LUMA

ROOT CAUSE ANALYSIS AND CORRECTIVE ACTIONS

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ROOT CAUSE ANALYSIS AND CORRECTIVE ACTIONS

1.0 Executive Summary

This procedure addresses the initiation and conduct of a Root Cause Analysis (RCA) and the associated Corrective Actions following a significant adverse event on the LUMA System. Included are the criteria for initiating a RCA, initial steps to safely mitigate the situation and the collection of all data and materials surrounding the event. RCA team formation and membership, as well as analysis tools typically used in the conduct of an RCA. The RCA management review, Corrective Action initiation, tracking of all RCA corrective actions, and an effectiveness review is also included in addition to developing a software tool to categorize the corrective actions to determine organizational trends.

2.0 Objective/Scope/Roles

2.1 Objective

The procedure defines the steps to conduct a Root Cause Analysis (RCA). This supports LUMA's goal to provide for the safe, reliable, and efficient operation of the Puerto Rico electric transmission and distribution system. It also provides a structured, data driven team approach to continuous process performance improvement. The procedure additionally establishes forward looking performance trends that can be utilized to pro-actively deal with areas of potential concern.

2.2 Scope

This procedure **shall** be used whenever there is a significant event that adversely impacts the health and safety of the public, LUMA employees or contractors, or the safe and reliable operation of the Bulk Power System. This document covers initial response to an adverse event, data and materials collection and RCA team formation. This procedure will also include how to conduct and RCA and timelines. This procedure is not intended to cover the specifics of each analysis tool that can be used during the actual conduct of the RCA and the resulting corrective actions identified from the use of these tools.

2.3 Roles and Responsibilities

Responsible Director (RD)– A Director that has responsibility for the performance of the employee(s) that were primarily involved in the significant adverse event. The RD **shall** also be responsible for sponsoring and forming the RCA Team, and final approval of the RCA and findings. The RD may accept the Corrective actions or reject them or add new corrective actions. The RD also accepts or denies requested due date changes for corrective actions.

Responsible Manager (RM) - A manager who has overall line responsibility for the performance of the employee(s) supervision, and management that were primarily involved in the significant adverse event. The RM **shall** lead the RCA Team by tracking team progress, assigning corrective actions to other members of management, and then insuring timely completion of their assigned corrective actions as appropriate. The RM **shall** also be responsible for reviewing and monitoring the RCA Team performance and corrective actions and monitoring completion of all corrective actions associated with the RCA Team.

RCA Team Facilitator (TF) – A supervisory employee trained in the RCA process and the analytical tools typically utilized to arrive at root causes. This employee can serve in this facilitator function without the need for having subject matter expertise in the aspects of the processes involved in an adverse event that triggers an RCA. This employee **shall** also function as the team's moderator and keeping the team "on task".

Corrective Action Assignee (CAA) – An employee, supervisor, or manager that has been assigned to complete a corrective action identified through an RCA Team. This employee may assign the Corrective action to a subordinate but **shall** continue to remain responsible for implementing the corrective action and providing periodic updates on the status of the corrective action also rests with the CAA.

Quality Assurance (QA) – This organization or individual is responsible for tracking the overall functioning of the RCA Procedure and evaluating the corrective actions to pro-actively identify organizational trends and provide periodic reports to management on the organization's diligence in assigning, tracking, and successfully completing the corrective actions. They **shall** also monitor

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Corrective Action Effectiveness Reviews (CAERs) that examine the extent to which the corrective action has been integrated into the organization, and the extent to which they have proven effective.

Public Relations (PR)– Responsible for communicating an adverse event in accordance with the Public Reporting procedure.

Legal – Responsible for evaluating the potential legal consequences to LUMA when a significant adverse event occurs including claims or legal action against LUMA for damages or other liability.

