Working to Perfect the Flow of Energy

PJM Manual 39:

Nuclear Plant Interface Coordination

Revision: 03~~02~~

Effective Date: June 1, 2011~~September 7, 2010~~

Prepared by

System Operations Division

Table of Contents

Approval

Approval Date: 4/27/2011~~09/07/2010~~
Effective Date: 06/01/2011~~09/07/2010~~

David Schweizer~~Souder~~, Manager Generation~~Operations Planning~~

Paul McGlynn, General Manager System Planning

Current Revision

Revision 03 (06/01/2011)~~02 (09/07/2010):~~

- ~~Section 1.1: Background – updated reference to manuals.~~
- ~~Section 2.1: Outage Coordination – updated maintenance notification requirements for facilities impact Nuclear Plant or off-site station light and power source.~~
- ~~Attachment B: Updated Peach Bottom NPIR to reflect new Cooper 230kV substation between Nottingham and Graceton.~~
- ~~Attachment C: Updated Peach Bottom NPIR revision.~~
- Changed manager ownership to Generation Department based on reorganization.
- Attachment B: Added Perry and Davis Besse NPIR as part of ATSI Integration into PJM
- Attachment C: Updated Perry and Davis Besse NPIR revision.

Introduction

Welcome to the PJM Manual for ***Nuclear Plant Interface Coordination***. 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 PJM for the operation, planning, and accounting requirements of PJM RTO and the PJM Energy Market. The manuals are grouped under the following categories:

- Transmission
- PJM Energy Market
- PJM Regional Transmission Planning Process
- Reserve
- Accounting and Billing
- PJM Administrative
- Miscellaneous

For a complete list of all PJM Manuals go to www.pjm.com and select "Manuals" under the "Documents" pull-down menu.

About This Manual

The PJM Manual for ***Nuclear Plant Interface Coordination*** focuses on how PJM and the PJM Members are expected to coordinate operations with the Nuclear Plant Generator operator entities to ensure the Nuclear Plant Interface Requirements (NPIR) are addressed and implemented while maintaining Bulk Electric System reliability.

The PJM Manual for ***Nuclear Plant Interface Coordination*** consists of four sections. The sections are as follows:

Section 1: Nuclear Plant Interface Requirements (NPIR)

Section 2: Operating to the NPIR

Section 3: Other NPIR Issues

Section 4: NUC-001 Requirements Not Addressed by Manual 39

PJM shall work with NPGO and the appropriate PJM Committees to periodically review and update this manual and its attachments.

Note 1: PJM and the PJM Member Nuclear Plant Generator Operators ("NPGO") and Transmission Entities ("TE")[1], as defined in NUC-001-1 (including amendments to NUC-001), covered by the NUC-001 requirements agree that Manual 39, as approved and implemented, represents an agreement, or one of the agreements, among the applicable NUC-001 covered entities that reflects the mutually agreed upon NPIRs and documents how the NPGOs and Transmission Entities shall address and implement the NPIRs. By approving and publishing Manual 39 on the PJM website, PJM acknowledges its agreement and intention to be bound by the Manual 39 requirements except as otherwise required under the PJM Tariff or any other FERC approved agreement, or any law, regulation or NERC Reliability Standard. Through the Operating Agreement the NPGOs and applicable TEs are required to comply with all approved and published PJM Manuals, including Manual 39 when approved and published on the PJM website except as otherwise required under the PJM Tariff or any other FERC approved agreement, or any law, regulation or NERC Reliability Standard.

Note 2: All capitalized terms incorporate the definitions given to those terms in the NERC Glossary, unless otherwise specifically stated (NUC-001 R9.1.1).

Note 3: The names of responsible entities, organizational relationships and responsibilities related to the NPIRs are contained within PJM Manual 39, Attachment B – Plant Specific NPIRs.

Note 4: Manual 39 was developed to capture in one document an overall statement of the requirements and procedures applicable to NPGO and relevant TEs in PJM for the purpose of satisfying NPIRs; however, because most of the requirements and procedures preceded FERC adoption of NUC-001, PJM Manual 39 contains cross-references to other manuals where requirements and procedures in compliance with NUC-001 are set forth.

Intended Audience

The Intended Audiences for the PJM Manual for ***Nuclear Plant Interface Coordination*** are:

- *PJM Nuclear Power Plant Operators and Support Staff* — Conduct safe nuclear plant operations and interface with transmission system operators.
- *Transmission Owner (TO) and Generation Owner Operators* — Conduct reliable operations of the Bulk Electric System and communicate with nuclear power plant operators. Unless noted otherwise Transmission Owners listed in Manual 39 are the Transmission Owner of the substation where the nuclear plant interconnects.
- *PJM System Operators* — Conduct reliable operations of the Bulk Electric System.
- *PJM and TO Planners* – Plan for the reliable operations of the Bulk Electric System, including safe nuclear plant operations consistent with NPIRs.

[1] Transmission Entities – As defined by NERC Reliability Standard NUC-001-1 titled "Nuclear Plant Interface Coordination", effective April 1, 2010. Transmission Entities identified in PJM manuals which contain requirement and procedures to support NUC-001 typically include applicable Reliability Coordinators, Transmission Operators and Transmission Owners.

References

The references to other documents that provide background or additional detail directly related to the PJM Manual for ***Nuclear Plant Interface Coordination*** are:

- PJM Manual for Control Center and Data Exchange Requirements (Manual 1)
- PJM Manual for Transmission Operations (Manual 3)
- PJM Manual for Energy Management Systems (EMS) Model Updates and Quality Assurance (QA) (Manual 3A)
- PJM Manual for Emergency Operations (Manual 13)
- PJM Manual for Generation and Transmission Interconnection Process (Manual 14A)
- PJM Manual for PJM Regional Transmission Planning Process (Manual 14B)
- PJM Manual for Definitions & Acronyms (Manual 35) - (NUC-001 R9.1.1).
- PJM Manual for System Restoration (Manual 36)
- PJM Manual for Reliability Coordination (Manual 37)
- PJM Manual for Operations Planning (Manual 38)
- PJM Manual for Certification and Training Requirements (Manual 40)

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
- An approval page that lists the required approvals and the revision history
- This introduction
- Sections containing the specific guidelines, requirements, or procedures including PJM actions and participant actions
- Attachments that include additional supporting documents, forms, or tables in this PJM Manual

Section 1: Nuclear Plant Interface Requirements (NPIR)

Welcome to the *Nuclear Plant Interface Requirements* section of the PJM Manual for ***Nuclear Plant Interface Coordination.***

This section of the manual addresses nuclear plant interface requirements.

1.1 Background

PJM and its member companies have a responsibility to ensure the safe, reliable operation of the bulk power transmission system while facilitating a fair and open energy market. The nuclear plant owners and operators have the responsibility to safely operate their facilities in compliance with all of the rules and requirements in order to protect the safety of the public. The licensee is accountable to the Nuclear Regulatory Commission (NRC) and personnel face criminal penalties for violations of the requirements of the license and the associated documents, including the technical specifications.

Of particular importance to both nuclear plant operations and transmission operations are those nuclear power plant licensing requirements, called Nuclear Plant Licensing Requirements (NPLR) included in the design basis of the nuclear plant and statutorily mandated, for:

1) Off-site power supply to enable safe shutdown of the nuclear plant during an electric system or plant event; and

2) Avoiding preventable challenges to nuclear safety as a result of an electric system disturbance, transient, or condition.

NERC Standard NUC-001 was approved by FERC on October 16, 2008 (Order 716 - Mandatory Reliability Standard for Nuclear Plant Interface Coordination). NPIRs are developed to satisfy the requirements of NUC-001. Manual 39 serves as the basis to document the requirements of NUC-001. Nuclear Plant Interface Requirements (NPIRs) are those requirements, based on NPLRs and Bulk Electric System requirements that have been mutually agreed to by the Nuclear Plant Generator Operator and the applicable Transmission Entities[1]. The Transmission Entities are required to incorporate the NPIRs into their systems and processes, and to operate the transmission system so as not to violate the NPIRs. Planning enhancements shall be coordinated between Transmission Entities and NPGO, consistent with the PJM Manuals for PJM Region Transmission Planning Process (Manual 14B) and Generation and Transmission Interconnection Process (Manual 14A) to either revise the NPIRs or initiate transmission reinforcement to ensure the continued compliance with the plant if the NPIR Limits are more restrictive than Transmission System base limits contained within PJM Transmission Operations Manual (M03), Section 3: Voltage and Stability Operating Guidelines.

In order to implement the appropriate limits for planning and operations, the NPIR must be known to Reliability Coordinators, Transmission Operators, Transmission Owners, Transmission Planners, Transmission Service Providers, Planning Authorities, Distribution Providers, Load-serving Entities, Generator Owners, Generator Operators, and Balancing Authorities. Further, the Reliability Coordinator, Transmission Operator, Transmission Owner and the Balancing Authority must conduct operations of the Bulk Electric System that ensures that the NPIR are upheld at all times. In cases where the NPIR cannot be

maintained within limits, the nuclear plant must be immediately notified so that it can take action to maintain compliance with the NPIR. If compliance with the NPIR is dependent on the performance of other neighboring Transmission Planners, Transmission Operators, Reliability Coordinators or Balancing Authorities, the NPIR request must be submitted to those entities by the NPGO.

In lieu of separate bilateral or multi-lateral agreements between the NPGO, the transmission owner(s), and PJM, operational aspects of the NPIR are to be performed in accordance with the requirements of the PJM agreements and manuals. Many of the requirements contained in NERC Standard NUC-001 are addressed in the PJM agreements and manuals. The remaining requirements of NUC-001 are addressed in separate agreements between the NPGOs and their respective Transmission Entities. Contents of Plant Specific Nuclear Plant Interface Requirements are documented in template format consistent with Attachment B. Due to the critical nature of the information, PJM, applicable Transmission Entities and NPGO maintain a current set of NPIR but are not published as part of the manual.

