5.1 eTools account and access

Access to eTools is only required for Production Market participation and is typically not required for Pilots. A regulating resource needs to have an eMKT account to participate into regulation market. The following activities will be finished in eMkt:

- Logging in
- Viewing regulation market messages
- Submitting regulation offers
- Viewing public regulation market results
- Responding to error messages
- Posting & downloading XML regulation files
- Bilaterals

A DR-type of regulating resource will also need to register in eLRS for Settlements purposes. The details about registration process to eMkt and eLRS can be found under PJM eSuite (<https://esuite.pjm.com/mui/>).

### 3.5.2 CDTF requirements

A regulating resource needs to comply with Cost Development Task Force (CDTF) manual 15 (<http://www.pjm.com/~media/documents/manuals/m15.ashx>) for offer data as well as manual 11

(<http://www.pjm.com/~media/documents/manuals/m11.ashx>, section 3) to ensure that their cost-based offer for opportunity cost clearing meets our needs.

Currently, PJM CDTF does not address costs for demand response resources. Therefore, the opportunity cost for a DR resource that is participating in PJM ancillary service markets is considered to be zero.

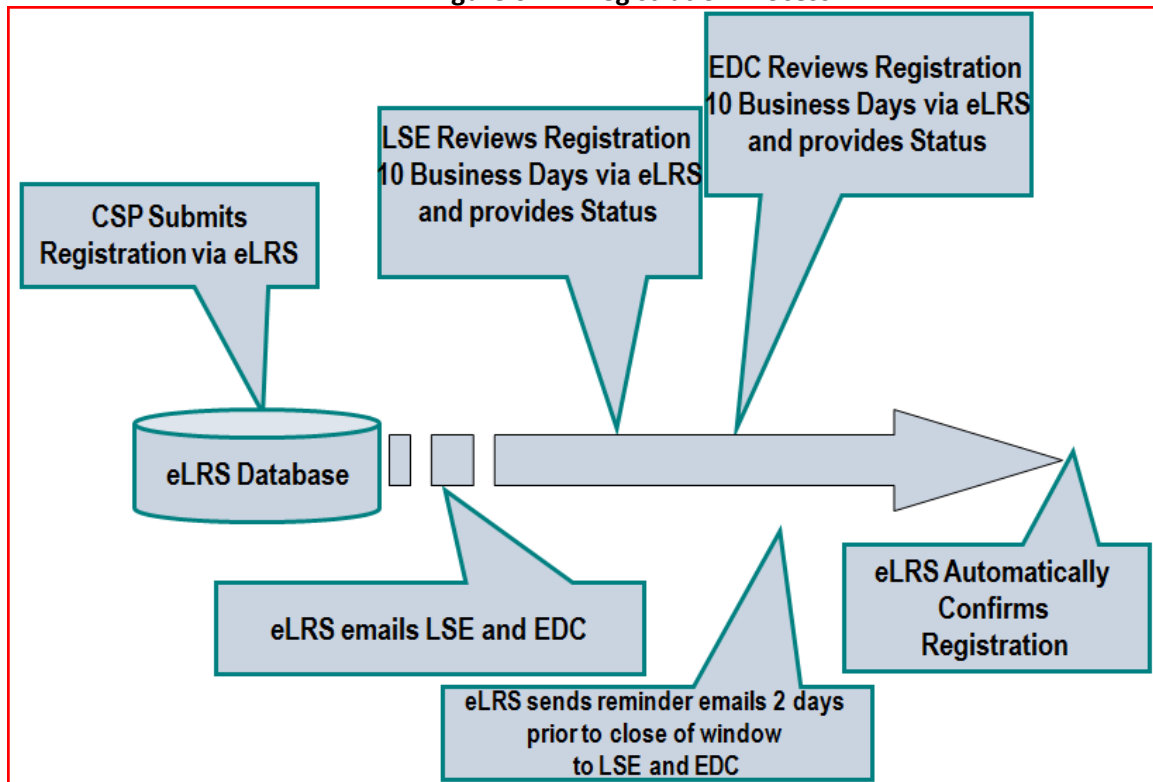
### 3.6 3<sup>rd</sup>-Party Certification or Approval requirements

PJM is not responsible for any 3<sup>rd</sup>-party certification or approval that may be required for a pilot project candidate to start or continue participating PJM regulation market. The information in this section is just for the pilot candidate’s reference.

