

Attachment K: Event ~~Investigation~~ ~~Analysis Program~~ Process

PJM Event ~~Investigation Analysis Program~~ Process 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~~ analyze 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 as needed, and may, in more severe cases, include representatives of ReliabilityFirst and/or NERC.

Features of the event investigation-analysis process ~~should~~ include:

- Starting with everything on the table at the beginning of the investigation, nothing should be initially ruled out or excluded from the investigation-analysis process.
- 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.
- Determine if event qualifies for inclusion in the NERC Event Analysis process.
- Learning as much about the event as possible with the goal of improving the reliability of the PJM system, not as a punitive exercise.
- Accurate and thorough determination of root causes, contributing factors and corrective actions using a recognized and structured Root Cause methodology as required.
- Investigation of “near miss/good catch” events. Learning captured from “near miss/good catch” events can be just as valuable as those of actual events, identifying trends that have potential for more severe events.
- The parties most involved in the event should lead the investigationanalysis, if possible.
- Allowance for timely delivery of initial/preliminary findings to implement interim corrective actions, if necessary.
- A challenge or critical review of findings and recommended corrective actions before finalization of the investigationanalysis.
- Assurance that corrective actions are completed.
- 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-Analysis Process and by participating, are not prevented from taking any action they determine necessary in the course of event investigation-analysis activities. This investigation-analysis process may be suspended when participating in the North American Electric Reliability Council (NERC) Event Analysis Process or when a similar investigations-analysis would cause duplication of effort or confusion.

Step	Activity	Responsibility
1	Event Identification, Classification, NERC EAP category and Fact Finding	PJM and PJM Member Officers (or designee)
2	Determination of <u>Investigative Analysis</u> Action	PJM and Member through the PJM System Operations Subcommittee (Transmission)
3	Establishment of <u>Investigation Analysis</u> Ownership	PJM and Involved Member(s)

Step	Activity	Responsibility
4	Launch of <u>ACA or RCA</u> Team	Investigation-Analysis Owner
5	Execution of <u>ACA or RCA</u>	<u>ACA/RCA</u> Investigation-Analysis Leader
6	<u>ACA/RCA</u> Challenge Review and Solicitation of Comments	Investigation-Analysis Owner
7	Publishing of RCA and ACA reports to PJM and Transmission Owners	Investigation-Analysis Owner
8	Follow-up of corrective actions/notification of completion	Investigation-Analysis Owner
9	Event Investigation-Analysis 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-analysis~~ of operational events on PJM monitored BES facilities, including but not limited to completion of a formal Apparent Cause Analysis or 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 shorter, but still thorough, event analysis utilized for less complicated or significant events; “RCA Lite.” 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 structured, facilitated team process to identify underlying (root) causes of an incident, which resulted in an undesired outcome and produced corrective actions. An RCA process identifies and breaks down the processes and systems that contributed to the incident. It may also present actions to prevent future incidents. 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-Analysis Owner** – PJM or a Transmission Owner that takes responsibility for leadership of the execution of an ACA, RCA investigationanalysis, or NERC Event Analysis Report. The Investigation-Analysis Owner is responsible for establishing the investigation-analysis team, timely completion of the investigationanalysis and acceptance of the corrective actions.~~

~~**Investigation-Analysis Team Leader** – Individual designated by PJM or a Transmission Owner to provide leadership and guidance to a team of personnel executing a RCA, ACA investigationanalysis, or NERC Event Analysis Report.~~

PJM System Operations Subcommittee (Transmission) – A subcommittee of the PJM Operating Committee that provides oversight of the Event Investigation-Analysis Process.

Scope

Events intended to be included in the scope of the Event Investigation-Analysis Process include events on the Bulk Electric System that result in significant reliability problems, violations of reliability criteria or standards, including near-miss/good catch 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.
- 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-Analysis 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 investigationanalysis.

PJM and members may conduct their own internal event analysis for any event as required by each company's internal event analysis process.

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 Analysis 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 Analysis 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 Analysis 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 Analysis Process and to specify the level of action as outlined below:

Level	Definition	Use when:
<u>1</u>	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.

42	Apparent Cause Analysis (ACA)	<ul style="list-style-type: none"> • The consequences of a repeat of a similar type event are unacceptable. • The cause of the event is not clear or there is disagreement on the causes. Further <u>investigation-analysis</u> is required. • Corrective actions are not obvious. Further <u>investigation-analysis</u> is required.
43	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” <u>investigation-analysis</u> 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-Analysis Owner

PJM and Involved Member representative shall select the Investigation-Analysis 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-Analysis Owner.

Step 4 – Launch of Investigation-Analysis Team

The Investigation-Analysis Owner for an ACA ~~investigation~~ shall obtain and distribute the names of PJM and involved member investigation-analysis participants and team leader.

The ACA Team Leader shall complete the investigation-analysis and report results using the ACA investigation-analysis form (Appendix1) to the PJM and involved member via conference call within 30 business days.

The Investigation-Analysis 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-Analysis 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 analysis, timelines for completion of activities and confidentiality of information.

Step 5 – Execution of RCA

The RCA Investigation Team 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 analysis 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 Analysis Owner and RCA Investigation Team 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 Team Leader and Team members and other organizational entities that may be affected by the implementation of corrective actions. At the discretion of the Investigation Analysis 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 Analysis 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 Analysis 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 Analysis 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 analysis results by PJM and involved Member, the investigation analysis 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-Analysis 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-analysis reports.

Step 9 – Event Investigation-Analysis Program Oversight

PJM shall maintain a record of events, conference calls for evaluating events for investigative analysis action, decisions made and the status of current and ongoing RCAs or ACAs 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 Report 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-Analysis Team Leader

Approved By:

~~Investigation-Analysis~~ Owner

Date Approved: xx/xx/xxxx

~~Investigation-Analysis~~ Participants:

List additional names of team members or persons that had input into the ~~investigation-analysis~~ (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.

Operational Impacts:

This section summarizes the operational and reliability impacts observed during the event

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~~Causal Factors and Recommendations:

In a brief synopsis: Identify the end result of the investigation analysis. Record any actions, conditions or events that caused the incident. List any equipment, behavioral or procedural problems identified in the investigation analysis. The causes should be identified by asking “why” to the point where the cause, if prevented would have prevented or mitigated the consequences of this or a similar incident.

Corrective Actions (with Name and due or completed date):

List any corrective actions completed or planned. List an owner by name and due date for each corrective action. List the date completed for those already taken. Corrective actions must have owner acceptance before capturing them in this report.

A. XXXXXXXXXXXXXXXXXXXXX

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

B. XXXXXXXXXXXXXXXXXXXXX

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

Appendix 2

RCA EVENT OWNER IMPLEMENTATION CHECKLIST

- Confirm agreement and sponsorship of PJM and other Involved Member representative.
- Select an Investigation Analysis 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-event analysis final~~ 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:

- Tap Root
- REASONS
- Sigma X

Events are submitted, as applicable, to NERC via the NERC Event Analysis Process located on the NERC website at: http://www.nerc.com/pa/rrm/ea/ero_eap_documents%20dl/ero_eap_v3.1.pdf