



Working to Perfect the Flow of Energy

PJM Manual 13
Emergency Operations

Revision: 576

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Prepared by:
System Operations Division

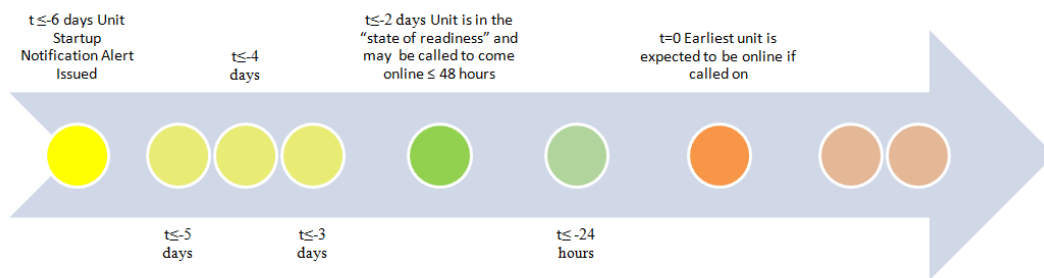
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PJM Manual 13

Emergency Operations

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Approval

Approval Date: **06/01/2014**
Effective Date: **06/01/2014**

Chris Pilong, Manager, Dispatch

Current Revision

Revision **576** (**06/01/2014**):

- Section 2.2 – Updated the DASR requirement to the new 2014/2015 values.

Section 2.3:

Added 'Advisory' as an Emergency Procedure type.

Added detail to the Warning, Alert and Action definitions.

Added a NOTE to give clarity for how unit owners received the "Unit Start Up Notification" Alert.

Section 2.3.1 – Added the Voltage Reduction Summary table based on SOS-T Feedback

Section 2.3.2 – Added clarity on the actions take prior to emergency procedures, included a statement about applying an Interchange Cap (based on ERPIV proposal)

Section 2.4.1 – Added the Min Gen Advisory procedure

- Section 3.3 & 3.4 – Cold/Hot Weather Alerts updated based on GUCC/ERPIV proposals for data entry updates and long lead commitment practices

Section 3.7 – Revised and updated the GMD procedure to include new monitoring stations and clarity on actions to take.

- Attachment A: Re-written, condensed & consolidated

- Current version 4 Levels

- Proposed version has 3 Levels, removing the Advisory level.

- Current version has Hot and Cold discrete messaging H1-H4 & C1-C4

- Proposed version has adjustable messaging W1-W3

- Attachment N – Removed Kammer/Belmont IROL allocations.

~~• Section 2.2 Reserve Requirements~~

- ~~Corrected the Primary and Synchronized Reserve requirements to cover the "largest single contingency", not just the "largest unit".~~

- ~~Section 2.3 Capacity Shortages and Section 5.2 Transmission Security Emergencies~~
 - ~~Exhibit 1 Action steps modified to reflect Pre-Emergency and Emergency Load Management~~
 - ~~Added language to the Maximum Emergency Generation Alert to include notice that Load Management may be required.~~
 - ~~Updates to Steps 1 and 2 to reflect the new categories and times.~~
 - ~~Noted that the minimum duration is 1 hr~~
 - ~~Added clarification that the official notice for CSPs to dispatch DR resources is the eLRS System. Emergency Procedures (EPs) will continue to be posted.~~
 - ~~The All-Call will continue to be issued but will be generic and indicate that DR has been called and that details are available on the EP website.~~
 - ~~Deleted Note 3 due to redundancy~~
- ~~Section 2.4.8 High System Voltage~~
 - ~~Revised the Black Oak SVC voltage settings based on changes in the field.~~
- ~~Sections 2.3 and 5.2~~
 - ~~Alerts to be issued 'in advance of the operating day', not just day ahead.~~
 - ~~Revised steps under the Primary Reserve Alert, Warning and Actions to clarify that PJM does not grant environmental waivers but will work with the GO if requested/notified.~~
 - ~~Added a note to the Voltage Reduction alert to indicate staffing will be expected at stations that do not have SCADA control but are needed to implement a voltage reduction~~
 - ~~Revised the Emergency Bid Form to indicate that email will be the primary means to submit the form, with fax serving as a back-up.~~
 - ~~Clarified that Manual Load Shed is expected to be implemented in 5 minutes if Directed~~
- ~~Section 3.3: Cold Weather Alert~~
 - ~~Alerts to be issued 'in advance of the operating day', not just day ahead.~~
 - ~~Changed the FE control zone names to the new naming convention~~
 - ~~Added a note that PJM Dispatch will reach out to gas-fired generation owners to validate fuel supplies.~~
- ~~Section 3.4: Hot Weather Alert~~
 - ~~Alerts to be issued 'in advance of the operating day', not just day ahead.~~
 - ~~Changed the FE control zone names to the new naming convention~~
 - ~~Revised temperature triggers for a HWA for EKPC and Dominion to 93-degrees~~



- ~~Section 5.4 Post-Contingency Local Load Relief Warning~~
 - ~~Added a step to indicate a “Load Shed Directive” message will be posted to the EP site if load shed is Directed.~~
- ~~Section 5.4.1: Post-Contingency Load Dump Limit Exceedance Analysis~~
 - ~~Added clarifying language to indicate pre-contingency load shed will not be directed in the case of a radial load pocket~~
- ~~Attachment C~~
 - ~~Eliminated Part C of the SSR for reporting of Load Response. These values will already be provided to PJM through the eLRS system by the CSPs.~~
- ~~Attachment E: Manual Load Dump Allocation tables~~
 - ~~Updated the Mid-Atlantic Load shed table with the 2014/15 PY numbers~~
 - ~~Update the FE company names~~
 - ~~Eliminated the table for the Eastern portion of the Mid-Atlantic~~
- ~~Attachment F: Manual Load Dump Capability tables~~
 - ~~Updated the Manual Load Dump capability table with the 2014/15 PY numbers~~
 - ~~Update the FE company names~~
- ~~Attachment G: Capacity Emergency Matrix~~
 - ~~Updated the matrix with the load management changes made to sections 2.3 and 5.2~~
- ~~Attachment N: IROL Load Dump Table~~
 - ~~Update the FE company names~~



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 <http://www.pjm.com/documents/manuals.aspx>

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 or internal 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 PJM neighboring and internal Transmission Operators (TOP), Balancing Authorities (BA), and Reliability Coordinators (RC), and appropriate Regional Reliability Organizations (RRO).

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 no 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 and internal 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 loading 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 electric system (BES) 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 Reserves: 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. Interruptible load resources cannot be part of the 10 minute synchronized generating reserves component of Synchronized Reserves.

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 Security Constrained Economic Dispatch application (SCED) 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 data link 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 SCED 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 SCED 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 eligible to determine 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 (M28)
- *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 (M28)

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:

Area	Ancillary Service Market Area	Day-ahead Scheduling (Operating)	Contingency (Primary)	Synchronized Reserve
RTO		Annual %	150% Largest Single Contingency	Largest Single Contingency
	Mid-Atlantic & Dominion	N/A	1700 MW	Largest Single Contingency
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).

Day-ahead Scheduling Reserves = Underforecasted LFE + 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 80th percentile of a rolling three year underforecast average.

Effective January 1, [2014-2015](#) the LFE error component of the Day-ahead Scheduling Reserve is 2.144%.

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, 2014 the FOR error component of the Day-ahead Scheduling Reserve is 4.463.75%.

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 1st (year – 3) through October 31st (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 1st.

Effective January 1, 2014 the Day-ahead Scheduling Reserve for RFC and EKPC regions of PJM is 6.275.88% times Peak Load Forecast for RFC plus EKPC.

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

The RFC, EKPC 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 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 Regulation Requirement for the PJM RTO is defined in section 4 of Manual 12, Balancing Operations.

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 PJM RTO 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:

- [Advisory – issued one or more days in advance of the operating day. General in nature and for elevated awareness only. No preparations required.](#)
- [Alerts – issued one or more days in advance of the operating day for elevated awareness and to give time for advanced preparations.](#)
- Warnings – issued real-time, [typically preceding, and with an estimated time/window for a potential future ACTION](#)
- Actions – issued real-time [and requires PJM and/or Member response](#)
 - PJM actions are consistent with NERC and RFC EOP standards.

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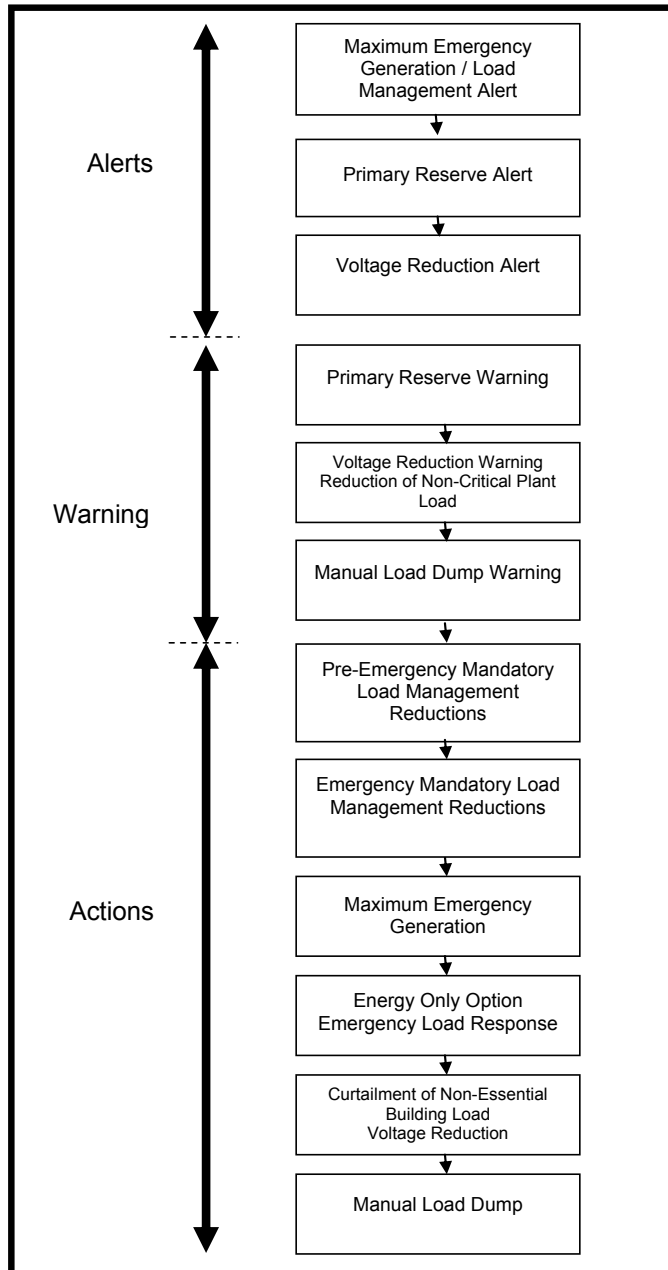




Exhibit 1: Emergency Levels

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 members are expected to implement all emergency procedures immediately to achieve the desired relief within 30 minutes unless otherwise directed. PJM dispatchers have the flexibility of implementing the emergency procedures in whatever order is required to ensure overall system reliability. PJM dispatchers have 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 shedding, 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.

Unit Startup Notification Alert

The purpose of the Unit Startup Notification Alert is to alert members to place units in state of readiness so they can be brought online within 48 hours for an anticipated shortage of operating capacity, stability issues or constrained operations for future periods. It is implemented when a reliability assessment determines that long lead time generation is needed for future periods and can be issued for the RTO, specific Control Zone(s) or individual unit basis. The Unit Startup Notification Alert is issued so that units can be ready to come online in 48 hours or less, based on the lesser of submitted notification time + startup time or 6 days. After reaching the state of readiness, if a unit fails to come online within 48 hours when called by PJM, the unit will be considered as forced outage until it can be online or PJM cancels the unit.

PJM Actions:

- PJM dispatch notifies PJM management and members.
- PJM dispatch issues the Alert to members, stating the Alert period(s) and the affected areas. An Alert can be issued for the RTO, specific Control Zone(s) or individual unit basis on the projected location of transmission constraints and

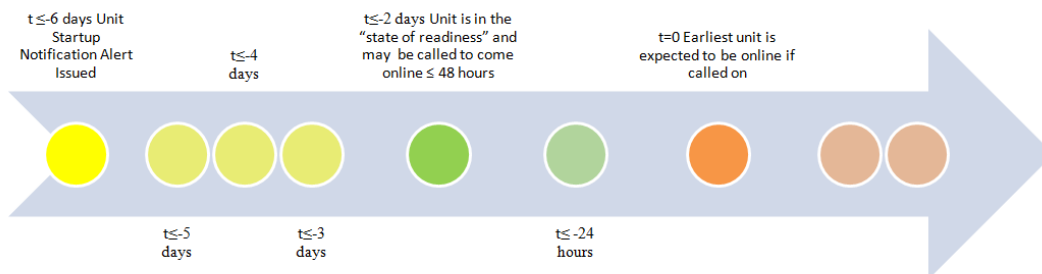
should be issued as soon as practicable (typically 6 days or less) prior to the anticipated need for long lead time generation to come online

NOTE: If the Alert is issued for the RTO or a control zone, it will be issued via the All-Call system. Otherwise individual unit owners will be called

- PJM will schedule an amount of long lead time generation anticipated to be needed for the operating day(s) in economic order respecting unit operating parameters. Once a generator is scheduled its offer price is locked for the operating day.
- PJM dispatch will evaluate system conditions daily to determine whether to release units from the Alert, to keep the units in the state of readiness or to call the units online.
- PJM dispatch 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.
- Generation dispatchers orders unit(s) to be in the state of readiness (i.e. able to be online within 48 hours) in the lesser of (submitted notification time + startup time or 6 days) minus 48 hours.



2.3.1 Advanced Notice Emergency Procedures: Alerts

The intent of the alert(s) is to keep all affected system personnel aware of the forecasted 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 / Load Management Alert

The purpose of the Maximum Emergency Generation / Load Management 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 or if Demand Response is projected to be implemented.

PJM Actions:

- PJM dispatch 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 dispatch issues an alert to members, stating the amount of estimated operating reserve capacity and the requirement. Alert can be issued for entire PJM RTO or for specific Control Zones and should be issued 1 or more days prior to the operating day.
- PJM dispatch reports significant changes in the estimated operating reserve capacity.
- PJM dispatch 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 dispatch 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 \(M2\)](#) 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 dispatch 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 dispatch 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 dispatch any and all fuel / environmental limited facilities as they occur and update PJM dispatch 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 forecasted primary reserve requirement.

PJM Actions:

- PJM dispatch notifies PJM management and members.
- PJM dispatch issues alert to members, stating the amount of estimated operating reserve capacity and the requirement. An Alert can be issued for the entire PJM RTO or for specific Control Zone(s) based on the projected location of transmission constraints and should be issued 1 or more days prior to the operating day.
- PJM dispatch reports significant changes in the estimated operating reserve capacity.
- PJM dispatch 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.
- Generation Dispatchers are to inform PJM of any environmentally restricted units and may consider the need to obtain a temporary variance from environmental regulators for specific generators in accordance with Attachment M to assist in preventing load shed. PJM is not responsible for obtaining a temporary variance from environmental regulations but will assist the member company if requested.

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. [A summary table below lists the estimated times to implement and approximate load relief.](#)

PJM Actions:

- PJM dispatch notifies PJM management.



- PJM dispatch 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 RTO or for specific Control Zone(s) based on the projected location of transmission constraints and should be issued 1 or more days prior to the operating day.
- PJM dispatch 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.

Note: Substations without SCADA control will be expected to be staffed in order to implement a Voltage Reduction Action if needed

Voltage Reduction Summary Table:-

PJM MID-ATLANTIC							
	TIME (m)	Voltage Reduction %	Load Reduction %	Est. PEAK LOAD	Est. Load Reduction	SCADA	COMMENTS
PPL	1m 10s	5%	3%	7,334	198.02	Y	
PSEG	5	5%	2%	10,614	212.28	Y	
DPL	5	5%	2%	4,181	83.62	Y	
ACE	5	5%	2%	2,750	55.00	Y	
PECO	2	5%	1%	8,843	88.43	Y	
RECO	10	5%	1%	423	4.23	Y	
UGI	2	5%	1%	198	1.98	Y	UGI will implement voltage reduction at the Mountain station.
PEPCO	5	5%	2%	6,870	137.40	Y	PEPCO is being required to

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							implement a permanent 3% conservation voltage reduction plan in Maryland. If Pepco adopts this plan PJM can expect less load reduction % after the implementation.
<u>BGE</u>	<u>2</u>	<u>5%</u>	<u>3%</u>	<u>7,283</u>	<u>182.08</u>	<u>Y</u>	Initially distribution voltages are lowered automatically. Additional adjustments are made to push voltage change up the transmission system through manual tap changes through SCADA. These additional operation steps take up to 15 min.
<u>FE East - JCPL</u>	<u>10</u>	<u>5%</u>	<u>1%</u>	<u>6,361</u>	<u>63.61</u>	<u>Y</u>	The Distribution Operator implements 5% voltages reduction via SCADA to distribution transformers with automatic ULTC. There are 17 control points in EMS and each control point sends the recudtion signal

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							to multiple stations. Takes about 10 minutes to implement.
FE East - PENLC	10	5%	1%	2,966	29.66	Y	The Distribution Operator implements a 5% voltage reduction by operating individual ULTC from SCADA. Takes about 10 minutes to implement.
FE East - METED	10	5%	1%	3,019	30.19	Y	The TSO implements a 5% voltage reduction on the 69 kV sub-transmission system by operating individual ULTC from SCADA and the Distribution Operator implements a 5% voltage reduction via SCADA to distribution transformers with automatic ULTC. The Distribution Operator has 14 control points in EMS and each control point sends the reduction signal to multiple stations. Takes about 10

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							<u>minutes to implement.</u>
TOTAL			<u>1.8%</u>	<u>60,842</u>	<u>1,086.49</u>		
PJM SOUTH AND WEST REGIONS							
	<u>TIME(m)</u>	<u>Voltage Reduction %</u>	<u>Load Reduction %</u>	<u>Est. PEAK LOAD</u>	<u>Est. Load Reduction</u>	<u>SCADA</u>	<u>COMMENTS</u>
<u>DUQU</u>	<u>60</u>	<u>5.0%</u>	<u>2%</u>	<u>2,997</u>	<u>59.94</u>	<u>Y</u>	
<u>DOM</u>	<u>2</u>	<u>3.5%</u>	<u>1%</u>	<u>20,197</u>	<u>201.97</u>	<u>Y</u>	
<u>AEP</u>	<u>60</u>	<u>2.5%</u>	<u>0.26%</u>	<u>23,556</u>	<u>61.25</u>	<u>N</u>	<u>10 Min (assuming stations are manned); this time does not include the amount of time to mobilize personnel. 2 hours minimum to mobilize personnel.</u>
<u>FE South</u>	<u>10</u>	<u>5%</u>	<u>1.7%</u>	<u>8,837</u>	<u>150.23</u>	<u>Y</u>	<u>FE South's voltage reduction program implements a 5% voltage reduction, in accordance with PJM procedures. The SCADA implemented program is capable of a 2.5% voltage reduction, however this would not be used during the PJM Voltage Reduction Action.</u>
	<u>30</u>	<u>2.5%</u>	<u>3%</u>	<u>23,275</u>	<u>721.53</u>	<u>Y</u>	<u>COMED can get</u>

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<u>COMED</u>		<u>5%</u>					<u>1.3% Load reduction in 15 minutes, then another 1.8% in the next 15 minutes. 2.5% voltage reduction inside Chicago. 5% voltage reduction outside Chicago.</u>
<u>DAYTON</u>	<u>10</u>	<u>5%</u>	<u>0.27%</u>	<u>3,476</u>	<u>9.39</u>	<u>Y</u>	<u>SCADA control in all 345/138kV and 138/69kV substations. Total load reduction is 0.7% in 3 hours; 0.94% in 6 hours; 1 % in 11 hour.</u>
<u>FE West - ATSI</u>				<u>13,341</u>	<u>-</u>		
<u>DEOK</u>				<u>5,597</u>	<u>-</u>		
<u>EKPC</u>				<u>1,899</u>	<u>-</u>		
TOTAL			<u>1.2%</u>	<u>103,175</u>	<u>1,204.29</u>		
RTO TOTAL			<u>1.4%</u>	<u>164,017</u>	<u>2,290.79</u>		

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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 dispatchers 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 dispatchers broadcast 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.

