



*Working to Perfect the Flow of Energy*

PJM Manual 13

## Emergency Operations

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Prepared by

System Operations Division

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## PJM Manual 13

## Emergency Operations

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## Current Revision

### ***Revision 37 (06/30/2009)***

- Updated date for 2009 Reserve Requirements
- Updated Contingency Control Notes in Section 2 for Wind
- Removed NERC and DOE reports and replaced with links to NERC standards
- Completed comprehensive annual review of the entire manual

## Introduction

Welcome to the ***PJM Manual for Emergency Operations***. 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 and the PJM Energy Market. The manuals are grouped under the following categories:

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

For a complete list of all PJM Manuals, go to [www.pjm.com](http://www.pjm.com) and select “Manuals” under the “Documents” pull-down menu.

### About This Manual

The ***PJM Manual for Emergency Operations*** focuses on how PJM and the PJM Members are expected to respond to emergency conditions. Emergency conditions include:

- an abnormal condition requiring manual or automatic action to maintain system frequency or to prevent loss of firm load, equipment damage, or tripping of system elements that could adversely affect the reliability of an electric system or the safety of persons or property
- a fuel shortage requiring departure from normal operating procedures in order to minimize the use of such scarce fuel
- a condition that requires implementation of emergency procedures as defined in the manuals

The ***PJM Manual for Emergency Operations*** consists of six sections and twelve attachments. These sections are listed in the table of contents beginning on page ii.

### Intended Audience

The Intended Audiences for the ***PJM Manual for Emergency Operations*** are:

- *PJM dispatchers* — Declare and implement emergency procedures.

- *Local Control Center and Market Operations Centers dispatchers* — respond to PJM dispatcher requests for emergency procedures.
- *PJM operations staff* — Perform system studies.
- Government, Regulatory, and Emergency Response personnel
- All PJM Members
- PJM neighboring Transmission Operators (TOP), Balancing Authorities (BA), and Reliability Coordinators (RC), and appropriate Regional Reliability Organizations (RRO)

## References

The references to other documents that provide background or additional detail directly related to the ***PJM Manual for Emergency Operations*** are:

- PJM Manual for [Balancing Operations](#) (M-12)
- PJM Manual for [Transmission Operations](#) (M-3)
- PJM Manual for [System Restoration](#) (M-36)
- PJM Manual for [Operating Agreement Accounting](#) (M-28)
- PJM Manual for [Definitions & Acronyms](#) (M-35)

## Using This Manual

We believe that explaining concepts is just as important as presenting procedures. This philosophy is reflected in the way we organize the material in this manual. We start each section with an overview. Then, we present details, procedures or references to procedures found in other PJM manuals. The following provides an orientation to the manual's structure.

## What You Will Find In This Manual

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



## Section 1: Overview

Welcome to the *Overview* section of the ***PJM Manual for Emergency Operations***.

- This section of the manual addresses PJM and the PJM Members' responsive actions to emergency conditions. An Emergency in the PJM RTO is defined as:
- An abnormal system condition requiring manual or automatic action to maintain system frequency, to prevent loss of firm load, equipment damage, or tripping of system elements that could adversely affect the reliability of an electric system or the safety of persons or property.
- Capacity deficiency or capacity excess conditions.
- A fuel shortage requiring departure from normal operating procedures in order to minimize the use of such scarce fuel.
- Abnormal natural events or man-made threats that would require conservative operations to posture the system in a more reliable state.
- An abnormal event external to the PJM service territory that may require PJM action.

This manual constitutes PJM's Emergency Operations Plan per NERC and RFC EOP standards for mitigating operating emergencies. PJM will review this plan annually and provide notification of such action to RFC and adjacent Reliability Coordinators per RFC Standard EOP-002-0 and NERC Standard IRO-006-1 (relative to transmission overloads, transmission voltage decay, or violations of system stability limits as discussed in Section 5 of the manual). PJM Manual 3, "Transmission Operations" and Manual 37 "Reliability Coordination" provide additional details regarding operating for SOL / IROL facilities, detailing specific equipment operating procedures.

### 1.1 Policy Statements

The policy of PJM is to maintain, at all times, the integrity of the PJM RTO transmission systems and the Eastern Interconnection, and to give maximum reasonable assistance to adjacent systems when a disturbance that is external to the PJM RTO occurs. Power system disturbances are most likely to occur as the result of loss of generating equipment, transmission facilities, or as the result of unexpected load changes. These disturbances may be of, or develop into, a magnitude sufficient to affect the reliable operation of the PJM RTO and/or the Eastern Interconnection. These events demand timely, decisive action to prevent further propagation of the disturbance.

Every effort is made to avoid interrupting system load. However, under certain operating conditions, it is necessary to curtail or interrupt customer load. PJM will work to interrupt the minimum amount of load necessary to adequately respond to the emergency. The PJM dispatcher requests the local transmission dispatcher (or LSE or agent in the case of Load Management / LM programs) to curtail or interrupt customer load as necessary. The PJM dispatcher has the absolute authority to order load dumping within the PJM RTO in order to preserve system reliability in accordance with NERC transmission Operations (TOP) standards and the PJM Operating Agreement (Section 1.6.2, "Scope of Services" and Section 1.7.11, "Emergencies").

### ***PJM Actions:***

In general, PJM is responsible for the following activities:

- Taking actions that it determines are consistent with Good Utility Practice and are necessary to maintain the operational integrity of the PJM RTO and the Eastern Interconnection.
- Declaring that an Emergency exists or has ceased to exist.
- Implementing the Emergency procedures of agreements with other neighboring Reliability Coordinators & Balancing Authorities.
- Implementing Emergency Procedures for the PJM Reliability Coordinator footprint consistent with NERC Policies.
- Purchasing emergency energy from outside the PJM RTO, as needed, to alleviate or end an Emergency.
- Selling emergency energy to other Control Areas as requested during Emergency conditions in other Control Areas.
- Directing the operations of any PJM Member as necessary to manage, alleviate, or end an Emergency, including but not limited to load shedding, increasing or decreasing generation output, and other actions.
- Documenting emergency procedures in PJM's Emergency Procedures logging application as well as its own internal Smartlog application. All logging data shall be retained for a period of not less than 10 years.
- Providing information to and receiving information from PJM Members in the PJM RTO and other control areas, as appropriate to manage, alleviate, or end an Emergency in the PJM RTO or in another Control Area.
- Retain evidence (operator logs, voice recordings, electronic communications, etc.) of PJM's implementation of capacity and energy emergency actions per NERC EOP Standards.
- Providing information to the PJM Members, as needed, in order to facilitate notification of governmental authorities and other interested entities of Emergency conditions and providing such notification if appropriate.
- Posting to the Reliability Coordinator Information System [RCIS] as appropriate and in accordance with NERC standards
- Preparing or assisting the PJM Members in preparing reports required by governmental or industry agencies as a result of an Emergency.
- Coordinating restoration of all or parts of the bulk power system in the PJM RTO, as necessary.
- PJM shall annually review and update this manual and provide a copy to neighboring Reliability Coordinators, Transmission Operators, Balancing Authorities, and appropriate Regional Reliability Organizations.

### ***PJM Member Actions:***

PJM Members will review this manual on an annual basis in accordance with NERC and RFC standards through the Systems Operation Subcommittee.

When an Emergency is declared by PJM, the PJM Members are responsible for performing the following activities:

- Taking other actions, as requested or directed by PJM, to manage, alleviate, or end an Emergency.
- Cooperating with each other and PJM to carry out the Emergency procedures and to implement requests and instructions received from PJM for the purpose of managing, alleviating, or ending an Emergency.
- Providing notification and other information to governmental agencies as appropriate.
- Collecting, storing, and providing data and other information to PJM, as necessary, to facilitate preparation of reports required by governmental or industry agencies as a result of an Emergency.
- Cooperating and coordinating with PJM and other PJM Members in the restoration of all or parts of the bulk power system in the PJM RTO.

A PJM Generation owner controlling the output of a Capacity Resource must take or arrange for any or all of the following actions as directed by PJM in order to manage alleviate, or end an Emergency, or such actions as PJM may deem appropriate for these purposes:

- Reporting the operating status and fuel situation.
- Canceling Generator testing and maintenance.
- Canceling GMS/EMS Database or communication link testing and maintenance.
- Reducing non-critical plant load.
- Reducing non-essential office load.
- Directing personnel to unattended generation sites.
- Starting, including black-start, and load such generation, as directed.
- Reducing output to Emergency Minimum Generation.
- Shutting down such generation.
- Interrupting sales for delivery to loads outside the PJM RTO.
- Selling energy to other control areas.
- Maintaining records of emergency actions taken and the results achieved.

A Transmission Owner / Load Serving Entity must take any or all of the following actions as directed by PJM in order to manage alleviate, or end an Emergency, or such actions as PJM may deem appropriate for these purposes:

- Canceling Transmission testing and maintenance.
- Canceling EMS Database or communication link testing and maintenance.

- Installing and maintaining under frequency load shedding relays.
- Providing capability for manual shedding of specified amounts of load.
- Reducing energy purchases (LSE only).
- Reducing non-essential office load.
- Implementing voltage reductions.
- Requesting voluntary customer energy conservation or load curtailment.
- Implementing manual load dumping.
- Managing, curtailing, or interrupting load, including PJM programs such as Load Management (LM) or other Load Reduction Programs.
- Maintaining records of Emergency actions taken and the results achieved.

PJM Members taking action to manage alleviate, or end an Emergency affecting any facilities not designated as part of the bulk power system in the PJM RTO must perform the following actions:

- Exerting their best efforts to avoid impairing the operational integrity of the bulk power system in the PJM RTO.
- Notifying PJM in advance of taking any such action if possible, or if not provide such notification immediately after taking such action.

**Note 1:** All alerts, warnings, and actions are communicated to Transmission / Generation dispatchers via an ALL-CALL message and posted on selected PJM web-sites. Local dispatchers are responsible for notifying Load Serving Entities (LSE), assuring they receive the same information.

**Note 2:** PJM Emergency Authority: Section 10.4, of the PJM Operating Agreement (OA) provides that the Office of the Interconnection has the responsibility to “direct the operations of the Members as necessary to manage, alleviate, or end an Emergency”. Likewise, Section 11.3.1 – e, of the (OA) states that PJM members must comply with “all directives of the Office of the Interconnection to take any action for the purpose of managing, alleviating or ending an Emergency.”

**Note 3:** Synchronized Reserve: Section 1.3.33B.01 of the PJM Operating Agreement (OA) defines Synchronized Reserves as the reserve capability of generation resources that can be converted fully into energy or Demand Resources whose demand can be reduced within 10 minutes from the request of the Office of the Interconnection dispatcher, and is provided by equipment that is electrically synchronized to the Transmission System. Synchronized Reserves are supplied from 10-minute synchronized generating resources (i.e., Spinning Reserves) and 10-minute demand-side response resources.

## 1.2 Governmental Notifications & Public Appeals Procedures

When the potential exists for a PJM bulk power emergency, PJM advises PJM participants as far in advance as possible. This permits participants and PJM the maximum lead-time in determining the appropriate steps to take, including governmental and public notification. Depending on the situation, Transmission Owners and PJM may each have responsibilities in notifying local, state or federal agencies. Generation owners may have separate reporting obligations related to plant restrictions / operating conditions. Due to the wide variety of conditions and the potential for the conditions to change rapidly, it is difficult to provide precise criteria that fit all situations to trigger the issuance of an early alert to the governmental agencies and the public. Each situation is evaluated to determine if any early alert to governmental agencies is required, and if an early alert to the public is appropriate. It is the ultimate responsibility of each Transmission and Generation Owner to adjust their guidelines to respond to any escalated concerns from governmental agencies. It is also essential that the Transmission and Generation Owners and PJM are informed of any owners' unilateral actions or anticipated restrictions.

Each of the alerts, warnings, and actions described in this manual should be considered for notification to government agencies as conditions and time permits.

When Maximum Emergency Generation is added to the schedule, a severe weather condition is issued, or a transmission system limitation affecting area supply is anticipated, PJM performs a situation analysis and prepares a capacity/load/reserve projection for the appropriate area and future time periods, including the effect of possible imports due to the supply situation of various neighbors. The analysis indicates expected emergency conditions.

**Note:** Public / Media Notification Messages are contained in Attachment A. Depending on the severity of projected system conditions, these messages may be modified and issued in advance to ensure sufficient notification is provided to the public. Public / Media Notification Messages C-2, C-3 and C-4 may need to be issued the night before due to load realized during a cold morning pick-up.

## 1.3 COMMUNICATIONS

Effective communications are critical to ensure reliability during emergency operations. Generally, PJM conducts regular conference calls during peak load operations. Attachment B defines Teleconference Protocol Guidelines.

Electronic communications and data quality are also critical. Interruptions to electronic communications can result in inaccurate analysis, inefficient dispatch and potential unreliable operations. Effective operator/operator or operator/support staff communications is essential to ensure reliable operations and quickly restore data communications.

### 1.3.1 Planned Database/ICCP Maintenance

PJM EMS Advanced Applications solves a single State Estimator solution, which serves as the basis for the PJM Unit Dispatch System (UDS) and Network Applications Package. Interruptions to data or processing of inaccurate data may result in non-convergence to the state estimator, which adversely impacts the efficiency of generation dispatch and could

result in the inability of PJM to monitor the transmission system. Since PJM operates a single state estimator, unnecessary ICCP link outages or database maintenance should be avoided.

Multiple company ICCP datalink outages can result in PJM EMS Security Analysis and potential system reliability issues if permitted to occur simultaneously, even during moderate load levels. PJM support staff and member company staff should adhere to the following rules when scheduling link outages:

- Attempt to schedule planned outages 24 hours in advance
- Only one company planned outage should be scheduled in any time period.
- PJM staff has the authority to:
  - Reschedule or cancel a member company scheduled planned outage based on system conditions.
  - Reschedule or cancel a member company scheduled planned outage based on existing ICCP data link outages
  - Deny a request for a member company planned outage if requested time has been previously scheduled

Further restrictions may be enforced when peak load operations are projected in any Control Zone. However, PJM recognizes that at times emergency outages/changes are required during projected peak load conditions. To the extent possible, emergency changes should occur prior to 11:00 EPT during summer operations and between 10:30 – 14:30 EPT during winter operations. Weekly routine maintenance should be canceled or rescheduled to days when emergency procedures are not anticipated.

### **1.3.2 Generation Owner EMS/ EMS Database/ICCP Link Outage**

#### ***PJM Member Actions (MOC):***

- Contact PJM Dispatch to discuss communication issue fully describing extent of communication problems to ensure PJM Dispatch understands the magnitude of the problem
- Recognize previous UDS approved base-points are stale while ICCP link problems exist
- Contact support staff to resolve communication issue
- Verbally communicate manual dispatch directions to plants if communication problems are not resolved within 10 minutes.
- Log manual dispatch direction
- Provide a consistent contact person to PJM Dispatch to enhance efficiency of communications avoiding potential reliability issues.

#### ***PJM Actions:***

- Contact MOC to discuss communications issue fully describing extent of communication problems to ensure MOC Dispatch understands the magnitude of the problem

- Recognize previous UDS approved base-points are stale while ICCP link problems exist
- Contact support staff to resolve communication issue
- Communicate zonal cost if communication problems are not resolved within 10 minutes.
- Communicate targeted generation dispatch if transmission constraints arise.
- Log manual dispatch direction.
- Reassign regulation as necessary
- Elevate PJM/MOC communication to Shift Supervisor level if reliability issues arise.

### **1.3.3 Transmission Owner EMS/EMS Database/ICCP Outage**

#### ***PJM Member Actions (LCC):***

- Contact PJM Dispatch to discuss communication issue fully describing extent of communication problems to ensure LCC Dispatch understands the magnitude of the problem
- Contact support staff to resolve communication issue
- Contact PJM Dispatch regarding Transmission Constraints
- Where necessary, staff critical substations to support transfer of critical data to PJM
- Verbally communicate critical data to PJM Dispatch as requested.

#### ***PJM Actions:***

- Contact LCC to discuss communication issues fully describing extent of communication problems to ensure MOC Dispatch understands the magnitude of the problem
- Communicate impact on ability to monitor transmission system
- Contact support staff to resolve communication issue
- Update EMS with the critical data provided by the Transmission Owner
- Manually re-dispatch, as necessary, to control transmission constraints based on LCC analysis. Ensure all actions are logged.



## Section 2: Capacity Emergencies

Welcome to the *Capacity Emergencies* section of the **PJM Manual for Emergency Operations**. In this section, you will find the following information:

- A general description of the system alert and emergency actions (see “*Overview*”).
- A general overview of Reserve Requirements by Control Zone (see “*Reserve Requirements*”).
- How PJM and the PJM Members respond to capacity shortage situations (see “*Capacity Shortages*”).
- How PJM and the PJM Members respond to capacity excess situations (see “*Light Load Procedures*”).

### 2.1 Overview

PJM is responsible for determining and declaring that an Emergency is expected to exist, exists, or has ceased to exist in any part of the PJM RTO or in any other Control Area that is interconnected directly or indirectly with the PJM RTO. PJM directs the operations of the PJM Members as necessary to manage, allocate, or alleviate an emergency.

- *PJM RTO Reserve Deficiencies* — If PJM determines that PJM-scheduled resources available for an Operating Day in combination with Capacity Resources operating on a self-scheduled basis are not sufficient to maintain appropriate reserve levels for the PJM RTO, PJM performs the following actions:
  - Recalls energy from Capacity Resources that otherwise deliver to loads outside the Control Area and dispatches that energy to serve load in the Control Area.
  - Purchases capacity or energy from resources outside the Control Area. PJM uses its best efforts to purchase capacity or energy at the lowest prices available at the time such capacity or energy is needed. The price of any such capacity or energy is not considered in determining Locational Marginal Prices in the PJM Energy Market. The cost of capacity or energy is allocated among the Market Buyers as described in the PJM Manual for Operating Agreement Accounting.
- *Light Load Procedures* — If PJM determines that the forecasted load in the PJM RTO falls below a margin of 2,500 megawatts above the sum of the output of the self-scheduled resources and the total Normal Minimum Generation of all PJM-scheduled resources, PJM implements the alert and possibly Minimum Generation Emergency procedures as described later in this section. To the extent it deems appropriate in order to avoid or reduce the cost of a Minimum Generation Emergency, PJM sells energy to other Control Areas. Any costs or revenues resulting from such sales are allocated as described in the [PJM Manual for Operating Agreement Accounting \(M28\)](#).

If PJM is requested to purchase energy from another Control Area in order to alleviate an actual or threatened Minimum Generation Emergency in the other control area, PJM may purchase energy if PJM determines that the purchases can be made without adversely affecting the safe or reliable operation of generators within the PJM RTO and without unduly increasing the cost of energy of the PJM



Members. Any energy purchased and associated costs or revenues are allocated as described in the PJM Manual for Operating Agreement Accounting.

**Note:** Emergency power purchases by PJM to assist in alleviating external Minimum Emergency Conditions should be accepted at a quote below the PJM system cost (unconstrained conditions) or interface locational marginal price.

## 2.2 Reserve Requirements

PJM schedules reserves on a day-ahead basis in order to ensure that differences in forecasted loads and forced generator outages does not negatively impact the reliable operation of the PJM Transmission System. PJM operates in real-time to ensure Contingency/Primary (10 minute) and Synchronized/Spinning reserve requirements are always maintained. Day Ahead Scheduling Reserves (Operating), Contingency (Primary) and Synchronized/Spinning Reserve Requirements are as follows:

RRO	Control Zone	Day-ahead Scheduling (Operating)	Contingency (Primary)	Synchronized Synchronized Reserve	Regulation
RFC		Annual %	150% Largest Unit	Largest Unit	1% valley for Off-Peak and 1% Peak for On-Peak
	Mid-Atlantic	Annual %	1700 MW	Largest Unit	
SERC	Dominion	VACAR ARS%	VACAR ARS%	VACAR ARS%	

The Day-ahead Scheduling Reserves for RFC are calculated on an annual basis. This calculation considers variables that adversely impact system reliability, specifically, Underforecasted Load Forecast Error (LFE) and Generator Forced Outage Rates (FOR).

$$\text{Day-ahead Scheduling Reserves} = \text{Underforecasted LFE} + \text{FOR}$$

### Load Forecast Error Component

The LFE component is based on a 3 year average of Underforecasted LFE. PJM focuses on only underforecasted Load Forecast errors because underforecasted loads result can result in a capacity deficiency. PJM computes the Underforecasted LFE based on the 80<sup>th</sup> percentile of a rolling three year underforecast average.

Effective January 1, 2009 the LFE error component of the Day-ahead Scheduling Reserve is 2.10%.

### Forced Outage Rate Component

The FOR component is based on a rolling three year average of forced outages that occur from 18:00 the scheduling day (day – 1) through the operating day at 20:00. This duration covers the timeframe after the Reserve Adequacy Run through the evening peak period for which the system is scheduled. Forced outages that occur prior to 18:00 of the scheduling day are accounted for in the commitment plan. PJM dispatch still has the ability to schedule additional reserves if a Hot Weather / Cold Weather Alert is issued since FOR are typically higher during such timeframes.

Effective January 1, 2009 the FOR error component of the Day-ahead Scheduling Reserve is 4.64%.

PJM Performance Staff performs Day-ahead Scheduling Reserve Requirement calculations every year during the month of November. The calculations cover the 3 year window from November 1<sup>st</sup> (year – 3) through October 31<sup>st</sup> (current year). The results are communicated to the Market Implementation Committee, Operating Committee and System Operations Subcommittees. The revised reserve calculations are implemented annually on January 1<sup>st</sup>.

Effective January 1, 2009 the Day-ahead Scheduling Reserve for RFC areas of PJM is 6.75% times Peak Load Forecast for RFC.

Dominion Day-ahead Scheduling Reserve is based on their share of the VACAR Reserve Sharing agreement and is set annually.

The RFC and Dominion Day-ahead Scheduling Reserve Requirements are added together to form a RTO Day-ahead Scheduling Reserve Requirement.

**Note 1:** PJM must schedule sufficient Regulating Reserves to satisfy control standards. Regulating Reserves shall not be less than 1% of the forecasted peak load of the next day, regulating reserves shall be made up of not less than 75% spinning reserves, and resources allocated to regulating reserves shall not be included as part of Contingency Reserves.

**Note 2:** PJM must schedule sufficient Contingency Reserves to satisfy the Reliability *First* (RFC) requirements. Contingency Reserves shall not be less than the largest contingency. Contingency Reserves must be made up of at least 50% Spinning Reserves. No more than 25% of Contingency Reserves should be interruptible load. (Standard BAL-002-0, BAL-002-RFC-02)

**Note 3:** PJM triggers the Contingency (Primary) Reserve Emergency Procedures on the Mid-Atlantic Control Zone based on a Contingency/Primary Reserve Requirement of 1700 MW due to potential deliverability issues. Contingency (Primary) Reserve Requirements for the RFC portion of the PJM footprint is 150% of the largest generators.

**Note 4:** The single Regulation Requirement for the PJM RTO is equal to 1% of the forecast peak load for the PJM RTO for the day.

**Note 5:** RFC and VACAR Contingency and Synchronized Reserve requirements are set on an annual basis.

**Note 6:** For Dominion Control Zone, SERC Reserve Requirements, as outlined in the SERC Contingency Reserve Policy, are maintained. Dominion-VP load is subject to the SERC requirements based on the VACAR Reserve Sharing Agreement which is set annually. For non Dominion-VP load in the Dominion Control Zone, SERC reserve requirements (non-reserve sharing group) are applicable to the Balancing Authority (PJM). There are sufficient reserves in the RTO to surpass these SERC requirements through the existing reserve methodology.

PJM schedules Day-ahead Scheduling reserves on a day-ahead basis as a single market in the RTO. Primary and Synchronized Reserves are maintained in real-time based on the locational requirements identified above, recognizing transmission constraints while

scheduling sufficient localized reserves on a control zone basis to satisfy reserve sharing agreements. The cost of capacity or energy is allocated among the Market Buyers as described in the PJM Manual for [Operating Agreement Accounting \(M-28\)](#)

PJM commits generation real-time on an economic basis, considering resource characteristics (start-up, min run, starts per day) and anticipated system changes (load curve, interchange, must-run generation) while honoring system constraints.

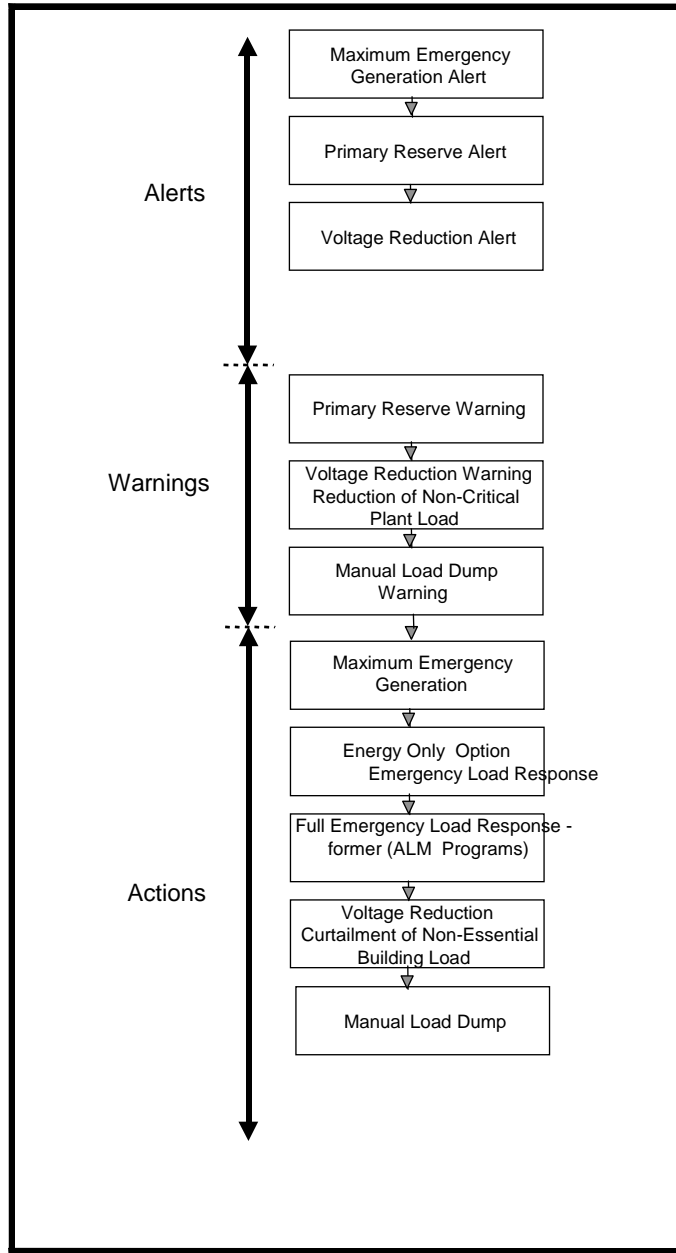
PJM issues capacity emergencies across the entire PJMCA except for PJM Load Dump Warnings/Actions, which are solely issued on a Control Zone basis. However, transmission constraints may force Emergency Procedure warnings/actions to be issued on a Control Zone or a subset of a Control Zone. For example, if known transmission constraints would prohibit delivery of Maximum Emergency Generation capacity from one Control Zone to another, a Maximum Generation Alert would not be issued for the Control Zone with undeliverable energy.

## 2.3 Capacity Shortages

PJM is responsible for declaring the existence of an Emergency, and for directing the operations of the PJM Members as necessary to manage, alleviate, or end an Emergency. PJM also is responsible for transferring energy on the PJM Members' behalf to resolve an Emergency. PJM is also responsible for executing agreements with other Control Areas interconnected with the PJM RTO for the mutual provision of service to meet an Emergency.

Exhibit 1 illustrates that there are three general levels of emergency actions for capacity shortages:

- Alerts – issued day-ahead
- Warnings – issued real-time
- Actions – issued real-time
- PJM actions are consistent with NERC and RFC EOP standards.



**Exhibit 1: Emergency Levels**

Exiting emergency procedures are achieved in a controlled, deliberate manner so as to not adversely affect system reliability, while minimizing the impact of these emergency actions on the LSE's customers. PJM dispatcher has the flexibility of implementing the emergency procedures in whatever order is required to ensure overall system reliability. PJM dispatcher has the flexibility to exit the emergency procedures in a different order than they are implemented when conditions necessitate.

PJM strives to meet customer energy demands either through the use of available generating resources, power purchases from PJM Members, or through the use of planned

load management programs. If customer demand cannot be met, Emergency actions, such as voltage reductions, and as a last resort, manual load dumping, are used.

During unconstrained operations, PJM Control Zones will jointly implement Emergency Procedures up to the point of a Manual Load Dump Action. Prior to the implementation of a Manual Load Dump Action, PJM dispatch will review each PJM Control Zone energy / reserves calculation to determine their relative level of capacity deficiency (reserves evaluated via PJM EMS system). If all PJM Control Zones are capacity deficient, Manual Load Dump Actions will be implemented proportionally, based on the level of shortage, otherwise only the deficient Control Zones will be required to shed load.

Transmission constraints may result in PJM dispatch implementing emergency procedures, including load dump, on a Control Zone specific basis or a subset of a Control Zone.

**Note:** All capacity related Alerts / Warnings / Actions are to be communicated via All-Call to local Transmission / Generation owners/ Curtailment Service Providers and posted to selected PJM web-sites.

### 2.3.1 Day-Ahead Emergency Procedures: Alerts

The intent of the alerts is to keep all affected system personnel aware of the forecast and/or actual status of the PJM RTO. All alerts and cancellation thereof are broadcast on the “ALL-CALL” system and posted to selected PJM web-sites to assure that all members receive the same information.

Alerts are issued in advance of a scheduled load period to allow sufficient time for members to prepare for anticipated initial capacity shortages.

#### Maximum Emergency Generation Alert

The purpose of the Maximum Emergency Generation Alert is to provide an early alert that system conditions may require the use of the PJM emergency procedures. It is implemented when Maximum Emergency Generation is called into the operating capacity.

#### ***PJM Actions:***

- PJM dispatcher notifies PJM management.
- PJM dispatchers perform a situation analysis and prepare capacity/load/ interchange/reserve projections for that day and appropriate future operating periods considering potential bottled generation based on location of transmission constraints.
- PJM dispatcher issues an alert to members, stating the amount of estimated operating reserve capacity and the requirement. Alert can be issued for entire PJM Control Area or for specific Control Zones
- PJM dispatcher reports significant changes in the estimated operating reserve capacity.
- PJM dispatcher issues a NERC Energy Emergency Alert Level 1 (EEA1 = ALERT LEVEL 1 / THREAT LEVEL = ELEVATED / THREAT COLOR = YELLOW) via the Reliability Coordinator Information System (RCIS) to ensure all Reliability Authorities clearly understand potential and actual PJM system energy emergencies. EEA1 signals that PJM foresees or is experiencing conditions where all available resources

are scheduled to meet firm load, firm transactions, and reserve commitments, and is concerned about sustaining its required Operating Reserves.

- PJM dispatcher reviews the level of dependency on External Transactions to serve PJM load and contacts PJM support staff if the need to implement Capacity Benefit Margin (CBM) is required (refer to PJM Manual for Transmission Service Request Section 2 for additional details regarding Capacity Benefit Margin). PJM Dispatch shall log occurrences where CBM is implemented base on the results of support staff analysis. PJM shall notify external systems via RCIS, and PJM members via the PJM website and issue appropriate NERC alert levels consistent with NERC EOP-002.
- PJM dispatcher determines whether a Supplemental Status Report (SSR) is required and notifies PJM Members via the All-Call. PJM Dispatch may elect not to request an SSR until the operating day for which the Alert is in effect.
- PJM dispatcher cancels the alert, when appropriate.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the alert.
- Transmission / Generation dispatchers advise all stations and key personnel.
- Transmission / Generation dispatchers review plans to determine if any maintenance or testing, scheduled or being performed, on any monitoring, control, transmission, or generating equipment can be deferred or cancelled.
- Generation dispatchers report to PJM dispatcher any and all fuel / environmental limited facilities as they occur and update PJM dispatcher as appropriate.
- Transmission / Generation dispatchers suspend any high risk testing of generating or transmission equipment.

**Primary Reserve Alert**

The purpose of the Primary Reserve Alert is to alert members of the anticipated shortage of operating reserve capacity for a future critical period. It is implemented when estimated operating reserve capacity is less than the forecast primary reserve requirement.

***PJM Actions:***

- PJM dispatcher notifies PJM management and members.
- PJM dispatcher issues alert to members, stating the amount of estimated operating reserve capacity and the requirement. An Alert can be issued for the entire PJM CA or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatcher reports significant changes in the estimated operating reserve capacity.
- PJM dispatcher will consider the need to obtain a temporary variance from environmental regulators for specific generators to assist in preventing load shedding in accordance with Attachment N.
- PJM dispatcher cancels the alert, when appropriate.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the alert.
- Transmission / Generation dispatchers advise all stations and key personnel.
- Transmission / Generation dispatchers review plans to determine if any maintenance or testing, scheduled or being performed, on any generating equipment or critical monitoring, control, or bulk power transmission facility can be deferred or cancelled.

**Voltage Reduction Alert**

The purpose of the Voltage Reduction Alert is to alert members that a voltage reduction may be required during a future critical period. It is implemented when the estimated operating reserve capacity is less than the forecasted synchronized reserve requirement.

***PJM Actions:***

- PJM dispatcher notifies PJM management.
- PJM dispatcher issues an alert to members, stating the amount of estimated operating reserve capacity and the requirement. An Alert can be issued for the entire PJM CA or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatcher advises members that a possibility exists that a voltage reduction will be issued and the estimated hour of implementation.
- PJM dispatcher cancels the alert, when appropriate.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the alert.
- Transmission / Generation dispatchers advise all stations and key personnel.
- Transmission dispatchers / LSEs proceed on the basis that a voltage reduction warning will be issued during this future period and take steps that could expedite implementation of a voltage reduction, should one become necessary.
- SOS members / PJM Management consider issuing the appropriate system-wide or Control Zone-specific Public/Media Notification Message See Attachment A.
- PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.

**2.3.2 Real-Time Emergency Procedures (Warnings and Actions)**

All warning and actions are issued in real-time. Warnings are issued during present operations to inform members of actual capacity shortages or contingencies that may jeopardize the reliable operation of the PJM RTO. Disturbance control actions per NERC standard BAL-002 are described in PJM Manual 12, "Balancing Operations") section 4, "Providing Ancillary Services". Generally, a warning precedes an associated action. The intent of warnings is to keep all affected system personnel aware of the forecast and/or actual status of the PJM RTO.



The PJM RTO is normally loaded according to bid prices; however, during periods of reserve deficiencies, other measures must be taken to maintain system reliability. These measures involve:

- loading generation that is restricted for reasons other than cost
- recalling non-capacity backed off-system sales
- purchasing emergency energy from participants / surrounding pools
- load relief measures

Due to system conditions and the time required to obtain results, PJM dispatcher may find it necessary to vary the order of application to achieve the best overall system reliability. Issuance and cancellation of emergency procedures are broadcast over the “ALL-CALL” and posted to selected PJM web-sites. Only affected systems take action. PJM dispatcher broadcasts the current and projected PJM RTO status periodically using the “ALL-CALL” during the extent of the implementation of the emergency procedures.

**Note:** The Real-Time Emergency Procedures section combines Warnings and Actions in their most probable sequence based on notification requirements during extreme peak conditions. Depending on the severity of the capacity deficiency, it is unlikely that some Steps would be implemented. Attachment G, entitled Capacity Emergency Matrix, is a tabular summary of PJM and Member Company Actions during Real-time Emergency Procedures.

#### Step 1: Full Emergency Load Response – formerly known as Active Load Management (Long Lead Time)

The purpose of the Load Management Curtailments is to provide additional load relief by using PJM controllable load management programs. Load relief is expected to be required after initiating Maximum Emergency Generation.

##### Long Time Frame to Implement (Between 1 – 2 hours)

**Note:** When requesting Full Emergency Load Response, PJM dispatcher provides an estimate of the magnitude of the curtailment required and the approximate duration of curtailment.

#### ***PJM Actions:***

- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to conserve electricity usage. PJM dispatcher notifies other Control Areas through the RCIS.
- PJM dispatcher requests members to implement Full Emergency Load Response formerly known as Active Load Management Long Lead Time (LLT) Curtailment. PJM dispatcher requests LSE's or their agent and Curtailment Service Providers to implement Full Emergency Load Response (formerly known as ALM) LLT. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.



- PJM dispatcher issues a NERC Energy Emergency Alert Level 2 (EEA2 = ALERT LEVEL 2) via the RCIS to ensure all Reliability Authorities clearly understand potential and actual PJM system emergencies if one has not already been issued concurrent with the issuance of Active Load Management Curtailables / Full Emergency Load Response (formerly known as ALM). NERC EEA2 is issued when the following has occurred: Public appeals to reduce demand, voltage reduction, and interruption of non-firm load in accordance with applicable contracts, demand side management/active load management, or utility load conservation measures.
- PJM dispatcher cancels, when appropriate.

***PJM Member Actions:***

- Member dispatchers notify management of the emergency procedure and that they should consider the use of public appeals to conserve electricity usage.
- Member dispatchers notify governmental agencies, as applicable.
- Member dispatchers implement load management programs as requested by PJM dispatchers.

**Step 2: Full Emergency Load Response – formerly known as Active Load Management (Short Lead Time)**

The purpose of the Load Management Curtailments is to provide additional load relief by using PJM controllable load management programs. Load relief is expected to be required after initiating Maximum Emergency Generation.

**Short Time Frame to Implement (1 Hour or Less)**

***PJM Actions:***

- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to conserve electricity usage. PJM dispatcher notifies other Control Areas through the RCIS.
- PJM dispatcher requests members to implement: Full Emergency Load Response (formerly known as Active Load Management) Short Lead Time (SLT). PJM dispatcher requests LSE's or their agent and Curtailment Service Providers to implement Full Emergency Load Response (formerly known as ALM) SLT. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatcher issues a NERC Energy Emergency Alert Level 2 (EEA2 = ALERT LEVEL 2) via the RCIS to ensure all Reliability Authorities clearly understand potential and actual PJM system emergencies if one has not already been issued concurrent with the issuance of Active Load Management Curtailables / Full Emergency Load Response (formerly known as ALM). NERC EEA2 is issued when the following has occurred: Public appeals to reduce demand, voltage reduction, and interruption of non-firm load in accordance with applicable contracts, demand side management/active load management, or utility load conservation measures.
- PJM dispatcher cancels, when appropriate.