1.2 Implementation of the NPIR

The NPGO is responsible for extracting requirements from its licensing documentation and design basis for inclusion into the NPIR. Candidate NPIR are to be transmitted to the Transmission Owner(s) and PJM with the proposed requirements that the TO and PJM will be expected to operate. PJM and TO Real-time communication requirements are documented in PJM Transmission Operations Manual 03 (M03) Section 5: Index and Operating Procedures for PJM RTO Operations, Voltage Control at Nuclear Stations. PJM Day-ahead analysis and communication requirements are documented in PJM Operations Planning Manual 38 (M38) Attachment B: Transmission Reliability Analysis Procedure and PJM Reliability Coordination Manual 37 (M37) Attachment A: PJM Reliability Plan.

PJM Actions:

PJM is responsible for the following activities:

- Receipt of proposed NPIR as submitted by the NPGO and acknowledge receipt of the NPIR back to the nuclear licensee. (NERC Standard NUC-001, R1)
- Incorporation of the mutually agreed NPIR into the PJM operating requirements, including: (NERC Standard NUC-001, R4.1)
    - Obtaining the necessary data from the NPGO or other entities that are necessary to support calculation and monitoring of the NPIR in real time operations (PJM Manual for Energy Management Systems (EMS) Model Updates and Quality Assurance (Manual 3A)).
    - Inclusion into the operating reliability analysis (See Manual M-38, Operations Planning)
    - Incorporation of the NPIR into the PJM operating limits that are monitored by the PJM real time operating tools. (See Manual M-03, Transmission System Operations, Attachment C: Requesting Voltage Limit Exceptions to the PJM Base-Line Voltage Limits).
    - Assisting the Nuclear Generator Operator in coordinating with the other members and external entities to ensure that the NPIR are included in their operating plans.

  - Operate the Bulk Electric System to meet the NPIR's (NERC Standard NUC-001, R4.2)
  - Notify the Nuclear Plant Generator Operator when the ability to assess the operation of the Bulk Electric System affecting NPIR is lost. (NERC Standard NUC-001, R4.3)

- Incorporation of the NPIR into the PJM planning analysis process. The frequency of planning analyses will be that which is required in the PJM RTEP process. (Manual 14B – Generation and Transmission Expansion Planning, NERC Standard NUC-001, R3, R9.2.3)
- The results of the planning analyses are made available to all participants, including the NPGOs, according to the RTEP process. (NERC Standard NUC-001, R3)
- If the planning analysis results identify the need for transmission reinforcements in the future in order to maintain compliance with the NPIRs, then PJM shall contact the NPGO to determine whether a change to the NPIR could be implemented to reduce or eliminate the need for transmission reinforcements or whether the appropriate reinforcements are required to be constructed in a timely manner to ensure that the transmission system will be able to operate within the limits of the NPIRs at all times (NERC Standard NUC-001, R3).
- The Nuclear Generator Owner will be responsible for costs of reinforcements resulting from more limiting plant limitations.

NPGO Actions:

PJM NPGOs are responsible for performing the following activities:

- Extracting licensing requirements from the licensing documentation and analysis for development as NPIR.
- Providing proposed NPIR in writing to the applicable Transmission Owners, Balancing Authorities, Transmission Operators, Transmission Planners, Transmission Service Providers, Reliability Coordinators, Distribution Providers, Load Serving Entities, Planning Authorities, Generator Owners, and Generator Operators as applicable. (NERC Standard NUC-001, R1)
- Verifying that the NPIR transmittals have been received by all of the Transmission Entities. (NERC Standard NUC-001, R1)
- Identifying the parameters, limits, configurations, and operating scenarios that comprise the NPIR and, as applicable, procedures for providing any specific data not provided within the agreement. (NERC Standard NUC-001, R9.2.1)
- Establishing the ownership demarcation of the electrical facilities, so that the boundaries of operational control and the associated responsibility for maintenance are clear. (NERC Standard NUC-001, R9.3.1)
- Specifying analyses and the frequency of such analyses necessary to ensure continuous compliance with the NPIR (NERC Standard NUC-001, R9.2.3).
- NPGO shall operate per Manual 39, which was developed to satisfy the requirements of NUC-001. (NERC Standard NUC-001, R5).

- NPGO shall establish agreements with other Transmission Entities to address requirements of NERC Standard NUC-001 that are not addressed within this manual and are identified in Section 4: NUC-001 Requirements Not Addressed by Manual 39.

Transmission Owner (TO) Actions:

PJM Transmission Owner(s) is responsible for the following activities:

- Acknowledge receipt of NPIR as submitted by the NPGO. (NERC Standard NUC-001, R1)
- Establishing the ownership demarcation of the electrical facilities, so that the boundaries of operational control and the associated responsibility for maintenance are clear. (NERC Standard NUC-001, R9.3.1)
- Incorporation of the NPIR into the TO operating requirements, including:
  - Obtaining the necessary data from the NPGO or other entities that are necessary to support calculation and monitoring of the NPIR in real time operations.
  - Inclusion into the operating reliability analysis. (NERC Standard NUC-001, R4.1)
  - Incorporation of the NPIR into the operating limits that are monitored by the real time operating tools and operate to those limits. (NERC Standard NUC-001, R4.2)
  - Upon direction/consultation from/with PJM, inform the Nuclear Plant Generator Operator when the ability to assess the operation of the Bulk Electric System affecting NPIR's is lost. (NERC Standard NUC-001, R4.3)

Section 2: Operating to the NPIR

Welcome to the *Operating to the NPIR* section of the PJM Manual for ***Nuclear Plant Interface Coordination***. In this section, you will find the following information:

- Outage Coordination
- Real Time Operations
- Notification for Loss of Calculation Capability
- Notification and Mitigation Protocols for NPIR voltage limits
- Emergency Operations
- System Restoration

2.1 Outage Coordination

PJM is responsible for coordinating and approving requests for outages of generation and transmission facilities, as necessary, for the reliable operation of the PJM RTO. PJM will coordinate outages which affect NPIRs with the NPGO and TEs. Outage coordination for outages, including testing and calibration of Protection System[2] equipment related to NPIR will be in accordance with M-38, Operations Planning, Section 2 and Attachment B: Transmission Reliability Analysis Procedure. [NERC Standard NUC-001, R6 and R9.3.3]

The Transmission Owner, whose asset connects to the same substation where the nuclear plant~~-~~ interconnects, or results in an off-site station light and power source to be outaged or single-sourced, or results in a loss of power flow to the nuclear plant or off-site source, and is performing the work is responsible to submit and coordinate planned outages consistent with timing requirements identified in the Nuclear Plant Interface Requirements (Attachment B).

2.2 Real Time Operations

PJM and the applicable Transmission Owners will monitor the NPIR limits in real time, in accordance with PJM Transmission Operations Manual (M-03), Section 5: Index and Operating Procedures for PJM RTO Operations, Voltage Control at Nuclear Stations. PJM and the Transmission Entities will take action in real time, to ensure that the NPIRs are not violated. [NERC Standard NUC-001, R4.2, R5]

2.3 Notification for Loss of Calculation Capability

The continuous calculation and monitoring of post-contingency voltages for nuclear power plants (for the loss of the nuclear unit) is an important requirement to ensure that adequate voltage is always available for the operation of the nuclear safety systems. Given this requirement, the nuclear power plant(s) shall be notified in cases where the transmission monitoring capability (at PJM and the Transmission Owner) becomes unavailable and the ability to calculate the post-contingency voltages is lost. [There may be situations where the calculations are only being performed at PJM. In this case, loss of the PJM capability shall trigger the notification to the nuclear power plant(s).] The notification will go via the All-Call

[2] As defined by NERC Glossary of Terms

from PJM to the Transmission Owner(s) who will then communicate with the applicable nuclear power plant(s) consistent with PJM Transmission Operations Manual (M-03), Section 5: Index and Operating Procedures for PJM RTO Operations, Voltage Control at Nuclear Stations [NERC Standard NUC-001, R4.3]. Such notification shall occur within 30 minutes of the loss of EMS capability [NERC Standard NUC-001, R9.3.4]

2.4 Notification and Mitigation Protocols for NPIR Voltage Limits

The maintenance of acceptable actual and post-contingency voltages at the substations of nuclear power plants is critical to assuring that the nuclear safety systems will work properly if required. In order to provide this assurance, the nuclear power plant operators must be notified whenever actual or post-contingency voltages are determined to be below acceptable limits. This requirement applies to all contingencies involving the tripping of the nuclear plant generator or any transmission facility as the contingent element. The notification is required even if the voltage limits are the same as the standard PJM voltage limits. [NERC Standard NUC-001, R4.3]

Generally, nuclear plants may have voltage limits that are more restrictive than standard PJM voltage limits. In the case where standard PJM voltage limits, as defined by the Transmission Owner (TO), are more restrictive, PJM will direct redispatch without consultation of nuclear plants after all non-cost measures are implemented; however, PJM will still notify the Nuclear Owner of the violation to the limit. [NERC Standard NUC-001, R4.2] Off-cost generation will set Locational Marginal Prices (LMP). In the case where NPIR voltage limits are more restrictive than standard PJM voltage limits, all costs required to mitigate the violations will be borne by the generation owner.

PJM's EMS models and operates to the most restrictive substation voltage limit for both actual and N-1 contingency basis. PJM will initiate notification to nuclear plants if the PJM EMS results indicate nuclear substation voltage violations. This notification should occur within 15 minutes for voltage contingency violations and immediately for actual voltage violations. To the extent practical, PJM shall direct operations such that the violation is remedied within 30 minutes. [NERC Standard NUC-001, R9.3.4]

2.4.1 Communication

All communication of future and current operations between PJM and the nuclear plant should be through the Transmission Owner (TO). If there is any confusion about a communication, the plant can talk directly with PJM, however, the Transmission Owner should be apprised of the discussion. If PJM to a nuclear plant direct discussions are needed the preferred method would be a 3-way call among all parties (i.e., inclusion of TO). Attachment A, entitled Nuclear Plant Communications Protocol, provides additional background materials and defines roles and responsibilities to ensure appropriate communications between NPGO and Transmission Entities. PJM Control Center Requirements Manual (M01) Section 4: Voice Communications details 3-part communication requirements. If off-cost operations are required based on a more restrictive NPIR voltage limit, the Nuclear Plant Operator may consult with the related Market Operations Center (MOC), as defined within the PJM Operating Agreement Section1.3.12, and evaluate whether an alternative such as operating at a reduced output would alleviate the voltage violation and is more cost effective. PJM will provide the approximate nuclear plant reduction, if applicable. (NERC Standard NUC-001, R9.4.1)

All communication of imminent or actual real-time operations should be through the Transmission Owner (TO) of the substation where the nuclear plant interconnects.