Actions taken prior to entering into capacity related Emergency Procedures:

- [1. Review weather projections, load forecasts, reserve projections and generation performance.](#)
- [2. Ensure LMPs are reflective of system conditions](#)
- [3. Curtail all non-Firm exports](#)
- [4. Dispatch may elect to implement an interchange cap to stabilize the amount of interchange during peak hours to protect against volatility](#)

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Step 1: Pre-Emergency Mandatory Load Management Reduction Action (30, 60 or 120-minute)

Applicability: Any site registered in the PJM Demand Response program as a demand resource (a.k.a. DR) type that needs 30, 60 or 120 minute lead time to make its reductions. These reductions are mandatory when dispatched during the product availability window.

NOTE: The minimum dispatch duration is 1-hr.

PJM Actions:

- PJM dispatch 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 dispatch, via the eLRS System and Emergency Procedures website, will post detailed instructions to the Curtailment Service Providers (CSP) to dispatch 30, 60 and/or 120 minute Pre-Emergency Mandatory Load Management Reductions. An



Action can be issued for the entire PJM RTO, specific Transmission Zone(s) or a Transmission Sub-zone(s) if transmission limitations exist. PJM dispatcher will also issue an All-Call informing the Members and CSPs to check the eLRS and Emergency Procedures postings for the detailed information pertaining to the Pre-Emergency Mandatory Load Management that has been called.

- PJM dispatch cancels the Action, when appropriate.

PJM Member Actions:

- Member Curtailment Service Providers implement load management reductions as requested by PJM dispatchers.

Step 2: Emergency Mandatory Load Management Reduction Actions (30, 60 or 120-minute Time)

Applicability: Any site registered in the PJM Demand Response program as a demand resource (a.k.a. DR) type that needs 30, 60 or 120 minute lead time to make its reductions. These reductions are mandatory when dispatched during the product availability window.

NOTE: The minimum dispatch duration is 1-hr.

The purpose of the Load Management Reduction 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.

PJM Actions:

- PJM dispatch notifies PJM management, PJM public information personnel, and members. PJM dispatch advises members to consider the use of public appeals to conserve electricity usage. PJM dispatch notifies other Control Areas through the RCIS.
- PJM dispatch, via eLRS System and Emergency Procedures website, will post detailed instructions to the Curtailment Service Providers (CSP) to implement dispatch 30, 60 and/or 120 minute Emergency Mandatory Load Management Reductions (Long Lead Time). An Action can be issued for the entire PJM RTO, specific Transmission Zone(s) or a subset of a Transmission Sub-zone(s) if transmission limitations exist. PJM dispatch will also issue an All-Call informing the Members and CSPs to check the eLRS and Emergency Procedures postings for the detailed information pertaining to the Emergency Mandatory Load Management that has been called.
- PJM dispatch 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 Emergency Mandatory Load Management Reductions. 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, or utility load conservation measures.
- PJM dispatch cancels the Action, when appropriate.



PJM Member Actions:

- Member Curtailment Service Providers implement load management reductions as requested by PJM dispatchers.
- 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.

Note 1: Load management programs, whether under PJM control and directed by PJM dispatch 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 mandatory PJM issued reductions are referred to as Pre-Emergency or Emergency Mandatory Load Management Reductions.

Note 2: PJM RTO Load Management Reductions are not to be used to provide assistance to adjacent Control Areas beyond PJM. Restoration of Load Management Reductions 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: Pre-Emergency and Emergency Mandatory Load Management Reductions are available for Limited, Extended Summer and Annual Demand Resources as defined in the Reliability Assurance Agreement (RAA).

Note 4, 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 Emergency Mandatory Load Management Reductions. A NERC EEA2 may be 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.

Note 5, Demand Resource Curtailment: If PJM needs to dispatch Demand Resources (DR) during the Limited DR availability Period then PJM will dispatch all DR products simultaneously unless all products have been dispatched frequently during the current delivery year. Frequent dispatch of DR during the delivery year is defined as:

- 2 times prior to July 1st,
- 4 times prior to August 1st, or,
- 7 times prior to September 1st.



Should PJM frequently dispatch DR during a delivery based on the criteria above PJM may elect to dispatch only the Extended Summer and Annual DR, to preserve Limited DR for the remainder of the delivery year.

Note6, Capacity Benefit Margin (CBM): Under NERC Energy Emergency Alert Level 2, the PJM dispatcher may request import energy over firm transfer capability set aside as CBM. If so, dispatch will waive any real-time operating timing and ramp requirements and document such actions in compliance with MOD-004-1.

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.

PJM Actions:

- PJM dispatch 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 RTO or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatch notifies PJM public information personnel.
- PJM dispatch rechecks with members to assure that all available equipment is scheduled and that requested secondary reserve is brought to primary reserve status.

- PJM dispatch 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 dispatch 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.
- Generation Dispatchers are to inform PJM of any environmentally restricted units and may consider the need to obtain a temporary variance from environmental regulators for specific generators in accordance with Attachment M to assist in



preventing load shed. PJM is not responsible for obtaining a temporary variance from environmental regulations but will assist the member company if requested.

- 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 dispatch.

PJM Actions:

- PJM dispatch issues Maximum Emergency Generation. An Action can be issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatch notifies PJM management, PJM public information personnel, and member dispatchers.
- PJM dispatch implements the Emergency Bid-Process, requesting Emergency bids by posting messages to selected PJM web-sites, RCIS, and contacting the neighboring control areas.
- PJM dispatch instructs members to suspend Regulation on all resources, except hydro generation.
- PJM dispatch determines the feasibility recalling off-system capacity sales that are recallable (network resources).
 - PJM dispatch will determine any limiting transmission constraints internal to PJM that would impact the ability to cut transactions to a specific interface.
 - PJM dispatch will identify off-system capacity sales associated with the identified interfaces.
 - PJM dispatch will contact the sink Balancing Authority to determine the impact of transaction curtailment.
 - If the net result of cutting off-system capacity sales would put the sink Balancing Authority into load shed then PJM will not curtail the transactions unless it would prevent load shedding within PJM.
 - If the net result of cutting off-system capacity sales would put PJM in a more severe capacity emergency than it is in currently in due to reciprocal transaction curtailments from the sink Balancing Authority, PJM will not initiate curtailing the transactions.
- PJM dispatch 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 dispatch 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.

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 use email as primary means of submitting bids with fax as a secondary means if email is unavailable 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 bid is loaded 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 will 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): Emergency Voluntary Energy Only Demand Response Reductions

Applicability: Any site registered in the PJM Demand Response program as an emergency energy only resource. These reductions are voluntary.

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

PJM Actions:

- PJM dispatch issues Action via the PJM All-call and post message to selected PJM Web-sites. An Action can be issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatch notifies PJM management, PJM public information personnel, and PJM Markets personnel.



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

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 dispatch 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 RTO or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatch notifies PJM public information personnel.
- PJM notifies the Department of Energy (DOE).
- PJM dispatch 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): 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 dispatch 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 issues a request to curtail non-essential building load. An Action can be issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatch 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 7 (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 dispatch 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 RTO or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatch notifies PJM public information personnel.
- PJM dispatch notifies FERC via the FERC Division of Reliability's electronic pager system, consistent with FERC Order No. 659.



- PJM dispatch establishes a mutual awareness with the appropriate member dispatchers of the need to address the occurrence of a serious contingency with minimum delay.
- PJM dispatch 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 8 (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 dispatch 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 RTO, 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 dispatch investigates loading of shared reserves with neighboring systems prior to implementation of a voltage reduction, recognizing the impact on transmission limits.
- PJM dispatch 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 dispatch 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.
- If it has not already begun, the PJM dispatch will initiate Shortage Pricing if the region where the voltage reduction action has been initiated corresponds with an entire Synchronized Reserve Zone or Sub-Zone.
- 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.
- Member Generation dispatchers must ensure generators (connected below 230kv) participate in a voltage reduction declared by PJM and operate the facility at the voltage level requested by the Local Control Center. Unless PJM requests a manual adjustment, the Generator must maintain the facility's automatic voltage regulator(s) in service during an Emergency.

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

Step 9 (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 dispatch 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 dispatch instructs members to suspend all remaining regulation, if not already suspended previously.
- PJM dispatch determines which Control Zone (s) are capacity deficient and the relative proportion of deficiency. PJM dispatch 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 dispatch 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 dispatch will implement load shedding in controlled step sizes to minimize system impact and further uncontrolled separation.
- PJM dispatch notifies PJM management, PJM public information personnel, and members. PJM dispatch advises members to consider the use of public appeals to conserve electricity usage and public announcements of the emergency. PJM dispatch notifies other Control Areas through the RCIS, and notifies DOE, FEMA, and NERC offices, using established procedures.
- PJM dispatch notifies FERC via the FERC Division of Reliability's electronic pager system, consistent with FERC Order No. 659.
- PJM dispatch 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.



- If it has not already begun, the PJM dispatch will initiate Shortage Pricing if the region where the manual load dump action has been initiated corresponds with an entire Synchronized Reserve Zone or Sub-Zone.

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 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) within 5 minutes of the issued directive. 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. PJM shall only use the assistance provided by the

Interconnection's frequency bias for the time needed to implement corrective actions. PJM will not unilaterally adjust generation in an attempt to return

Interconnection frequency to normal beyond that supplied through frequency bias action and Interchange Schedule changes. 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.

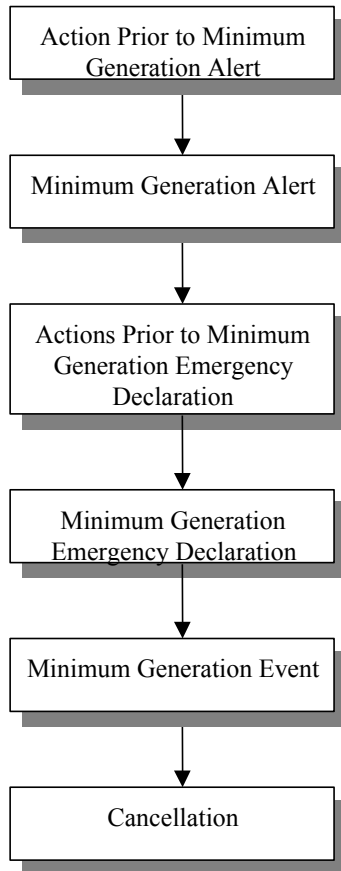


Exhibit 2: Sequence of Actions

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 reviews the valley load forecasts for the next several days. If the RTO load is projected to be at or below 70,000MWs \(Summer/Winter\) or 65,000MWs \(Spring/Fall\), PJM Issues a **Minimum Generation Advisory** message to the Emergency Procedures site 1-2 days ahead of time to provide an informational only notice that a Min Gen Alert/Action is likely.](#)

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- 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 dispatch issues the Alert for the specified light load period via the ALL-CALL and posts the alert on selected PJM web-sites and the NERC RCIS. 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.

Note 1: In order to ensure resources do not force emergency procedures they must be dispatchable (Dispatchable Generation) in the range between the greater of the resource's physical minimum operating level or Capacity Interconnection Rights (CIR) and Maximum Facility Output (MFO) (i.e. fixed gen flag must not be selected).

Note 2: Resources may not submit an economic minimum that exceeds the greater of the resource's physical minimum operating level or the level of their CIR in the real-time energy market. This restriction does not apply to the day-ahead market.

Note 3: An intermittent resource's Economic Minimum shall not exceed the level of its CIR.

Note 4: An intermittent resource's Emergency Minimum should be set to 0.

- Generation dispatchers compile their emergency reducible information and report to the PJM Master 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 dispatch 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 forecasted 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.

Note 1: 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 dispatch 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 and the NERC RCIS.

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 SCED base point.
- 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 Master 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 dispatch 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 dispatch issues via the ALL-CALL the 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 dispatch also posts the Event on selected PJM web-sites and the NERC RCIS.

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 dispatch recommends the shutdown of specific units that are not required for area protection during the current load period or the subsequent on-peak period. PJM dispatch recommends return times for these units.

Note: Having reviewed the conditions for the next on-peak period, PJM dispatch 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.
- PJM dispatch 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 dispatch 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 dispatch 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.

2.4.8 High System Voltage

To prepare the system for expected high voltages, PJM will coordinate with the Transmission owners to proactively take steps to control high voltages prior to entering the



light load period. These steps are outlined in PJM Manual [M-03](#) Section 3.5.3. The steps below will be taken in real time when portions of the PJM RTO are experiencing a low load / high voltage condition. PJM will issue an all call to PJM members to trigger the following steps:

PJM Actions:

- PJM issues High System Voltage messages directing all companies to take the actions listed below to control high system voltages.
- PJM may coordinate with Transmission and Generation Owners to direct generators to be operated outside of their voltage schedule bandwidth on a case by case basis.
- PJM dispatch cancels the high voltage message, when appropriate.

PJM Member Actions:

- Transmission Owners ensure all appropriate substation switchable capacitors, including distribution capacitors, are out of service as well as SVC's in the lead.
- Transmission Owners ensure all available shunt reactors are in service.
- Transmission Owners are requested to review and adjust LTC settings as appropriate. All LTC (230 kV and above) and voltage schedule adjustments shall be coordinated with PJM Dispatch.
- FE Southwill set the Black Oak SVC to begin absorbing MVARs when voltage exceeds 535kV PECO will set the Elroy 500kV capacitors to manual.
- Transmission Owners are requested to review and adjust generator voltage schedules to have generators absorb reactive power as modeled in the unit D-curve or as appropriate. Voltage schedule adjustments (including default voltage schedule) shall be coordinated with PJM Dispatch. (Generation owners should not take voltage actions outside their voltage schedule prior to coordinating with the local Transmission Owner.)
- Generation Owners communicate with PJM and the Transmission Owner restrictions to their generator's ability to absorb MVARs if that capability varies from the existing "D" curve.
- Generation Owners will operate generators at the lower bandwidth of their voltage schedule when possible.
 - **Example:** A generator following the PJM default 230 kV voltage schedule of 235 kV +/- 4 kV should be operating to 231 kV if possible.

2.5 General Assistance to Adjacent Control Areas

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

PJM Actions:



- PJM dispatch notifies PJM management, PJM public information personnel, and Local Control Center dispatchers. PJM dispatch notifies outside Control Areas using the RCIS, and the NERC hotline if necessary.
- PJM dispatch orders, as required, increased generation, including Maximum Emergency Generation (with the exception of fuel limited and environmentally restricted capacity). PJM dispatch 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 Balancing Areas. PJM dispatch 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 Member 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).

Note 1: 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.

Note 2: 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
 - PJM enters an unknown operating state

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, PJM can initiate a Cold Weather Alert across the RTO or on a Control Zone basis when the forecasted weather conditions approach minimum or actual temperatures of 10 degrees Fahrenheit or below . 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 initiate the Cold Weather Alert for the appropriate region(s) in advance of the operating day [based on historical experience, information supplied by the pipelines and/or information supplied from the generator owners.](#)

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](#)
 - [Reminder to Gen Owners to update their unit parameters in eMkt to reflect revised Start-up and Notification times, max run times, min run times, etc.](#)
 - PJM Dispatch communicates whether fuel limited resources are required to be placed into Maximum Emergency Category.
- [PJM Dispatch reviews the load forecast, interchange forecast, the increased MW unavailability from the tables below and generator Times to Start \(Start-Up + Notification in eMkt\) to confirm if the Day Ahead Market will be able to clear sufficient generation that can be on-line to meet the reliability needs of the system for the operating day. If sufficient generation cannot be cleared in the Day Ahead market based the start-up + notification time, the following processes will be used to commit generation in advance of the Day Ahead Market:](#)

NOTE: [Any discussions on unit commitment outside of the Day Ahead Market must be predicated on the unit parameters listed in eMkt which include: notification/start-up time, min run time, max run time, cost and price schedule.](#)

- [Natural gas generating units:](#)
 - [PJM Dispatch will notify the generator owner that the unit is required to be online and ready to follow PJM dispatch signals at XX:XXhrs on XX day for reliability. The unit parameters and the offer will then be confirmed and the unit will be offer capped with the schedule being](#)

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'locked in' as indicated in M-11. PJM Dispatch will inform the gen owner to run for the greater of:

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- The unit's Min Run time OR
- The duration that PJM requires the unit to run for reliability reasons.
- Generators committed under this procedure will be run for the hours scheduled, assuming no reliability issues, and will be included in the DA Market as indicated in Manual M-11.
- The PJM OATT does not allow for stranded fuel recovery for any reason to include forced outage, failure to meet start profiles, or decommitted due to reliability issues.
- Non-natural gas generating units:
 - PJM Dispatch will notify the generator owner that the unit is required to be online and ready to follow PJM dispatch signals at XX:XXhrs on XXday for reliability. The unit parameters and the offer will then be confirmed and the unit will be offer capped. PJM dispatch will NOT commit to run the unit longer than its Min Run time.
 - Generators committed under this procedure will be run for the hours scheduled and will be included in the DA Market as indicated in M-11
 - **NOTE:** The unit may also be cancelled at any time prior to coming on-line if system conditions change. Costs will be recoverable as indicated in M-11.