3.0 Procedure

This Procedure **shall** be utilized whenever a significant adverse event meets, or exceeds the following criteria:

- $100,000 in damage to the LUMA System and/or customer owned equipment, facilities, or property.
- Any event that results in an employee Lost Time Injury or an injury to the public.
- Any un-scheduled loss of power to a transmission line that was not the result of adverse environmental conditions.
- Any generator trip caused by LUMA operations that results in loss of power/load.

3.1 Immediate Actions

Initial actions following a significant adverse event unless the circumstances surrounding the event deem them as not applicable.

3.1.1 Safety First

Secure the immediate area and take any measures necessary to eliminate any immediate safety hazards.

3.1.2 Notifications

Notify the Transmission Operations Center (TOC) or Distribution Operations Center (DOC) who **shall** immediately notify the RM most directly involved , Upper Management, Safety, Public Relations, Legal.

3.1.3 Medical Support

IF employee or public injuries are involved, medical assistance **shall** be immediately dispatched to the area.

3.1.4 Emergency Contacts

Management **shall** contact any injured employee's emergency contact and inform them of the event and pertinent information of the employee.

3.1.5 Back-up Employees

If employees were directly involved in the event, they **shall** be immediately replaced with other employees and the involved employees returned to their service center by supervision so that event information can be obtained in a timely fashion.

3.1.6 Fitness-for-Duty

The employees **shall** then be considered for fitness-for-duty testing by management and, if deemed appropriate, escorted to a testing facility by a member of supervision or management.

3.1.7 Interview Employees

All involved employees **shall** then be interviewed by supervision regarding the incident and notes taken.

3.1.8 All-Hands Event Notification

Management **shall** take steps to immediately notify all employees of the event on the system through an All-Hands Event Notification and provide general details to the extent that they are known and confirmed.

3.1.9 Retain Event Records

RM **shall** then initiate steps to take or obtain:

- Photographs and measurements of the area involved.
- Any failed, damaged, or broken equipment, facilities, tools, or property.
- SCADA and other computer data, screen shots or records pertinent to the event, including any recordings of conversations.

- Copies of all documents related to the event including, but not limited to, clearance orders, work orders, procedures, written notes, recordings of communications, pre-job briefing sheets, equipment and vehicle operating manuals, manufacturer manuals and documentation for any damaged or failed material, construction standards, and weather information.

3.2 RCA Team Formation, Structure and Conduct

3.2.1 Timeline to Form Team

The RD with input from the RM **shall** review all information surrounding the event and determine if any disciplinary action is warranted before forming the RCA team. The RD **shall** then form and convene an RCA team within 5 business days of the event.

3.2.2 Team Members

The RCA team **shall** consist of the RM or another manager, a facilitator, and at least one supervisor. Additional members **shall** be based on the nature of the event and may include, Legal, Public Affairs, Safety, Training, Engineering, System Operations, support personnel, field personnel, union representative, and QA personnel.

3.2.3 Team Schedule

The RCA team **shall** meet either daily or weekly, but in no case **shall** the Team take longer than 4 weeks to complete the RCA including a review meeting with the RD to present recommended corrective actions CAAs and CA completion due dates.

3.2.4 Team Facilitator

The RCA TF **shall** provide direction to the RCA team and assist in facilitating all aspects and requirements to complete the RCA including the analysis tools available and assist the RM in keeping the team on-task.

3.2.5 Meetings, Tasks and Decisions

The RM **shall** be responsible for developing the team's meeting schedule, assigning any tasks to be completed between team meetings, and making any necessary decisions to keep the teams progress on schedule including making decisions when the team is failing to reach consensus on an issue.

3.2.6 Confidentiality

The RCA team **shall** not discuss any details of their meeting with anyone outside the team members until after the team's final presentation to the RD.

3.2.7 Analysis

The team **shall** make use of all the data collected during the initial actions after the event and can request additional information or interview any personnel to provide additional details surrounding the event.

NOTE: The Corrective Actions should have SMART Goals (see Appendix A – Glossary for definition.