All communication regarding outage planning should be facilitated by the asset owner submitting the planned outage.

2.4.2 Information Exchange

Normally, PJM does not provide information relative to transmission operation to any individual market participant without providing that information to all. However, in this unique condition where the public safety requirement is to have a reliable source for safe unit shutdown and/or accident mitigation; it is imperative that specific information be provided to a nuclear plant (this information should not be provided to their marketing members). If PJM observe voltage violations or anticipate voltage violations (pre or post-contingency) at any nuclear stations; PJM is permitted to provide the nuclear plant with the actual voltage at that location, the post-contingency voltage at that location (if appropriate) and limiting contingency causing the violation. The operation for more restrictive NPIR limits at these nuclear stations should not be posted or provided to the market via eData, once off-cost operations are initiated. PJM Transmission Operations Manual (M-03), Section 5: Index and Operating Procedures for PJM RTO Operations, Voltage Control at Nuclear Stations contain the defined procedure to analyze and communicate NPIR or PJM limit violations to the NPGO.

PJM Action

- PJM shall notify the nuclear plant, through the Transmission Owner, of calculated post contingency voltage violation of the Nuclear Plant Generator Operator requirements (Transmission Owner or more limiting voltage limits defined in the NPIR).
- PJM shall notify the nuclear plant, through the Transmission Owner, of violations to actual voltage limits (Transmission Owner or more limiting voltage limits defined in the NPIR). Actions taken to mitigate violations of more restrictive NPIR limits must be agreed upon by the nuclear plant and logged by PJM.
- All non-cost actions should be implemented prior to MW adjustments.
- All costs required to mitigate violations of more restrictive NPIR voltage limits will be borne by the generation owner.
    - Controlling actions must be cost-capped, if applicable.
    - LMP shall not be used to control the voltage at these locations.
    - TLR shall not be used to control the voltage at these locations.
- PJM shall notify the nuclear plant, through the Transmission Owner, when the voltage level is restored within limits (and stable).
- PJM shall attempt to control more restrictive NPIR voltage limitations within 30 minutes.
- PJM will continue to monitor the appropriate voltage limits based on changes provided.

Transmission Owner Action

- Transmission Owner shall independently monitor for Nuclear Plant actual and contingency voltage violations as reflected on the Transmission System.
- Transmission Owner will communicate notifications from PJM to the nuclear plant (Transmission Owner or more limiting NPIR voltage limit violations).
- Transmission Owners will monitor the appropriate voltage limits based on changes to more limiting NPIR voltage limits as provided by the Nuclear Plant Operator.

NPGO Action

- Nuclear plant will notify PJM, through the Transmission Owner, when different (new or default) temporary voltage limits shall be used based on various plant service loading conditions. The process to communicate temporary voltage limit restrictions is documented in the PJM Manual for Transmission Operations (M03), Attachment C: Requesting Voltage Limit Exceptions to the PJM Base-Line Voltage Limits.
- Determine internal plant options, and if appropriate, provide revised limits.
- Coordinate with MOC to evaluate PJM provided redispatch option (no cost or unit information will be provided).
- Provide PJM with decision to redispatch – if applicable.
- Provide PJM with decision that nuclear plant will closely monitor plant activities and will take action within the plant if conditions change and inform PJM not to implement off-cost.
- Provide PJM with clear direction if they do not want PJM to perform redispatch.

Note 1: PJM's goal is to resolve all security violations (i.e., N-1 contingency) within 30 minutes, however; inherent communication delays related to off-cost agreement for NPIR voltage limits may not permit this goal to be achieved.

2.5 Emergency Operations

Emergency operations are conducted in accordance with PJM Manual, M-13, Emergency Operations. Any situation or operation that either impacts or could impact the continuing ability to comply with the NPIR must be communicated to the nuclear plant, as provided for in the manual. The process for communicating is explained in Attachment A, Nuclear Communications Protocol. [NERC Standard NUC-001, R9.4.1, NERC Standard NUC-001, R9.4.2)]

2.6 System Restoration

System restoration is conducted in accordance with PJM Manual, M-36. PJM and the Transmission Owner will provide the Nuclear Plant Generator Operator provisions for coordination during an off-normal or emergency event affecting NPIRs, including timely information explaining the event, an estimate of when the system will be returned to a normal state, and the actual time the system is returned to normal. (NERC Standard NUC-001, R9.3.5 and R9.4.2).

Offsite power should be restored as soon as possible to nuclear units, both units that had been operating and those that were already offline prior to the system disturbance, without regard to using these units for restoring customer load. There is a heightened urgency if the nuclear plant has lost both offsite and onsite AC power (NERC Standard NUC-001, R9.3.5).

Section 3: Other NPIR Issues

Welcome to the *Other NPIR Issues* section of the PJM Manual for **Nuclear Plant Interface Coordination**. In this section, you will find the following information:

- Changes to the NPIR
- Reporting and Investigation of Unplanned Events
- Training
- Dispute Resolution
- Periodic Review of Manual

3.1 Changes to the NPIR

The NPGO shall inform PJM and the other applicable Transmission Entities whenever there is a proposed change to the NPIR. Similarly, PJM and the Transmission Entities shall inform the NPGO whenever there is an actual or proposed change to the transmission system that can impact the ability of the electric system to meet the NPIRs. All such changes need to be communicated as soon as known, as monitoring systems and operator training may need to be updated to support the change. It is important that there be a clear understanding between the NPGO, PJM, and the other applicable Transmission Entities as to when the change becomes effective, so that there be no discontinuity or confusion in compliance requirements. [NERC Standard NUC-001, R7, R8]

PJM Actions:

- Receive proposed changes to NPIR from the NPGO.
- Identify changes that may impact the ability of the electric system to meet the NPIRs and communicate that information to the Transmission Entities and the NPGO.
- Incorporate NPIR change into monitoring systems, analysis techniques, operator training materials, etc. to ensure that the modified NPIR will be properly considered in real time operations.
- Inform the NPGO of actual or proposed changes to electric system design, configuration, operations, limits, protection systems, or capabilities that may impact the ability of the electric system to meet the NPIRs.

NPGO Action

- Provide actual or proposed NPIR, including proposed changes to nuclear plant design, configuration, operations, limits, protection systems, or capabilities that may impact the ability of the electric system to meet the NPIRs. The NPIRs shall be provided in writing to the Transmission Owner(s), Balancing Authorities, Transmission Operators, Transmission Planners, Planning Authorities, Transmission Service Providers, Reliability Coordinators, Distribution Providers, Load Serving Entities, Generation Owners and Generation Operators, as applicable.

- Cooperate with PJM, other members, and external entities, to explain and clarify the proposed changes to the NPIR and its incorporation into the operations of PJM and the other members.

Transmission Owner Actions:

- Receive proposed changes to NPIR from the NPGO.
- Incorporate NPIR change into monitoring systems, analysis techniques, operator training materials, etc. to ensure that the modified NPIR will be properly considered in real time operations.
- Inform the NPGO of actual or proposed changes to electric system design, configuration, operations, limits, protection systems, or capabilities that may impact the ability of the electric system to meet the NPIRs.

3.2 Reporting and Investigation of Unplanned Events

PJM, Transmission Owners and the NPGO shall coordinate investigations of causes of unplanned events affecting the NPIRs and develop solutions to minimize future risk of such events. Unplanned events that impact the NPIR will be reported to governmental agencies if such events meet the reporting criteria, as detailed in PJM Manual for Emergency Operations (M-13), Attachment L: Event Investigation Program. [NERC Standard NUC-001, R9.4.4] The event may also be investigated according to the PJM Event Investigation Process, which is included in PJM Manual M-13, Emergency Operations. [NERC Standard NUC-001, R9.4.3]

3.3 Training

Specific training on this manual is included in the curriculum for the PJM System Operators (PJM Dispatch, PJM Transmission Owners and Market Operations Centers). Specific training for the member operators will be conducted as part of the PJM Initial Training Program and refreshed on a periodic basis at the annual PJM Spring Operator Seminar. PJM System Operator training requirements are defined within PJM Manual for Certification and Training Requirements (Manual 40). [NERC Standard NUC-001, R9.4.5]

3.4 Dispute Resolution

Should the execution of the requirements of this process, which are embodied in the PJM agreements and manuals, result in a dispute between any interested parties, the PJM Dispute Resolution Procedures (Schedule 5 of the PJM Operating Agreement) shall be used. (NERC Standard NUC-001, R9.1.4)

3.5 Periodic Review of Manual

A periodic review of this manual shall be conducted by the System Operations Subcommittee, with support from the Nuclear Generators Owners Users Group (NGOUG), with a periodicity not to exceed every 3 years. (NERC Standard NUC-001, R9.1.3) As part of this review, NPGO and Transmission Entities shall review and revise the NPIRs in Attachment B and update revision history in Attachment C.

Section 4: NUC-001 Requirements Not Addressed by M39

Welcome to the *NUC-001 Requirements Not Addressed by M39* section of the PJM Manual for **Nuclear Plant Interface Coordination**. In this section, you will find the following information:

- Additional NPGO Requirements

4.1 Additional Nuclear Plant Generator Operator Requirements

In order to fully comply with NERC Standard NUC-001, the PJM NPGO shall establish agreements with applicable Transmission Entities to address requirements of NERC Standard NUC-001 and the NPIRs that are not explicitly addressed within the body of this manual.