### ***PJM Member Actions:***

- Member dispatchers notify their management of the emergency procedure and that they should consider the use of public appeals to conserve electricity usage.
- Member dispatchers notify governmental agencies, as applicable.
- Member dispatchers implement load management programs, as requested by PJM dispatchers.

**Note 1:** Load management programs, whether under PJM control and directed by PJM dispatcher or solely under the Local Control Center's direction, have various names including, but not limited to Active Load Management, interruptibles, curtailables, or load management. To simplify operations during these emergency situations, all curtailments are referred to as Full Emergency Load Response (formerly known as Active Load Management).

**Note 2:** PJM RTO Load Management Curtailments are not to be used to provide assistance to adjacent Control Areas beyond PJM. Restoration of Load Management Curtailments is undertaken in a stepped approach, as necessary. PJM Control Zones implement Emergency Procedures concurrently until a Manual Load Dump Action, which will only occur in the deficient Control Area.

**Note 3:** Load management programs can be issued system-wide or by Control Zone, depending on current / projected system constraints.

**NOTE 4, FULL EMERGENCY LOAD RESPONSE (FORMERLY KNOWN AS ALM) RESTRICTIONS:** Full Emergency Load Response (LM) is available for up to ten PJM initiated interruptions at any time during the planning period. Interruptions of up to six hours duration during the hours of 12:00 (Noon) to 20:00 (08:00 PM) on weekdays, other than PJM holidays (Independence Day (observed) and Labor Day (observed)).

**Note 5, EEA Levels:** PJM dispatcher issue a NERC Energy Emergency Alert Level 2 (EEA2 = ALERT LEVEL 2) via the Reliability Coordinator Information System (RCIS) to ensure all Reliability Authorities clearly understand potential and actual PJM system emergencies if one has not already been issued concurrent with the issuance of Load Management Curtailables / Full Emergency Load Response (formerly known as ALM). NERC EEA2 is issued when the following has occurred: Public appeals to reduce demand, voltage reduction, interruption of non-firm load in accordance with applicable contracts, demand side management/active load management, or utility load conservation measures.

### **Step 3 (Real-time): Primary Reserve Warning**

The purpose of the Primary Reserve Warning is to warn members that the available primary reserve is less than required and present operations are becoming critical. It is implemented when available primary reserve capacity is less than the primary reserve requirement, but

greater than the synchronized reserve requirement, after all available secondary reserve capacity (except restricted maximum emergency capacity) is brought to a primary reserve status and emergency operating capacity is scheduled from adjacent systems.

***PJM Actions:***

- PJM dispatcher issues a warning to members and PJM management stating the amount of adjusted primary reserve capacity and the requirement. A Warning can be issued for the entire PJM CA or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatcher notifies PJM public information personnel.
- PJM dispatcher rechecks with members to assure that all available equipment is scheduled and that requested secondary reserve is brought to primary reserve status.
- PJM dispatcher ensures that all deferrable maintenance or testing on the control and communications systems has halted at PJM Control Center. PJM dispatcher should provide as much advance notification as possible to ensure maintenance/testing does not impact operations. This notification may occur prior to declaration of Primary Reserve Warning.
- PJM dispatcher will obtain a temporary variance from environmental regulators for specific generators to assist in preventing load shedding in accordance with Attachment N.
- PJM dispatcher cancels the warning, when appropriate.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the warning.
- Transmission / Generation dispatchers advise all stations and key personnel.
- Generation dispatchers prepare to load all available primary reserve, if requested.
- Transmission / Generation dispatchers ensure that all deferrable maintenance or testing affecting capacity or critical transmission is halted. Any monitoring or control maintenance work that may impact operation of the system is halted.
- PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.

**Step 4 A (Real-time): Maximum Emergency Generation**

The purpose of the Maximum Emergency Generation is to increase the PJM RTO generation above the maximum economic level. It is implemented whenever generation is needed that is greater than the highest incremental cost level.

**Note:** Maximum Emergency Generation can only be included in the daily operating capacity when requested by PJM dispatcher.

### **PJM Actions:**

- PJM dispatcher issues Maximum Emergency Generation. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatcher notifies PJM management, PJM public information personnel, and member dispatchers.
- PJM dispatcher implements the Emergency Bid-Process, requesting Emergency bids by posting messages to selected PJM web-sites, RCIS, and contacting the neighboring control areas.
- PJM dispatcher instructs members to suspend Regulation on all resources, except hydro generation.
- PJM dispatcher recalls off-system capacity sales that are recallable (network resources).
- PJM dispatcher declares Maximum Emergency Generation and begins to load Maximum Emergency Generation or purchase available emergency energy from PJM Members (Emergency Bid Process) and from neighboring Control Areas based on economics and availability.
- PJM dispatcher loads Maximum Emergency Generation incrementally as required, if the entire amount of Maximum Emergency Generation is not needed. PJM dispatchers generally load Maximum Emergency CTs prior to loading Maximum Emergency Steam in order to preserve synchronized reserve.
- PJM dispatcher initiates scarcity pricing based on loading of Maximum Emergency Generation or acceptance of Emergency Energy Purchases in the appropriate Scarcity Pricing Region.
- PJM dispatcher cancels, when appropriate.

**Note 1:** Emergency Bid-Process: Following issuance of Maximum Emergency Generation, PJM may purchase available energy from any PJM Member (as emergency) that is available up to the amount required or until there is no more available, recognizing the impact on transmission constraints. The following rules are used to provide an orderly operation.

**Note 2:** PJM should consider loading of shared reserves with neighboring systems prior to implementing voltage reduction, while recognizing the impact on transmission limits.

- The PJM Member is responsible for delivering (i.e., securing all transmission service) of the energy to one of PJM's borders with a neighboring control area. To ensure deliverability, firm transmission service may be required if external Reliability Authorities have issued TLRs.
- PJM attempts to provide 60-minutes notice before the energy is required by posting on selected PJM web-sites an emergency procedure message stating that PJM anticipates requiring emergency energy purchases beginning at a specific time.
- Once PJM posts the request for emergency purchases all PJM Members can submit "bids" to make emergency energy sales to PJM. PJM Members should fax in their

bids and call PJM to confirm receipt. The Emergency Bid form is found in Attachment D along with the rules for submitting. Bids may also be called into a pre-assigned, recorded voice line. They should be structured as follows:

- time – of energy available
- amount – of energy available
- price of energy
- duration (hours) energy is available and limits on minimum time required to take
- notification time to cancel/accept
- PJM Member identification
- interface and contract path
- PJM accepts the offers and schedules the energy using the following guidelines:
  - Energy is accepted based on economics (least cost offers will be accepted first based on energy price and minimum hours) if more energy is offered than required.
  - Energy is accepted as required based on economics from the available bids (i.e., if PJM requires 500 MW immediately it takes the cheapest 500 MW bid at the time). PJM adjusts current schedules to correct economics if time permits (i.e., if a cheaper scheduled is bid after a more expensive schedule is loaded PJM only cancels the first if reasonable time exists to cancel one and load the other).
  - Similarly priced offers are selected based on timestamps (i.e., first in first selected).

Bids accepted by PJM are Emergency Purchases by PJM and do not set the Locational Marginal Price. The energy received is accounted for according to the current Emergency Energy accounting procedures. See the [PJM Manual for Operating Agreement Accounting \(M28\)](#) for more details.

PJM reserves the right to load maximum emergency equipment as required to control the system regardless of whether any bids were/were not accepted (i.e., sudden unit loss may not allow time to accept bids).

PJM implements and curtails emergency purchase transactions with as much notice as practical to allow for a reliable transition into and out of emergency conditions.

PJM requests emergency energy from neighboring Control Areas (under current Control Area agreements) after all energy offered by the PJM Members is accepted, unless there is an immediate need for the energy.

PJM can deviate from or change the order of the above actions as/if necessary.

#### ***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the emergency procedure.
- PJM Marketers recall off-system capacity sales that are recallable as directed by PJM dispatchers.

- Generation dispatchers suspend regulation, as requested, and load all units to the Maximum Emergency Generation level, as required.
- Generation dispatchers notify PJM dispatching of any Maximum Emergency (ME) generation loaded prior to PJM requesting ME generation is loaded.

#### Step 4 B (Real-time): Energy Only Option of Emergency Load Response (formerly known as Load Reduction Action)

The purpose of the Load Reduction Action is to request end-use customers, who participate in the Energy Only Option Emergency Load Response, to reduce load during emergency conditions.

##### ***PJM Actions:***

- PJM dispatcher issues Action via the PJM All-call and post message to selected PJM Web-sites. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatcher notifies PJM management, PJM public information personnel, and PJM Markets personnel who notify Emergency Load Response Program participants.

##### ***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the emergency procedure.
- Curtailment Service Providers with Demand Resource(s) registered in the Energy Only Option of Emergency Load Response reduce load.

**Note:** Energy Only Option of Emergency Load Response (formerly known as Load Reduction Action) is the emergency procedure associated with the Emergency Load Response.

#### Step 5 (Real-time): Voltage Reduction Warning & Reduction of Non-Critical Plant Load

The purpose of the Voltage Reduction Warning & Reduction of Non-Critical Plant Load is to warn members that the available synchronized reserve is less than the Synchronized Reserve Requirement and that present operations have deteriorated such that a voltage reduction may be required. It is implemented when the available synchronized reserve capacity is less than the synchronized reserve requirement, after all available secondary and primary reserve capacity (except restricted maximum emergency capacity) is brought to a synchronized reserve status and emergency operating capacity is scheduled from adjacent systems.

##### ***PJM Actions:***

- PJM dispatcher issues a warning to members and PJM management, stating the amount of adjusted synchronized reserve capacity and the requirement. A Warning can be issued for the entire PJM CA or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatcher notifies PJM public information personnel.



- PJM notifies the Department of Energy (DOE).
- PJM dispatcher cancels the warning, when appropriate.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the warning.
- Transmission / Generation dispatchers notify governmental agencies, as applicable.
- Transmission / Generation dispatchers advise all stations and key personnel.
- Generation dispatchers order all generating stations to curtail non-essential station light and power.
- Transmission dispatchers / LSEs prepare to reduce voltage, if requested.
- Transmission dispatchers / LSEs and Curtailment Service Providers notify appropriate personnel that there is a potential need to implement load management programs, in addition to interrupting their interruptible/curtailable customers in the manner prescribed by each policy, if it has not already been implemented previously.
- PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.

**Step 6 (Real-time): Manual Load Dump Warning**

The purpose of the Manual Load Dump Warning is to warn members of the increasingly critical condition of present operations that may require manually dumping load. It is issued when available primary reserve capacity is less than the largest operating generator or the loss of a transmission facility jeopardizes reliable operations after all other possible measures are taken to increase reserve. The amount of load and the location of areas(s) are specified.

***PJM Actions:***

- PJM dispatcher issues the warning to members and PJM management, stating the estimated amount of load relief that is required (if applicable). A Warning can be issued for the entire PJM CA or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatcher notifies PJM public information personnel.
- PJM dispatcher notifies FERC via the FERC Division of Reliability's electronic pager system, consistent with FERC Order No. 659.
- PJM dispatcher establishes a mutual awareness with the appropriate member dispatchers of the need to address the occurrence of a serious contingency with minimum delay.
- PJM dispatcher examines bulk power bus voltages and alerts the appropriate member dispatchers of the situation.
- PJM dispatcher cancels the warning, when appropriate.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the warning.

- Transmission dispatchers notify governmental agencies, as applicable.
- Transmission / Generation dispatchers advise all station and key personnel.
- Transmission dispatchers / LSEs review local procedures and prepare to dump load in the amount requested.
- Transmission dispatchers / LSEs reinforce internal communications so that load dumping can occur with minimum delay.
- PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.

#### Step 7 A (Real-time): Voltage Reduction

The purpose of Voltage Reduction during capacity deficient conditions is to reduce load to provide a sufficient amount of reserve to maintain tie flow schedules and preserve limited energy sources. A curtailment of non-essential building load is implemented prior to or at this same time as a Voltage Reduction Action. It is implemented when load relief is still needed to maintain tie schedules.

**Note:** Voltage reductions can also be implemented to increase transmission system voltages.

#### ***PJM Actions:***

- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to conserve electricity usage. PJM dispatcher notifies outside systems through the RCIS. PJM dispatch notifies DOE. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM Management may issue system-wide or Control Zone-specific Public/Media Notification Message C-3 or H-3, (whichever is applicable). See Attachment A.
- PJM dispatcher investigates loading of shared reserves with neighboring systems prior to implementation of a voltage reduction, recognizing the impact on transmission limits.
- PJM dispatcher issues the order for a 5% voltage reduction.

**Note:** AP Control Zone has capabilities of 2.5% or 5.0% Voltage Reductions). Northern Illinois Control Zone has capabilities of 2.5% or 5.0% Voltage Reductions but is limited to 2.5% within the city of Chicago. PJM South performs a voltage reduction utilizing SCADA. Voltage Reduction varies depending upon the local set level of 2.5% or 5%.

- PJM dispatcher issues a NERC Energy Emergency Alert Level 2 (EEA2 = ALERT LEVEL 2) via the RCIS to ensure all Reliability Authorities clearly understand potential and actual PJM system emergencies if one has not already been issued concurrent with the issuance of Active Load Management Curtailables / Full Emergency Load Response (formerly known as ALM). NERC EEA2 is issued when the following has occurred: Public appeals to reduce demand, voltage reduction, and



interruption of non-firm load in accordance with applicable contracts, demand side management/active load management, or utility load conservation measures.

- PJM dispatcher initiates scarcity pricing based on the issuance of a voltage reduction in the appropriate Scarcity Pricing Region.
- PJM dispatcher cancels the reduction, when appropriate.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the emergency procedure and to consider the use of public appeals to conserve electricity usage.
- Member Transmission dispatchers notify governmental agencies, as applicable.
- Member Transmission dispatchers / LSEs take steps to implement the voltage reduction.

**Note:** Curtailment of non-essential building load may be implemented prior to, but no later than, the same time as a voltage reduction.

**Step 7 B (Real-time): Curtailment of Non-Essential Building Load**

The purpose of the Curtailment of Non-Essential Building Load is to provide additional load relief, to be expedited prior to, but no later than the same time as a voltage reduction.

***PJM Actions:***

- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to conserve electricity usage. PJM dispatcher notifies outside systems through the RCIS.
- PJM dispatcher issues a request to curtail non-essential building load. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatcher cancels the request, when appropriate.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the emergency procedure and to consider the use of public appeals to conserve electricity usage.
- Transmission dispatchers notify governmental agencies, as applicable.
- Transmission / Generation dispatchers / LSEs switch off all non-essential light and power in LSE-owned commercial, operations, and administration offices.

**Note:** Curtailment of non-essential building load may be implemented prior to, but no later than the same time as a voltage reduction.

**Step 8 (Real-time): Manual Load Dump**

The purpose of the Manual Load Dump is to provide load relief when all other possible means of supplying internal PJM RTO load have been used to prevent a catastrophe within the PJM RTO or to maintain tie schedules so as not to jeopardize the reliability of the other interconnected regions. It is implemented when the PJM RTO cannot provide adequate

capacity to meet the PJM RTO's load or critically overloaded transmission lines or equipment cannot be relieved in any other way and/or low frequency operation occurs in the PJM RTO, parts of the PJM RTO, or PJM RTO and adjacent Control Areas that may be separated as an island.

Under capacity deficient conditions, the PJM EMS load dump calculator was modified to institute changes to the Operating Agreement set forth in Schedule 1, Section 1.7.11 that states that "...the Office of Interconnection may not order a manual load dump in a Control Zone solely to address capacity deficiencies in another Control Zone."

The load dump calculation determines which Control Zone(s) is short based on real-time load and energy values from EMS and capacity values received daily from the Capacity Adequacy Planning Department. Real-time energy values are used as a surrogate for available capacity, because in a capacity shortage situation all available generation should be loaded to full capacity. Since most of the values used in the load dump calculation are real-time dynamic numbers, the calculation is performed in the PJM EMS. Load Serving Entities will be able to designate within eCapacity that capacity resources are being used to serve load in a specific Control Zone. Similarly EES users will be able to specify that an external energy schedule is designated for a specific Control Zone. Resources that are not designated for a specific Control Zone will be considered an RTO resource for load dump calculation purposes and allocated across all Control Zones according to load ratio share. Only Control Zones that are determined to be deficient will be assigned a share of a load dump request initiated due to RTO capacity deficiencies. If the PJM Mid-Atlantic Region is determined to be deficient, its share will be further allocated according to Attachment E.

***PJM Actions:***

- PJM dispatcher verifies that separations have not occurred and that load dumping is desirable on the system being controlled (i.e., make sure that a load dump will help, not aggravate the condition).
- PJM dispatcher instructs members to suspend all remaining regulation, if not already suspended previously.
- PJM dispatcher determines which Control Zone (s) are capacity deficient and the relative proportion of deficiency. PJM dispatcher estimates the total amount of load to be dumped and utilizes the PJM EMS to determine deficient Control Zones and their share of load dump required.
- PJM dispatcher orders the appropriate member dispatchers to dump load according to PJM EMS calculations. The PJM Mid-Atlantic Region share will be further allocated according to Attachment E.
- PJM dispatcher will implement load shedding in controlled step sizes to minimize system impact and further uncontrolled separation.
- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to conserve electricity usage and public announcements of the emergency. PJM dispatcher notifies other Control Areas through the RCIS, and notifies DOE, FEMA, and NERC offices, using established procedures.
- PJM dispatcher notifies FERC via the FERC Division of Reliability's electronic pager system, consistent with FERC Order No. 659.

- PJM dispatcher issues a NERC Energy Emergency Alert Level 3 (EEA3 = ALERT LEVEL 3) via the RCIS to ensure all Reliability Authorities clearly understand potential and actual level of PJM System Emergencies.
- PJM Management issues a system-wide or Control Zone specific Public/Media Notification Message C-4 or H-4, (whichever is applicable). Typically, this would be issued prior to a Manual Load Dump. See Attachment A.
- PJM dispatcher initiates scarcity pricing based on the issuance of a Manual Load Dump Action in the appropriate Scarcity Pricing Region.
- PJM dispatcher cancels the load dump order and restores required regulation, when appropriate.

**Note 1:** If partial restoration of the load dumped is requested by PJM dispatcher, confirmation of the load restored by each member must be made prior to further restoration requests by PJM dispatcher.

**Note 2:** If step 1 of UFLS is insufficient to return frequency to acceptable ranges and if emergency procedures cannot be implemented in a timely fashion then PJM dispatch shall dump sufficient load to restore system frequency.

#### ***PJM Member Actions:***

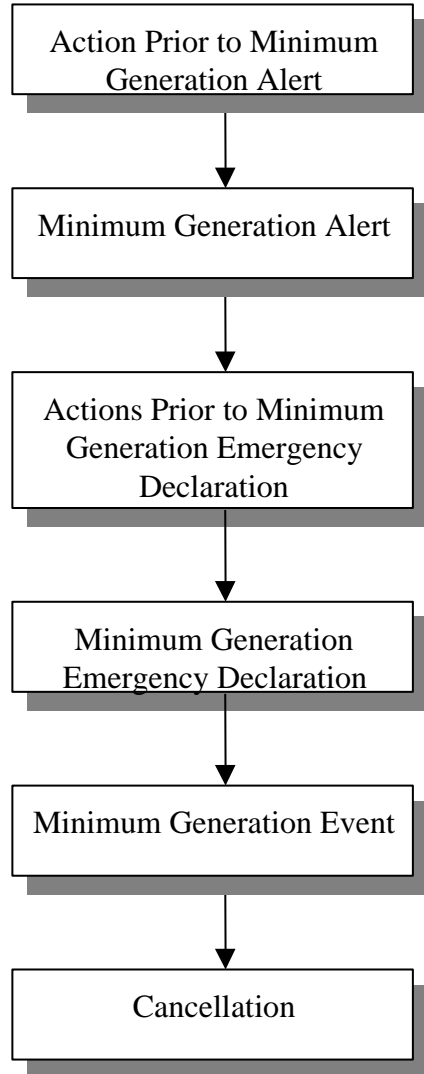
- Generation dispatchers suspend remaining regulation, when directed by PJM prior to dumping load.
- Transmission dispatchers / LSEs promptly dump an amount of load equal to or in excess of the amount requested by PJM dispatcher (Mid-Atlantic Region operators refer to Attachment E for specific allocation). The load dump plan should consider/recognize priority/critical load.
- Transmission / Generation dispatchers notify management of the emergency procedure.
- Transmission dispatchers / LSEs consider the use (or continued use) of public appeals to conserve electricity usage and consider the use of public announcements of the emergency.
- Transmission dispatchers notify governmental agencies, as applicable.
- Transmission dispatchers / LSEs maintain the requested amount of load relief until the load dump order is cancelled by PJM dispatcher.
- Transmission dispatchers report the amount of load curtailed / restored upon implementation to the PJM Power Dispatcher.

**Note:** PJM dispatch should take necessary actions to support system frequency, consistent with good utility practices. These actions may include emergency procedures to arrest frequency decline, but PJM will not violate BAAL (Balancing Authority ACE Limit) limits by overgenerating to correct for a low frequency. In general, emergency procedures are preserved to ensure PJM net tie deviation is not adversely impacting system frequency after all economic options have been exhausted. However, Emergency Procedures should be exhausted, including Manual Load Dump, to arrest frequency decline once Under Frequency Load Shedding Schemes (UFLS) have triggered but prior to generating stations tripping off-line (57.5 Hz). Underfrequency Load Shedding Plan settings are defined in Attachment F, "PJM Manual Load Dump Capacity."

## 2.4 Light Load Procedures

Each Control Area has a commitment to control its generation in a manner so as not to burden the interconnected systems. Failure to provide adequate control can result in deviations in frequency and inadvertent power flow, stability issues or transmission constraints. For the PJM RTO to meet its commitment during light load periods, it may be necessary to deviate appreciably from normal operating procedures. PJM scheduling personnel are responsible for identifying light load conditions and projecting the extent of operating procedures.

Exhibit 2 presents the general sequence of actions that may be implemented during light load periods.



**Exhibit 2: Sequence of Actions**

### 2.4.1 Actions Prior to Minimum Generation Alert

The purpose of the Minimum Generation Alert is to provide an early alert that system conditions may require the use of the PJM Emergency Procedures. It is implemented when the expected generation level is within 2,500 MW of normal minimum energy limits.

#### **PJM Actions:**

- PJM prepares Minimum Generation Worksheet (see [Minimum Generation Calculation](#) exhibit or [eDART Minimum Generation Calculation Worksheet](#) exhibit, each in Attachment H) to determine if Minimum Generation Alert criteria is met and if Light Load Procedures are required for upcoming scheduling period.
- PJM personnel formulate a scheduling strategy for the light load period. Hydro plant schedules are reviewed to ensure, where possible, pumping at pumped storage

plants is maximized and generation at run-of-river plants is minimized during the light load period(s).

## 2.4.2 Minimum Generation Alert

### ***PJM Actions:***

- If the expected generation level is within 2,500 MW of normal minimum energy limits, PJM dispatcher issues the Alert for the specified light load period via the ALL-CALL and posts the alert on selected PJM web-sites. Adjusted Minimum generation, valley load estimate, and margin values are given to members.

### ***PJM Member Actions:***

- Generation dispatchers review with station operating personnel, unit normal maximum and minimum energy limits, as well as emergency minimum energy limits.

During Normal Operations, Wind Resources will reduce economically to economic minimum based on their bid parameters as follows:

**Economic Minimum** = Minimum capacity based on available wind turbines in-service (i.e. minimum value based on blade feathering capability or other control limit as available).

**Emergency Minimum** = 0

- Generation dispatchers compile their emergency reducible information and report to the PJM scheduling dispatcher via eDART (see Attachment H, [eDART ERG Reporting Form](#)). The amount reported in the Reducible on Declaration Column is, by region, the Emergency Reducible Generation (ERG) that will be started down when PJM makes the Minimum Generation Emergency Declaration, before the actual Minimum Generation Event. The amount reported in the Total Reducible Generation is the total reducible generation available for both the Declaration and Event. Joint-owned generation is reported by the operating company.
- Generation dispatchers schedule additional unit maintenance, as appropriate, for the expected light load periods. PJM dispatchers are informed of any maintenance scheduled.
- Generation dispatchers renew and update resource data in PJM's computer systems. Particular attention is given to resource availability and energy limits (normal maximum, normal minimum, and emergency minimum).
- Generation dispatchers should contact PJM dispatch if ramp limits are prohibiting the ability to export energy from the PJM system during projected minimum emergency conditions. To assist in system control, exports should coincide with load drop-out periods (refer to eData for plotted load).

## 2.4.3 Actions Prior to Minimum Generation Emergency Declaration

### ***PJM Actions:***

- Re-evaluate valley load estimate and amount of Spot-in transactions.

- PJM dispatcher updates the amount of emergency reducible generation available. Final strategy is determined from the results, including the anticipated amount of reducible generation to be reduced (by percentage) and a forecast time of the reduction.
- Reduce units to normal minimum generation. Review units assigned to regulate. Relieve units that are unable to regulate at or near normal minimum levels.

Reduce System LMP to “0” and reduce Spot-in contracts as required to maintain system control.

**Note1 :** The unit default cost/price bid will be assumed 0 unless provided via eMkt.

**Note 2:** Other system conditions may at times require the reducing of System LMP to 0 or below. The implementation of any steps under the Light Load Procedures is NOT a pre-requisite of moving System LMP to 0.

#### 2..4.4 Minimum Generation Emergency Declaration

##### ***PJM Actions:***

- PJM dispatcher issues via the ALL-CALL a Minimum Generation Emergency Declaration and notifies members of survey results and strategy, including the anticipated amount of reducible generation to be reduced (by percentage) and a forecast time of the reduction. PJM dispatcher also posts the Declaration on selected PJM web-sites.

##### ***PJM Member Actions:***

- Generation Dispatchers ensure their units are following PJM economic base points to Economic Minimum output.
- Wind Generator Operators will adjust Wind Turbine Control Systems or manually adjust turbine output to achieve the desired UDS basepoint.
- Generation dispatchers reduce generation as reported via eDART on the Minimum Generation Form in the Reducible on Declaration column. (See [eDART ERG Reporting Form](#) in Attachment H.)
- Generation dispatchers determine the specific units that will be reduced and the sequence and timing of reductions based on the direction given by PJM.
- Generation dispatchers contact PJM Scheduling Coordinator and report additional Reducible Generation that is reduced beyond what is reported on the Minimum Generation Form upon a Minimum Generation Emergency Declaration.

#### 2.4.5 Minimum Generation Event

Minimum Generation Event is implemented when PJM dispatcher can no longer match the decreasing load and utilization of emergency reducible generation is necessary. PJM shall not differentiate between resource types during a Minimum Generation Emergency Event. All resources are expected to reduce proportionally based on the percentage Emergency Reducible Generation declared.



### ***PJM Actions:***

- If Transmission constrained, follow the Guidelines for Constrained Operations.
- PJM dispatcher issues via the ALL-CALL Minimum Generation Emergency Event and requests Local Generation dispatchers to reduce Emergency Reducible Generation (ERG), in proportion to the total amount of ERG reported minus what was reported as being reducible on declaration. PJM dispatcher also posts the Event on selected PJM web-sites.

**Example:** If Member reported 200mw as total ERG with 100mw reported as Reducible on Declaration, 100mw would have been started down when PJM issued the Minimum Generation Emergency Declaration. If when issuing the Minimum Generation Event, PJM requests 20% reducibles, Member would reduce 20mw from the 100mw that was reported as targeted for reduction on the Event.

- Attempt to sell Emergency Energy to external systems.
- After all internal PJM resources are reduced to Emergency Minimum Levels (100% Reducible Generation implemented), reduce Network External Designated purchases as required to maintain system control.
- In concert with individual members, PJM dispatcher recommends the shut down of specific units that are not required for area protection during the current load period or the subsequent on-peak period. PJM dispatcher recommends return times for these units.

**Note:** Having reviewed the conditions for the next on-peak period, PJM dispatcher recommends the sequence of units being removed from service at this time and recommends the sequence of return for the units that would be needed for reliable operation for the next on-peak period.

### ***PJM Member Actions:***

Generation dispatchers follow the direction of PJM dispatcher.

**Note:** Implementation of Emergency Reducible Generation Curtailments should be achieved within 15 minutes or within a timeframe that the technology permits. PJM should be notified if curtailment is expected to exceed 15 minutes.

## **2.4.6 Local Minimum Generation Event**

A Local Minimum Generation Event is implemented when there is an excess generation situation in a localized area or set of areas, which has the potential to result in stability issues or constrained operations.

### ***PJM Actions:***

- After reducing effective local generation to their economic minimum levels, curtailing dispatchable contracts and Spot Market Imports (as applicable), the PJM dispatcher issues a Local Minimum Generation Emergency Event and requests Local Generation dispatchers to reduce Emergency Reducible Generation (ERG) under



PJM control, in proportion to the total amount of ERG reported. The PJM dispatcher posts the Event on selected PJM web-sites.

- Attempt to sell Emergency Energy to external systems (as applicable).
- After all effective PJM resources are reduced to Emergency Minimum Levels (100% Reducible Generation implemented), reduce Network External Designated purchases.
- The PJM dispatcher directs the shutdown of effective units that are not required for area protection during the current load period or the subsequent on-peak period. The PJM dispatcher recommends return times for these units.

**Note:** Having reviewed the conditions for the next on-peak period, the PJM dispatcher recommends the sequence of units being removed from service at this time and recommends the sequence of return for the units that would be needed for reliable operation for the next on-peak period.

***PJM Member Actions:***

- Generation dispatchers follow the direction of PJM dispatcher via eDART (see [eDART ERG Reporting Form](#) in Attachment H).

**Note:** If reduction of emergency reducible generation is requested, no update of the PJM dispatch lambda program is required.

**2.4.7 Cancellation**

The above steps are followed in reverse order as the PJM RTO's load begins to exceed the generation. PJM dispatcher cancels a Minimum Generation Emergency when actions taken under these procedures are no longer necessary.

***PJM Member Actions:***

- Generation dispatchers report actual generation that was reduced to the PJM dispatcher.

**2.5 General Assistance to Adjacent Control Areas**

When adjacent Control Areas are deficient in generation and are requesting assistance from the PJM RTO, actions are taken, provided the adjacent Control Area has taken the same actions requested of PJM.

***PJM Actions:***

- PJM dispatcher notifies PJM management, PJM public information personnel, and Local Control Center dispatchers. PJM dispatcher notifies outside Control Areas using the RCIS, and the NERC hotline if necessary.
- PJM dispatcher orders, as required, increased generation, including Maximum Emergency Generation (with the exception of fuel limited and environmentally restricted capacity). PJM dispatcher also implements a 5% Voltage Reduction to provide the required assistance provided that the power system requesting assistance is already in a 5% Voltage Reduction.

Note that PJM load management programs are not to be used to provide assistance to adjacent Control Areas. PJM dispatcher prefaces these procedures by the words “due to PJM providing emergency assistance to an adjacent Control Area(s), PJM is issuing an (*appropriate alert or action message*)”.

**PJM Members Actions:**

- The Local Transmission / Generation dispatchers notify management.
- The Local Transmission dispatchers notify governmental agencies, as applicable.
- The Local Transmission / Generation dispatchers implement all emergency procedure requests issued by PJM dispatcher and notify appropriate Local Control Center personnel.

## Section 3: Weather/Environmental Emergencies

Welcome to the *Weather/Environmental Emergencies* section of the **PJM Manual for Emergency Operations**. In this section, you will find the following information:

- A description of the conditions that warrant conservative operation (see “*General Conditions*”).
- How PJM responds to thunderstorms, tornadoes, and other severe weather conditions (see “*Thunderstorms and Tornadoes*”).
- How PJM responds to solar magnetic disturbances (see “*Solar Magnetic Disturbances*”).

### 3.1 Overview

To maximize the PJM RTO’s ability to operate reliably during periods of extreme and/or prolonged severe weather conditions, procedures are necessary to keep all affected system personnel aware of the forecast and/or actual status of the system and to ensure that maximum levels of resource availability are attained.

The purpose of this section is to explain how severe weather conditions are identified and to describe when it is necessary to provide additional capacity and to staff the necessary generating sites for a future critical period. For example, Combustion turbine (CT) start up reliability may be adversely affected by extreme cold temperatures.

PJM’s analysis of system conditions considers higher levels of resource unavailability during severe weather conditions. PJM uses its best judgment about the magnitude of the projected unavailability of equipment, considering the length of the forecasted and actual weather conditions.

Participants monitor their fuel supplies and inventories and keep PJM updated about station/units that are experiencing or projected to experience fuel limitations. Conference calls are scheduled to review the operating situations, as appropriate.

Coordination and communication with the applicable natural gas transmission pipelines, in conjunction with neighboring RTOs/ISOs, should be implemented during extreme weather conditions to ensure that the availability of the natural gas-fired generation resources is assessed and contingency plans developed, if necessary.

Generally, any fuel or resource restricted unit (*< 72 burn hours at max capacity, see Section 6 of this manual*) should be classified as Fuel Limited Generation, with PJM dispatcher kept informed about the number of burn hours available for all fuel restricted equipment. **In particular, gas-fired only units cannot be in the scheduled capacity, unless firm gas delivery is assured.**

- Units bid to the PJM Market when Conservative Operations/Cold or Hot Weather Alert have been declared and PJM Dispatch requests Fuel Limited Resources be placed into the Maximum Emergency Generation Category, should adhere to the following guidelines: CTs are removed from dispatch and placed in Maximum Emergency when their fuel inventory is less than 16 hours (Oil, Kerosene, or Diesel) or 8 hours (gas) at rated output. The concept is that 16 hours is equal to four 4-hour peak load periods over a two-day period.

- Gas fired CTs with a limited daily allowance of fuel (less than 8 hours) should be reported as Maximum Emergency Generation (8 hours is equal to two 4-hour peak load periods for a resource with daily restrictions).

**Note1:** Since a Cold Weather/Hot Weather Alert may only be issued on a portion of the PJM footprint, and since PJM schedules and operates the footprint as a single Balancing Authority, PJM may elect not to automatically place Fuel Limited Resources into the Maximum Emergency Category.

**Note2:** There may be times when Gas-fired Fuel Limited Combustion Turbines are placed into the Maximum Emergency Generation Category with a daily availability < 8 hours per day (i.e. 5 hours of gas per day). Considering the daily nature of gas limitations, the PJM Dispatcher has the option of requesting the generator owner, with daily gas limitations, to remove the fuel limited resource from the Maximum Emergency Category to ensure PJM tools economically schedule the gas fired CTs

- Oil, coal or gas-fired steam units are removed from dispatch to Maximum Emergency when their fuel inventory is less than 32 hours. The concept is that 32 hours at rated output equals two 16-hour periods over a two-day period.

In general, two days is sufficient to alert governmental agencies of the situation and to receive assistance. Depending on the situation, units may be forced out of service (full or partial) prior to these guidelines in order to protect plant equipment or for future system needs.

### 3.2 Conservative Operations

- The need to operate the PJM RTO more conservatively can be triggered by any number of weather or environmental events, including:
  - potential fuel delivery issues identified
  - forest fires/brush fires that threaten major transmission circuits
  - weather-related events, such as ice/snow/wind storms, hurricanes, tornadoes, severe thunderstorms, and floods
  - environmental alerts
  - solar magnetic disturbance events

During conservative operations, system operations may reflect conservative transfer limit values, selected double-contingencies, and/or maximum credible disturbances.

#### ***PJM Actions:***

- PJM dispatcher has the authority to reduce transfers into, across, or through the PJM RTO or take other actions, such as cost assignments to increase reserves and reduce power flows on selected facilities.
- It is PJM dispatcher's responsibility to analyze the reliability of the PJM RTO and determine if it is in jeopardy. If required, operations planning branch staff are called upon to develop revised limitation curves.

### **PJM Member Actions:**

- Transmission / Generation dispatchers and PJM Marketers respond, as required, to specific requests and directions of PJM dispatcher.

## **3.3 Cold Weather Alert**

The purpose of the Cold Weather Alert is to prepare personnel and facilities for expected extreme cold weather conditions. As a general guide when the forecasted weather conditions approach minimum or actual temperatures for the Control Zone fall near or below ten degrees Fahrenheit. PJM can initiate a Cold Weather Alert at higher temperatures if PJM anticipates increased winds or if PJM projects a portion of gas fired capacity is unable to obtain spot market gas during load pick-up periods (refer to Inter RTO Natural Gas Coordination Procedure below). PJM will generally initiate a Cold Weather Alert on a Control Zone basis.

### **PJM Actions:**

- PJM dispatcher notifies PJM management, PJM public information personnel, and members.
- PJM dispatcher issues an Alert and provides the following information:
  - Control Zone
  - Forecasted low temperature
  - The forecasted duration of the condition
  - Amount of estimated operating reserve and reserve requirement
- PJM Dispatch communicates whether fuel limited resources are required to be placed into Maximum Emergency Category.

**Note1:** Since a Cold Weather Alert may only be issued on a portion of the PJM footprint, and since PJM schedules and operates the footprint as a single Balancing Authority, PJM may elect not to automatically place Fuel Limited Resources into the Maximum Emergency Category.

**Note2:** There may be times when Gas-fired Fuel Limited Combustion Turbines are placed into the Maximum Emergency Generation Category with a daily availability < 8 hours per day (i.e. 5 hours of gas per day). Considering the daily nature of gas limitations, the PJM Dispatcher has the option of requesting the generator owner, with daily gas limitations, to remove the fuel limited resource from the Maximum Emergency Category to ensure PJM tools economically schedule the gas fired CTs.

PJM utilizes the following weather locations and approximate unavailability rates to declare Cold Weather Alerts on a PJM Control Area or Control Zone basis.

Control Zone	Region	Weather	Unavailability
PJM	Mid-Atlantic	Philadelphia	4000 - 5000 MW
AP	Western	Pittsburgh	1000 – 2000 MW
AEP	Western	Columbus	2000 – 3000 MW
Dayton	Western	Dayton	1000 – 2000 MW

ComEd	Western	Chicago	2000 – 3000 MW
Dominion	Southern	Richmond	2000 – 3000 MW

**Note:** Unavailability numbers are conservative estimates and are not necessarily additive. Values can be adjusted based on the duration of cold weather, actual unit performance during cold weather, the impact on fuel sources (i.e., frozen coal, gas interruptions, etc.), the projected level of combined cycle/combustion turbine usage, and level of scheduled long-lead/seldom-run generation.