Note 1: 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.

Note 2: 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
Mid Atlantic	Mid-Atlantic	Philadelphia	4000 - 5000 MW
FE-South	Western	Pittsburgh	500 – 1000 MW



AEP	Western	Columbus	1000 – 1500 MW
Dayton	Western	Dayton	500 – 1000 MW
ComEd	Western	Chicago	2000 – 3000 MW
Dominion	Southern	Richmond	1000 – 2000 MW
FE-West	Western	Cleveland	500 – 1000 MW
DEOK	Western	Cincinnati	200 – 300 MW
EKPC	Western	Winchester	200 – 300 MW

Note: Unavailability numbers are conservative estimates and are not necessarily additive. During the start of extreme cold weather unavailability rates are typically higher. Values can be adjusted based on the duration of cold weather, actual unity 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 dispatch may assume an unavailability factor for scheduled interchange that could range from 25% to 75% of the pre-scheduled interchange. PJM Dispatch 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.

~~**Note:** PJM Dispatch will make efforts to contact owners of gas-fired generation to obtain information regarding the supply and procurement of gas from their respective pipeline suppliers in advance of the operating day for when the cold weather alert is issued.~~



- PJM dispatch reports significant changes in the estimated operating reserve capacity.
- PJM dispatch cancels the alert if the weather forecast is changed or when the alert period is over.

PJM Member Actions:

- Transmission/Generation dispatchers notify management of the alert.
- [Generation dispatchers update their unit parameters, including the Start-up and Notification, Min Run Time, Max Run Time, Eco Min, Eco Max, etc. in eMkt.](#)
- [Generation dispatchers with dual fuel determine whether alternate fuel will be made available to PJM for dispatch. If made available, any known alternate fuel restrictions will be communicated via eMkt in the “operating restrictions” field. If available but only in an emergency, this will also be communicated via eMkt in the “operating restrictions” field.](#)
- 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 [and update the unit Max Run field in eMkt.](#)
- 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. A Hot Weather Alert will be issued for the Dominion and EKPC Control Zones when projected temperatures are to exceed 93 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
Mid-Atlantic	Mid-Atlantic	Philadelphia	2000 - 2500 MW
FE South	Western	Pittsburgh	300 – 500 MW
AEP	Western	Columbus	500 – 1000 MW
Dayton	Western	Dayton	300 – 500 MW
ComEd	Western	Chicago	1000 – 1500 MW
Dominion	Southern	Richmond	500 - 1000 MW
FE West	Western	Cleveland	300 – 500 MW
DEOK	Western	Cincinnati	100 – 200 MW
EKPC	Western	Winchester	100 – 200 MW

Note: Unavailability numbers are conservative estimates and are not necessarily additive. As extreme hot weather continues unavailability rates may begin to increase. 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 dispatch notifies PJM management and member dispatchers.
- PJM dispatch issues an Alert stating the amount of estimated operating reserve capacity and the reserve requirement.
- [Reminder to Gen Owners to update their unit parameters in eMkt to reflect revised Start-up and Notification times, max run times, min run times, etc.](#)
- PJM Dispatch communicates whether fuel limited resources are required to be placed into Maximum Emergency Category for Hot Weather/Cold Weather Alerts.
- PJM Dispatch reviews the load forecast, interchange forecast, the increased MW unavailability from the tables below and generator Times to Start (Start-Up +

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Notification in eMkt) to confirm if the Day Ahead Market will be able to clear sufficient generation that can be on-line to meet the reliability needs of the system for the operating day. If sufficient generation cannot be cleared in the Day Ahead market based the start-up + notification time, the following processes will be used to commit generation in advance of the Day Ahead Market:

NOTE: Any discussions on unit commitment outside of the Day Ahead Market must be predicated on the unit parameters listed in eMkt which include: notification/start-up time, min run time, max run time, cost and price schedule.

o Natural gas generating units:

- PJM Dispatch will notify the generator owner that the unit is required to be online and ready to follow PJM dispatch signals at XX:XXhrs on XX day for reliability. The unit parameters and the offer will then be confirmed and the unit will be offer capped with the schedule being 'locked in' as indicated in M-11. PJM Dispatch will inform the gen owner to run for the greater of:
 - The unit's Min Run time OR
 - The duration that PJM requires the unit to run for reliability reasons.
- Generators committed under this procedure will be run for the hours scheduled, assuming no reliability issues, and will be included in the DA Market as indicated in Manual M-11.
- The PJM OATT does not allow for stranded fuel recovery for any reason to include forced outage, failure to meet start profiles, or decommitted due to reliability issues.

o Non-natural gas generating units:

- PJM Dispatch will notify the generator owner that the unit is required to be online and ready to follow PJM dispatch signals at XX:XXhrs on XXday for reliability. The unit parameters and the offer will then be confirmed and the unit will be offer capped. PJM dispatch will NOT commit to run the unit longer than its Min Run time.
- Generators committed under this procedure will be run for the hours scheduled and will be included in the DA Market as indicated in M-11
 - **NOTE:** The unit may also be cancelled at any time prior to coming on-line if system conditions change. Costs will be recoverable as indicated in M-11.

Note 1: 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.

Note 2: 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 dispatch reports significant changes in the estimated operating reserve capacity.
- PJM dispatch cancels the alert, when appropriate.

PJM Member Actions:

- Transmission/Generation dispatchers notify management of the alert.
- [Generation dispatchers update their unit parameters, including the Start-up and Notification, Min Run Time, Max Run Time, Eco Min, Eco Max, etc. in eMkt.](#)
- [Generation dispatchers with dual fuel determine whether alternate fuel will be made available to PJM for dispatch. If made available, any known alternate fuel restrictions will be communicated via eMkt in the “operating restrictions” field. If available but only in an emergency, this will also be communicated via eMkt in the “operating restrictions” field.](#)
- 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 [and update the unit Max Run field in eMkt.](#)
- 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 Member 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 EHV 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 dispatch 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 dispatch can request that the reclosers be restored.
- Where practical, PJM dispatch requests that any maintenance and testing being performed on any critical transmission generating, control, or monitoring equipment be deferred or cancelled.
- PJM dispatch 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 Geo-Magnetic Disturbances

Geomagnetically-induced currents (GIC) caused by ~~the~~ geo-magnetic disturbances (GMD) that result from solar storms flow through the power system equipment and facilities may ~~result cause in major~~ increases in system reactive requirements, equipment damage, voltage drops, and disruption of interconnected system operation.

-If the National Oceanic and Atmospheric Administration (NOAA) issues an alert for a potential geo-magnetic storm of severity K6 or greater, PJM will provide notification via the All-Call system and Emergency Procedure Posting Application ~~when the National Oceanic~~



~~and Atmospheric Administration (NOAA) has issued an alert for a potential geo-magnetic disturbance of severity K5 or greater.~~

~~If GIC measurements exceed 10 amperes at one and only one of the transformers monitored for GIC flow, PJM dispatch confirms that this measurement is a result of a severe geomagnetic storm by contacting the TO or GO in order to verify that the readings are accurate. If GIC measurements exceed 10 amperes at two or more transformers monitored for GIC flow, PJM dispatch contacts the TO(s) and GO(s) in order to verify the readings are accurate and determine if excess MVAR exist at area transformers. PJM also checks the NOAA GMD (<http://www.swpc.noaa.gov/>) to confirm if any storm warnings have been issued, but this confirmation is not required for implementation of procedures.~~

~~When conditions warrant, the PJM dispatcher may take action as soon as necessary for a GMD disturbance but must take action if conditions persist for 10 minutes.~~

~~To implement the procedure, a geomagnetic storm is detected that produces DC measurements at Missouri Avenue in Atlantic City and/or Meadow Brook Station near Winchester, Virginia with magnitudes greater than 10 amperes for a maximum of 10 minutes and the PJM dispatcher confirms that this measurement is a result of a severe geomagnetic storm by checking additional sources of information. When conditions warrant, the PJM dispatcher may take action as soon as necessary for a GMD disturbance but must take action if conditions persist for 10 minutes. Additional data sources include:~~

- ~~• PJM dispatch contacts PS Generation (Energy Resource & Trading) Dispatcher to determine if excess transformer MVAR exist at Salem or Hope Creek.~~
- ~~• PJM dispatch contacts FE Allegheny Transmission Dispatcher to determine if excess transformer neutral current exists at Meadow Brook, Bedington, Doubs, and or Black Oak.~~
- ~~• PJM dispatch contacts ComEd Transmission Transmission Dispatcher to determine if excess transformer neutral current exists at State Line and Libertyville.~~
- ~~• PJM dispatch 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.~~
- ~~• PJM dispatch will also check with BGE Transmission Dispatcher to see if similar high DC measurements are being observed at Waugh Chapel and Conastone if available.~~

Upon identification of a geomagnetic disturbance, PJM dispatch 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 Division and Transmission Planning department group on a seasonal basis and are updated for current conditions, as required, when PJM dispatch implements this procedure.

PJM Actions:

- PJM dispatch notifies members (Generation and Transmission) via the PJM All-Call of GMD warnings/alerts issued by the National Oceanic and Atmospheric Administration (NOAA) via the RCIS.
- PJM dispatch notifies members via the PJM All-Call and postings on selected PJM web-sites upon initiation of Conservative Operations due to GMD 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 re-dispatch assignments are made in the most effective areas to control this limit. PJM dispatch 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 GIC measurements at all monitored transformers value at Missouri Avenue has have~~ 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~~ contacting TOs and GOs. If the measurement values are confirmed to remain below 10 amperes for three hours, members are notified that the procedure is cancelled. PJM dispatch 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 dispatch.
- 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-GIC neutral measurements at remote locations dispatch personnel to ensure that measurement equipment 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 dispatch.



Section 4: Sabotage/Terrorism Emergencies

This is the *Sabotage/Terrorism Emergencies* section. Sabotage reporting should be conducted in accordance with EOP-004-2. 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.

PJM Sabotage Definition:

PJM defines sabotage as deliberate or planned disturbances and events that could potentially threaten the reliability of the Bulk Electric System (BES) or lead to cascading outages. Such disturbances and events include, but are not limited to, the following:

- Any physical threat that could impact the operability of a set of electrical equipment that operate as a single BES element.
- Any unauthorized addition or modification of software or data intended to disrupt the proper operation of cyber assets.
- Sudden loss of BES situation awareness.
- Suspected malicious cyber events that result in actual or potential intrusion to a PJM critical computer or PJM telecom system.
- Suspected malicious physical events that cause damage to PJM facilities.
- Suspected malicious physical or cyber events that cause transmission outages, loss of generation, loss of load, damage to facilities.
- Threats received to PJM and its members Facilities (e.g. bomb, mail, telephone).

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, DHS, 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 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 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 the highest alert level is issued, PJM may have implemented all actions for prior threat levels. Given the ability for the Department of Homeland Security (DHS) to issue alerts out of sequence, the order that the steps are presented does not mandate a set implementation plan.

The DHS has revised the threat level system in order to simplify the threat notification process. The new system which is referred to as the National Terrorism Advisory System (NTAS) consists of the following two alerts:

- **Imminent Threat Alert:** warns of a credible, specific, and impending terrorist threat against the United States.
- **Elevated Threat Alert:** warns of a credible terrorist threat against the United States.

NTAS alerts also include a sunset provision which provides a specific end date for each alert while also allowing for extensions when new information or threats occur.

The following DHS link provides information regarding NTAS Alerts:

<http://www.dhs.gov/files/publications/ntas-public-guide.shtm>.

NTAS and other alerts and potential PJM and Member actions include:



NTAS Alert: No Alert Issued	Actions
	Operations
No NTAS Alert Issued	Conditions Normal – Routine Operations and Communications
Additional Threat Alert Sources	Actions
	Operations
Suspicious activity reported by Adjacent Systems	1. Reminders to all operators for increased Vigilance
	2. PJM Operations Management review and discuss this section of the emergency operations manual
	3. Increased Vigilance and Reporting
	Communications
	4. PJM passes along credible/actionable intelligence
	5. All operations centers should review reporting requirements/process
NTAS Alert: ELEVATED THREAT LEVEL	Actions
	Operations
Additional Threat Alert Sources	1. Maintenance Outages Analyzed – additional coordination with TO/GO to confirm emergency return times, if necessary
DHS/FBI issued a Threat Advisory	2. Maximum Credible Contingencies analyzed by PJM Reliability Engineer
Suspicious activity reported by Adjacent Systems	3. Increased Vigilance/Reporting
	4. Analyze Hydro Schedules – for possible interruption to increase Black start capability
	5. Initiate Black Start Assessment (SSR) – to determine fuel limitations



	<p align="center">Communications</p>
	6. Communicate threat over ALL CALL.
	7. Satellite Phone Checks (daily upon initiation and weekly thereafter)
	8. 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)
	9. Enhance Cyber Security Scanning
	10. As needed PJM conducts Conference Calls with GO and TO – no exchange of market sensitive data permitted
	11. PJM conducts SOS meetings and conference calls, as needed, to review crisis response posture
	12. PJM staffs an Incident Response Team [to coordinate physical security measures, media responses, and communications to PJM staff not on site]
	13. If an attack occurs, immediately notify members via the ALL CALL (identify any immediate actions and a conference call time)
NTAS Alert: IMMINENT THREAT LEVEL	Actions
	Operations
Additional Threat Alert Sources	1. Operate to more conservative modeling measures which may include double contingencies, maximum credible disturbances, or lower reactive transfer limits
	2. Increase Available Operating Reserve
	3. Cancel selected Maintenance Outages – attempt to return selected outaged equipment to service. [Consider invoking a “no touch” maintenance stance]
	4. Consider staffing selected substations for communications
Cyber event has shut down control center EMS capability, OR physical attack at multiple sites (control center or grid assets-lines, substations, generators)	



<p>Intelligence of an impending attack on a PJM facility.</p> <p>Cyber event has shut down control center EMS capability, OR physical attack at multiple sites (control center or grid assets-lines, substations, generators).</p> <p>Significant terrorist activity beyond the East Coast (situational dependent)</p>	5. Consider staffing critical combustion turbine sites (Seek TO's recommendations)
	6. Increase Synchronized Reserve
	7. Obtain emergency energy bids as a precaution
	8. Initiate Black Start Assessment (SSR) – to determine fuel limitations
	9. Consider staffing Critical Black Start Units
	10. PJM recommends enhanced physical security at critical substations.
	Communications
	11. Communicate threat over ALL CALL.
	12. Institute Daily Conference Calls, as necessary, with the GOs and TOs – to assess posture
	13. If cyber attack is occurring consider limiting internet accessibility (Appendix 1)
14. PJM maintains 24 hour Operations Management Presence	
15. Consider providing instructions to units to operate within a given set of parameters if communications is lost	
16. PJM and TOs staff Back-Up Control Centers (BUCC), as necessary	
17. PJM will not post emergency actions on its website	
18. PJM will reassess the level of allowable communications that is acceptable between generators and transmission operators in order to facilitate necessary communications	

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 any PJM member company operator has been contacted by 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.
- In the event a PJM member company operator has received or observed a sabotage event, contact 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.
- How PJM uses the NERC Transmission Loading Relief procedure to reduce loadings.
- 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 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 RTO, 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 dispatch 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 Dispatch. (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 RTO, 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 at the EHV level. This Action can be issued for entire PJM RTO, 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 dispatch 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 at the EHV level 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 at the EHV level 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.

Unit Startup Notification Alert

The purpose of the Unit Startup Notification Alert is to alert members to place units in state of readiness so they can be brought online within 48 hours for an anticipated shortage of operating capacity, stability issues or constrained operations for future periods. It is implemented when a reliability assessment determines that long lead time generation is needed for future periods and can be issued for the RTO, specific Control Zone(s) or individual unit basis. The Unit Startup Notification Alert is issued so that units can be ready to come online in 48 hours or less, based on the lesser of submitted notification time + startup time or 6 days. After reaching the state of readiness, if a unit fails to come online within 48 hours when called by PJM, the unit will be considered as forced outage until it can be online or PJM cancels the unit.

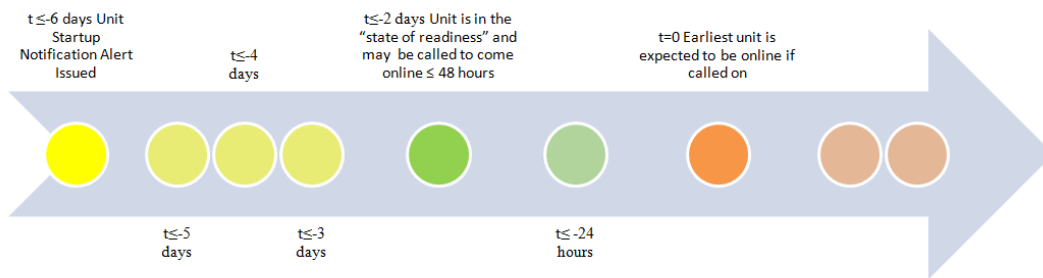
PJM Actions:

- PJM dispatch notifies PJM management and members.
- PJM dispatch issues the Alert to members, stating the Alert period(s) and the affected areas. An Alert can be issued for the RTO, specific Control Zone(s) or individual unit basis on the projected location of transmission constraints and should be issued as soon as practicable (typically 6 days or less) prior to the anticipated need for long time to start generation.
- PJM will schedule an amount of long lead time generation anticipated to be needed for the operating day(s) in economic order respecting unit operating parameters. Once a generator is scheduled its offer price is locked for the operating day.
- PJM dispatch will evaluate system conditions daily to determine whether to release units from the Alert, to keep the units in the state of readiness or to call the units online.

- PJM dispatch 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.
- Generation dispatchers orders unit(s) to be in the state of readiness (i.e. able to be online within 48 hours) in the lesser of (submitted notification time + startup time or 6 days) minus 48 hours.



Day-Ahead Transmission Security Emergency Procedures

Maximum Emergency Generation / Load Management Alert (for Transmission Security)

The purpose of the Maximum Emergency Generation / Load Management 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 or if Demand Response is projected to be implemented 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.