#### 3.6.1 Local EDC and LSE

To participate in PJM’s markets, a demand resource needs to be “registered.” In order to become a registered demand resource their registration data has to be reviewed and confirmed/denied by both the EDC (Electricity Distribution Company) and LSE (Load Serving Entity.) Confirmation by both the EDC and LSE is required to complete the registration process. The figure below shows the timeline for a DR registration process.

Figure 6: DR Registration Process



### 3.6.2 Others

If a pilot participant needs to become a Curtailment Service Provider to participate into PJM markets, the participant is obligated to:

- Hold necessary environmental permits for Distributed Generating units
- Comply with applicable permits
- CSP obligated for both Emergency and Economic participation

## 4 Participation Requirements: Demand Response

This section is limited discussions relevant to the Economic Load Response program and presumes that the Demand Response Participant(s) is already a PJM Member. Demand Response Resources participate in the PJM Wholesale Markets via resource aggregators known as Curtailment Service Providers (CSPs).

### 4.1 Economic Market Participation

The PJM Economic Load Response program enables Demand Resources to respond to PJM energy, synchronized reserve, and/or day-ahead scheduling reserve prices by reducing consumption and receiving a payment for the reduction or following PJM signal to reduce or increase load if providing regulation services.

- The **Day-Ahead Option** will provide a mechanism by which any qualified market participant may offer Demand Resources the opportunity to reduce the load they draw from the PJM system in advance of real-time operations and receive payments based on day-ahead LMP for the reductions.
- The **Real-Time Option** will provide a mechanism by which any qualified market participant may offer Demand Resources the opportunity to commit to a reduction and receive payments based on real-time LMP for the reductions.

### 4.2 Registration Requirements

For Demand Response Registration and Program descriptions please see detailed descriptions in Manual 11 (<http://www.pjm.com/~media/documents/manuals/m11.ashx>).

### 4.3 Customer Base Load Calculations

The Customer Base Load calculation (CBL) compares the metered load against an estimate of what metered load would have been without the reduction in load by the end use customer. The CBL calculations may be adjusted for weather when the load is subject to weather sensitivity. The details of CBL calculation and business rules can be found under PJM – Training Materials – Demand Side Response (<http://www.pjm.com/training/training-material.aspx>).

### 4.4 Demand Response Participants' Notifications & Dispatch

The PJM "All Call" system is the official notification protocol for Emergency Events. Alternative unofficial communication methods exist such as email notifications, an XML download from the Load Response System or an Internet based control systems e.g. ARCOM DIRECTOR – Series IV-P. In cases where the Load is not directly metered by PJM, the LSE is responsible for submitting the appropriate data to PJM, within the specified enrollments and compliance timeframes as specified in the appropriate manuals. For a detailed description of the All Call System See "Manual 1, Control Center & Data Exchange Requirements" at <http://www.pjm.com/~media/documents/manuals/m01.ashx>.