- When scheduling for a period covered by a Cold Weather Alert, PJM scheduling dispatcher may assume an unavailability factor for scheduled interchange that could range from 25% to 75% of the pre-scheduled interchange. The scheduling dispatcher will make this decision based on the severity of the conditions, recent interchange curtailment experience, and the current/projected impact of the weather system on other Control Areas. This decrease may require the commitment of additional steam units and/or the purchase of emergency power from external systems.
- When in PJM's judgment combustion turbines in excess of 2000 MW are needed to operate within a control zone, PJM will notify the respective combustion turbine owners that PJM expects these units to be run. If the predicted minimum temperature is -5 degrees Fahrenheit or less or if recent unit performance has shown a significant increase in unit unavailability, an additional level of unavailability is added to the amount of CTs expected to operate. PJM will notify these additional combustion turbine owners that PJM expects these units to be run.
- PJM confers with generator owners and if appropriate, directs them to call in or schedule personnel in sufficient time to ensure that all combustion turbines and diesel generators that are expected to operate are started and available for loading when needed for the morning pick up. This includes operations, maintenance, and technical personnel that are necessary to gradually start all equipment during the midnight period. Directions may also be given to bring units on at engine idle, or loaded as necessary to maintain reliability. Once units are started, they remain on-line until PJM dispatcher requests the units be shut down. Running CTs to provide for Synchronized Reserve is monitored closely for units where fuel and delivery may be hampered. Most troublesome or unreliable units should be started first. PJM dispatch should make this notification on afternoon shift the day prior, paying particular attention to weekend staffing levels.
- PJM dispatch should poll large combined cycle units regarding projected availability during reserve adequacy run.
- PJM dispatcher reports significant changes in the estimated operating reserve capacity.
- PJM dispatcher cancels the alert if the weather forecast is changed or when the alert period is over.

### ***PJM Members Actions:***

- Transmission/Generation dispatchers notify management of the alert.
- Generation dispatchers, based on direction received from PJM call in or schedule personnel in sufficient time to ensure that all combustion turbines and diesel generators that are expected to operate are started and available for loading when needed for the morning pick up. This includes operations, maintenance, and technical personnel that are necessary to gradually start all equipment during the midnight period. The units are brought on at engine idle, where possible, and loaded as necessary to maintain reliability. Once units are started, they remain on-line until PJM dispatcher requests the units be shut down. Running CTs to provide for Synchronized Reserve is monitored closely for units where fuel and delivery may be hampered. Each generator owner attempts to start their most troublesome or unreliable units first.

**NOTE:** When a unit that PJM alerted to be prepared to run is not started, the owner of this unit can receive compensation for its costs. The Generation Owner must submit a letter to the PJM Manager of Market Settlements within 45 days identifying the actual costs of staffing the unit. After such notification, PJM will compensate the unit from Operating Reserves for these cancellation costs up to the capped start-up costs (as per the Operating Agreement, Section 1.10.2d Pool Scheduled Resources and .2.3g Operating Reserves Credits; for detailed process see Operating Agreement Accounting Manual, Operating Reserves Credits).

- Generation dispatchers review their combustion turbine capacities, specifically units burning No. 2 fuel oil that do not have sufficient additive to protect them from the predicted low temperature.
- Generation dispatchers review fuel supply/delivery schedules in anticipation of greater than normal operation of units.
- Generation dispatchers monitor and report projected fuel limitations to PJM dispatcher.
- Generation dispatcher contact PJM dispatch if it is anticipated that spot market gas is unavailable, resulting in unavailability of bid-in generation.
- Generation dispatchers contact PJM dispatch to inform them of gas-fired CTs placed in Maximum Emergency Generation due to daily gas limitations of less than 8 hours (i.e. 5 hours of gas per day).
- Transmission/Generation dispatchers review plans to determine if any maintenance or testing, scheduled or being performed, on any monitoring, control, transmission, or generating equipment can be deferred or cancelled.



### 3.4 Hot Weather Alert

The purpose of the Hot Weather Alert is to prepare personnel and facilities for extreme hot and/or humid weather conditions which may cause capacity requirements/unit unavailability to be substantially higher than forecast are expected to persist for an extended period. In general, a Hot Weather alert can be issued on a Control Zone basis, if projected temperatures are to exceed 90 degrees with high humidity for multiple days.

PJM utilizes the following weather locations and approximate unavailability rates to declare Hot Weather Alerts on a PJM Control Area or Control Zone basis.

Control Zone	Region	Weather	Unavailability
PJM	Mid-Atlantic	Philadelphia	2000 - 2500 MW
AP	Western	Pittsburgh	500 – 1000 MW
AEP	Western	Columbus	1000 – 1500 MW
Dayton	Western	Dayton	500 – 1000 MW
ComEd	Western	Chicago	1000 – 1500 MW
Dominion	Southern	Richmond	1000 – 1500 MW

**Note:** Unavailability numbers are conservative estimates and are not necessarily additive. Values can be adjusted based on the duration of hot weather, actual unit performance during hot weather, projected environmental impacts (i.e. river water temperatures, hydro elevation) and level of scheduled long lead/seldom run generation.

#### **PJM Actions:**

- PJM dispatcher notifies PJM management and member dispatchers.
- PJM dispatcher issues an Alert stating the amount of estimated operating reserve capacity and the reserve requirement.
- PJM Dispatch communicates whether fuel limited resources are required to be placed into Maximum Emergency Category for Hot Weather/Cold Weather Alerts.

**Note1:** Since a Hot Weather Alert may only be issued on a portion of the PJM footprint, and since PJM schedules and operates the footprint as a single Balancing Authority, PJM may elect not to automatically place Fuel Limited Resources into the Maximum Emergency Category.

**Note2:** There may be times when Gas-fired Fuel Limited Combustion Turbines are placed into the Maximum Emergency Generation Category with a daily availability < 8 hours per day (i.e. 5 hours of gas per day). Considering the daily nature of gas limitations, the PJM Dispatcher has the option of requesting the generator owner, with daily gas limitations, to remove the fuel limited resource from the Maximum Emergency Category to ensure PJM tools economically schedule the gas fired CTs.

- PJM dispatcher reports significant changes in the estimated operating reserve capacity.
- PJM dispatcher cancels the alert, when appropriate.

***PJM Members Actions:***

- Transmission/Generation dispatchers notify management of the alert.
- Generation dispatchers advise all generating stations and key personnel.
- Transmission/Generation dispatchers review plans to determine if any maintenance or testing, scheduled or being performed, on any monitoring, control, transmission, or generating equipment can be deferred or cancelled.
- Generation dispatchers report to PJM dispatcher all fuel / environmental limited facilities as they occur and update PJM dispatcher as appropriate.
- Generation dispatchers contact PJM dispatch to inform them of gas-fired CTs placed in Maximum Emergency Generation due to daily gas limitations of less than 8 hours (i.e. 5 hours of gas per day).

### **3.5 Inter RTO Natural Gas Coordination Procedure**

PJM, ISO New England, and New York ISO rely on natural gas-fired generation resources for a significant amount of their capacity. During periods of extremely cold weather, the natural gas supply to gas-fired generators may become impacted due to the various demands placed on the pipelines and the manner in which the generation owners may have contracted for their gas transportation.

During normal operations, and when extremely cold weather is expected in any or all parts of the Northeast US, ISO New England, New York ISO, and PJM (the RTOs) will jointly act to communicate with the interstate natural gas pipelines, and coordinate actions to be taken to manage potential gas supply inadequacy situations.

To facilitate this process, each PJM has (1) developed a database of natural gas-fired generation on its system, including its interstate pipeline supplier or LDC, connection point on the gas pipeline system, and contract arrangements for gas supply and transmission; (2) a complete set of maps of the interstate gas pipelines serving units on its system; and (3) a contact list for people at the gas pipelines or LDC. This information will be shared among the RTOs and combined such that each RTO has a complete set of information for facilities in the combined area.

The following actions are considered a part of normal operations; however, these procedures are an essential step in cold weather operations.

***PJM Actions:***

- PJM will monitor weather conditions in the PJM area and identify forecast conditions which could trigger the need for a Cold Weather Alert (see Cold Weather Alert above).
- PJM will analyze and forecast the need for natural gas-fired resources, given forecast weather conditions, and determine the need for invoking this procedure.
- PJM will request a conference call with ISO New England and New York ISO to request the invoking of the procedures. [The RTOs may decide to invoke the procedures across the combined area or portions of the combined area.] Each RTO will share its assessment of the need for its natural gas-fired resources.

- The RTOs will jointly communicate with the interstate pipelines. The communication will include:
  - High level summary of the expected electrical demand and capacity conditions in the RTOs during the forecasted weather event
  - Expected need for the natural gas-fired generation
  - Contact information in each RTO for the interstate pipelines to obtain additional information.
- Each RTO will follow up individually with each of its interstate pipeline suppliers in its respective area, requesting (1) the operational status of the pipeline, (2) the presence or anticipation of any Operational Flow Orders (OFOs) or other emergency procedures, and (3) an assessment of the pipelines ability to serve contracts for gas-fired generation through the expected duration of the weather event.
- After the data collection effort with the pipelines, the RTOs will share the information with each other, reconvene, and determine actions to be taken, based on the collective assessment. Actions could include: (1) modification of the generation dispatch day-ahead to account for expected unavailability of gas-fired generation; (2) limitation of the granting of outages to maximize availability of generation resources; (3) adoption of conservative operations actions intended to mitigate risks associated with gas system contingencies or gas-fired generation unavailability.
- After a course of action has been determined, it will be communicated to the PJM System Operations Subcommittee.

#### ***PJM Members Actions:***

- Prior to the winter season, the gas-fired generation owners will be requested to provide information on their facilities, above that requested of other generation owners. That information will be considered confidential and only shared with the other RTOs for the purpose of facilitating this process and communications with the pipeline companies.
- The gas-fired generation owners will be requested to provide any information that they have relative to delivery limitations to their gas supply that they may have received from their gas supplier or gas transmission provider.
- The gas-fired generation owners will be expected to comply with any special instructions or emergency procedures that may be requested by PJM either via an SOS conference call or All-call message during a severe weather event.

### **3.6 Thunderstorms and Tornadoes**

If automatic reclosing schemes are not in service and a severe thunderstorm(s) exist in the vicinity of a critical bulk power transmission facility, it is necessary to take action. When thunderstorms are in the vicinity of the PJM RTO, automatic reclosing capability should be in service for all 500 kV and critical 230 kV and above circuits. If tornadoes are reported in an area, the failure of automatic reclosing to restore a transmission facility to service should be interpreted as a more serious failure existing. The transmission owner will generally dispatch a patrol of the line to ensure that the line can be safely returned to service or that additional maintenance or repair activity needs to be done.

***PJM Actions:***

- PJM dispatcher requests that automatic reclosing capability be put in service on those critical facilities. The Local Control Center at either end of a tie line or PJM dispatcher can request that the reclosers be restored.
- Where practical, PJM dispatcher requests that any maintenance and testing being performed on any critical transmission generating, control, or monitoring equipment be deferred or cancelled.
- PJM dispatcher informs affected Members of any storms moving in their direction.

***PJM Member Actions:***

- Transmission dispatchers inform PJM dispatcher of any storms in their systems.
- Transmission dispatchers determine when reclosers are to be restored to service and report this information to PJM dispatcher.
- Transmission dispatchers place reclosers in service.

### **3.7 Solar Magnetic Disturbances**

Geomagnetically-induced currents (GIC) caused by the solar magnetic disturbance (SMD) flow through the power system equipment and facilities may result in major increases in system reactive requirements, equipment damage, and disruption of interconnected system operation. To implement the procedure, a geomagnetic storm is detected that produces a DC measurement at Missouri Avenue in Atlantic City and/or Meadow Brook Station near Winchester, Virginia at a magnitude greater than 10 amperes and PJM dispatcher confirms that this measurement is a result of a severe geomagnetic storm by checking additional sources of information. Additional data sources include:

- PJM dispatcher contacts Public Service Gas & Electric Transmission Dispatcher to determine if excess transformer MVAR exist at Salem or Hope Creek.
- PJM dispatcher contacts Allegheny Power Transmission Dispatcher to determine if excess transformer neutral current exists at Meadow Brook, Bedington, Doubs, and or Black Oak.
- PJM dispatcher also checks with PECO Energy Transmission Dispatcher to see if similar high DC measurements are being observed at Limerick and Peach Bottom. Implementation occurs only when the Missouri Avenue activity has been confirmed by at least one additional data source. A confirmation of a geomagnetic storm by the National Oceanic and Atmospheric Administration (NOAA), which is generally received via notification from the RCIS, is not required to initiate this procedure.

Upon identification of a geomagnetic disturbance, PJM dispatcher operates the system to geomagnetic disturbance transfer limits. The geomagnetic disturbance transfer limits are determined from studies modeling various scenarios, including:

- partial or complete loss of Hydro Quebec Phase 2 DC line to Sandy Pond
- reduction or complete loss of generation at Artificial Island
- tripping of certain EHV capacitors

These studies are performed by PJM's operations planning department group on a seasonal basis and are updated for current conditions, as required, when PJM dispatcher implements this procedure.

***PJM Actions:***

- PJM dispatcher notifies members (Generation and Transmission) via the PJM All-Call of SMD warnings/alerts issued by the National Oceanic and Atmospheric Administration (NOAA) via the RCIS.
- PJM dispatcher notifies members via the PJM All-Call and postings on selected PJM web-sites upon initiation of Conservative Operations due to SMD upon confirmation of activity on the PJM system. PJM dispatcher begins to operate the system to the geomagnetic disturbance transfer limits.
- When the GIC limit is approached or exceeded, generation redispatch assignments are made in the most effective areas to control this limit. PJM dispatcher also evaluates the impact of the existing inter-area transfers and modifies the schedules that adversely affect the GIC transfer limit. If insufficient generation is available to control this limit, the emergency procedures contained in Section 2 of this Manual are implemented. If it appears that these emergency procedures are required, an operations engineer is requested to validate the GIC transfer limit and develop a voltage drop curve for the GIC transfer limit contingency. Pre-contingency load dumping will not be used to control transfers to the GIC transfer limit.
- After the measurement value at Missouri Avenue has fallen below the initial trigger point of 10 amperes, PJM dispatcher continues to operate the system to the geomagnetic disturbance transfer limits for a period of three hours. PJM dispatcher must again confirm this measurement by checking the other sources of information. If the measurement value remains below 10 amperes for three hours, members are notified that the procedure is cancelled. PJM dispatcher restores the appropriate transfer limits for operation of the system.

***PJM Member Actions:***

- Transmission/Generation dispatchers provide confirmation of measurement values as requested by PJM dispatcher.
- Generation dispatchers provide as much advance notification as possible regarding details of more restrictive plant procedures that may result in plant reductions to protect equipment.
- Upon notification of the implementation of this procedure, members that operate facilities with instrumentation installed to record DC neutral measurements at remote locations dispatch personnel to ensure that strip chart recorders are working properly. Members employing a MVAR summing algorithm method also initiate data collection at this time. It is requested that any data collected during a geomagnetic storm be forwarded to PJM for further analysis.
- The member dispatchers report all actions to PJM dispatcher.

## Section 4: Sabotage/Terrorism Emergencies

This is the Sabotage/Terrorism Emergencies section. Sabotage reporting should be conducted in accordance with NERC CIP standards. In this section you will find the following information:

- A description of the conditions that warrant conservative operation (see "General Conditions")
- An understanding of actions that PJM may take in the event of these potential and/or realized manmade threats.
- Centralize information related to preparing and responding to man-made threats/attacks.

This section is not intended to be any of the following:

- A fixed blueprint for action – the very nature of a crisis requires a tailored solution. Even if such a solution existed, it would not be printed in this public document.
- The definitive guide for PJM's members to determine what physical or cyber security measures they should take to protect their assets. The focus of this section is upon power system operations and communications.

### 4.1 General Conditions

As a result of man-made threats, the need may exist to operate the PJM RTO more conservatively (i.e., operate some margin away from the reactive transfer limit or some margin away from the post-contingency flow value) than in normal conditions.

Examples of conditions warranting possible conservative operations include:

- Terrorist threats and/or attacks upon the transmission system and related infrastructures (i.e., Telecom, Fuel, Transportation)
- Intelligence from the Federal Government or other credible sources (i.e., DOE, NIPC, Reliability Authority, PJM Member)
- Suspicious events on either PJM or neighboring systems
- Other system conditions or outages with unknown causes

The significant triggers for PJM action during crisis will be the Homeland Security Threat Levels and NIPC Threat Advisories. However, if PJM becomes aware of a possible threat before any one of these triggers (e.g., PJM sees a significant terrorist attack on CNN) PJM may decide to act before any such alerts. Each of these alert conditions is further explained in the attached appendices.

#### ***PJM Actions:***

This section of the manual will address possible PJM conservative operations in the event of a man-made threat to the bulk power grid and/or other significant infrastructures.

The tailored response to any of these triggers will include a multi-faceted plan to safeguard personnel and maintain reliable operations. The facets of this response include power system operations, communications, cyber security, and physical security. The emphasis of



this section is upon the Operations and Communications measures that may be taken based upon the threat and intelligence.

As PJM progresses into ever increasing alert levels the actions of the higher level include the actions of the lower levels. Such that when PJM is at Security RED, PJM may have implemented all of the actions listed in Security ORANGE and YELLOW. However, PJM will tailor the actual response to the event. As such, the order that steps are presented does not mandate a set implementation pattern.

<b>PJM SECURITY GREEN</b>	
<b>Possible Triggers</b>	<b>Possible Actions</b>
Homeland Security at GREEN	Operations Conditions Normal – Routine Operations and Communications
<b>PJM SECURITY BLUE</b>	
<b>Possible Triggers</b>	<b>Possible Actions</b>
Homeland Security at BLUE	Operations 1. O – Reminders to all operators for increased Vigilance
	2. O – PJM Operations Management review and discuss this section of the emergency operations manual
	3. Increased Vigilance and Reporting
	Communications
	4. C – PJM passes along credible/actionable intelligence
	5. C – PJM will announce Security level BLUE on the ALL CALL – if conditions warrant, an SOS Conference Call will be announced
	6. C – All operations centers should review NIPC reporting requirements/process
<b>PJM SECURITY YELLOW</b>	
<b>Possible Triggers</b>	<b>Possible Actions</b> <b>(Includes Actions in PJM Security BLUE)</b>
Homeland Security at Yellow NERC Emergency Alert Security 1  NIPC/FBI issued a Threat Advisory  Suspicious activity reported by Adjacent Systems  Significant terrorist activity beyond the East Coast (situational dependent) Cyber threat identified or is imminent, OR verified physical threat against control center or grid assets.	Operations 1. O – Maintenance Outages Analyzed – additional coordination with TO/GO to confirm emergency return times, if necessary
	2. Maximum Credible Contingencies analyzed by PJM OPD
	3. O – Increased Vigilance/Reporting Communicate NERC Emergency Alert Security 1
	Communications
	4. C – Satellite Phone Checks (daily upon initiation and weekly thereafter)
	5. C – Enhance Voice Communications Security (Operators who do not recognize another operator, should call back to the entity or organizations should have a password to validate directives)



		6. C – Enhance NIPC reporting
		7. C – Enhance Cyber Security Scanning
		8. C – As needed PJM conducts Conference Calls with GO and TO – no exchange of market sensitive data permitted Communicate NERC Emergency Alert Security 1
<b>PJM SECURITY ORANGE</b>	<b>Possible Actions (Includes Actions in PJM Security YELLOW)</b>	
<b>Possible Triggers</b>	<b>Operations</b>	
<p>Homeland Security at ORANGE NERC Emergency Alert Security 2 Suspicious Activity around critical PJM facilities (not to be defined) Cyber event is affecting control center EMS capability OR physical attack at single site (control center or grid assets-lines, substations, generators).</p>	1. O – Analyze Hydro Schedules – for possible interruption to increase Blackstart capability	
	2. O – Initiate Black Start Assessment (SSR) – to determine fuel limitations	
	3. O – If threat is against a particular facility, consider operating for the contingent loss of the facility Communicate NERC Emergency Alert Security 2	
	<b>Communications</b>	
	4. C – PJM conducts SOS meetings and conference calls, as needed, to review crisis response posture	
	5. C – PJM staffs a Incident Response Team [to coordinate physical security measures, media responses, and communications to PJM staff not on site]	
	6. C – In an attack occurs, immediately notify members via the ALL CALL (identify any immediate actions and a conference call time) Communicate NERC Emergency Alert Security 2	
<b>PJM SECURITY RED</b>	<b>Possible Actions (Includes Actions in PJM Security ORANGE)</b>	
<b>Possible Triggers</b>	<b>Operations</b>	
<p>Homeland Security at RED NERC Emergency Alert Security 3</p> <p>B. Intelligence of an impending attack on a PJM facility Cyber event has shut down control center EMS capability, OR physical attack at multiple sites (control center or grid assets-lines, substations, generators).</p>	1. O – Operate to more conservative modeling measures which may include double contingencies, maximum credible disturbances, or lower reactive transfer limits	
	2. O – Increase Available Operating Reserve	
	3. O – Cancel selected Maintenance Outages – attempt to return selected outaged equipment to service. [Consider invoking a “no touch” maintenance stance]	
	4. O – Consider staffing selected substations for communications	
	5. O – Consider staffing critical combustion turbine sites (Seek TO’s recommendations)	
	6. O – Increase Synchronized Reserve	
	7. O – Obtain emergency energy bids as a	

	precaution
	8. O – Initiate Black Start Assessment (SSR) – to determine fuel limitations
	9. O – Consider staffing Critical Black Start Units
	10. O – PJM recommends enhanced physical security at critical substations. Communicate NERC Emergency Alert Security 3
	<b>Communications</b>
	11. C – Institute Daily Conference Calls, as necessary, with the GOs and TOs – to assess posture
	12. C – If cyber attack is occurring consider limiting internet accessibility (Appendix 1)
	13. C – PJM maintains 24 hour Operations Management Presence
	14. C – Consider providing instructions to units to operate within a given set of parameters if communications is lost
	15. C – PJM and TOs staff Back-Up Control Centers (BUCC), as necessary
	16. C – PJM will not post emergency actions on its website
	17. C – PJM will reassess the level of allowable communications that is acceptable between generators and transmission operators in order to facilitate necessary communications Communicate NERC Emergency Alert Security 3

**Exhibit 3: PJM Security Alert Levels**

## 4.2 Communications Plan

The following outlines the manner in which communications will flow from the Federal Government to PJM and other Reliability Coordinators as well as between PJM and its members. Timely and clear communications between PJM and its Members, in both directions, is a key to the successful management of any suspected or actual crisis.

- The Electric Sector – Information Sharing and Analysis Center (ES-ISAC) receives information from a US or Canadian Federal Agency, a Reliability Coordinator, an ES Entity (e.g. Region, Control Area, Purchasing Selling Entity, other), another Sector ISAC, or – potentially - outside the Sector. The ES-ISAC will review the information (which may be classified).
- If the information is specific and has any credibility at all, the ES-ISAC will contact the involved Entity directly (this may be the Reliability Coordinator of the Entity, depending upon contact information. If either a PJM Generation or Transmission Operator has been contacted by the NIPC or ES-ISAC or the information is releasable immediately, contact appropriate parties in the Interconnection in the event of sabotage to include the PJM Shift Supervisor at 610-666-8806.
- PJM will communicate the information to other Reliability Coordinators, via RCIS as appropriate.

- If the information is urgent or time sensitive, the information will be passed to the personnel on the call, and a Reliability Coordinator conference call will be requested (the on-duty personnel will alert the call participants). PJM will rapidly assess the information and pass the information to its members via the All Call for urgent/time sensitive information or via SOS conference calls or e-mail if the information is of a general/non-actionable nature.
- The ES-ISAC will notify other Electricity Sector Entities (including the EEI Security Committee, APPA, EEI, EPSA, NEI, NRECA, and CEA) as appropriate; no information shared by Reliability Coordinators will be passed on without approval.
- Any information shared in this manner will be noted as to any restrictions on further distribution. No information shared is to be delivered to the public media.

## Section 5: Transmission Security Emergencies

Welcome to the *Transmission Security Emergencies* section of the **PJM Manual for Emergency Operations**. In this section, you will find the following information:

- How PJM anticipates/responds to potential Heavy Load/Low Voltage conditions
- How PJM implements Capacity Related Emergency Procedures to control Transmission Constraints.
- An explanation of the use of the Post Contingency Local Load Relief Warning to alert local control center operators of the potential need to perform local load shedding due to the lack of any other available load relief options.
- An explanation of the use of the Post Contingency Local Load Relief Action.
- How PJM uses the NERC Transmission Loading Relief procedure to reduce loadings.
- PJM is responsible for determining and declaring that an Emergency is expect to exist, exists or has ceased to exist in any part of the PJM RTO or in any other Control Area that is interconnected directly or indirectly with PJM RTO. PJM directs the operations of the PJM Members as necessary to manage, allocate, or alleviate an emergency. These actions are consistent with NERC and RFC EOP standards.

**NOTE:** This section of the manual is intended to supplement PJM Transmission Operations Manual (M-3) Section 2: Thermal Operation Guidelines and Section 3: Voltage and Stability Operating Guidelines. M03 specifies corrective actions for actual and post-contingency simulated loadings and associates targeted time to correct. Section 5 of this manual specifies in which emergency procedures would be issued.

### 5.1 Heavy Load, Low Voltage Conditions

The following may be used to supplement other existing procedures when system loads are heavy and bulk power voltage levels are, on an anticipated or actual basis, at or approaching voltage limits. These procedures consist of the following:

- Low Voltage Alert
- Heavy Load Voltage Schedule Warning
- Heavy Load Voltage Schedule Action

#### 5.1.1 Low Voltage Alert

The purpose of the Low Voltage Alert is to heighten awareness, increase planning, analysis, and preparation efforts when heavy loads and low voltages are anticipated in upcoming operating periods. PJM will issue this alert to members (Generation and Transmission) when projections show these conditions are expected. This Alert can be issued for the entire PJM CA, specific Control Zone(s) or a subset of Control Zone(s).

### ***PJM Actions:***

- PJM will conduct power flow analysis of the impact of future load and transfer increases upon the PJM system. Using this forward analysis, evaluation and planning will take place; including ensuring any reasonable necessary off-cost generation is ready to respond to anticipated transfer constraints. In this evaluation, consideration will also be given to changing the Reactive Transfer back-off limit from its normal value of 50 MW to 300 MW (interface dependant). If the decision is made to implement this measure, PJM will continually reassess the impact of this change on operations.
- PJM will review generation and transmission outages (internal and external) and their impact on projected voltage problems.
- PJM will assess the impact of transfers and be prepared to rapidly identify any curtailable transactions that are adversely impacting reactive transfer limits.
- Using the NERC Interchange Distribution Calculator (IDC), PJM will assess the impact of parallel flows on its own facilities and transfer limits. If these flows are seen to be significant, PJM will be prepared, prior to dumping load, to invoke the NERC Transmission Loading Relief (TLR) process to provide relief from these parallel flows.
- PJM will monitor overuse of the 5018 line between NYISO and PJM.
- PJM will enhance reactive reporting from members by requesting a Reactive Reserve Check. (Also see the [\*\*\*PJM manual for Generator Operational Requirements \(M14D\)\*\*\*](#) Attachment D: PJM Generating Unit Reactive Capability Curve Specification and Reporting Procedures.)
- PJM will enhance communications among SOS Transmission members via SOS conference calls to discuss the status of critical equipment, voltage trends, and possible corrective actions.
- PJM dispatcher cancels the alert, when appropriate.

### ***PJM Member Actions:***

- Transmission/Generation dispatchers notify their management and advise all stations and key personnel.
- Transmission/Generation dispatchers ensure that all deferrable maintenance or testing affecting capacity or critical transmission is halted. Any monitoring or control maintenance work that may impact operation of the system is halted.
- Transmission/Generation dispatchers to respond to Reactive SSR by checking status and availability of all critical reactive resources. This includes polling generating stations of their reactive capabilities and the status of automatic voltage regulators. Any deviations or deficiencies of any equipment's reactive capabilities from what is modeled in the PJM EMS must be reported to PJM Power Dispatcher. (Also see Attachment D in ***PJM manual for Generator Operational Requirements: PJM Generating Unit Reactive Capability Curve Specification and Reporting Procedures.***)

### 5.1.2 Heavy Load Voltage Schedule Warning

A Heavy Load Voltage Schedule Warning is issued to members via the ALL-CALL system (Generation and Transmission) to request members to prepare for maximum support of voltages on the bulk power system. This Warning can be issued for entire PJM CA, specific Control Zone(s) or a subset of Control Zone(s).

#### ***PJM Actions:***

- Four hours prior to requesting the actual implementation of the Heavy Load Voltage Schedule, PJM may give advance notice to members of the upcoming need for this schedule. At that time, impacted members will be requested to verify that all actions have been taken on the distribution and sub-transmission systems to support the voltage at the EHV level
- PJM dispatcher cancels the Heavy Load Voltage Schedule Warning, when appropriate.

#### ***PJM Member Actions:***

- While observing established limits, impacted transmission dispatchers should ensure that where possible, all underlying reactors are out of service, all capacitors on the underlying system are in service, and transformer taps are adjusted to ensure distribution capacitors are in-service.
- Generation dispatchers should ensure all unit voltage regulators are in service.

### 5.1.3 Heavy Load Voltage Schedule

A Heavy Load Voltage Schedule is issued to members (Generation and Transmission) at peak load periods via the ALL-CALL system to request maximum support of voltages on the bulk power system and increase reactive reserves on the 500kv system. This Action can be issued for entire PJM CA, specific Control Zone(s) or a subset of Control Zone(s). PJM Actions:

- At peak load period, request all companies implement the Heavy Load Voltage Schedule via the ALL-CALL system.
- PJM dispatcher cancels the Heavy Load Voltage Schedule, when appropriate.

#### ***PJM Member Actions:***

- While observing established limits, impacted transmission dispatchers should ensure that where possible, all reactors are out of service, all capacitors on the underlying system are in service, capacitors on the 500kv system with PLC's are in service where required.
- Generation dispatchers should ensure all unit voltage regulators are in service.
- Impacted Transmission/Generation dispatchers should ensure all units on the 230kV system and below should increase MVAR output as necessary to maintain designated bus voltage schedules or nominal voltage, whichever is greater. Voltage levels should be maintained within predetermined limits at all times. Results of real-time monitoring tools shall be used by PJM and the LCC's, to maintain sufficient reactive reserves on these systems to ensure operations within established

operating criteria. When Real-time monitoring tools are unavailable, PJM in coordination with LCC's, may need to commit additional local resources to ensure sufficient local reactive reserves are available for contingency response.

- Impacted Transmission / Generation dispatchers should ensure all units connected to the 500kv system are operated so that reasonable MVAR reserve is maintained as determined by real-time monitoring tools or good engineering judgment. Reactive moves on these units should be coordinated through the PJM Power Dispatcher.
- Transmission / Generation dispatchers should keep the PJM Power Dispatcher informed of any units approaching maximum MVAR output, any abnormal unit MVAR restrictions, and any voltage regulators that are out of service.

## 5.2 Transmission Security Emergency Procedures

PJM is responsible for implementing selected Emergency Procedures identified in Section 2 in order to control transmission loading to ensure continued reliable operations. These Emergency Procedures are separated into Alerts, Warnings, Actions and are called on a portion of the PJM RTO (Control Zone, Transmission Zone(s) or portion of a Transmission Zone). Alerts are issued day-ahead. Warnings and Actions are implemented real-time. PJM and PJM Member Actions in response to the Emergency Procedure should be implemented consistent with Section 2 of this manual.

### ***Day-Ahead Transmission Security Emergency Procedures***

#### **Maximum Emergency Generation Alert (for Transmission Security)**

The purpose of the Maximum Emergency Generation Alert for Transmission Security is to provide an early alert that Security Analysis projections indicate the need for generation in excess of economics to ensure Transmission Reliability. It is implemented when Maximum Emergency Generation is called into the operating capacity on a portion of the PJM System to ensure Transmission Reliability.

##### **Triggers:**

PJM Day-ahead Study analysis identifies Transmission Reliability issues that cannot be resolved via economic generation adjustments.

#### **Voltage Reduction Alert (for Transmission Security)**

The purpose of the Voltage Reduction Alert for Transmission Security is to alert members that a voltage reduction may be required during a future critical period to ensure Transmission Reliability. It is implemented when the projected loading of Maximum Emergency Generation is insufficient to ensure Transmission Reliability.

##### **Triggers:**

PJM Day-ahead Study analysis identifies Transmission Reliability issues that cannot be resolved via economic generation adjustments and loading of Maximum Emergency Generation.



### ***Real-Time Transmission Security Emergency Procedures***

All warning and actions are issued in real-time. Warnings are issued during present operations to inform members of actual capacity shortages or contingencies that may jeopardize the reliable operation of the PJM RTO. Generally, a warning precedes an associated action. The intent of warnings is to keep all affected system personnel aware of the forecast and/or actual status of the PJM RTO.

The PJM RTO is normally loaded according to bid prices; however, during periods of reserve deficiencies, other measures must be taken to maintain system reliability. These measures involve:

- loading generation that is restricted for reasons other than cost
- recalling non-capacity backed off-system sales
- purchasing emergency energy from participants / surrounding pools
- load relief measures

Due to system conditions and the time required to obtain results, PJM dispatcher may find it necessary to vary the order of application to achieve the best overall system reliability. Issuance and cancellation of emergency procedures are broadcast over the “ALL-CALL” and posted to selected PJM web-sites. Only affected systems take action. PJM dispatcher broadcasts the current and projected PJM RTO status periodically using the “ALL-CALL” during the extent of the implementation of the emergency procedures.

**Note:** The Real-Time Emergency Procedures section combines Warnings and Actions in their most probable sequence based on notification requirements during extreme peak conditions. Depending on the severity of the capacity deficiency, it is unlikely that some Steps would be implemented. Attachment G, entitled Capacity Emergency Matrix, is a tabular summary of PJM and Member Company Actions during Real-time Emergency Procedures.

#### **Step 1: Full Emergency Load Response - formerly known as Active Load Management (Long Lead Time)**

The purpose of the Load Management Curtailments is to provide additional load relief by using PJM controllable load management programs. Load relief is expected to be required after initiating Maximum Emergency Generation.

##### **Long Time Frame to Implement (Between 1 – 2 hours)**

**Note:** When requesting Full Emergency Load Response, PJM dispatcher provides an estimate of the magnitude of the curtailment required and the approximate duration of curtailment.

***PJM Actions:***

- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to conserve electricity usage. PJM dispatcher notifies other Control Areas through the RCIS.
- PJM dispatcher requests members to implement Full Emergency Load Response formerly known as Active Load Management Long Lead Time (LLT) Curtailment. PJM dispatcher requests LSE's or their agent and Curtailment Service Providers to implement Full Emergency Load Response (formerly known as ALM) LLT. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatcher issues a NERC Energy Emergency Alert Level 2 (EEA2 = ALERT LEVEL 2) via the RCIS to ensure all Reliability Authorities clearly understand potential and actual PJM system emergencies if one has not already been issued concurrent with the issuance of Active Load Management Curtailables /Full Emergency Load Response (formerly known as ALM). NERC EEA2 is issued when the following has occurred: Public appeals to reduce demand, voltage reduction, and interruption of non-firm load in accordance with applicable contracts, demand side management/active load management, or utility load conservation measures.
- PJM dispatcher cancels, when appropriate.

***PJM Member Actions:***

- Member dispatchers notify management of the emergency procedure and that they should consider the use of public appeals to conserve electricity usage.
- Member dispatchers notify governmental agencies, as applicable.
- Member dispatchers implement load management programs as requested by PJM dispatchers.

**Step 2: Full Emergency Load Response – formerly known as Active Load Management (Short Lead Time)**

The purpose of the Load Management Curtailments is to provide additional load relief by using PJM controllable load management programs. Load relief is expected to be required after initiating Maximum Emergency Generation.

**Short Time Frame to Implement (1 Hour or Less)**

***PJM Actions:***

- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to conserve electricity usage. PJM dispatcher notifies other Control Areas through the RCIS.
- PJM dispatcher requests members to implement: Full Emergency Load Response (formerly known as Active Load Management) Short Lead Time (SLT). PJM dispatcher requests LSE's or their agent and Curtailment Service Providers to implement Full Emergency Load Response (formerly known as ALM) SLT. An Action

can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.

- PJM dispatcher issues a NERC Energy Emergency Alert Level 2 (EEA2 = ALERT LEVEL 2) via the RCIS to ensure all Reliability Authorities clearly understand potential and actual PJM system emergencies if one has not already been issued concurrent with the issuance of Active Load Management Curtailables / Full Emergency Load Response (formerly known as ALM). NERC EEA2 is issued when the following has occurred: Public appeals to reduce demand, voltage reduction, and interruption of non-firm load in accordance with applicable contracts, demand side management/active load management, or utility load conservation measures.
- PJM dispatcher cancels, when appropriate.

### ***PJM Member Actions:***

- Member dispatchers notify their management of the emergency procedure and that they should consider the use of public appeals to conserve electricity usage.
- Member dispatchers notify governmental agencies, as applicable.
- Member dispatchers implement load management programs, as requested by PJM dispatchers.

**Note 1:** Load management programs, whether under PJM control and directed by PJM dispatcher or solely under the Local Control Center's direction, have various names including, but not limited to Active Load Management, interruptibles, curtailables, or load management. To simplify operations during these emergency situations, all curtailments are referred to as Full Emergency Load Response (formerly known as Active Load Management).

**Note 2:** PJM RTO Load Management Curtailments are not to be used to provide assistance to adjacent Control Areas beyond PJM. Restoration of Load Management Curtailments is undertaken in a stepped approach, as necessary. PJM Control Zones implement Emergency Procedures concurrently until a Manual Load Dump Action, which will only occur in the deficient Control Area.

**Note 3:** Load management programs can be issued system-wide or by Control Zone, depending on current / projected system constraints.

**NOTE 4, FULL EMERGENCY LOAD RESPONSE (FORMERLY KNOWN AS ALM) RESTRICTIONS:** Full Emergency Load Response (LM) is available for up to ten PJM initiated interruptions at any time during the planning period. Interruptions of up to six hours duration during the hours of 12:00 (Noon) to 20:00 (08:00 PM) on weekdays, other than PJM holidays (Independence Day (observed) and Labor Day (observed)).