3.2.8 Team Presentation

Findings and Corrective Actions: The team **shall** present its findings, corrective actions, recommended CAAs, and completion dates for each CORRECTIVE ACTION, to the RD during a team meeting held at the conclusion of the team's work.Each member of the team **shall** be responsible to actively participate in the team presentation and explain the data and tools used to arrive at the corrective action recommendations.

3.2.9 Management Review

The RD **shall** actively participate in the final presentation and ask questions to ensure that the CORRECTIVE ACTIONs are based on the data and analysis tools that the team utilized.

3.2.10 Management Approval

The RD **shall** have the final authority to reject or modify the recommended corrective actions/CAAs and **shall** explain the rationale of any changes.

3.3 Post RCA Team Actions

3.3.1 Communication

The RM or a designee **shall** prepare a summary of the RCA Teams Corrective Actions for dissemination to the organization and enter the Corrective Actions into the appropriate Log developed by QA for tracking Corrective Actions.

3.3.2 Assignee Agreement

Each CAA **shall** be responsible for accepting the Corrective Actions for completion or making a request to the RD for the Corrective Actions to be re-assigned to a more appropriate assignee.

3.3.3 Status Updates

Each CAA **shall** update the status of each assigned Corrective Actions in the log on a weekly basis and indicate if the required due date will still be met. If the required due date is in jeopardy, the RD may either accept or reject the new date.

3.3.4 Corrective Action Log Review

The Corrective Actions Log **shall** be reviewed at the RD level at least once each month and any overdue Corrective Actions **shall** be highlighted.

3.3.5 Management Review

The Corrective Actions Completion Log **shall** also be presented by QA at any monthly Director or higher staff meetings as part of their Key Performance Indicators (KPIs) review process.

3.3.6 Completion Log

The Corrective Actions Completion Log **shall** also be part of the RMs KPIs that are periodically reported to management.

3.3.7 Communication of Completion

As Corrective Actions are completed their status **shall** be communicated to the employees either at monthly safety meetings or in some other form of monthly or weekly written communication.

3.3.8 Effectiveness Check Timing

After the Corrective Action is completed, the RD **shall** assign a date no longer than one year in the future into the Corrective Action Completion Log when a Corrective Action Effectiveness Review (CAER) will be convened to determine its effectiveness in eliminating the re-occurrence of the event that prompted the Corrective Action.

3.3.9 Corrective Action Effectiveness Review (CAER)

- The RD **shall** reconvene the original RCA Team when their Corrective Actions are due for their CAER. The RD may elect to only select some of the original team members for this effectiveness review depending upon the nature of the originating event and Corrective Actions.
- The team **shall** review their original work, and any organizational trends that may assist in identifying the Corrective Action's effect on performance.
- The Team **shall** also interview employees that are subject to the Corrective Actions to determine their assessment of the Corrective Actions' effectiveness.
- If the CAER indicates that the Corrective Action has not been effectively implemented and another adverse event is likely to occur as a result, then the RD and the CAER Team **shall** determine what further corrective action(s) is required.
- If the Corrective Action has been effective, then the Corrective Actions **shall** be updated,then closed, and no further action taken.

- If the Corrective Action has been rendered outdated because of process changes within the organization, then the Corrective Action **shall** be updated, then closed, and no further action taken.

Appendix A: Glossary

Term	Definition
Fitness for Duty Testing	The process for having an employee medically tested for the presence of any drug or other chemicals in their system that could adversely affect their ability to safely function.
Key Performance Indicators	A comprehensive set of charts and data that measures performance in areas that are viewed as being key to the organizations success in meeting their goals.
RCA Tools	A set of analytical tools designed to use data to objectively evaluate the various factors that can result in an event that adversely effects the organization, and then derive those factors that are the root of the adverse event. These tools typically consist of the following: • Fishbone (sometimes referred to as an Ishikawa) Diagram • The 5 – "Whys" • Pareto Chart • Failure Mode and Effects Analysis • Scatter Plots • Flow Charting
All Hands Event Notification	PENDING An all-hands notification to announce a significant event can create alignment, build trust and transparency, boost engagement and foster a sense of belonging among employees.
Root Cause Analysis	Root cause analysis (RCA) is the process of identifying the underlying root cause of a problem, so you can then approach the problem with solutions to prevent the problem from occurring again.

