PJM Manual 40:

Training and Certification Requirements

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Prepared by
Systems Operations Division

Table of Contents

Table of Exhibits

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- Section 3.2:
- Updated Small Generation Plant Dispatchers to Small Generation Resource Dispatchers
- Added lower MW threshold for training requirements to accommodate ESR as well as Small Gen Resources
- Updated Energy Storage Device to Energy Storage Resource
- Updated language for training requirements for ESR operators

Introduction

Welcome to the ***PJM Manual for Training and Certification Requirements***. In this Introduction, you will find the following information:

- What you can expect from the PJM Manuals in general (see “About PJM Manuals”).
- What you can expect from this PJM Manual (see “About This Manual”).
- How to use this manual (see “Using This Manual”).

About PJM Manuals

The PJM Manuals are the instructions, rules, procedures, and guidelines established by the PJM Interconnection, L.L.C. for the operation, planning, and accounting requirements of the PJM RTO and the PJM Energy Market. The manuals are grouped under the following categories:

- Transmission
- PJM Energy Market
- Generation and transmission interconnection
- Reserve
- Accounting and Billing
- PJM administrative services
- Miscellaneous

For a complete list of all PJM Manuals, go to the Library section on PJM.com.

About This Manual

The ***PJM Manual for Training and Certification Requirements*** is one of a series of manuals. This manual describes the PJM Member Systematic Approach to Training (SAT) and outlines the specific training and certification requirements for different entities operating on the PJM systems (e.g., operators and dispatchers at Transmission Owners and Market Operation Centers). This manual also describes the SAT used internally at PJM to develop training and qualification programs for PJM system operators.

The ***PJM Manual for Training and Certification Requirements*** consists of four sections. The sections are listed in the table of contents beginning on page ii.

Intended Audience

The intended audiences for the PJM Manual for Training and Certification Requirements are:

- Applicants to the Operating Agreement of PJM Interconnection, L.L.C.
- PJM Members
- PJM staff

References

There are some other reference documents that provide both background and detail. The ***PJM Manual for Training and Certification Requirements*** does not replace any of the information in these reference documents. These documents are the primary source for specific requirements and implementation details. The references for the ***PJM Manual for Training and Certification Requirements*** are:

- PJM Manual for Control Center and Data Exchange Requirements (M-01)
- PJM Manual for Transmission Operations (M-03)
- PJM Manual for Pre-Scheduling Operations (M-10)
- PJM Manual for Energy and Ancillary Services Market Operations (M-11)
- PJM Manual for Balancing Operations (M-12)
- PJM Manual for Emergency Operations (M-13)
- PJM Manual for System Restoration (M-36)

Using This Manual

Because we believe that explaining concepts is just as important as presenting the procedures, we start each section with an overview. Then, we present details and procedures. This philosophy is reflected in the way we organize the material in this manual. The following paragraphs provide an orientation to the manual's structure.

What You Will Find In This Manual

- A table of contents that lists two levels of subheadings within each of the sections
- An approval page that lists the required approvals and a brief outline of the current revision
- Sections containing the specific guidelines, requirements, or procedures including PJM actions and Market Participant actions
- Attachments that include additional supporting documents, forms, or tables in this PJM Manual
- A section at the end detailing all previous revisions of this PJM Manual

Section 1: Training Overview

Welcome to the *Training Overview* section of the ***PJM Manual for Training and Certification Requirements***. In this section you will find the following information:

- Training Overview
- PJM Member Systematic Approach to Training (SAT)
- Training Staff
- Job Analysis and Task Lists
- Development of Training Programs
- Implementation of Training Program Activities
- Evaluation of Training Program Activities

1.1 Training Overview

1.1.1 Member Training Curriculum

PJM offers a full complement of training courses and materials applicable to many audiences, including operators, dispatchers, power marketers, Load Serving Entities, Curtailment Service Providers, system planners and government and consumer groups. This training is provided to keep current market participants updated on new products and processes, introduce new market participants to PJM and provide focused knowledge on specific aspects of PJM operations.

Additional information about PJM's complete training curriculum can be found at: https://pjm.com/training/course-catalog.aspx.

Not all targeted audiences have training or certification requirements in place due to the limited impact they have on reliability. However if the activity of these personnel increases, requirements related to training may become appropriate. The type and nature of the requirements will be based on the operational significance they have on PJM. The different types of operating entities are defined in Section 3 of this manual along with their associated requirements.

1.1.2 Training for Member Operating/Dispatch Personnel

The focus of this section is on Member operating/dispatch personnel who interact with the PJM control room and who carry out operating instructions and tasks in support of the reliable operation of the PJM system. Targeted "Programs" within PJM's overall curriculum are developed for these personnel. These Programs are made up of "Learning Activities" of various kinds (Section 1.6).

The goal is to have continuously improving training programs that will produce the skilled and qualified personnel needed to operate in the highly dynamic environment of a modern Bulk Electric System (BES). The desire is to develop operators who not only know how to follow or carry out procedures, but also have superior analytical skills and situational awareness to better deal with the nearly infinite number of scenarios an interconnected power system is capable of producing.

1.2 PJM Member Systematic Approach to Training (SAT)

PJM has designed and implemented a systematic approach to training in conjunction with its Members to meet the unique and specific requirements of operating in the PJM Regional Transmission Organization (RTO). This approach:

- Takes into account the tightly integrated operations between PJM and its Members
- Promotes a consistent approach to operator development and understanding of roles and responsibilities as outlined in PJM Manuals
- Integrates with PJM's pre-existing training and certification requirements
- Leverages the training resources and expertise of PJM and its Members, primarily through the work of the Dispatcher Training Subcommittee (DTS)

The systematic approach to training described in this section is a joint effort between operational and training SMEs at both PJM and the Member Companies. The approach has been designed to comply with the NERC Standard PER-005. However, PER-005 is not applicable to all operating/dispatch personnel with PJM requirements, including some of the non-traditional entities that have become participants in PJM markets and operations. Therefore, not all elements of this approach will apply to every type of operating personnel. The approach is not meant to introduce any new requirements beyond those explicitly outlined in the NERC Standard.

The approach is designed to be agile and flexible. It seeks to streamline administrative tasks wherever possible so that the maximum resources can be used to develop and deliver quality, timely, relevant training to those that need it. It allows for a successive, iterative approach to training development with opportunities for evaluation and refinement. The approach involves collaboration between PJM training staff and the members of the DTS, thus harnessing the collective wisdom of these two groups.

1.3 Training Staff

The PJM Member SAT is implemented by personnel that are knowledgeable in system operations/dispatch and/or instructional capabilities. The central body responsible for this approach is the Dispatcher Training Subcommittee.

1.3.1 Dispatcher Training Subcommittee Representatives

Note:
The DTS is primarily made up of dedicated operations trainers at PJM and Member Companies, many with years of practical operating experience. This group has been operating continuously in PJM since the 1980s and has been instrumental in creating both training and certification programs. PJM considers Member representatives qualified to participate by virtue of their role at the Member Company, along with the Member recommendation that they serve on the DTS.

Because of the extensive collective experience of the group in both operations and instructional capabilities, other individuals with less experience in either operations or instructional capabilities may also participate in the DTS. This arrangement facilitates the continuing development of industry training professionals and also provides the DTS access to fresh perspectives. PJM monitors participation in the DTS along with experience levels to ensure this current criterion remains valid.

The DTS conducts regular meetings where much of the business related to the SAT is completed. Additionally, a select sub group or task force may be formed as needed to perform work on specific projects related to training and certification. In conjunction with PJM, the group will also seek to increase the capabilities of its members and other training professionals by sponsoring “train the trainer” activities to develop instructional capabilities along with practical application of the SAT tools and processes used in PJM.

Transmission Owners are required by the TO/TOP Matrix to participate in the PJM SAT process. Members document their participation through the PJM LMS.

Note:
The PJM Learning Management System (LMS) is the common system of record related to the requirements found in this manual. The ongoing development of this system will be with the goal of streamlining administrative tasks associated with the PJM/Member SAT, assisting with compliance monitoring, and providing clear, consistent reports for evidence during audits.

Note:
Members may choose to utilize the capability of the PJM LMS for elements of their own company specific training programs. However, it’s recognized that many members have other corporate systems that contain personnel performance records and other data not related to the requirements of this manual.

Note:
If those systems are also used for the PJM requirements, corresponding records should be created in the PJM LMS. This is necessary for the compliance monitoring process described in Section 3.3.Information on how to do this can be found on the Member Training Liaison website (http://www.pjm.com/training/member-training-liaison.aspx).

1.3.2 Member Training Liaison

Any entity identified as having operating personnel with training and/or certification requirements listed in Section 3 of this manual, is required to designate a PJM Training Liaison. Alternate

Training Liaisons may also be named. In some cases, the Member DTS representative will serve as the Training Liaison or alternate. DTS Representatives and/or the Training Liaisons are granted supervisory access to the PJM Learning Management System (LMS) upon request.

The Training Liaison primarily serves an administrative role related to the implementation of training activities along with keeping the PJM LMS up to date with the current status of the Member's operating personnel. Specific instruction related to submitting data on operator status and records of training activity can be found on the PJM Member Training Liaison web page and in the LMS documentation.

For training activities that are not directly facilitated by on-site PJM State and Member Training Department, the Training Liaison serves as the representative for PJM training. He/she is responsible for verifying attendance and participation of operators in the training and ensuring successful completion of any related training assessments and/or evaluations.

Where onsite proctored training assessments are required, the Training Liaison may also serve in this role, maintaining a secure testing environment for the administration of the assessment. This role and standard for a secure test environment must also be carried out for any company or vendor supplied training used to meet the PJM training and re-certification requirements.

For audit purposes, all source data (e.g., attendance sign-in sheets, assessments, evaluations, etc.) for company and vendor supplied training, as well as PJM drill documentation, must be maintained by the member company. Transmission entities must retain this source documentation for a minimum of 36 months. Generation entities must retain this source documentation for a minimum of 72 months.

Additional duties of the Training Liaison include monitoring the training and certification status of his/her operating personnel, as recorded in the PJM LMS, ensuring that company operators are in compliance with PJM training and certification requirements, are informed of their training obligations, and are aware of upcoming relevant training opportunities. The Training Liaison is typically the first point of contact related to any issues regarding operator data found in the PJM LMS.

1.4 Analysis

1.4.1 Job Analysis

The DTS (or a sub group of the DTS) periodically conducts an analysis of common operational tasks performed by PJM Members. PJM manuals and other resources are analyzed to identify the specific tasks performed in support of reliability. These tasks are organized according to the common work groups that perform them and then designated with a common job title descriptive of the operating position and its role.

Note:
Presently, a full job analysis has been conducted for MOC Generation Dispatchers and Transmission Owner Operators. A PJM Member Task List has been created for these positions.

1.4.2 Task Lists

Much thought has gone into determining the proper level at which to write the tasks. Since these tasks will provide the framework for many other elements of the SAT and, depending on the job, may also be used to support certification and/or compliance, they should, as much as possible,

be written so that they are mutually exclusive and jointly exhaustive. That is, they do not overlap but are exclusive of each other. However, taken together or jointly, they represent the full scope of what PJM requires for that job or operating entity.

Each task is referred to as a "Terminal Task", meaning the end result of its performance will represent a broad but distinct area of competency. The structure of each Terminal Task will generally be; Condition – Action – Criteria. The criteria typically relate to the measures outlined in the PJM manuals.

Two other items are developed under each Terminal Task. These are "Company Specific Tasks" and "Enabling Objectives". Both of these items support or enable the successful completion of the Terminal Task. The Company Specific Tasks are common to most Member operating entities, but the specific performance of them varies based on the Member's internal tools and processes. Tasks and Enabling Objectives may be used to develop more specific "Learning Activity Objectives" as will be described in Section 1.5 and 1.6.

Some Members have developed more detailed task lists for their own internal purposes. An evaluation of these lists reveals that many contain lower level steps that can easily be mapped to the Task List. While these lists are utilized by Members in carrying out their responsibilities related to the programs discussed in Section 1.5, for compliance purposes, documentation of program activities is based on the PJM Member Task Lists. The Member is responsible for mapping its list to the Task List, ensuring that there are no gaps.

To review the current Task Lists, please refer to: https://pjm.com/committees-and-groups/subcommittees/dts.aspx.

1.4.3 Reliability-Related Tasks

All tasks are reviewed by PJM and the DTS to determine if they are reliability-related. For applicable entities, this designation indicates that the task and related training are subject to the requirements of PER-005.

Note:
A reliability- related task is one that has the potential to impact the level of reliability of the BES (as defined in PJM Manuals) if the task is not performed, or is performed improperly. The DTS determines which specific tasks will be designated as "reliability related", using this criterion and any other relevant factors.

If needed, individual Member Companies may add their own custom company-specific tasks, above and beyond those covered in the Task List. The Member will submit to PJM details about the additional company specific task for review. The Member Company, along with PJM and the DTS, will make the determination if the custom task is reliability-related. Reliability-related custom company specific tasks will be subject to the requirements outlined in this manual.

1.4.4 Task List Maintenance

Member company representatives are provided with the opportunity to review and comment on both the Transmission Owner Operator Task List and the Generation Dispatcher Task List via the PJM LMS. Any comments received are compiled and either brought to the DTS for general discussion or resolved with the submitter. In addition, PJM may include an agenda item to discuss task updates or changes during a DTS meeting as required.

1.4.5 Task Modification

Note:
For terminal tasks, if PJM, in conjunction with the DTS, determines that an existing reliability-related-task has been changed significantly, or if a new task is identified, the task change will be discussed with the committee. Task changes will require actions related to re-training and task re-verification.

For company-specific tasks, the member makes the determination if there is a change significant enough to merit internal training and task re-verification. They may verify their criteria in conjunction with PJM, who will then trigger a task re-verification in the PJM LMS for their company specific task.

Re-verification of both terminal and company specific tasks are tracked in the PJM LMS. The complete task verification process is discussed in Section 1.5.

Examples of declaring a reliability-related task as new or significantly modified so as to trigger the task verification process includes (but is not limited to) new tools or procedures (or updates) that impact successful task completion. Routine procedure refreshes, tool updates, database updates, grammatical updates or other changes that are insignificant or unrelated to task completion will not require supplemental training or task verification.

1.5 Development of Training Programs

PJM, in conjunction with the DTS, creates both an initial training program and a continuing training program for the Member operating personnel identified in Section 3 of this manual. The initial training program is utilized in the qualification of new operators; the continuing training program is utilized in maintaining that qualification. The specific course names, topics, and other details related to the learning activities that make up each program can be found in the PJM LMS.

As outlined in Section 3, depending on the entity, these programs may include other elements in addition to the successful completion of training, such as a task verification process and/or certification (covered in Section 2 of this manual). For an overview of how these elements fit together, please refer to Figure 1.

Regardless of the elements used in each program, the foundation for developing all training is the Task List identified in Section 1.4. This section will explain how that list is used to systematically develop programs. A description of all the typical elements that may be part of the PJM Member SAT are given below, along with delineating the areas for which PJM and Member training organizations each have responsibility.

All training developed by Member companies must be developed utilizing the Task List in accordance with a systematic approach to training. Members may use the PJM Member Systematic Approach to Training or their own internal approach, provided that this internal approach is developed in harmony with the documentation requirements and principles of the PJM Member SAT.

1.5.1 Tasks and Objectives

Whether initial or continuing, all programs are based on the Task Lists for each job or operating entity. These tasks are written in a format that clearly defines the measurable performance a

learner will be able to demonstrate at the conclusion of training. Taken together, they provide the framework for the development and description of a training program. The enabling objectives and tasks under each terminal task may be used to further guide the design and development of learning activities of many kinds (Section 1.6).