**Note 5, EEA Levels:** PJM dispatcher issue a NERC Energy Emergency Alert Level 2 (EEA2 = ALERT LEVEL 2) via the Reliability Coordinator Information System (RCIS) to ensure all Reliability Authorities clearly understand potential and actual PJM system

emergencies if one has not already been issued concurrent with the issuance of Load Management Curtailables / Full Emergency Load Response (formerly known as ALM). NERC EEA2 is issued when the following has occurred: Public appeals to reduce demand, voltage reduction, and interruption of non-firm load in accordance with applicable contracts, demand side management/active load management, or utility load conservation measures.

### Step 3 (Real-time): Primary Reserve Warning

The purpose of the Primary Reserve Warning is to warn members that the available primary reserve is less than required and present operations are becoming critical. It is implemented when available primary reserve capacity is less than the primary reserve requirement, but greater than the synchronized reserve requirement, after all available secondary reserve capacity (except restricted maximum emergency capacity) is brought to a primary reserve status and emergency operating capacity is scheduled from adjacent systems.

#### ***PJM Actions:***

- PJM dispatcher issues a warning to members and PJM management stating the amount of adjusted primary reserve capacity and the requirement. A Warning can be issued for the entire PJM CA or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatcher notifies PJM public information personnel.
- PJM dispatcher rechecks with members to assure that all available equipment is scheduled and that requested secondary reserve is brought to primary reserve status.
- PJM dispatcher ensures that all deferrable maintenance or testing on the control and communications systems has halted at PJM Control Center. PJM dispatcher should provide as much advance notification as possible to ensure maintenance/testing does not impact operations. This notification may occur prior to declaration of Primary Reserve Warning.
- PJM dispatcher will obtain a temporary variance from environmental regulators for specific generators to assist in preventing load shedding in accordance with Attachment N.
- PJM dispatcher cancels the warning, when appropriate.

#### ***PJM Member Actions:***

- Transmission/Generation dispatchers notify management of the warning.
- Transmission/Generation dispatchers advise all stations and key personnel.
- Generation dispatchers prepare to load all available primary reserve, if requested.
- Transmission/Generation dispatchers ensure that all deferrable maintenance or testing affecting capacity or critical transmission is halted. Any monitoring or control maintenance work that may impact operation of the system is halted.
- PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.

#### Step 4 A (Real-time): Maximum Emergency Generation

The purpose of the Maximum Emergency Generation is to increase the PJM RTO generation above the maximum economic level. It is implemented whenever generation is needed that is greater than the highest incremental cost level.

**Note:** Maximum Emergency Generation can only be included in the daily operating capacity when requested by PJM dispatcher.

#### ***PJM Actions:***

- PJM dispatcher issues Maximum Emergency Generation. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatcher notifies PJM management, PJM public information personnel, and member dispatchers.
- PJM dispatcher implements the Emergency Bid-Process, requesting Emergency bids by posting messages to selected PJM web-sites, RCIS, and contacting the neighboring control areas.
- PJM dispatcher instructs members to suspend Regulation on all resources, except hydro generation.
- PJM dispatcher recalls off-system capacity sales that are recallable (network resources).
- PJM dispatcher declares Maximum Emergency Generation and begins to load Maximum Emergency Generation or purchase available emergency energy from PJM Members (Emergency Bid Process) and from neighboring Control Areas based on economics and availability.
- PJM dispatcher loads Maximum Emergency Generation incrementally as required, if the entire amount of Maximum Emergency Generation is not needed. PJM dispatchers generally load Maximum Emergency CTs prior to loading Maximum Emergency Steam in order to preserve synchronized reserve.
- PJM dispatcher initiates scarcity pricing based on loading of Maximum Emergency Generation or acceptance of Emergency Energy Purchases in the appropriate Scarcity Pricing Region.
- PJM dispatcher cancels, when appropriate.

**Note 1:** Emergency Bid-Process: Following issuance of Maximum Emergency Generation, PJM may purchase available energy from any PJM Member (as emergency) that is available up to the amount required or until there is no more available, recognizing the impact on transmission constraints. The following rules are used to provide an orderly operation.

**Note 2:** PJM should consider loading of shared reserves with neighboring systems prior to implementing voltage reduction, while recognizing the impact on transmission limits.

- The PJM Member is responsible for delivering (i.e., securing all transmission service) of the energy to one of PJM's borders with a neighboring control area. To ensure

deliverability, firm transmission service may be required if external Reliability Authorities have issued TLRs.

- PJM attempts to provide 60-minutes notice before the energy is required by posting on selected PJM web-sites an emergency procedure message stating that PJM anticipates requiring emergency energy purchases beginning at a specific time.
- Once PJM posts the request for emergency purchases all PJM Members can submit “bids” to make emergency energy sales to PJM. PJM Members should fax in their bids and call PJM to confirm receipt. The Emergency Bid form is found in Attachment D along with the rules for submitting. Bids may also be called into a pre-assigned, recorded voice line. They should be structured as follows:
  - time – of energy available
  - amount – of energy available
  - price of energy
  - duration (hours) energy is available and limits on minimum time required to take
  - notification time to cancel/accept
  - PJM Member identification
  - interface and contract path
- PJM accepts the offers and schedules the energy using the following guidelines:
  - Energy is accepted based on economics (least cost offers will be accepted first based on energy price and minimum hours) if more energy is offered than required.
  - Energy is accepted as required based on economics from the available bids (i.e., if PJM requires 500 MW immediately it takes the cheapest 500 MW bid at the time). PJM adjusts current schedules to correct economics if time permits (i.e., if a cheaper scheduled is bid after a more expensive schedule is loaded PJM only cancels the first if reasonable time exists to cancel one and load the other).
  - Similarly priced offers are selected based on timestamps (i.e., first in first selected).

Bids accepted by PJM are Emergency Purchases by PJM and do not set the Locational Marginal Price. The energy received is accounted for according to the current Emergency Energy accounting procedures. See the [PJM Manual for Operating Agreement Accounting \(M28\)](#) for more details.

PJM reserves the right to load maximum emergency equipment as required to control the system regardless of whether any bids were/were not accepted (i.e., sudden unit loss may not allow time to accept bids).

PJM implements and curtails emergency purchase transactions with as much notice as practical to allow for a reliable transition into and out of emergency conditions.

PJM requests emergency energy from neighboring Control Areas (under current Control Area agreements) after all energy offered by the PJM Members is accepted, unless there is an immediate need for the energy.



PJM can deviate from or change the order of the above actions as/if necessary.

***PJM Member Actions:***

- Transmission/Generation dispatchers notify management of the emergency procedure.
- PJM Marketers recall off-system capacity sales that are recallable as directed by PJM dispatchers.
- Generation dispatchers suspend regulation, as requested, and load all units to the Maximum Emergency Generation level, as required.
- Generation dispatchers notify PJM dispatching of any Maximum Emergency (ME) generation loaded prior to PJM requesting ME generation is loaded.

**Step 4 B (Real-time): Energy Only Option of Emergency Load Response (formerly known as Load Reduction Action)**

The purpose of the Load Reduction Action is to request end-use customers, who participate in the Energy Only Option Emergency Load Response, to reduce load during emergency conditions.

***PJM Actions:***

- PJM dispatcher issues Action via the PJM All-call and post message to selected PJM Web-sites. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatcher notifies PJM management, PJM public information personnel, and PJM Markets personnel who notify Emergency Load Response Program participants.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the emergency procedure.
- Curtailment Service Providers with Demand Resource(s) registered in the Energy Only Option of Emergency Load Response reduce load.

**Note:** Energy Only Option of Emergency Load Response (formerly known as Load Reduction Action) is the emergency procedure associated with the Emergency Load Response.

**Step 5 (Real-time): Voltage Reduction Warning & Reduction of Non-Critical Plant Load**

The purpose of the Voltage Reduction Warning & Reduction of Non-Critical Plant Load is to warn members that the available synchronized reserve is less than the Synchronized Reserve Requirement and that present operations have deteriorated such that a voltage reduction may be required. It is implemented when the available synchronized reserve capacity is less than the synchronized reserve requirement, after all available secondary and primary reserve capacity (except restricted maximum emergency capacity) is brought to a synchronized reserve status and emergency operating capacity is scheduled from adjacent systems.



***PJM Actions:***

- PJM dispatcher issues a warning to members and PJM management, stating the amount of adjusted synchronized reserve capacity and the requirement. A Warning can be issued for the entire PJM CA or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatcher notifies PJM public information personnel.
- PJM notifies the Department of Energy (DOE).
- PJM dispatcher cancels the warning, when appropriate.

***PJM Member Actions:***

- Transmission / Generation dispatchers notify management of the warning.
- Transmission / Generation dispatchers notify governmental agencies, as applicable.
- Transmission / Generation dispatchers advise all stations and key personnel.
- Generation dispatchers order all generating stations to curtail non-essential station light and power.
- Transmission dispatchers / LSEs prepare to reduce voltage, if requested.
- Transmission dispatchers / LSEs and Curtailment Service Providers notify appropriate personnel that there is a potential need to implement load management programs, in addition to interrupting their interruptible/curtailable customers in the manner prescribed by each policy, if it has not already been implemented previously.
- PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.

**Step 6 (Real-time): Manual Load Dump Warning**

The purpose of the Manual Load Dump Warning is to warn members of the increasingly critical condition of present operations that may require manually dumping load. It is issued when available primary reserve capacity is less than the largest operating generator or the loss of a transmission facility jeopardizes reliable operations after all other possible measures are taken to increase reserve. The amount of load and the location of areas(s) are specified.

***PJM Actions:***

- PJM dispatcher issues the warning to members and PJM management, stating the estimated amount of load relief that is required (if applicable). A Warning can be issued for the entire PJM CA or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatcher notifies PJM public information personnel.
- PJM dispatcher notifies FERC via the FERC Division of Reliability's electronic pager system, consistent with FERC Order No. 659.
- PJM dispatcher establishes a mutual awareness with the appropriate member dispatchers of the need to address the occurrence of a serious contingency with minimum delay.

- PJM dispatcher examines bulk power bus voltages and alerts the appropriate member dispatchers of the situation.
- PJM dispatcher cancels the warning, when appropriate.

***PJM Member Actions:***

- Transmission/Generation dispatchers notify management of the warning.
- Transmission dispatchers notify governmental agencies, as applicable.
- Transmission/Generation dispatchers advise all station and key personnel.
- Transmission dispatchers/LSEs review local procedures and prepare to dump load in the amount requested.
- Transmission dispatchers/LSEs reinforce internal communications so that load dumping can occur with minimum delay.
- PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.

**Step 7 A (Real-time): Voltage Reduction**

The purpose of Voltage Reduction during capacity deficient conditions is to reduce load to provide a sufficient amount of reserve to maintain tie flow schedules and preserve limited energy sources. A curtailment of non-essential building load is implemented prior to or at this same time as a Voltage Reduction Action. It is implemented when load relief is still needed to maintain tie schedules.

**Note:** Voltage reductions can also be implemented to increase transmission system voltages.

***PJM Actions:***

- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to conserve electricity usage. PJM dispatcher notifies outside systems through the RCIS. PJM dispatch notifies DOE. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM Management may issue system-wide or Control Zone-specific Public/Media Notification Message C-3 or H-3, (whichever is applicable). See Attachment A.
- PJM dispatcher investigates loading of shared reserves with neighboring systems prior to implementation of a voltage reduction, recognizing the impact on transmission limits.
- PJM dispatcher issues the order for a 5% voltage reduction.

**Note:** AP Control Zone has capabilities of 2.5% or 5.0% Voltage Reductions). Northern Illinois Control Zone has capabilities of 2.5% or 5.0% Voltage Reductions but is limited to 2.5% within the city of Chicago. PJM South performs a voltage reduction utilizing SCADA. Voltage Reduction varies depending upon the local set level of 2.5% or 5%.

- PJM dispatcher issues a NERC Energy Emergency Alert Level 2 (EEA2 = ALERT LEVEL 2) via the RCIS to ensure all Reliability Authorities clearly understand potential and actual PJM system emergencies if one has not already been issued concurrent with the issuance of Active Load Management Curtailables / Full Emergency Load Response (formerly known as ALM). NERC EEA2 is issued when the following has occurred: Public appeals to reduce demand, voltage reduction, and interruption of non-firm load in accordance with applicable contracts, demand side management/active load management, or utility load conservation measures.
- PJM dispatcher initiates scarcity pricing based on the issuance of a voltage reduction in the appropriate Scarcity Pricing Region.
- PJM dispatcher cancels the reduction, when appropriate.

***PJM Member Actions:***

- Transmission/Generation dispatchers notify management of the emergency procedure and to consider the use of public appeals to conserve electricity usage.
- Member Transmission dispatchers notify governmental agencies, as applicable.
- Member Transmission dispatchers/LSEs take steps to implement the voltage reduction.

**Note:** Curtailment of non-essential building load may be implemented prior to, but no later than, the same time as a voltage reduction.

**Step 7 B (Real-time): Curtailment of Non-Essential Building Load**

The purpose of the Curtailment of Non-Essential Building Load is to provide additional load relief, to be expedited prior to, but no later than the same time as a voltage reduction.

***PJM Actions:***

- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to conserve electricity usage. PJM dispatcher notifies outside systems through the RCIS.
- PJM dispatcher issues a request to curtail non-essential building load. An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatcher cancels the request, when appropriate.

***PJM Member Actions:***

- Transmission/Generation dispatchers notify management of the emergency procedure and to consider the use of public appeals to conserve electricity usage.
- Transmission dispatchers notify governmental agencies, as applicable.
- Transmission/Generation dispatchers/LSEs switch off all non-essential light and power in LSE-owned commercial, operations, and administration offices.

**Note:** Curtailment of non-essential building load may be implemented prior to, but no later than the same time as a voltage reduction.

### Step 8 (Real-time): Manual Load Dump

The purpose of the Manual Load Dump is to provide load relief when all other possible means of supplying internal PJM RTO load have been used to prevent a catastrophe within the PJM RTO or to maintain tie schedules so as not to jeopardize the reliability of the other interconnected regions. It is implemented when the PJM RTO cannot provide adequate capacity to meet the PJM RTO's load or critically overloaded transmission lines or equipment cannot be relieved in any other way and/or low frequency operation occurs in the PJM RTO, parts of the PJM RTO, or PJM RTO and adjacent Control Areas that may be separated as an island.

Under capacity deficient conditions, the PJM EMS load dump calculator was modified to institute changes to the Operating Agreement set forth in Schedule 1, Section 1.7.11 that states that "...the Office of Interconnection may not order a manual load dump in a Control Zone solely to address capacity deficiencies in another Control Zone."

The load dump calculation determines which Control Zone(s) is short based on real-time load and energy values from EMS and capacity values received daily from the Capacity Adequacy Planning Department. Real-time energy values are used as a surrogate for available capacity, because in a capacity shortage situation all available generation should be loaded to full capacity. Since most of the values used in the load dump calculation are real-time dynamic numbers, the calculation is performed in the PJM EMS. Load Serving Entities will be able to designate within eCapacity that capacity resources are being used to serve load in a specific Control Zone. Similarly EES users will be able to specify that an external energy schedule is designated for a specific Control Zone. Resources that are not designated for a specific Control Zone will be considered an RTO resource for load dump calculation purposes and allocated across all Control Zones according to load ratio share. Only Control Zones that are determined to be deficient will be assigned a share of a load dump request initiated due to RTO capacity deficiencies. If the PJM Mid-Atlantic Region is determined to be deficient, its share will be further allocated according to Attachment E.

#### ***PJM Actions:***

- PJM dispatcher verifies that separations have not occurred and that load dumping is desirable on the system being controlled (i.e., make sure that a load dump will help, not aggravate the condition).
- PJM dispatcher instructs members to suspend all remaining regulation, if not already suspended previously.
- PJM dispatcher determines which Control Zone (s) are capacity deficient and the relative proportion of deficiency. PJM dispatcher estimates the total amount of load to be dumped and utilizes the PJM EMS to determine deficient Control Zones and their share of load dump required.
- PJM dispatcher orders the appropriate member dispatchers to dump load according to PJM EMS calculations. The PJM Mid-Atlantic Region share will be further allocated according to Attachment E.
- PJM dispatcher will implement load shedding in controlled step sizes to minimize system impact and further uncontrolled separation.
- PJM dispatcher notifies PJM management, PJM public information personnel, and members. PJM dispatcher advises members to consider the use of public appeals to

conserve electricity usage and public announcements of the emergency. PJM dispatcher notifies other Control Areas through the RCIS, and notifies DOE, FEMA, and NERC offices, using established procedures.

- PJM dispatcher notifies FERC via the FERC Division of Reliability's electronic pager system, consistent with FERC Order No. 659.
- PJM dispatcher issues a NERC Energy Emergency Alert Level 3 (EEA3 = ALERT LEVEL 3) via the RCIS to ensure all Reliability Authorities clearly understand potential and actual level of PJM System Emergencies.
- PJM Management issues a system-wide or Control Zone specific Public/Media Notification Message C-4 or H-4, (whichever is applicable). Typically, this would be issued prior to a Manual Load Dump. See Attachment A.
- PJM dispatcher initiates scarcity pricing based on the issuance of a Manual Load Dump Action in the appropriate Scarcity Pricing Region.
- PJM dispatcher cancels the load dump order and restores required regulation, when appropriate.

**Note 1:** If partial restoration of the load dumped is requested by PJM dispatcher, confirmation of the load restored by each member must be made prior to further restoration requests by PJM dispatcher.

**Note 2:** If step 1 of UFLS is insufficient to return frequency to acceptable ranges and if emergency procedures cannot be implemented in a timely fashion then PJM dispatch shall dump sufficient load to restore system frequency.

### ***PJM Member Actions:***

- Generation dispatchers suspend remaining regulation, when directed by PJM prior to dumping load.
- Transmission dispatchers/LSEs promptly dump an amount of load equal to or in excess of the amount requested by PJM dispatcher (Mid-Atlantic Region operators refer to Attachment E for specific allocation). The load dump plan should consider/recognize priority/critical load.
- Transmission/Generation dispatchers notify management of the emergency procedure.
- Transmission dispatchers/LSEs consider the use (or continued use) of public appeals to conserve electricity usage and consider the use of public announcements of the emergency.
- Transmission dispatchers notify governmental agencies, as applicable.
- Transmission dispatchers/LSEs maintain the requested amount of load relief until the load dump order is cancelled by PJM dispatcher.
- Transmission dispatchers report the amount of load curtailed/restored upon implementation to the PJM Power Dispatcher.

**Note:** PJM dispatch should take necessary actions to support system frequency, consistent with good utility practices. These actions may include emergency procedures to arrest frequency decline, but PJM will not violate BAAL (Balancing Authority ACE Limit) limits by overgenerating to correct for a low frequency. In general, emergency procedures are preserved to ensure PJM net tie deviation is not adversely impacting system frequency after all economic options have been exhausted. However, Emergency Procedures should be exhausted, including Manual Load Dump, to arrest frequency decline once Under Frequency Load Shedding Schemes (UFLS) have triggered but prior to generating stations tripping off-line (57.5 Hz). Underfrequency Load Shedding Plan settings are defined in Attachment F, "PJM Manual Load Dump Capacity."

### 5.3 Scarcity Condition Procedures

Scarcity conditions that trigger scarcity pricing will occur when the Office of the Interconnection's system operators perform any one of the following identifiable, specifically defined actions for a Scarcity Pricing Region:

1. Begin to dispatch online generators, which are partially designated as Maximum Emergency, into emergency output levels.
2. Begin to dispatch online generators, which are designated entirely as Maximum Emergency, above their designated minimum load points, if they are currently online and operating at their minimum load points because of restrictive operating parameters associated with the generators.
3. Begin to dispatch any offline generators that are designated entirely as Maximum Emergency and that have start times plus notification times less than or equal to 30 minutes.
4. Voltage reduction action.
5. Emergency energy purchases.
6. Manual load dump action.

Whenever the Office of the Interconnection's system operators take any of the above designated actions triggering scarcity pricing, they shall post on the PJM website the emergency message describing the action and include in the posting the Scarcity Pricing Region for which the action is being taken.

Scarcity Pricing Regions must meet the following criteria: (1) consist of at least two entire transmission zones; (2) consist of contiguous transmission zone and sub-zones; (3) transmission import or transfer must be limited by EHV (500 KV or greater) constraints; and (4) consist of pricing nodes that have a 5% or greater positive power distribution factor ("dfax") relative to the constraints. Whenever scarcity pricing is triggered, PJM will post on their website the emergency message describing the action taken that is triggering scarcity pricing and include in the posting the Scarcity Pricing Region for which action is being taken.

When scarcity pricing is triggered in a Scarcity Pricing Region, the price in the entire Scarcity Pricing Region will be set equal to the highest market-based offer price of all generating units operating under PJM direction to supply either energy or reserves on a real-time dispatch basis. No offer capping for transmission constraints may be initiated or continued in the Scarcity Pricing Region while scarcity pricing is in effect; provided, however, that generation in the Scarcity Pricing Region shall remain subject to the overall offer cap of



\$1,000 per megawatt-hour. In addition, if a generator outside of a Scarcity Pricing Region is called upon to relieve the transmission constraint that caused the scarcity condition in a Scarcity Pricing Region, then during the time that scarcity pricing is in effect in that Scarcity Pricing Region that generator shall be paid the higher of the scarcity price for the Scarcity Pricing Region or the price that it otherwise would have been paid; however, that generator's offer shall not be used to set locational marginal prices or scarcity prices in the Scarcity Pricing Region.

For purposes of defining scarcity conditions, PJM will consider generators that have been classified as Maximum Emergency only if they fall in one of the following categories:

- **Environmental limits.** If the unit has a hard cap on its run hours imposed by an environmental regulator that will temporarily significantly limit its availability.
- **Fuel limits.** If physical events beyond the control of the unit owner result in the temporary interruption of fuel supply and there is limited on-site fuel storage. A fuel supplier's exercise of a contractual right to interrupt supply or delivery under an interruptible service agreement shall not qualify as an event beyond the control of the unit owner.
- **Temporary emergency conditions at the unit.** If temporary emergency physical conditions at the unit significantly limit its availability.
- **Temporary megawatt additions.** If a unit can provide additional megawatts on a temporary basis by oil topping, boiler overpressure, or similar techniques and such megawatts are not ordinarily otherwise available.

On days when PJM has declared, prior to 1800 hours on the day prior to the operating day, a Maximum Emergency Generation Alert for the entire PJM Control Area or for specific Control Zones or Scarcity Pricing Regions, the only units for which all or part of their capability may be designated as Maximum Emergency are those that meet the criteria described above. Should PJM declare a Maximum Generation Alert during the operating day for which the alert is effective, generation owners will be responsible for removing any unit availability from the Maximum Generation category that does not meet the above criteria within 4 hours of the issuance of the alert. PJM will make a mechanism available to participants by which they may inform PJM of their generating capability that meets the above criteria and indicate which of the criteria it meets.

PJM will post on its website the aggregate amount of generation megawatts that are classified as Maximum Emergency for purposes of defining scarcity conditions.

### Termination of Scarcity Conditions

Scarcity Pricing will be terminated in a Scarcity Region when demand and reserves can be fully satisfied with generation that is not designated Maximum Emergency. Under this condition, some generation that is designated Maximum Emergency may continue to operate due to timing limitations or operating limitations, but that generation is no longer needed under dispatch to satisfy system requirements, and scarcity pricing will no longer apply. Under no circumstances shall scarcity conditions be terminated if any of the following conditions remain in effect for the Scarcity Pricing Region:

- Voltage reduction action as described in the PJM Manuals.



- Emergency energy purchases from offers that do not have minimum purchase requirements of greater than 30 minutes duration attached to the offer
- Manual load dump action as described in the PJM Manuals.

The PJM RTO will post on their website the time when scarcity conditions are terminated.

## 5.4 Post Contingency Local Load Relief Warning

The purpose of the Post Contingency Local Load Relief Warning is to provide advance notice to a transmission owner(s) of the potential for manual load dump in their area(s). It is issued after all other means of transmission constraint control have been exhausted or until sufficient generation is on-line to control the constraint within designated limits and timelines as identified in PJM Manual 3 Transmission Operations, Section 2 – Thermal Operating Guidelines. (Warning to be communicated to the applicable TO and posted via the Emergency Procedures Posting Application, but not communicated via the “PJM All-Call”). This procedure is distinct and separate from the MANUAL LOAD DUMP WARNING (Use “ALL CALL”). Refer to Manual Load Dump Warning procedure for Capacity Shortages, Interface Reactive Constraint Management or Multi Area Transmission Constraint Management.

**Note 1:** Except for the single area “Post Contingency Local Load Relief Warning”, the Manual Load Dump Warning is unchanged. This change should preserve the sense of urgency appropriate for both.

**Note 2:** Post-Contingency Local Load Relief Warnings are intended to relieve localized constraints, generally 230kV and below. A Manual Load Dump Warning should still be used for Capacity Shortage conditions which result in Interface Reactive Constraint or Multi Area Transmission Constraint Management.

**Note 3:** Attachment I, Local Post-Contingency Operating Guide, contains planning guidelines to identify and document known contingency pairs where post-contingency load dump would be acceptable in lieu of transmission reinforcements. These guidelines do not impact how PJM Dispatch implements Post-Contingency Local Load Relief Warnings.

**Note 4:** PJM Dispatch operates more conservative for designated Interconnection Reliability Operating Limits (IROL).

**Note 5:** PCLLRW should be implemented as post-contingency violations approach 60 minutes in duration. PCLLRW can be issued sooner at the request of the Transmission Owner or at the discretion of the PJM Dispatcher if it is anticipated that generator startup + notification exceed 60 minutes.

### **PJM Actions:**

- PJM and transmission owner dispatcher review contingency flows / limits and discuss off-cost operations/switching solutions prior to implementation of a Post-Contingency Local Load Relief Warning, system conditions and time permitting.
- PJM and transmission owner dispatcher(s) review and implement acceptable pre-contingency switching options in lieu of issuing a Post-Contingency Local Load Relief Warning. Post-contingency switching options documented in the PJM Transmission

Operations Manual (M03), Attachment G: Post Contingency Congestion Management Program, may alleviate the need to issue a Post-Contingency Local Load Relief Warning.

- PJM dispatcher commits/de-commits effective generation consistent with Manual 12 – Dispatch Operations, Attachment B – Transmission Constraint Control Guidelines, including adjusting hydro/pumping schedules, curtailing interchange transactions, and/or committing quick-start generation to control flows within acceptable limits, as appropriate. The market to market redispatch must be implemented where applicable.
- PJM dispatch implements 100% Synchronized Reserves and/or declares a Local Maximum Emergency Generation Event, as appropriate.
- PJM dispatcher issues the Post-Contingency Local Load Relief Warning to the transmission owner dispatcher(s) stating the estimated amount of relief that is required on the monitored facility to return flows below the Emergency Rating or an agreed upon level. The actual amount of load dump required to control facility flows may be higher depending upon the distribution factor effect on the facility.
- PJM dispatcher provides the load distribution factor report to the impacted transmission owner dispatcher(s) via e-mail. Load Distribution Factor reports should be redistributed as changes to system reconfiguration warrant.
- PJM Dispatcher issues a Post-Contingency Local Load Relief Warning via Emergency Procedure Posting Application to PJM web-site, detailing any post-contingency switching, generation reduction, procedure or load-transfer solution, providing additional information regarding the firmness of anticipated post-contingency load dump.
- PJM and transmission owner dispatcher (s) periodically review and monitor approved post-contingency switching options.
- PJM dispatcher reviews acceptable post-contingency switching options. Post-contingency switching, generator reduction, or load transfer options should be implemented prior to implementing a Post-Contingency Local Load Relief Action.
- PJM and Transmission Owner Dispatcher(s) should review potential post-contingency manual generation trip schemes prior to implementing a Post-Contingency Local Load Relief Action. Manual generation trip schemes should be identified and agreed to in advance.
- PJM and transmission owner dispatcher (s) should agree upon post-contingency load transfer options. Transmission owner dispatch(s) would need to periodically re-evaluate the load transfer solution.
- PJM dispatcher establishes a mutual awareness with the appropriate transmission owner dispatcher(s) of the need to address the occurrence of a serious contingency with minimum delay.
- PJM dispatcher examines area bulk power bus voltages and alerts the appropriate transmission owner dispatcher(s) of the situation.
- PJM dispatcher cancels the warning, when appropriate.

***PJM Member Actions:***

- PJM and the transmission owner dispatcher(s) discuss the amount of load to be curtailed to return flows below emergency ratings and the effective location(s).
- Transmission Owner dispatch shall identify facility loading concerns which would necessitate additional load dump to reduce post-contingency flows below emergency rating.
- Transmission Owner dispatch continues to monitor expected post-contingency flows and adjusts their load dump strategy as appropriate.
- Transmission owner dispatcher(s) advise appropriate station/stations and key personnel.
- Transmission owner dispatcher(s)/LSEs review local procedures and prepare to dump load in the amount requested.
- Transmission owner dispatcher(s)/LSEs reinforce internal communications so that load dumping can occur with minimum delay.
- Transmission owner dispatcher(s) shall be prepared to implement post-contingency switching options, manual generation trip schemes or load transfer via SCADA with minimum delay.
- Transmission owner dispatcher(s) shall be prepared to implement a Post-Contingency Local Load Relief Action if post-contingency switching, generator reduction, or load transfer options fail.
- Transmission owner dispatcher(s) man substations as necessary if SCADA control is unavailable or insufficient.
- Transmission owner dispatcher (s) shall notify PJM Dispatch if post-contingency flows fall below Emergency Ratings and the PCLLRW has not been canceled.

## **5.5 Interconnection Reliability Operating Limits (IROL) Facilities**

PJM identifies specific facilities that if loaded above a designated limit could significantly impact system reliability. PJM dispatch must quickly act to mitigate IROL facilities in accordance with operating procedures identified in PJM Transmission Operations Manual (M03), Section 2: Thermal Operating Guidelines and Section 3: Voltage & Stability Operating Guidelines, and the PJM Emergency Operations Manual (M13) Section 5: Transmission Security Emergencies. Identified IROL facilities are as follows: Eastern Reactive Interface, Central Reactive Interface, Western Reactive Interface, Bedington – Black Oak Reactive Interface, AP-South Reactive Interface, Kammer 765/500kV Transformer, Belmont 765/500kV Transformer, Wylie Ridge #5 500/345kV Transformer, Wylie Ridge #7 500/345kV Transformer, and the South Canton 765/345kV Transformer.

***PJM Actions:***

- Implement operating strategy consistent with PJM Transmission Operations Manual (M03) and PJM Emergency Operations Manual (M13).

- PJM issues a Transmission Emergency Alert 1 (TEA 1) – When all available generation resources committed to respecting IROLs and/or is concerned about its ability to respect the IROL.
- PJM issues a Transmission Emergency Alert 2 (TEA 2) — When PJM foresees or has implemented procedures up to, but excluding, interruption of firm load commitments. When time permits, these procedures may include, but are not limited to:
  - Public appeals to reduce demand.
  - Voltage reduction.
  - Interruption of non-firm end use loads in accordance with applicable contracts (for emergency purposes, not economic reasons)
  - Demand-side management.
  - Utility load conservation measures
  - TLR 6
- Note: TLR 5 would normally be implemented in advance. The RC is obligated to report any IROL violations that last longer than 30 minutes to the applicable Regional Reliability Organization and NERC.

## 5.6 Transmission Loading Relief (TLR)

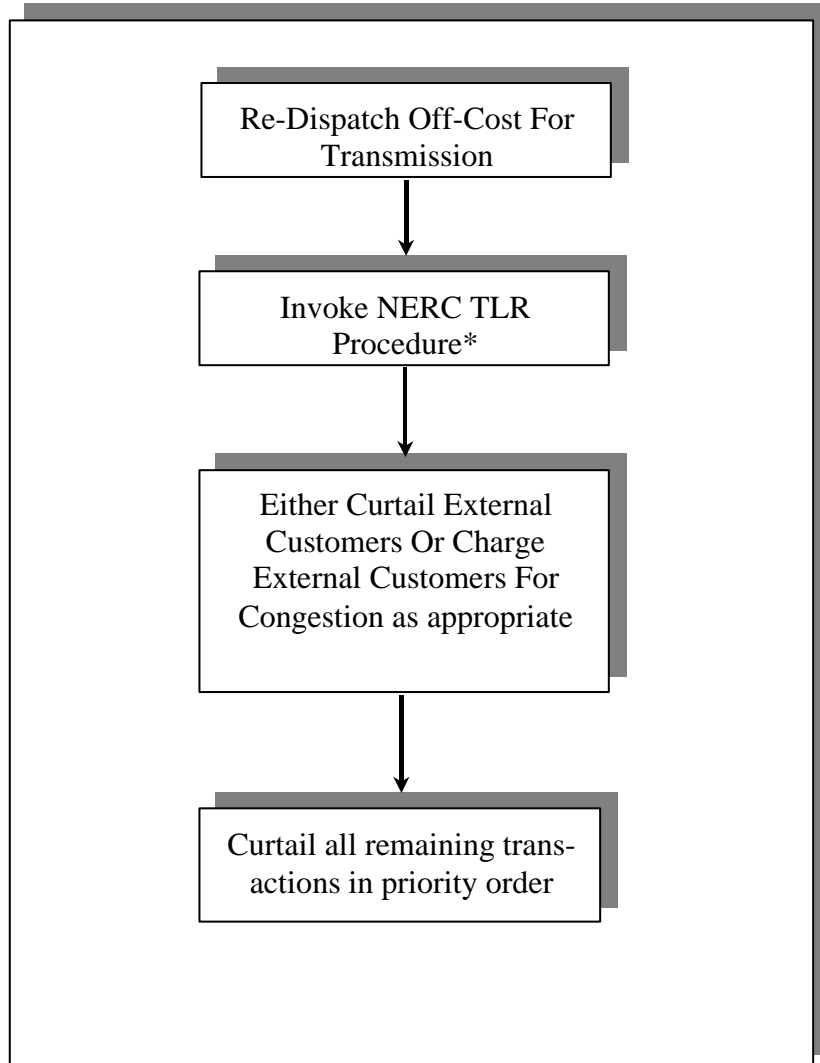
PJM monitors designated transmission facilities within the PJM RTO as well as tie-lines with adjacent interconnected control areas. When PJM determines overload conditions exist on any designated facility, or would exist for the first contingency loss of another facility, PJM will take all reasonable necessary action(s) to restore transmission facilities within operating security limits.

During periods of excessive circulation, PJM will issue a TLR and curtail transactions that are not willing to pay congestion on the PJM system. However, under normal system conditions, PJM will re-dispatch internal generation to the extent possible and if more relief is needed, PJM will perform the following actions:

- Invoke the NERC Transmission Loading Relief Procedure
- Curtail external transactions and/or charge external customers for the cost of congestion as specified in the PJM Open Access Transmission Tariff

If all transactions for which transmission customers have elected not to pay through congestion have been curtailed and further relief is still required on the transmission facility, PJM will begin to curtail all transactions (internal and external) for which transmission customers have elected to pay through congestion, in priority order.

Exhibit 4 presents the general sequence of events leading to the initiation of the NERC TLR Process.



**Exhibit 4: Initiation of NERC TLR Process**

\*See NERC Policy 9, Appendix 9C1 for Details on the NERC TLR Procedure

**PJM Actions:**

- PJM implements all non-cost measures to control transmission flows.
- PJM curtails transactions with transmission service in PJM that are “not willing to pay through congestion”.
- PJM adjusts output of generators off-cost to alleviate overloads.
- PJM re-dispatches to the fullest extent possible, excluding Maximum Emergency Generation, and then initiates the NERC TLR procedure.
- PJM curtails external transmission customers not willing to pay through congestion and charges other external customers willing to pay for the cost of congestion, as set forth in the PJM Open Access Transmission Tariff.

- PJM curtails transmission customers willing to pay through congestion (and no longer charges those curtailed for congestion) in priority order.

***PJM Transmission Customer Actions:***

- External transmission customers may elect, in accordance with section 1.10.6A of the Open Access Transmission Tariff, to pay congestion charges during Transmission Loading Relief in the PJM RTO.
- PJM transmission customers may elect to curtail their own transactions at any time if congestion charges have become too great.

## Section 6: Reporting Emergencies

Welcome to the *Reporting Emergencies* section of the **PJM Manual for Emergency Operations**. In this section, you will find the following information:

- Reporting System Disturbances to the Department of Energy
- Reporting System Disturbances to NERC
- Reporting Capacity or Energy Shortages to FERC
- How PJM responds to fuel limitations (see “*Fuel Limitation Reporting*”)
- Analysis process for System Events and Disturbances

### 6.1 Reporting System Disturbances to the Department of Energy

Under certain defined conditions, PJM and/or its members are required to report the details of system disturbances to NERC and/or the Department of Energy. The reporting criteria and instructions for filing are contained in NERC Standard EOP-004 (<http://www.nerc.com/files/EOP-004-1.pdf>).

### 6.2 Reporting System Disturbances to NERC

Under certain defined conditions, PJM is required to report the details of system disturbances to NERC. Normally, PJM will file the necessary report to NERC on behalf of the PJM member unless otherwise coordinated. The reporting criteria and instructions for filing the report to NERC are contained in NERC Standard EOP-004, which can be accessed at the NERC website, <http://www.nerc.com/files/EOP-004-1.pdf>.

If the PJM member submits the report, PJM should be copied on the report. If PJM submits the report, PJM will copy the affected members with the report.

### 6.3 Reporting Capacity or Energy Shortages to FERC

Whenever PJM anticipates a shortage of capacity or energy which could affect deliveries to members' wholesale customers within the PJM Control Area, PJM is required to report such shortages to FERC. The report is to be submitted electronically to FERC via the FERC Division of Reliability's electronic pager system.

The report is to include the following information, at a minimum:

- Nature and projected duration of the anticipated shortage
- List of firm wholesale customers likely to be affected by the shortage
- Procedures for responding to the shortage
- Contact person at PJM for further information [Shift Supervisor and the Chief System Operator(s)]

The trigger for the report to FERC is the initiation of a Manual Load Dump Warning or Action in accordance with this Manual.



## 6.4 Fuel Limitation Reporting

### ***Background and Intent***

PJM needs data concerning unit fuel reserves for it to reliably operate the PJM RTO and its associated markets. This is especially true during periods of severe weather and/or times when there are external fuel constraints (i.e., coal strike, oil embargo). During PJM's last capacity driven load dump situation (Winter Freeze, 1994) the fuels data provided by PJM's members reduced the severity and duration of actual load curtailments.