Attachment B of M39 contains the complete set of NPIRs for each nuclear plant as defined in NUC-001. For the requirements not handled in the body of M39, separate agreements will need to be established between NPGOs and applicable transmission entities.

PJM Actions:

- PJM shall provide support to NPGO to assist in identifying applicable Transmission Entities that the Licensee may have to establish agreements with to comply with NUC-001.

NPGO Action:

- Licensee shall establish necessary agreements with entities to ensure compliance with NUC-001.

Transmission Owner Actions:

- Transmission Owner shall provide support to NPGO to assist in identifying other entities that the Licensee may have to establish agreements with to comply with NUC-001.
- Transmission Owner shall work with NPGO to establish agreements necessary to comply with NUC-001.

Attachment A: Nuclear Plant Communications Protocol

A.1 Purpose

PJM and its member companies have a responsibility to ensure the safe, reliable operation of the bulk power transmission system while facilitating a fair and open energy market. The nuclear plant owners and operators have the responsibility to safely operate their facilities in compliance with all of the rules and requirements in order to protect the safety of the public. The proper execution of these responsibilities by the respective set of parties can have very significant impact on the others. The collective requirements are not mutually exclusive, but support the business needs of nuclear and transmission as they both strive to maintain operational excellence.

It is imperative that the nuclear plant owners and operators, the transmission owning members of PJM, and PJM work seamlessly together to carry out these significant responsibilities. A key aspect of that mutual effort to achieve operational excellence is to provide accurate and timely communications among the parties so that all operations are conducted safely and reliably.

Given that the respective regulatory obligations and lexicons are different, the purpose of this document is to provide explanatory information for both the nuclear and transmission businesses to enable the seamless cooperation and communication that we all seek. Also, each business needs to understand the key phrases and terms that each other use to signify critical events that require open and immediate response from the other. Understanding and properly using the key phrases will ensure that each business supports the other in the proper execution of their respective responsibilities and obligations.

This document provides examples of significant events that require implementation of this protocol document in order to ensure safe and reliable operation of both the transmission system and nuclear generation facilities.

A.2 Nuclear Safety

The Atomic Energy Act of 1954 and the Energy Reorganization Act of 1974 "empowers the NRC to establish by rule or order, and to enforce, such standards to govern these uses as the Commission may deem necessary or desirable in order to protect health and safety and minimize danger to life or property."[3]

The nuclear industry is strictly regulated because of the potential hazards involved in using radioactive materials. These radioactive materials give off radiation, which can be hazardous to people if they are exposed to it in significant amounts. The extent of the risk depends on the type and amount of radiation emitted by the radioactive material, the distance between the source of the radiation and a person, and the length of time a person is exposed to the radiation. If radioactive materials are properly handled and regulated, they do not pose a significant risk to the public or to workers.[4]

[3] NRC Website
[4] NRC Website

A.3 Grid Reliability

Bulk-power systems are fundamentally different from other large infrastructure systems, such as air-traffic control centers, natural-gas pipelines, and long-distance telephone networks. Electric systems have two unique characteristics:

- The need for continuous and near instantaneous balancing of generation and load, consistent with transmission-network constraints. This requires metering, computing, telecommunications, and control equipment to monitor loads, generation, and the voltages and flows throughout the transmission system, and to adjust generation output to match load. Generation must follow load in near real time because it is difficult and expensive to store electricity.
- The transmission network is primarily passive. Unlike natural gas pipelines, transmission grids have few “control valves” or “booster pumps” to regulate electrical flows; control actions are limited primarily to adjusting generation output and to opening and closing switches to add or remove transmission lines from service.

These two unique characteristics lead to four reliability consequences with practical implications that dominate power system design and operations. The consequences are:

- Every action can affect all other activities on the grid. Specifically, changes in the locations and amounts of power generated and consumed, and in the configuration of the transmission grid can affect flows throughout the system. Therefore, the operations of all bulk-power participants must be coordinated.
- Cascading problems that increase in severity are a real problem. Failure of a single element can, if not managed properly, cause the subsequent rapid failure of many additional elements, disrupting the entire transmission system.
- The need to be ready for the next contingency, more than current conditions, dominates the design and operation of bulk-power systems. It is usually not the present flow through a line or transformer that limits allowable power transfers, but rather the flow that would occur if another element fails.
- Because electricity flows at nearly the speed of light, maintaining reliability often requires that actions be taken instantaneously (within fractions of a second), which requires computing, communication, and control actions that are automatic.[5]

A.4 Operating Philosophy

A.4.1 Nuclear Safety

Nuclear Risk Management

Nuclear power plants assess risk based on a plant risk model, usually a computer model, at various plant operating conditions. The objective of risk management is to control risk increases from maintenance activities on maintenance rule[6] (10CFR50.65) structure

[5] Hirst, Eric. Electric Reliability—Potential Problems and Possible Solutions. May 2000 (EEI Website), page 4.

[6] Maintenance rule equipment generally includes any equipment that could cause a plant trip and may include switchyard equipment and other non-safety related equipment. The purpose of the maintenance rule is to

systems and components (SSCs). While the plant may experience an increase in instantaneous risk during scheduled activities, the overall plant risk will decrease as a result of the activities. Preventative and corrective maintenance and modifications control the aging process, renew equipment and correct deficiencies in the equipment. The equipment reliability is improved as a result of the activities.

The risk program will protect systems and equipment vital to the safe shutdown of the nuclear units. Performing work on maintenance rule equipment for any reason - corrective or preventative maintenance, surveillance testing, etc. - removes the equipment from its normal alignment. The additional risk involved with these evolutions must be assessed. The results of the assessment must then be used to manage the risk based on the magnitude and duration of the risk impact, the nature of the activity and other factors.

Nuclear Safety Significant

A condition or potential condition which can lead to operation in a degraded mode, with regard to safety systems, which may exceed the Limiting Conditions for Operation (LCO) as defined by the plants Technical Specifications. Events declared as "Nuclear Safety Significant" by the nuclear plant operators are with the intent to minimize the consequences of undue risk to the public health and safety. In these scenarios, requests for information that may ordinarily be understood as market sensitive due to Code of Conduct concerns should be granted as the nuclear safety concerns are paramount.

A.4.2 Transmission

The Bulk Electric System is planned, maintained and operated such that it can withstand the loss or outage of any single element, such as a transmission line, transformer, or generation plant or contingency without causing the remaining elements of the system to become overloaded or to cause cascading outages.

The philosophy is contained in the purpose statement from NERC Standard TOP-004, Transmission Operations:

> "To ensure that the transmission system is operated so that instability, uncontrolled separation, or cascading outages will not occur as a result of the most severe single Contingency and specified multiple Contingencies."

To ensure that the N-1 operating philosophy is not violated, PJM and the other control area operators of North America use analytical tools which simulate the loss of each element (a contingency) and calculate that the remaining system will be secure from the thermal (conductor or equipment heating), voltage (magnitude and stability) and stability (transient and dynamic) perspectives. (In PJM's case, the analysis is on-line, running approximately every minute.) If the security analysis program identifies a contingency or actual violation, PJM's operators will initiate any number of actions, including redispatch of generation, reconfiguring the transmission system (e.g. opening lines, removing equipment from service, etc.), invoking emergency procedures, or interrupting load or combinations of the above. Normally, the consequences of not responding correctly or timely enough is to cause protective devices on the equipment to operate taking the equipment out of service. However, such events can also lead to catastrophic equipment failure from overheating, or induce a cascading outage which can interrupt large numbers of customers, etc.

---

monitor and analyze important plant equipment to ensure that the overall maintenance program related to this. equipment is effective.

A.5 Roles and Responsibilities

A.5.1 Nuclear Plant Operations

Operate in compliance with the license

The nuclear plant must operate in accordance with the provisions of its license. It is accountable to the NRC and personnel face criminal penalties for violations of the requirements of the license and the associated documents, including the technical specifications.

Any request for a nuclear plant to deviate from any regulatory requirement must allow time for the plant owner, the Transmission Owner, and PJM to approach the NRC with the appropriate analysis to justify the request. It is simply not possible for the nuclear plant to honor such requests in real time. Also, such a request will only be considered when the electrical system emergency is such that there is significant risk of widespread outages impacting large numbers of consumers. Therefore, it is imperative that PJM, through the Transmission Owner and the applicable market operations center, fully inform the nuclear plant of any impending system problems or emergencies that could require unusual operations by the nuclear plant.

Inform Market Operations Center (MOC) and/or Local Control Center (LCC) of impending plant status changes or regulatory circumstances that could impact power production

Nuclear plant generation is a very significant portion of the PJM generating assets. As such, any changes to the ability of the nuclear plants to provide energy will likely have significant impacts to PJM's generation schedule and will be difficult to replace in a short period of time. Therefore, it is very important that any condition of the nuclear plant's operational capability be communicated to the MOC, the associated LCC, and to PJM so that analysis can be conducted to assess any system impacts and to develop contingency plans.

Coordinate maintenance outages with MOC and/or LCC

Normally, the nuclear plant outages are planned far is advance. However, there can be situations where transmission work needs to be done in the window of the nuclear plant outage. Such coordination is important to ensuring that the minimum amount of outage time is needed to accomplish the necessary maintenance for the nuclear plants and the transmission facilities.

Respond to transmission system operator requests

Requests from the transmission system operators will come into the nuclear plant from the MOC or the LCC. In some circumstances, the various parties may be convened by PJM on a conference call. All requests need to be complied with on a timely basis after consideration of consequences to nuclear safety, personnel safety, and equipment protection. If there are questions or doubts in the nuclear plant operators' minds, the request should be questioned with the requestor and elevated as necessary to assure that there is understanding of the situation and the request.

A.5.2 Affiliated Power Marketer Operations Center (MOC)

Inform PJM of nuclear plant conditions that could impact the continued power production of the nuclear plant.

If there are conditions that have the potential to result in the nuclear plant having to reduce generation or go off line, the LCC and PJM need to know as soon as possible. If the situation is regulatory-related, that is important information that needs to be conveyed.

Submit bidding information for applicable nuclear plants.