Note: Substations without SCADA control will be expected to be staffed in order to implement a Voltage Reduction Action if needed

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 dispatch 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 dispatch 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 Emergencies.

Step 1: Pre-Emergency Mandatory Load Management Reduction Action (30, 60 or 120-minute)

Applicability: Any site registered in the PJM Demand Response program as a demand resource (a.k.a. DR) type that needs 30, 60 or 120 minute lead time to make its reductions. These reductions are mandatory when dispatched during the product availability window.

NOTE: The minimum dispatch duration is 1-hr.

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, via the eLRS System and Emergency Procedures website, will post detailed instructions to the Curtailment Service Providers (CSP) to dispatch



30, 60 and/or 120 minute Pre-Emergency Mandatory Load Management Reductions. An Action can be issued for the entire PJM RTO, specific Transmission Zone(s) or a Transmission Sub-zone(s) if transmission limitations exist. PJM dispatcher will also issue an All-Call informing the Members and CSPs to check the eLRS and Emergency Procedures postings for the detailed information pertaining to the Pre-Emergency Mandatory Load Management that has been called.

- PJM dispatcher cancels the Action, when appropriate.

PJM Member Actions:

- Member Curtailment Service Providers implement load management reductions as requested by PJM dispatchers.

Step 2: Emergency Mandatory Load Management Reduction Action (30, 60 or 120-minute)

Applicability: Any site registered in the PJM Demand Response program as a demand resource (a.k.a. DR) type that needs 30, 60 or 120 minute lead time to make its reductions. These reductions are mandatory when dispatched during the product availability window.

NOTE: The minimum dispatch duration is 1-hr.

The purpose of the Load Management Reduction Action 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.

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, via the eLRS System and Emergency Procedures website, will post detailed instructions to the Curtailment Service Providers (CSP) to implement dispatch 30, 60 and/or 120 minute Emergency Mandatory Load Management Reductions. An Action can be issued for the entire PJM RTO, specific Transmission Zone(s) or a Transmission Sub-zone(s) if transmission limitations exist. PJM dispatcher will also issue an All-Call informing the Members and CSPs to check the eLRS and Emergency Procedures postings for the detailed information pertaining to the Emergency Mandatory Load Management that has been called.
- 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 Emergency Mandatory Load Management Reductions. 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, or utility load conservation measures.

- PJM dispatcher cancels the Action, when appropriate.

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 mandatory PJM issued reductions are referred to as Pre-Emergency or Emergency Mandatory Load Management Reductions.

Note 2: PJM RTO Load Management Reductions are not to be used to provide assistance to adjacent Control Areas beyond PJM. Restoration of Load Management Reductions 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: Pre-Emergency and Emergency Mandatory Load Management Reductions are available for Limited, Extended Summer and Annual Demand Resources as defined in the Reliability Assurance Agreement (RAA).

Note 4, 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 Emergency Mandatory Load Management Reductions. A NERC EEA2 may be 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.

Note 5, Demand Resource Curtailment: If PJM needs to dispatch Demand Resources (DR) during the Limited DR availability Period then PJM will dispatch all DR products simultaneously unless all products have been dispatched frequently during the current delivery year. Frequent dispatch of DR during the delivery year is defined as:

- 2 times prior to July 1st,
- 4 times prior to August 1st, or,
- 7 times prior to September 1st.

Should PJM frequently dispatch DR during a delivery based on the criteria above PJM may elect to dispatch only the Extended Summer and Annual DR, to preserve Limited DR for the remainder of the delivery year.

Note6, Capacity Benefit Margin (CBM): Under NERC Energy Emergency Alert Level 2, the PJM dispatcher may request import energy over firm transfer capability set aside as CBM. If so, dispatch will waive any real-time operating timing and ramp requirements and document such actions in compliance with MOD-004-1.

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.

PJM Actions:

- PJM dispatch 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 RTO or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatch notifies PJM public information personnel.
- PJM dispatch rechecks with members to assure that all available equipment is scheduled and that requested secondary reserve is brought to primary reserve status.
- PJM dispatch ensures that all deferrable maintenance or testing on the control and communications systems has halted at PJM Control Center. PJM dispatch 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 dispatch 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.
- Generation Dispatchers are to inform PJM of any environmentally restricted units and may consider the need to obtain a temporary variance from environmental regulators for specific generators in accordance with Attachment M to assist in preventing load shed. PJM is not responsible for obtaining a temporary variance from environmental regulations but will assist the member company if requested.
- 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 dispatch.



PJM Actions:

- PJM dispatch issues Maximum Emergency Generation. An Action can be issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatch notifies PJM management, PJM public information personnel, and member dispatchers.
- PJM dispatch implements the Emergency Bid-Process, requesting Emergency bids by posting messages to selected PJM web-sites, RCIS, and contacting the neighboring control areas.
- PJM dispatch instructs members to suspend Regulation on all resources, except hydro generation.
- PJM dispatch determines the feasibility recalling off-system capacity sales that are recallable (network resources).
 - PJM dispatch will determine any limiting transmission constraints internal to PJM that would impact the ability to cut transactions to a specific interface.
 - PJM dispatch will identify off-system capacity sales associated with the identified interfaces.
 - PJM dispatch will contact the sink Balancing Authority to determine the impact of transaction curtailment.
 - If the net result of cutting off-system capacity sales would put the sink Balancing Authority into load shed then PJM will not curtail the transactions unless it would prevent load shedding within PJM.
 - If the net result of cutting off-system capacity sales would put PJM in a more severe capacity emergency than it is in currently in due to reciprocal transaction curtailments from the sink Balancing Authority, PJM will not initiate curtailing the transactions.
- PJM dispatch 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 dispatch 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 dispatch 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 submit bids via email. If email is unavailable PJM Members can fax in their bids. PJM Members then call PJM dispatch 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 are eligible to 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): Emergency Voluntary Energy Only Demand Response Reductions

Applicability: Any site registered in the PJM Demand Response program as an emergency energy only resource. These reductions are voluntary.

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

PJM Actions:

- PJM dispatch issues Action via the PJM All-call and post message to selected PJM Web-sites and the NERC RCIS. An Action can be issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatch notifies PJM management, PJM public information personnel, and PJM Markets personnel.

PJM Member Actions:

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



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 dispatch 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 RTO or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatch notifies PJM public information personnel.
- PJM notifies the Department of Energy (DOE).
- PJM dispatch 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): 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 dispatch 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 issues a request to curtail non-essential building load. An Action can be issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.
- PJM dispatch 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 7 (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 dispatch 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 RTO or for specific Control Zone(s) based on the projected location of transmission constraints.
- PJM dispatch notifies PJM public information personnel.
- PJM dispatch notifies FERC via the FERC Division of Reliability's electronic pager system, consistent with FERC Order No. 659.
- PJM dispatch establishes a mutual awareness with the appropriate member dispatchers of the need to address the occurrence of a serious contingency with minimum delay.
- PJM dispatch examines bulk power bus voltages and alerts the appropriate member dispatchers of the situation.
- PJM dispatch 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 8 (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 dispatch notifies PJM management, PJM public information personnel, and members. PJM dispatch advises members to consider the use of public appeals to conserve electricity usage. PJM dispatch notifies outside systems through the RCIS. PJM dispatch notifies DOE. An Action can be issued for the entire PJM RTO, 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 dispatch investigates loading of shared reserves with neighboring systems prior to implementation of a voltage reduction, recognizing the impact on transmission limits.
- PJM dispatch 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 dispatch 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.



- If it has not already begun, the PJM dispatch will initiate Shortage Pricing if the region where the voltage reduction action has been initiated corresponds with an entire Synchronized Reserve Zone or Sub-Zone.
- PJM dispatch 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 9 (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 dispatch 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 dispatch instructs members to suspend all remaining regulation, if not already suspended previously.
- PJM dispatch determines which Control Zone (s) are capacity deficient and the relative proportion of deficiency. PJM dispatch 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 dispatch 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 dispatch will implement load shedding in controlled step sizes to minimize system impact and further uncontrolled separation.
- PJM dispatch notifies PJM management, PJM public information personnel, and members. PJM dispatch advises members to consider the use of public appeals to conserve electricity usage and public announcements of the emergency. PJM dispatch notifies other Control Areas through the RCIS, and notifies DOE, FEMA, and NERC offices, using established procedures.
- PJM dispatch notifies FERC via the FERC Division of Reliability's electronic pager system, consistent with FERC Order No. 659.
- PJM dispatch 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.
- If it has not already begun, the PJM dispatch will initiate Shortage Pricing if the region where the manual load dump action has been initiated corresponds with an entire Synchronized Reserve Zone or Sub-Zone.
- PJM dispatch cancels the load dump order and restores required regulation, when appropriate.

Note 1: If partial restoration of the load dumped is requested by PJM dispatch, 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 Shortage Pricing Conditions and Procedures

Shortage pricing conditions are triggered based on the existence of a Primary or Synchronized Reserve shortage in a Synchronized Reserve Zone or Sub-Zone. The intent of the Shortage Pricing design is to provide a seamless transition from normal operations into shortage conditions. As such, Primary and Synchronized Reserve shortages are intended to be detected by PJM's dispatch software without the need for manual operator intervention. However, PJM dispatchers have the ability to override the system state from a non-shortage condition to a shortage condition if current operations dictate the need to do so. Additionally, the initiation of either a Voltage Reduction Action or Manual Load Dump Action in an entire Synchronized Reserve Zone or Sub-Zone will also automatically trigger shortage pricing if a shortage does not currently exist.



For purposes of defining shortage 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, Primary Reserve Alert or Voltage Reduction Alert for the entire PJM Control Area, specific Control Zones, Synchronized Reserve Zones or Sub-Zones, the only units for which all of part of their capability may be designated as Maximum Emergency are those that meet the criteria described above. Should PJM declare a Maximum Generation Warning 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 so they may inform PJM of their generating capability that meets the above criteria and indicate which of the criteria it meets.

Termination of Shortage Conditions

- Shortage Pricing will be terminated in a Synchronized Reserve Zone or Sub-Zone when demand and reserves can be fully satisfied without the use of a Voltage Reduction Action or Manual Load Dump Action.

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) (TOs) of the potential for load shed 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. A Post Contingency Local Load Relief Warning is to be communicated to the applicable TO(s) and posted via the Emergency Procedures Posting Application and is not communicated via the "PJM All-Call". The PCLLRW is not considered a standing Directive to the TO for load shed. If the contingency for which the PCLLRW was issued occurs, PJM will evaluate the system conditions and then, if needed, issue a Load Shed Directive. The Load Shed Directive will be posted via the Emergency Procedures Posting Application. 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 anticipates that generator startup + notification exceed 60 minutes.

PJM Actions:

- PJM and TO dispatcher(s) 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 TO 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 D: Post Contingency Congestion Management Program, may alleviate the need to issue a Post-Contingency Local Load Relief Warning.

Note: If post contingency flows exceed the Load Dump rating, PJM will direct the Transmission Owner to implement any available switching solutions, provided they do not create any additional actual overloads in exceedance of their normal rating or post-contingency overloads.

- PJM dispatch 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 re-dispatch must be implemented where applicable.



Note: As indicated in M-12, for “Reliability Only” facilities (i.e. facilities not under PJM Congestion Management) the Transmission Owners have the option to pay for generation redispatch on a pre-contingency basis or accept a PCLLRW. However, if a “Reliability Only” facility exceeds its Load Dump rating, PJM will manually dispatch generation to maintain flows below the Load Dump rating. Transmission Owners will be responsible for financial impacts of generation that is redispatched to alleviate an overloaded facility above its Load Dump Rating.

- PJM dispatch implements 100% Synchronized Reserves and/or declares a Local Maximum Emergency Generation Event, as appropriate.
- PJM dispatch issues the Post-Contingency Local Load Relief Warning to the TO dispatcher of the overloaded equipment, stating that enough load must be shed to maintain flows on the monitored facility below the Emergency Rating or an agreed upon level. If the TO does not have sufficient load to shed or sufficient time to shed the load to comply, the TO will inform PJM. PJM will then review the PCLLRW to include neighboring TO loads if applicable or develop an alternative plan to control.

Note: If all of the load to be shed is in the non-owning Transmission Owner’s territory, PJM may issue the PCLLRW to the Transmission Owner with the load and not the Transmission Owner of the limiting equipment. However, PJM will inform/coordinate the post contingency load shed plan with the Transmission Owner of the equipment.

- PJM dispatch provides the load distribution factor report to the impacted TO dispatcher(s) via e-mail. Load Distribution Factor reports should be redistributed as changes to system reconfiguration warrant.
- PJM Dispatch issues a Post-Contingency Local Load Relief Warning via Emergency Procedure Posting Application to the PJM web-site, detailing any post-contingency switching, quantity of generation reduction, procedure or load-transfer solution, providing additional information regarding the firmness of anticipated post-contingency load dump.
- PJM and TO dispatcher (s) periodically review and monitor approved post-contingency switching options.
- PJM dispatch reviews acceptable post-contingency switching options. Post-contingency switching, generator reduction, or load transfer options should be implemented prior to implementing a Load Shed Directive . .
- PJM and TO Dispatcher(s) should review potential post-contingency manual generation trip schemes. . Manual generation trip schemes should be identified and agreed to in advance.
- PJM and TO dispatch (s) should agree upon post-contingency load transfer options. Transmission owner dispatch(s) would need to periodically re-evaluate the load transfer solution.
- PJM dispatch establishes a mutual awareness with the appropriate TO dispatcher(s) of the need to address the occurrence of a serious contingency with minimum delay.



- PJM dispatch examines area bulk power bus voltages and alerts the appropriate TO dispatcher(s) of the situation.
- PJM dispatch shall be prepared to implement a Load Shed Directive if post-contingency switching, generator reduction, or load transfer options fail and the contingency occurs. The Load Shed Directive will be posted via the Emergency Procedures Posting Application.
- PJM dispatch cancels the warning, when appropriate.

Note: A Load Shed Directive will be issued in accordance with the Load Shed Directive Operating Procedure as outlined in the [PJM Transmission Operations Manual, M-03](#) under Section 5: Index and Operating Procedures for the PJM RTO.

PJM Member Actions:

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

5.4.1 Post-Contingency Load Dump Limit Exceedance Analysis

As indicated in section 5.4, a PCLLRW 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. However, if post-contingency flow



were to exceed the 15-minute Load Dump rating, there is a concern that the facility may trip before actions can be taken to reduce the flow within limits. To prepare for this potential N-2 (initial contingency plus the overloaded facility) and prevent a cascade, PJM will perform up to an N-5 on facilities over 115% of their 15-minute Load Dump rating.

As indicated in PRC-023 R1.2 and R1.11, transmission line relays and transformer overload protection relays are set so they do not operate at or below 115% of the facility's highest emergency rating. For PJM facilities, the highest rating is the Load Dump rating. Therefore, PJM will perform the following analysis for any facility that reaches or exceeds 115% of its Load Dump limit:

PJM Actions:

- If a facility approaches 115% of its Load Dump limit, the PJM Operator will study the loss of the contingency element and the overloaded facility:
 - If the study results indicate no additional facilities will be overloaded over 115% of their Load Dump limit, this is determined to be a localized event and no additional pre-contingency actions will be taken.
 - If the study results in an additional facility(s) over 115% of its Load Dump rating, the operator will continue the analysis to also trip the additional circuits. This analysis will be performed tripping a maximum of 5 facilities. If the study indicates either a non-converged case OR continues to show facilities exceeding 115% of their Load Dump limits, this will be considered a potential cascade situation. In accordance with PJM Manual M-03 section 4 the PJM operator will review the results with the Transmission Owner and direct pre-contingency Load Shed. However, if both PJM and the impacted TO(s) operators agree the non-convergence is the result of an unsupported radial load pocket (i.e. local voltage collapse) or the overloaded facility is serving radial load, this will be considered a local event and precontingency load shed will NOT be instructed by PJM.

Note: Load Shed will be directed in the amount needed to maintain the post contingency flow below 115% of the Load Dump limit on the original contingency within 30-minutes of detection of the potential cascade situation.

5.5 Interconnection Reliability Operating Limits (IROL) Manual Load Dump Warning/Action

PJM identifies specific facilities that if loaded above a designated limit could significantly impact system reliability. Such facilities are not localized constraint, rather wide-area limits that are a result of excessive transfers or an indication of wide-area capacity deficiencies. 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 (Manual 37, Section 3.1):

- Eastern Reactive Transfer Interface
- Central Reactive Transfer Interface



- 5004/5005 Reactive Transfer Interface
- Western Reactive Transfer Interface
- AP South Reactive Transfer Interface
- Bedington – Black Oak Reactive Transfer Interface
- AEP-DOM Reactive Transfer Limit
- Kammer 765/500kV Xfmr. Thermal Rating
- Belmont #5 765/500 kV Xfmr Thermal Rating
- Cleveland Reactive Transfer Interface
- ComEd Reactive Transfer Interface

The purpose of the IROL Manual Load Dump Action is to provide loading relief on IROL facilities as a last step to prevent exceeding an IROL Limit for 30 minutes (IROL Violation).

Note 1: As part of normal operations, PJM Dispatch operates more conservative limits (Reactive Transfer Limit / LTE rating) for designated IROL facilities. The IROL Limit is the limit at the last convergent Reactive Transfer case or transmission facility Load Dump Limit.

Note 2: Post-Contingency Local Load Relief Warnings are intended to relieve localized constraints, generally 230kV and below. IROL facilities are an indication of Capacity Shortage/Heavy Transfer conditions which result in IROL Limit Violations.

The IROL Manual Load Dump allocation results in individual Transmission Owner multipliers to determine the amount of load that needs to be curtailed to relieve IROL facility loading. The IROL Manual Load Dump allocation factors are developed by dividing the Load Ratio Share of effective load, based on typical distribution factor effects as periodically developed by the PJM EMS, which occurs annually or upon major transmission system enhancements.

PJM Actions:

- Implement operating strategy consistent with PJM Transmission Operations Manual (M03) and PJM Emergency Operations Manual (M13).
- PJM issues an IROL Manual Load Dump Warning via the PJM All-Call System when the IROL Limit has been exceeded for 5 minutes or longer in order to prepare Transmission dispatchers / LSEs to curtail load.
- PJM issues an IROL Load Dump Action via the PJM All-Call System when the IROL Limit has been exceeded for 25 minutes, allowing Transmission dispatchers / LSEs to curtail load within 5 minutes to return flows below the IROL Limit. PJM should curtail sufficient load to return flows within Reactive Transfer or LTE limits indicating the IROL facility and the amount of transmission load relief required.
- PJM dispatch notifies PJM management, PJM public information personnel, and members. PJM dispatcher notifies other Control Areas through the RCIS, and notifies DOE, FEMA, and NERC offices, using established procedures.
- PJM dispatch notifies FERC via the FERC Division of Reliability's electronic pager system, consistent with FERC Order No. 659.