It is the intent of this procedure to require all capacity resources to report fuel data so that in severe situations, PJM can continue to make the calls that are in the best interest of all its members. In contrast with past procedures, where PJM could have used this data to restrict the output of various generators based upon their fuel limitations without financial compensation, PJM will now use the information to assist the market in providing solutions to emergency situations.

PJM's authority to require all capacity resource owners to provide these reliability based reports is found in the PJM Operating Agreement (11.3 Member Responsibilities; 11.3.1 General; 1.10 Emergency, line ii) and in the "good utility practices" of NERC Policy 6 (Section B, Emergency Operations, Guides 1 and 2.2).

### ***Seasonal Reporting***

Prior to going into the winter season, PJM will notify and request from all members with capacity resources, a by unit report of fuel information. Additionally this information may be requested at other intervals as deemed necessary such as a fuel crisis (i.e., embargo, strike) or forecasted period of severe cold weather.

An electronic spreadsheet will be sent to participants indicating required data. (Exhibit 5)  
The required data will include information such as each unit's:

- Available primary fuel
- Available secondary fuel
- Projected fuel inventory (in terms of MWh)
- Typical fuel inventory (in terms of MWh)
- Average amounts of fuel per delivery
- Delivery frequency
- Amount of firm gas schedules

While some of this data may represent broad projections, it will assist in providing a baseline that can be compared to data submitted in the real-time reporting process to assist in determining the severity of specific emergency conditions.

Fuel Baseline Data													DATE: 1/30/01		
Company	Plant Name	Unit Type	Winter (kW)	Primary Fuel		Alternate Fuel		Primary Fuel Availability (MW-Hours)	Primary Average Fuel Availability (MW-Hours)	Alternate Fuel Availability (MW-Hours)	Alternate Average Fuel Availability (MW-Hours)	Gas Schedules (% of Firm)	Average Delivery Amount	Delivery Frequency	Comments
				Fuel Type	Transport Method	Fuel Type	Transport Method								
Company A	Unit 1	GT	7,000	NG	PL	REP	TRK	1200	1400	870	420	37%	35	3/DAY	
Company A	Unit 2	ST	10,000	FO6	RR			2000	1800				60	5/DAY	

**Exhibit 5: Sample Data**

## Real-Time Reporting

When PJM receives a severe cold weather forecast or foresees a potential fuel crisis (i.e. embargo, strike), real-time updates of fuel limited units will be requested of members via Part G of the Supplementary Status Report. ([Attachment C](#)) This data will also be reported in other situations when a Supplementary Status Reports is requested, such as Capacity Shortage emergencies.

A unit is considered fuel limited when it is not capable at running at its maximum capacity for the next 72 hours. If a unit has an alternate fuel which would allow it to run at its maximum capacity for more than 72 hours, it does not need to be reported. However, if switching fuels involves a shut down and introduces the risk of the unit not being able to re-start after the switch, the unit should be reported if its primary fuel supply would produce less than 72 hours of runtime at maximum capacity. Besides fuel, the limitation of other resources, such as water, may also restrict the amount of time a unit will be able to operate. If a unit has less than 72 hours of run time at maximum capacity due to any resource limitation, it along with any fuel limited units should be reported in Part G, "Resource Limited Units", of the Supplementary Status Report (See [Attachment C](#)). The following information should be included:

- Unit Name - The name of the unit(s) (units with shared resource supplies should be listed together) that are considered resource limited.
- Fuel type
- Maximum Capacity - The current maximum capacity of the unit(s).
- Emergency Minimum - If a unit cannot cycle due to uncertainty of starting up again, Emergency Minimum must be included with a note in the Comments section.
- Current Energy - Current MW output.
- Total Burn Hours Remaining - Total burn hours remaining with unit at max capacity.
- Comments - If a unit is limited for a resource other the fuel, this should be noted in this column as well as any other pertinent information on the unit.

In addition to unit information submitted to PJM via Part G of the SSR, members should also monitor fuel inventories for the following minimum levels:

- Oil, Kerosene, or Diesel CT's - Less than or equal to 16 hours at maximum capacity
- Gas CT's – Less than or equal to 8 hours at maximum capacity. Generation dispatchers should inform PJM dispatch if the gas limitation is daily.
- Steam - Less than or equal to 32 hours at maximum capacity

In the event the above levels are reached, generation owners must immediately report this to the PJM Scheduling Coordinator (610) 666-8809.

### ***PJM's use of Fuels Data***

PJM uses the fuel data in conjunction with the other data reported in the SSR to evaluate system conditions. Reports such as the PJM System Status Report (*Attachment C, pages 131 to 139*) are compiled. Some portions of the reports are posted electronically via the internet or faxed to members so all members can assess the severity of the impending weather and available generation capacity. Additionally reports derived from this information are used to lead strategy discussions among SOS members about the criticality of the situation and to determine the timing of various emergency procedures that may be used.

An invitation may also be posted to other members to attend a PJM SOS conference call to discuss the meaning of this data and how it may result in various emergency procedures.

PJM will treat as confidential the information on individual units or company data in accordance with PJM's OATT and Operating Agreement. Discussions on individual units or company's fuel status will only occur between PJM and the generation owners who provided the data. During group discussions, PJM will only discuss what possible emergency actions are foreseen or what aggregate fuel crisis exists.

Unit specific Fuel Limitation Information is considered proprietary and confidential, and will not be distributed amongst participants. Only aggregate information will be discussed for the sole purpose of developing reliable operating strategies during projected capacity deficient conditions.

### ***Operation of Fuel Limited Units***

- PJM requests companies that have units classified as fuel or resource limited units to bid these units in the Max Emergency category. This will serve to preserve these resources for the times when they are needed most. If a unit bid into PJM has resources of less than 32 hours (at maximum capacity) for a steam unit, 16 hours (at maximum capacity) for a Oil, Kerosene, or Diesel CT, or 8 hours (at maximum capacity) for a gas fired CT, and PJM has issued Conservative Operations, a Cold or Hot Weather Alert, then the unit **must** be bid in the Max Emergency category, unless directed not to do so by PJM Dispatch.

**Note1:** Since a Cold Weather/Hot Weather Alert may only be issued on a portion of the PJM footprint, and since PJM schedules and operates the footprint as a single Balancing Authority, PJM may elect not to automatically place Fuel Limited Resources into the Maximum Emergency Category.

**Note2:** There may be times when Gas-fired Fuel Limited Combustion Turbines are placed into the Maximum Emergency Generation Category with a daily availability < 8 hours per day (i.e. 5 hours of gas per day). Considering the daily nature of gas limitations, the PJM Dispatcher has the option of requesting the generator owner, with daily gas limitations, to remove the fuel limited resource from the Maximum Emergency Category to ensure PJM tools economically schedule the gas fired CTs.

- PJM will continue to schedule system generation based upon the Two Pass methodology and generator owner's individual bids. If PJM has particular concerns over units deemed critical to current or future system conditions, then PJM will initiate individual communications with the members responsible for those units.

If PJM asks a unit to operate differently than what was accepted in the day ahead market (in order to conserve the unit's current fuel), then this unit would be paid its lost opportunity cost for the accepted hours that it was not run. (Reference Operating Agreement, section 3.2.3, (e), (f)).

## **6.5 Analysis of System Events and Disturbances**

The Transmission Owning members of PJM and PJM are committed to preserving the reliability of PJM monitored transmission facilities. Part of that commitment is to analyze system events or problems for the purpose of implementing corrective actions and sharing knowledge to improving operations at PJM and Transmission Owning companies. [See [Attachment K.](#)]

## **Attachment A: Public Notification Statements**

The following attachments are to be used by PJM Interconnection Corporate Communications and local control center (LCC)/electric distribution company (EDC) personnel in the event of a potential or actual generation capacity emergency.

The attachments include advisories to member communicators, statements for members' use and sample news releases for PJM. Advisories convey information to member communicators. Statements are intended as guides for members developing their own statements and news releases. The sample news releases provide the basis of the communications that PJM would issue.

The attachment contains baseline communications that represent the minimum that should be communicated to the public at each level as defined herein. PJM and its members should and will expand and adapt communications at each level as they deem appropriate under the circumstances. Members should tailor their public statements and communications tactics to suit their individual needs. Each member's communications department, in cooperation with its system operations organization, will determine how best to respond to each emergency level.

The PJM System Operations Subcommittee-Transmission (SOS-T) will authorize use of these messages. PJM Corporate Communications will coordinate emergency message response with the communications departments of SOS-T members.

## Level 1 Advisory for Potential Cold Weather Emergency (C1)

### Purpose and Procedures:

This advisory is issued to the communications departments of SOS-T members when weather conditions may cause power supply problems. It allows communicators to adjust their messages to the public. PJM does **not** issue a level 1 advisory directly to the news media, but may use it as the basis of a response to inquiries.

PJM would issue the level 1 advisory first to the communications departments of SOS-T members by e-mail and alert them via the All Call system. Typically, PJM Corporate Communications would conduct a conference call with SOS-T member communicators following issuance of the level 1 advisory.

### C1 Advisory:

This is an electric power **advisory** from PJM Interconnection.

PJM System Operations expects higher than usual demand for electricity *today/tomorrow* because of the region's continuing frigid weather. While PJM currently expects to have enough electricity to meet the heavy demand for power, it may need to call on the public to conserve electricity.

PJM will continue to monitor conditions. If conditions change, PJM may need to make a public statement about power supplies and a call for conservation.

This message applies to (*all of PJM/names of PJM transmission zones*).

## Level 1 Advisory for Potential Hot Weather Emergency (H1)

### Purpose and Procedures:

This advisory is issued to the communications departments of SOS-T members when weather conditions may cause power supply problems. It allows communicators to adjust their messages to the public. PJM does **not** issue a level 1 advisory directly to the news media, but may use it as the basis of a response to inquiries.

PJM would issue the level 1 advisory first to the communications departments of SOS-T member by e-mail and alert them via the All Call system. Typically, PJM Corporate Communications would conduct a conference call with SOS-T member communicators following issuance of the level 1 advisory.

### H1 Advisory:

This is an electric power **advisory** from PJM Interconnection.

PJM System Operations expects higher than usual demand for electricity *today/tomorrow* because of the region's continuing hot weather. While PJM currently expects to have enough electricity to meet the heavy demand for power, it may need to call on the public to conserve electricity.

PJM will continue to monitor conditions. If conditions change, PJM may need to make a public statement about power supplies and a call for conservation.

This message applies to (*all of PJM/names of PJM transmission zones*).



## Level 2 Statement for Cold Weather Emergency (C2)

### Purpose and Procedures:

This statement is a request to the public to conserve electricity because of developing power supply problems. Typically it would be issued after the curtailment of interruptible/curtailable customer loads when further load reduction measures may be taken.

PJM would issue the level 2 statement first to the communications departments of SOS-T members by e-mail and alert them via the All Call system – indicating both times whether the statement applies to all of PJM or a specific region or zone. Then, PJM Corporate Communications would conduct a conference call with SOS-T member communicators. Immediately following the conference call, PJM will issue a level 2 news release to the news media.

### C2 Statement:

This is an electric power warning from *(name of local control center)* and PJM Interconnection, the electric power grid operator for the region. *(name of local control center)* and PJM are experiencing an extremely high demand for electricity because of today's frigid weather. Electricity supplies are tight.

To help prevent possible power supply problems, *(name of local control center)* and PJM suggest that you conserve electricity when use of electricity is highest – from 6 a.m. to 9 a.m. and from 3 p.m. to 7 p.m.

Some electricity conservation options are:

- Set thermostats lower than usual, if health permits.
- Postpone using major household electric appliances such as stoves, dishwashers and clothes dryers until mid-day or after 9 p.m., when the demand for electricity decreases.
- Turn off non-essential electric appliances and equipment.

Following these guidelines to reduce the use of electricity will help avoid possible electric power shortages later. *(Name of local control center)* and PJM are carefully monitoring the situation. They will do everything possible to keep power flowing in the region.

## **Level 2 DRAFT News Release for Cold Weather Emergency (C2)**

### **PJM ASKS CONSUMERS TO CONSERVE ELECTRICITY**

*Cold Weather Continues to Push  
Electricity Use Higher*

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electricity grid operator for more than 51 million people in 13 states and the District of Columbia, today requested the public to conserve electricity. The call for conservation was prompted by continuing frigid weather.

The request is being made (*throughout PJM / in names of transmission zones*).

Demand for electricity is expected to increase as the extremely cold weather lingers for the next several days. PJM asks customers to conserve electricity, if health permits – especially from 6 a.m. to 9 a.m. and from 3 p.m. to 7 p.m. Electricity customers can take simple electricity conservation steps:

- Set thermostats lower than usual, if health permits,
- Postpone using major electric appliances such as stoves, dishwashers and clothes dryers until mid-day or after 9 p.m., when the demand for electricity decreases, and
- Turn off electric lights and appliances that you do not need or are not using.

Conserving electricity today will help ensure adequate power supplies. PJM continues to carefully monitor the power supply conditions. It will do everything possible to keep power flowing in the region. If necessary, PJM may take additional steps, such as reducing voltage.

Utility customers on interruptible or curtailable rates have been told to reduce their electricity use. These customers receive a special rate or payments from their electric utilities. The customers agreed to eliminate or significantly reduce their use of electricity when told to do so.

PJM is communicating about the situation with state government officials throughout the region. PJM's region includes all or parts of Delaware, Indiana, Illinois, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM is coordinating efforts among generators, power suppliers and local utilities.

###

## Level 2 Statement for Hot Weather Emergency (H2)

### Purpose and Procedures:

This statement is a request to the public to conserve electricity because of developing power supply problems. Typically it would be issued after the curtailment of interruptible/curtailable customer loads when further load reduction measures may be taken.

PJM would issue the level 2 statement first to the communications departments of SOS-T members by e-mail and alert them via the All Call system – indicating both times whether the message applies to all of PJM or a specific region or zone. Then, PJM Corporate Communications would conduct a conference call with SOS-T member communicators. Immediately following the conference call, PJM will issue a level 2 news release to the news media.

### H2 Statement:

This is an electric power warning from (*name of local control center*) and PJM Interconnection, the electric power grid operator for the region. (*name of local control center*) and PJM are experiencing an extremely high demand for electricity because of today's hot weather. Electricity supplies are tight.

To help prevent potential power supply problems, (*name of local control center*) and PJM suggest that you conserve electricity when use of electricity is highest – between 3 p.m. and 7 p.m. This includes requests to appropriate government agencies to implement programs to achieve necessary energy reductions.

Some conservation options are:

- Close curtains and blinds to keep the sun out and retain cooler air inside.
- Set air conditioner thermostats higher than usual, if health permits.
- Postpone using major household electric appliances such as stoves, dishwashers and clothes dryers until cooler evening hours.
- Turn off electric appliances and equipment that you do not need or are not using.

Following these guidelines to reduce the use of electricity will help avoid possible electric power shortages later. (*Name of local control center*) and PJM are carefully monitoring the situation. They will do everything possible to keep power flowing in the region.

## **Level 2 DRAFT News Release for Hot Weather Emergency (H2)**

### **PJM ASKS CONSUMERS TO CONSERVE ELECTRICITY**

*Heat Continues to Push  
Electricity Use Higher*

(Valley Forge, Pa. – Date) – PJM Interconnection, the electric grid operator for more than 51 million people in 13 states and the District of Columbia, today requested the public to conserve electricity. The call for conservation was prompted by the intense heat wave.

The request is being made (*throughout PJM / in names of transmission zones*).

Demand for electricity is expected to increase as the excessive heat and humidity continue. PJM asks customers to conserve electricity, if health permits – especially between 3 p.m. and 7 p.m. Electricity customers can take simple electricity conservation steps:

- Close curtains and blinds to keep out the sun and retain cooler air inside,
- Postpone using major electric household appliances such as stoves, dishwashers and clothes dryers until the cooler evening hours,
- If health permits, set air conditioner thermostats higher than usual, and
- Turn off electric appliances and equipment that you do not need or are not using.

Conserving electricity will help ensure adequate power supplies. PJM continues to carefully monitor the power supply conditions. It will do everything possible to keep power flowing in the region. If necessary PJM may take additional steps, such as reducing voltage.

Utility customers on interruptible or curtailable rates have been told to reduce their electricity use. These customers receive a special rate or payments from their electric utilities. The customers agreed to eliminate or significantly reduce their use of electricity when told to do so.

PJM is communicating about the situation with state government officials throughout the region. PJM's region includes all or parts of Delaware, Indiana, Illinois, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM is coordinating efforts among generators, power suppliers and local utilities.

###

## Level 3 Statement for Cold Weather Emergency (C3)

### Purpose and Procedures:

This statement is issued when a voltage reduction has been ordered. Additional, immediate electricity reductions may be needed.

PJM would issue the level 3 statement first to the communications departments of SOS-T members by e-mail and alert them via the All Call system – indicating both times whether the statement applies to all of PJM or a specific region or zone. Then, PJM Corporate Communications would conduct a conference call with SOS-T member communicators. Immediately following the conference call, PJM will issue a level 3 news release to the news media.

### C3 Statement:

Because of extremely high demand for electricity, (*name of local control center*) has reduced voltage by 5 percent. (*Name of local control center*) took this action at the direction of PJM Interconnection, the electric power grid operator for the region. The high usage of electricity results from the exceptionally cold weather.

A 5 percent reduction in voltage produces a 2 to 3 percent decrease in electricity use over a few hours. Voltage reductions generally are undetectable to the average customer. The reductions will assist in maintaining overall reliability of the region's electric power supply system.

(*Name of local control center*) and PJM request that you reduce your use of electricity. Conservation is most important when demand for electricity is highest – from 6 a.m. to 9 a.m. and from 3 p.m. to 7 p.m. This includes requests to appropriate government agencies to implement programs to achieve necessary energy reductions. Simple conservation steps include:

- Set thermostats lower than usual, if health permits.
- Postpone using major household electric appliances such as stoves, dishwashers and clothes dryer until mid-day or after 9 p.m., when the demand for electricity decreases.
- Turn off electric appliances and equipment that you do not need or are not using.

(*Name of local control center*) and PJM will do everything possible to keep power flowing in the region.

## **Level 3 DRAFT News Release for Cold Weather Emergency (C3)**

### **PJM ORDERS VOLTAGE REDUCTIONS AS EXTREMELY COLD WEATHER CONTINUES**

#### *Public Requested to Conserve Electricity*

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electricity grid operator for more than 51 million people in 13 states and the District of Columbia, has ordered a 5 percent voltage reduction to meet the extremely high demand for electricity. The high electricity use results from the frigid weather conditions. PJM also is asking consumers to conserve electricity.

The voltage reduction and request for conservation are being made (*throughout PJM / in names of transmission zones*).

PJM is working to ensure the area has enough electricity to meet demand as power supplies grow tight during the cold weather. A voltage reduction lowers the demand for electricity. It helps to conserve generating or transmission line capacity. Electrical equipment generally is designed to operate at plus or minus 10 percent of normal 120-volt current. A 5 percent reduction is within that range. As a result, most customers generally do not notice voltage reductions.

PJM said consumers' conservation of electricity has been important in meeting power supply needs. PJM requests that, if health permits, customers reduce their use of electricity during the times when overall use is highest – primarily from 6 a.m. to 9 a.m. and from 3 p.m. to 7 p.m. Simple conservation steps include:

- Set thermostats lower than usual, if health permits,
- Postpone using major electric appliances such as stoves, dishwashers and clothes dryers until mid-day or after 9 p.m., when the demand for electricity decreases, and
- Turn off electric appliances and equipment that you do not need or are not using.

PJM always takes steps first that have the least effect on most electricity customers. The steps include reducing large customers' electricity use through incentive programs and calling on existing back-up power supply at commercial locations. PJM will continue to monitor conditions and will request the public's assistance as necessary.

PJM is communicating about the situation with state government officials throughout the region. PJM's region includes all or parts of Delaware, Indiana, Illinois, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM is coordinating efforts among generators, power suppliers and local utilities.

###

## Level 3 Statement for Hot Weather Emergency (H3)

### Purpose and Procedures:

This statement would be issued when a voltage reduction has been ordered. Additional, immediate electricity reductions may be needed.

PJM would issue the level 3 statement first to the communications departments of SOS-T members by e-mail and alert them via the All Call system – indicating both times whether the statement applies to all of PJM or a specific region or zone. Then, PJM Corporate Communications would conduct a conference call with SOS-T member communicators. Immediately following the conference call, PJM will issue a level 3 news release to the news media.

### H3 Statement:

Because of extremely high demand for electricity, (*name of local control center*) has reduced voltage by 5 percent. (*Name of local control center*) took this action at the direction of PJM Interconnection, the electric power grid operator for the region. The high usage of electricity results from the exceptionally hot weather.

A 5 percent reduction in voltage produces a 2 to 3 percent decrease in electricity use over a few hours. Voltage reductions, which are generally undetectable to the average customer, will assist in maintaining overall reliability of the region's electric power supply system.

(*Name of local control center*) and PJM urge all electric customers to conserve electricity, primarily between 3 p.m. and 7 p.m., when demand for electricity is highest. Simple conservation steps include:

- Close curtains and blinds to keep the sun out and retain cooler air inside.
- Set air conditioner thermostats higher than usual, if health permits.
- Postpone using major household electric appliances such as stoves, dishwashers and clothes dryer until cooler evening hours.
- Turn off electric appliances and equipment that you do not need or are not using.

(*Name of local control center*) and PJM will do everything possible to keep power flowing in the region.



## **Level 3 DRAFT News Release for Hot Weather Emergency (H3)**

### **PJM ORDERS VOLTAGE REDUCTIONS AS HEAT WAVE CONTINUES**

*Public Requested to Conserve Electricity*

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electric grid operator for more than 51 million people in 13 states and the District of Columbia, has ordered a 5 percent voltage reduction to meet the extremely high demand for electricity. The high electricity use results from the intense heat wave. PJM also is asking consumers to conserve electricity.

The voltage reduction and request for conservation are being made (*throughout PJM / in names of transmission zones*).

PJM is working to ensure the area has enough electricity to meet demand as power supplies grow tight during the hot weather. A voltage reduction lowers the demand for electricity. It helps to conserve generating or transmission line capacity. Electrical equipment generally is designed to operate at plus or minus 10 percent of normal 120-volt current. A 5 percent reduction is within that range. As a result, most customers generally do not notice voltage reductions.

PJM said consumers' conservation of electricity has been important in meeting power supply needs. PJM requests that, if health permits, customers reduce their use of electricity during the times when overall use is highest – primarily between 3 p.m. and 7 p.m. Simple conservation steps include:

- Close curtains and blinds to keep out the sun and retain cooler air inside,
- Postpone using major household electric appliances such as stoves and clothes dryers until the cooler evening hours,
- If health permits, set air conditioner thermostats higher than usual, and
- Turn off appliances and equipment that you do not need or are not using.

PJM always takes steps first that have the least effect on most electric customers. The steps include reducing large customers' electricity use through incentive programs and calling on existing back-up supply at commercial locations. PJM will continue to monitor conditions and will request the public's assistance as necessary.

PJM is communicating about the situation with state government officials throughout the region. PJM's region includes all or parts of Delaware, Indiana, Illinois, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM is coordinating efforts among generators, power suppliers and local utilities.

## Level 4 Statement for Cold Weather Emergency (C4)

### Purpose and Procedures:

This emergency statement is issued when rotating power outages are ordered. Additional, immediate load reductions are needed.

PJM would issue the level 4 statement first to the communications departments of SOS-T members by e-mail and alert them via the All Call system – indicating both times whether the statement applies to all of PJM or a specific region or zone. Then, PJM Corporate Communications would conduct a conference call with SOS-T member communicators. Immediately, following the conference call, PJM will issue a level 4 news release to the news media.

### C4 Statement:

Because of extremely high demand for electricity, *(Name of local control center)* has begun brief, temporary rotating power outages to avoid wide-spread problems. *(Name of local control center)* took this action at the direction of PJM Interconnection, the electric power grid operator for the region. Cold weather has pushed the use of electricity beyond available supplies.

During a rotating power outage, electric service is interrupted to some customers for up to *(amount of time per local control center's procedure)*. At the end of that time, service is restored to them and interrupted to a different group of customers. In effect, the controlled power interruptions share limited power supplies among all customers. The procedure prevents the failure of the entire electric power supply system.

Immediate reductions in electricity use are urgently needed. *(Name of local control center)* and PJM urge all customers to reduce electricity use as much as is safely possible. Simple steps include:

- Turn off electric appliances and equipment that you do not need or are not using.
- Set thermostats lower than usual, if health permits.

Customers should be prepared for electric service outages. Check the backup power of electric-powered medical equipment. Check battery operated radios and flashlights.

## **Level 4 DRAFT News Release for Cold Weather Emergency (C4)**

### **EXTREME ELECTRICITY DEMAND FORCES ROTATING POWER OUTAGES IN PJM**

*Grid Operator Says Voluntary Reductions in Electricity Use  
Urgently Needed Because of Cold Weather*

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electric grid operator for more than 51 million people in 13 states and the District of Columbia, has directed the area's utilities to temporarily interrupt electricity service to some customers. PJM said substantial cutbacks in electricity use are urgently needed.

The brief rotating power outages and request for conservation affect (*the entire PJM region / names of transmission zones*).

The extremely cold weather has pushed demand for electricity in the area beyond available supplies. The rotating power outages help prevent the failure of the region's entire electric power supply system.

PJM said that consumers' conservation efforts make a vital contribution to meeting the region's power supply needs.

The company requests that, if health permits, customers reduce their use of electricity today when overall use is highest – primarily from 6 a.m. to 9 a.m. and from 3 p.m. to 7 p.m. Simple conservation steps include:

- Set thermostats lower than usual, if health permits,
- Postpone using major electric appliances such as stoves, dishwashers and clothes dryers until mid-day or after 9 p.m., when the demand for electricity decreases, and
- Turn off electric equipment and appliances that you do not need or are not using.

"We understand the difficulty of being without electricity for any period of time during the cold weather," said Michael J. Kormos, PJM senior vice-president. "That's why we first take steps that have the least effect on electric customers. However, given today's situation, we had to direct regional utilities to conduct controlled electricity interruptions for some customers. These short outages assist us in preserving continued operation of the power supply system."

During a rotating power outage, electric service is interrupted to some customers for a relatively short time. The outage can last 15 minutes to one hour depending on the requirements of the local utility's system. At the end of that time, service is restored to the affected customers. It is then interrupted to a different group of customers. In effect, the controlled power interruptions share limited power supplies among all customers. The procedure prevents the failure of the entire electric power supply system.

PJM will continue to monitor conditions and request the public's assistance as necessary.



PJM is communicating about the situation with state government officials throughout the region. PJM's region includes all or parts of Delaware, Indiana, Illinois, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM is coordinating efforts among generators, power suppliers and local utilities.

###

## Level 4 Statement for Hot Weather Emergency (H4)

### Purpose and Procedures:

This emergency statement is issued when rotating power outages are ordered. Additional, immediate load reductions are needed.

PJM would issue the level 4 statement first to the communications departments of SOS-T members by e-mail and alert them via the All Call system – indicating both times whether the statement applies to all of PJM or a specific region or zone. Then, PJM Corporate Communications would conduct a conference call with SOS-T member communicators. Immediately following the conference call, PJM will issue a level 4 news release to the news media.

### H4 Statement:

Because of extremely high demand for electricity, (*name of local control center*) has begun brief, temporary rotating power outages to avoid wide-spread problems. (*Name of local control center*) took this action at the direction of PJM Interconnection, the electric power grid operator for the region. Hot weather has pushed the use of electricity beyond available supplies.

During a rotating power outage, electric service is interrupted to some customers for up to (*amount of time per local control center's procedure*). At the end of that time, service is restored to them and interrupted to a different group of customers. In effect, the controlled power interruptions share limited power supplies among all customers. The procedure prevents the failure of the entire electric power supply system.

Immediate reductions in electricity use are urgently needed. (*Name of local control center*) and PJM urge all customers to reduce electricity use as much as is safely possible. Simple steps include:

- As health permits, turn off electric appliances and equipment that you do not need or are not using.
- Set thermostats higher than usual, if health permits.

Customers should be prepared for electric service outages. Check the backup power of electric-powered medical equipment. Check battery operated radios and flashlights.

## **Level 4 DRAFT News Release for Hot Weather Emergency (H4)**

### **EXTREME ELECTRICITY DEMAND FORCES ROTATING POWER OUTAGES IN PJM**

*Grid Operator Says Voluntary Reductions in Electricity Use  
Urgently Needed Because of Heat Wave*

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electric grid operator for more than 51 million people in 13 states and the District of Columbia, has directed the area's utilities to temporarily interrupt electricity service to customers. PJM said substantial cutbacks in electricity use are urgently needed.

The brief rotating power outages and request for conservation affect (*the entire PJM region / names of transmission zones*).

The extremely hot weather has pushed demand for electricity in the area beyond available supplies. The rotating power outages help prevent the failure of the region's entire electric power supply system.

PJM said that consumers' conservation efforts make a vital contribution to meeting the region's power supply needs.

The company requests that, if health permits, customers reduce their use of electricity today when overall use is highest – primarily between 3 p.m. and 7 p.m. Simple conservation steps include:

- Close curtains and blinds to keep out the sun and retain cooler air inside,
- Postpone using major household electric appliances such as stoves and clothes dryers until the cooler evening hours,
- If health permits, set air conditioner thermostats higher than usual, and
- Turn off electric appliances and equipment that you do not need or are not using.

"We understand the difficulty of being without electricity for any period of time during this hot weather," said Michael J. Kormos, PJM senior vice-president.. "That is why we first take steps that have the least effect on electric customers. However, given today's situation, we had to direct regional utilities to conduct controlled electricity interruptions for some customers. These short outages assist us in preserving continued operation of the power supply system."

During a rotating power outage, electric service is interrupted to some customers for a relatively short time. The outage can last 15 minutes to one hour depending on the requirements of the local utility's system. At the end of that time, service is restored to the affected customers. It is then interrupted to a different group of customers. In effect, the controlled power interruptions share limited power supplies among all customers. The procedure prevents the failure of the entire electric power supply system.

PJM will continue to monitor conditions and request the public's assistance as necessary.



PJM is communicating about the situation with state government officials throughout the region. PJM's region includes all or parts of Delaware, Indiana, Illinois, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM is coordinating efforts among generators, power suppliers and local utilities.

###



## Statements for Exiting Emergency Conditions

### Purpose and Procedures:

Exit statements (post-level statements) inform SOS-T member communications departments that system conditions have improved and that an emergency action has been canceled. Member communicators can appropriately shape their messages to the public and their customers. The post-level 1 message is **not** issued directly to the news media. PJM would issue news releases to announce the end of other, higher emergency actions.

PJM would issue the post-level messages first to the communications departments of SOS-T members by e-mail and alert them via the All Call system – indicating both times whether the message applies to all of PJM or a specific region or zone. Then, if appropriate, PJM Corporate Communications could conduct a conference call with SOS-T member communicators. PJM also will issue news release for post-level 2 and above.

### Post-level 1 Advisory

PJM Interconnection has canceled the level 1 **advisory** message. Electric power supplies and demand are expected to be balanced. PJM no longer anticipates calling on the public to reduce electricity use because of power supply conditions.

### Post-level 2 Advisory

PJM Interconnection has canceled the level 2 statement. PJM is no longer requesting the public to reduce electricity use because of power supply conditions.

This message applies to (*all of PJM / names of PJM transmission zones*).

### Post-level 3 Advisory

PJM Interconnection has canceled the level 3 statement. The voltage reduction has ended. PJM instructed regional utilities to return voltages to normal levels at (*time*).

This message applies to (*all of PJM / names of PJM transmission zones*).

### Post-level 4 Advisory

PJM Interconnection has canceled the level 4 statement. PJM has instructed regional utilities to end rotating power outages.

This message applies to (*all of PJM / names of PJM transmission zones*).

## **Post-level 2 DRAFT News Release for Exiting Weather Emergency**

### **PJM ENDS SPECIAL CALL TO CONSUMERS TO CONSERVE ELECTRICITY**

(Valley Forge, Pa. – Date) – PJM Interconnection, the electric grid operator for more than 51 million people in 13 states and the District of Columbia, has ended its special request for the public to conserve electricity. The call to reduce electricity use was prompted by the (*intense heat wave/extremely cold weather*).

The request to reduce electricity use had applied (*throughout PJM / in names of transmission zones*).

PJM thanked consumers for their conservation of electricity and added that wise use of energy was always prudent. PJM said conservation had been important in meeting power supply needs.

*PJM Interconnection ensures the reliability of the high-voltage electric power system serving 51 million people in all or parts of Delaware, Indiana, Illinois, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM coordinates and directs the operation of the region's transmission grid; administers a competitive wholesale electricity market, the world's largest; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion. Visit PJM at [www.pjm.com](http://www.pjm.com).*

###

## **Post-level 3 DRAFT News Release for Exiting Weather Emergency**

### **PJM ENDS VOLTAGE REDUCTION**

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electricity grid operator for more than 51 million people in 13 states and the District of Columbia, has canceled the voltage reduction it ordered. PJM had ordered utilities to reduce voltage to meet the extremely high demand for electricity during (*intense heat/frigid temperatures*). PJM also has canceled its request to consumers to reduce their use of electricity.

The voltage reduction and request for special conservation had applied to (*the entire PJM region / in names of transmission zones*).

The 5 percent voltage reduction ended at (*time*) (*EDT/EST*). The request to reduce the use of electricity ended at (*time*) (*EDT/EST*).

PJM thanked consumers for their conservation of electricity and added that wise use of energy was always prudent. PJM said conservation had been important in meeting power supply needs.

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###

## **Post-level 4 DRAFT News Release for Exiting Weather Emergency**

### **PJM ENDS ROTATING POWER OUTAGES**

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electric grid operator for more than 51 million people in 13 states and the District of Columbia, has ended its order to utilities to temporarily interrupt electricity service to customers. Their electricity service should resume to normal.

Substantial cutbacks in electricity were required because extremely (*hot/cold*) weather had pushed demand for electricity in the area beyond available supplies. The brief rotating power outages helped prevent the failure of the region's entire electric power supply system.

The rotating power outages had occurred in (*the entire PJM region / names of transmission zones*).

"We appreciate electricity customers' patience during the rotating outages, said Phillip G. Harris, PJM president and chief executive officer. "We well understand the difficulty of being without electricity for any period of time especially with current temperatures. These short outages helped us keep the regional power supply system in operation."

During a rotating power outage, electric service is interrupted to some customers for a relatively short time. The outage can last 15 minutes to one hour depending on the requirements of the local utility's system. At the end of that time, service is restored to the affected customers. It is then interrupted to a different group of customers. In effect, the controlled power interruptions share limited power supplies among all customers. The procedure prevents the failure of the entire electric power supply system.

The rotating power outages were ordered at (*time*) (*EDT/EST*) and ended at (*time*) (*EDT/EST*).

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## Attachment B: Teleconference Protocol Guidelines

Conference calls should be as brief as possible with only issues requiring immediate attention being discussed.

- Each committee should designate an official leader for all conference calls, typically the chairman of the committee.
- Conference calls should be conducted from a quiet location. Side conversations should be prohibited to prevent distractions during calls. Conference call participants should utilize phone muting capabilities, avoid the use of cell phones whenever possible, and avoid placing the conference call on hold.
- When conference calls are conducted as joint calls between committees, there should be a clear understanding of who the spokes person is for each company.
- The leader should communicate an Agenda to the members prior to the call if time permits. Otherwise, at the start of the meeting, the leader should announce the Agenda and ask for additional Agenda items. It should be made clear that once the Agenda is finalized, only items on the Agenda will be discussed.
- Status information, spreadsheets, or other text to be discussed during the conference call should be e-mailed or faxed to participants prior to the call with sufficient lead time to allow for delivery and review.
- Issues not relating to the group as a whole should be handled by a separate communication between the involved parties.
- Committee members should make every attempt to enter the conference call by or prior to the specified time of the call. The start of the call should not be delayed waiting for participants to join.
- At the start of the call, the leader will initiate a roll call. At this time, it is the responsibility of the individual committee members to announce and introduce any guests that will be on the call.
- Guests should channel all comments through the committee members unless asked to address a certain issue.
- All speakers should identify themselves when speaking
- It is the leader's responsibility to encourage participation by all, while at the same time keeping the meeting on track.
- Silence does not necessarily indicate agreement. When voting on issues, the leader should poll each committee member. It should be predetermined how much agreement is needed on an issue for its approval.
- The meeting should be summarized by the leader highlighting all decisions, action items and priorities. The next conference, if needed, should be set up at this time.
- In crisis situations, action items resulting from the conference call should be sent to all committee members as soon as possible following the end of the call. In routine situations, minutes should be sent out by the end of the following day.
- Use muting capability when not speaking.

- Avoid cell phones, if possible.
- Do not place call on hold.

Draft Agenda Template for Transmission calls:

Roll Call

- Solicit additions to Peak Load Conference Call Agenda during role call

Summary of System Conditions

- Summary of Previous Days operations (optional)
  - Problem areas
  - Emergency Procedures
- Current Day Operations
  - Weather Projections / fronts
  - SSR Information (Load/Capacity/Reserves)
  - Interchange projections
  - Transmission Constraints
  - Voltage Profile
  - Current Emergency Procedures
  - Projected Emergency Procedures
- External System Conditions
- Future Day (s) Operation Projections
  - Weather Projections / fronts
  - SSR Information (Load/Capacity/Reserves)
  - Transmission Constraints
  - Projected Emergency Procedures
- Summary of PJM operating Strategy
- As needed – additional tasks to be coordinated between PJM transmission owners and neighbors to facilitate emergency operations to include:
  - Public appeals
  - Fuel supply and restrictions (environmental, etc.)
  - Load management
  - Government requests and notifications
  - Communications with other PJM operating entities, members and neighbors
- Future Conference Call Times



- Additional agenda Items

#### Roll Call

- Additional Company Concerns
- Agreement with PJM Operating Strategy
- Agreement on future Conference Calls





## Attachment C: Supplementary Status Report

### PJM SUPPLEMENTARY STATUS REPORT INFORMATION FOR:

(CONTROL CENTER NAME)

Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Time: \_\_\_\_ : \_\_\_\_

Completed By:

Phone #:

Values are to be completed for the time requested by PJM Dispatcher

#### PART A: Instantaneous Capacity Check

**NOTE:** Only generation that is synchronized, Hydro and CTs less than 10 minutes, and applicable Resource limited units reported in Part G should be included in this section.