The MOC needs to understand the business implications of any nuclear and transmission system situation that could impact the nuclear plant operations so that it can accurately reflect the impact into the market. Interface with PJM regarding maintenance outage requests and other potential reliability issues.

If the situation will require the nuclear plant to be out of service, the MOC will need to process the appropriate outage request for approval by PJM.

A.5.3 Transmission Owner Local Control Center (LCC)

Inform the nuclear plant operations staff of system events or conditions that could impact the continued safe operation of the nuclear plant.

The LCC is a critical link in the communications chain from PJM to the nuclear plant and back. The LCC also has the clearest picture of the local situation in the vicinity of the nuclear plant. It can be an important facilitator in the discussions between PJM, the MOC, and the nuclear plants.

A.5.4 PJM Control Center

Operate the transmission system in accordance with NERC standards, regional reliability council requirements, PJM agreements, and PJM manuals.

PJM is responsible for the safe and reliable operation of the transmission facilities on behalf of the PJM Transmission Owners. PJM is accountable to FERC, NERC, the regional councils, the PJM members, and the various state regulatory bodies who have oversight responsibility for PJM's activities.

In an emergency situation, PJM has the authority to direct any necessary action to be taken to preserve the reliability of the system. Normally, PJM will work directly with the LCCs to accomplish these actions, but there may be situations where PJM will need to gather the nuclear plant operators, LCCs, MOCs together to explain a request for coordinated action by all parties.

Inform the LCC and MOC of system conditions and events that need to be communicated to nuclear plant operations.

Timely information is the key for permitting the proper response to any operating situation. Regarding the nuclear plants, it is important to convey the details behind the event, so that the need for understanding that is ingrained in the nuclear business can be satisfied.

It is incumbent upon PJM to keep timely and accurate information flowing to all of the operating entities during the course of transmission system events. Effective concerted action can only be accomplished when the all of the operating entities completely

understand the situation and their role in implementing the solution. In order to facilitate rapid communications to the nuclear plant, the Code of Conduct should be bypassed when conditions are such that the nuclear plant needs to have immediate information on the transmission system.

Facilitate communications among nuclear plant operations, MOC, and LLC as necessary to ensure that nuclear plant and transmission system event information is transferred and understood by the respective operational entities.

Ensuring that all entities understand the situation and are clear in their role in the response is the key to successfully mitigating any negative impacts. Since the level of understanding of the transmission system may be an issue, PJM must strive to get the right parties together and take the time to explain what is happening and what response PJM seeks.

A.6 Implementation of the Protocol

A.6.1 Event Initiation and Identification

Normal Communications

Communications between and among the nuclear plants, MOCs, LCCs, and PJM should be in accordance with accepted professional practices. There is a need to be able to clearly direct and communicate instructions in a timely manner to ensure safe and reliable operations. Nothing in this protocol supersedes the need for professional behavior by all of the parties.

Special Situations

There will be special situations where the need to communicate rapidly and clearly will be heightened. The need for clear, accurate communications will be even more important due to the impact either to nuclear safety or transmission system reliability or both. All parties need to be prepared to understand the language used and the implications associated with the situation. Listed below are the special terms to which all parties need to be especially attentive. (The following is not intended to be an all-inclusive list, but is meant to identify many of the situations that operators can be expected to face.)

KEY NUCLEAR TERMS

Limiting condition for operation (LCO)

The section of Technical Specifications that identifies the lowest functional capability or performance level of equipment required for safe operation of the facility. Failure to resolve the LCO within the established timeframe will result in a controlled shutdown of the plant. Nuclear Power Plants are required to follow the actions of the LCO unless prior NRC approval is obtained.

> **Implication**: If the LCO time period ends without satisfactory resolution of the problem, the nuclear plant is required to immediately implement a safe shutdown of the plant. Immediate replacement of the energy of the plant will be necessary. During the course of any LCO event, the transmission system operators should be planning for the potential loss of that plant's energy at the end of the LCO time limit. [Bear in mind that multiple unit sites can have differing requirements and an LCO may apply to one or all units at the site.]

Safety limit

A restriction or range placed upon important process variables that are necessary to reasonably protect the integrity of the physical barriers that guard against the uncontrolled release of radioactivity. The nuclear plant cannot violate these limits under any circumstances.

> **Implication**: When the nuclear plant communicates that it is up against a safety limit that is the end of any discussion about providing any additional output (MW or MVAR).

Safety related

The managerial controls, administrative documents, operating procedures, systems, structures, and components that have been designed to mitigate the consequences of postulated accidents that could cause undue risk to public health and safety.

> **Implication**: When the nuclear plant reports degradation of safety related equipment (nuclear safety system unavailability, diesel generator unavailability, off site power loss, etc.), a serious situation exists which the nuclear plant is required to immediately resolve or face near-term shutdown. Any assistance that can be immediately rendered should be dispatched. Plans should be developed to replace the plant's energy.

Scram

The sudden shutting down of a nuclear reactor, usually by rapid insertion of control rods, either automatically or manually by the reactor operator. (May also be called a reactor trip)

> **Implication***:* A SCRAM is an unplanned manual or automatic trip of a Nuclear Plant. In many cases the initiating event of a SCRAM may not be known. In these situations the Transmission system operators should be supportive to the nuclear plant information request, as the nuclear plant operators may need expeditious answers to questions from regulator or plant oversight safety review committees.

Reactor Shutdown

A decrease in the rate of fission (and heat production) in a reactor.

> **Implication**: A nuclear plant is never completely out of service, unless it is decommissioned. A nuclear plant in shutdown mode still is required to have its safety systems and off site power sources in service and maintain them in service throughout any outage.

Technical Specifications

Part of an NRC license authorizing the operation of a nuclear production or utilization facility. A Technical Specification establishes requirements for items such as safety limits, limiting safety system settings, limiting control settings, limiting conditions for operation, surveillance requirements, design features, and administrative controls.

> **Implication**: Technical specifications are non-negotiable, mandatory requirements that the nuclear plant must comply with as part of its license to operate. Requesting that the nuclear plant provide a variance to a technical specification is simply not an option.

Notice of Enforcement Discretion (NO ED)

Term used when the nuclear facility goes to the NRC to request an extension of an LCO (see 5.2.2.1 above) to prevent plant shutdown when the LCO limit is reached. NRC can grant extension of LCO time if the nuclear facility can demonstrate that they know precisely the problem (i.e. they are not troubleshooting) and a clear time estimate to fix the problem is available.

> **Implication**: In order to provide this discretion to the nuclear plant, the NRC may require detailed information from the transmission operators that would provide the justification for granting this discretion. These requests should be immediately elevated to management for a response.

KEY TRANSMISSION TERMS

First Contingency Violation

The transmission system is operated so that the single loss of any facility (line, generator, etc.) will not result in violation of any operating limit. The single loss is called the first contingency. The transmission operators have software that simulates the first contingency individually for a number of facilities on the system.

> **Implication**: The operators are required to correct any first contingency violation that will violate the emergency ratings on any facility within a period of time (normally within 30 minutes). If the operators ask the nuclear plant to take action as the result of the first contingency violation, the action should be implemented unless the action will jeopardize nuclear safety, personnel safety, or equipment protection.

Actual Overload/Voltage Violation

The transmission operators receive telemetered data from a large number of facilities and are monitoring actual thermal overloads (excessive flow) and actual voltages. Violations are alarmed and require immediate action from the operators to prevent equipment damage.

> **Implication**: Actual overloads need to be mitigated quickly (minutes). Requests to the nuclear plant should be accommodated unless nuclear safety, personnel safety, or equipment protection would be jeopardized. Such requests may include changing voltage regulator modes to either increase or decrease VAR output.

Voltage Collapse/Instability

Stability or collapse conditions are serious situations for the transmission system because they can result in significant loss of load in an instant. Stability problems occur in two scenarios: Transient instability—Instability caused by a sudden outage of equipment. Normally, these situations are analyzed ahead of time but may arise when equipment is removed from service for maintenance in certain combinations or patterns. Dynamic instability—Instability caused by the interaction of various system elements, characterized by oscillating flows or voltages.

Voltage collapse can occur when there are insufficient reactive resources (capacitors, generator VARs, etc.) in an area leading to local blackout or a cascading outage, which is an outage that spreads to large areas of the system (e.g. the Northeast Blackout of August 14, 2003).

> **Implication**: All of these situations are serious situations that require quick action by the transmission operators. Transmission operators will attempt to mitigate these

conditions as quickly as possible. The transmission operators may ask for additional VAR output from the nuclear plant in these scenarios.

These requests need to be implemented immediately to avoid system collapse and blackout.

A.7 Emergency Procedures

Emergency procedures are a set of steps that are implemented by transmission system operators to avoid loss of load associated with a lack of capacity (capacity emergency). The procedures are a sequence of escalating measures, generally starting with alerts and warnings, progressing to voluntary curtailments, voltage reductions, and ultimately load shedding. Issuance of NERC EEAs (Energy Emergency Alerts) can also be a part of emergency procedures, indicating an impending capacity emergency.

Another type of emergency procedure is a Minimum Generation Emergency. In this scenario, demand is forecast to be lower than the level of economically dispatchable generation. Demand and generation must match in real time, so PJM will issue a Minimum Generation event, and call for reducible generation to reduce output. There may be times when the call for reducible generation will fall upon the nuclear plants.

Emergency procedures can also be implemented for other situations. Responses to security threats, solar magnetic disturbances (SMDs), or local reliability issues are examples of other problems that can cause PJM to invoke emergency procedures. PJM Manual M-13, Emergency Procedures should be consulted for complete descriptions of emergency procedure scenarios and guidance as to the associated PJM response.

> **Implication**: Invoking emergency procedures means that a capacity emergency or other reliability problem is anticipated or imminent. The last stages of the emergency procedures can result in load shedding. These situations are very serious situations and ***require the full support of all of the parties.***

A.8 Communication of the Event

Dissemination

The receiver of the initial message concerning a special situation needs to quickly disseminate the message among their shift team, particularly to the shift supervision. 3-part communication is necessary to verify that the received message is correct and any requested action is accurately heard and recorded. Any questions regarding the message or requested action should be immediately raised with the requester. Reference to this protocol may be necessary. Accurate logging is important to assure that actions that were requested for later investigation. (Inevitably, these special situations are of such a magnitude that post-event investigations are the norm in both the nuclear and transmission businesses.)