- If shortage pricing is not already in effect, the PJM dispatcher initiates it based on the issuance of an IROL Manual Load Dump Action.
- PJM dispatch cancels the load dump order and restores required regulation, when appropriate.

PJM Member Actions:

- Transmission dispatchers / LSEs immediately review IROL Manual Load Dump Allocation Table (Attachment N) in preparation of Manual Load Dump once an IROL Manual Load Dump Warning has been implemented.
- After 25 minutes Transmission dispatchers / LSEs dump an amount of load equal to or in excess of the amount requested by PJM dispatcher in accordance with Attachment N The load dump plan should consider/recognize priority/critical load. This step will be implemented within 5 minutes.
- Transmission / Generation dispatchers notify management of the emergency procedure.
- 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.

Example: If PJM issues an IROL Manual Load Dump Action for 300 MW of relief on the Eastern Reactive Transfer IROL Limit Violation. PJM Transmission dispatchers / LSEs shall refer to the IROL Load Dump Table (Attachment N) and multiply the load dump request (300 MW) by the IROL Manual Load Dump allocation factors in Attachment N. For example the PS Operator would multiple (300 MW Load * XX Eastern Reactive Transfer IROL Manual Load Dump Allocation Factor) = XX MW Load.

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:

- Implement 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.

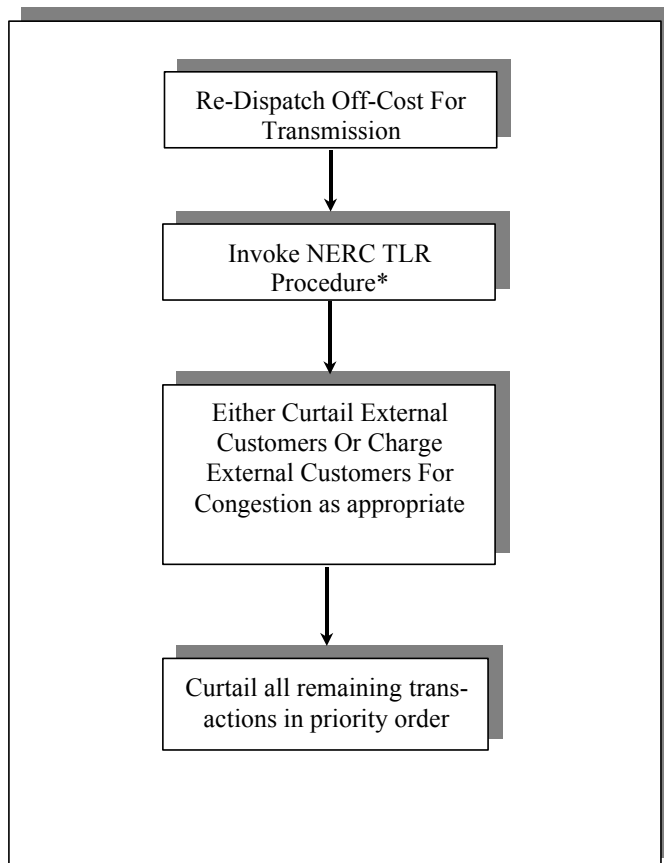


Exhibit 4: Initiation of NERC TLR Process

*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. Per Attachment J, the reporting criteria and responsible entity for writing and submitting event reports are identified in the PJM Operating Plan.

6.2 Reporting System Disturbances to NERC, SERC or RFC

Under certain defined conditions, PJM is required to report the details of system disturbances to NERC. Attachment J contains the PJM Operating Plan that outlines the reporting criteria and responsible entity for writing and submitting the event reports...

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	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	CRS	DK	1200	1400	620	470	37%	35	3/DAY	
Company A	Unit 2	ST	10,000	FOB	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. PJM members can contact the PJM Master Coordinator (610-666-8809) with questions or concerns. Real-time reporting of fuel deficiencies (outside of a SSR request) can be reported directly to the PJM Master Coordinator.

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 Master Coordinator (610) 666-8809.

During those occasions where fuel supply emergencies have the potential to impact bulk electric system reliability or capacity adequacy, PJM will submit an OE-417 report to DOE, NERC, and RFC and/or SERC on behalf of the appropriate PJM Member.



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.

Note 1: 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.

Note 2: 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

This attachment identifies the steps PJM Interconnection Corporate Communications will take, when PJM System Operations authorizes use of the identified weather-related capacity emergency messages, to inform member communications department staffs, the news media and the public and to coordinate emergency messages among the communications departments of members.

The attachment includes notices to member communicators and prepared draft PJM news releases.

The attachment contains baseline communications that represent the minimum that should be communicated to the public. PJM and its members should and will expand and adapt communications as they deem appropriate under the circumstances. Members will tailor their public statements and communications tactics to suit their individual needs and based upon their procedures. Each member's communications department will determine how best to respond to each emergency level.



W1 Statement – Call for Conservation

Purpose and Procedures:

This statement instructs affected transmission owners to request the public to conserve electricity because of developing power supply problems. The W1 statement may be issued subsequent to a Voltage Reduction Alert and should be issued 12 to 15 hours before the effective period. When PJM System Operations orders a W1 statement, it will specify the hours and days to which the call for conservation applies.

PJM issues the W1 notice to member communications departments by email and alerts communications staff of SOS-T members via an all call system – indicating in both cases whether the notice applies to all of PJM or a specific transmission zone(s). Then, PJM issues a news release to the news media.

W1 Notice to Member Communicators:

Electricity supplies are tight. PJM System Operations is calling for public voluntary conservation of electricity because of the continuing (hot / frigid) weather.

The call for conservation applies to (all of PJM / names of PJM transmission zones) during the hours of (start and end times) on (date).

Communications departments at affected PJM members should implement their procedures for communicating the call for voluntary conservation to their customers. PJM will issue a news release shortly.



W1 DRAFT News Release – Call for Conservation

PJM ASKS CONSUMERS TO CONSERVE ELECTRICITY

(Cold / Hot) Weather Continues to Push Electricity Use Higher

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electricity grid operator for more than 61 million people in 13 states and the District of Columbia, has requested the public in its region to conserve electricity. The call for conservation was prompted by continuing (hot / frigid) weather.

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

PJM is asking consumers to reduce their use of electricity, if health permits, during the hours of (times as specified by System Operations) on (date).

(Cold Weather option)

Demand for electricity is expected to increase because of the extremely cold weather. Electricity customers can take simple electricity conservation steps such as:

- Setting thermostats lower than usual, if health permits,
- Postponing use of major electric appliances such as stoves, dishwashers and clothes dryers until other times, and
- Turning off non-essential electric lights, equipment and appliances.

<end cold weather option>

(Hot Weather option)

Demand for electricity is expected to increase as the excessive heat and humidity continue. Electricity customers can take simple electricity conservation steps such as:

- Closing curtains and blinds to keep out the sun and retain cooler air inside,
- Postponing use of major electric household appliances such as stoves, dishwashers and clothes dryers until the cooler evening hours,
- If health permits, setting air conditioner thermostats higher than usual, and
- Turning off non-essential electric appliances, equipment and lights.

<end hot weather option>

Conserving electricity during (times as specified by System Operations) on (date) 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. PJM is coordinating efforts among generators, power suppliers and local utilities.

PJM is communicating about the situation with state government officials throughout the region.



PJM Interconnection, founded in 1927, ensures the reliability of the high-voltage electric power system serving 61 million people in all or parts of Delaware, Illinois, Indiana, 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, which includes 62,556 miles of transmission lines; administers a competitive wholesale electricity market; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion. Visit PJM at www.pjm.com.

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W2 Statement – Voltage Reduction

Purpose and Procedures:

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

PJM issues the notice to member communications departments by email and alerts communications staff of SOS-T members via an all call system – indicating in both cases whether the notice applies to all of PJM or a specific transmission zone(s). Then, PJM issues a news release to the news media.

W2 Notice to Member Communicators:

Because of extremely high demand for electricity, a temporary voltage reduction is in effect for *(all of PJM / names of PJM transmission zones)*.

Communications departments at affected PJM members should implement their procedures for communicating about the voltage reduction to their customers. PJM will issue a news release shortly.



W2 DRAFT News Release – Voltage Reduction

PJM ORDERS VOLTAGE REDUCTIONS AS EXTREMELY (*HOT / COLD*) WEATHER CONTINUES

Public Requested to Conserve Electricity

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electricity grid operator for more than 61 million people in 13 states and the District of Columbia, has ordered a temporary voltage reduction to help meet the extremely high demand for electricity. The high electricity use results from the (*frigid / extremely hot*) weather conditions.

The voltage reduction and a request for consumers to reduce use of electricity are being made (*throughout PJM / in names of transmission zones*).

PJM and its members are working to ensure the area has enough electricity to meet demand as power supplies grow tight during the (*cold / hot*) weather.

A voltage reduction lowers the demand for electricity. It helps to conserve generating or transmission line capacity. Most customers generally do not notice voltage reductions.

(Cold Weather option)

PJM is asking consumers to reduce their use of electricity, if health permits, during the hours of (*times as specified by System Operations*) on (*date*). Electricity customers can take simple electricity conservation steps such as:

- Setting thermostats lower than usual, if health permits,
- Postponing use of major electric appliances such as stoves, dishwashers and clothes dryers until other times, and
- Turning off non-essential electric lights, equipment and appliances.

<end cold weather option>

(Hot Weather option)

PJM is asking consumers to reduce their use of electricity, if health permits, during the hours of (*times as specified by System Operations*) on (*date*).

Electricity customers can take simple electricity conservation steps such as:

- Closing curtains and blinds to keep out the sun and retain cooler air inside,
- Postponing use of major electric household appliances such as stoves, dishwashers and clothes dryers until the cooler evening hours,
- If health permits, setting air conditioner thermostats higher than usual, and
- Turning off non-essential electric appliances, equipment and lights.

<end hot weather option>

PJM always takes steps first that have the least effect on most electricity customers. The steps include calling on demand response resources. These utility customers agreed in advance to



eliminate or significantly reduce their use of electricity when told to do so and are paid for cutting back their electricity use. 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 Interconnection, founded in 1927, ensures the reliability of the high-voltage electric power system serving 61 million people in all or parts of Delaware, Illinois, Indiana, 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, which includes 62,556 miles of transmission lines; administers a competitive wholesale electricity market; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion. Visit PJM at www.pjm.com.

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W3 Statement – Rotating Outages

Purpose and Procedures:

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

PJM issues the notice to member communications departments by email and alerts communications staff of SOS-T members via an all call system – indicating in both cases whether the notice applies to all of PJM or a specific transmission zone(s). Then, PJM issues a news release to the news media.

W3 Notice to Member Communicators:

Temporary rotating power outages are in effect. The brief rotating power outages affect (the entire PJM region / names of transmission zones). PJM System Operations ordered the power outages because of extremely high demand for electricity to avoid widespread problems.

Communications departments at affected PJM members should implement their procedures for communicating to customers about the rotating outages. PJM will issue a news release shortly.



W3 DRAFT News Release – Rotating Outages

EXTREME ELECTRICITY DEMAND FORCES ROTATING POWER OUTAGES IN PJM

Grid Operator Says Voluntary Reductions in Electricity Use
Urgently Needed Because of (Cold / Hot) Weather

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electric grid operator for more than 61 million people in 13 states and the District of Columbia, has directed utilities to temporarily interrupt electricity service to some customers. PJM said substantial cutbacks in electricity use are urgently needed.

The brief, temporary power outages and request for consumers to reduce use of electricity affect (the entire PJM region / names of transmission zones).

The extremely (cold / hot) weather has pushed demand for electricity in the area beyond available supplies. The controlled power outages help prevent the failure of the entire electric power supply system in the affected areas.

(Cold Weather option)

“We understand the difficulty of being without electricity for any period of time during the cold weather,” said Terry Boston, PJM president and chief executive officer. “That’s why we first take steps that have the least effect on electric customers. However, given today’s situation, we had to tell utilities to conduct controlled electricity interruptions for some customers. These short outages assist us in preserving continued operation of the power supply system.”

PJM is asking consumers to reduce their use of electricity, if health permits, during the hours of (times as specified by System Operations) on (date). Electricity customers can take simple electricity conservation steps such as:

- Setting thermostats lower than usual, if health permits,
- Postponing use of major electric appliances such as stoves, dishwashers and clothes dryers until other times, and
- Turning off non-essential electric lights, equipment and appliances.

<end cold weather option>

(Hot Weather option)

“We understand the difficulty of being without electricity for any period of time during this hot weather,” said Terry Boston, PJM president and chief executive officer. “That’s why we first take steps that have the least effect on electric customers. However, given today’s situation, we had to tell utilities to conduct controlled electricity interruptions for some customers. These short outages assist us in preserving continued operation of the power supply system.”

PJM is asking consumers to reduce their use of electricity, if health permits, during the hours of (times as specified by System Operations) on (date).



Electricity customers can take simple electricity conservation steps such as:

- Closing curtains and blinds to keep out the sun and retain cooler air inside,
- Postponing use of major electric household appliances such as stoves, dishwashers and clothes dryers until the cooler evening hours,
- If health permits, setting air conditioner thermostats higher than usual, and
- Turning off non-essential electric appliances, equipment and lights

<end hot weather option>

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 Interconnection, founded in 1927, ensures the reliability of the high-voltage electric power system serving 61 million people in all or parts of Delaware, Illinois, Indiana, 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, which includes 62,556 miles of transmission lines; administers a competitive wholesale electricity market; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion. Visit PJM at www.pjm.com.

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Statements for Exiting Emergency Conditions

Purpose and Procedures:

These notices inform 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. PJM would issue news releases to announce the end of these emergency procedures.

PJM issues the post-level notices first to member communications departments by email and alerts communications staff of SOS-T members via an all call system – indicating in both cases whether the message applies to all of PJM or a specific transmission zone(s). Then, PJM issues a news release.

Post-W1 Notice to Member Communicators:

As of (time), PJM Interconnection canceled the call for conservation. 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-W2 Notice to Member Communicators:

PJM Interconnection has canceled the voltage reduction. PJM instructed utilities to return voltages to normal levels at (time).

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

Post-W3 Notice to Member Communicators:

PJM Interconnection has canceled the rotating outages. PJM instructed utilities to end rotating power outages at (time).

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



Post-W1 DRAFT News Release for Exiting Call for Conservation

PJM ENDS SPECIAL CALL TO CONSUMERS TO CONSERVE ELECTRICITY

(Valley Forge, Pa. – **DATE**) – PJM Interconnection, the electric grid operator for more than 61 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 is always prudent. PJM said conservation had been important in meeting power supply needs.

PJM Interconnection, founded in 1927, ensures the reliability of the high-voltage electric power system serving 61 million people in all or parts of Delaware, Illinois, Indiana, 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, which includes 62,556 miles of transmission lines; administers a competitive wholesale electricity market; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion. Visit PJM at www.pjm.com.



Post-W2 DRAFT News Release for Exiting Voltage Reduction

PJM ENDS VOLTAGE REDUCTION

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electricity grid operator for more than 61 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 voltage reduction ended at (time) (EDT/EST). The request to reduce the use of electricity ended at (time) (EDT/EST).

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

PJM Interconnection, founded in 1927, ensures the reliability of the high-voltage electric power system serving 61 million people in all or parts of Delaware, Illinois, Indiana, 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, which includes 62,556 miles of transmission lines; administers a competitive wholesale electricity market; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion. Visit PJM at www.pjm.com.

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Post-W3 DRAFT News Release for Exiting Rotating Outages

PJM ENDS ROTATING POWER OUTAGES

(Valley Forge, Pa. – DATE) – PJM Interconnection, the electric grid operator for more than 61 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 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 Terry Boston, PJM president and chief executive officer. “We 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).

PJM Interconnection, founded in 1927, ensures the reliability of the high-voltage electric power system serving 61 million people in all or parts of Delaware, Illinois, Indiana, 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, which includes 62,556 miles of transmission lines; administers a competitive wholesale electricity market; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion. Visit PJM at www.pjm.com.

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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).~~

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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.~~

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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.