To assist in this, more detailed and specific “Learning Activity Objectives” may be developed from the Task List. In general, these objectives should state what the learning is meant to accomplish, providing clear guidance in the development of whatever materials or methods will be used. One or more of these Learning Activity Objectives may be sequenced together to comprise a “Learning Activity”.

These additional learning objectives are for training development only and are not meant to be subject to any regulatory requirements or those outlined in this manual. This is to preserve the elements of the Task List at the proper level to maintain the clarity necessary for the ongoing implementation and evaluation of the overall programs. While Members may choose to create and use these more detailed Learning Activity Objectives as part of their training materials, PJM will not require that these lower level details are documented in the PJM LMS, but only the Learning Activity’s linkages to the source elements found on the Task List. Forms and other information related to documenting Learning Activities can be found on the Member Training Liaison website.

1.5.2 Initial Training Program (ITP)

The initial training program covers all tasks. PJM and Member training staff each have responsibility for the development and delivery of the initial training program.

PJM develops learning activities or courses that cover all of the common terminal tasks and common enabling objectives. Detailed information related to the PJM provided portion of the ITP is found in the PJM LMS and at: https://pjm.com/training/member-training-liaison.aspx

An operator’s completion of this part of the program is tracked in the PJM LMS.

PJM also develops training on more introductory or fundamental topics. Participation in these training activities is at the discretion of the Member. Depending on their individual learners needs, this training may be used as prerequisites to the Initial Training Program.

The Member Company is responsible for the development of learning activities that cover all applicable company specific tasks. Members shall document this training in the PJM LMS, providing the proper linkages between the learning activity and the relevant task.

1.5.3 Continuing Training Program

All operating entities have continuing training requirements. Specific requirements are found in Section 3.

The learning activities that make up the continuing training program may vary from year to year, but are based on the entity’s Task List. PJM and the DTS determine which tasks should be included, either annually or at other intervals. Such decisions may be based on:

- Standard requirements
- PJM/DTS observations
- Trainee assessment results
- Updates or changes in operating criteria

- Program/Course evaluations (Section 1.7)

Both PJM and Training Staff at Member Companies share responsibility for the Continuing Training Program.

As in the initial program, PJM develops learning activities that cover the applicable common terminal tasks and common enabling objectives.

Training staff at the Member Company is responsible for developing learning activities that cover all applicable company specific tasks.

All training associated with the continuing training program is documented in the LMS with associated links established between the training activity and the applicable terminal and/or company specific tasks.

At times, elements of the Initial Training Program (ITP), including topics on fundamentals and theory may be utilized in the Continuing Training Program as refresher training.

1.5.4 Task Verification

Entities that require task verification are identified in Section 3 along with further details about this process.

In general, all applicable operators must be verified on the reliability-related terminal tasks and all reliability-related company specific tasks that are assigned to them. Only tasks that are designated as reliability-related are subject to this process. The task verification process for an operator must be completed prior to him/her taking on independent shift duties.

As noted in Section 1.4, any time the DTS determines that a task has been modified, all operators must be re-verified on the modified task within six months of its modification.

Each Member is responsible for performing the task verification of its operators. This includes verification on both the common terminal tasks as well as the company specific reliability-related tasks.

Note:
One method of verifying the minimum proficiency on a task is direct observation by a qualified assessor of the operator successfully performing the task (either in a real-time or simulated environment). When this is not feasible, a combination of the following may be used:

Successful completion of relevant training or certification

AND

Verbal questioning by a qualified assessor, OR

Assessment check-off lists, OR

Other means to assure the assessor that the task can be properly completed

PJM and NERC Certifications can support verification of proficiency, but alone do not indicate verification of sufficient capability to perform the task.

The Member Company will designate who may serve as a qualified assessor for its operators. The assessor should be proficient in the tasks they are assessing others on.

All task verifications (including those triggered by task modifications) must be entered into the Task Tracking Module of the LMS.

A Member Company may internally use slightly different job titles or divide the identified tasks among several different positions. To manage this, Members can create company specific job profiles in the LMS Task Tracking Module and assign the specific tasks that apply to the profiles that they have created.

Additionally, the Member Company may find that some common tasks do not apply to its operations and may choose to "opt out" of those tasks. Any Member desiring to opt out of any task must notify PJM and explain the reasons for the exemption. These cases are reviewed annually to verify that any approved "opt out" provisions remain valid.

1.5.5 Certification

Certification may be required as part of the initial qualification process. Additional information on the PJM TO Operator and Generation Dispatcher Certification Program can be found in Section 2 of this manual. If an operating entity has personnel with certification requirements, they will be listed in Section 3.

1.6 Implementation of Program Activities

The above training Programs are made up of courses and individual learning activities that can be very varied in nature. They include:

- In-person instructor-led training
- Virtual instructor-led training
- Online asynchronous training available 24/7
- Simulations and exercises
- System Restoration, Emergency Procedure Drills and Grid Security Drills
- Annual Spring Seminar
- Member On the Job Training (OJT)
- Online 'Just in Time' (JIT) training modules on operational updates

Records of completion for required training activities are stored in the LMS and serve as documentation of the implementation of program activities. Additionally, specific details about all PJM provided training can be found in the LMS along with schedules and links for registration. All required training will be clearly designated as such in the LMS.

Where possible and appropriate, PJM has its operationally focused training approved through the NERC Continuing Education Program.

1.7 Evaluation of Program Activities

PJM evaluates each learning activity that is delivered. This is primarily done by an evaluation form filled out by the participants, but also includes instructor observations and the results of student performance on any assessment instruments used.

Ongoing evaluation is also performed by the DTS. Aggregate evaluation data is provided to the DTS and feedback and suggestions for improvement are solicited.

Note:
PJM, in conjunction with the DTS, performs at least one formal evaluation of the initial and continuing training program annually.

Each Member is also required to perform and document with PJM an annual evaluation of its portion of the training programs.

These evaluations are managed and documented through the PJM LMS.

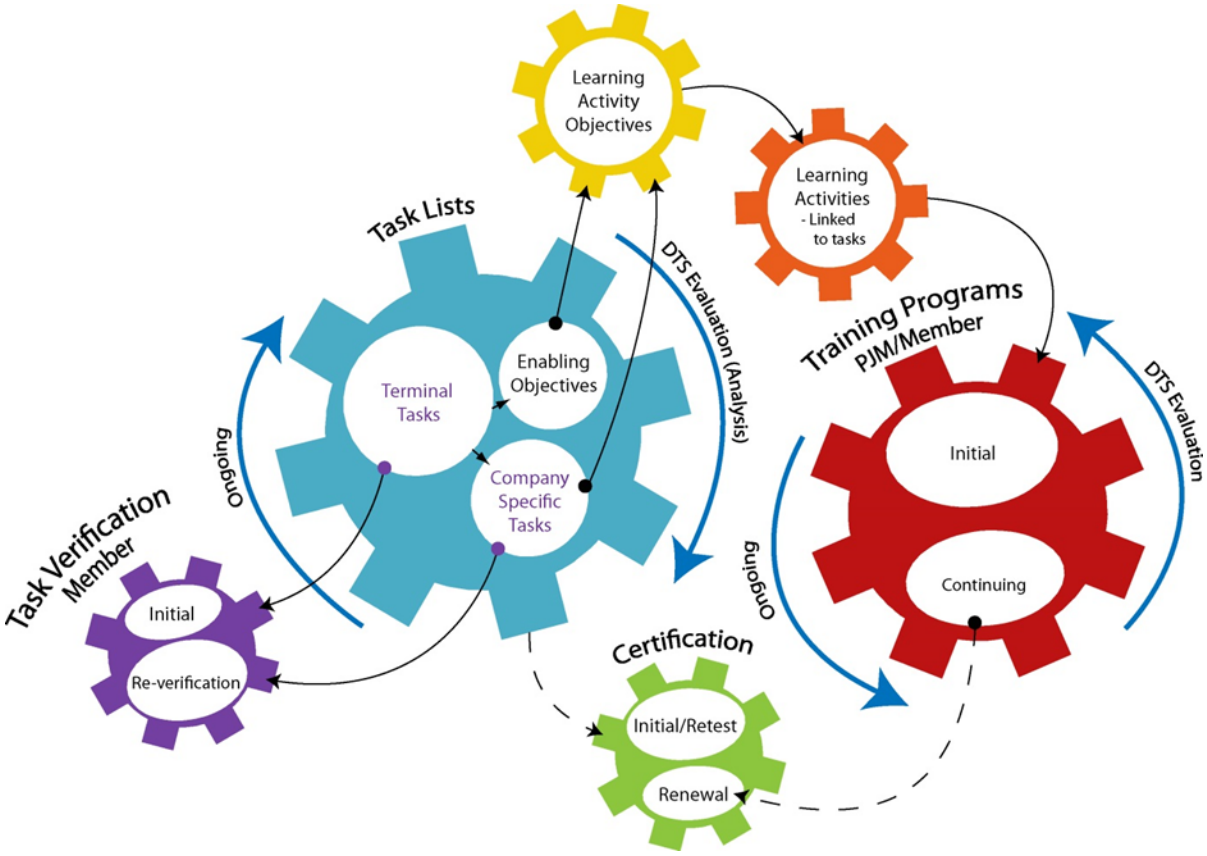

Exhibit 1: Overview of PJM Member Systematic Approach to Training (SAT)

Section 2: Certification Overview

Welcome to the *Certification Overview* section of the ***PJM Manual for Training and Certification Requirements***. In this section you will find the following information:

- Purpose and Scope of the Certification Program
- Requirements and prerequisites
- Term of Certification and Recertifying
- Administration of the Certification Program

2.1 Purpose

Certification focuses on defining required competencies for a work group and recognizing individuals who possess these competencies. The PJM Certification Program provides the public and governmental entities with a measure of confidence in the capabilities of personnel within the PJM Regional Transmission Organization (RTO) to maintain the reliability of the bulk electric system and the energy markets. In addition, the Certification Program provides assurance to PJM and its members that personnel in the PJM RTO have a demonstrated knowledge of PJM real time operating requirements and business rules.

The PJM Certification Program is comprised of three credentials:

- PJM Generation Dispatcher
- PJM Transmission Owner Operator
- PJM Markets (voluntary)

The certification exams are revised on a periodic basis to reflect changes in operating procedures in effect on the PJM system. Certification exams are developed and revised in accordance with the current versions of the Task Lists in effect at the time of exam revision. Due to the fact that certification exam development is cyclic in nature and Task List maintenance is on-going, there may be times when the certification content outlines and the Task Lists do not match.

The PJM certification exams are validated, objective, multiple choice exams administered by a computer testing service at designated locations. The PJM Exam Working Group developed the certification exams and assists in periodically reviewing and maintaining them to ensure they are current.

The PJM Candidate Bulletin details the application and testing procedures and requirements. The bulletin also contains information on the Content Outlines, other key documents, and the fee schedule.

2.2 Administration of the Certification Program

2.2.1 Prerequisites

There are no training or work experience requirements that candidates must satisfy before they can apply to sit for the PJM certification exam. However, completion of one or more PJM training programs for system operators is highly recommended.

2.2.2 Validity, Reliability and Defensibility

The PJM Certification Program was developed and is operated in accordance with the "good practices" of the National Commission for Certifying Agencies (NCCA). Following these "good practices" ensures that the program conforms to EEOC guidelines, is legally defensible and is fairly administered to all candidates.

Assistance of a consultant skilled in the development of certification exams has been secured on a continuing basis to guide, advise, and perform selected tasks to ensure that the PJM Certification Program remains valid, reliable and legally defensible.

2.2.3 Certification Oversight Group

The Certification Oversight Group (COG) is charged with ensuring that the PJM Certification Program is kept fair to all and free from undue influence in order to protect against actual or perceived bias toward candidates or their employers, and that the Certification Program is valid and legally defensible. The COG also participates in the PJM Certification Dispute Resolution Process.

2.2.4 Dispute Resolution Procedure

A non-binding dispute resolution procedure is available to address complaints and challenges regarding the certification exams, and related application and test administration processes. As backup to PJM Certification Dispute Resolution, a complainant not satisfied with the results of Certification Dispute Resolution can submit his/her case to the PJM Alternate Dispute Resolution Committee.

2.2.5 Disciplinary Actions

In the event that an individual acts inconsistent with the expectations of the PJM Certification Program, disciplinary actions may be required. The purpose of the Disciplinary Action Procedure is to protect the integrity of the PJM credentials.

2.2.5.1 Grounds for Action

The following may be grounds for disciplinary action:

- Intentional misrepresentation of information provided to PJM or the test administrator for the purposes of initial certification or credential maintenance
- Any form of cheating during a certification exam, including but not limited to: use of unauthorized reference materials or sharing details of exam questions with others

2.2.5.2 Review

In the event of alleged misconduct, the PJM COG will review the details of the case, including information provided by the applicable candidate/credential holder. If the misconduct is

substantiated and significant, disciplinary actions up to and including the revocation of the PJM credential may result.

2.2.6 Financing the Certification Program

The PJM RTO funds the operation and maintenance of the Certification Program. All individuals who take the examination pay a modest fee to cover the cost of sitting for the exam.

2.2.7 Additional Resources

For additional information about the PJM Certification Program, including the Candidate Bulletin, Content Outlines for the exams and the Certification Dispute Resolution Procedure, please go to: https://pjm.com/training/certification.aspx. If you have questions about the certification program, please call PJM Member Relations at (610) 666-8980.

2.3 Certification Requirements

The following section focuses specifically on the PJM Transmission Owner Operator and PJM Generation Dispatcher credentials, for which there are associated certification requirements. For more information about the voluntary PJM Markets credential, please refer to: https://pjm.com/training/certification/resources-markets.aspx

2.3.1 Scope of the PJM TO Operator and Generation Dispatcher Certification Program

There are two relevant certification programs for operators: the NERC System Operator Certification Program and the PJM TO Operator and Generation Dispatcher Certification Program. The goal of the NERC certification program is to ensure a minimum qualification for operators operating across the entire North American bulk power system. If applicable, NERC certification requirements for entities operating in PJM can be found in Section 3 of this manual.

Whereas the scope of the NERC program is broad so as to encompass the skills common to all operating areas within North America, PJM developed its own certification program to more specifically focus on the tasks and procedures required for the reliable operation of the PJM system.

The scope of requirements for operators/dispatchers in the PJM RTO is based on the daily operations-related knowledge and skills needed to implement procedures for normal, emergency and restoration conditions. All operators/dispatchers must understand and be able to implement these procedures as presented in the PJM Manuals to ensure reliable operation of the PJM RTO. In addition, operators/dispatchers must understand basic operating concepts in order to perform the referenced tasks.

The results of a Job Analysis have determined that there are two discrete sets of tasks performed by operators/dispatchers in the PJM RTO. A Transmission Content Outline details the common tasks performed by operators who operate transmission facilities. A Generation Content Outline details the common tasks performed by dispatchers of generation facilities. Therefore, there are two PJM certification examinations: Transmission and Generation.

2.3.2 Requirements for Operators and Dispatchers

The PJM Certification Program applies to operators, dispatchers, or other individuals who:

- operate or dispatch on the PJM system,
- are in direct communication with the PJM System Operator, and

- perform daily operations-related functions at the direction of the PJM System Operator during normal, emergency and/or system restoration states.

System personnel performing these tasks may be at a Transmission Owner (TO) control center, a Market Operations Center (MOC), or other location. The requirement to obtain a PJM credential is ultimately determined by who is performing the identified PJM tasks and not the location from which they perform them. For instance, in some cases, PJM generation dispatch instructions and communications occur directly between PJM and personnel at a plant control room. Even though these personnel are not located at an MOC, they interact with PJM and are responsible for performing generation dispatch tasks. Therefore they are required to obtain the Generation Certification (unless they qualify as a Small Generation Plant Dispatcher – See Section 3.2.4)

Refer to Section 3 of this manual for specific requirements related to PJM certification. Although operators and dispatchers are the only group on the PJM system required to be PJM certified, other participants including marketers and generation control room operators are encouraged to sit for the PJM Certification exam due to their impact on reliability. Opportunity to sit for either of the PJM Certification exams is open to all.