PJM operators may be required to report some of these events to the Department of Energy, FERC, NERC, or other entities. Similarly, nuclear plant operators may be required to report to the NRC or other regulatory bodies. All organizations should be mindful of these reporting responsibilities and be supportive to ensure that all reporting obligations are carried out within the mandated times.

Transmission operators, including PJM and the PJM Transmission Owners are required to abide by a Code of Conduct as required by FERC Order 889. Normally, the Code of

Conduct prohibits the disclosure of transmission information by PJM or the LCCs to market entities outside of the OASIS system.

There will be situations where the Code of Conduct should be bypassed, because the potential nuclear safety implications take precedence. Examples of applicable situations are: (1) actual or imminent transmission system degradation or failure that could impact the nuclear plant and its off-site power sources; (2) ongoing or forecasted system conditions that may result in emergency procedures, outages, or blackout; (3) transmission stability issues that could impact the nuclear plant and its off-site power sources. If PJM or the LCCs choose to disclose this information to the market entiti***e***s, PJM will be required to follow-up that information with a posting on the PJM OASIS.

Elevation

Shift personnel should not carry the full burden of managing these events. It is important to elevate the event to management. Management may decide to further communicate the event within the respective organization. PJM will normally implement conference calls with the System Operators Subcommittee to coordinate information and response to special situations. PJM may also implement additional communications with neighboring systems as necessary to assure coordinated action.

Monitoring

Vigilance is necessary to ensure that any continuing surveillance or action is being properly implemented. Periodic reviews of the situation are required, both within the shift personnel and management. Shift turnovers are particularly important as a means to make sure that accurate information is both available and being acted upon in these events.

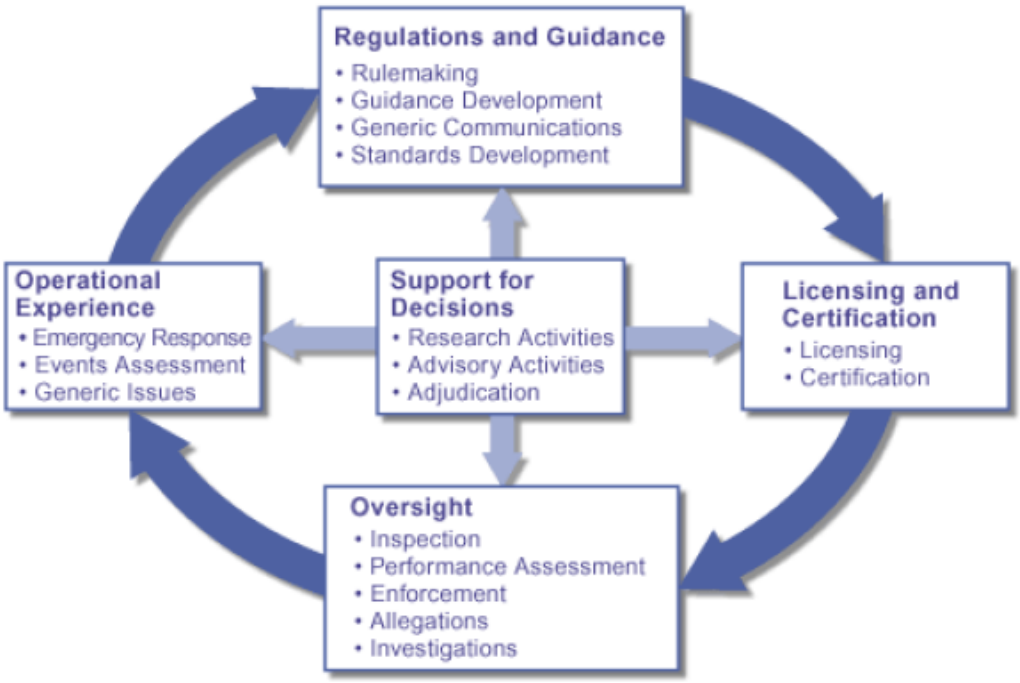
Close Out

Once the situation has been resolved, communications need to go to close out the event and to clearly indicate to the operating entities to resume normal operations.

Appendix 1 – Regulatory Background

US Nuclear Regulatory Commission (NRC)

The U.S. Nuclear Regulatory Commission (NRC) was formed in 1975 to regulate the various commercial and institutional uses of nuclear energy, including nuclear power plants. The agency succeeded the Atomic Energy Commission, which previously had responsibility for both developing and regulating nuclear activities. Under its responsibility to protect public health and safety, the NRC has three principal regulatory functions: (1) establish standards and regulations; (2) issue licenses for nuclear facilities and users of nuclear materials; and (3) inspect facilities and users of nuclear materials to ensure compliance with the requirements. These regulatory functions relate to both nuclear power plants and to other uses of nuclear materials -- like nuclear medicine programs at hospitals, academic activities at educational institutions, research work, and such industrial applications as gauges and testing equipment.



This diagram gives an overview of NRC's regulatory process which has five main components (1) developing regulations and guidance for our applicants and licensees, (2) licensing or certifying applicants to use nuclear materials or operate nuclear facilities, (3) overseeing licensee operations and facilities to ensure that licensees comply with safety requirements, (4) evaluating operational experience at licensed facilities or involving licensed activities, and (5) conducting research, holding hearings to address the concerns of parties affected by agency decisions, and obtaining independent reviews to support our regulatory decisions.[7]

[7] NRC Website

Nuclear Plant Licensing Summary

The licenses for nuclear power plants are issued for a 40-year period. Licenses for nuclear power plants can be amended and updated as the result of operating experiences at that plant or at other plants. When necessary, the NRC can impose new regulations or require changes in operating procedures or equipment to improve the safety of nuclear power plant operations.

In addition to licensing the facility, the NRC also licenses the individuals who operate the controls of the reactor. Licenses fall into two categories -- reactor operator and senior reactor operator. The second category is necessary for supervisory positions. Before operator licenses are issued, individuals must complete an extensive training program conducted by the utility and pass license examinations administered by NRC examiners. Once licensed, the operators continue to receive training and are periodically tested to show they remain qualified to operate the plant.

Key Licensing Documents

The application for a nuclear plant license contains many parts which form the basis for the enforcement program that follows once the application is approved and the plant goes into service. Key documents include:

Updated Final Safety Analysis Report (UFSAR).

Each application for a license to operate a facility shall include a final safety analysis report. The final safety analysis report shall include information that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components and of the facility as a whole.[8]

The Final Safety Analysis report contains information on the plants Transient Stability Studies that are required to show, for transmission configurations with various bus and line faults, the system remains stable and satisfactory recovery voltages are maintained, resulting in uninterrupted supply to the offsite power system. The acceptance criteria are based on the reliability requirements of the applicable NERC regional reliability council along with any plant specific stability requirements listed in their FSAR or design basis documents.

In order for the nuclear power plants to be able to support their design basis, the transmission system minimum allowable voltages have been determined and provided to PJM. PJM uses these plant specific voltage requirements to ensure under all contingency cases and as part of the PJM planning process; these voltage limits are not violated. The plant specific voltage requirements are usually contained in design basis calculations or plant Technical Specifications. The FSAR provides the design basis criteria in which the plant voltage limits need to support.

Technical Specifications

Each license authorizing operation of a production or utilization facility of a type described in §50.21 or §50.22 will include technical specifications. The technical specifications will be

[8] 10CFR 50.34

derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to §50.34. The Commission may include such additional technical specifications as the Commission finds appropriate. Technical specifications will include items in the following categories:

- Safety limits, limiting safety system settings, and limiting control settings.
- Limiting conditions for operation (LCO) – Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met.
- Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.
- Design features
- Administrative controls
- Decommissioning
- Initial notification
- Written Reports[9]

Enforcement

Violations are identified through inspections and investigations. All violations are subject to civil enforcement action and may also be subject to criminal prosecution. Unlike the burden of proof standard for criminal actions (beyond a reasonable doubt), the NRC uses the Administrative Procedures Act standard in enforcement proceedings (preponderance of evidence, i.e., information that is of greater weight or credibility or is more likely correct than not). After an apparent violation is identified, it is assessed in accordance with the Commission's Enforcement Policy.[10]

> 1. The Commission may obtain an injunction or other court order to prevent a violation of the provisions of -- (1) The Atomic Energy Act of 1954, as amended; (2) Title II of the Energy Reorganization Act of 1974, as amended; or (3) A regulation or order issued pursuant to those Acts.
>
> 2. The Commission may obtain a court order for the payment of a civil penalty imposed under Section 234 of the Atomic Energy Act: (1) For violations of -- (i) Sections 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Atomic Energy Act of 1954, as amended; (ii) Section 206 of the Energy Reorganization Act; (iii) Any rule, regulation, or order issued pursuant to the sections specified in paragraph (b)(1)(i) of this section; (iv) Any term, condition, or limitation of any license issued under the sections specified in paragraph (b)(1)(i) of this section. (2) For any

[9] 10CFR 50.36 (33 FR 18612, Dec. 17, 1968, as amended at 48 FR 33860, July 26, 1983; 51 FR 40308, Nov. 6, 1986; 53 FR 19249, May 27, 1988; 60 FR 36959, July 19, 1995; 61 FR 39299, July 29, 1996)
[10] NRC Website, Enforcement Program Overview

violation for which a license may be revoked under section 186 of the Atomic Energy Act of 1954, as amended.[11]

Federal Energy Regulatory Commission (FERC)

The Commission is a five-member independent regulatory agency, which succeeded to the regulatory responsibilities of the Federal Power Commission in 1977. The Commission's responsibilities include the licensing of non-federal hydroelectric facilities, the certification of natural gas pipelines, regulating the rates of natural gas pipelines and pipelines transporting crude oil and oil products, and regulating the rates and other aspects of electric utility activities.