## 5 FAQ

- 1) What are the membership requirements for pilot participants?
  - PJM membership is required as long as an external party intends to:
    - Participate in any of PJM markets and pursue financial benefits from PJM market(s); OR
    - View and use any data/information that PJM treats confidential to members only.
  - Depending upon the particular pilot project targets and what role the pilot candidate will play in the project, PJM may not require full membership to all pilot participants.
  - As mentioned in Section 3.1, a pilot participant does not need membership at a project's initiation phase.
- 2) If I have to become a member, what's involved in doing that?
  - Before submit application, the membership applicant ("Applicant") has read and understands the terms and conditions of the Operating Agreement ("Agreement", <http://www.pjm.com/documents/downloads/agreements/oa.pdf>). The Applicant agrees to accept the concepts and obligations set forth in this Agreement.
  - The Applicant also commits to supply data required for coordination of planning and operating, including data for capacity accounting, and agrees to pay all costs and expenses in accordance with the Operating Agreement and all other applicable costs under the PJM Open Access Transmission Tariff ("Tariff").
  - The Applicant will pay the annual fee of \$5,000 for the remainder of the year of application upon notification of PJM application approval per Schedule 3.
  - Please refer to Section 3.1 or contact PJM Membership Relations at 610-666-8980 or toll free at 866-400-8980 for additional information.
- 3) How long will it take for the pilot program to complete?
  - PJM's pilot program represents PJM continuous effort to open markets to a new and diverse set of valuable resources that complement existing generation. The pilot program will help emerging new energy resources to explore all opportunities to fully participate into PJM's markets. These goals will continue into 2011 and future years. In saying so, PJM does not pre-set any due date for the pilot program, including all pilot projects.
- 4) Which step takes the longest to complete?
  - It may vary from one project to another. For DR regulating resources, the real-time telemetry and MOV may cost more time than other steps. PJM is willing to help pilot participants identify any potential risks within a project at the Planning phase.
- 5) What's the difference between what they have to do for a pilot vs. a full-blown implementation?
  - A pilot project involves no financial transactions within PJM market(s).
- 6) What's the role of the EDC / LSE in the pilot?
  - As described in section 3.6.1, in order to become a registered demand response resource their registration data has to be reviewed and confirmed/denied by both the EDC (Electricity Distribution Company) and LSE (Load Serving Entity.)
- 7) Who are my contacts at PJM?
  - PJM will assign a main contact for each pilot project. More details will be provided after further discussion.

- 8) Is the pilot company allowed to mention PJM's name?
  - Yes...we can provide a letter of support as well, if that's deemed for appropriate purposes
- 9) What are the Regulation service testing requirements before one can participate in the Reg market?
  - PJM Manual 12 Section 4 provides operational detail for regulation participation (<http://www.pjm.com/~media/documents/manuals/m12.ashx>). More specifically, metering requirements are defined in Section 4.4.2 Regulation Signals.
  - The Regulation Testing process tests two important factors for regulating resources, response time and sustainability. A regulating resource is expected to be able to adjust its output to match the regulation signal in 5 minutes, and sustain that match for an additional 5 minutes.
  - Please refer to Section 3.4.1 of this document for more details.
- 10) Is the market an hourly market where we can offer Reg in specific hours?
  - Yes, the Regulation Market is an hourly market, where you can enable/disable specific hours to prevent regulation assignments.
- 11) Does the regulation have to be up and down, or can we offer a set point and only up or down?
  - PJM's regulation model is combined up and down.
- 12) How is Regulation "self-scheduled" in PJM?
  - Self-scheduling is part of the offer process in eMKT. Self-scheduled resources subtract from the service requirement (so the market could clear at a lower price) but they will be guaranteed to be active in the hour.
- 13) What are the metering requirements?
  - The resource will need to be metered at most a 10 second scan rate, and send the net output (positive for discharge, negative for charge) on the same ICCP Link as the REGA/AREG/TREG. Additionally, they will need to submit quality hourly meter data after-the-fact to eMeter. Please refer to Section 3.3.3 for details.
- 14) What eTools access do I need to participate into regulation market?
  - A regulating resource needs to have an eMKT account to participate into regulation market.
  - A Demand Response resource that regulates will also need to register in eLRS for Settlements purposes.
  - Please refer to Section 3.5.1 for more details.
- 15) Is there any opportunity cost for regulating DR resources?
  - According to current PJM policy, there is no opportunity cost for demand response resources.

## 6 PJM Contacts

For any questions or enquiries regarding pilots, please contact us at [pilots@pjm.com](mailto:pilots@pjm.com) or visit our website: <http://pilots.pjm.com>.