2.3.3 Term of Certification

PJM certificates are valid for three years.

2.3.4 Recertification

There are two ways a PJM Generation or PJM Transmission credential can be renewed:

1. Retest

Before the certificate for a PJM certified operator/dispatcher expires, apply for, take and pass the same PJM certification exam for which he/she holds a valid certificate.

2. Continuing Education Hours (CE Hours):

On a rolling three year basis, complete at least 140 hours of NERC approved CE training related to the PJM credential which has been recorded in the PJM (LMS).Of the 140 CE hours required to renew, 30 CE hours must be approved for the category of Simulation. If an operator/dispatcher has more than the required 140 CE hours at the time of the request for renewal, PJM will allow up to 30 CE hours to be carried over to the next 3 year period. No hours will be carried over in any of the CE category classifications (e.g., Simulation, Standards, or EOP hours). Those who fail to get credit for 140 CE hours, of which 30 CE hours must be for Simulation, must apply for, take, and pass the appropriate PJM exam before their current certificate expires.

Specific requirements for maintaining a PJM certification are outlined in Section 3 of this manual. Failure to renew a certification prior to the certification date of the credential will be subject to the compliance monitoring process described in Section 3.3. Mitigation plans developed to address such lapses in certification will be reviewed on a case-by-case basis and may include remedial actions such as supplemental training activities or retesting. Please note that an individual with an expired PJM certification may not independently take direction from PJM.

Section 3: Member Training and Certification Requirements

Welcome to the Training and Certification Requirements section of the **PJM Manual for Training and Certification Requirements**. In this section you will find the following information:

- Overview
- Requirements outlined by entity:
  - Training and certification requirements for TO Operators
  - Training and certification requirements for MOC Generation Dispatchers
- Training and certification requirements for Transmission Owner Operators and Generation Dispatchers
  - Training requirements for Small Generation Resource Dispatchers
  - Training requirements for Demand Response Resources
  - Training requirements for Energy Storage Resource operators
- Compliance monitoring process for training and certification requirements
- Process for requesting a temporary waiver of PJM training and certification requirements
- NERC training requirements

3.1 Overview

This section addresses the different operating entities and positions that interact with PJM operations, performing tasks or carrying out operational instructions and directives at PJM's request. The type and nature of these requirements are based on the operational significance each type of entity has on the Bulk Electric System (BES).

3.2 Entity Training and Certification Requirements

3.2.1 Transmission Owner Operators

Transmission Owner (TO) Operators are defined as operators who participate in the real time operations of the PJM system by operating under the direction of PJM, their local transmission facilities and performing other transmission-related real time duties of a TO as found on the PJM Transmission Owner (TO) Operator Task List.

Initial Training:

TO Operators must successfully complete the PJM sponsored Initial Training Program (ITP) and all open and required Just-in-Time training modules prior to independently participating in real time operations. The initial training may be completed either in-person or online through the PJM LMS.

PJM continues to provide a variety of both introductory and more advanced training on operational and PJM specific topics that may be used by Members to help qualify new TO Operators or to provide a refresh for incumbent operators. However, these courses are not considered mandatory prerequisites to the Initial Training Program.

Each TO is responsible for providing initial training to new operators related to their reliability-related company specific tasks and any other training needed to prepare the operator for the task verification process described below and in Section 1.5.4 of this manual. Members should document their company provided training in the PJM LMS with associated links to the common and company specific TO tasks. This can be accomplished via the Training Activity Forms found on the Member Training Liaison webpage. However, PJM considers the company initial training as complete when the operator's capability to perform each applicable task has been verified in the PJM LMS.

PJM Transmission Certification:

New TO Operators (including TO Operators whose company is integrating into PJM) must obtain a PJM transmission certification prior to independently operating on the PJM system. An uncertified operator may participate in on-the-job training, as defined in that company's training program, under the direct, in-person supervision of a PJM/NERC certified operator.

NERC Certification:

PJM requires any TO Operator who is required to be PJM transmission certified to also be NERC certified. These operators are required to obtain the NERC Transmission Operator Certification, the NERC Balancing, Interchange and Transmission Operator Certification, or the NERC Reliability Operator Certification. The NERC Transmission Operator Certification is recommended as it is more applicable to the functions performed by TO Operators. Operators currently certified at the Reliability Operator or Balancing, Interchange and Transmission Operator level may maintain their certification at this level or convert their certification to a Transmission Operator certificate. The Balancing and Interchange Operator Certification will not be acceptable for TO Operators to meet this requirement.

Any new TO Operator must be NERC Certified prior to taking independent shift responsibilities. New operators in a "training mode" without a NERC certification must be working under the direct supervision of a PJM/NERC certified operator and cannot take independent direction from PJM.

Renewal of NERC certifications will follow the existing NERC process. This process will be between NERC and the certified operator through the NERC System Operator Certification and Continuing Education Database (SOCCED). The Training Liaison will provide PJM with each of his/her operators' NERC certification information for entry into the PJM LMS.

Task Verification:

Each TO must verify the capability of each TO Operator to perform each applicable reliability-related task contained within their Task List at least one time. This verification must be completed prior to the new TO Operator assuming independent shift duties. For more detailed information about the verification process, refer to Section 1.5.4 of this manual.

Annual Continuing Training:

Note:
For the purpose of this requirement, “annual” is defined on a calendar year basis (January – December) beginning the year that an operator assumes shift responsibilities.

It is recognized that various situations can occur related to measuring annual and other requirements. These include new operators not starting at the beginning of the year, variations in operator shift schedules and the timing of certain annual training conducted from year to year.

PJM monitors compliance with the requirements on an annual and monthly basis. However, as noted above, requirements not met within a 12 month period do not necessarily constitute an exception.

Each individual case will be evaluated in accordance with the guidelines of this manual and if necessary a mitigation plan will be put in place.

Beginning the first full calendar year that an operator assumes shift responsibilities in real time PJM operations (with the exception as noted above), he/she shall complete at least 32 hours, per calendar year, of emergency preparedness training by the following or its equivalent:

- Attendance at the annual PJM Operator Seminar (Note: The annual PJM Operator Seminar is a large component of the PJM Continuing Training Program. Since much of the content involves important updates and preparation for the summer peak season, it is highly recommended that all TO operators attend this event each year.)
- Completion of PJM sponsored emergency preparedness activities, including drills, table-top exercises, simulations and instruction delivered either in-person or online through the PJM LMS
- Completion of company sponsored emergency preparedness activities, including drills, table-top exercises, simulations and other training linked to the company specific tasks. (Note: This training should be documented in the PJM LMS utilizing the appropriate Training Activity Forms found on the Member Training Liaison webpage. This will allow the LMS to generate useful task to training reports that can be used by PJM and the member for the evaluation phase of the SAT.)

Operators who have less than one full year of service at the end of the calendar year shall complete a pro-rated amount of emergency preparedness training according to the following schedule:

- Individuals who were operators for 3 calendar quarters shall complete at least 24 hours of emergency preparedness training during that calendar year
- Individuals who were operators for 2 calendar quarters shall complete at least 16 hours of emergency preparedness training during that calendar year
- Individuals who were operators for 1 calendar quarter shall complete at least 8 hours of emergency preparedness training during that calendar year
- Individuals who were operators for less than one full calendar quarter have no minimum training requirement for that calendar year

As outlined in Section 1 of this manual, PJM will work in collaboration with the DTS to determine the relevant tasks and training topics that will be included in the annual PJM/Member continuing training program, based on an evaluation of training needs.

When appropriate, members of the DTS shall adjust the training content covered in their company specific continuing training programs to address specific, individualized needs of their operators. This content includes training on the company specific tasks identified in an evaluation of training needs.

Company Sponsored Equivalent Training:

As outlined in Section 1 of this manual, Member TOs have systematically developed training programs related to their company specific tasks which may also include similar training identified in the PJM sponsored training courses. Member Company sponsored training activities may be accepted as equivalent training for the continuing education requirement if they:

- are identified as acceptable emergency operations preparedness activities
- are properly documented as being linked to a PJM and/or company specific task

Such company training may also be approved through the NERC Continuing Education Program, although this is not required for equivalency.

Vendor Sponsored Equivalent Training:

Additionally, there may be third party suppliers of relevant, quality training. These training courses will be considered for equivalency if they meet the criteria of the NERC Continuing Education Program (CEP), have been developed in harmony with a systematic approach, and are properly documented as being linked to a terminal and/or company-specific task.

PJM reserves the right to review training documentation and the systematic approach to training used in the development of any learning activity prior to granting equivalency.

PJM initial training requirements cannot be met by equivalent training. Additionally, the annual continuing training program may include requirements to complete certain PJM online “Just in Time” (JIT) Training modules on important changes to operations. These requirements must be satisfied by completion of PJM sponsored training and associated assessments.

3.2.2 Market Operation Center Generation Dispatchers

Market Operation Center (MOC) Generation Dispatchers are defined as dispatchers who participate in the real time operations of the PJM system by dispatching generation and performing other generation-related real time duties as found on the PJM Generation Dispatcher Task List. In some cases personnel responsible for these tasks are at locations other than a traditional MOC. For instance, in some cases, PJM generation dispatch instructions and communications occur directly between PJM and personnel at a plant control room. Even though these personnel are not located at an MOC, they interact with PJM and are responsible for performing generation dispatch tasks. Therefore they are required to meet the following PJM requirements (unless they qualify as a Small Generation Plant Dispatcher – See Section 3.2.4).

Initial Training:

Newly hired MOC Generation Dispatchers must successfully complete the PJM sponsored Initial Training Program (ITP) and all open and required Just-in-Time training modules within six

(6) months of being deemed qualified by their company to begin operating on the PJM system. The initial training may be completed either in-person or online through the PJM LMS.

PJM Generation Certification:

New MOC Generation Dispatchers (including MOC Generation Dispatchers whose company is integrating into PJM) will have a maximum of six (6) months to become PJM generation certified after being deemed qualified by their company to begin operating on the PJM system. During this six (6) month period, if the dispatcher is dispatching on the system without a PJM generation certification, he/she must work under the direct supervision of a PJM certified generation dispatcher, either in person or via an on-call arrangement.

For new entities, at least one dispatcher must be PJM Generation certified dispatcher prior to that entity beginning operations in PJM.

Continuing Training:

All MOC Generation Dispatchers with at least one full calendar year of shift responsibilities in real time PJM operations shall complete at least 18 hours per calendar year of refresher, operations and markets updates, or emergency preparedness training.

The following or its equivalent is satisfactory for meeting this requirement:

- Attendance at the annual PJM Operator Seminar (Note: The annual PJM Operator Seminar is a large component of the PJM Continuing Training Program. Since much of the content involves important updates and preparation for the summer peak season, it is highly recommended that all Generation Dispatchers attend this event.)
- Completion of PJM sponsored refresh, operations and markets updates, or emergency preparedness activities, including drills, table-top exercises, simulations and instruction
- Completion of company sponsored emergency preparedness activities, including drills, table-top exercises, simulations and other training linked to the company specific tasks. (Note: This training should be documented in the PJM LMS utilizing the appropriate Training Activity Forms found on the Member Training Liaison webpage. This will allow the LMS to generate useful task to training reports that can be used by PJM and the member for the evaluation phase of the SAT.)

As outlined in Section 1 of this manual, PJM will work in collaboration with the DTS to determine the relevant training topics that will be included in the annual PJM/Member continuing training program, based on an evaluation of training needs. Additionally, DTS members are also responsible for addressing any of the individualized training needs for operators at their company.

Company or Vendor Sponsored Equivalent Training:

PJM recognizes that many Member Companies have rigorous training programs that provide similar training identified in the PJM sponsored training courses. Additionally, there may be third party suppliers of relevant, quality training. These training courses will be considered for equivalency if they meet the criteria of the NERC Continuing Education Program (CEP) and contain topics consistent with the PJM and company-specific Task List.

PJM reserves the right to review training documentation and the systematic approach to training used in the development of any learning activity prior to granting equivalency.

PJM initial training requirements cannot be met by equivalent training. Additionally, the annual continuing training program may include requirements to complete certain PJM online “Just in Time” (JIT) Training modules on important changes to operations. These requirements must be satisfied by completion of PJM sponsored training and associated assessments.

3.2.3 Transmission Owner Operators/Generation Dispatchers

Transmission Owner Operators/Generation Dispatchers are defined as personnel who participate in the real time operations of the PJM system by performing both transmission and generation related functions as found on the Transmission Owner Operator and Generation Dispatcher Task Lists.

Initial Training:

Transmission Owner Operator/Generation Dispatchers are subject to the initial training requirements of both the TO Operators and the MOC Generation Dispatchers. Please refer to sections 3.2.1 and 3.2.2 of this manual, respectively, for details.

PJM Transmission and Generation Certification:

Transmission Owner Operators/Generation Dispatchers must be both PJM transmission and PJM generation certified. Since there is no overlap of the content outlines for the certification exams, a combination examination is not available. Please refer to sections 3.2.1 and 3.2.2 of this manual for details on the timeframes associated with the certification requirement.

NERC Certification:

PJM requires any operator performing transmission related functions, who is required to be PJM transmission certified, to also be NERC certified. These operators are required to obtain the NERC Transmission Operator Certification, the NERC Balancing, Interchange and Transmission Operator Certification, or the NERC Reliability Operator Certification. The NERC Transmission Operator Certification is recommended as it is more applicable to the functions performed by these operators. Operators currently certified at the Reliability Operator or Balancing, Interchange and Transmission Operator level may maintain their certification at this level or convert their certification to a Transmission Operator certificate. The Balancing and Interchange Operator Certification will not be acceptable for operators to meet this requirement.

Any new Transmission Owner Operator/Generation Dispatcher must be NERC Certified prior to taking independent shift responsibilities. New operators in a “training mode” without a NERC certification must be working under the direct supervision of a NERC certified operator and cannot take independent direction from PJM.

If a Transmission Owner Operator/Generation Dispatcher allows his/her NERC certification to become suspended or expire (as defined in the NERC System Operator Certification Program Manual), he/she must be removed from his/her operating shift responsibilities until such time that he/she can renew the credential.

Renewal of NERC certifications will follow the existing NERC process. This process will be between NERC and the certified operator through the NERC System Operator Certification and Continuing Education Database (SOCCED).

Task Verification:

Each entity must verify each TO Operator/Generation Dispatchers capability to perform each applicable reliability-related task contained within their Task List at least one time. This verification must be completed prior to the new TO Operator/Generation Dispatcher assuming

independent shift duties. For more detailed information about the verification process, refer to Section 1.5.4 of this manual.

Continuing Training:

TO Operator/Generation Dispatchers are subject to the continuing training requirements of both the TO Operator and the MOC Generation Dispatcher. Please refer to sections 3.2.1 and 3.2.2 of this manual, respectively, for details.

3.2.4 Small Generation Resource Dispatchers

Small Generation Resource Dispatchers are defined as dispatchers located at a generation resource who participate in the real time operations and meet the requirements of this classification. To be eligible for the Small Generation Resource Dispatcher classification the company must meet the following criteria:

- Operates/dispatches a total of 75 MW or less of generation (nameplate capacity) within PJM.
- Does not operate a black-start unit

Requests for this classification should be sent to TrainingSupport@pjm.com.

PJM will review all requests for this classification and notify the entity of its classification status and applicable requirements based on the entity's participation level in PJM and relative impact on the BES. If the request for Small Generation Resource Dispatcher classification is denied, the entity is subject to the training and certification requirements outlined in Section 3.2.2 of this manual. If an entity is approved as a Small Generation Resource Dispatcher, the following requirements apply.