Since 1935, the Commission has regulated certain electric utility activities under the Federal Power Act (FPA). Under FPA Sections 205 and 206, the Commission oversees the rates, terms and conditions of sales for resale of electric energy and transmission service in interstate commerce by public utilities. The Commission must ensure that those rates, terms and conditions are just and reasonable, and not unduly discriminatory or preferential. Under FPA Section 203, the Commission reviews mergers and other asset transfers involving public utilities. The utilities regulated under FPA sections 203, 205 and 206 are primarily investor-owned utilities; government-owned utilities (such as the Tennessee Valley Authority [TVA], the federal power marketing agencies, and municipal utilities) and most cooperatively-owned utilities are not subject to the Commission's regulation, with certain exceptions. [12]

[11] 10CFR50.110 Violations (57 FR 55075, Nov. 24, 1992)
[12] FERC Website

Open Access Order (Order No. 888)

FERC issued Order 888 in April 1996, requiring investor-owned utilities to file tariffs for open-access transmission. The Order also encouraged utilities to form and join independent system operators (ISOs) to operate transmission grids and be independent of all commercial interests.

Today, these systems are used to transport power over longer distances, often across several utility systems. Both the number and complexity of these wholesale power transactions have grown dramatically in recent years, stimulated by the creation of more than 700 FERC-approved power marketers.[13]

Code of Conduct and OASIS (Order No. 889)

FERC issued Order 889 in April 1996, requiring each transmission service provider to provide an Open Access Same-time Information System (OASIS), where transmission customers could view availability and product information to enable them to make informed purchase decisions. In addition, the Order required transmission service providers and others who possess transmission information to establish a Code of Conduct which would ensure that transmission information was not made available to affiliated marketing organizations of vertically integrated utilities and other power marketers in a preferential manner. Such information was only to be made available via OASIS or other suitable electronic means.

FERC Interpretive Orders on 888/889

FERC issued Interpretive Orders on 888/889 on February 16, 2006 and May 18,2006.

The Order on February 16, 2006 clarified that Transmission Providers may communicate with affiliated nuclear power plants regarding certain matters related to the safety and reliability of the transmission system on the nuclear power plants, in order to comply with the requirements of the Nuclear Regulatory Commission.

The Order on May 18, 2006 clarified that, in the event of a grid disturbance, a Transmission Provider may communicate to affiliated nuclear power plant specific information about transmission system conditions on a real-time basis.

RTO Order (Order No. 2000)

FERC issued Order 2000 in December 1999, setting forth requirements for the formation of Regional Transmission Organizations (RTO) which FERC indicated were the key to advancing competitive wholesale markets and eliminating anticompetitive behaviors by vertically integrated utilities. The RTO characteristics and functions are as follows:

[13] Hirst, Eric. Electric Reliability—Potential Problems and Possible Solutions. May 2000 (EEI Website), page 6

Minimum Characteristics:

1. Independence
2. Scope and Regional Configuration
3. Operational Authority
4. Short-term Reliability
5. Minimum Functions:
6. Tariff Administration and Design
7. Congestion Management
8. Parallel Path Flow
9. Ancillary Services
10. OASIS and Total Transmission Capability (TTC) and Available Transmission Capability (ATC)
11. Market Monitoring
12. Planning and Expansion
13. Interregional Coordination

PJM was granted RTO status by FERC in July 2001.

North American Electric Reliability Corporation (NERC)

NERC's mission is to improve the reliability and security of the bulk power system in North America. To achieve that, NERC develops and enforces reliability standards; monitors the bulk power system; assesses future adequacy; audits owners, operators, and users for preparedness; and educates and trains industry personnel. NERC is a self-regulatory organization that relies on the diverse and collective expertise of industry participants. As the Electric Reliability Organization, NERC is subject to audit by the U.S. Federal Energy Regulatory Commission and governmental authorities in Canada.[14]

Planning and Operating Standards

NERC reliability standards define the reliability requirements for planning and operating the North American Bulk Electric System. NERC's ANSI-accredited standards development process is defined in the Reliability Standards Process Manual and is guided by reliability and market interface principles. The Reliability Functional Model defines the functions that need to be performed to ensure the Bulk Electric System operates reliably, and is the foundation upon which the reliability standards are based. NERC has established a compliance enforcement program to monitor and enforce compliance with operating and planning standards.

[14] NERC Website

Regional Reliability Councils

Regional Reliability Councils (RRCs) are the organizations that implement and enforce NERC standards in the various regions of the North American system. In addition, the RRCs can issue regional guidance and requirements to support reliability in their regions. The PJM members are contained within two RRCs: Reliability*First* (RFC) and SERC Reliability Corporation. The RRCs have a compliance organization to conduct audits and assess penalties if necessary and permitted.

State Regulatory Commissions

State regulatory commissions exert broad powers over jurisdictional utilities and are involved with most activities of utilities as it relates to providing reliable and cost effective service to distribution customers. Transmission is not normally state jurisdictional; it is regulated by FERC. Similarly, nuclear power generation is not normally state jurisdictional; it is regulated by the NRC. However, to varying degrees, PJM members are vertically integrated and hence, subject to state regulatory oversight in many areas, including transmission and nuclear power generation.

The following is an explanation of the Pennsylvania state regulatory process, which is typical of state regulatory regimes:

Regulation

In order to provide the most economical, efficient and practical service to a community, the state grants a utility the sole right to provide its service within a specified geographical area. Experience and past history have determined that the construction of facilities by more than one utility company in the same location would be extremely costly and disruptive to community life and property. In exchange for the geographic monopoly, the utility accepts regulation by state government to assure that rates are fair and service safe and adequate for customers who cannot choose a different company.

Commission Role

The PUC is responsible for ensuring safe, adequate service for consumers at fair and reasonable rates. The Commission is required to make decisions that allow utilities to meet all prudent expenses including the cost of borrowing money for expansion to provide service. The PUC does not exist solely for the benefit of any one group, but must balance the concerns of all the parties. The Office of Trial Staff, which has experts in economics, engineering, law and financial accounting, represents the public at large by reviewing the company records and rate requests and presenting its view on what is in the public interest.

Utility Role

Regulated utilities must meet all reasonable requests for service by customers within their designated territories. To provide adequate service, it is recognized that the company must obtain a return on its investment sufficient to attract investors. If a company must expand its capacity to provide increased or improve service, it must borrow money, persuade investors to make money available, or seek a rate increase from the PUC.

Ratepayer Role

Ratepayers must pay for the service they use, which includes a share of the cost of utility company expenses, such as salaries, equipment, maintenance and taxes. While the ratemaking process is complex, consumers have the right to be informed about the process; to receive an explanation of their utility bills; to have their complaints resolved in a prompt and fair manner; and to receive continuous utility service if payment responsibilities are met.[15]

[15] "An Overview of the Ratemaking Process", PA PUC Annual Report, 2001-2002, Page 6.

PJM Agreements

PJM and member roles and responsibilities are defined in the main agreements that PJM members must execute as a condition of membership—Operating Agreement, Transmission Owners Agreement, and the Transmission Tariff. Following are excerpts from the agreements which outline major roles for each party:

Operating Agreement

PJM Roles and Responsibilities

The Office of the Interconnection, under the direction of the President as supervised and overseen by the PJM Board, shall carry out the following duties and responsibilities, in accordance with the provisions of this Agreement (list shortened to include only applicable operations duties):

a. Prepare, maintain, update and disseminate the PJM Manuals;

b. Comply with NERC, and Applicable Regional Reliability Council operation and planning standards, principles and guidelines;

c. Maintain an appropriately trained workforce, and such equipment and facilities, including computer hardware and software and backup power supplies, as necessary or appropriate to implement or administer this Agreement;

d. Direct the operation and coordinate the maintenance of the facilities of the PJM RTO and PJM West Region used for both load and reactive supply, so as to maintain reliability of service and obtain the benefits of pooling and interchange consistent with this Agreement, the Reliability Assurance Agreement, and the Reliability Assurance Agreement-West;

e. Direct the operation and coordinate the maintenance of the bulk power supply facilities of the PJM RTO and PJM West Region with such facilities and systems of others not party to this Agreement in accordance with agreements between the LLC and such other systems to secure reliability and continuity of service and other advantages of pooling on a regional basis;

f. Perform operating studies of the bulk power supply facilities of the PJM RTO and PJM West Region and make such recommendations and initiate such actions as may be necessary to maintain reliable operation of the PJM RTO and PJM West Region;

g. Perform those functions and undertake those responsibilities transferred to it under the East Transmission Owners Agreement and West Transmission Owners Agreement, including (A) direct the operation of the transmission facilities of the parties to the East Transmission Owners Agreement (B) direct the operation of the transmission facilities of the Parties to the West Transmission Owners Agreement, (C) administer the PJM Tariff, and (D) administer the Regional Transmission Expansion Planning Protocol set forth as Schedule 6 to this Agreement;

h. Perform those functions and undertake those responsibilities transferred to it under the Reliability Assurance Agreement, as specified in Schedule 8 of this Agreement, and those functions and responsibilities transferred to it under the

Reliability Assurance Agreement-West, as specified in Schedule 8A of this Agreement;

i. Monitor the operation of the PJM RTO and PJM West Region, ensure that appropriate Emergency plans are in place and appropriate Emergency drills are conducted, declare the existence of an Emergency, and direct the operations of the Members as necessary to manage, alleviate or end an Emergency;

j. Incorporate the grid reliability requirements applicable to nuclear generating units in the PJM RTO and PJM West Region planning and operating principles and practices.[16]

Member Roles and Responsibilities

Each Member shall, to the extent applicable;

a. Maintain adequate records and, subject to the provisions of this Agreement for the protection of the confidentiality of proprietary or commercially sensitive information, provide data required for (i) coordination of operations, (ii) accounting for all interchange transactions, (iii) preparation of required reports, (iv) coordination of planning, including those data required for capacity accounting under the Reliability Assurance Agreement and Reliability Assurance Agreement-West; (v) preparation of maintenance schedules, (vi) analysis of system disturbances, and (vii) such other purposes, including those set forth in Schedule 2, as will contribute to the reliable and economic operation of the PJM RTO and PJM West Region;

b. Provide such recording, telemetering, communication and control facilities as are required for the coordination of its operations with the Office of the Interconnection and those of the other Members and to enable the Office of the Interconnection to operate the PJM RTO and PJM West Region and otherwise implement and administer this Agreement, including equipment required in normal and Emergency operations and for the recording and analysis of system disturbances;

c. Provide adequate and properly trained personnel to (i) permit participation in the coordinated operation of the PJM RTO and PJM West Region, (ii) meet its obligation on a timely basis for supply of records and data, (iii) serve on committees and participate in their investigations, and (iv) share in the representation of the Interconnection in inter-regional and national reliability activities;

d. Comply with the requirements of the PJM Manuals and all directives of the Office of the Interconnection to take any action for the purpose of managing, alleviating or ending an Emergency, and authorize the Office of the Interconnection to direct the transfer or interruption of the delivery of energy on their behalf to meet an Emergency and to implement agreements with other Control Areas interconnected with the PJM RTO or PJM West Region for the mutual provision of service to meet an Emergency, and be subject to the emergency procedure charges specified in Schedule 9 of this Agreement for any failure to follow the Emergency instructions of the Office of the Interconnection.