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- ~~• 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.~~

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~~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.~~~~

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~~• 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.~~

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~~Level 3 DRAFT News Release for Cold Weather Emergency (C3)~~ ~~PJM ORDERS VOLTAGE REDUCTIONS~~ ~~AS EXTREMELY COLD WEATHER CONTINUES~~

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~~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.~~

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~~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~~

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~~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.~~

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~~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.~~

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~~“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.~~

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~~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.~~

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~~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.~~

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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

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~~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.~~

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~~Post-level 3 DRAFT News Release for Exiting Weather Emergency PJM ENDS VOLTAGE REDUCTION~~

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~~(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.~~

~~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.~~

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~~Post-level 4 DRAFT News Release for Exiting Weather Emergency~~ ~~PJM ENDS ROTATING POWER OUTAGES~~

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~~(Valley Forge, Pa. — DATE) — PJM Interconnection, the electric grid operator for more than 61 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).~~



~~PJM Interconnection ensures the reliability of the high-voltage electric power system serving 61 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.~~



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

PJM Phone Number: 610-666-8810	PJM Fax Number: 610-666-4287

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



Supplementary Status Report Terminology

The objective of the Supplementary Status Report (SSR) is to get an instantaneous “snapshot” of the PJM RTO generating capacity 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 Master 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 Dispatch 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 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. Unless directed otherwise by PJM, the following units that are bid in and or running for PJM must be placed into Max Emergency following completion of the SSR Part G if a Cold Weather or Hot Weather Alert has been issued:

- steam units with less than 32 hours (at maximum capacity) of resources in current inventory,
- Oil, Kerosene, or Diesel combustion turbines with less than 16 hours (at maximum capacity), and
- gas fired combustion turbines with less than 8 hours of resources

The PJM Master 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 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
Nuclear Capacity					
A.) On Cost					
B.) Maximum Emergency					
Fossil Capacity					
C.) On Cost					
D.) Maximum Emergency					
Hydro Capacity					
E.) On Cost					
C.T. / Diesel Capacity					
F.) On Cost					
G.) Maximum Emergency					
TOTALS					
EXPECTED CAPACITY					
PURCHASES					
RESOURCE LIMITED MW					
SALES					
LOAD ESTIMATE					
ESTIMATED RESERVE					
RESERVE REQUIREMENT					
UNSCHEDULED AVAILABLE CAPACITY					
ADDITIONAL COMMENTS:					
				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
Nuclear Capacity																
A.) On Cost																
B.) Maximum Emergency Energy Loaded (-)																
Fossil																
C.) On Cost																
D.) Maximum Emergency Energy Loaded (-)																
Hydro																
E.) On Cost																
Maximum Emergency Energy Loaded (-)																
C.T. / Diesel																
F.) On Cost																
G.) Maximum Emergency Energy Loaded (-)																

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



PJM SYSTEM STATUS REPORT – FORCASTED SYSTEM CONDITIONS

TO: PJM System Operations Subcommittee

**Cc: M. Kormos
R. Dotter
Member Relations Department**

	(Yesterday) mm/dd/yy	(Today) mm/dd/yy	(Day 1) mm/dd/yy	(Day 2) mm/dd/yy
Economic Internal Capacity				
Maximum Emergency Generation				
Generation Returning				
Internal Generation				
External Transactions				
Forecasted Unavailable				
Adjusted Capability				
Load Estimate				
Expected Peak Hour				
Reserve, Using Economic Generation				
Reserve, with ME Generation				
Estimated Full Emergency Load Response				
Estimated Reserve, with Active Load Management				
Operating Reserve Objective				
Temperature at PHL Effective / THI				

Notes:

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						
Maximum Emergency Generation Alert					East	MW
Primary Reserve Alert					Central	MW
Primary Reserve Warning					West	MW
Voltage Reduction Warning / Reduction of Plant Load					BC/PEP	MW
Manual Load Dump Warning					Bedngtn - BlkOak	MW
					AP South	MW
					PJM HOURLY INTEGRATED LOADS*	
Maximum Emergency Generation					Hour Ending	Yesterday Today
Curtailment of PJM Controlled Interruptible						mm/dd/yy mm/dd/yy
Curtailable Customer Load					01	
Voltage Reduction					02	
Curtailment of Non-Essential Building Load					03	
Radio and TV Load Curtailment Appeal					04	
Manual Load Dump					05	
					06	
					07	
Full Emergency Load Response (PJM Totals)					08	
MW Curtailed So Far	MW				09	
MW Still to Curtail	MW				10	
					11	
	Capacity Backed	Emergency	Other		12	
NYISO to PJM					13	
PJM to NYISO					14	
					15	
					16	
					17	
					18	
					19	
					20	
					21	
					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



Attachment D: Emergency Bid Form

Emergency Bid Form

<p><i>Working to Perfect the Flow of Energy</i></p> <p>Date: _____</p> <p>Company: _____</p> <p>Representative: _____</p> <p>Phone: (____) ____-____, Ext: _____</p> <p>Control Area/Interface through which the power is being delivered: _____</p> <p>NYPP Identifier (if applicable): _____</p> <p>Full Path (including supplier, wheelers, marketers, brokers, receiver)</p> <p>¹Notification time to accept: _____</p> <p>Minimum Run Time: _____</p>	<p style="text-align: center;">Emergency Energy Bid Form</p> <p style="text-align: right;">For Internal Use</p> <p>Email: emergencybid@pjm.com Phone: _____</p> <p>Voice: (610) 666 - 4505 ID: _____</p> <p>Fax: (610) 666 - 4287</p>		
For Capacity Backed only:			
From – To HHMM-HHMM	Emergency Energy Available to Deliver (MW)	Bid Price of Energy (\$/MWh)	
EES ID	From – To HHMM-HHMM	Capacity Backed Available to Cut (MW)	Bid Price of Energy (\$/MWh)
	-		
	-		
	-		
¹ 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.
- There are no price caps on emergency bids. Emergency Energy Bids are eligible to set LMP.
- The Completed Emergency Energy Bid Form is to be submitted via email as the primary means to emergencybid@pjm.com
- If email is not available, Emergency Energy Bid Forms may be faxed as a secondary means of submittal. The fax number 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	AECO	Vineland	DPL	ODEC	DEMEC	Dover	Easton		
%	17.56%	14.51%	12.03%	0.32%	12.01%	20.18%	9.93%	1.38%	4.25%	0.25%	4.78%	1.26%	0.47%	0.27%	0.11%	0.69%	
500	88	73	60	2	60	101	50	7	21	1	24	6	2	1	1	3	
1000	176	145	120	3	120	202	99	14	42	2	48	13	5	3	1	7	
1500	263	218	180	5	180	303	149	21	64	4	72	19	7	4	2	10	
2000	351	290	241	6	240	404	199	28	85	5	96	25	9	5	2	14	
3000	527	435	361	10	360	605	298	41	127	7	143	38	14	8	3	21	
4000	702	580	481	13	480	807	397	55	170	10	191	50	19	11	4	28	
5000	878	725	601	16	600	1009	497	69	212	12	239	63	23	14	5	35	

Manual Load Dump Allocation - PJM Mid-Atlantic Region

When issuing a manual Load Dump via All Call, the PJM Dispatcher will include the following information in the message:

- ✓ (1) Area (PJM Mid-Atlantic Region or a zone / company)
- ✓ (2) Total megawatts (refer to appropriate tables for allocation)
- ✓ (3) Allocation table to be used
- ✓ (4) Transmission Zone allocations will be handled separately based on PJM EMS capacity calculations

Allocation percentages are based on 2014 summer but applicable to both 2014 summer and 2014/2015 Winter Load conditions

Exhibit 16: Manual Load Dump Allocation Tables



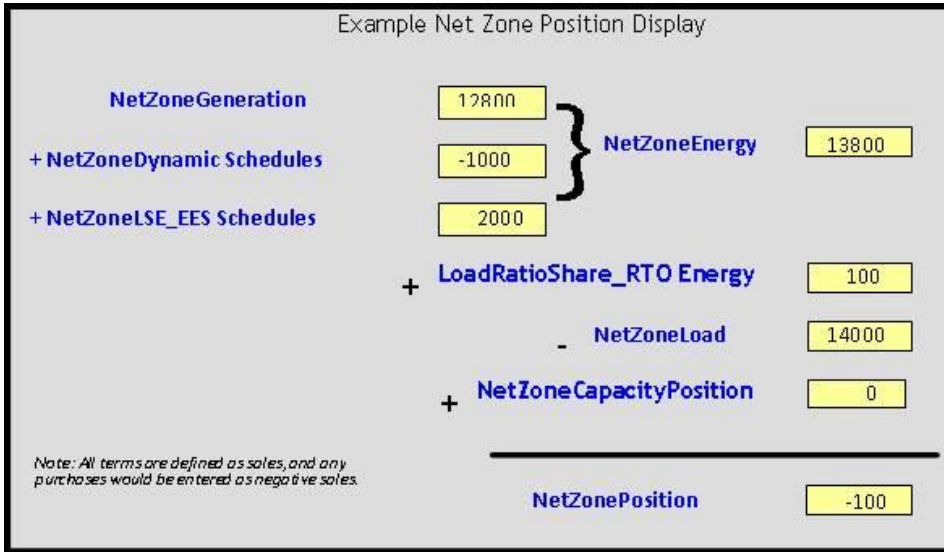
Under capacity deficient conditions, the PJM EMS load dump calculator was modified during market growth to institute changes to the Operating Agreement set forth in Schedule 1, Section 1.7.11 that states that:

(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 zonal net unforced capacity position from the PJM eRPM system).

The $NetZoneCapacityPosition_{RPM}$ is determined from information in the Reliability Pricing Model (RPM).

$$NetZoneCapacityPosition_{RPM} = (Final\ Zonal\ UCAP\ Obligation_{Control\ Zone} + Final\ Zonal\ FRR\ Obligation_{Control\ Zone}) - (RPM\ Committed\ Capacity_{Control\ Zone} + FRR\ Committed\ Capacity_{Control\ Zone})$$

Where,

$RPM\ Committed\ Capacity_{Control\ Zone}$ = Sum of RPM commitments on all capacity resources within the control zone. Generation resource commitments are valued at the delivery year EFORD.

$FRR\ Committed\ Capacity_{Control\ Zone}$ = Sum of FRR commitments on all capacity resources within the control zone. Generation resource commitments are valued at the delivery year EFORD.



Manual 13: Emergency Operations
Attachment E: Manual Load Dump Allocation Tables

Empower SPECTRUM	LOAD DUMP ALLOCATION										
	RTO	MID-ATL	AP	AEP	DAY	DLCO	CE	DOM	FE	DEOK	EKPC
+ Net Zone Generation	81150	28130	6823	12799	2792	1851	13451	7734	6312	1258	1041
+ Net Zone Dynamic Schedules	51	-31	0	26	0	0	-20	76	0	0	0
+ Active Zone Reserve Share Energy	0	0	0	0	0	0	0	0	0	0	0
+ Net Zone LSE EES Schedules	0	0	0	0	0	0	0	0	0	0	0
+ Load Share Ratio RTO Energy Schedules	1124	398	72	189	26	23	149	130	100	39	0
- Net Zone Load	82184	29072	5256	13798	1868	1661	10915	9492	7285	2837	1201
= Net Zone Energy Position (A)	141	-575	1639	-783	950	212	2665	-1552	-874	-1540	0
Net Zone Capacity Position (B)	-643	1023	-173	-4339	-527	707	-326	-1555	2981	1566	0
Net Zone Position (A + B)	-502	448	1466	-5122	423	919	2339	-3107	2107	26	0
Zone Positions		EXCESS	EXCESS	SHORT	EXCESS	EXCESS	EXCESS	SHORT	EXCESS	EXCESS	# 0
Desired Load Dump Amount	1500										
Load Dump Allocation		0	0	934	0	0	0	566	0	0	0
+ EES Net Capacity Backed Purchases	-171										
- eCapacity Net External Cap Purchases	1489										
Net Unloaded Capacity Transactions	-1660										



Attachment F: PJM Manual Load Dump Capability

PJM Manual Load Dump Capability							
	1	2	3	4	5	6	7
Transmission Owner	2014 Summer System Peak Load Est. (MW)	Maximum Manual Load Shedding Capability based on System Peak Load Estimate (MW)	Load Shed Cap (%) (Percent = #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)
AE	2599	1033	39.75%	335	32.43%	698	26.86%
AEP	23556	4617	19.60%	2039	44.16%	2578	10.94%
AP	8190	1577	19.25%	122	7.74%	1455	17.77%
BGE	7283	3535	48.54%	791	22.38%	2744	37.68%
Com Ed	22761	12713	55.85%	3596	28.29%	9117	40.06%
Dayton	3476	242	6.96%	0	0.00%	242	6.96%
DEMEC	284	0	0.00%	0	-	0	0.00%
Dominion	17736	8609	48.54%	6038	70.14%	2571	14.50%
Dover	166	166	100.01%	66	39.76%	100	60.25%
DPL-Conectiv	2901	847	29.20%	252	29.75%	595	20.51%
Duquesne	2997	1586	52.91%	834	52.57%	752	25.10%
Easton	67	27	40.57%	7	25.93%	20	30.05%
JC	6361	2009	31.58%	412	20.51%	1597	25.11%
ME	3019	1022	33.85%	43	4.21%	979	32.43%
NCEMC - DVP	307	0	0.00%	0	-	0	0.00%
Neptune	660	0	0.00%	0	-	0	0.00%
Hudson Transmission Partners	660	0	0.00%	0	-	0	0.00%
NOVEC	986	231	23.43%	100	43.29%	131	13.29%
ODEC - AP	647	5	0.77%	4	80.00%	1	0.15%
ODEC - DPL	764	28	3.67%	13	46.43%	15	1.96%
ODEC - DVP	1168	59	5.05%	34	57.63%	25	2.14%
PECO	8843	1191	13.47%	316	26.53%	875	9.89%
PEPCO	6030	5162	85.60%	1976	38.28%	3186	52.83%
PN	2966	2130	71.81%	108	5.07%	2022	68.17%
PPL	7334	4608	62.83%	1646	35.72%	2962	40.39%
Public Service	10614	1664	15.68%	517	31.07%	1147	10.81%
RECO	423	423	100.00%	144	34.04%	279	65.96%
SMECO	840	505	60.13%	176	34.85%	329	39.18%
UGI	198	198	100.00%	67	33.74%	131	66.26%
Vineland	151	92	60.93%	40	43.48%	52	34.44%
ATSI	12277	2795	22.77%	395	14.13%	2400	19.55%
DUKE	5597	1500	26.80%	1039	69.27%	461	8.24%
CPP	315	119	37.78%	70	58.82%	49	15.56%
EKPC	1899	706	37.18%	421	59.63%	285	15.01%

**Exhibit 17: PJM Manual Load Dump Capability
(Manual Load Shed Capability excluding UFLS refers to load that can be curtailed via SCADA within 5 minutes)**

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
<p>Step 1: Pre-Emergency Mandatory Load Management Reductions (30, 60 and 120 minute)</p>	<p>Pre-Emergency Mandatory Load Management Curtailment, Step 1 requires LSE's or their agent to implement Load Management.</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 RTO, specific Control Zone(s) or a subset of a Control Zone or Reserve Market Region(s) if transmission limitations exist.</p> <p>Notifications: 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>Notifications: Notify management and governmental agencies, as applicable.</p>	<p>The time to implement the corrective action step is 30, 60 or 120 minutes from notification based on the Load Management product type.</p>
<p>Step 2: Emergency Mandatory Load Management Reductions (30, 60 and 120 minute)</p>	<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 RTO, specific Control Zone(s) or a subset of a Control Zone or Reserve Market Region (s) if transmission limitations exist.</p> <p>Notifications: 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>Issue EEA 2 via RCIS</p>	<p>Member dispatchers implement load management programs.</p> <p>Notifications: Notify management and governmental agencies, as applicable.</p>	<p>The time to implement the corrective action step is 30, 60 or 120 minutes from notification based on the Load Management product type.</p>



Procedure	PJM Actions	Company Actions	Comments
<p>Step 3: Primary Reserve Warning</p>	<p>Primary Reserve Warning issued stating the amount of adjusted primary reserve capacity and the requirement. PJM Dispatcher:</p> <ul style="list-style-type: none"> rechecks with members to assure that all available equipment is scheduled and that requested secondary reserve is brought to primary reserve status ensures that all deferrable maintenance or testing on the control and communications systems has halted at PJM Control Center. <p>Issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone or Reserve Market Region (s) if transmission limitations exist.</p> <p>Notifications: PJM management, PJM public information personnel, members via All-Call and Emergency Procedures Posting Application, and other Control Areas through the RCIS.</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>Notifications: Notify management and advise all stations and key personnel.</p>	<p>The approximate time to implement the corrective action step is 1 hour.</p>



Procedure	PJM Actions	Company Actions	Comments
<p>Step 4 A Maximum Emergency Generation Action</p>	<p>Maximum Emergency Generation Action issued.</p> <p>Issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone or Reserve Market 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>recall off-system capacity sales that are recallable (network resources), 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>Notifications: PJM management, PJM public information personnel, members via All-Call and Emergency Procedures Posting Application, and other Control Areas through the RCIS.</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>Notifications: Notify management.</p>	<p>The approximate time to implement the corrective action step is 1 hour from notification.</p>
<p>Step 4 B Emergency Voluntary Energy Only Demand Response Reductions</p>	<p>PJM dispatcher issues Load Reduction Action via the PJM All-call and post message to selected PJM Web-sites and the NERC RCIS.</p> <p>An Action can be issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone or Reserve Market Region (s) if transmission limitations exist.</p> <p>Notification: 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>Notifications: Notify management.</p>	<p>The approximate time to implement the corrective action step is 30 minutes from notification.</p>



Procedure	PJM Actions	Company Actions	Comments
<p>Step 5 Voltage Reduction Warning and Reduction of Non-Critical Plant Load</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 RTO or for specific Control Zone(s) or Reserve Market Region (s) based on the projected location of transmission constraints.</p> <p>Notification: 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. Substations are to be staffed if required in order to implement voltage reduction</p> <p>PJM marketers remain on heightened awareness regarding PJM system conditions and the potential need for Emergency Energy Purchases.</p> <p>Notifications: Notify management and advise all stations and key personnel.</p>	<p>The approximate time to implement the corrective action step is 15 minutes.</p>
<p>Step 6 Curtailement of non-Essential Building Load (Action)</p>	<p>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.</p> <p>PJM dispatcher issues a request to curtail non-essential building load. An Action can be issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone if transmission limitations exist.</p>	<p>Transmission / Generation dispatchers notify management of the emergency procedure and to consider the use of public appeals to conserve electricity usage.</p> <p>Transmission dispatchers notify governmental agencies, as applicable.</p> <p>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.</p>	<p>The approximate time to implement the corrective action step is 15 minutes.</p>



Procedure	PJM Actions	Company Actions	Comments
<p>Step 7 Manual Load Dump Warning</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 RTO or for specific Control Zone(s) or Reserve Market 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>Notification: 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>Notifications: Notify management, government agencies (as applicable) and advise all stations and key personnel.</p>	<p>The approximate time to implement the corrective action step is 15 minutes.</p>
<p>Step 8 Voltage Reduction Action</p>	<p>PJM dispatcher issues the order for a voltage reduction.</p> <p>Issue EEA 2 via RCIS</p> <p>Issue system-wide or Control Zone or Reserve Market Region-specific Public/Media Notification Message C-3 or H-3.</p> <p>An Action can be issued for the entire PJM RTO, specific Control Zone(s) or a subset of a Control Zone or Reserve Market Region (s) if transmission limitations exist.</p> <p>PJM initiates shortage pricing, as needed, based on the issuance of Voltage Reduction.</p> <p>Notification: PJM dispatcher notifies PJM management, PJM public information personnel, Reliability Coordinators via RCIS (EEA 2), and Department of Energy (DOE).</p>	<p>Member Transmission dispatchers / LSEs take steps to implement the voltage reduction.</p> <p>Notifications: Notify management, government agencies (as applicable) and advise all stations and key personnel.</p>	<p>The approximate time to implement the corrective action step is 15 minutes from notification.</p>



Procedure	PJM Actions	Company Actions	Comments
<p>Step 9 Manual Load Dump</p>	<p>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).</p> <p>Suspend all remaining regulation.</p> <p>Estimate the total amount of load to be dumped. Utilizes the PJM EMS to determine deficient Control Zones or Reserve Market Region and their share of load dump required.</p> <p>The PJM Mid-Atlantic Region share will be further allocated according to Attachment E.</p> <p>Issues a system-wide or Control Zone or SReserve Market Region specific Public/Media Notification Message C-4 or H-4</p> <p>PJM initiates shortage pricing, as needed, based on the issuance of Manual Load Dump.</p> <p>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.</p>	<p>Generation dispatchers suspend remaining regulation, when directed by PJM prior to dumping load.</p> <p>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).</p> <p>Transmission dispatchers report the amount of load curtailed / restored upon implementation to the PJM Power Dispatcher.</p> <p>Notifications: Notify management, government agencies (as applicable) and advise all stations and key personnel.</p>	<p>The time to implement the corrective action step is 5 minutes from notification.</p>



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		
Request ID: 14835	Timestamp:	05/21/2005 19:51
Period: MIDNIGHT	Date:	05/22/2005
Notes:	<input type="text"/>	
<hr/>		
Normal Minimum Generation:		
Pumps (-):		
Net Interchange (+/-):		
Pumps (-):		
Pumps (-):		
Hydro (+):		
Hydro (+):		
Dispatchable Contracts(-):		
Spot Market (-):		
RECS's (+):		
Pumps (-):		
Hydro (+):		
Pumps (-):		
Generation Adjustment (+):		
Pumps (-):		
Adjusted Minimum Generation:		
Valley Load Estimate:		
Margin:		

Exhibit 20: eDART Min Gen Calculation Worksheet



Emergency Reducible Generation				
User Name: seminarg1 Company: SBT Gen Comp 1				
Request ID: 12247 Timestamp: 11/18/2005 07:45				
Date: 11/18/2005 Period: 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 re-dispatch 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) and EOP-004-2 Event Reporting

Background

Emergency electric incidents and disturbances leading to interruptions of power 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 reporting of electrical emergency incidents, disturbances or destruction that disrupts the operation of critical infrastructure in the electric power industry. DOE form OE-417 covers additional reporting requirements such as cyber attacks and loss of customers. Under R2 of EOP-004-2, Responsible Entities may submit either the Attachment 2 form included in EOP-004-2 or a DOE-OE-417 form.