3.2.4.1 For entities operating between 20 MW and 75 MW on an aggregate basis:

Initial Training:

Small Generation Resource Dispatchers must successfully complete the PJM sponsored Initial Training Program (ITP) and all open and required Just-in-Time training modules within six (6) months of being deemed qualified by their company to begin operating on the PJM system. Specific content covered in these courses may be adjusted based on the PJM generation dispatch tasks the entity is responsible for and the training needs of the individual company.

Operator Readiness Exam:

Small Generation Resource Dispatchers must successfully complete an operator readiness exam within six (6) months of being deemed qualified by their company to begin operating on the PJM system. This exam is based on the initial training program and assesses the dispatcher to ensure he/she has a baseline level of knowledge, awareness and familiarity of the content covered in this training.

Anytime during this six (6) month period, if a dispatcher is interacting with the PJM control room without having completed the requirements outlined above, he/she must work under the direct supervision of another dispatcher who has met the requirements, either in person or via an on-call arrangement.

For new entities, at least one dispatcher must pass the operator readiness exam prior to that entity beginning operations in PJM.

Continuing Training:

All Small Generation Resource Dispatchers with at least one full calendar year of shift responsibilities in real time PJM operations shall complete at least 8 hours per calendar year of refresher, operations and markets updates, or emergency preparedness training.

The following or its equivalent is satisfactory for meeting this requirement:

- Attendance at the annual PJM Operator Seminar (Note: The annual PJM Operator Seminar is a large component of the PJM Continuing Training Program. Since much of the content involves important updates and preparation for the summer peak season, it is highly recommended that Small Generation Resource Dispatchers attend this event.)
- Completion of PJM sponsored refresh, operations and markets updates, or emergency preparedness activities, including drills, table-top exercises, simulations and instruction
- Completion of company or vendor sponsored refresh, operations and markets updates, or emergency preparedness activities, including drills, table-top exercises, simulations and other training linked to the company specific tasks. (Note: This training should be documented in the PJM LMS utilizing the appropriate Training Activity Forms found on the Member Training Liaison webpage. This will allow the LMS to generate useful task to training reports that can be used by PJM and the member for the evaluation phase of the SAT).

3.2.4.2 For entities operating less than 20 MW on an aggregate basis:

Initial Training:

Small Generation Resource Dispatchers must successfully complete an initial training module on the requirements and business rules related to PJM markets and operations. Specific content covered in these courses may be adjusted based on the PJM generation dispatch tasks the entity is responsible for and the training needs of the individual company. This training module is available online, through the PJM Learning Management System (LMS) and must be completed, along with all open and required Just-in-Time training modules within six (6) months of being deemed qualified by their company to begin operating on the PJM system.

Anytime during this six (6) month period, if a dispatcher is interacting with the PJM control room without having completed the requirements outlined above, he/she must work under the direct supervision of another dispatcher who has met the requirements, either in person or via an on-call arrangement.

For new entities, at least one dispatcher must meet the above requirements prior to that entity beginning operations in PJM.

Continuing Training:

Small Generation Resource Dispatchers must annually complete a refresher training module on the requirements and business rules related to PJM markets and operations. This training is available online, via the PJM LMS.

Company or Vendor Sponsored Equivalent Training:

PJM recognizes that many Member Companies have rigorous training programs that provide similar training identified in the PJM sponsored training courses. Additionally, there may be third party suppliers of relevant, quality training. These training courses will be considered for

equivalency if they meet the criteria of the NERC Continuing Education Program (CEP) and contain topics consistent with the PJM and company-specific Task List.

PJM reserves the right to review training documentation and the systematic approach to training used in the development of any learning activity prior to granting equivalency.

PJM initial training requirements cannot be met by equivalent training. Additionally, the annual continuing training program may include requirements to complete certain PJM online "Just in Time" (JIT) Training modules on important changes to operations. These requirements must be satisfied by completion of PJM sponsored training and associated assessments.

3.2.5 Demand Response Resources

For the purpose of the training and certification requirements, the Demand Response Resources audience is defined as individuals who serve as an agent of each Curtailment Service Provider (CSP) that is interested in participating in PJM's Regulation and Synchronized Reserve markets and/or has Load Management (Emergency and Pre-Emergency) Resources. These individuals are in direct communication with Demand Response (DR) customers, advising them to curtail load when advised by PJM.

Initial Training:

Demand Response Resources must complete an initial training module on the requirements and business rules of the Regulation and Synchronized Reserve markets and relevant PJM Emergency Procedures. This training module is available online, through the PJM Learning Management System (LMS) and must be completed, along with all open and required Just-in-Time training modules, within 3 months of the individual beginning participation in Demand Response.

Anytime during this 3 month period that a Demand Response Resource individual is interacting with PJM without having completed the requirement outlined above, he/she must work under the direct supervision of another individual who has met the requirement, either in person or via an on-call arrangement.

For new entities, at least one individual must complete the initial training prior to that entity beginning participation in the PJM markets.

Certification:

At this time, PJM certification is not required for Demand Response Resources.

Continuing Training:

Demand Response Resources must annually complete a brief refresher training module on the requirements and business rules of the Regulation and Synchronized Reserve markets and relevant PJM Emergency Procedures. This training is available online, through the PJM LMS.

3.2.6 Energy Storage Resource Operators

For the purpose of the training and certification requirements, Energy Storage Resources are those facilities that may participate in various PJM markets. These resources may include, but are not limited to: batteries, plug-in hybrid electric vehicles (PHEV), flywheels and compressed air. Energy Storage Resource Operators are those individuals who will interact with PJM Dispatch for any dispatch assignments or emergency procedures.

Initial and Continuing Training:

For entities operating resources that aggregate to:

- Greater than 75 MW
  - Energy Storage Resource Operators are subject to the training requirements of the MOC Generation Dispatcher. Please refer to section 3.2.2 of this manual for details.
- 75 MW or less
  - Energy Storage Resource Operators are subject to the training requirements of the Small Generation Resource Dispatcher. Please refer to section 3.2.4 of this manual for details.

Certification:

For entities operating resources that aggregate to:

- Greater than 75 MW
  - Energy Storage Resource Operators are subject to the certification requirements of the MOC Generation Dispatcher. Please refer to section 3.2.2 of this manual for details.
- 75 MW or less
  - At this time, PJM certification is not required

3.3 Compliance Monitoring Process for Training and Certification Requirements

Section 1 of this manual describes the various elements and activities involved in implementing the PJM/Member SAT. These represent best practices that help ensure relevant training is implemented in a coordinated manner. However each SAT element does not represent a compliance monitoring point. The specific individual requirements that are monitored for compliance are outlined in Section 3.2 of this manual.

For additional clarity, below is a summary of the personnel requirements against which PJM performs compliance checks on a monthly and annual basis.

TO Operator

- Task verifications and reverifications completed
- Initial Training Program (ITP) completed
- Continuing Training Program requirements met
  - 32 Hours, per calendar year, Emergency Preparedness Training
  - Required Just-In-Time Training (by assigned due date)
  - Fulfillment of Annual Training Tasks (by the end of each calendar year)
- Active NERC and PJM Transmission Certifications

MOC Generation Dispatcher

- Initial Training Program (ITP) completed
- Continuing Training Program requirements met
  - 18 hours of continuing/refresher training per calendar year
  - Required Just-In-Time Training (by assigned due date)
- Active PJM Generation Certification

Small Generation Plant Dispatchers

- Initial Training Program (ITP) completed
- Operator Readiness Exam passed
- Continuing Training Program requirements met
  - 8 hours of continuing/refresher training per calendar year
  - Required Just-In-Time Training (by assigned due date)

Demand Response Resource and Energy Storage Device Operators

- Initial Training completed
- Continuing Training Program requirements met
  - Annual refresher training module assigning via the PJM LMS
  - Required Just-In-Time Training (by assigned due date)

Any operator or dispatcher that is not compliant with the applicable requirements listed above must be removed from his/her shift responsibilities until such time that he/she comes into compliance with those requirements.

If an exception to any of the requirements is identified, PJM will notify the company's Training Liaison, Member Committee Representative and Compliance contact of the compliance issue. Upon notification of the compliance issue, the Training Liaison will submit to PJM a mitigation plan outlining the steps the company plans to take to resolve the exception and satisfy the training and/or certification requirements. The mitigation plan should conform to the suggested guidelines provided in the notification of the compliance issue.

PJM will evaluate the details and milestones of the mitigation plan that is submitted. If the plan is approved, these milestones will provide the timing of subsequent compliance checks to verify that the details of the plan are being carried out. If the plan is not approved, PJM will request additional information needed to complete the mitigation plan.

PJM will develop a compliance score for each non-compliant company based on the number of months each operator/dispatcher is out of compliance. For companies that have a compliance score of 5 or greater, are consistently out of compliance with the requirements or are non-responsive, PJM Legal will issue a letter to said company warning of a report to FERC of a potential OA/OATT violation. If the company is still out of compliance with the requirements 30 days after the warning letter from PJM Legal, a report will be made to FERC that the company is in violation of the PJM OA/OATT.

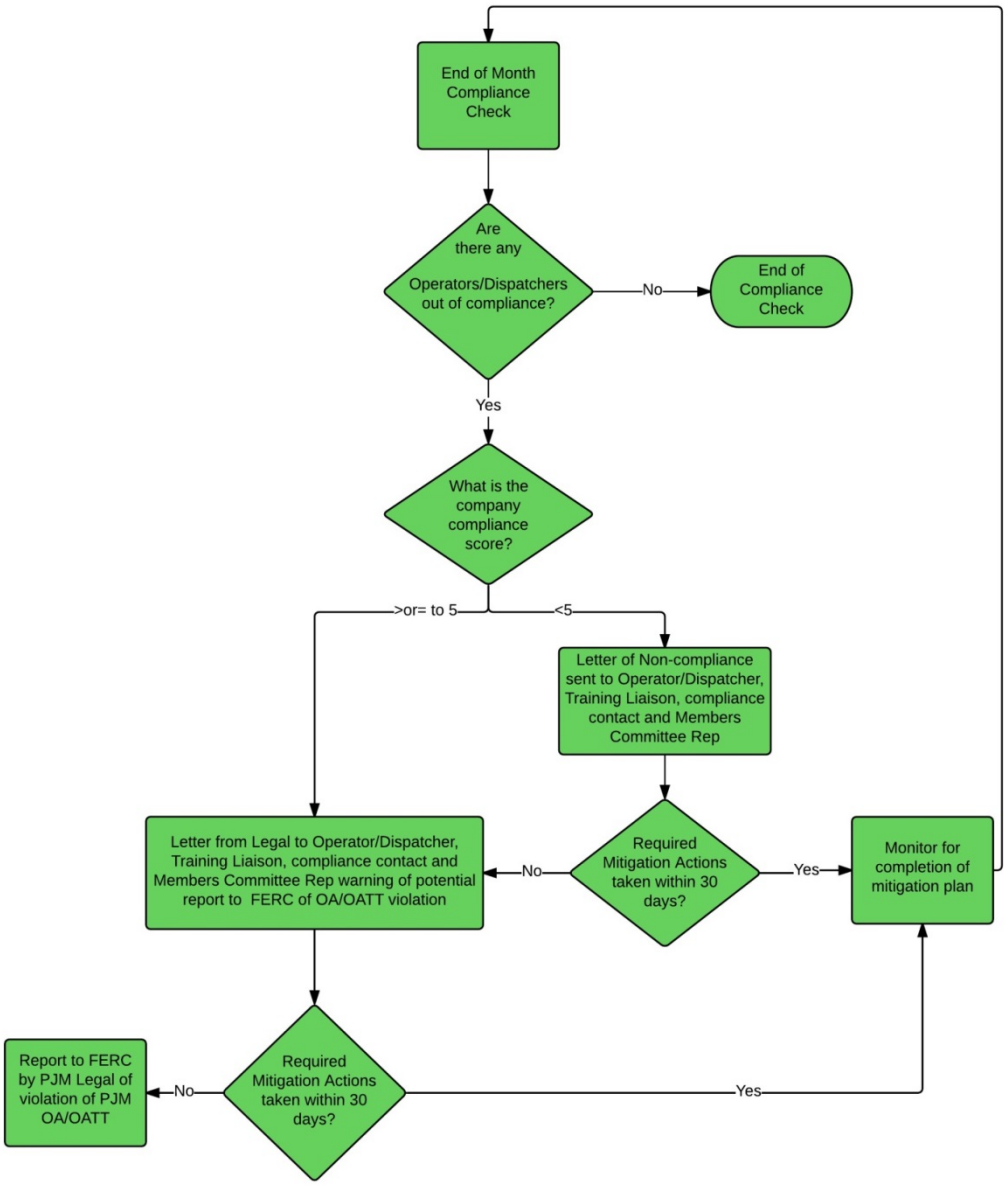

Exhibit 2: Compliance Monitoring Process

3.4 Temporary Waiver of PJM Training and Certification Requirements

Situations lasting three months or longer within a calendar year may arise which can prevent a system operator from fulfilling assigned work duties and satisfying the applicable PJM training and certification requirements.

In such cases, the Training Liaison must, on behalf of the operator, submit a letter requesting a temporary waiver from the PJM training and certification requirements with a supporting statement by the entity's manager of system operations, or equivalent. The letter must provide a thorough explanation of the circumstances preventing the operator from satisfying the requirements, and should be emailed to TrainingSupport@pjm.com.

PJM will review the request and will provide the Training Liaison with a final determination. The terms of the waiver, if granted, will be suited to the specifics of the case.

The Training Liaison is required to advise TrainingSupport@pjm.com of the date when the operator resumes normal duties and can participate in training activities.

3.5 NERC Training Requirements

The PJM training requirements described in section 3.2 of this manual do NOT replace or supplant any NERC training requirements defined in the NERC standards. The PJM training requirements are in addition to these applicable NERC standards on training and operator qualification.

TO Operator requirements as they relate to PER 005 are outlined in the TO/TOP Matrix.

Section 4: PJM Operator Training

Welcome to the *PJM Operator Training* section of the ***PJM Manual for Training and Certification Requirements***. In this section you will find the following information:

- Systematic Approach to Training
- PJM Master Coordinator training and qualification requirements
- PJM Generation Dispatcher training and qualification requirements
- PJM Power Director/Master Dispatcher training and qualification requirements
- PJM Reliability Engineer training and qualification requirements
- PJM Shift Supervisor training and qualification requirements
- Description and objectives of continuing training program for PJM system operators
- Process for ensuring proficiency following extended absence

4.1 Overview

To ensure continued reliable and economic operations, PJM is committed to providing their operators high quality training. PJM has well defined training programs for initial qualification training for their system operators as well as a continuing training program. PJM system operators have a training week built into their shift schedule allowing for 8 weeks of dedicated training time per year.

PJM may supplement its training program with additional training provided by universities, vendors or internal staff as required.

4.2 Systematic Approach to Training

PJM Trainers have been trained in utilization of a Systematic Approach to Training (SAT). A SAT approach is used for initial and continuing training of the PJM system operators. PJM utilizes a variation of the Dept. of Energy's ADDIE process for its Systematic Approach to Training. Described below is the process that is followed for each phase of the "ADDIE process" which is utilized in training development.

Note:
Definition of the ADDIE Process – Systematic Approach to Training including five distinct, yet interrelated phases as follows:

Analysis – This phase identifies the training requirements and may include a needs analysis, job analysis and task analysis.

Note:
Design – The design phase uses the information collected during the analysis phase to provide a “blueprint” for developing training programs and includes development of training objectives.

Development – This phase incorporates the results of the design activities. The output of this phase is the training material.

Implementation – Implementation involves taking the results of the development phase into the training setting and conducting the training.

Evaluation – This phase involves periodic review of training material and a method for collecting feedback from trainees and supervisors on the effectiveness of the training.