[16] PJM Operating Agreement, Sheet 42

Facilities Planning and Operation

Consistent with and subject to the requirements of this Agreement, the PJM Tariff, the governing agreements of the Applicable Regional Reliability Councils, the Reliability Assurance Agreement, the Reliability Assurance Agreement-West, the West Transmission Owners Agreement, the East Transmission Owners Agreement, and the PJM Manuals, each Member shall cooperate with the other Members in the coordinated planning and operation of the facilities of its System within the PJM RTO or PJM West Region so as to obtain the greatest practicable cooperate with the other Members in the coordinated planning and operation of the facilities of its System within the PJM RTO or PJM West Region so as to obtain the greatest practicable degree of reliability, compatible economy and other advantages from such coordinated planning and operation. In furtherance of such cooperation each Member shall, as applicable:

a. Consult with the other Members and the Office of the Interconnection;

b. Coordinate the installation of its electric generation and Transmission Facilities with those of such other Members so as to maintain reliable service in the PJM RTO and PJM West Region;

c. Coordinate with the other Members, the Office of the Interconnection and with others in the planning and operation of the regional facilities to secure a high level of reliability and continuity of service and other advantages;

d. Cooperate with the other Members and the Office of the Interconnection in the implementation of all policies and procedures established pursuant to this Agreement for dealing with Emergencies, including but not limited to policies and procedures for maintaining or arranging for a portion of a Member's Capacity Resources, at least equal to the applicable levels established from time to time by the Office of the Interconnection, to have the ability to go from a shutdown condition to an operating condition and start delivering power without assistance from the power system;

e. Cooperate with the members of Applicable Regional Reliability Councils to augment the reliability of the bulk power supply facilities of the region and comply with Applicable Regional Reliability Councils and NERC operating and planning standards, principles and guidelines and the PJM Manuals;

f. Cooperate with the Office of the Interconnection's coordination of the operating and maintenance schedules of the Member's generating and Transmission Facilities with the facilities of other Members to maintain reliable service to its own customers and those of the other Members and to obtain economic efficiencies consistent therewith;

g. Cooperate with the other Members and the Office of the Interconnection in the analysis, formulation and implementation of plans to prevent or eliminate conditions that impair the reliability of the PJM RTO and PJM West Region; and

h. Adopt and apply standards adopted pursuant to this Agreement and conforming to NERC, and Applicable Regional Reliability Council standards, principles and guidelines and the PJM Manuals, for system design, equipment ratings, operating practices and maintenance practices.[17]

[17] Ditto, Sheet 43

~~practices.~~[18]

Transmission Owners Agreement

The Transmission Owners Agreement (TOA) defines the relationship between and among PJM and the transmission owning members of PJM. The TOA binds the Transmission Owners to operating their facilities in accordance with applicable rules and policies and at the direction of PJM. The following is an excerpt from the TOA, regarding operations:

Operation of Transmission Facilities

Each Party shall operate its Transmission Facilities in accordance with (i) the terms of this Agreement, (ii) applicable NERC and MAAC reliability principles, guidelines, and standards, (iii) the PJM Manuals, and (iv) the direction of the Office of the Interconnection. Consistent with the provisions of this Section 4.4, the Parties shall conform to the Office of the Interconnection's operating instructions as they apply to such Party's Transmission Facilities. Nothing in this Agreement shall be construed to require a change in the physical control of any Transmission Facilities using a Party's existing facilities and equipment.[19]

~~[18] Ditto, Sheet 43~~

[19] PJM Transmission Owners Agreement, Page 9.

Attachment B: Plant Specific NPIRs

This attachment summarizes Plant Specific NPIRs.

Unit: _____ **Operating Company:** _____

Transmission Zone(s): _____

Requirement Categories:

1. **Operational requirements** (e.g. minimum and maximum voltage, voltage drop or stability limits, configuration or topology limitations, post-accident load requirements, environmental limitations, etc. that are required to be respected in real time operations.) The requirements should contain associated communications requirements to ensure that the nuclear licensee is properly informed about the ability of the Transmission Entities to comply with the requirements.

2. **Planning Requirements** (e.g. minimum and maximum voltage, voltage drop or stability limits, configuration or topology limitations, post-accident load requirements, environmental limitations, etc. that are required to be respected in planning studies and analysis.)

3. **Design Criteria**

4. **Restoration Requirements** (e.g. Minimum service level requirements to enable restoration of nuclear plant generation, minimum restoration times for the restoration of service to the nuclear plant station service busses, etc.)

5. **Equipment Maintenance Requirements** (e.g., equipment performance requirements, notification and/or communication requirements to inform the plant of degraded equipment function or capability, etc.)
6. **Communication Requirements** (e.g. Emergency Procedures, Conservative Operations, Emergent Grid Issues, Periodic Operations/Planning Study Results, Periodic Restoration/Emergency Procedure Drill Results, RTEP upgrades impacting Nuclear Stations.)

Note 1: Maintenance will be addressed between Nuclear Owner and Transmission Owner or designee.

Note 2: Attachment B is completed for each nuclear unit on the PJM RTO footprint. Since the completed template may include Critical Infrastructure information it is maintained by PJM Operations Planning Department but not published as part of the manual.

Attachment C: Plant Specific NPIRs Revision History

Asset Owner	Plant Name	App Date	Revision Number
Calvert Cliffs Nuclear PP Inc	Calvert Cliffs Nuclear Power Plant 1	3/25/2010	0
Calvert Cliffs Nuclear PP Inc	Calvert Cliffs Nuclear Power Plant 2	3/25/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Braidwood Generation Station 1	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Braidwood Generation Station 2	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Byron Generating Station 1	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Byron Generating Station 2	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Dresden Generating Station 1	3/23/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Dresden Generating Station 2	3/23/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	LaSalle Generating Station 1	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	LaSalle Generating Station 2	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Limerick 1	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Limerick 2	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Oyster Creek	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Peach Bottom 2	7/14/2010	1
Exelon Generation Company, LLC - Exelon Nuclear	Peach Bottom 3	7/14/2010	1
Exelon Generation Company, LLC - Exelon Nuclear	Quad Cities Generating Station 1	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Quad Cities Generating Station 2	3/17/2010	0
Exelon Generation Company, LLC - Exelon Nuclear	Three Mile Island	3/17/2010	0
FirstEnergy Nuclear Operating Company	Beaver Valley 1	3/29/2010	0
FirstEnergy Nuclear Operating Company	Beaver Valley 2	3/29/2010	0
FirstEnergy Nuclear Operating Company	Davis Besse	6/1/2011	0
FirstEnergy Nuclear Operating Company	Perry	6/1/2011	0
Indiana Michigan Power Co	Donald C Cook 1	3/24/2010	0
Indiana Michigan Power Co	Donald C Cook 2	3/24/2010	0
PPL Susquehanna LLC	PPL Susquehanna 1	3/19/2010	0

PPL Susquehanna LLC	PPL Susquehanna 2	3/19/2010	0
PSEG Nuclear LLC	PSEG Hope Creek Generating Station 1	3/29/2010	0
PSEG Nuclear LLC	PSEG Salem Generating Station 1	3/31/2010	0
PSEG Nuclear LLC	PSEG Salem Generating Station 2	3/31/2010	0
Virginia Electric & Power Co	North Anna 1	3/22/2010	0
Virginia Electric & Power Co	North Anna 2	3/22/2010	0
Virginia Electric & Power Co	Surry 1	3/22/2010	0
Virginia Electric & Power Co	Surry 2	3/22/2010	0

Revision History

Revision 02 (09/07/2010):

- Section 1.1: Background – updated reference to manuals.
- Section 2.1: Outage Coordination – updated maintenance notification requirements for facilities impact Nuclear Plant or off-site station light and power source.
- Attachment B: Updated Peach Bottom NPIR to reflect new Cooper 230kV substation between Nottingham and Graceton.
- Attachment C: Updated Peach Bottom NPIR revision.

Revision 01 (4/1/2010):

- Section 2.1: Outage Coordination – modified language to clarify outage coordination process.
- Section 2.3: Notification for Loss of Calculation Capability – added 30 minute timeframe to notify Nuclear Station of loss of EMS.
- Section 2.4.1: Communications – modified language to clarify real-time communication process.
- Section 2.6: System Restoration – highlighted urgency if the nuclear plant has lost both offsite and onsite AC power.
- Attachment B: Added individual Plant Specific NPIR for all nuclear plants with PJM RTO footprint. Plant Specific NPIR are not posted due to the confidential nature of subject matter.
- Attachment C: Plant Specific NPIR Revision History – updated to include approval date for plant specific Nuclear Plant Interface Requirements.

Revision 00 (10/01/2009):

New manual to address NUC-001 standard