Reporting Requirements

EOP-004-2 requirements may result in several Responsible Entities submitting a report for the same event. Specific to the PJM Operating Plan, if an event requires a report to be submitted, PJM will submit an event report. Member companies are required to provide the event information to PJM via either the Attachment 2 in EOP-004-2 or the OE-417 form. Copies of the reports required for EOP-004-2 are to be provided to PJM six hours prior to the 24 submittal deadline to allow time for PJM to meet reporting requirements.

Members may use the Attachment 2 form in EOP-004-2 or the DOE form OE-417. There may be other submittal timing requirement for the OE-417 form. They include: either 1hr or 6hrs, criteria dependent. The PJM Operating Plan includes the specific timing submittal requirements.

Attachment 2 report and/or OE-417 report must be submitted by the Entity Responsible to PJM (listed in the PJM Operating Plan table below) at the following address:

1. PJM – dispsup@pjm.com

PJM will then review and submit the report to the following organizations:

1. NERC - systemawareness@nerc.net.
2. DOE - doehqgeoc@hq.doe.gov
3. RFC (disturbance@rfirst.org) or SERC (reporting_line_sit@list-serc1.org)



When PJM submits a report, PJM will copy the affected members with the report.

A Member company may also have direct compliance responsibility to EOP-004-2 where the member is required to report an event to applicable law enforcement and government agencies per R1 of standard EOP-004-2 and their specific Operating Plan. Refer to the NERC website for details on filling out the report and for the most recent version of the report. An online version of the OE-417 form can be found at <http://www.oe.netl.doe.gov/oe417.aspx>.



PJM Operating Plan for EOP-004-2 (R1 and R2)

Event Type	Entity with Reporting Responsibility as indicated in EOP-004-2 or OE-417	Threshold for Reporting	Entity responsible for providing report to PJM	Deadline to submit the report to regulatory organizations.
Damage or destruction of a Facility (OE-417 #1 or #9)	RC, BA, TOP	Damage or destruction of a Facility within its Reliability Coordinator Area, Balancing Authority Area or Transmission Operator Area that results in actions to avoid a BES Emergency.	Transmission Owner supplies damage information. PJM will supply the actions taken to avoid a BES Emergency and submit the report.	24hrs per EOP-004-2 1hr or 6hrs per OE-417 (criteria dependent). 72hrs for final OE-417
Damage or destruction of a Facility (OE-417 #1 or #9)	BA, TO, TOP, GO, GOP, DP	Damage or destruction of its Facility that results from actual or suspected intentional human action.	Entity that owns damaged equipment	24hrs per EOP-004-2 1hr or 6hrs per OE-417 (criteria dependent). 72hrs for final OE-417
Physical threats to a Facility	BA, TO, TOP, GO, GOP, DP	Physical threat to its Facility excluding weather or natural disaster related threats, which has the potential to degrade the normal operation of the Facility. OR Suspicious device or activity at a Facility. Do not report theft unless it degrades normal operation of a Facility.	Entity that owns the equipment threatened	24hrs per EOP-004-2
Physical threats to a BES control center	RC, BA, TOP	Physical threat to its BES control center, excluding weather or natural disaster related threats, which has the potential to degrade the normal operation of the control center. OR Suspicious device or activity at a BES control center.	Entity whose control center is threatened (This applies to TO control centers as they are carrying out matrixed TOP tasks)	24hrs per EOP-004-2



PJM Operating Plan for EOP-004-2 (R1 and R2)

Event Type	Entity with Reporting Responsibility as indicated in EOP-004-2 or OE-417	Threshold for Reporting	Entity responsible for providing report to PJM	Deadline to submit the report to regulatory organizations.
BES Emergency requiring public appeal for load reduction (OE-417 #8)	Initiating entity is responsible for reporting	Public appeal for load reduction event.	PJM will write and submit the report	24hrs per EOP-004-2 1hr per OE-417. 72hrs for final OE-417
BES Emergency requiring system-wide voltage reduction (OE-417 #7)	Initiating entity is responsible for reporting	System wide voltage reduction of 3% or more.	PJM will write and submit the report	24hrs per EOP-004-2 1hr or 6hrs per OE-417 (criteria dependent). 72hrs for final OE-417
BES Emergency requiring manual firm load shedding (OE-417 #6)	Initiating entity is responsible for reporting	Manual firm load shedding \geq 100 MW.	PJM will write and submit the report	24hrs per EOP-004-2 1hr per OE-417. 72hrs for final OE-417
BES Emergency resulting in automatic firm load shedding	DP, TOP	Automatic firm load shedding \geq 100 MW (via automatic undervoltage or underfrequency load shedding schemes, or SPS/RAS).	Transmission Owner (Matrixed Task)	24hrs per EOP-004-2
Voltage deviation on a Facility	TOP	Observed within its area a voltage deviation of \pm 10% of nominal voltage sustained for \geq 15 continuous minutes.	PJM will write and submit the report	24hrs per EOP-004-2



PJM Operating Plan for EOP-004-2 (R1 and R2)

Event Type	Entity with Reporting Responsibility as indicated in EOP-004-2 or OE-417	Threshold for Reporting	Entity responsible for providing report to PJM	Deadline to submit the report to regulatory organizations.
IROL Violation (all Interconnections) or SOL Violation for Major WECC Transfer Paths (WECC only)	RC	Operate outside the IROL for time greater than IROL Tv (all Interconnections) or Operate outside the SOL for more than 30 minutes for Major WECC Transfer Paths (WECC only).	PJM will write and submit the report	24hrs per EOP-004-2
Loss of firm load (OE-417 #5)	BA, TOP, DP	Loss of firm load for ≥ 15 Minutes: ≥ 300 MW for entities with previous year's demand $\geq 3,000$ OR ≥ 200 MW for all other entities	Transmission Owner (Matrixed Task)	24hrs per EOP-004-2 1hr per OE-417. 72hrs for final OE-417
System separation (islanding) (OE-417 #4)	RC, BA, TOP	Each separation resulting in an island ≥ 100 MW	PJM will write and submit the report	24hrs per EOP-004-2 1hr per OE-417. 72hrs for final OE-417
Generation loss	BA, GOP	Total generation loss, within one minute, of : $\geq 2,000$ MW for entities in the Eastern or Western Interconnection OR $\geq 1,000$ MW for entities in the ERCOT or Quebec Interconnection	PJM will write and submit the report	24hrs per EOP-004-2
Complete loss of off-site power to a nuclear generating plant (grid supply)	TO, TOP	Complete loss of off-site power affecting a nuclear generating station per the Nuclear Plant Interface Requirement	Transmission Owner	24hrs per EOP-004-2



PJM Operating Plan for EOP-004-2 (R1 and R2)

Event Type	Entity with Reporting Responsibility as indicated in EOP-004-2 or OE-417	Threshold for Reporting	Entity responsible for providing report to PJM	Deadline to submit the report to regulatory organizations.
Transmission loss	TOP	Unexpected loss within its area, contrary to design, of three or more BES Elements caused by a common disturbance (excluding successful automatic reclosing).	Transmission Owner (Matrixed Task)	24hrs per EOP-004-2
Unplanned BES control center evacuation	RC, BA, TOP	Unplanned evacuation from BES control center facility for 30 continuous minutes or more.	Entity that evacuates their control center (This applies to TO control centers as they are carrying out matrixed TOP tasks)	24hrs per EOP-004-2
Complete loss of voice communication capability	RC, BA, TOP	Complete loss of voice communication capability affecting a BES control center for 30 continuous minutes or more.	Entity that loses communications (This applies to TO control centers as they are carrying out matrixed TOP tasks)	24hrs per EOP-004-2
Complete loss of monitoring capability	RC, BA, TOP	Complete loss of monitoring capability affecting a BES control center for 30 continuous minutes or more such that analysis capability (i.e., State Estimator or Contingency Analysis) is rendered inoperable.	Entity that loses monitoring (This applies to TO control centers as they are carrying out matrixed TOP tasks)	24hrs per EOP-004-2
OE-417 #2	Electric Utilities that operate as Control Area Operators and/or Reliability Authorities	Cyber event that causes interruption of electrical system operations	Entity that experiences the cyber event if it impacts the BES	1hr per OE-417. 72hrs for final OE-417



PJM Operating Plan for EOP-004-2 (R1 and R2)

Event Type	Entity with Reporting Responsibility as indicated in EOP-004-2 or OE-417	Threshold for Reporting	Entity responsible for providing report to PJM	Deadline to submit the report to regulatory organizations.
OE-417 #3	Electric Utilities that operate as Control Area Operators and/or Reliability Authorities	Complete operational failure or shut-down of the transmission and/or distribution electrical system	PJM	1hr per OE-417. 72hrs for final OE-417
OE-417 #10	Electric Utilities that operate as Control Area Operators and/or Reliability Authorities	Cyber event that could potentially impact electric power system adequacy or reliability	Entity that experiences the cyber event if it could impact the BES.	6hr per OE-417. 72hrs for final OE-417
OE-417 #11	Electric Utilities that operate as Control Area Operators and/or Reliability Authorities	Loss of electric service to more than 50,000 customers for 1 hour or more	Entity that loses the customers	6hr per OE-417. 72hrs for final OE-417
OE-417 #12	Electric Utilities that operate as Control Area Operators and/or Reliability Authorities	Fuel supply emergencies that could impact electric power system adequacy or reliability	PJM will obtain this via the SSR Part G	6hr per OE-417. 72hrs for final OE-417

*The deadlines to submit are taken directly from the EOP-004 and DOE requirements.



Attachment K: Event Investigation Program

PJM
Event Investigation Program Document and NERC Event
Analysis Process



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POLICY STATEMENT

PJM and its members are committed to preserving the reliability of PJM monitored Bulk Electric System (BES) 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 Member companies.

To accomplish this they have implemented a process to provide the necessary resources to investigate events or near-miss events that have resulted in reliability concerns. These fact finding efforts work in conjunction with the NERC Event Analysis Process to insure that all events that may impact system reliability are examined. In many instances the EAP event categories may preclude additional investigation, allowing that due diligence will be required for events outside the scope of the EAP. Event analysis will be a collaborative effort utilizing similar tools as those listed in the PJM internal process. Teams will be comprised of PJM and member companies' representatives, and may, in more severe cases, include representatives of ReliabilityFirst and/or NERC.

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. Determine if event qualifies for inclusion in the NERC Event Analysis process.
4. Learning as much about the event as possible with the goal of improving the reliability of the PJM system, not as a punitive exercise.
5. Accurate and thorough determination of root causes, contributing factors and corrective actions using a recognized and structured Root Cause methodology as required.
6. Investigation of "near miss" events. Learning captured from "near miss" events can be just as valuable as those of actual events, identifying trends that have potential for more severe events.
7. The parties most involved in the event should lead the investigation, if possible.
8. Allowance for timely delivery of initial/preliminary findings to implement interim corrective actions, if necessary.
9. A challenge or critical review of findings and recommended corrective actions before finalization of the investigation.
10. Assurance that corrective actions are completed.
11. Dissemination of findings to members or industry in general, either internally or through the NERC "lessons learned" web posting.

PJM and Members 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. This investigation process may be suspended when participating in the North American Electric Reliability Council (NERC) Event Analysis Process or when similar investigations would cause duplication of effort or confusion.



Simplified EVENT INVESTIGATION PROCESS STEPS

Step	Activity	Responsibility
1	Event Identification, Classification, NERC EAP category and Fact Finding	PJM and PJM Member Officers (or designee)
2	Determination of Investigative Action	PJM and Member through the PJM System Operations Subcommittee (Transmission)
3	Establishment of Investigation Ownership	PJM and Involved Member(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 Members to initiate and perform event investigations of operational events on PJM monitored BES facilities, including but not limited to completion of a formal Root Cause Analysis of events by PJM and/or a combination of PJM Members.

Definitions

PJM – PJM Interconnection, LLC

Transmission Owner(s)(TO) – Transmission owning company or companies of PJM as specified in the PJM Transmission Owners Agreement (TOA).

PJM or Transmission Owner Officer(TOP) – 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.

Generation Owner(s) (GO) - Is a Member that owns, or leases with rights equivalent to ownership, facilities for the generation of electric energy that are located within the PJM Balancing Authority.

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.

North America Electric Reliability Council Event Analysis Process (EAP) - A processes for use by the industry to report, categorize, analyze, identify conclusions and recommendations and disseminate lessons learned from BES events.

Investigation Owner – PJM or a Transmission Owner that takes responsibility for leadership of the execution of an ACA, RCA investigation, or NERC Event Analysis Report. 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, ACA investigation, or NERC Event Analysis Report.

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 Bulk Electric 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 Member system operators. Events listed below should initiate the event investigation process:

Event criteria that qualifies for one of the NERC Analysis Process categories.

Violations to a NERC Operational Standards 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 an event report in accordance with the NERC event reporting standard: EOP-004-2.

Nuclear power plant tripping or operational problem, reported to PJM and/or the NRC where PJM and/or Member 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 BES 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. (Weather-related event reports may be required by regulatory entities (NERC/FERC/RFC/SERC) to identify common issues or lessons learned.)

- 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. (This type event is not excluded from the NERC EAP and may require coordination between the transmission and generation owners to complete the necessary reporting.)

- 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 the event will likely end up in litigation, PJM and the member 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. Supplies subject matter expert or other representative for RCA or other formal investigatory processes.

Generation Owners:

- Monitors generation resources and coordinates with PJM and Transmission Owners during system events.
- Serve as the Investigation Owner when necessary. Supplies subject matter expert for input to RCA or other formal investigation processes.

Investigation Process

Step 1 – Event Identification, Classification, NERC EAP Category and Fact Finding

PJM and Member system operators monitor system operations and identify record and report events covered or potentially covered by the Event Investigation Process scope.

PJM and/or Members 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 facility 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"> The consequences of a repeat of a similar type event are acceptable. Information brought to light during the conference call adequately explains the cause of the events. Corrective actions are either not needed or appear simple and obvious.
II	Apparent Cause Analysis (ACA)	<ul style="list-style-type: none"> The consequences of a repeat of a similar type event are acceptable. The cause of the event is not clear or there is disagreement on the causes. Further investigation is required. Corrective actions are not obvious. Further investigation is required.
III	Root Cause Investigation (RCA)	<ul style="list-style-type: none"> The consequences of the event or a repeat of a similar type event are unacceptable. A pattern of repeat (or similar) events has emerged. A comprehensive, "best effort" investigation to assure identification of root causes and effective corrective actions to prevent recurrence is required.

If the event classification results in initiation of an Apparent Cause Analysis (ACA) or a Root Cause Analysis (RCA), then proceed to Step 3

Step 3 – Establishment of Investigation Owner

PJM and Involved Member representative shall select the Investigation Owner and serve as the primary sponsor for completion of the ACA or RCA. The intent is that the Member 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 member investigation participants and team leader.

The ACA Team Leader shall complete the investigation and report results using the ACA investigation form (Appendix1) to the PJM and involved member 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 Member representatives, the Investigation Team Leader, team members and any external expert resources supporting the RCA. Appendix 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 Member, expectations for the thoroughness of the investigation, timelines for completion of activities and confidentiality of information.

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 Appendix 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 Member representative.

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 Member representative, 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 members 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 Involved Members

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 involved Member 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 applicable members. Both the final draft and final report shall be marked as confidential. PJM and all Members shall treat the report as confidential information.

For ACA Investigations – Upon review and approval of the investigation results by PJM and involved Member, the investigation shall be marked as confidential and distributed to PJM and all applicable members. PJM and all Members 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 impacted Member when completion of all corrective actions has occurred.

PJM and involved Member 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 for review, evaluation and oversight by the Committee. All conditions of Code of Conduct and information confidentiality will be followed due to sensitive nature of supplied data.