4.2.1 Analysis Phase

PJM has performed a comprehensive Job and Task analysis for each operating position within the PJM control room. This analysis includes the following components for each identified task: Conditions of the task, Duration of the task, Frequency task is performed, Criticality of the task, Standards for Completion of the task, Detailed steps of the task, Skills/Knowledge required to perform the task and the Tools used to complete the task. This Job and Task analysis was used to identify all Reliability-Related tasks in compliance with NERC Standard PER-005-2, Requirement 1.1.

Note:
Reliability Related Task – For its operators, PJM has defined a Reliability Related Task as one that has the potential to impact the adequate level of reliability of the BES if that task is not performed or performed improperly. By reviewing the task criticality listed in the Job Task Analysis (JTA), PJM has determined that all tasks in its Job Task Analysis are Reliability Related (PER-005-2, R1.1)

This Job and Task analysis (and Reliability Related Task List) is updated at least annually or more frequently as required based on changes to operator tasks in accordance with NERC Standard PER-005-2, Requirement 1.1.1.

In addition, PJM employs the use of a standardized ADDIE template for training analysis (Training needs analysis and task analysis) when developing training for continuing education or just in time training.

Note:
Changes to Reliability Related Tasks requiring task verification within 6 months: PJM trainers will conduct an analysis to determine the impact of operating changes on Reliability Related Tasks. For all new or significantly changed Reliability Related Tasks, training and verification of task competency is required per PER-005-2 R3.1. Examples of these situations include new tools that impact task completion, operation in new transmission zones (market integrations), and new procedures that modify task completion. PJM will track task verification related to these task changes in the LMS Task Tracking module.

Routine procedure refreshes, tool update, database updates, grammatical updates or other changes that are insignificant to task completion will not require training or task verification.

4.2.2 Design Phase

Section 4 of this Manual describes the training plan for PJM operator initial and continuing training that result from this design phase. This plan is reviewed and updated on at least an annual basis based on feedback from system operators and operations management.

PJM identifies a yearly training plan for system operator continuing training based on NERC required training, training needs identified by operations management, refresher training and training on new tools, processes and procedures.

This yearly plan is further refined and detailed prior to each of the 8 continuing education training cycles to identify any required changes or updates to the planned cycle training.

Objectives are defined for the training plan and the individual training topics.

4.2.3 Development Phase

The output of this phase is the actual training material. For PJM operator training, this includes the following:

Initial Training:

- OJT Training Materials and documentation
- Online training presentations
- Position Qualification checklists
- DTS Practice session documentation
- Written/DTS Qualification test documentation

Continuing Training:

- Online training presentations
- Classroom training material
- DTS scenario documentation
- Training quizzes
- Student evaluations

4.2.4 Implementation Phase

PJM makes use of a Learning Management System to maintain all records of training completion by system operators. In addition to the training records maintained in the LMS, PJM maintains completed OJT training material, completed DTS practice session sheets and completed Qualification checklists. All of these are evidence of completion of the Implementation Phase of the ADDIE process.

4.2.5 Evaluation Phase

PJM utilizes several methods to obtain feedback on training programs to continuously improve the effectiveness of these programs.

These evaluation methods include:

- Trainee performance on quizzes

- Trainee critiques of training

In addition, for more detailed feedback on PJM training programs, PJM utilizes a “Training Advisory Committee (TAC)”. The TAC is made up of operator representatives from each of the Dispatch teams and meets approximately every training cycle (every 6 weeks). TAC responsibilities include:

- Review/Update of training material
- Offer feedback and suggestions on presented training
- Identify future training needs

To determine operator qualification, PJM employs a “Qualification Board”. This board is comprised of the Director of Dispatch, Shift Supervisors, Manager of System Operator Training, Operator Trainers and Human Resources. A minimum of three training and operations personnel must participate in the board. It is the responsibility of the Qualification Board to review the candidate operator’s test results, training performance, qualification status, and feedback from those involved in the candidate operator’s training. Upon review of this data the board will reach one of three recommendations:

- Fully Qualified with no restrictions
- Qualified with restrictions (additional training, etc)
- Not recommended for Qualification at this time

4.2.6 PJM System Operator Testing Requirements

PJM System Operators are tested using a variety of methods to ensure task proficiency and readiness to assume real time operating positions. These methods include:

- Written test
- Computer based test
- Skill demonstration
- Simulator exam

The methods are based on the position, the JTA, and the availability of testing technology.

Written/Computer Based Tests

The trainee will complete a written or computer-based test after the OJT trainer and System Operator Training Department determines the trainee is ready (typically after the completion of OJT sign-offs and other required training). The minimum passing score for the written/computer based exams is 80%.

Simulator Exams

Based on a review of the trainee’s progress the OJT trainer and System Operator Training Department will determine when the trainee will be given at least 2 simulator practice sessions (at least 3 sessions for PD trainee in preparation for the Simulator test (where applicable). Additional simulator practice sessions will be made available if requested by the trainee, based on instructor availability.

The simulator exam will test the Trainee on system knowledge, skills and ability to perform the tasks of the position for which they are qualifying. The minimum passing score for the simulator exam is 80%. The score will be the average score of at least four evaluators including at least two Shift Supervisors (or one Shift Supervisor and a Lead Reliability Engineer), and at least two simulator operators/system operations trainers.

Skills Demonstration

After successful completion of the written/computer exam, the trainee will be required to perform a skills demonstration (where PJM does not have a simulated environment). The purpose is to demonstrate their ability to perform key duties and reliability related tasks. The minimum passing score for the skills test is 80%. The score will be the average score of a minimum of two evaluators including System Operator Trainers, Shift Supervisor, or Lead Reliability Engineer.

Retesting

If the initial test score of any test is less than 80%, a retest will be administered after a two-week period. During this time, any areas of deficiency will be reviewed with a Trainer. The second test will be materially different from the initial test/demonstration (where applicable). The passing score for all retests is 85%.

The Trainee is allowed one retest opportunity on any qualification exam. If the individual is still unsuccessful after 1.) two test attempts (written or skills) for MC, or 2.) four test attempts (written, computer based, or simulator) for all other positions, the trainee's disposition will be determined by PJM HR policies.

4.3 PJM Trainer Qualifications

4.3.1 PJM System Operator Trainers

PJM System Operator Trainers are knowledgeable in both System Operations and Instructional Design methods. PJM System Operator Trainers are expected to complete a "Train-the-Trainer" program within the first 6 months of employment as a trainer. This may be waived if the trainer has a strong background in training, instructional design or the SAT. Trainers may also be required to attend the training courses outlined in Section 3 if they do not have experience in PJM System Operations.

In addition, each System Operator Trainer is recommended to attend a minimum of one "training industry" event per year. These events can include, but are not limited to:

- Transmission Forum Train-the-Trainer workshops
- Transmission Forum Peer Review teams
- RTO/ISO Training Committee meetings
- Industry sponsored Training workshops (i.e. IEEE, NERC, etc)
- Third party provided training

4.3.2 PJM OJT Trainers

PJM utilizes a structured approach to On the Job Training (OJT). A cadre of qualified OJT Trainers is maintained and utilized as required to assist with operator qualification training. The OJT Trainers are given training on the approach, requirements and documentation of the OJT Training. The OJT Trainers are selected based on job performance, communication skills and

willingness to serve in the OJT Trainer role. Task verification and documentation is completed by the OJT Trainers as the student operators become proficient in the required tasks. The OJT Trainers serve as the student operator mentors and guide trainees through the job qualification process as detailed in sections 4.4 through 4.7 of this Manual.

4.4 Master Coordinator Initial Training and Qualification Requirements

A candidate for the position of Master Coordinator(MC) at PJM will receive up to 12 weeks of MC specific training to complete position related training.

NERC Certification must be obtained within 24 weeks of hire in order to meet the requirements of the Master Coordinator position and work the position without direct supervision. If a trainee already is NERC certified at the Balancing and Interchange level, this certification will meet the NERC certification requirements of Master Coordinator.

PJM Generation Certification and the Initial Training Program (ITP) are required within 6 months of Master Coordinator qualification.

Training for the Master Coordinator position is accomplished through on-line training modules, one-on-one training with PJM Trainers, self-study and on- the-job training (OJT). During the training period, the Trainee is assigned to an on-shift OJT Trainer who will work with the Trainee and guide them in acquiring the knowledge and skills required for the position. The OJT Trainer, to whom the Trainee is assigned, shall complete an Observation Assessment Record (OAR) and submit periodic (not less than 3) progress reports to System Operator Training. Included in this progress report is any area of weakness, which the System Operator Trainer or OJT Trainer will review with the Trainee and arrange for remediation as appropriate.

The Master Coordinator OJT Trainer assesses the Trainee's mastery of the tasks and, when acceptable, performs the task verification and associated documentation, including, but not limited to:

- Identify the different operating levels of a generator
- Recognize PJM reserves
- Identify Emergency Procedures and their role.
- Demonstrate the scheduling process
- Load Forecasting
- Reserves
- Regulation
- Data inputs and tools
- Different Load Curve shapes
- Cost vs. price
- No load and operating rate for generators
- Economic Dispatch
- Cost capping

- On/Off reasons in Dispatch Management Tool

Note:
The Trainee must be up to date with completion of training assignments, OJT sign-offs and procedure review as assigned through the PJM Learning Management System prior to scheduling of final written and skills testing.

Upon completion of training, the Trainee will be required to take a test – refer to Section 4.2.6 .

Training Objectives for the Master Coordinator Position

1. Define the purpose, organization and functions of the PJM RTO.
2. Demonstrate mastery of the knowledge and skills required of a PJM Master Coordinator.
3. Demonstrate mastery of the job task routines performed by the Master Coordinator for all three shifts: day, evening and night, and in all three operating states: normal, emergency and restoration.
4. Define the function of the Dispatch Department in scheduling and real-time operation of the PJM RTO system, and functions performed by the Master Coordinator.
5. List the member companies participating in real time operations, the characteristics of their system and generating facilities.
6. List the duties and responsibilities of the other PJM Dispatch positions and related PJM operations support staff.
7. Develop a mastery of all applicable NERC and Regional Reliability Standards.
8. Define all applicable regulatory requirements.
9. List applicable PJM operating procedures as defined in the PJM Manuals and Operating Memos.
10. Demonstrate the ability to prepare a load forecast.
11. Analyze day-ahead market results for reliability and reserve adequacy.
12. Manage appropriate documentation and reports to assist with the status, cost, availability and the scheduling of generation.
13. Analyze submitted Generation Checkout information.
14. Evaluate system conditions and Locational Marginal Prices.
15. Demonstrate the ability to prepare a hydro schedule.
16. Analyze generation outage tickets as reported in the eDART application.
17. Demonstrate performing Control Area checkout processes and procedures.
18. Analyze Ramp Limits and their relationship to customer Ramp Reservations.
19. Evaluate the submission, dispatch, curtailment and reload of energy transactions.
20. Evaluate the submission of transmission service reservation requests.

21. Prepare appropriate reports in support of other dispatch and supervisory positions as they relate to normal and emergency conditions including Minimum Generation and Maximum Emergency conditions.
22. Explain the use and purpose of electronic tools in use by the Master Coordinator position.
23. Monitor the status of control room systems and equipment.

Knowledge and Skills required for the Master Coordinator Position

- PJM Energy and Ancillary Service Markets
- Unit Commitment and Economic Dispatch
- NERC and Regional Reliability Organization (RRO) Standards
- Regulatory requirements
- Ability to utilize various PJM tools in support of required tasks including but not limited to, Dispatcher Management Tool (DMT), eDART, Data Viewer, SmartLog, Resource Scheduling and Commitment (RSC), Security Constrained Economic Dispatch (SCED), Interchange Management Tool (IXM), Interchange Distribution Calculator (IDC) and OATI tagging system.
- Generation scheduling procedures
- Generation outage scheduling rules, systems and procedures.
- Ability to recognize impacts to load forecasting
- Ability to perform load forecasting within required error bandwidths
- Automatic Generation Control concepts
- PJM, RFC, SERC and NERC Reserve requirements
- Ability to schedule generation to meet next day's load forecast, net interchange and reserve requirements
- PJM Emergency Procedures and associated reporting

Non-technical Competencies required for the Master Coordinator Position

- Problem Solving (PJM Competency)
- Time Management (PJM Competency)
- Drive for Results (PJM Competency)
- Interpersonal Savvy (PJM Competency)
- Customer Focus (PJM Competency)
- Initiative
- Productivity
- Communication Skills

- Teamwork
- Decision Making
- Adaptability/Dependability

4.5 Generation Dispatcher Initial Training and Qualification Requirements

Readiness for Generation Dispatcher Training

Although some operators are hired directly as Generation Dispatcher (GD), the majority of system operators are hired as Master Coordinators and will progress up to Generation Dispatcher.

To begin training for the position of Generation Dispatcher within PJM dispatch, the trainee must have a current NERC Certification (RC or BI) and PJM Certification (Generation), and have successfully passed a Master Coordinator to Generation Dispatcher pre-test with a minimum score of 80%. The purpose of the pre-test is to determine if the candidate has gained the minimum knowledge required to begin training for the Generation Dispatcher position. Failure to pass the pre-test will require a two week period before candidate can re-test. The trainee must also be current on all training requirements as identified in the PJM Learning Management System.

Skills and knowledge required to pass the pre-test include:

- Area Control Error (ACE) components
- NERC Resource and Demand Balancing Standards
- Generation impact on PJM Reactive Transfer Limits
- NERC, RFC, SERC and PJM Reserve requirements
- Emergency Procedures
- NERC Interchange Scheduling and Coordination Standards
- SCED, DMT, ExSchedules, and ASO applications
- Communication Protocols
- PI Displays
- PJM Manuals

Generation Dispatcher Training

Upon successful completion of the pre-test, the training and testing requirements of the Generation Dispatcher Training will be reviewed with the candidate.

Training is for a period of up to 12 weeks of GD specific training and consists of on-line training, self-study, one-on-one training, DTS simulations, and on-the-job training (OJT). During the training period, the Trainee is assigned to an on-shift OJT Trainer who will work with the Trainee and guide them in acquiring the knowledge and skills required for the position. The OJT Trainer to whom the Trainee is assigned shall complete an Observation Assessment Record (OAR) and

submit periodic (not less than 3) progress reports to System Operator Training. Included in this progress report is any area of weakness, which the System Operator Trainer or OJT Trainer will review with the Trainee and arrange for remediation as appropriate. Completion of the OAR ensures that the Trainee has performed a task verification of every step for each task of the Job Task Analysis.

Completion of PJM Classroom Courses

If not completed during their time as a Master Coordinator, the Generation Dispatcher must successfully complete the Initial Training and Qualification requirements for Master Coordinators as outlined in Section 4.4. prior to qualifying for the Generation Dispatcher position.

Job Qualification

Note:
The Trainee must be up to date with completion of training assignments, OJT sign-offs and procedure review as assigned through the PJM Learning Management System prior to scheduling of final written and skills testing.

Upon completion of training requirements, the trainee will be required to pass a written and simulation exam. See Section 4.2.6 for testing criteria.

Training Objectives for the Generation Dispatcher Position:

1. Demonstrate mastery of the knowledge and skills required of a PJM Generation Dispatcher.
2. Demonstrate mastery of the job task routines performed by the Generation Dispatcher in all three operating states: normal, emergency and restoration.
3. Develop a mastery of all applicable NERC and Regional Reliability Standards and their application to the Generation Dispatcher position.
4. Demonstrate the ability to balance generation with demand factoring in all variables including load, interchange, frequency, generation movements, weather and emergency conditions.
5. Define all applicable regulatory requirements.
6. Develop a mastery of applicable PJM operating procedures as defined in the PJM Manuals and Operating Memos.
7. Demonstrate the ability to monitor Generation Alarms and events, system dispatch, load and generation and Locational Marginal Prices.
8. Demonstrate the ability to perform an Instantaneous Reserve Check.
9. Demonstrate the knowledge of and ability to activate/de-activate shared reserves.
10. Apply PJM procedures for Capacity deficiency situations.
11. Apply PJM procedures for light load situations.