		Nuclear		Fossil		Hydro		CT/Diesel
On Cost Capacity	A		C		E		F	
Maximum Emergency Capacity	B		D				G	

#### PART B: Energy Loaded

	Nuclear		Fossil		Hydro		CT/Diesel

#### PART C: Full Emergency Load Response and Inter. /Curtail. Customers

PJM Step 1 Time > 1 Hour	H		Other Load Management		
PJM Step 2 Time < 1 Hour	I				
Time to Implement Step 1	L				
Total MW Interrupted so far	M				

PJM Phone Number: 610-666-8810

PJM Fax Number: 610-666-4287

**Exhibit 6: Supplementary Status Report Information Reported by PJM Members - Page 1**



<b>PJM SUPPLEMENTARY STATUS REPORT</b>				
<b>INFORMATION FOR: _____ (CONTROL CENTER NAME)</b>				
<b>Date:</b> ____ / ____ / ____			<b>Time:</b> ____ : ____	
<b>Completed By:</b> _____			<b>Phone #:</b> _____	
<b>Values are to be completed for the <i>time requested</i> by PJM Dispatcher</b>				
<b>PART E: Changes to Capacity Reported in PART A</b> (Example: Unit to start outage, Unit reduced due to outage, etc.) <b>ANY CHANGE IN NEXT 24 HOURS (No Minimum MW)</b> <b>ANY CHANGES &gt; 300 MW WITHIN 72 HOURS</b>				
<b>Unit Name</b>	<b>Old Capacity</b>	<b>New Capacity</b>	<b>Expected Date</b>	<b>Expected Time of Change</b>
<b>PART F: Additional Capacity Expected and CT's &gt; 10 minutes</b> (Example: Unit scheduled to synchronize later in the day, CT's that were <u>NOT</u> included in Part A) <b>NOTE: Please identify ME Units in the Expected Time to Synchronize column</b> <b>EXPECTED GENERATION THAT WAS NOT REPORTED IN PART A</b>				
<b>Unit Name</b>	<b>Capacity</b>	<b>Date</b>	<b>Expected Time to Synchronize</b>	

**Exhibit 7: Supplementary Status Report Information Reported by PJM Members - Page 2**

**PJM SUPPLEMENTARY STATUS REPORT**  
**INFORMATION FOR:** \_\_\_\_\_

\_\_(CONTROL CENTER NAME)

**Date:** \_\_\_\_/\_\_\_\_/\_\_\_\_

Time: \_\_\_\_\_:\_\_\_\_\_

**Completed By:**

**Phone #:**

Values are to be completed for the *time requested* by PJM Dispatcher

**PART G: Resource Limited Unit (Any unit with less than 72 hours at maximum capacity)**

**NOTE: Resource limited units should be placed under the appropriate category in PART A, if applicable. Notify the Scheduling Coordinator immediately if a Steam unit has < 32 hours or Oil, Kerosene, or Diesel CT's has < 16 hours available or Gas CT's has < 8 hours**

[illegible]

Exhibit 8: Supplementary Status Report Information Reported by PJM Members - Page 3

[illegible]

Exhibit 9: Supplementary Status Report Information Reported by PJM Members - Page 4

## Supplementary Status Report Terminology

The objective of the Supplementary Status Report (SSR) is to get an instantaneous “snapshot” of the PJM RTO generating capacity, Full Emergency Load Response, and fuel limitations. Each PJM Member is obligated to provide information for all requested sections that apply to them.

This information can be forwarded to PJM either by facsimile to PJM Control Room or by telephone to PJM Scheduling Coordinator.

The Supplementary Status Report will be used by PJM to perform an analysis and prepare a capacity/load/reserve projection when the potential exists for a serious PJM bulk power emergency.

This document is designed to provide members with a common reference for defining terms used on the PJM Supplementary Status Report. The definitions below are organized in the same order as the terms are listed on the Supplementary Status Report.

### Part A: Instantaneous Capacity Check

When PJM Dispatcher requests a Supplementary Status Report, a time will be specified for providing the information on the report. In Part A, **the synchronized capacity** for all units should be broken down by the specified categories of “on cost” and maximum emergency.

- Hydro and CT/Diesel Units that can be started and synchronized within ten minutes of the time specified are to be considered instantaneous capacity.

The intent of Part A is to provide PJM with an accurate “real-time” picture of the **actual available capacity**. Part A should only include the actual available capacity at the specified time. If any part of the capacity is unavailable for any reason, (i.e. start failure, partial de-rating, etc.) that capacity **should not** be included in Part A but reported in Part E: Capacity Changes.

The categories of capacity are defined as follows:

**Nuclear Capacity:** Any nuclear unit synchronized at the time of the Supplementary Status Report. The net capacity of all nuclear units should be broken down by:

Line A - **On cost:** All capacity that will be loaded following economic dispatch.

Line B - **Max Emergency:** The total amount of capacity classified as Maximum Emergency generation. This is the amount above economic (on cost) generation that will load if PJM requests Max Emergency.

**Fossil Capacity:** Any unit synchronized that is classified as a fossil unit (including combined cycles) at the time of the Supplementary Status Report. The net capacity of all fossil units should be broken down by:

Line C - **On-cost:** All capacity that will be loaded following economic dispatch.

Line D - **Max Emergency:** The total amount of capacity classified as Maximum Emergency generation. This is the amount above economic (on cost) generation that will load if PJM requests Max Emergency.

**Hydro Capacity:** Any unit that is classified as a Hydro unit (including pumped storage and run of river) at the time of the Supplementary Status Report. The net capacity of all hydro units should be broken down by:

Line E - **On-cost:** All capacity that will be loaded following economic dispatch.

**CT/Diesels Capacity:** Any unit synchronized that is classified as a CT or diesel unit at the time of the Supplementary Status Report. The net capacity of all CT/Diesel units should be broken down by:

**Note:** Hydro and CT/Diesel Units that can be started and synchronized within ten minutes of the time specified are to be considered “on cost”.

Line F - **On-cost:** All capacity that will be loaded following economic dispatch.

Line G - **Max Emergency:** The total amount of capacity classified as Maximum Emergency generation. This is the amount above economic (on cost) generation that will load if PJM requests Max Emergency.

## Part B: Energy Loaded

Part B allows members to inform PJM of the total amount of energy already loaded at the time of the Supplementary Status Report. This includes all energy classified as On-cost and Max Emergency.

## Part C: Full Emergency Load Response and Interruptible/Curtailable Customers

Part C of the Supplementary Status Report contains information regarding the relief available and the time required to implement the Active Load Management and Interruptible and Curtailable Customer programs.

Line H - **OI Step 1:** The amount of load relief under Step 1: Load Management Long Lead Time (LM LLT).

Line I - **OI Step 2:** The amount of load relief under Step 2: Load Management Short Lead Time (LM SLT).

Line J – **Time to Implement Steps 1 (LM LLT):** The longest amount of time that it will take to obtain the entire load relief reported on LM LLT.

Line K - **Total MW interrupted so far:** Any portion of lines H-K that has already been realized at the time of the Supplementary Status Report.

Line L – **Other Load Management Programs:** Amount of company Load Management not offered in PJM LM programs.

**NOTE:** Companies, who use temperature in value determination, should use the projected temperature at the peak.

## Part E: Capacity Changes to Part A Capacities

Part E of the Supplementary Status Report allows members to inform PJM of any capacity changes to those units that were included in Part A. Any change in **actual available capacity** reported in Part A (no minimum MW limit) in the following **24-hours** and any change larger than **300 MW** for the **next 72-hours** should be reported. The reported changes will allow PJM Dispatcher to determine accurate forecast of expected capacity in the specified Operating Day(s).

The headings are as follows:

**Name:** The name of the unit(s) that are expected to change available capacity.

**Old Capacity:** Capacity as reported in Part A.

**New Capacity:** The expected capacity of the unit(s).

**Date:** The date the change is expected to be completed.

**Time:** The time the change is expected to be completed.

## Part F: Expected Additional Capacity:

Part F of the Supplementary Status Report allows members to update PJM on units that are expected to synchronize to the system to provide additional capacity for the specified Operating Day. Expected time to synchronize is in reference to the actual clock time that the unit is expected to synchronize. Please indicate ME for Max Emergency units in the "Expected Time to Synchronize" column. Changes to those units whose capacities were reported in Part A, should not be included in this section, but rather in Part E. Part F should also include CT's that take longer than 10 minutes to synchronize. If there are numerous CT's in this category (non quick start), they may be totaled and reported together as a single entry.

## Part G: Resource Limited Units

Part G of the Supplementary Status Report allows members to update PJM on units that currently have a limited resource (fuel, water, etc.) amount. The definition for determining if a unit is resource limited is when it is not capable of running at its rated capacity for more than 72 hours. Resource Limited Units should also be placed in Part A under their appropriate category, if applicable. Generally, resource limited units should be placed in Max Emergency to preserve them for the time they will be most needed. If a steam unit with less than 32 hours (at maximum capacity) of resources in current inventory, or a Oil, Kerosene, or Diesel combustion turbine with less than 16 hours (at maximum capacity) or a gas fired combustion turbine with less than 8 hours of resources in current inventory is bid into or running for PJM, and a Cold Weather or Hot Weather Alert has been issued, the unit must be placed in Max Emergency, unless directed otherwise by PJM Dispatch. The PJM Scheduling Coordinator should also be notified by phone (610 666-8809) when a unit has reached this status. Additional information on the operation of fuel limited units is found in Section 5 of this Manual. The headings for Part G are as follows:

**Unit Name:** The name of the unit(s) (units with shared resource supplies should be listed together) that are considered resource limited.



**Fuel Type**

**Maximum Capacity:** The current maximum capacity of the unit(s).

**Emergency Minimum:** If a unit cannot cycle due to uncertainty of starting up again, Emergency Minimum must be included with a note in the Comments section.

**Current Energy:** Current MW output.

**Total Burn Hours Remaining:** Total burn hours remaining with unit at max capacity from the time the SSR was called.

**Comments:** If a unit is limited for a resource other than the fuel, this should be noted in this column as well as any other pertinent information on the unit.



PJM MAXIMUM GENERATION REPORT FOR:		Date:		Time:	
	RSC Capacity	SSR Capacity	Capacity Changes	Bias	Adjusted Capacity
<b>Nuclear Capacity</b>					
A.) On Cost					
B.) Maximum Emergency					
<b>Fossil Capacity</b>					
C.) On Cost					
D.) Maximum Emergency					
<b>Hydro Capacity</b>					
E.) On Cost					
<b>C.T. / Diesel Capacity</b>					
F.) On Cost					
G.) Maximum Emergency					
<b>TOTALS</b>					
EXPECTED CAPACITY					
PURCHASES					
RESOURCE LIMITED MW					
SALES					
LOAD ESTIMATE					
ESTIMATED RESERVE					
RESERVE REQUIREMENT					
UNSCHEDULED AVAILABLE CAPACITY					
<b>ADDITIONAL COMMENTS:</b>					

NET SUMMER  
INSTALLED  
CAPACITY =

**Exhibit 10: PJM Maximum Generation Report - Page 1 of 2**



COMPANY DATA																
	AETS	PS	PE	PL	WPS	BC	FE	Reliant Energy	EMMT	PEPCo	Mirant	AE	DPL	SH	JO	PJM Total
<b>Nuclear Capacity</b>																
A.) On Cost																
B.) Maximum Emergency Energy Loaded (-)																
<b>Fossil</b>																
C.) On Cost																
D.) Maximum Emergency Energy Loaded (-)																
<b>Hydro</b>																
E.) On Cost																
Maximum Emergency Energy Loaded (-)																
<b>C.T. / Diesel</b>																
F.) On Cost																
G.) Maximum Emergency Energy Loaded (-)																
<b>LM</b>																
H.) Step 1 Time > 1 Hour																
I.) Step 2 Time < 1 Hour																
J.) Time to Implement Step 1																
K.) Total MW Interrupted so far																
L.) Other Company Load Management Programs																

**Exhibit 11: PJM Maximum Generation Report - Page 2 of 2**



<b>PJM SYSTEM STATUS REPORT – FORCASTED SYSTEM CONDITIONS</b>				
<b>TO: PJM System Operations Subcommittee</b>				
<b>Cc: M. Kormos R. Dotter Member Relations Department</b>				
	<b>(Yesterday)</b> mm/dd/yy	<b>(Today)</b> mm/dd/yy	<b>(Day 1)</b> mm/dd/yy	<b>(Day 2)</b> mm/dd/yy
<b>Economic Internal Capacity</b>				
<b>Maximum Emergency Generation</b>				
<b>Generation Returning</b>				
<b>Internal Generation</b>				
<b>External Transactions</b>				
<b>Forecasted Unavailable</b>				
<b>Adjusted Capability</b>				
<b>Load Estimate</b>				
<b>Expected Peak Hour</b>				
<b>Reserve, Using Economic Generation</b>				
<b>Reserve, with ME Generation</b>				
<b>Estimated Full Emergency Load Response</b>				
<b>Estimated Reserve, with Active Load Management</b>				
<b>Operating Reserve Objective</b>				
<b>Temperature at PHL</b>				
<b>Effective / THI</b>				
<b>Notes:</b>				
At this time, no OC & SOS conference call is scheduled. If system conditions change, you will be notified via the PJM All-Call of any scheduled conference calls.				

**Exhibit 12: PJM System Status Report - Page 1 of 3**



PJM SYSTEM STATUS REPORT – Forecasted System Conditions – PART B									
SIGNIFICANT EVENTS & EMERGENCY PROCEDURES NOW IN EFFECT:						CURRENT LOAD			
PROCEDURE	IN EFFECT		CANCELLED			_____ MW (integrated for hour ending HHMM) _____			
	Date	Time	Date	Time		TRANSACTION LIMITS (as of HHMM)			
Cold Weather Alert									
Hot Weather Alert							Actual Flows	Limit	
Maximum Emergency Generation Alert						East	MW		MW
Primary Reserve Alert						Central	MW		MW
Voluntary Customer Load Curtailment Alert						West	MW		MW
Primary Reserve Warning						BC/PEP	MW		MW
Voltage Reduction Warning / Reduction of Plant Load						Bedngtn - BlkOak	MW		MW
Manual Load Dump Warning						AP South	MW		MW
						PJM HOURLY INTEGRATED LOADS*			
Maximum Emergency Generation						Hour	Yesterday	Today	
Curtailment of PJM Controlled Interruptibles						Ending	mm/dd/yy	mm/dd/yy	
Curtailable Customer Load						01			
Voltage Reduction						02			
Curtailment of Non-Essential Building Load						03			
Voluntary Customer Load Curtailment						04			
Radio and TV Load Curtailment Appeal						05			
Manual Load Dump						06			
						07			
Full Emergency Load Response (PJM Totals)						08			
MW Curtailed So Far	MW					09			
MW Still to Curtail	MW					10			
						11			
	Firm MW	Emergency	Other			12			
AEP to PJM						13			
DLCO to PJM						14			
FE(CEI) to PJM						15			
NYISO to PJM						16			
VAP to PJM						17			
PJM to AEP						18			
PJM to DLCO						19			
PJM to FE(CEI)						20			
PJM to NYISO						21			
PJM to VAP						22			
						23			
						24			
*These loads are hourly integrated loads based on telemetered data, NOT the official PJM LDC load data.									

Exhibit 13: PJM System Status Report - Page 2 of 3



**PJM SYSTEM STATUS REPORT – Forecasted System Conditions – PART C**  
**This Report is as of (HH/MM):**

**Status of PJM On-Line Generating Resources**

(This is a blurb indicating any units that have limitations or problems that may have an impact on system operation.)


**Condition of Outside Pools / Companies**


(This is a blurb listing any information on outside pools including alerts and limitations.)


**Exhibit 14: PJM System Status Report - Page 3 of 3**



## Attachment D: Emergency Bid Form

### Emergency Bid Form

 <i>Working to Perfect the Flow of Energy</i>		<b>Emergency Energy Bid Form</b>		<b>For Internal Use</b>
		Voice: (610) 666 - 4505 Fax: (610) 666 - 4287	Phone: _____ ID: _____	
Date: _____				
Company: _____				
Representative: _____				
Phone: (____) ____ - ____, Ext: _____				
Control Area/Interface through which the power is being delivered: _____				
NYPP Identifier (if applicable): _____				
Full Path (including supplier, wheelers, marketers, brokers, receiver)				
<sup>1</sup> Notification time to accept: _____				
Minimum Run Time: _____				
<b>From – To HHMM-HHMM</b>		<b>Emergency Energy Available to Deliver (MW)</b>		<b>Bid Price of Energy (\$/MWh)</b>
<b>For Capacity Backed only:</b>				
<b>EES ID</b>	<b>From – To HHMM-HHMM</b>	<b>Capacity Backed Available to Cut (MW)</b>	<b>Bid Price of Energy (\$/MWh)</b>	
	-			
	-			
	-			
<sup>1</sup> Minimum time required to start the energy flowing into PJM.				

**Exhibit 15: Emergency Bid Form**



## **Rules for submitting an Emergency Energy Bid Form**

- Submitter must verify, by telephone, that the bid was received by PJM, otherwise the bid is invalid.
- Form must be completed fully with valid and complete path.
- No transmission is required from the PJM provider.
- Only one price per bid.
- Only one MW value per bid.
- PJM will evaluate bids based on bid price, notification time, and minimum run time.
- While there are no price caps on emergency bids; however bids cannot set price.
- The fax number the bid is to be submitted to is (610) 666-4287.



## Attachment E: Manual Load Dump Allocation Tables

Winter/Summer Required Manual Load Dump PJM Mid-Atlantic Region															
MW	PS	PE	PPL Zone		BC	GPU	PEPCO Zone		AE	DPL Zone					Rockland
			PPL	UGI			PEPCO	SMECO		DPL	ODEC	DEMEC	Dover	Easton	
%	16.6	14.1	13.8	0.4	12.5	19.8	9.7	1.4	4.3	5.0	1.0	0.4	0.3	0.1	0.6
500	83	71	69	2	63	99	49	7	22	25	5	2	2	1	3
1000	166	141	138	4	125	198	97	14	43	50	10	4	3	1	6
1500	249	212	207	6	188	297	146	21	65	75	15	6	5	2	9
2000	332	282	276	8	250	396	194	28	86	100	20	8	6	2	12
3000	498	423	414	12	375	594	291	42	129	150	30	12	9	3	18
4000	664	564	552	16	500	792	388	56	172	200	40	16	12	4	24
5000	830	705	690	20	625	990	485	70	215	250	50	20	15	5	30

Manual Load Dump Allocation - PJM Mid-Atlantic Region

Winter/Summer Required Manual Load Dump Eastern Portion of PJM Mid-Atlantic Region Only													
MW	PS	PE	PL East	JC	ME East	AE	DPL Zone				Dover	Easton	Rockland
							DPL	ODEC	DEMEC				
%	29.7	25.0	5.0	18.3	1.3	7.6	8.9	1.7	0.7		0.5	0.2	1.1
500	149	125	25	92	7	38	45	9	4		3	1	6
1000	297	250	50	183	13	76	89	17	7		5	2	11
1500	446	375	75	275	20	114	134	26	11		8	3	17
2000	594	500	100	366	26	152	178	34	14		10	4	22

Manual Load Dump Allocation - Eastern Portion of PJM Mid-Atlantic Region

When issuing a Manual Load Dump via the ALL-CALL, the PJM Dispatcher should include the following information in the message:

- (1) Area (PJM Mid-Atlantic Region, Eastern Portion of PJM Mid-Atlantic Region, or a Company)
- (2) Total Megawatts (Companies refer to appropriate table for allocation)
- (3) Allocation Table to be used (if applicable).
- (4) Control Zone allocations will be handled separately based on PJM EMS capacity calculations.

Allocation percentages are based on 2006 Summer and 2005/06 Winter Load Conditions.

### Exhibit 16: Manual Load Dump Allocation Tables

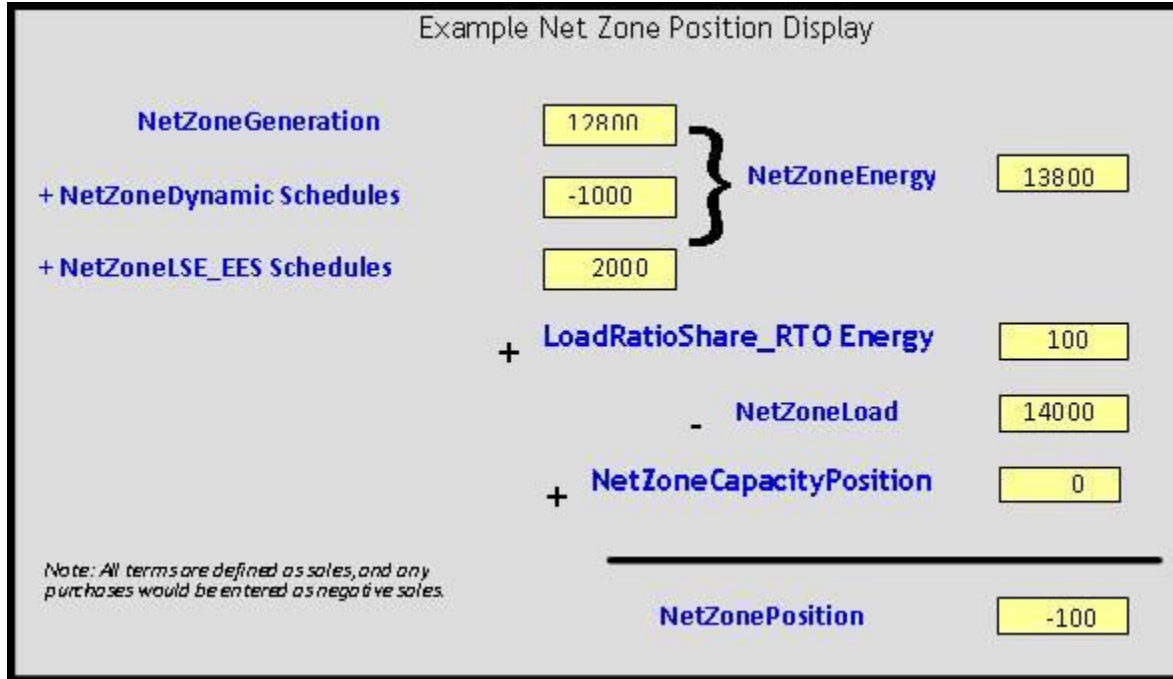
Under capacity deficient conditions, the PJM EMS load dump calculator was modified during market growth to institute changes to the Operating Agreement set forth in Schedule 1, Section 1.7.11 that states that:

(b) To the extent load must be shed to alleviate an Emergency in a Control Zone, the Office of the Interconnection shall, to the maximum extent practicable, direct the shedding of load within such Control Zone. The Office of the Interconnection may shed load in one Control Zone to alleviate an Emergency in another Control Zone under its control only as necessary after having first shed load to the maximum extent practical in the Control Zone experiencing the Emergency and only to the extent that PJM supports other control areas (not under its control) in those situations where load shedding would be necessary, such as to prevent isolation of facilities within the Eastern Interconnection, to prevent voltage collapse or to restore system frequency following a system collapse; *provided, however, **that the Office of the Interconnection may not order a manual load dump in a Control Zone solely to address capacity deficiencies in another Control Zone.*** This paragraph shall be implemented consistent with North American Electric Reliability Council and applicable Reliability Council Standards.

Post market integration but prior to the implementation of RPM, the load dump calculation determined which Control Zone(s) is short based on real-time

Load, energy values from EMS and **capacity values received daily from the Capacity Adequacy Planning Department (Net Zone Capacity Position)**. Real-time energy values are used as a surrogate for available capacity because in a capacity shortage situation all available generation should be loaded to full capacity. Since most of the values used in the load dump calculation are real-time dynamic numbers, the calculation is performed in the PJM EMS. Load Serving Entities were able to designate within eCapacity that capacity resources were being used to serve load in a specific Control Zone. Similarly, EES users are able to specify that an external energy schedule is designated for a specific Control Zone. Resources that are not designated for a specific Control Zone are considered an RTO resource for load dump calculation purposes and allocated across all Control Zones according to load ratio share. Only Control Zones that are determined to be deficient are assigned a share of a load dump request initiated due to RTO capacity deficiencies. If the PJM Mid-Atlantic Region is determined to be deficient, its share is further allocated according to PJM Manual M13, Attachment E.

The calculation follows:



**NetZoneCapacityPosition** is the actual zone daily net unforced capacity position from the PJM eCapacity system).

On June 1<sup>st</sup>, 2007, the PJM RPM market was implemented, for which participating loads generally maintained a 19% reserve margin. With the creation of the RPM market and retirement of the eCapacity Market, the LSE were no longer able to designate capacity resources within eCapacity that were being used to serve load in a specific Control Zone (i.e. NetZoneCapacityPosition).

Effective June 1, 2007, the PJM staff will calculate the NetZoneCapacityPosition based on the RPM Based Residual Auction. This calculation by Control Zone will result in the net capacity purchases/sales and will replace the NetZoneCapacityPosition that was determined by eCapacity on a daily basis.

$$\text{NetZoneCapacityPosition}_{\text{RPM}} = \text{Total RPM Capacity Obligation}_{\text{Control Zone}} - \text{Physical RPM Capacity Cleared}_{\text{Control Zone}}$$

	PJM RTO Total	PJM Mid-Atlantic	AP	AEP	DPL	Duquesne	NI	PJM South Dominion
+ Net Zone Generation	93,900	55,900	10,000				28,000	
+ Net Zone Dynamic Schedules	65	30	85				-50	
+ Active Zone Reserve Share Energy	0	0	0				0	
+ Net Zone LSE EES Schedules	400	3,600	-700				-2,500	
= Net Zone Energy (A)	94,365	59,530	9,385	0	0	0	25,450	0
Net RTO Interchange	600							
Load Ratio Share RTO Energy (B)	-1,600	-1,051	-146	0	0	0	-402	0
+ eCapacity Sales	2,000	1,300	100				600	
- Unavailable Capacity	200	200	0				0	
= Net Zone Capacity Sales (C)	1,800	1,100	100	0	0	0	600	0
Net Zone Load (D)	87,500	57,500	8,000				22,000	
Net Zone Position (A + B - C - D)	3,465	-121	1,139	0	0	0	2,448	0
Number of Control Zones that are Short	1	Short	Excess				Excess	
MW Amount in Zones that are Short	-121							
Desired Load Dump Amount	500							
Load Dump Allocation	500	500	0	0	0	0	0	0

KEY:

	From eCapacity, Manually Entered by Dispatch (once daily)
	From EES
	Manually Entered by Dispatch
	From EMS Telemetry
	Calculated

docs #267656, v1  
kas - 6/2/2004



User: spay on m11p  
at Fri Jan 5 08:36:55 2007

3: PHD - Process/RealTime - PJM Load Shed

Tools

Empower SPECTRUM

Gen Alarm ☐ Crit Alarm ☐ Displ Alarm ☐ Man ED ☐ PJM Null ☐ ED ☐ HydroGen ☐ R M ☐ CompOver ☐ LFC ☐ ED Cmp Cur ☐ ED Cmp ST ☐ ED Cmp Mid ☐

LOAD DUMP ALLOCATION

AGC ☐

	RTO	MID-ATL	AP	AEP	DAY	DLCO	CE	DOM
+ Net Zone Generation	82971	31653	5805	16995	2695	2498	15887	7436
+ Net Zone Dynamic Schedules	-389	-296	0	-53	-207	0	40	127
+ Active Zone Reserve Share Energy	0	0	0	0	0	0	0	0
+ Net Zone LSE EES Schedules	10	0	0	0	10	0	0	0
+ Load Share Ratio RTO Energy Schedules	-676	-277	-48	-136	-18	-14	-99	-84
- Net Zone Load	81918	33509	5778	16490	2235	1715	11988	10203
= Net Zone Energy Position (A)	-3	-2428	-20	315	244	769	3841	-2724
Net Zone Capacity Position (B)	3969	1241	476	867	822	1	512	50
Net Zone Position (A + B)	3966	-1187	456	1182	1066	770	4353	-2674
Zone Positions		SHORT	EXCESS	EXCESS	EXCESS	EXCESS	EXCESS	SHORT
Desired Load Dump Amount	500							
Load Dump Allocation		154	0	0	0	0	0	346
+ EES Net Capacity Backed Purchases	-554							
- eCapacity Net External Cap Purchases	-2073							
Net Unloaded Capacity Transactions	1519							

Cancel

Jan 05 2007 08:36:59

## Attachment F: PJM Manual Load Dump Capability

PJM Manual Load Dump Capability							
	1	2	3	4	5	6	7
TO	2008 Summer System Peak Load Est. (MW)	Maximum Manual Load Shedding Capability based on System Peak Load Estimate (MW)	Load Shed Cap (%) (% = #2 ÷ #1)	Overlap of Load Shedding and Under frequency Loads (MW)	Overlap of Load Shedding and Under frequency Loads (%) (Percent = #4 ÷ #2)	Manual Load Shedding if Under frequency relays have operated (MW) (MW = #2 - #4)	Manual Load Shedding if Under frequency relays have operated (%) (Percent = #6 ÷ #1)
PS	10967	2259	20.60%	746	33.02%	1513	13.80%
PE	8759	1350	15.41%	362	26.81%	988	11.28%
PPL	7292	4010	54.99%	1743	43.47%	2267	31.09%
BC	7344	3368	45.86%	694	20.61%	2674	36.41%
JC	6478	1950	30.10%	759	38.92%	1191	18.39%
ME	2929	1845	62.99%	554	30.03%	1291	44.08%
PN	2850	1881	66.00%	550	29.24	1331	46.70%
PEPCO	6199	3518	56.75%	2001	56.88%	1517	24.47%
SMECO	858	295.9	34.49%	114.2	38.59%	181.8	21.18%
AE	2829	1296	45.81%	398	30.71%	898	31.74
DPL	3426	1003	29.28%	399	39.78%	604	17.63%
ODEC-DPL	630	156	24.76%	0	0.00%	156	24.76%
DEMEC	245	30	12.24%	0	0.00%	30	12.24%
Easton	61.9	27.3	44.10%	5	18.32%	22.3	36.03%
UGI	197	197	100.00%	60	30.46%	137	69.54%
RECO	435	435	100.00%	137.4	31.59%	297.6	68.41%
AP	8688	2002	23.04%	301	15.03%	1701	19.58%
DOM	17890	11815	66.04%	5557	47.03%	6258	34.98%
ODEC-DOM	1789	929	51.93%	0	0.00%	929	51.93%
NCEMCDOM	311.7	0	0.00%	0	0.00%	0	0.00%
AEP	23939	5136	21.45%	2612	50.86%	546	2.28%
DLCO	2942	1458.9	49.59%	773.1	52.99%	685.1	23.31%
DAY	3597	287.8	8.00%	20.7	7.19%	267.1	7.43%
ComEd	23654	23654	100%	8025	33.93%	15628	66.07%
<b>TOTAL</b>							

Exhibit 17: PJM Manual Load Dump Capability

Note: Control Zone Underfrequency Settings as follows:

Mid-Atlantic: 59.3, 58.9, 58.5 Hz @ 10% increments

Western Control Zone: 59.5, 59.3, 59.1, 58.9, and 58.7 Hz @ 5% increments

ComEd: 59.3, 59.0 and 58.7 Hz @ 10% increments

Dominion: 59.3, 59.0 and 58.5 Hz @ 10% increments.



## Attachment G: Capacity Emergency Matrix

Procedure	PJM Actions	Company Actions	Comments
<b>Step 1:</b> <b>Full Emergency Load Response</b> <b>Formerly known as Active Load Management (ALM)</b> <b>– Long Lead</b>	<p>Load Management Curtailment, Step 1 requires LSE's or their agent to implement LM.</p> <p>Issues a system-wide or Control Zone specific Public/Media Notification Message C-2 or H-2</p> <p>Issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone or Scarcity Pricing Region(s) if transmission limitations exist.</p> <p><b>Notifications:</b> PJM management, PJM public information personnel, members via All-Call and Emergency Procedures Posting Application, and other Control Areas/Reliability Coordinator through the RCIS.</p>	<p>Member dispatchers implement load management programs.</p> <p><b>Notifications:</b> Notify management and governmental agencies, as applicable.</p> <ul style="list-style-type: none"> <li>•</li> </ul>	
	<p>Issue EEA 2 via RCIS</p>		
<b>Step 2:</b> <b>Full Emergency Load Response –</b> <b>Formerly known as Active Load Management (ALM)</b> <b>– Short Lead</b>	<p>Load Management Curtailment, Step 1 requires LSE's or their agent to implement LM.</p> <p>Issues a system-wide or Control Zone specific Public/Media Notification Message C-2 or H-2</p> <p>Issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone or Scarcity Pricing Region(s) if transmission limitations exist.</p> <p><b>Notifications:</b> PJM management, PJM public information personnel, members via All-Call and Emergency Procedures Posting Application, and other Control Areas/Reliability Coordinators through the RCIS.</p>	<p>Member dispatchers implement load management programs.</p> <p><b>Notifications:</b> Notify management and governmental agencies, as applicable.</p> <ul style="list-style-type: none"> <li>•</li> </ul>	
	<p>Issue EEA 2 via RCIS</p>		

<b>Step 3: Primary Reserve Warning</b>	<p>Primary Reserve Warning issued stating the amount of adjusted primary reserve capacity and the requirement.</p>	<p>Generation dispatchers prepare to load all available primary reserve, if requested.</p>
	<p>PJM Dispatcher:</p> <ul style="list-style-type: none"> <li>rechecks with members to assure that all available equipment is scheduled and that requested secondary reserve is brought to primary reserve status</li> <li>ensures that all deferrable maintenance or testing on the control and communications systems has halted at PJM Control Center.</li> </ul>	<p>Transmission / Generation dispatchers ensure that all deferrable maintenance or testing affecting capacity or critical transmission is halted. Any monitoring or control maintenance work that may impact operation of the system is halted.</p>
	<p>Issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone or Scarcity Pricing Region(s) if transmission limitations exist.</p>	<p>PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.</p>
	<p><b>Notifications:</b> PJM management, PJM public information personnel, members via All-Call and Emergency Procedures Posting Application, and other Control Areas through the RCIS.</p>	<p><b>Notifications:</b> Notify management and advise all stations and key personnel.</p>

<p><b>Step 4 A Maximum Emergency Generation Action</b></p>	<p>Maximum Emergency Generation Action issued.</p> <p>Issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone or Scarcity Pricing Region(s) if transmission limitations exist.</p> <p>implement the Emergency Bid-Process,</p> <p>suspend Regulation on all units, except hydro generation.</p> <p>recalls off-system capacity sales that are recallable (network resources).</p> <p>declare Maximum Emergency Generation and begins to load Maximum Emergency Generation or purchase available emergency energy</p> <p>PJM dispatchers generally load Maximum Emergency CTs prior to loading Maximum Emergency Steam in order to preserve spinning reserve.</p> <p>PJM initiates scarcity pricing based on loading of Maximum Generation or acceptance of Emergency Energy Purchases.</p>	<p>Generation dispatchers: suspend regulation, as requested, and load all units to the Maximum Emergency Generation level, as required.</p> <p>notify PJM dispatching of any Maximum Emergency (ME) generation loaded prior to PJM requesting ME generation is loaded.</p> <p>PJM Marketers recall off-system capacity sales that are recallable as directed by PJM dispatchers.</p> <p><b>Notifications:</b> Notify management.</p>
<p><b>Step 4 B Energy Only Option of Emergency Load Response (formerly know as Load Reduction) Action</b></p>	<p>PJM dispatcher issues Load Reduction Action via the PJM All-call and post message to selected PJM Web-sites.</p> <p>An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone or Scarcity Pricing Region(s) if transmission limitations exist.</p> <p><b>Notification:</b> PJM dispatcher notifies PJM management, PJM public information personnel, and Emergency Load Response Program participants.</p>	<p>Curtailment Service Providers with Demand Resources registered in the Energy Only Option – of Emergency Load Response reduce load.</p> <p><b>Notifications:</b> Notify management.</p>

<p><b>Step 5</b> <b>Voltage Reduction</b> <b>Warning</b></p>	<p>PJM dispatcher issues a warning to members and PJM management, stating the amount of adjusted spinning reserve capacity and the requirement.</p> <p>A Warning can be issued for the entire PJM CA or for specific Control Zone(s) or Scarcity Pricing Region(s) based on the projected location of transmission constraints.</p> <p><b>Notification:</b> PJM dispatcher notifies PJM management, PJM public information personnel, Department of Energy (DOE).</p>	<p>Generation dispatchers prepare to load all available primary reserve, if requested.</p> <p>Transmission / Generation dispatchers ensure that all deferrable maintenance or testing affecting capacity or critical transmission is halted. Any monitoring or control maintenance work that may impact operation of the system is halted.</p> <p>PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.</p> <p><b>Notifications:</b> Notify management and advise all stations and key personnel.</p>
<p><b>Step 6</b> <b>Manual Load Dump</b> <b>Warning</b></p>	<p>PJM dispatcher issues the warning to members stating the estimated amount of load relief that is required (if applicable) and the need to address the occurrence of a serious contingency with minimum delay.</p> <p>A Warning can be issued for the entire PJM CA or for specific Control Zone(s) or Scarcity Pricing Region(s) based on the projected location of transmission constraints.</p> <p>PJM dispatcher examines bulk power bus voltages and alerts the appropriate member dispatchers of the situation.</p> <p><b>Notification:</b> PJM dispatcher notifies PJM management, PJM public information personnel, and FERC via the FERC Division of Reliability's electronic pager system; consistent with FERC Order No. 659.</p>	<p>Transmission dispatchers / LSEs review local procedures and prepare to dump load in the amount requested.</p> <p>Transmission dispatchers / LSEs reinforce internal communications so that load dumping can occur with minimum delay.</p> <p>PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.</p> <p><b>Notifications:</b> Notify management, government agencies (as applicable) and advise all stations and key personnel.</p>

### Step 7 Voltage Reduction

PJM dispatcher issues the order for a voltage reduction.

Issue EEA 2 via RCIS

Issue system-wide or Control Zone or Scarcity Pricing Region-specific Public/Media Notification Message C-3 or H-3.

An Action can be issued for the entire PJM CA, specific Control Zone(s) or a subset of a Control Zone or Scarcity Pricing Region(s) if transmission limitations exist.

PJM initiates scarcity pricing based on the issuance of Voltage Reduction.

**Notification:** PJM dispatcher notifies PJM management, PJM public information personnel, Reliability Coordinators via RCIS (EEA 2), and Department of Energy (DOE).

Member Transmission dispatchers / LSEs take steps to implement the voltage reduction.