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. XXXXXXXXXXXXXXXXXXXXXXXX
Owner (name): nnnnnnnn Due Date: dd/dd/yyyy

B. XXXXXXXXXXXXXXXXXXXXXXXX
Owner (name): nnnnnnnn Due Date: dd/dd/yyyy



Appendix 2

RCA EVENT OWNER IMPLEMENTATION CHECKLIST

- ❑ Confirm agreement and sponsorship of PJM and other Involved Member representative.
- ❑ Select an Investigation Leader for the RCA and brief the leader.
- ❑ Request RCA team members from PJM and any other involved Member representative.
- ❑ 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 Member representative.
- ❑ Schedule the Challenge Review Meeting.
- ❑ Distribute investigation report.
- ❑ Notify PJM and involved Member 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 X

Link to NERC Event Analysis Process site: <http://www.nerc.com/page.php?cid=5>

Appendix 4

Target Timeframes for Completion of Brief Reports, Event Analysis Reports and Lessons Learned

Event Category	Brief Report	Event Analysis Report	Lessons Learned	Close Event Analysis
1	Draft within five business days, sent to applicable Regional Entity for review. Final report within 10 days.	Not required	Within 30 business days (if applicable)	10 business days following receipt of Brief Report
2	Draft within five business days, sent to applicable Regional Entity for review. Final report within 10 days.	(If requested) Within 30 business days of the event	Within 30 business days	30 business days following receipt of EAR
3	Draft within five business days, sent to applicable Regional Entity for review. Final report within 10 days.	Within 60 business days of the event	Within 60 business days	30 business days following receipt of EAR
4	Draft within five business days, sent to applicable Regional Entity for review. Final report within 10 days.	Within 180 business days of the event	Within 180 business days	60 business days following receipt of EAR
5	Draft within five business days, sent to applicable Regional Entity for review. Final report within 10 days.	Within 180 business days of the event	Within 180 business days	60 business days following receipt of EAR

Appendix 5

The categories listed in this appendix do not cover all possible events related to CIP, EMS loss of functionality, or loss of BPS “visibility.” If such events occur, their analyses are discussed with the affected registered entity, appropriate Regional Entity and NERC to determine if the use of the event analysis process is warranted.

Category 1: An event that results in one or more of the following:

- a. An unexpected outage, contrary to design, of three or more BPS elements caused by a common disturbance. For example:
 - i. The loss of a combination of NERC-defined elements or facilities.
 - ii. The loss of an entire generation station of three or more generators (aggregate generation of 500 MW to 1,999 MW); combined cycle units are represented as one unit.
- b. Intended and controlled system separation by the proper operation of a Special Protection System Scheme (SPS) or Remedial Action Scheme (RAS) in Alberta from the Western Interconnection, New Brunswick or Florida from the Eastern Interconnection.
- c. Failure or misoperations of BPS SPS/RAS.
- d. System-wide voltage reduction of 3% or more that lasts more than 15 continuous minutes due to a BPS emergency.
- e. Unintended BPS system separation that results in an island of 100 MW to 999 MW. Excludes BPS radial connection, and non-BPS (distribution) level islanding.
- f. Unplanned evacuation from a control center facility with BPS SCADA functionality for 30 minutes or more.
- g. In ERCOT, the loss of generation of 1,000 MW - 1,399 MW.

Category 2: An event that results in one or more of the following:

- a. Complete loss of all BPS control center voice communication systems for 30 minutes or more.
- b. Complete loss of SCADA, control or monitoring functionality for 30 minutes or more.
- c. Voltage excursions equal to or greater than 10% lasting more than 15 continuous minutes due to a BPS emergency.
- d. Loss of off-site power (LOOP) to a nuclear generating station per the Nuclear Plant Interface Requirement.



- e. Unintended system separation that results in an island of 1,000 MW to 4,999 MW.
- f. Unintended loss of 300 MW or more of firm load for more than 15 minutes.
- g. Interconnection Reliability Operating Limit (IROL) Violation or SOL Violation (WECC only) for time greater than Tv.

Category 3: An event that results in one or more of the following:

- a. The loss of load or generation of 2,000 MW or more in the Eastern Interconnection or Western Interconnection or Québec Interconnection, or 1,400 MW or more in the ERCOT Interconnection.
- b. Unintended system separation that results in an island of 5,000 MW to 10,000 MW.
- c. Unintended system separation (without load loss) that results in an island of Florida from the Eastern Interconnection.

Category 4: An event that results in one or more of the following:

- a. The loss of load or generation from 5,001 MW to 9,999 MW
- b. Unintended system separation that results in an island of more than 10,000 MW (with the exception of Florida as described in Category 3c).

Category 5: An event that results in one or more of the following:

- a. The loss of load of 10,000 MW or more.
- b. The loss of generation of 10,000 MW or more.



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:

- Member(s) inform PJM Dispatch of generator(s) 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.
- The member company is to identify 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, PJM will assist the member company by performing 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.



Attachment N: IROL Load Dump Tables

- The following table is used for Transmission Owners and LSEs to shed load in their zones to mitigate an IROL as described in Section 5.5:

Table – effective 06/01/2014

New TRAIL In Service									
IROL	East	Central	5004/05	West	AP South	Bed-BO	AEP/DOM	CLVLND	ComEd
TO Zone	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier
DPL	0.21	0.16	0.40	0.18					
DPL-Dover	0.01	0.01	0.02	0.01					
DPL-DEMEC	0.02	0.01	0.03	0.02					
DPL-Easton	0.00	0.00	0.01	0.00					
DPL-ODEC	0.05	0.04	0.10	0.05					
AE	0.14	0.11	0.27	0.12					
AE-Vineland	0.01	0.01	0.02	0.01					
PS	0.59	0.46	1.10	0.49					
RECO	0.02	0.02	0.04	0.02					
PE	0.60	0.47	1.12	0.50					
FE East -JC	0.32	0.25	0.60	0.27					
PL		0.51	1.23	0.55					
UGI		0.01	0.03	0.01					
FE East-ME		0.18	0.43	0.19					
FE East-PN									
BC				0.44	0.93	3.98	1.48		
PEP				0.35	0.75	3.20	1.19		
PEP-SMECO				0.05	0.10	0.44	0.17		
FE South									
Dom					2.91	4.10	4.62		
Dom-NCCEMC					0.26	1.11	0.41		
Dom-ODEC					0.05	0.19	0.07		
DLCO									
AEP							1.00		
Dayton									
FE West								0.93	
CPP								0.07	
ComEd									1.00
DEOK									
EKPC									



New TrAIL In Service											
IROL	East	Central	5004/05	West	AP South	Bed-BO	AEP/DOM	CLVLND	Belmont	Kammer	ComEd
TO Zone	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier	Multiplier
DPL	0.21	0.16	0.40	0.18					0.45	0.41	
DPL-Dover	0.01	0.01	0.02	0.01					0.03	0.02	
DPL-DEMEC	0.02	0.01	0.03	0.02					0.04	0.04	
DPL-Easton	0.00	0.00	0.01	0.00					0.01	0.01	
DPL-ODEC	0.05	0.04	0.10	0.05					0.12	0.11	
AE	0.14	0.11	0.27	0.12					0.30	0.28	
AE-Vineland	0.01	0.01	0.02	0.01					0.02	0.02	
PS	0.59	0.46	1.10	0.49					1.25	1.13	
RECO	0.02	0.02	0.04	0.02					0.04	0.04	
PE	0.60	0.47	1.12	0.50					1.28	1.16	
FE East-JC	0.32	0.25	0.60	0.27					0.68	0.62	
PL		0.51	1.23	0.55					1.39	1.27	
UGI		0.01	0.03	0.01					0.04	0.03	
FE East-ME		0.18	0.43	0.19					0.49	0.44	
FE East-PN									0.56	0.51	
BC				0.44	0.93	3.98	1.48		1.12	1.02	
PEP				0.35	0.75	3.20	1.19		0.90	0.82	
PEP-SMECO				0.05	0.10	0.44	0.17		0.13	0.11	
FE South									1.60	1.45	
Dom					2.91	4.10	4.62		1.54	2.99	
Dom-NCENC					0.26	1.11	0.41		0.31	0.28	
DOM-ODEC					0.05	0.19	0.07		0.05	0.05	
DLCO											
AEP							1.00				
Dayton											
FE West								0.93			
CPP								0.07			
ComEd											1.00
DEOK											
EKPC											

Revision History**Revision 56 (06/01/2014):**

- Section 2.2 Reserve Requirements
 - Corrected the Primary and Synchronized Reserve requirements to cover the "largest single contingency", not just the "largest unit".
- Section 2.3 Capacity Shortages and Section 5.2 Transmission Security Emergencies
 - Exhibit 1 Action steps modified to reflect Pre-Emergency and Emergency Load Management
 - Added language to the Maximum Emergency Generation Alert to include notice that Load Management may be required.
 - Updates to Steps 1 and 2 to reflect the new categories and times.
 - Noted that the minimum duration is 1-hr
 - Added clarification that the official notice for CSPs to dispatch DR resources is the eLRS System. Emergency Procedures (EPs) will continue to be posted.
 - The All-Call will continue to be issued but will be generic and indicate that DR has been called and that details are available on the EP website.
 - Deleted Note 3 due to redundancy
- Section 2.4.8 High System Voltage
 - Revised the Black Oak SVC voltage settings based on changes in the field.
- Sections 2.3 and 5.2
 - Alerts to be issued 'in advance of the operating day', not just day ahead.
 - Revised steps under the Primary Reserve Alert, Warning and Actions to clarify that PJM does not grant environmental waivers but will work with the GO if requested/notified.
 - Added a note to the Voltage Reduction alert to indicate staffing will be expected at stations that do not have SCADA control but are needed to implement a voltage reduction
 - Revised the Emergency Bid Form to indicate that email will be the primary means to submit the form, with fax serving as a back-up.
 - Clarified that Manual Load Shed is expected to be implemented in 5-minutes if Directed
- Section 3.3: Cold Weather Alert
 - Alerts to be issued 'in advance of the operating day', not just day ahead.
 - Changed the FE control zone names to the new naming convention

- Added a note that PJM Dispatch will reach out to gas-fired generation owners to validate fuel supplies.
- Section 3.4: Hot Weather Alert
 - Alerts to be issued 'in advance of the operating day', not just day ahead.
 - Changed the FE control zone names to the new naming convention
 - Revised temperature triggers for a HWA for EKPC and Dominion to 93-degrees
- Section 5.4 Post Contingency Local Load Relief Warning
 - Added a step to indicate a "Load Shed Directive" message will be posted to the EP site if load shed is Directed.
- Section 5.4.1: Post-Contingency Load Dump Limit Exceedance Analysis
 - Added clarifying language to indicate pre-contingency load shed will not be directed in the case of a radial load pocket
- Attachment C
 - Eliminated Part C of the SSR for reporting of Load Response. These values will already be provided to PJM through the eLRS system by the CSPs.
- Attachment E: Manual Load Dump Allocation tables
 - Updated the Mid Atlantic Load shed table with the 2014/15 PY numbers
 - Update the FE company names
 - Eliminated the table for the Eastern portion of the Mid Atlantic
- Attachment F: Manual Load Dump Capability tables
 - Updated the Manual Load Dump capability table with the 2014/15 PY numbers
 - Update the FE company names
- Attachment G: Capacity Emergency Matrix
 - Updated the matrix with the load management changes made to sections 2.3 and 5.2
- Attachment N: IROL Load Dump Table
 - Update the FE company names

Revision 55 (12/01/2013):

- Section 2.2: Added a note under the reserve requirements to indicate the requirements may be raised during emergency and/or conservative operations.
- Section 2.2: Updated Load Forecasting Error metrics for 2014
- Section 2.3.2: References to ILR (interruptible load for reliability) have been removed.
- Section 2.3.2: Revised language to be consistent with M-28 changes that Emergency Energy Purchases by PJM will set LMP.

- Section 2.3.2: Revised order of emergency procedures so that Curtailment of non-essential plant and building load is curtailed as step 6, rather than step 7B: Manual Load Dump Warning.
- Section 2.3.2: Added Note 7 to reference the option to invoke CBM consistent with NERC MOD standards.
- Sections 2.3 and 2.4: Updates to Min Gen and Max Gen Alerts to include posting to the RCIS.
- Section 2.4: Added a step to set the Elroy 500kV caps to manual.
- Section 3.3 and 3.4: Cold and Hot Weather MW unavailability tables updated to include EKPC.
- Section 4: Deleted reference to CIP standards and added reference to EOP-004-2.
- Section 5.2: Revised order of emergency procedures so that Curtailment of non-essential plant and building load is curtailed as step 6, rather than step 7B: Manual Load Dump Warning.
- Section 5.4: PCLLRW language revised to indicate the PCLLRW is issued to the TO owning the equipment and that the TO is then responsible for confirming and notifying PJM that they have enough load to shed to control.
- Sections 6.1 and 6.1: Revised member reporting requirements per the requirements of EOP-004-2.
- Attachment J: Updated to include the new Operating Plan and with other event reporting changes as required by EOP-004-2.
- Attachment L: Deleted. The Transmission Emergency Alert and Security Emergency Alerts were retired by the NERC ORS

Revision 54 (09/26/2013):

- Removed the following from section 2.3: "NOTE: The following section on Unit Startup and Notification is not effective pending implementation of internal PJM tools and software"

Revision 53 (06/01/2013):

- This set of updates contains required changes for EKPC integration.
- 2013 Annual Review of M-13.
- Various grammatical and reference corrections throughout.
- Section 2.3.1: Correct reference to Attachment M, not N.
- Section 3.2: Added an unknown operating state as a potential reason to enter conservative operations.
- Section 5.4.1: Complete incomplete sentence.
- Section 5.5: Added COMED Reactive Interface to IROL list
- Attachment E: Updated with 2013 load values.

- Attachment F: Updated with 2013 load values.
- Attachment N: Add the EKPC Zone and COMED Reactive Interface.
- Update manual owner.

Revision 52 (01/31/2013):

- Updated Section 2.2 to remove reference to old regulation requirement. Also updated DASR requirement for 2013 values.
- Following a review of the Southwestern Blackout recommendations #13 and #23, updated Section 5.4 to include the two NOTES regarding controlling actions for facilities exceeding their post-contingency limits.
- Following a review of the Southwestern Blackout recommendations #13 and #23, added Section 5.4.1 for a new analysis to be performed for any post-contingency flows exceeding 115% of a facility's load dump rating. (Section 5.4.1 to be effective as of 3/1/2013).
- Updated Section 5.5 and Attachment G to remove remaining references to Scarcity Pricing and add Cleveland Interface to list of IROLs.
- Updated Section 6 to reference RFC and SERC as potential RROs for notifications.

Revision 51 (11/01/2012):

- Section 2.2: Update regulation requirement to point to M-12
- Section 5.3 and throughout: Remove references to scarcity pricing due to shortage pricing changes. Rewrite portions of section based on shortage pricing rules.
- Section 3.3: Update Hot and Cold Weather Alert CT charts
- Section 3.7: Add new monitoring points at Libertyville and State Line.
- Section 6.2 and Attachment J: Add new NERC disturbance reporting email address.

Revision 50 (06/28/2012):

- Correction to load dump tables in Attachments E and F.

Revision 49 (06/28/2012):

- Annual Review of M-13
- Updated Attachment K to memorialize Event Investigation Process
- Reviewed Attachment N: IROL Load Dump tables – no changes required
- Attachments E & F - Updated load dump tables for 2012
- Added language to Sections 2.3 and 5.2 per the approved rules for unit startup and notification



- Changed NIPC references to DHS where applicable in Section 4
- Updated section 3.7 to include Waugh Chapel and Conastone.

Revision 48 (04/03/2012):

- Updated Sections 2.3.2 and 5.2 to reflect new rules for additional DR products and sub-zonal dispatch capability and to add more detail on PJM dispatch processes to identified curtailable transactions during emergencies.
- Update Section 2.4.8 to add clarity on PJM and member actions during a High Voltage Action.
- Updated Section 3.7 to add the severity level for which PJM will provide All-Call notification of an SMD.
- Update Section 5.4 to fix reference from Attachment G in M-03 to Attachment D in M-03. Also clarified language regarding post-contingency generation reductions.
- Updated Attachment C. Form for Part B of the SSR contained information regarding VCLC Alert language and also required information regarding capacity transfer between PJM and areas that are now internal.
- Updated Attachment J to include a link to the online version of the OE-417 form.

Revision 47 (01/01/2012):

- Updated Section 2.2 to reflect 2012 Day Ahead Scheduling Reserve requirement percentages. Also correct language regarding regulation requirement.

Revision 46 (11/16/2011):

- Corrections to Exhibit 3 in Section 4.1, to include missing Imminent Threat Level information.

Revision 45 (11/16/2011):

- Revisions performed as part of 2011 annual review of M-13.
- Updated Section 3.7 – Add clarity on the duration of an SMD event prior to taking action. Change SMD to GMD and company contacts.
- Updated Section 2.3.2 and 5.2 – Remove language stating PJM would load Maximum Emergency Generation prior to issuing a Primary Reserve Warning.
- Updated Attachment E – Clarified language on calculation of Net Zonal Capacity Position. Update screenshots of EMS load dump table.
- Updated Attachment N – Added zonal load shed percentage for AEP zone for AEP/DOM IROL. Added DEOK zone placeholder.
- Updated Attachment L – Removed references to Homeland Security Color scheme.
- Updated SSR Part G to reflect ability for PJM to request units not be placed in max emergency.
- Updates include what is needed for DEOK integration.



Revision 44 (05/26/2011):

- Updated tables in Attachments E and F which had errors in the previous posting of revision 43.

Revision 43 (05/19/2011):

- Updated Attachment N – IROL Load Dump table to reflect ATSI integration and new TRAIL line for 6/1/2011.
- Updated Attachment E
- Updated Attachment F

Revision 42 (01/24/2011):

- Section 2.2 – updated 2011 DASR % to 7.11%

Revision 41 (10/1/2010)

- Section 2.4.2 Minimum Generation Alert: Replaced existing note box to reflect revision to PJM tariff regarding Energy Resource Curtailments (Docket #ER10-1762-000).

Revision 40 (08/13/2010)

- Updated diagram in Exhibit 1 (Emergency Levels)
- Updated language in Load management (Section 5) to match language in Section 2
- Updated table in Attachment E
- Updated table in Attachment F
- Completed 2010 Annual Review of the EOP manual
 - Section 2 Capacity Emergencies, page 27, Step 7A (Real-Time): Voltage Reduction
 - Section 2.4.2: Minimum Generation Alert, page 32 updated text box:
 - Updated 6.1 Reporting System Disturbances to the Department of Energy, page 79
 - Updated 6.4 Fuel Limitation Reporting, page 81
 - All UDS entries changed to SCED.
 - All Scheduling Coordinator entries changed to Master Coordinator.
 - All PJM CA entries changed to PJM RTO.

Revision 39 (01/01/2010)

- Updated language in Load Management steps in section 2 and section 5, and Attachment G
- Updated table in Attachment F
- Updated IROL table in Attachment N



Revision 38 (10/05/2009)

- Updated Attachment E
- New Section 5.5 – IROL Load Dump Procedure
- New Attachment N – IROL Load Dump Table
- New High Voltage / Low Load Procedure – New Section 2.4.8
- Clarified language on Sabotage Reporting in Section 4.2
- Updated Attachment G with estimated time to implement
- Update Attachment J – EOP-004 Reporting Responsibilities

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

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 judgment.
- 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 (01/1/2008)



- 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 (05/24/2007)

- 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 shutdown 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 shutdown 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.