12. Identify the need to load synchronized reserves in response to system disturbance conditions.
13. Describe the response to Geomagnetic disturbance conditions.
14. Demonstrate the ability to restore reserves after a system disturbance.
15. Demonstrate the implementation of a time error correction.
16. Demonstrate the ability to implement system dispatch including off-cost operations
17. Demonstrate the ability to perform Regulation and Synchronous Reserve Market checks
18. Identify and report Control room equipment issues
19. Explain the use of the Dispatch Management Tool
20. Discuss the transfer of shift procedure.

Skills and knowledge for the Generation Dispatcher position include:

- NERC and Regional Reliability Organization (RRO) Standards
- Regulatory requirements
- NERC, RFC, SERC and PJM Reserve requirements
- Generation Control
- Time Error Correction
- Emergency Procedures
- Security Constrained Economic Dispatch (SCED) operation
- Combustion Turbine Parameters
- Dispatch Management Tool Operation (including logging)
- Energy Management System (EMS)
- EMS Alarm Recognition
- Various methods of Generation Control
- System Reserves and Instantaneous Reserve Check
- Economic Dispatch/ Economic Decisions
- ACE and Frequency deviations (what they indicate)
- PJM Manuals
- Business Rules for Generation
- Understand impact of generation on Reactive Transfer limits
- Shared Reserves activation

Non-technical Competencies required for the Generation Dispatcher Position:

- Problem Solving (PJM Competency)

- Time Management (PJM Competency)
- Drive for Results (PJM Competency)
- Interpersonal Savvy (PJM Competency)
- Customer Focus (PJM Competency)
- Initiative
- Productivity
- Communication Skills
- Coaching Skills
- Strategy Development
- Dealing with and managing change
- Teamwork
- Decision Making
- Adaptability/Dependability

4.6 Power Director/Master Dispatcher[1] Initial Training and Qualification Requirements

Readiness for Power Director Training

Most Power Directors(PD) progress to this position from the Generation Dispatcher position.

Candidates hired directly into the Power Director position must obtain their NERC Certification (RC) prior to assuming shift duties. They also must obtain PJM Certification (Generation and Transmission) prior to assuming shift duties.

To begin training from the position of Generation Dispatcher to the Power Director at PJM, the candidate must be both NERC (RC) and PJM (Generation and Transmission) certified.

The candidate must also be current on all training requirements as identified in the PJM Learning Management System.

The candidate will also be required to have successfully passed the Power Director pre-test. The purpose of the pre-test is to determine if the candidate has gained the minimum knowledge required to begin training for the Power Director position.

Skills and knowledge required to pass the pre-test include:

- Mastery of all applicable NERC and Regional Reliability Standards relating to operations including Reliability Coordination
- PJM Emergency Procedures
- Voltage control concepts and procedures
- Reactive Transfer Limits
- Interchange impacts on transmission control

- Contingency control and operating criteria
- Communication protocols
- Voltage drop analysis and prevention
- Interpreting EMS and trend data
- SCED (transmission constraint control)
- EMS One Lines
- EMS Alarm Classifications

Power Director Training

The training and testing requirements of the Power Director Training will be reviewed with the candidate.

Training is for a period of up to 22 weeks of PD specific training and consists of on-line training, self-study, one-on-one training, DTS simulations, and on-the-job training (OJT) as described in the Power Director Initial Training Manual. During the training period, the Trainee is assigned to an on-shift OJT Trainer who will work with the Trainee and guide them in acquiring the knowledge and skills required for the position. The OJT Trainer, to whom the Trainee is assigned, shall complete an Observation Assessment Record (OAR) and submit periodic (not less than 3) progress reports to System Operator Training. Included in this progress report is any area of weakness, which the System Operator Trainer or OJT Trainer will review with the Trainee and arrange for remediation as appropriate.

Completion of PJM Courses

If not completed during their time as Generation Dispatcher, the Power Director must successfully complete the Initial Training Program course and obtain NERC RC and PJM Transmission Certifications prior to qualifying for the Power Director position. The time spent in these courses will not be deducted from the 22 weeks training.

Job Qualification

By week eight of training, the Trainee will complete a written PD basic theory test after the OJT trainer and Syste Operator Training Department determines the trainee is ready (typically after the completion of OJT sign-offs and other required training). The minimum passing score for the written/computer based exam is 80%.

Note:
The Trainee must be up to date with completion of training assignments, OJT sign-offs and procedure review as assigned through the PJM Learning Management System prior to scheduling of final written and skills testing.

Upon completion of training requirements, the trainee will be required to pass a written and simulation exam. See Section 4.2.6 for testing criteria.

Note:

Training Objectives for the Power Director Position:

Upon completion of the Power Director training program, the successful candidate will be able to:

1. Demonstrate the knowledge of and ability to apply all applicable NERC and Regional Reliability Organization (RRO) Standards with a primary focus on EOP, Emergency Preparedness and Operations, IRO, Interconnection Reliability Operations and Coordination, TOP, Transmission Operations and VAR, Voltage and Reactive
2. Demonstrate mastery of the job task routines performed by the Power Director in all three operating states: normal, emergency and restoration.
3. Define all applicable regulatory requirements.
4. Demonstrate the knowledge of and ability to apply all RTO zonal transmission area specific operating procedures
5. Demonstrate the knowledge of and ability to apply all RTO zonal transmission area specific operating considerations and problem areas
6. Demonstrate the knowledge of all Remedial Action Schemes (RAS) contained in the RTO and specific operating considerations based on the operation of these schemes.
7. Demonstrate the knowledge of PJM communication protocols
8. Demonstrate the knowledge of NERC, RFC, SERC and PJM Reserve requirements
9. Demonstrate the knowledge of and ability to apply PJM Emergency Procedures when necessary
10. Demonstrate the knowledge of and ability to apply Reactive Power and Voltage Control concepts
11. Demonstrate the knowledge of Surge Impedance Loading and identify its impact on voltage
12. Identify contingency overloads and employ correction techniques
13. Determine the impact of Interchange on transmission flows
14. Assess and maintain PJM reliability limits including thermal limits, voltage limits, reactive transfer limits and stability limits within their acceptable limits
15. Use Transmission Equipment Ratings Monitor(TERM) application for changing of thermal limits
16. Operate the Security Constrained Economic Dispatch (SCED) application for generation and transmission constraint control
17. Evaluate and employ System Restoration techniques, strategies and procedures
18. Demonstrate the knowledge of Combustion Turbine parameters
19. Use the Dispatch Management Tool Operation (DMT) (including logging)

20. Operate the Energy Management System (EMS) and all network analysis applications
21. Recognize EMS Alarms, analyze alarm data and initiate corrective actions
22. Assess ACE and Frequency deviations and identify what they indicate
23. Interpret and apply the operating concepts contained within PJM Manuals
24. A Reactive Transfer Limit data and determine the impact of generation on Reactive Transfer limits
25. Demonstrate the knowledge of and ability to activate/de-activate Shared Reserves
26. Demonstrate the knowledge of PJM One-line diagrams symbols and colors

Skills and knowledge for the Power Director position include:

- Ability to demonstrate a knowledge of applicable NERC and Regional Reliability Organization (RRO) Standards with primary focus on EOP, Emergency Preparedness and Operations, IRO, Interconnection Reliability Operations and Coordination, TOP, Transmission Operations and VAR, Voltage and Reactive
- Ability to demonstrate a knowledge of applicable regulatory requirements
- NERC, RFC, SERC and PJM Reserve requirements
- PJM Emergency Procedures
- Reactive Power and Voltage Control concepts
- Surge Impedance Loading and its impact on voltage
- Contingency overload identification and correction techniques
- Interchange impacts on transmission flows
- PJM reliability limits including thermal limits, voltage limits, reactive transfer limits and stability limits
- TERM application for viewing of thermal limits
- Security Constrained Economic Dispatch (SCED) operation
- System Restoration techniques, strategies and procedures
- Combustion Turbine Parameters
- Dispatch Management Tool Operation (including logging)
- Energy Management System (EMS) and all network analysis applications
- EMS Alarm Recognition
- ACE and Frequency deviations (what they indicate)
- PJM Manuals
- Ability to demonstrate a knowledge of the impact of generation on Reactive Transfer limits
- Shared Reserves

- One-line diagrams symbols and colors
- eDART use for transmission outages and reactive capability adjustments
- Reactive Reserve Check process
- Transmission area specific operating procedures
- Transmission area specific operating considerations and problem areas
- Remedial Action Schemes (RAS)

Non-technical Competencies required for the Power Director Position:

- Problem Solving (PJM Competency)
- Time Management (PJM Competency)
- Drive for Results (PJM Competency)
- Interpersonal Savvy (PJM Competency)
- Customer Focus (PJM Competency)
- Initiative
- Productivity
- Communication Skills
- Coaching Skills
- Strategy Development
- Dealing with and managing change
- Teamwork
- Decision Making
- Adaptability/Dependability
- Conflict Management

[1]A Master Dispatcher (MD) is an operator that can perform the tasks associated with Generation Dispatcher and Power Director. They are familiar with the specific transmission systems of all areas of the RTO. Ideally, the Master Dispatchers are rotated between the GD and PD positions frequently to maintain proficiency in these tasks.

4.7 Reliability Engineer Initial Training and Qualification Requirements

Most Reliability Engineers are hired directly into this position though some may come from the Power Director/Master Dispatcher candidate pool.

Candidates hired directly into the Reliability Engineer (RE) position must obtain their NERC Certification (RC) prior to assuming shift duties. They also must obtain PJM Certifications (Generation and Transmission) prior to assuming shift duties.

The Reliability Engineer Trainee will have a training plan developed based on skills and experience. This plan will be approved by the Managers of both System Operator Training and Reliability Engineering Departments.

Reliability Engineer Training

Training is for a period of up to 14 weeks and consists of on-line training, self-study, one-on-one training, DTS simulations, and on-the-job training (OJT). The Trainee will be assigned to an OJT Trainer who is responsible for completion of Observation and Assessment Records (OAR) sign-offs, and submit periodic (not less than 3) progress reports to System Operator Training. Included in this progress report is any area of weakness, which the System Operator Trainer or OJT Trainer will review with the Trainee and arrange for remediation as appropriate.

Completion of PJM Courses

If not already completed, the Reliability Engineer Trainee is required to successfully complete all the requirements in the “Completion of PJM Courses” for Power Directors Section 4.6 prior to qualifying for the Reliability Engineer position. The time spent in these courses will not be deducted from the 14 weeks training.

Job Qualification

By week fourteen of training, and after having attained all Reliability Engineer OAR sign-offs, and completed review of all training materials assigned, the trainee will be tested per Section 4.2.6.

Training Objectives for the Reliability Engineer Position:

- Demonstrate mastery of the knowledge and skills required of a PJM Reliability Engineer.
- Demonstrate mastery of the job task routines performed by the Reliability Engineer in all three operating states: normal, emergency and restoration.
- Develop a mastery of all applicable NERC and Regional Reliability Standards and their application to the Reliability Engineer position.
- Demonstrate the ability to maintain transmission reliability factoring in all variables including load, interchange, generation movements, weather, transmission maintenance, voltage and emergency conditions.
- Demonstrate the ability to maintain voltages within acceptable limits factoring in all variables including load, interchange, generation movements, maintenance outages and emergency conditions.
- Demonstrate the ability to utilize all network analysis advanced applications to monitor and control the power system within all reliability limits.
- Demonstrate the ability to process outage data and interpret outage study results
- Define remedial actions to be taken in the event that an equipment outage causes operational issues.
- Define all applicable regulatory requirements.
- Develop a mastery of applicable PJM operating procedures as defined in the PJM Manuals and Operating Memos.

- Control for Actual and Post-Contingency Thermal Overloads and Voltage Violations
- Demonstrate the ability to monitor and utilize the RCIS, M2M, TLR and IDC tools
- Develop study cases for the purpose of outage, nuclear voltage and reliability studies.
- Perform outage request, day-ahead and two-pass studies
- Perform coordination and notification regarding equipment outages/returns, special events and tests
- Perform Transient Stability analysis utilizing the TSA tool.

Skills and knowledge for the Reliability Engineer position include:

- NERC and Regional Reliability Standards with primary focus on EOP, Emergency Preparedness and Operations, IRO, Interconnection Reliability Operations and Coordination, TOP, Transmission Operations and VAR, Voltage and Reactive
- Regulatory requirements
- NERC, RFC, SERC and PJM Reserve requirements
- PJM Emergency Procedures
- Reactive Power and Voltage Control concepts
- Surge Impedance Loading and its impact on voltage
- Contingency overload identification and correction techniques
- Interchange impacts on transmission flows
- Use of the Interchange Distribution Calculator (IDC) program to control transactions for system reliability
- PJM reliability limits including thermal limits, voltage limits, reactive transfer limits and stability limits
- TERM application for viewing of thermal limits
- Security Constrained Economic Dispatch (SCED) operation
- System Restoration techniques, strategies and procedures
- Combustion Turbine Parameters
- Dispatch Management Tool Operation (including logging)
- Energy Management System (EMS) and all network analysis applications
- EMS Alarm Recognition
- ACE and Frequency deviations (what they indicate)
- PJM Manuals
- Impact of generation on Reactive Transfer limits
- One-line diagrams symbols and colors
- eDART use for transmission outages and reactive capability adjustments

- Market to Market duties
- Reliability Coordinator Information System (RCIS) posting procedures and requirements
- System Data Exchange (SDX) files for sharing of transmission and generation outages across RTO borders
- Transient Stability Analysis (TSA) tool

Non-technical Competencies required for the Reliability Engineer Position:

- Problem Solving (PJM Competency)
- Time Management (PJM Competency)
- Drive for Results (PJM Competency)
- Interpersonal Savvy (PJM Competency)
- Customer Focus (PJM Competency)
- Initiative
- Productivity
- Communication Skills
- Coaching Skills
- Strategy Development
- Dealing with and managing change
- Teamwork
- Decision Making
- Adaptability/Dependability
- Conflict Management

4.8 Shift Supervisor Initial Training and Qualification Program

Most Shift Supervisor candidates progress through the various system operator positions and thus are familiar with the tasks and responsibilities of each. The candidates that have operating experience in the positions of Master Coordinator, Generation Dispatcher and Power Director will not be required to re-train or re-qualify in these positions.

Candidates hired directly into the Shift Supervisor position without any real-time Dispatch experience will be required to go through the training and qualification programs for Master Coordinator in Section 4.4, Generation Dispatcher in Section 4.5 and Power Director in Section 4.6.

Candidates with experience at some of the real-time Dispatch positions will be required to go through the training and qualification programs for those operating positions which they do not have experience.

Required Certifications

Shift Supervisors are required to have current NERC RC Certification, PJM Generation Certification and PJM Transmission Certification prior to assuming on-shift duties.

Completion of PJM Classroom Courses

Shift Supervisors are required to have successfully completed all the training requirements in the “Completion of PJM Courses” for Power Directors as outlined in Section 4.6(if not already completed).

Shift Supervisor Training

Training for the Shift Supervisor will consist of up to 6 weeks of OJT training. A limited number of reliability-related tasks have been identified specific to the Shift Supervisor.

Shift Supervisors are expected to complete all of the training offered as part of PJM’s Continuing Training Program.

Additional training will focus on the development of the leadership and management skills of the Shift Supervisors. Management/Leadership courses offered by Human Resources are recommended training for new Shift Supervisors.