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Term	Definition
Corrective Action Effectiveness Review	An effectiveness review is the measure and determination that the corrective action has (or has not) eliminated the problem.
Smart Goals	Each corrective action should have SMART Goals. The (CA) should be: Specific-make goals specific for effective planning Measurable-what evidence will prove you are progressing Attainable-can be accomplished within a certain time frame Relevant-aligned with long term objective Time-Based-realistic end date

Appendix B: Procedure Cross-Reference Matrix

Procedure Reference Matrix, Part 1 of 2	Short Term Load Forecasting	New Facility Interconnection	Resource Adequacy Planning	Interconnected Facility Retirements	Legacy T&G Demarcation	Interconnected Facilities Capabilities	Black Start	Telemetry	Cybersecurity	Root Cause Analysis & Corrective Actions	Public Reporting	Performance Reporting	Stakeholder Management	Policy on Reserves
Short Term Load Forecasting														
New Facility Interconnection														
Resource Adequacy Planning														
Interconnected Facility Retirements														
Legacy T&G Demarcation														
Interconnected Facilities Capabilities														
Black Start														
Telemetry														
Cybersecurity														
Root Cause Analysis & Corrective Actions														
Public Reporting														
Performance Reporting														
Stakeholder Management														
Policy On Reserves														
Reducing Risk Exposure to Contingencies														
Critical Loads														
Load Shedding														
Contingency and System Operating Limits Response														
Energy Dispatch, Scheduling and Merit Order														
Transmission Operations														
Plant Level Communications														
Balancing Frequency and Voltage														
Demand-Side Resources (Non-Wire Alternatives)														
System Operator Training														
Scheduling Planned T&G Outages														
Forced Outage														
Outage Execution and Closeout														
Emergency Response Execution														
Emergency Response Drills														

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Procedure Reference Matrix, Part 2 of 2	Reducing Risk Exposure to Contingencies	Critical Loads	Load Shedding	Contingency & System Operating Limits Response	Energy Dispatch, Shedding & Merit Order	Transmission Operations	Plant Level Communications	Balancing Frequency & Voltage	Demand Side Resources (NWA)	System Operator Training	Scheduling Planned T&G Outages	Forced Outage	Outage Execution & Closeout	Emergency Response Execution	Emergency Response Drills
Short Term Load Forecasting															
New Facility Interconnection															
Resource Adequacy Planning															
Interconnected Facility Retirements															
Legacy T&G Demarcation															
Interconnected Facilities Capabilities															
Black Start															
Telemetry															
Cybersecurity															
Root Cause Analysis & Corrective Actions															
Public Reporting															
Performance Reporting															
Stakeholder Management															
Policy On Reserves															
Reducing Risk Exposure to Contingencies															
Critical Loads															
Load Shedding															
Contingency and System Operating Limits Response															
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Balancing Frequency and Voltage															
Demand-Side Resources (Non-Wire Alternatives)															
System Operator Training															
Scheduling Planned T&G Outages															
Forced Outage															
Outage Execution and Closeout															
Emergency Response Execution															
Emergency Response Drills															

Appendix C: All Hands Notification Example

ALL HANDS EVENT NOTIFICATION

[ ] Near Miss [ ] PROSHA Recordable [ ] Employee [ ] Contractor
[ ] Property Damage [ ] Load Loss [ ] Other

Date & Time	
Contact Person	
Subject	
Location	
Alert #	
Event Summary	
Immediate Learnings	
Corrective Actions	

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