**Notifications:** Notify management, government agencies (as applicable) and advise all stations and key personnel.

### Step 8 Manual Load Dump

PJM dispatcher verifies that separations have not occurred and that load dumping is desirable on the system being controlled (i.e., make sure that a load dump will help, not aggravate the condition).

Suspend all remaining regulation.

Estimate the total amount of load to be dumped. Utilizes the PJM EMS to determine deficient Control Zones or Scarcity Pricing Regions and their share of load dump required.

The PJM Mid-Atlantic Region share will be further allocated according to Attachment E.

Issues a system-wide or Control Zone or Scarcity Pricing Region specific Public/Media Notification Message C-4 or H-4

PJM initiates scarcity pricing based on the issuance of Manual Load Dump.

**Notification:** PJM dispatcher notifies PJM management, PJM public information personnel, Reliability Coordinators via the RCIS, DOE, FEMA, NERC offices and FERC via the FERC Division of Reliability's electronic pager system; consistent with FERC Order No. 659.

Generation dispatchers suspend remaining regulation, when directed by PJM prior to dumping load.

Transmission dispatchers / LSEs promptly dump an amount of load equal to or in excess of the amount requested by PJM dispatcher (Mid-Atlantic Region operators refer to Attachment E for specific allocation).

Transmission dispatchers report the amount of load curtailed / restored upon implementation to the PJM Power Dispatcher.

**Notifications:** Notify management, government agencies (as applicable) and advise all stations and key personnel.

## Attachment H: Minimum Generation Calculation – Midnight Period

[illegible]

**Exhibit 18: Minimum Generation Information**



Minimum Generation Worksheet – Midnight Period			
Day of Week:		Date:	
Date			
Time			
Initials			
Normal Min Generation	#		
Pumping Load	-		
Hydro	+		
Net Interchange	+		
Dispatchable Contracts	-		
Spot Market	-		
R.E.C.'s	+		
Adjusted Min Generation			
Valley Load Estimate	#		
Margin			
NO Minimum Generation Alert needed			

*Exhibit 19: Minimum Generation Calculation*



Minimum Generation Alert		
<b>Request ID:</b> 14835	<b>Timestamp:</b>	05/21/2005 19:51
<b>Period:</b> MIDNIGHT	<b>Date:</b>	05/22/2005
<b>Notes:</b>		
<p><b>Normal Minimum Generation:</b></p> <p style="padding-left: 40px;">Pumps (-):</p> <p style="padding-left: 40px;">Net Interchange (+/-):</p> <p style="padding-left: 80px;">Pumps (-):</p> <p style="padding-left: 80px;">Pumps (-):</p> <p style="padding-left: 40px;">Hydro (+):</p> <p style="padding-left: 80px;">Hydro (+):</p> <p><b>Dispatchable Contracts (-):</b></p> <p style="padding-left: 40px;">Spot Market (-):</p> <p style="padding-left: 40px;">RECS's (+):</p> <p style="padding-left: 80px;">Pumps (-):</p> <p style="padding-left: 40px;">Hydro (+):</p> <p style="padding-left: 80px;">Pumps (-):</p> <p style="padding-left: 40px;">Generation Adjustment (+):</p> <p style="padding-left: 80px;">Pumps (-):</p> <p><b>Adjusted Minimum Generation:</b></p> <p><b>Valley Load Estimate:</b></p> <p><b>Margin:</b></p>		

*Exhibit 20: eDART Min Gen Calculation Worksheet*

Emergency Reducible Generation				
<b>User Name:</b> <span style="color: blue;">seminarg1</span> <b>Company:</b> <span style="color: blue;">SBT Gen Comp 1</span> <b>Request ID:</b> 12247 <b>Timestamp:</b> 11/18/2005 07:45 <b>Date:</b> 11/18/2005 <b>Period:</b> MIDNIGHT				
Region	Reported		Actual	
	Total Reducible Generation	Reducible on Declaration	Declaration	Event
Western	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mid Atl	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Southern	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
NI	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

*Exhibit 21: eDART ERG Reporting Form*

## Attachment I: Local Post Contingency Operations Guide

### Introduction and Background

Each PJM Transmission Owner has established local planning criteria for its system that apply to the lower voltage facilities and its associated distribution facilities. Those criteria may vary from the planning criteria that are embodied in the PJM Regional Transmission Planning Process. Part of those criteria may be to assume a level of risk of load shedding in local areas for contingencies that the transmission owner has determined has a low probability of occurrence.

PJM's operational practice is to respect all limits on monitored facilities over which PJM has operational control. In local contingency situations, it is common to reach a point where there are no generation redispatch options that can be employed to mitigate the contingency overloads. In those situations, PJM issues a Post-contingency Local Load Relief Warning (PCLLRW) to alert the Transmission Owner in that area that it may be necessary to shed load if the contingency occurs.

In many areas, the PCLLRWs are issued on a frequent basis when the intention of the Transmission Owner's planning criteria is to accept the risk of load shedding. Therefore, this guide is being implemented to establish a process for identifying those areas where the local planning criteria assume the load shedding risk and document those areas in this guide.

### Procedure

1. The Transmission Owner will review their system and local planning criteria and identify local areas where local planning criteria accept some level of risk, and those areas meet the following criteria:
  - Load area at risk will not exceed 100 MW.
  - Load area at risk is not served by three or more transmission lines at 345 kV or higher.
2. For the areas identified in Step 1, the Transmission Owner will identify the contingency pairs that would place the area at risk, and those contingency pairs meet the following criteria:
  - The monitored element cannot be a transmission line at 230 kV or higher, unless the line is a radial feed.
3. PJM Planning will review the submitted information to verify its conformance with the requirements of this guide. Planning will report its results to Operations and the Transmission Owner. If the facilities are acceptable, the contingency pairs will be entered into the table in this guide and posted as part of PJM Manual, M-3 Transmission Operations.

## Attachment J: Disturbance Reporting—US Department of Energy

### Electric Emergency Incident and Disturbance Report (United States Department of Energy, Form OE-417)

#### Background

Emergency electric incidents and disturbances leading to interruptions of power, such as rotating blackouts, could lead to disruptions of critical infrastructures such as natural gas or petroleum product pipelines, water supplies, and telecommunications systems. The national security, economic prosperity, and social well-being of the nation depends on the continuing reliability of our increasingly complex and interdependent infrastructures.

In addition to these interdependencies, the rapid evolution of information technology in the electric power industry has national security implications due to the interdependent networks of physical and information infrastructures. Information technology has changed the way the Nation's business is transacted, the way government operates, and the way government addresses national security. EOP-004 covers the critical alert mechanism for informing NERC and DOE of electrical emergency incidents or disturbances that disrupt the operation of any critical infrastructure in the electric power industry.

#### Reporting Requirements

PJM and/or the member companies are required to submit a Form OE-417 in accordance with NERC EOP-004 (<http://www.nerc.com/files/EOP-004-1.pdf>). Refer to The NERC website for details on filling out the report and for the most recent version of the report.

Copies of this report should be sent to:

1. NERC - [esisac@nerc.com](mailto:esisac@nerc.com).
2. DOE - [doehgeoc@hq.doe.gov](mailto:doehgeoc@hq.doe.gov)
3. RFC ([disturbance@rfirst.org](mailto:disturbance@rfirst.org)) or SERC ([reporting\\_line\\_sit@list-serc1.org](mailto:reporting_line_sit@list-serc1.org))
4. PJM – [DispSup@pjm.com](mailto:DispSup@pjm.com)



<b>Attachment K: Event Investigation Program</b>
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**PJM and Transmission Owners  
Event Investigation Program Document**

## **Contents**

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## **POLICY STATEMENT**

The Transmission Owning members of PJM and PJM are committed to preserving the reliability of PJM monitored transmission facilities. Part of that commitment is to analyze system events or problems for the purpose of implementing corrective actions and sharing knowledge to improving operations at PJM and Transmission Owning companies.

PJM Transmission Owners and PJM are committed to implementing a process to investigate events or near-miss events that resulted in reliability problems and to providing the resources necessary for robust process.

Features of the event investigation process should include:

1. Starting with everything on the table at the beginning of the investigation, nothing should be initially ruled out or excluded from the investigation process.
2. Performing a thorough analysis of all systems, human performance, work processes, materials, environmental conditions, physical plant and management systems both individually and collectively, that contributed to the event.
3. Learning as much about the event as possible with the goal of improving the operation of the transmission system, not punishing the involved parties.
4. Accurate and thorough determination of root causes, contributing factors and corrective actions using a recognized and structured Root Cause methodology.
5. Investigation of “near miss” events. Learning captured from “near miss” events can be just as valuable as those of actual events.
6. The parties most involved in the event should lead the investigation, if possible.
7. Allowance for timely delivery of initial/preliminary findings to implement interim corrective actions, if necessary.
8. A challenge or critical review of findings and recommended corrective actions before finalization of the investigation.
9. Assurance that corrective actions are completed.
10. Dissemination of learning to all Transmission Owners.

PJM and the Transmission Owners are not formally bound to participate in the Event Investigation Process and by participating, are not prevented from taking any action they determine necessary in the course of event investigation activities. The Event Investigation Process should be suspended where investigation of an event by the North American Electric Reliability Council (NERC) or other organizations would cause duplication of effort or confusion.

## Simplified EVENT INVESTIGATION PROCESS STEPS

Step	Activity	Responsibility
1	Event Identification, Classification and Fact Finding	PJM and Transmission Owner Officers (or designee)
2	Determination of Investigative Action	PJM and Transmission Owners through the PJM System Operations Subcommittee (Transmission)
3	Establishment of Investigation Ownership	PJM and Involved Transmission Owner(s)
4	Launch of RCA Team	Investigation Owner
5	Execution of RCA	RCA Investigation Leader
6	RCA Challenge Review and Solicitation of Comments	Investigation Owner
7	Publishing of RCA and ACA reports to PJM and Transmission Owners	Investigation Owner
8	Follow-up of corrective actions/notification of completion	Investigation Owner
9	Event Investigation Program Oversight	PJM System Operations Subcommittee (Transmission)



## Procedure

### Purpose

The purpose of this document is to provide guidance, instruction and clarify roles and responsibilities for PJM and PJM Transmission Owners to initiate and perform event investigations of operational events on PJM monitored transmission facilities, including but not limited to completion of a formal Root Cause Analysis of events by PJM and/or a combination of PJM Transmission Owners.

### Definitions

PJM – PJM Interconnection, LLC

Transmission Owner(s) – Transmission owning company or companies of PJM as specified in the PJM Transmission Owners Agreement (TOA).

PJM or Transmission Owner Officer – A company officer or designee with responsibility for the operation of their respective transmission system with authority to execute the responsibilities of and commit resources to execution of the PJM Transmission Owners Event Investigation Process.

PJM and Involved Transmission Owner Officer(s) – Transmission Owner Officers with personnel or equipment directly or substantively involved in an operating event on PJM monitored transmission facilities.

Apparent Cause Analysis (ACA) – a systematic gathering and reporting of information in a report format that separates and clarifies the facts regarding the description of an event, the apparent causes of the event and corresponding corrective actions in order to reasonably prevent or mitigate recurrence.

Root Cause Analysis (RCA) – A systematic methodology for performing analysis of operational events to determine root cause(s) and contributing factors that led to an event and corrective actions to preclude recurrence of the event or similar events.

Investigation Owner – PJM or a Transmission Owner that takes responsibility for leadership of the execution of an ACA or RCA investigation. The Investigation Owner is responsible for establishing the investigation team, timely completion of the investigation and acceptance of the corrective actions.

Investigation Team Leader – Individual designated by PJM or a Transmission Owner to provide leadership and guidance to a team of personnel executing a RCA or ACA investigation.

PJM System Operations Subcommittee (Transmission) – A subcommittee of the PJM Operating Committee that provides oversight of the Event Investigation Process.

### Scope

Events intended to be included in the scope of the Event Investigation Process include events on the transmission system that result in significant reliability problems, violations of reliability criteria or standards, including near-miss situations or situations where operational conditions of the system are not well understood or explained by PJM or Transmission

Owner system operators. Events listed below should initiate the event investigation process:

Violations to a NERC Operational Standard that are reportable to NERC or applicable regional compliance process: Examples:

- Actual overloads which result in a reportable interconnection reliability operational limit (IROL) violation.

- Near-miss events that could have resulted in an IROL violation.

Submittal of a DOE EIA-417 form or a report to NERC in accordance with the NERC disturbance-reporting standard: EOP-004-0.

Nuclear power plant tripping or operational problem, reported to PJM and/or the NRC where PJM and/or Transmission Owner equipment did not operate as intended or within a nominal range and may have been the cause or a contributing factor.

Events, due to their impact or severity, are attracting widespread public media coverage.

Events involving multiple transmission facility tripping, where the cause cannot be immediately explained or that may have involved personnel error.

Events intended to be excluded from the scope of the Event Investigation Process include events:

- Occurring due to weather or other acts of nature or where equipment operated as intended or within a nominal range of what is expected.

- Occurring on sub-transmission or distribution systems, assuming no impact on the transmission system.

- Involving generator owned and operated equipment where PJM and Transmission Owner equipment operated as intended or within a nominal range of what is expected.

- Originating outside the transmission system where PJM and Transmission Owner equipment operated as intended or within a nominal range of what is expected.

- Where the event results in purely economic consequences and the reliability of the transmission system is not challenged or compromised.

- Where the event is limited to the complete failure of or mis-operation of a single transmission system component and otherwise transmission system equipment operated as intended or within a nominal range of what is expected and did not contribute to significant reliability problems or violations of reliability criteria or standards.

Should an event occur that challenges system reliability and it is anticipated that the event is likely to end up in litigation; PJM and the Transmission Owners should contact their respective legal counsel to obtain legal advice about the investigation.

## Responsibilities

General Responsibilities of PJM and Transmission Owners:

- Monitor transmission system operations and initiate discussions with PJM and other transmission owners to determine appropriate actions to system events.
- Serve as the Investigation Owner when necessary. Remain prepared to supply an Investigation Team Leader, team members and /or expert resource personnel trained in a formal RCA process in order to support execution of a RCA.

## Investigation Process

### ***Step 1 – Event Identification, Classification and Fact Finding***

PJM and Transmission Owners monitor system operations and identify, record and report events covered or potentially covered by the Event Investigation Process scope.

PJM and/or Transmission Owner Officers direct the preliminary gathering of facts and information as necessary to provide a succinct description of the event, its extent and consequences in preparation for a conference call briefing with PJM and Involved Transmission Owners.

### ***Step 2 - Determination of Investigative Action***

Upon identification or notification of an event, PJM will schedule a conference call of the System Operations Subcommittee (Transmission) for the purpose of deciding if the event falls within the scope of the Event Investigation Process and to specify the level of action as outlined below:

Level	Definition	Use when:
I	No Action	<ul style="list-style-type: none"> <li>• The consequences of a repeat of a similar type event are acceptable.</li> <li>• Information brought to light during the conference call adequately explains the cause of the events.</li> <li>• Corrective actions are either not needed or appear simple and obvious.</li> </ul>
II	Apparent Cause Analysis (ACA)	<ul style="list-style-type: none"> <li>• The consequences of a repeat of a similar type event are acceptable.</li> <li>• The cause of the event is not clear or there is disagreement on the causes. Further investigation is required.</li> <li>• Corrective actions are not obvious. Further investigation is required.</li> </ul>
III	Root Cause Investigation (RCA)	<ul style="list-style-type: none"> <li>• The consequences of the event or a repeat of a similar type event are unacceptable.</li> <li>• A pattern of repeat (or similar) events has emerged.</li> <li>• A comprehensive, "best effort" investigation to assure identification of root causes and effective corrective actions to prevent recurrence is required.</li> </ul>

If the event classification results in initiation of an Apparent Cause Analysis (ACA) or a Root Cause Analysis (RCA), then proceed to Step 5.3

### ***Step 3 - Establishment of Investigation Owner***

PJM and Involved Transmission Owner Officers shall select either PJM or an Involved Transmission Owner to be the Investigation Owner and serve as the primary sponsor for completion of the ACA or RCA. The intent is that the transmission operator with the most direct involvement in the event should take the role of Investigation Owner.

### ***Step 4 – Launch of Investigation Team***

The Investigation Owner for an ACA investigation shall obtain and distribute the names of PJM and Involved Transmission Owner investigation participants and team leader.

The ACA Team Leader shall complete the investigation and report results using the ACA investigation form (Attachment 6.1) to the PJM and Involved Transmission Owners via conference call within 30 business days.

The Investigation Owner for a RCA investigation shall schedule an in-person kick-off meeting for the RCA Team that includes PJM and Involved Transmission Owner Officers, the Investigation Team Leader, team members and any external expert resources supporting the RCA. Attachment 6.2 provides a checklist as an aid for initiating the RCA.

The RCA kick-off meeting shall cover topics required to support the work of the RCA team and clarify management expectations, including: management sponsorship, resources available to the team, time commitment of participants, access to information from PJM and Transmission Owners, expectations for the thoroughness of the investigation, timelines for completion of activities and confidentiality of information.

The RCA Investigation leader and team members shall submit a team charter to PJM and the Involved Transmission Owners. The charter will outline the problem statement and scope of the investigation and estimated schedule milestones for completion of the RCA through and including Step 6 of the Event Investigation Process - RCA Challenge Review and Solicitation of Comments.

### ***Step 5 – Execution of RCA***

The RCA Investigation Leader, in concert with any internal or external RCA expert resources provided, shall conduct the RCA utilizing a RCA methodology and guidelines cited in Attachment 6.3 or equivalent process.

Information gathered from individual interviews and documents relating to the personal performance of specific individuals involved in the event investigation shall remain confidential. Access to this information is to be limited to the investigation team and PJM and Involved Transmission Owner Officers.

### ***Step 6 – RCA Challenge Review and Solicitation of Comments***

Upon completion of preliminary results of the RCA, the RCA Investigation Owner and RCA Investigation Leader shall sponsor a RCA Challenge Review Meeting. The purpose of the Challenge Review Meeting is to provide a critical review of root cause determinations, contributing factors and proposed corrective actions. Participants in the Challenge Review Meeting shall include PJM and Involved Transmission Owners, the RCA Investigation

Leader and Team members and other organizational entities that may be affected by the implementation of corrective actions. At the discretion of the Investigation Owner, other uninvolved Transmission Owners may be invited in order to provide an impartial and objective perspective to the challenge review. The Challenge Board chairperson may be the Investigation Owner or another agreed upon executive. Review and acceptance of proposed corrective actions by all affected parties should be obtained prior to the challenge meeting. Challenge board approval of conclusions and corrective actions should constitute final approval of the report unless otherwise directed by the chairperson.

### ***Step 7 - Publishing of Investigations to PJM and Transmission Owners***

For RCA Investigations - Upon completion of actions resulting from the Challenge Review Meeting and preparation of a final draft report, the RCA Investigation Leader shall distribute the final draft report to the Transmission Owners and solicit comments for a period of 30 business days. At the conclusion of the period and resolution of comments, the final report shall be distributed to PJM and all Transmission Owners. Both the final draft and final report shall be marked as confidential. PJM and all Transmission Owners shall treat the report as confidential information.

For ACA Investigations – Upon review and approval of the investigation results by PJM and Involved Transmission Owners, the investigation shall be marked as confidential and distributed to PJM and all Transmission Owners. PJM and Transmission Owners shall treat the report as confidential information.

### ***Step 8 - Corrective Action Follow-up and Notification of Completion***

The Investigation Owner shall monitor completion of corrective actions and notify PJM and the Transmission Owners when completion of all corrective actions has occurred.

PJM and Involved Transmission Owners shall retain copies of investigation reports.

### ***Step 9 Event Investigation Program Oversight***

PJM shall maintain a record of events, conference calls for evaluating events for investigative action, decisions made and the status of current and ongoing RCA or ACA investigations. The record shall be included in the standard agenda of the PJM System Operations Subcommittee (Transmission) for review, evaluation and oversight by the Committee.

## **Appendices**

### **ACA Investigation Form**

### **RCA Investigation Owner Implementation Checklist**

### **Guidelines for Selecting and Using Root Cause Analysis Methodologies**

## **Appendix 1**

### **ACA INVESTIGATION FORM**

#### Apparent Cause Analysis (ACA) Investigation Report

.

**DATE OF INCIDENT** xx/xx/xxxx

.

**TITLE:** The title should identify the equipment, behavior or process affected and what the incident or problem was. Also include the location of the incident.

.

**REPORT BY:**

---

Name of the Investigation Team Leader

.

**APPROVED BY:**

---

Investigation Owner

.

**DATE APPROVED:** xx/xx/xxxx

#### **INVESTIGATION PARTICIPANTS:**

List additional names of team members or persons that had input into the investigation (e.g. subject matter experts, supervisors, etc).

#### **EXECUTIVE SUMMARY:**

Summarize with a single length paragraph containing a brief synopsis of the event. Including significant consequences (injuries, damaged equipment, outages). Also, summarize the notable causes and corrective actions.

.

#### **EVENT DESCRIPTION:**

Identify what happened and how it was discovered. Identify procedures, activities or processes involved. If this was a repeat event identify it as such and how it differed from previous events. Parties involved should also be identified (Do not use names - use titles or positions...customers, others). Include actual and/or potential consequences.

### **ANALYSIS METHODOLOGY:**

Identify what approach, analysis, and/or resources were used to reach the cause conclusions (e.g., change analysis, barrier analysis, interviews, etc.). If there was an equipment failure, include the failure mode (i.e. how it happened).

### **CAUSES:**

In a brief synopsis: Identify the end result of the investigation. Record any actions, conditions or events that caused the incident. List any equipment, behavioral or procedural problems identified in the investigation. The causes should be identified by asking "why" to the point where the cause, if prevented would have prevented or mitigated the consequences of this or a similar incident.

### **CORRECTIVE ACTIONS (WITH NAME AND DUE OR COMPLETED DATE):**

List any corrective actions completed or planned. List an owner by name and due date for each corrective action. List the date completed for those already taken. Corrective actions must have owner acceptance before capturing them in this report.

A. XXXXXXXXXXXXXXXXXXXXX

Owner (name): nnnnnnnn

Due Date: dd/dd/yyyy

.

B. XXXXXXXXXXXXXXXXXXXXX

Owner (name): nnnnnnnn

Due Date: dd/dd/yyyy

## **Appendix 2**

### **RCA EVENT OWNER IMPLEMENTATION CHECKLIST**

- ❑ Confirm agreement and sponsorship of PJM and other Involved Transmission Owner Officers.
- ❑ Select an Investigation Leader for the RCA and brief the leader.
- ❑ Request RCA team members from PJM and any other Involved Transmission Owners.
- ❑ If the team leader does not have experience or expertise in performing a RCA, provide the team leader a qualified internal or external expert resource.
- ❑ Schedule the in-person kick-off meeting – include sponsors, team leader & members, expert resources.
- ❑ Review and approve/amend the team charter document with PJM and Involved Transmission Owner Officers.
- ❑ Schedule the Challenge Review Meeting.
- ❑ Distribute investigation report.
- ❑ Notify PJM and Involved Transmission Owner Officers of completion of all corrective actions.



## **Appendix 3**

### **GUIDELINES FOR SELECTING AND USING ROOT CAUSE ANALYSIS METHODOLOGIES**

Overall Guideline: A good Root Cause Analysis should be thorough, fair and efficient.

A thorough root cause analysis will generally identify more than one root cause.

There are a wide variety of analytical methods and expert systems available to assist in performing a RCA. Thoroughly describe the methods and systems used by the team for examination by readers and reviewers.

To improve the RCA team's efficiency, use risk assessment to scale analysis efforts.

If possible, use a skilled, independent facilitator.

Use subject matter experts to provide the needed information, but use an independent facilitator and objective team members to prevent bias from controlling the direction of the investigation.

Document in detail the procedures used to do the RCA. The documentation should include details on how information was gathered, requirements for training, team membership, analytical tools, issues investigated, report format, due date, and review responsibilities.

Value and practice independence throughout the process.

Do not automatically assume that each RCA is unique. Thoroughly search historical records (inside and outside of the event or problem area) for precursors or related data, especially for establishing the context or that would establish a pattern of similar failures across the industry. Be open to generic issues.

In some cases, it may be necessary to use multiple RCA methods.

Use Root Cause Analysis methods that have a systematic repeatable methodology.

Before identifying individual faults and assigning individual responsibility, look for systemic root causes. For example: weaknesses in policies, procedures, monitoring or supervision would be systemic. For repeat occurrences, determine why the previous corrective actions did not work or consider the possible deficiencies in the corrective action program as contributors to the repeat occurrence. For repeat occurrences, determine why the previous corrective actions did not work or consider the possible deficiencies in the corrective action program as contributors to the repeat occurrence.

Discourage the "you found it, you fix it" philosophy when it comes to the corrective action program.

Thoroughly detail and support all causes and contributors.

Maximize learning from the RCA process.

**Commonly Used RCA Analytical Methods:**

Event and Causal Factor Analysis

Change Analysis

Barrier Analysis

Task Analysis

Five Why's; Seven Why's

Problem Solving/Decision Making

Management Oversight and Risk Tree (MORT)

**Commercially Available RCA Processes:**

- 1.) Tap Root
- 2.) REASONS
- 3.) Sigma XL

## Attachment L: Guide for Operating State Alert Levels

### Guideline for Operating State Alert Levels

#### Background

System operators need common definitions for normal, alert, and emergency conditions to enable them to act appropriately and predictably as system conditions change. On August 14, 2003, the principal entities involved in the blackout did not have a shared understanding of whether the grid was in an emergency condition, nor did they have a common understanding of the functions, responsibilities, capabilities, and authorities of reliability coordinators and control areas under emergency or near-emergency conditions.

*The U.S./Canada Task Force Recommendation 20 recommends the establishment of clear definitions of normal, alert, and emergency operational system conditions, and to clarify the roles, responsibilities, and authorities of reliability coordinators and control areas under each condition.*

At its May 2006 meeting, the NERC Reliability Coordinator WG approved a motion to implement a pilot program that defined normal, alert, and emergency operating conditions as they relate to Transmission Loading and Security. This guideline has been created to clarify the application of the definitions being used as part of the pilot program. The intent is to align the definitions for Transmission Loading and Security with the conditions identified in the Emergency Energy Alert (EEA) states (EOP 002-0). The time frame for declaration of these Alert states should be consistent with the approach used to declare EEAs and would normally apply to Real Time declarations and not forecast conditions.

This guideline is intended to act as a check list for operating staff when they anticipate or are confronted with actual operating conditions requiring the declaration of Operating State Alert Levels.

***In the event of a conflict between the pilot program and applicable NERC Standards, compliance with NERC Standards should always be applied first. This pilot has been extended until June 2009 or until the new NERC standard has been approved.***

## Operating State Alert Levels

Condition Level >>>>	Normal	Alert Level 1	Alert Level 2	Alert Level 3
Threat Level>>>>	Low	Elevated	High	Severe
Condition/Threat Color >>>>	Green	Yellow	Orange	Red
Generating/capacity	EEA 0 No Energy Deficiencies	EEA 1 all available generation resources in use	EEA 2 Load management procedures in effect	EEA 3 Firm load interruption imminent or in progress
Transmission	TEA 0 Respecting all IROLs	TEA 1 All available generation resources committed to respecting IROLs OR concern with ability to respect IROL	TEA 2 Load Mgmt procedures in effect to respect IROLs	TEA 3 Firm Load Curtailments in effect to respect IROLs
Security	SEA 0 No cyber threat identified; No known threats on control center or grid assets (lines, substations, generators)	SEA 1 Cyber threat identified or is imminent, OR verified physical threat against control center or grid assets	SEA 2 Cyber event is affecting control center EMS capability, OR physical attack at <b>single</b> site (control center or grid assets- lines, substations, generators)	SEA 3 Cyber event has shut down control center EMS capability, OR physical attack at <b>multiple</b> sites (control center or grid assets- lines, substations, generators)

## Transmission Emergency Alert (TEA) Levels

### Introduction

This Attachment provides the procedures by which a Transmission Operator or Reliability Coordinator can advise of actions taken to manage potential or actual Interconnected Reliability Operating Limit (IROL) violations.

All three operating alert states (EEAs, TEAs and SEAs) are independent of each other and should be declared independently but they may also be declared concurrently.

### A. General Requirements

**1. Initiation by Reliability Coordinator.** A Transmission Emergency Alert (TEA) may be initiated only by a Reliability Coordinator at:

- 1) the Reliability Coordinator's own request, or
- 2) upon the request of a Transmission Operator

**1.1. Situations for initiating alert.** A Transmission Emergency Alert may be initiated for the following reasons:

- When all the available generation resources (would also include dispatchable load facilities that dispatch similar to generators on an economic basis) have been committed to respect an IROL in the pre-contingency state or;
- When load curtailment procedures have been implemented to respect an IROL.

**2. Notification.** A Reliability Coordinator who declares a Transmission Emergency Alert shall notify all Transmission Operators and Balancing Authorities in its Reliability Area. The Reliability Coordinator shall also notify Reliability Coordinators of the situation via the Reliability Coordinator Information System (RCIS) using the "System Emergency" category. Additionally, conference calls between Reliability Coordinators shall be held as necessary to communicate system conditions. The Reliability Coordinator shall also notify all Transmission Operators and Balancing Authorities in its Reliability Area and Reliability Coordinators when the alert has ended.

### B. Transmission Emergency Alert Levels

#### Introduction

To ensure that all Reliability Coordinators clearly understand potential and actual actions taken to manage IROLs on the Interconnection, NERC has established three levels of Transmission Alerts. The Reliability Coordinators will use these terms when explaining actions taken to manage IROLs to each other. A Transmission Emergency Alert is an emergency communication protocol, not a daily operating practice, and is not an alternative

to compliance with NERC reliability standards. The Reliability Coordinator may declare whatever alert level is appropriate, and need not proceed through the alerts sequentially.

### **1. Transmission Emergency Alert 1 (TEA 1) – All available generation resources committed to respecting IROLs.**

#### **Circumstances:**

- The Reliability Coordinator or Transmission Operator foresees or is experiencing conditions where all available generation resources are committed to respect the IROL and/or is concerned about its ability to respect the IROL.

### **2. Transmission Emergency Alert 2 (TEA 2) — Load management procedures in effect to respect IROLs.**

#### **Circumstances:**

- The Reliability Coordinator or Transmission Operator foresees or has implemented procedures up to, but excluding, interruption of firm load commitments. When time permits, these procedures may include, but are not limited to:
  - Public appeals to reduce demand.
  - Voltage reduction.
  - Interruption of non-firm end use loads in accordance with applicable contracts (for emergency purposes, not economic reasons)
  - Demand-side management.
  - Utility load conservation measures
  - TLR 6

Note: TLR 5 would normally be implemented in advance of this alert state. Under some circumstances TLRs may not be available or effective and would not be called prior to this alert state.

During TEA 2, Reliability Coordinators and Transmission Operators have the following responsibilities:

**2.1 Declaration period.** The declaring Reliability Coordinator shall update the RCIS under “System Emergency” at a minimum of every hour until the TEA 2 is terminated.

**2.2 Evaluating and mitigating transmission limitations.** The Reliability Coordinators shall review all System Operating Limits (SOLs) and Interconnection Reliability Operating Limits (IROLs) and transmission loading relief procedures in effect that may be contributing to the alert level. *Where appropriate*, the Reliability Coordinators shall inform the Transmission Operators under their purview of the

pending Transmission Emergency Alert and request that they increase their ATC by actions such as restoring transmission elements that are out of service, reconfiguring their transmission system, adjusting phase angle regulator tap positions, implementing emergency operating procedures and redispatching generation.

The following additional actions should also be considered where appropriate:

- **Notification of ATC adjustments.** Resulting increases in ATCs shall be communicated to the market via posting on the appropriate OASIS websites by the Transmission Providers.
- **Availability of generation redispatch options.** Available generation redispatch options shall be immediately communicated to the declaring Reliability Coordinator.
- **Evaluating impact of current transmission loading relief events.** The Reliability Coordinators shall evaluate the impact of any current transmission loading relief events on the ability to supply emergency assistance to the declaring entity. This evaluation shall include analysis of system reliability and involve close communication among Reliability Coordinators.
- **Initiating inquiries on re-evaluating SOLs and IROLs.** The Reliability Coordinators shall consult with the Balancing Authorities and Transmission Providers in their Reliability Areas about the possibility of re-evaluating and revising SOLs or IROLs.

**2.3 Coordination of emergency responses.** The Reliability Coordinator shall communicate and coordinate the implementation of emergency operating responses.

**2.4 Actions Prior to Declaration of TEA 3.** Before declaring a TEA 3, all available generation resources must be committed. This includes but is not limited to:

- **All available generation units are on-line.** All generation capable of being on-line in the time frame of the emergency is on-line including quick-start and peaking units, regardless of cost.
- **Purchases made regardless of cost.** All firm and non-firm purchases have been made, regardless of cost.
- **Non-firm sales recalled and contractually interruptible loads and demand-side management curtailed.** All non-firm sales have been recalled, contractually interruptible retail loads curtailed, and demand-side management activated within provisions of the agreements.
- **Operating Reserves.** Operating reserves are being utilized such that the declaring entity may be carrying reserves below the required minimum or has initiated emergency assistance through its operating reserve sharing program.

### **3. Transmission Emergency Alert 3 (TEA 3) — Firm load curtailment in effect to respect IROLs.**

### **Circumstances:**

The Reliability Coordinator or Transmission Operator foresees or has implemented firm load obligation interruption to respect an IROL.

**3.1 Continue actions from TEA 2.** The Reliability Coordinators and the declaring entity shall continue to take all actions initiated during TEA 2.

**3.2 Declaration Period.** The declaring Reliability Coordinator shall update the RCIS under "System Emergency" at a minimum of every hour until the TEA 3 is terminated.

**3.3 Use of Transmission short-time limits.** The Reliability Coordinators shall request the appropriate Transmission Providers within their Reliability Area to utilize available short-time transmission limits or other emergency operating procedures in order to increase transfer capabilities.

**3.4 Re-evaluating and revising SOLs and IROLs.** The Reliability Coordinator of the declaring entity shall evaluate the risks of revising SOLs and IROLs on the reliability of the overall transmission system. Re-evaluation of SOLs and IROLs shall be coordinated with other Reliability Coordinators and only with the agreement of the Transmission Operator whose equipment would be affected. The resulting increases in transfer capabilities shall only be made available to the declaring entity who has requested a TEA 3 condition. SOLs and IROLs shall only be revised as long as a TEA 3 condition exists or as allowed by the Transmission Operator whose equipment is at risk. The following are minimum requirements that must be met before SOLs or IROLs are revised:

**3.4.2 Mitigation of cascading failures.** The Reliability Coordinator shall use its best efforts to ensure that revising SOLs or IROLs would not result in any cascading failures within the Interconnection.

**3.5 Returning to pre-emergency SOLs and IROLs.** Whenever the transmission systems can be returned to their pre-emergency SOLs or IROLs, the declaring Entity shall notify its respective Reliability Coordinator.

**3.5.1 Notification of other parties.** When an alert has been downgraded, the Reliability Coordinator shall notify via the RCIS the affected Reliability Coordinators, Transmission Operators and Balancing Authorities that their systems can be returned to their normal limits.

### **4. Transmission Emergency Alert 0 (TEA 0) - Termination.**

When the declaring Entity is able to respect IROL requirements and is no longer concerned with its ability to respect IROLs, it shall request its Reliability Coordinator to terminate the alert.



**4.1. Notification.** The Reliability Coordinator shall notify Reliability Coordinators via the RCIS of the termination. The Reliability Coordinator shall also notify the affected Transmission Operators and Balancing Authorities.

## RCIS Posting Examples

Each RCIS posting should be clear and concise. If the actions are being taken as a result of a contingency, the contingency should also be identified as the cause.

The following are examples of possible of RCIS postings:

### TEA 1

*(name of RC)* is declaring a TEA 1 on the *(name of the interface)*.

### TEA 2

*(name of RC)* is declaring a TEA 2 on the *(name of the interface)*. Flows from *(direction of flow that impacts the interface)* aggravate this interface. *(amount of MW relief)* of *(type of load management procedures that have been or expected to be implemented i.e. voltage reduction, curtailable load reductions)* of relief has been *(or is expected)* to be implemented to respect the limit. These actions are expected to last the next *(length of time – hours/days)* and should be sufficient to prevent the need for Firm load shedding.

### TEA 3

*(name of RC)* is declaring a TEA 3 on the *(name of the interface)*. Flows from *(direction of flow that impacts the interface)* aggravate this interface. *(amount of MW relief)* of Firm Load curtailments have been *(or is expected)* implemented to respect the limit. These actions are expected to last the next *(length of time – hours/days)*.

## Contingency Example

If the TEA is being declared as a result of a contingency the message could be modified simply by adding the contingency description as below:

*(name of RC)* is declaring a TEA 2 on the *(name of the interface)*. This is a result of a contingency on *(name of the interface or contingent element)*. Flows from *(direction of flow that impacts the interface)* aggravate this interface. *(amount of MW relief)* of *(type of load management procedures that have been or are expected to be implemented i.e. voltage reduction, curtailable load reductions)* to respect the limit. These actions are expected to last the next *(length of time – hours/days)* and should be sufficient to prevent the need for Firm load shedding.