These courses include:

1. Harassment, Americans with Disabilities Act (ADA) Laws, Family and Medical Leave Act (FMLA) Laws and Employment Laws. This training will be completed in-person or via on-line training modules and tracked in the Human Resources Learning Management System.
2. SAP User Training – This 2 hour training session is delivered by PJM’s Finance Dept and is designed to give new managers and supervisors the basics of using the SAP accounting system including time entry and approval, expense approval and requisitioning. This training is offered on demand.
3. Performance Management Training – This training will be sponsored by Human Resources annually. This in-person training class will explain PJM’s Performance Management process, teach methods of delivering feedback and getting optimal team performance.
4. New Reporting Relationship (NRR) Meeting – This one day meeting facilitated by Human Resources will help the Shift Supervisor identify issues that his/her new team feels are important and allow the team to get to better know their new supervisor.
5. Center for Creative Leadership –Maximizing your Leadership Potential- This 3-day vendor-delivered class focuses on identifying the Shift Supervisor’s individual strengths and areas for improvement. The course presents fundamental conflict management and influencing skills and culminates with a one-on-one feedback session designed to allow for individual development plan creation.
6. Managing Conflict for Managers – This course can be offered in-house or through an external consultant. It expands upon the concepts presented in the Foundations for Leadership course dealing with conflict management and teamwork.

Job Qualification

Readiness for taking shift will be determined by the OJT instructor and Dispatch management based on the successful completion of the tasks identified in the Job Task Analysis.

Training Objectives for the Shift Supervisor Position:

1. Demonstrate leadership in the control room and accept overall responsibility for maintaining reliability on the PJM system.
2. Demonstrate mastery of the job task routines performed within the control room in all three operating states: normal, emergency and restoration.
3. Maintain a mastery of all NERC, RFC, SERC and other regulatory standards and their application within PJM.
4. Demonstrate the ability to maintain transmission reliability factoring in all variables including load, interchange, generation movements, weather, transmission and generation maintenance, voltage and emergency conditions.
5. Demonstrate the ability to utilize all network analysis advanced applications to monitor and control the power system within all reliability limits.

Skills and knowledge for the Shift Supervisor position include:

- Mastery of all NERC, RFC, SERC and other regulatory standards and requirements
- PJM Emergency procedures
- PJM Transmission operations and constraint control procedures
- SCED application mastery
- PJM reliability limits including thermal limits, voltage limits, reactive transfer limits and stability limits
- System Restoration techniques, strategies and procedures
- Energy Management System (EMS) and all network analysis applications
- All auxiliary tools used in operations including Dispatcher Management Tool (DMT), Interchange Distribution Calculator (IDC), SmartLogs, eDART, Reliability Coordinator Information System (RCIS), System Data eXchange (SDX), and Transient Stability Analysis (TSA).
- Coordination with neighboring areas

Non-technical Competencies required for the Shift Supervisor position include:

- Problem Solving (PJM Competency)
- Organizing (PJM Competency)
- Drive for Results (PJM Competency)
- Written Communication (PJM Competency)
- Interpersonal Savvy (PJM Competency)
- Customer Focus (PJM Competency)

- Negotiating (PJM Competency)
- Verbal Communication Skills
- Ability to Maintain Focus
- Adaptable & Agile
- Abstract Thinking Ability
- Analysis, Problem Solving and Decision Making
- Accountability/Ownership
- Honesty/Integrity/Credibility
- Advocation/Persuasiveness
- The Capacity to Learn Quickly
- Efficient and Proactive

4.9 PJM System Operator Continuing Training Program

To ensure continued reliable and economic operations, PJM is committed to providing their operators high quality training. PJM has well defined continuing training programs for their system operators. PJM system operators have a training week incorporated into their shift schedule allowing for 8 weeks of dedicated training time per year. All PJM System Operators are required to obtain, at a minimum, 32 hours of emergency preparedness training per year beginning the first full calendar year that an operator assumes shift responsibilities . PJM Continuing Training Program is broken into eight 6-week training “cycles”. These training cycles correspond to the training week for each operator team as identified on the shift schedule. PJM System Operator Training Department prepares training activities for each of these 8 training cycles. Activities include PJM-developed computer based training, simulation training, instructor-led training and other training activities.

The Systematic Approach to Training (SAT) is followed for all PJM Continuing Training programs.

Dispatcher Training Simulator

PJM operates and maintains a full-scale, full-fidelity Dispatcher Training Simulator² (DTS). The DTS is designed to replicate the response of the real-time power system in a similar operating environment to the PJM control room. The DTS allows PJM operators to build their experience base quicker by allowing them to see and operate in conditions that may be unusual or unexpected on the real time power system. Simulator training is recognized by NERC as an important component in any initial or continuing training program for system operators.

PJM utilizes its DTS in the following manner:

- Continuing team training on normal and emergency operations during PJM system operator’s training weeks.
- Initial job qualification testing (except MC)
- Training and development of new operator tools

- System Restoration drills and training
- Cyber and physical security drills

Each Shift Team is assessed on their performance in the DTS in the following areas: Shift Turnover Process, Generation Control, Transmission Control, Proper Use of Applications, and Crew Resource Management skills (including Situational Awareness, Teamwork, Decision-making, Communications and Assertiveness.

Annual Training

In support of NERC and Regional Standards, PJM system operators will receive training annually in the following topical areas:

- NERC/Regional Standards
- System Restoration
- Emergency Procedures and Operations
- System Protection
- Communications
- Backup Control Center Evacuation Drills and Procedures
- Control of IROL facilities
- Cyber Security

Training Objectives for Continuing System Operator Training:

1. Maintain operator proficiency on procedures, markets or tools in a timely manner.
2. Build the PJM system operator's level of experience through participation in DTS team training scenarios on normal, emergency and restoration operations.
3. Evaluate PJM system operator performance through DTS training scenarios and provide training on these areas of deficiency.
4. Provide refresher training on topics of critical importance to reliability including emergency preparedness, emergency operations and system restoration.
5. Facilitate the delivery of PJM Emergency Preparedness drills annually.
6. Accurately track successful completions of all delivered training in PJM Learning Management System and identify areas for follow-up training.

Training plan and general assumptions of the PJM System Operator Continuing Training Program include:

- All System Operators are encouraged to complete all offered training (regardless of their operating position). This is to enhance the concept of cross-training of operators and help facilitate the job qualification and rotation process.
- Each system operator will have the responsibility for ensuring completion of the required training modules by the due dates assigned. The Shift Supervisors will monitor the

progress of their teams. Reports showing the operators status of completion of assigned training are available through the PJM Learning Management System.

- PJM System Operators will be scheduled to attend applicable and relevant member training programs that are offered through the PJM Training Curriculum.
- System Operator Training departmentwill participate in the bi-annual PJM wide Emergency Procedure and System Restoration Drills when they are scheduled.
- There will be formal team DTS training scenarios scheduled throughout the training year. The simulations will be evaluated and debriefed in accordance with Crew Resource Management principles.
- Topics for the simulations will be selected based on a needs analysis with input from the applicable stakeholders.
- Each training week will include some computer based training.
- There will be an assessment developed for each required training topic by the PJM System Operator Training Department.
- Completion of required training topics and assessments will be tracked in the PJM's Learning Management System (LMS)
- System Operator Training Department will apply to NERC for Continuing Education Hour (CEH) credit for most training delivered to PJM operators including DTS simulations, computer-based training, instructor-led training and any other training activities.

Skills and knowledge taught in the PJM Continuing Training include:

- Mastery of all applicable NERC and Regional Standards
- Applicable NERC, RFC, SERC and PJM Reserve requirements
- Applicable regulatory requirements
- PJM Emergency Procedures
- Reactive Power and Voltage Control concepts
- Contingency overload identification and correction techniques
- Interchange impacts on transmission flows
- PJM reliability limits including thermal limits, voltage limits, reactive transfer limits and stability limits
- Familiarization with the purpose and limitations of protection system schemes
- Theory of protection technology and the pros and cons of different relay schemes
- How outages of primary or backup protection systems can effect operations
- SCED Application
- System Restoration techniques, strategies and procedures
- Dispatch Management Tool Operation (including logging)
- Energy Management System (EMS) and all network analysis applications

- EMS Alarm Recognition
- ACE and Frequency deviations (what they indicate)
- PJM Manuals
- Understand impact of generation on Reactive Transfer limits
- Shared Reserves
- One-line diagrams symbols and colors
- Reactive Reserve Check process
- Reliability Engineer specific duties
- Operating Procedures and Operating Memos

Non-technical Competencies drilled in the PJM Continuing Training program:

- Problem Solving (PJM Competency)
- Organizing (PJM Competency)
- Drive for Results (PJM Competency)
- Written Communication (PJM Competency)
- Interpersonal Savvy (PJM Competency)
- Customer Focus (PJM Competency)
- Negotiating (PJM Competency)
- Time Management
- Communication Skills
- Coaching Skills
- Strategy Development
- Dealing with and managing change
- Teamwork
- Decision Making
- Adaptability/Dependability
- Conflict Management

[2]Operator Training Simulator (OTS) and Dispatcher Training Simulator (DTS) are independent simulators which can be used interchangeably.

4.10 Process for Ensuring Proficiency Following Extended Absence

4.10.1 Purpose

Ensure PJM System Operator proficiency following an extended period where the operator has not worked shift duties due to illness, military service, project assignment or other extended leave situations.

4.10.2 Illness, Military Service or Other Extended Leave Situations

This process will apply to all PJM System Operators, Reliability Engineers and Shift Supervisors who have not worked their shift position for a consecutive period of three months (90 days) or more due to reasons of illness, military service or other extended leave situations.

4.10.3 Process for System Operators who have not worked shift for a consecutive period of 3-6 months

Upon clearance to return to work, these operators must:

- Successfully complete all online training and classroom training (if possible) assigned to them in the Learning Management System (LMS) during their absence
- Read and acknowledge understanding of all new or revised Operating Memos assigned to the operators in the LMS during their absence
- Complete 2 days of On-The-Job Training for each month of absence with a qualified OJT Trainer

Upon completion of the above, the system operator shall be interviewed and evaluated by their OJT Trainer and their Shift Supervisor to determine their readiness to resume shift duties.

4.10.4 Process for System Operators who have not worked shift for a consecutive period of 6 months or longer

Upon clearance to return to work, these operators must:

- Successfully complete all online training and classroom training (if possible) assigned to them in the LMS during their absence
- Read and acknowledge understanding of all new and revised Operating Memos assigned to the system operators in the LMS during their absence
- Complete a minimum of 2 days of On-The-Job Training for each month of absence with a qualified OJT Trainer
- Complete all requirements of a new candidate qualifying into the operating position including;
    - Completion of all OJT sign-offs
    - Completion of required online training modules

Upon completion of the above, the operator shall:

- Be interviewed and evaluated by their OJT Trainer and their Shift Supervisor to determine their readiness to resume shift duties.

- Successfully complete all position qualification requirements outlined in Manual M-40 including:
  - Passing of written qualification test
  - Passing of DTS qualification test
  - Currency of required NERC and PJM Certifications

4.10.5 Project Work or Other Temporary Special Assignments

This process will apply to all PJM System Operators, Reliability Engineers and Shift Supervisors who have been taken out of the normal shift rotation to participate in projects or other special assignments on a temporary basis.

These system operators are expected to:

- complete all training assignments during this period
- be available to fill shifts as required during this period

These system operators will still be considered “active”. They will be offered up to 2 days of OJT per month of their assignment, if needed, prior to their return to full shift rotation.

4.11 Training for Operations Support Personnel

PER-005-2, Requirement 5 requires that entities shall use a systematic approach to develop and implement training for its identified Operations Support Personnel on how their job functions impact BES Real-time reliability related tasks.

NERC defines Operations Support Personnel as individuals who perform current day or next day outage coordination or assessments, or who determine SOLs, IROLs, or operating nomograms in direct support of Real-time operations of the Bulk Electric System.

PJM has reviewed the Job and Task Analysis for each of the control room operating positions to determine where Operations Support Personnel may impact these tasks in accordance with the definition above. The PJM Reliability Engineer performs all next day outage coordination and assessments. PJM considers the Reliability Engineer as a System Operator and covered by R1 of PER-005-2. Therefore, the definition of Operations Support Personnel (for PJM) reduces to those who determine SOLs, IROLs or operating nomograms in direct support of Real-time operations of the Bulk Electric System. Based on this analysis, PJM has identified employees in the following Departments or functions as Operations Support Personnel and therefore subject to R5 of PER-005-2:

1. Employees in the Transmission Operations Department
2. Employees in the Generation Department
3. Employees in the Real Time Data Management Department
4. Employees in the Transmission Service Department
5. Employees in the Outage Analysis Technology Department
6. Employees in the EMS Technologies

Employees in these areas assist in determining Thermal, Voltage or Stability limits (SOLs or IROLs) that the operators utilize in real-time to control the BES. They may also assist in developing weather or load forecasts which may in turn impact the determination of how to utilize these limits.

While outside the required target audience of PER-005-2 R5, PJM has decided to extend training to other employees in Operations and Operations Support Divisions as an awareness of the impact that their job functions could have on Real-time Operations.

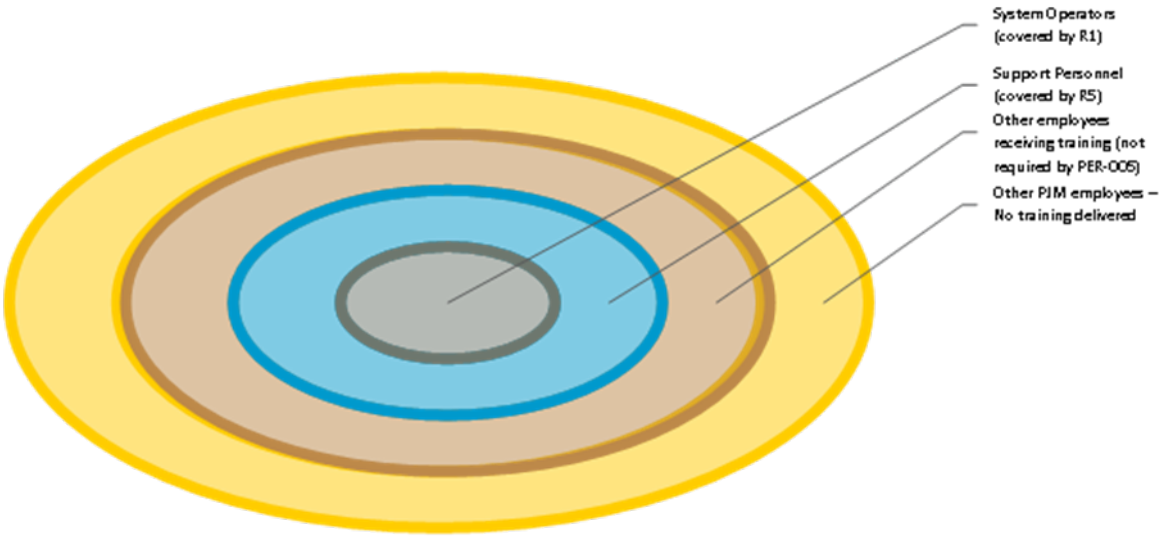

Exhibit 3: Target audience for Support Personnel training

PJM will deliver this training on an annual basis to all employees identified in the discussion above.

4.12 PJM Human Performance Program

4.12.1 Purpose

The purpose and intent of the PJM Human Performance Program is to promote behaviors throughout System Operations that support reliable execution of work, which contributes to achieving an “event-free” culture. The targeted scope of the program includes all control room personnel including operators, Reliability Engineers and Shift Supervisors. Other employees in Operations Division, Operations Support Division and Information Technology Division have also been provided Human Performance training.

4.12.2 Human Performance Tools

PJM has incorporated the following Human Performance tools into their control room activities. These tools were selected based on relevance to job tasks and possible impact on error reduction. PJM provides routine training on these tools including case studies and exercises during training weeks. Use of the tools is reinforced in control room operations. PJM utilizes a model based on Crew Resource Management – Threat Error Management skills.

- Situational Awareness – Understanding what is happening, why it is happening and what might happen next
  - Questioning Attitude – Asking questions that are constructive and positive to learn, find truth, discover efficiencies and produce results
  - Effective Shift Turnover – The process of transferring duties and responsibilities of job positions between personnel. It includes ensuring that incoming operators have an accurate picture of current facility status and provide a review of past and scheduled operations
- Planning and Decision Making
  - Procedure Adherence and Use – Procedure Adherence refers to the understanding of the procedure's intent and purpose and following its direction. Procedure Use refers to the frequency or degree of reference by the user versus dependence on the user's memory and recall
  - Decision Making – Using critical thinking to make appropriate decisions for the given situation
- Workload Management
  - Stress Management – managing one's behavior and demeanor during stressful situations
  - Task Loading – recognizing the differing levels of task loading and when to ask for assistance
- Monitor/Cross-Check
  - Checking and Verification – Peer checking methods include concurrent verification and independent verification
  - Self-Checking – Applying the STAR principle (Stop Think Act Review) to focus ones attention on the task at hand
- Communication
  - Effective Listening – Practice active listening skills to resolve misunderstandings
  - PJM Communication Protocols – Apply the PJM Communication Protocols (outlined in Manual M-01, Section 4.5) to the communication of Operating Instructions
- Leadership Effectiveness
  - Conflict Resolution – Ensuring that conflicts between what is being experienced and what was expected are effectively resolved
  - Leadership – providing guidance, expertise and direction to individuals and work teams

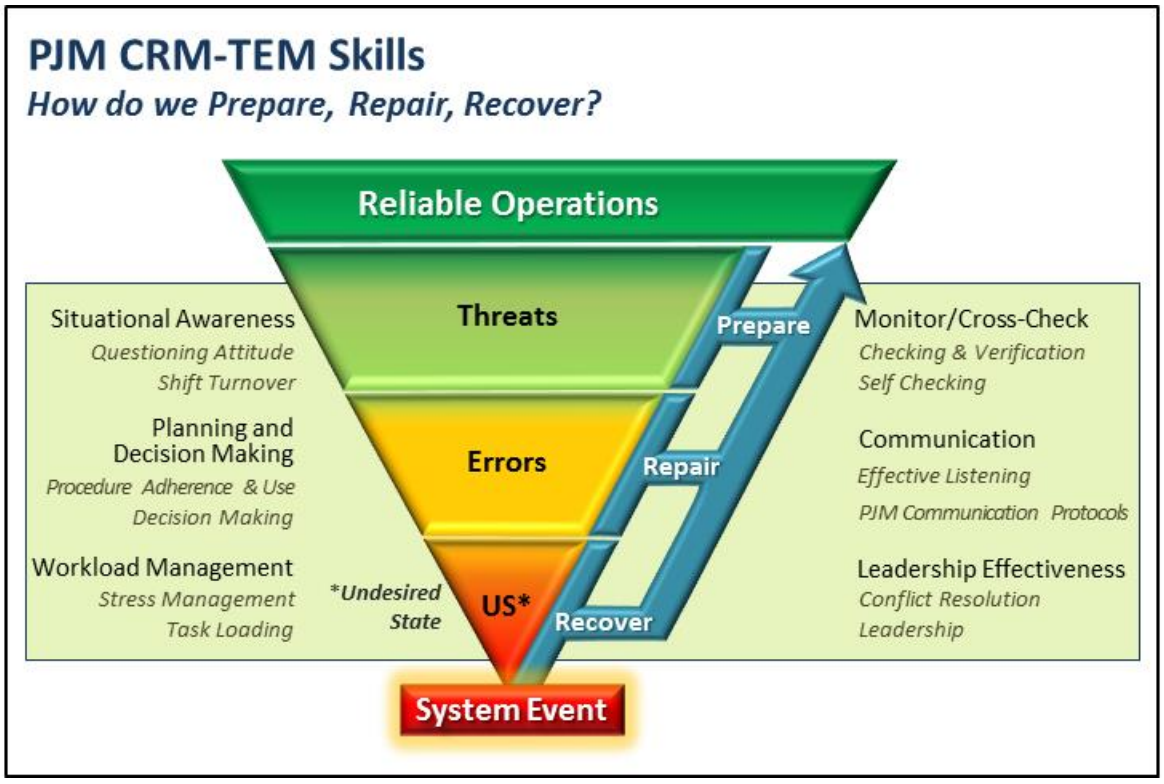

Exhibit 4: PJM Crew Resource Management – Threat Error Management Skills

4.12.3 Good Catch Program

A “Good Catch” is an unplanned event that did not result in injury, illness or damage – but had the potential to do so. PJM has implemented a Good Catch reporting system. The purpose of the Good Catch program is designed to enhance human performance by preventing significant events, reporting close calls, determining the cause of the event, recommending and initiating corrective actions and sharing lessons learned. A Good Catch program is not an after event or event analysis program.

PJM reviews submitted events with all operators during training weeks and utilize the data to identify training and performance issues. PJM utilizes the Human Performance Oversight Group to analyze Good Catch submissions and develop recommendations, as appropriate, to address systematic issues uncovered by the Good Catch program. Data will also be analyzed for trends.

4.12.4 Human Performance Oversight Group Charter

Purpose and Scope

The purpose of the Human Performance Oversight Group is to maximize the operational effectiveness of the Operations Division from a human performance perspective through the use of human performance tools and best practices.

- The group was established to provide oversight, make decisions and provide recommendations to the Operations Management team on the following:
- Identifying emerging human performance issues from Good Catch database submissions and recommending corrective actions

- Promoting human performance improvement by utilizing human performance tools and practices
- Identifying human performance communications, education and training opportunities
- Sharing lessons learned from operational events with Operations personnel

Membership & Roles

The Human Performance Oversight Group consists of the following roles:

- Chair
- Secretary
- Members
- Executive Sponsors

The group members are directed to build and maintain consensus within the group in an orderly manner and work to fulfill the purpose of the charter. Group decisions shall be reached utilizing a consensus model. Primary members are expected to represent their respective department's business needs.

The group shall consist of representatives from the following departments (not limited to):

- Dispatch
- Reliability Engineering
- Markets Coordination
- System Operator Training
- Transmission Service
- Real Time Data Management
- Model Management
- Operations Planning
- NERC and Regional Coordination

Other divisions or projects will be represented on an as needed basis. Each represented department will be responsible to appoint a primary representative to the group. Appointed officials may also appoint their designated alternate to serve and make decisions when the primary representative is unavailable. The Oversight Group Secretary will be responsible for setting agendas and ensuring that time is provided for group members to prepare for and attend the meetings and working sessions.

Meetings & Communication

The group will hold face-to-face meetings on a quarterly basis. Additional meetings will be called on an as needed basis by the group Chair.

Agenda for regular group meetings will be coordinated by the group Secretary and distributed to Members at least two weeks in advance.

It is expected that every group member be represented at each meeting and it is further expected that this representation will be by the Primary, not the Alternate.

Ongoing work and discussions will be handled via informal conferencing and e-mail.

Revision History

Revision 20 was published with current change information in the Revision History that should have appeared in the Current Revision section.

Moved misplaced Current Revision information, which mistakenly appeared in Revision History during publishing on January 24 2019, back into the Current Revision section for Revision 20:

- [Removed testing requirements from Sections 4.4, 4.5, 4.6, and 4.7 and consolidated all requirements in a separate Section 4.2.6.
- Changed OJT Instructor to OJT Trainer
- Added footnote 1 defining Master Dispatcher
- Added footnote 2 defining OTS versus DTS
- Added clarifying language throughout Section 4
- Updated Exhibit 4 “Threat Error Management”]

Revision 20 (01/24/2019):

- Cover to Cover Periodic Review
- Updated co-ownership to Richard Brown
- Section 3: Removed references to legacy training requirements
- Removed testing requirements from Sections 4.4, 4.5, 4.6, and 4.7 and consolidated all requirements in a separate Section 4.2.6.
- Changed OJT Instructor to OJT Trainer
- Added footnote 1 defining Master Dispatcher
- Added footnote 2 defining OTS versus DTS
- Added clarifying language throughout Section 4
- Updated Exhibit 4 “Threat Error Management”

Revision 19 (02/01/2018):

- Cover to Cover Periodic Review
- Added clarifying language to the role of the Dispatcher Training Subcommittee (DTS) in the Task List Review and Program Evaluation – Section 1
- Reorganized Section 2 to accommodate the Markets certification exam
- Added section on disciplinary actions for certification exam – Section 2.2.
- Removed references to the timeframes associated with certification requirements from Section 2.3. Added reference to Section 3 where these are covered in detail.
- Added clarifying language to EOP requirement in Section 3.2.1
- Added clarifying language to the DTS role in determining the annual tasks that are included in the continuing training program in Section 3.2

- Changed MOC and Small Plant Generation Dispatcher continuing training requirement from rolling 3-year requirement to annual requirement in Section 3.2
- Added language to include Load Management Resources in Section 3.2.5
- Removed “beginning in 2012” Section 4.3.1
- Changed requirement for PJM Generation Certification timeline from 1 year to 6 months. Section 4.4
- Removed ExSchedules from list of Master Coordinator related tools. Section 4.4
- Added clarifying language to Simulator Retest process. Section 4.5
- Added clarifying language to Simulator Retest process. Replaced the word “Understand” in Skills and Knowledge section with “Ability to demonstrate knowledge of”. Section 4.6
- Replaced the word “quiz” with “assessment. Section 4.9

Revision 18 (02/01/2017):

- Cover to Cover Periodic Review
- Annual review of PJM Training Plan (Section 4) in accordance with NERC Standard PER-005-2
- Removed references to Daily Review Team in Section 4.9
- Updated PJM Human Performance program skills in Section 4.12.2
- Added Grid Security Drills as another component of the continuing education offerings – Section 1.6
- Added language to reflect how initial training requirements may be completed – Section 3.2
- Added language to include open/required JIT training to Initial Training Requirements - Section 3.2
- Changed the grace period for completing Initial Requirements and Certification Requirements from 12 months to 6 months for MOC Generation Dispatchers and Small Generation Plant Dispatchers – Section 3.2.2 and 3.2.4
- Added clarification to items which are monitored during monthly and annual compliance checks – Section 3.3
- Removed references to Manual 35 as this manual was retired on November 17, 2016.

Revision 17 (02/01/2016):

- Annual review of PJM Training Plan (Section 4) in accordance with NERC Standard PER-005.
- Administrative Change: Updated references from eDATA to Data Viewer.
- Clarifying changes to Section 4.4 describing retesting process for Master Coordinator qualification.

- Minor change to Section 4.7 to remove requirement for weekly self-assessment quiz for Reliability Engineer qualification.
- Added language in Section 3.3 to indicate that a dispatcher/operator must be removed from shift responsibilities if they fail to meet the applicable requirements listed. Removed duplicate language from Section 3.2.1.
- Updated language in Section 3.3 to reflect changes in Compliance Monitoring process and added flow chart.

Revision 16 (10/01/2015):

- Periodic Review
- Section 1: Added additional info related to role of the LMS.
- Updated task management process to reflect current practice.
- Section 2: Added additional clarity for identifying personnel required to be certified.
- Added consistency to use of the terms TO Operator and Generation Dispatcher.
- Removed references to 5 year credential.
- Added reference about certificate renewal requirements & compliance monitoring.
- Section 3: Changed designation of initial required training to ITP (Initial Training Program).
- Added reference to Just in Time Training requirements.
- Modified Small Plant Operator Classification criteria.

Revision 15 (02/27/2015):

- Annual review of Manual and training plans in accordance with NERC Standard PER-005.
- Section 4: Added new section 4.11 on Training of Operations Support Personnel in accordance with PER-005-2.
- Renumbered Section 4.11 PJM Human Performance Program to Section 4.12 and made minor edits.
- Changed Near Miss program to Good Catch program.
- Added Section 4.12.3 on Human Performance Oversight Group.

Revision 14 (02/28/2014):

- Annual review of Manual and training plans in accordance with NERC Standard PER-005.
- General grammatical cleanup.
- Section 1: Changed data retention requirement.
- Section 3: Clarified continuing training requirements for Transmission System Operators.

- Section 3: Clarified initial requirements for new entities.
- Section 4: Clarified classroom training requirements for PJM operators. Replaced Operator Training Simulator (OTS) with Dispatcher Training Simulator (DTS). Performed general wording and grammatical cleanup.
- Added Section 4.11 on the PJM Human Performance Program.

Revision 13 (03/01/2013):

- Annual review of Manual.
- Complete rewrite of Sections 1, 2 and 3 to comply with the requirements of NERC Standard PER-005.
- Clarified training requirements for Training Audiences.
- Section 4 - Added definition of “reliability-related task”. Updated position classroom training requirements for consistency.
- Replaced Appendix 1 with updated version of the Task List.
- Removed Appendices 2, 3, and 4.

Revision 12 (05/01/2012):

- Annual review of Manual.
- Updated task lists in Appendix 3.
- Updated CEH Tracking Process forms in Appendix 4.
- Replaced Local Control Center with Transmission Owner throughout document.
- Added definition of “Annual” in Section 2 as it relates to PJM Training requirements.
- Section 4 – Added Training Advisory Committee and Qualification Board processes. Added section 4.3 on Instructor Qualifications. Updated objectives for each operating position to more closely reflect job tasks. Updated competencies for each operating position.
- Minor miscellaneous edits throughout.

Revision 11 (6/22/2011):

- Annual review of Manual.
- Updated task lists in Appendix 3.
- Removed old deadlines in Section 1.
- Minor changes to MD training plan in Section 4.
- Clarified number of test attempts in Section 4.

Revision 10 (6/23/2010):

- Annual review of Manual.

- Added additional detail to section 1.4 Compliance Monitoring of Certification.
- Added additional clarity to Section 2.6 – Training Requirements for Demand Response Resources Supplying Regulation or Synchronized Reserve.
- Added new Section 2.7 - Training Requirements for Storage Resources Supplying Regulation or Synchronized Reserve.
- Miscellaneous clarifying changes to Section 4.

Revision 09 (1/1/2010):

- Added NERC Certification requirement for Transmission Owner operators.

Revision 08 (10/01/2009):

- Added language for Small Generation Plant Operator Certification Exemptions to Section 1.
- Made changes to Master Dispatcher training in Section 4.

Revision 07 (08/01/2009):

- Modified Certification requirement for TO operators to require certification prior to operator taking shift as of 7/1/2010.
- Added description of Systematic Approach to Training (SAT) method utilized by PJM to Section 4.
- Annual Review of Manual.

Revision 06 (04/24/2009):

- Section 4: Added process for ensuring operator competency following an extended absence.

Revision 05 (02/12/2009):

- Section 4: Revised requirements for PJM Certification for PJM operators. Added section on Shift Supervisor Training Plan.
- Section 1: Revised some PJM Certification requirements – changed term of certification to 3 years from 5 years, changed required CEH credit to renew, added provisions for certifying and within 1 year for TO and GO operators.
- General grammatical changes and clarification made throughout the document.

Revision 04 (11/05/2008):

- Revised requirements for PJM PD completion of PJM classroom courses in Section 4.
- Updated Training Liaison Forms in Appendix 4.
- Minor clarifications and grammatical updates.
- Removed option for PJM-approved CEH credit.

- Annual review of manual.

Revision 03 (01/25/2008):

- Separated the Power Director and Reliability EngineerTraining descriptions in Section 4.
- Added references to formal OJT training to MC, GD, PD and RE positions.
- Changed “Power Dispatcher” title to “Power Director”.

Revision 02 (09/10/2007):

- Minor clarifications to the PJM Master Coordinator Initial Training and Qualification Requirements in Section 4.

Revision 01 (07/13/2007):

- Added section on Master Dispatcher Training program for PJM operators.
- Added annual requirement for training on company specific System Restoration plans for TO operators per NERC Standard EOP-005.

Revision 00 (05/16/2007):

- This is the original issuance of the PJM Manual for Certification and Training Requirements.