## Updates

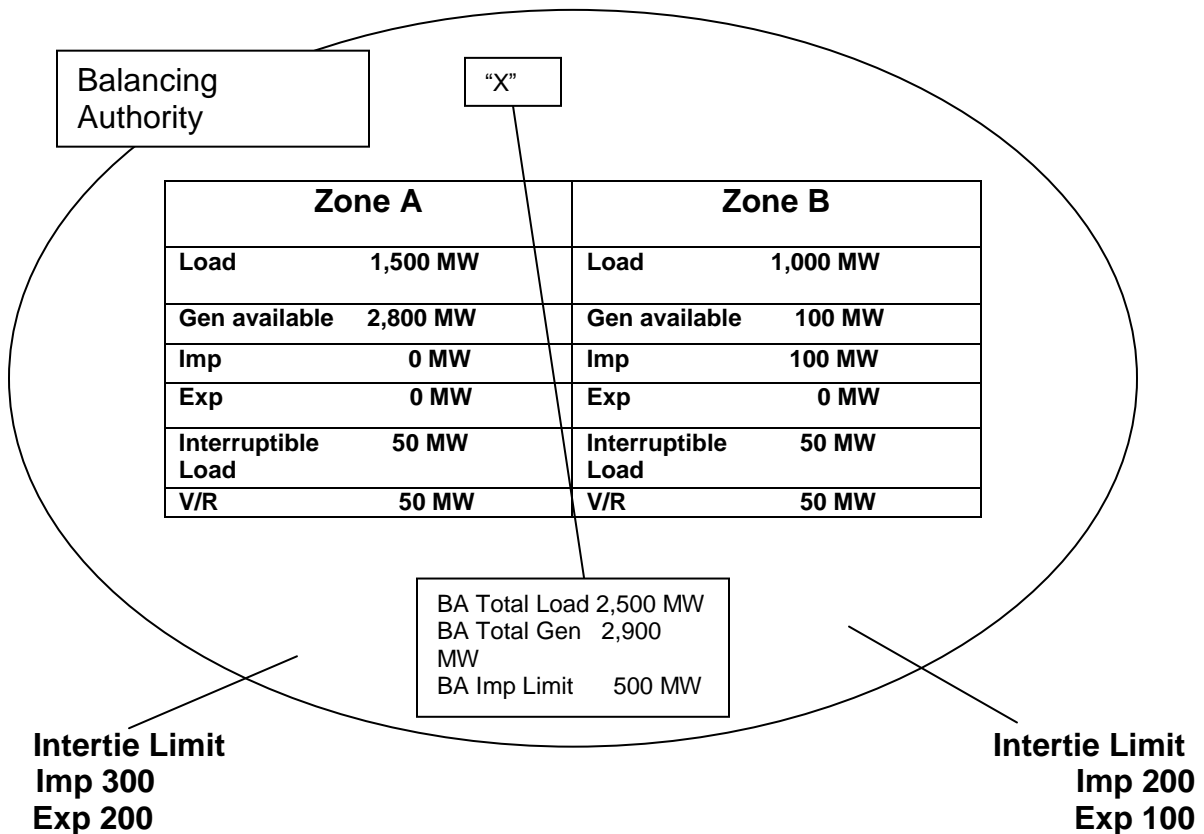
When updating postings only significant changes need be identified. The following is appropriate:

*(name of RC)* remains in a TEA *(2 or 3)* on the *(name of the interface)*. *(amount of MW relief)* of *(type of load management procedures that have been or are expected to be implemented i.e. voltage reduction, curtailable load reductions, firm load reductions)* have been implemented *(description of the change i.e. increased/reduce by amount of MW change or identify no change)*.

### Example #1

#### IROL violation on "X" No Global Adequacy Concerns

IROL "X"  
500 MW - A to B  
300 MW - B to A



EEA	1	No
	2	No
	3	No
TEA	1	Yes
	2	Yes
	3	Yes

In this example the available generation in A is in excess of its load requirements. The available generation in B is less than its load requirements. Area B will be relying on the full transfer capability of the interface "X" plus an additional import of 100 MW to the maximum limit on the intertie in Area B. With the implementation of the interruptible load and V/R the firm load requirements in B cannot be met without the use of Firm load shedding.

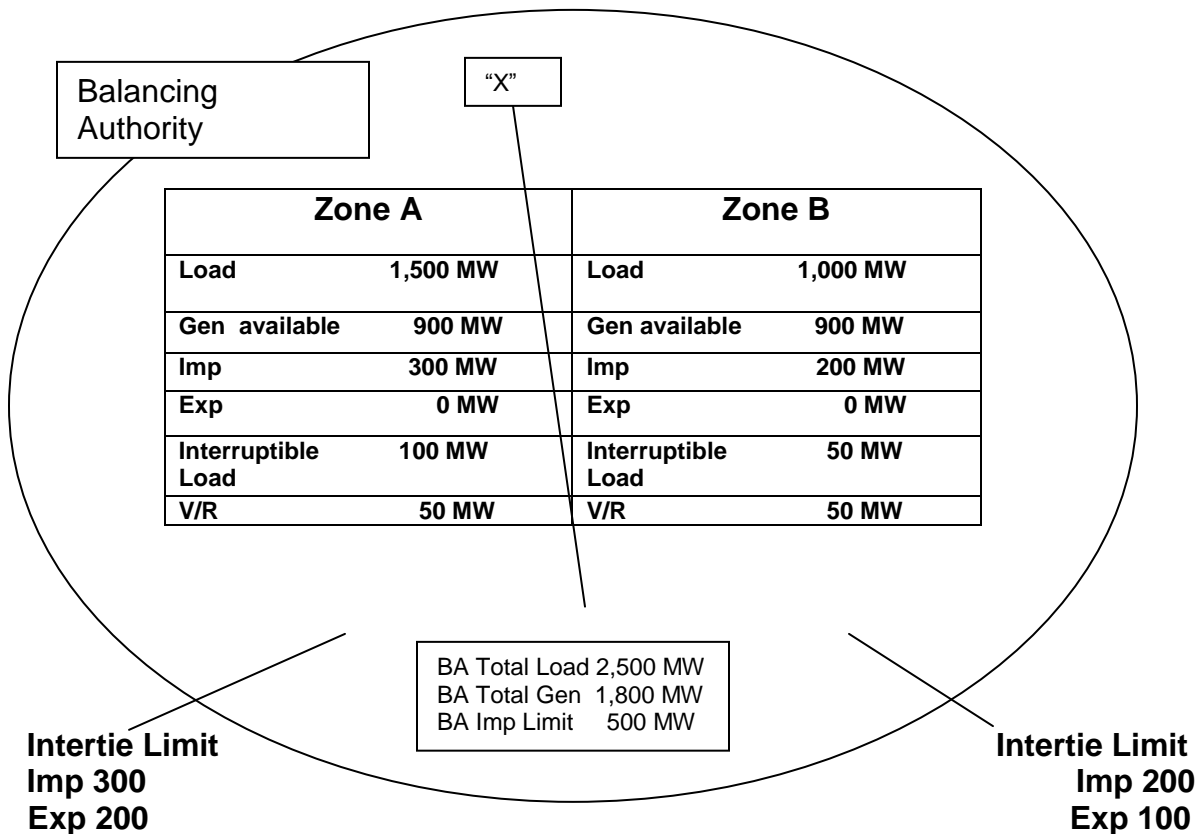
- In this scenario an EEA is not required as the BA is able to meet its global load/generation requirements.

- When this situation is forecast a TEA 1 should be issued to indicate the potential concerns with the ability to respect the IROL limit “X” without the use of load management procedures.
- When load management procedures are implemented in Real Time to respect the IROL “X”, a TEA 2 should be issued.
- When Firm load is curtailed to respect the limit a TEA 3 should be issued.

## Example #2

### Global Adequacy Deficiency No IROL Violation

**IROL "X"**  
**500 MW - A to B**  
**300 MW - B to A**



EEA	1	Yes
	2	Yes
	3	No
TEA	1	No
	2	No
	3	No

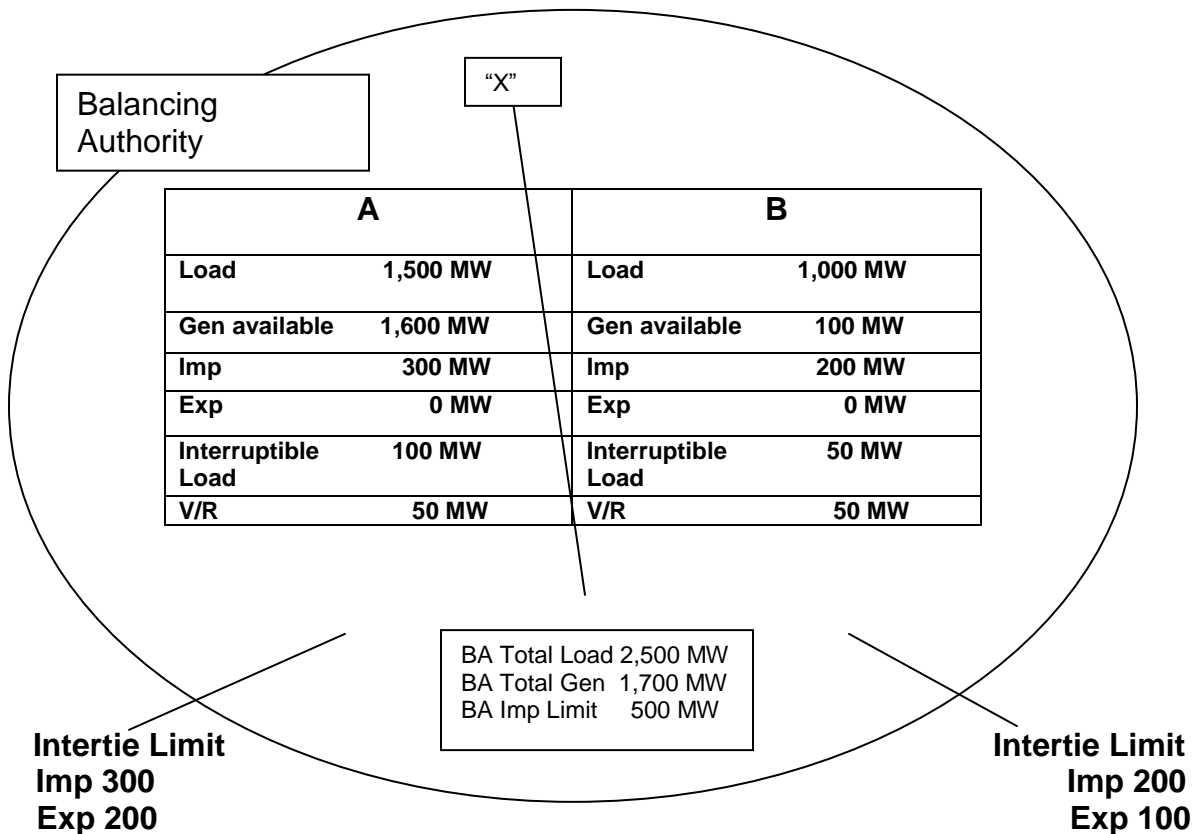
In this example the available generation in A is less than its load requirements. The available generation in B is less than its load requirements. There is a Global Adequacy deficiency after considering full import capability and utilization of interruptible load and V/R.

- EEA procedures should be followed
- There is no need for a TEA to be issued

### Example #3

#### Global Adequacy Deficiency IROL Violation

**IROL "X"**  
**500 MW - A to B**  
**300 MW - B to A**



<b>EEA</b>	<b>1</b>	<b>Yes</b>
	<b>2</b>	<b>Yes</b>
	<b>3</b>	<b>No</b>
<b>TEA</b>	<b>1</b>	<b>Yes</b>
	<b>2</b>	<b>Yes</b>
	<b>3</b>	<b>Yes</b>

In this example the available generation in A meets its load requirements. The available generation in B is less than its load requirements. There is a Global Adequacy deficiency after considering full import capability. There is also an IROL violation at "X" in the direction of A to B to meet the load requirements in B depending on where load management procedures are implemented.

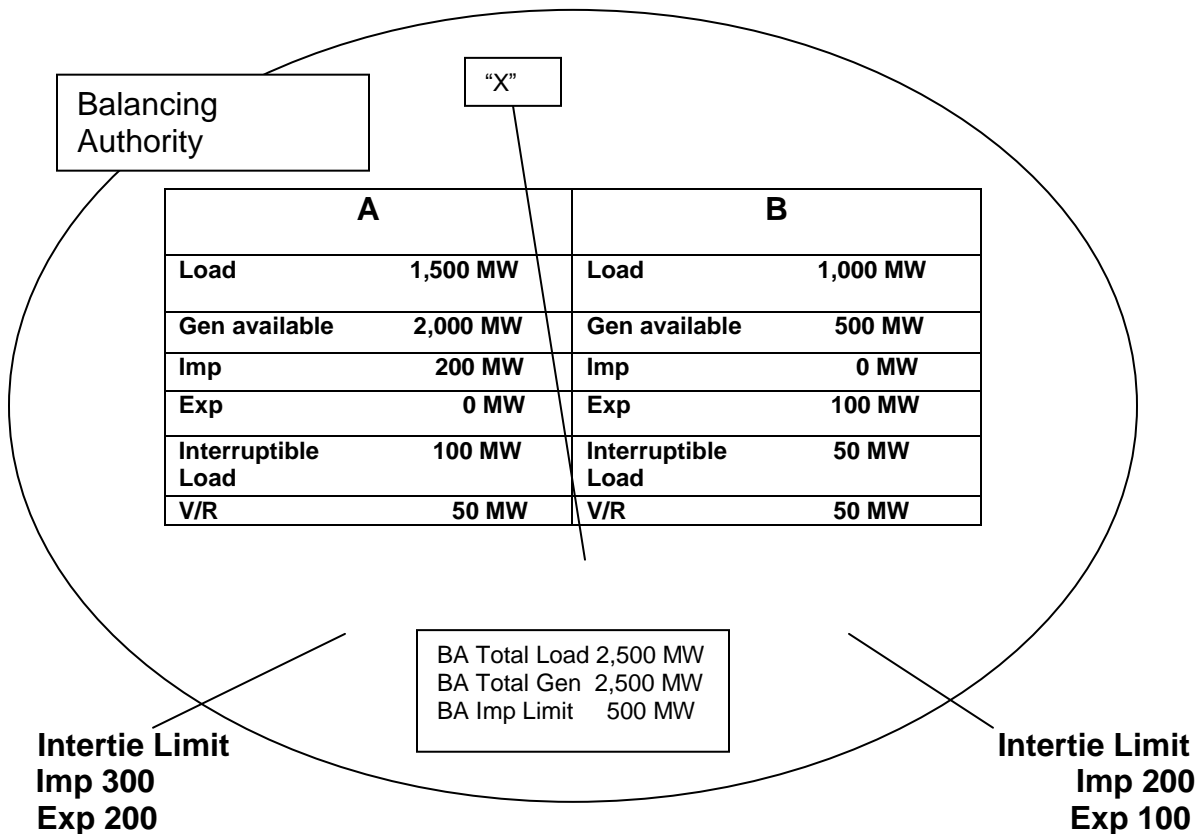
- An EEA 1 and a TEA 1 should be issued to identify the potential issues

- When load management procedures are implemented to manage the transfer from A to B a TEA 2 should be issued (assumes B will be deficient before the global deficiency occurs).
- An EEA 2 should be issued when load management procedures are being implemented in A to manage global requirements.
- TEA 3 should also be issued when Firm load is shed in B to meet the load requirements in B while respecting the IROL.

## Example #4

### Transaction Curtailments

**IROL "X"**  
**500 MW - A to B**  
**300 MW - B to A**



EEA	1	No
	2	No
	3	No
TEA	1	No
	2	No
	3	No

In this example there are no global adequacy concerns. There is an export transaction in B that is causing a limit concern on "X" in the A to B direction. With the available generation in B plus the transfer capability there is no concern for violating the IROL limit. The transaction is creating a situation where it will be required curtailed at some point to prevent the IROL violation. Assuming the TLR procedure would be effective at relieving this constraint regardless of the TLR level (at either the TLR 3 or 5 level) no TEA would be required as there is no concern that the IROL can't be respected with control actions that don't involve load management procedures.



## Security Emergency Alerts (SEA)

### Introduction

This Attachment provides the communication protocols by which a Reliability Coordinator, Transmission Operator or Balancing Authority can communicate the physical and cyber security status of their facilities.

All three operating alert states (EEAs, TEAs and SEAs) are independent of each other and should be declared independently but they may also be declared concurrently.

### A. General Requirements

**1. Initiation by Reliability Coordinator.** A Security Emergency Alert may be initiated only by a Reliability Coordinator at

- 1) The Reliability Coordinator's own request, or
- 2) Upon the request of a Transmission Operator, or
- 3) Upon the request of a Balancing Authority

**1.1. Situations for initiating alert.** A Security Emergency Alert may be initiated for the following reasons:

- A Cyber threat affecting a control center, grid or generator assets has been identified or is imminent.
- A physical threat affecting a control center, grid or generator assets has been identified or is imminent.

### 2. Notification.

A Reliability Coordinator who initiates a Security Emergency Alert shall notify all Transmission Operators and Balancing Authorities in its Reliability Area. The Reliability Coordinator shall also notify Reliability Coordinators of the situation via the Reliability Coordinator Information System (RCIS) using the "CIP" category. Additionally, conference calls between Reliability Coordinators shall be held as necessary to communicate system conditions. The Reliability Coordinator shall also notify all Transmission Operators and Balancing Authorities in its Reliability Area and other Reliability Coordinators when the alert has ended

### B. Security Emergency Alert (SEA) Levels

To ensure that all Reliability Coordinators clearly understand potential and actual Security Emergency Alerts, NERC has established three levels of Security Emergency Alerts. The Reliability Coordinators will use these terms when explaining security alerts to each other. A Security Emergency Alert is an emergency communication protocol, not a daily operating

practice, and is not intended as an alternative to compliance with NERC reliability standards. The Reliability Coordinator may declare whatever alert level is necessary, and need not proceed through the alerts sequentially.

**1. Security Emergency Alert 1 (SEA 1) – Cyber or Physical threat is identified or imminent**

**Circumstances:**

- The Reliability Co-ordinator, Transmission Operator or Balancing Authority has identified an actual or imminent cyber or physical threat to one of its facilities including but not limited to:
  - Control Centers
  - Generating facilities
  - Substations
  - Transmission Lines

**2. Security Emergency Alert 2 (SEA 2) – Cyber event *impacts* control center EMS or physical attack at a *single site***

**Circumstances:**

- The Reliability Coordinator, Transmission Operator or Balancing Authority has identified an actual cyber threat event that is affecting control center EMS capability.
- The Reliability Coordinator, Transmission Operator or Balancing Authority has identified a physical attack at a single site.

During Security Emergency Alert 2, Reliability Coordinators, Transmission Operators and Balancing Authorities have the following responsibilities:

**2.1 Notifying other Reliability Coordinators, Transmission Operators and Balancing Authorities**

The Reliability Coordinator shall post the declaration of the alert level along with the location of the affected facility on the RCIS under “CIP”.

**2.2 Declaration period.**

The declaring Entity shall update its Reliability Coordinator of the situation at a minimum of every hour until the SEA 2 is terminated. The Reliability Coordinator shall update the RCIS as changes occur and pass this information on to the affected Reliability Coordinators, Transmission Operators and Balancing Authorities.

### **3. Security Emergency Alert 3 (SEA 3) – Cyber event *shuts down* control center EMS or physical attack at *multiple sites***

#### **Circumstances:**

- The Reliability Coordinator, Transmission Operator or Balancing Authority has identified an actual cyber threat event that has shutdown a control center EMS capability.
- The Reliability Coordinator, Transmission Operator or Balancing Authority has identified a physical attack at a multiple sites

#### **3.1. Notifying other Reliability Coordinators, Balancing Authorities and Transmission Operators**

The Reliability Coordinator shall post the declaration of the alert level along with the locations of the affect facilities on the RCIS under “CIP”.

#### **3.2. Declaration period**

The declaring Entity shall update its Reliability Coordinator of the situation at a minimum of every hour until the SEA 3 is terminated. The Reliability Coordinator shall update the RCIS as changes occur and pass this information on to the affected Reliability Coordinators, Transmission Operators and Balancing Authorities.

### **4. Security Emergency Alert 0 (SEA 0) – Termination of alert level**

When the declaring entity believes it is no longer under threat, it shall request its Reliability Coordinator to terminate the SEA.

#### **4.1. Notification**

The Reliability Coordinator shall notify all other Reliability Coordinators via the RCIS of the termination. The Reliability Coordinator shall also notify the affected Transmission Operators and Balancing Authorities

## **Attachment M: Procedure for Obtaining a Temporary Environmental Variance**

During emergency conditions when load shedding is likely or imminent, it may be possible to obtain a temporary variance from environmental regulatory authorities for the purpose of allowing generators to operate and mitigate the risk of or prevent load shedding. Such a request must be reserved for times when the possibility of load shedding is imminent yet there is still time (hours) to approach regulatory contacts to explain the situation. It must be recognized that regulatory bodies will need some time to understand the situation prior to rendering a decision.

Environmental regulation is such that the generation owners are under significant pressure to remain in compliance with regulations at all times. In addition, environmental regulation tends to be local as opposed to regional or national in nature. However, based on the severity of the operating circumstances, temporary variances can sometimes be granted.

The following steps shall be followed:

- Identify specific generators that are either being reduced or are off-line due to environmental restrictions and their availability would make a significant contribution to alleviating the risk of load shedding in a specific area or region of PJM.
- Contact the generation owner to verify the unavailability of the generator and the appropriate environmental regulatory body that has jurisdiction on the generator. The generation owner will be aware of the regulations under which they operate and the possibility of obtaining a temporary variance from the appropriate regulatory authority.
- If the owner indicates that a temporary variance may be possible, prepare the following situation assessment:
  - Operating summary – including forecasted loads and capacity for the area in question and PJM in total
  - Estimated duration for the temporary variance
  - Estimate of the probability of load shedding in the area.
- Decide with the owner who will contact the environmental regulatory authority with the request. Generally, the regulators will need to hear directly from PJM, but the generation owner maintains the relationship with the regulator.
- If the variance is granted, operate the generator to the minimum extent possible within the bounds of the variance, and conclude the variance as soon as possible.

## PJM Manual 13 Revision History

### ***Revision 36 (01/30/2009)***

- Updated 2009 Reserve Requirements
- Updated Contingency Control Note – Section 5

### ***Revision 35 (11/07/2008)***

- Added steps and procedures for environmentally limited resources
- Updated load dump table
- Updated Operating Agreement Reference in Section 1
- Updated government notification language in Section 1

### ***Revision 34 (06/13/2008)***

- Section 3 and Section 6, Attachment C: Provided clarification for when Fuel Limited Gas Fired CTs should be placed into Maximum Emergency Resource Category.
- Modified Cold Weather/Hot Weather Alert to permit Emergency Procedure to be issued without Fuel Limited Resources being automatically placed into Maximum Emergency Resource Category, based on PJM Dispatch judgement.
- RPM Load Dump update
- Correct Operating Reserves
- Look at load dump table on page 127 - FE is duplicated
- Update Load Dump Table
- RFC / SERC Updated Disturbance Contacts

### ***Revision 33 (1/1/2008)***

- Updated language for Day Ahead Scheduling Reserves and Contingency Reserves to be effective 1/1/2008
- Draft Agenda for Conference Calls
- Additional corrections to ALM wording
- Updated OE-417 form and contacts
- Matched section 2 real-time emergency procedure language with section 5 real-time emergency procedure language

### ***Revision 32 (11/01/2007)***

- Corrections and clarifications to PJM Reserve Requirements notes
- Clarified issuing of NERC EEA levels
- Added note to clarify manual load shed after UFLS
- Added language for Gas Coordination for normal procedures for compliance with FERC order 698.

- Added general level for conservative operations
- Added clarifying language for Emergency Energy bids
- Added corrections to DOE reporting section.

**Revision 31 (09/28/2007)**

- Section 5: Transmission Security Emergencies: Revised definitions of Transmission Emergency Alerts and related procedures.
- Attachment J: Added latest version of Form OE-417.
- Added NERC Alert levels at Attachment M
- Updated Load Shed table in Attachment E
- Updated Annual Review language in overview
- Updated language in conservation request to add government agencies

**Revision 30 (5/24/2007)**

- Section 1: Added requirement for PJM to review manual (i.e. Emergency Operations Plan) on an annual basis in accordance with NERC and RFC standards.
- Section 2: Updated Reserve Requirements Table.

**Revision 29 (05/15/2007)**

- Attachment F: Updated to reflect PJM Manual Load Dump Capability attributes.
- Attachment J: Updated reporting requirements to U.S. Department of Energy to mirror DOE Form OE-417.
- Attachment K: Added NERC Disturbance Report form.
- Throughout: Added references to applicable NERC standards.

**Revision 28 (03/15/2007)**

- Section 2: Capacity Emergencies
  - Implement Full Emergency (Energy + Capacity) and Energy Only Option (Energy) Load Response.
  - Include Curtailment Service Providers as aggregators of Demand Resources for Full Emergency and Energy Only Option Load Response.
- Attachment G: Capacity Emergency Matrix
  - Modified to clarify Associated “Scarcity Pricing” with designated emergency procedure trigger points.
- Implement Full Emergency (Energy + Capacity) and Energy Only Option (Energy) Load Response.
- Introduction trimmed to eliminate redundant information.
- List of PJM Manuals exhibit removed, with directions given to PJM website where all the manuals can be found.

- Revision History permanently moved to the end of the manual.

#### ***Revision 27 (09/05/2006)***

- Section 2: Capacity Emergencies
- Updated Reserve Requirements section to summarize minimum RFC requirements.
- Added NERC EEA 2 as part of Active Load Management (ALM), PJM Actions.
- Added Note 2 under Maximum Emergency Generation, PJM Actions, indicating that PJM should consider loading shared reserves prior to implementing voltage reduction.
- Added Note providing guidance as to when dispatch should consider dumping load to arrest frequency decline as part of Manual Load Dump.
- Added clarification on Light Load Emergency reductions during Minimum Generation Declaration and Event. Also added exhibits of associated eDART forms.
- Section 4: Sabotage/Terrorism Emergencies
- Added references to NERC Emergency Alert Security Levels to PJM Security Alert Levels exhibit.
- Section 5: Transmission Security Emergency
- Added section titled “Interconnection Reliability Operating Limits (IROL) Facilities,” identifying IROL facilities and providing operating guidelines.

#### ***Revision 26 (07/26/06)***

- Section 1: Overview
- Modified Communications section to enhance coordination of ICCP link outages.
- Section 5: Transmission Security Emergency
- Modified Post-Contingency Local Load Relief Warning Section to include requirement to post on appropriate PJM web-site.

#### ***Revision 25 (05/19/06)***

- Section 2: Capacity Emergencies
- Change “unit” references to “resource” as they apply to Demand Side Response providing Ancillary Services.
- Change “Spinning” references to “Synchronized” as they apply to Demand Side Resources providing Ancillary Services.
- Associated “Scarcity Pricing” with designated emergency procedure trigger points in section 2
- Included NERC Energy Emergency Alert 3 (EEA3) under Manual Load Dump Action.
- Added Event Investigation Process, as Attachment L.

**Revision 24 (02/22/06)**

Revised all instances of Load Response Program and Load Reduction Program to Emergency Load Response Program.

Revised all instances of Load Response Action to Load Reduction Action.

Added note to Section 2, Step 4B (Real-time): Load Reduction Action.

Revisions were made on the following pages: 33, 67, 68 and 121.

**Revision 23 (12/01/05)**

Added Communications to Section 1, eliminated Voluntary Customer Load Curtailment and reordered Section 2, Added Inter RTO Natural Gas Coordination Procedures to Section 3, developed Section 5: Transmission Security Emergencies, modified Post Contingency Local Load Relief Warning, modified: Public/Media Notification Attachment, reordered sequence of Attachments. Included new Form OE-417 and revised instructions in Attachment J.

**Revision 22 (06/20/05)**

Section 6: Added requirement to report anticipated capacity and energy shortages to FERC, per FERC Order No. 659, issued May 27, 2005

**Revision 21 (05/12/05)**

Revised Attachment C: Manual Load Dump Allocation Tables.

**Revision 20 (02/04/05)**

Revised Section 5, Post Contingency Local Load Relief Warning.

**Revision 19 (10/01/04)**

General rearrangement of the Manual.

Moved Sections 6 & 8 to a new manual entitled, System Restoration

**Revision 18 (04/23/04)**

Attachment C: updated version of the Manual Load Dump Allocation Table.

**Revision 17 (03/03/04)**

Section 3: Conservative Operation: Changed a reference to "PJM Generating Unit Reactive Capability Curve Specification and Reporting Procedures" being Attachment J in Manual 3, to being located as Attachment D in Manual 14D.

Attachment D: PJM Manual Load Dump Capability: Added a row for AP and the Total Column has been updated.

Added Attachment J: Teleconference Protocol Guidelines

**Revision 16 (12/11/03)**

Section 2: Light Load Procedures: Revised to include curtailment of External Network Designated Resources. Included Local Minimum Generation Action to control localized overgeneration resulting in transmission or stability events.



Section 3: Conservative Operations: Revised to include clarification to Heavy Load Voltage Schedule.

Attachment C: Load Dump Allocation Tables: Relabeled table from PJM RTO to PJM. Provided note regarding PJM West Region Load Dump Allocation.

**Revision 15 (05/01/03)**

Attachment C: Manual Load Dump Allocation Tables

Revised allocation percentages based on 2002 Summer and 2001/02 Winter Load conditions.

**Revision 14 (04/01/03)**

Revised Section 3: Conservative Operation. Updated to include procedures for 'Post Contingency Local Load Relief Warning' and to bring the PJM threat levels into alignment with Homeland Security and NERC. PJM adopted the color scheme now in use by Homeland Security.

**Revision 13 (01/01/03)**

Revised Attachment I: Conservative Operations – Crisis Response. Updated Appendix 6: Threat Alert System and Physical Response guidelines for the Electricity Sector. Added new Appendix 7: Emergency Incident and Disturbance Report.

**Revision 12 (04/01/02)**

Introduction:

Expansion of Emergency Conditions and description of target users.

Section 1: Overview

Expansion of Emergency Condition description. Inclusion of Emergency Authority.

Section 2: Capacity Conditions

Defined rules regarding level to which PJM/PJM West will implement Emergency Procedures, revised PJM triggers for NERC Energy Emergency Alert notification levels., clarified delineation of duties among Generation / Transmission / LSE / Marketer, reflected name change from Security Coordinator to Reliability Coordinator, modified exhibit 2.1 and 2.4, incorporated Load Reduction Action, and revised Action to incorporate ALM terms / restrictions.

Section 3: Conservative Operations

Revised to include, 'Heavy Load Voltage Schedule Warning' and 'Crisis Response'.

Section 8: System Restoration

Clarified 'PJM Operator Responsibilities During Restoration', clarified duties among Generation / Transmission / Load Serving Entities, clarified / consolidated 'PJM Assumes Control', eliminated 'Emergency Procedures', consolidated redundant material, incorporated satellite phone and PJM West.

Attachment E: Minimum Generation Calculation for Midnight Period

Removed company names from form.

Attachment G: Public/Media Notification Message

Revised Alert messages / examples.

Attachment I: Crisis Response – Conservative Operations

Incorporated new attachment / appendices.

### ***Revision 11 (6/01/01)***

Section 2: Capacity Conditions

Revised Light Load Procedures.

Section 3: Conservative Operation

Revised to include, 'Heavy Load, Low Voltage Conditions' and 'Reporting Threats to Power System Infrastructure'.

Section 5: Fuel Limitation Reporting

Complete revision and name change of section.

Section 7: Severe Weather Conditions

Revised Cold Weather Alert.

Attachment A: Supplementary Status Report

Revised forms.

Attachment C: Manual Load Dump Allocation Tables

Revised to include Summer 2001 allocations.

### ***Revision 10 (12/01/00)***

Section 2: Capacity Conditions

Revised to include the incorporation of NERC EEA levels.

Attachment A: Definitions and Abbreviations

Removed Attachment A and all references. Attachment A is being developed into a new PJM Manual for ***Definitions and Abbreviations (M-35)***. All remaining attachments have been renumbered and all references have been corrected.

### ***Revision 09 (06/01/00)***

Revised Attachment I: Emergency Bid Form.

### ***Revision 08 (04/01/00)***

Section 2: Capacity Conditions

Removed all reference to Maximum Scheduled Generation.

Revised Exhibit 2.1: Emergency Levels, removed reference to Maximum Scheduled Generation; also revised Exhibit 2.4: Shortage Actions, removed reference to Maximum Scheduled Generation.

### Section 3: Conservative Operations

Removed all reference to Maximum Scheduled Generation.

### Section 5: Fuel Disruption Plans

Removed all reference to Maximum Scheduled Generation.

### Section 8: System Restoration

Added new subsection: “Guidelines for Area Interconnection and Use of External Power during System Restoration”.

### Section 9: Transmission Loading Relief

Removed all reference to Maximum Scheduled Generation.

Revised Exhibit 9.1: Initiation of NERC TLR Process, removed reference to Maximum Scheduled Generation.

### Attachment B: Supplementary Status Report

Removed all reference to Maximum Scheduled Generation.

Revised Exhibit B1: Supplementary Status Report Information Reported by Local Control Center – Page 1, removed reference to Maximum Scheduled Generation.

Revised Exhibit B2: Supplementary Status Report Information Reported by Local Control Center – Page 2, removed reference to Maximum Scheduled Generation.

Revised Exhibit B5: PJM Maximum Generation Report – Page 1 of 2, removed reference to Maximum Scheduled Generation. Revised Exhibit B6: PJM Maximum Generation Report – Page 2 of 2, removed reference to Maximum Scheduled Generation. Revised Exhibit B7: PJM System Status Report – Page 1 of 3, removed reference to Maximum Scheduled Generation. Revised Exhibit B8: PJM System Status Report – Page 2 of 3, removed reference to Maximum Scheduled Generation.

### ***Revision 07 (01/24/00)***

### Attachment B: Supplementary Status Report

Revised all supplementary status forms.

### Attachment D: Manual Load Dump Allocation Tables

Revised Exhibit D.1: Manual Load Dump Allocation –PJM RTOs and revised Exhibit D.2: Manual Load Dump Allocation – Eastern PJM RTO.

### Attachment G: Restoration Forms

Revised all restoration forms.

### Attachment H: Public/Media Notification Messages

Revised and replaced previous Attachment H: Government Notification Messages.

### Attachment I: Emergency Bid Form

Revised Emergency Bid Form, changed ‘Bid Price of Energy’ (Mils) to (\$/MWh).

**Revision 06 (06/03/99)**

Section 9: Transmission Loading Relief

Added this section to describe PJM procedures for implementing NERC Transmission Loading Relief (TLR).

**Revision 05 (03/17/99)**

Section 2: Capacity Conditions

Added new instruction, "Three Hours Prior to Light Load Period", and revised "Minimum Generation Emergency Declaration" and "Minimum Generation Event".

**Revision 04 (01/10/99)**

Attachment B: Supplementary Status Report

- Revised Forms and Supplementary Status Report Terminology.

**Revision 04 (10/08/98)**

Attachment G: Restoration Forms

- Revised "PJM Composite Initial Restoration Report," "Information To Be Exchanged Between Two Companies/Areas Prior To Interconnecting" and "PJM Assumes Control."
- Added "Company Initial Restoration Report," "PJM Composite Hourly Restoration Report," "Company Hourly Generation Restoration Report" and "Company Hourly Transmission Restoration Report."
- Deleted "LSE Hourly Report - Generation Restoration Report 1" and LSE Hourly Report - Transmission Restoration Report 2."

**Revision 03 (06/09/98)**

Added Attachment H: Government Notification Messages

Added Attachment I: Emergency Bid Form

**Revision 02 (03/25/98)**

Attachment 2: Capacity Conditions

- Revised text.

Section 3: Conservative Operation

- Revised text.

Attachment 7: Severe Weather Conditions

- Revised text.

Attachment B: Supplementary Status Report

- Revised text and forms.

### **Revision 01 (10/14/97)**

Changed “Hydro Unit Pick-Up Factor” from 5% to 15% in Exhibit G: PJM Assumes Control of Attachment G: Restoration Forms.

Deleted “attempt sales to outside” from “Minimum Generation Emergency Declaration in Section 2 “Capacity Conditions.”

Revised “PJM Actions” under “Minimum Generation Event” in Section 2 “Capacity Conditions” to:

- (1) PJM dispatcher loads all remaining pumps and reduces run-of-river plant energy, where reservoir elevation and river flow allow, without spilling water or violating reservoir elevation limits.
- (2) PJM dispatcher reduces the PJM dispatch signal to zero.
- (3) Cancel Spot Market Purchases bid at zero (0).
- (4) If Transmission Constrained, follow the Guidelines for Constrained Operations
- (5) Collect Reducible Generation Information, if not already obtained.
- (6) Declare a Minimum Generation Event
- (7) PJM dispatcher requests Local Control Centers to reduce Emergency Reducible Generation (ERG), in proportion to the total amount of ERG reported.
- (8) Attempt to sell Emergency Energy to external systems.
- (9) In concert with the Local Control Centers, PJM dispatcher recommends the shut down of specific units that are not required for area protection during the current load period or the subsequent on-peak period. PJM dispatcher recommends return times for these units.
- from:
  - (1) PJM dispatcher loads all remaining pumps and reduces run-of-river plant energy, where reservoir elevation and river flow allow, without spilling water or violating reservoir elevation limits.
  - (2) PJM dispatcher reduces the PJM dispatch signal to zero and attempts to sell excess generation to external systems.
  - (3) PJM dispatcher requests Local Control Centers to reduce Emergency Reducible Generation (ERG), in proportion to the total amount of ERG reported.
  - (4) In concert with the Local Control Centers, PJM dispatcher recommends the shut down of specific units that are not required for area protection during the current load period or the subsequent on-peak period. PJM dispatcher recommends return times for these units.

### **Revision 00 (04/30/97)**

This revision is a draft of the PJM Manual for **Emergency Operations**.

Added Supplementary Status Report Information Reported by PJM Member (Exhibit B.6, Exhibit B.7) and Supplementary Status Report Terminology to Attachment B (Supplementary Status Report).

Added the following paragraph to the Restoration Process in Section 8 (System Restoration):

- Nuclear units require additional consideration. Restoring customer load will normally need to be accomplished without the help of nuclear units. NRC start-up checklists do not permit hot restarts of nuclear units and their diesels are not permitted to supply auxiliary power to other generating stations. Nuclear units that are taken off line on a controlled shutdown can normally be restored to service between 24 and 48 hours following the controlled shutdown.

Added the following item (3) to the Market Participant Actions of Implement Restoration Procedure in Section 8 (System Restoration):

- (3) Off-site power should be restored as soon as possible to nuclear units, both units that had been operating and those that were already off line prior to the system disturbance, without regard to using these units for restoring customer load.

Added the following paragraph to Governmental Notification & Public Appeals Procedures in Section 1 (Overview):

- PJM will notify emergency contacts in state agencies within the PJM RTO. Specific notification of state and other agencies by PJM Members may also be required.

Changed references to PJM Interconnection Association to PJM Interconnection, L.L.C.

Changed references to PJM to PJM where appropriate.

Changed references to PJM to PJM RTO where appropriate.

Changed references to PJM IA to PJM.

Changed references to IA to PJM.

Changed references to Mid-Atlantic Market to PJM Interchange Energy Market.

Changed references to Mid-Atlantic Market Operations Agreement to Operating Agreement of PJM Interconnection, L.L.C.

Changed references to pool to control area.

Changed references to parties to PJM Members.