NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Electric Reliability Organization Event Analysis Process Version 5.0

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Preface

Electricity is a key component of the fabric of modern society and the Electric Reliability Organization (ERO) Enterprise serves to strengthen that fabric. The vision for the ERO Enterprise, which is comprised of NERC and the six Regional Entities, is a highly reliable, resilient, and secure North American bulk power system (BPS). Our mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

Reliability | Resilience | Security
Because nearly 400 million citizens in North America are counting on us

The North American BPS is made up of six Regional Entities as shown on the map and in the corresponding table below. The multicolored area denotes overlap as some load-serving entities participate in one Regional Entity while associated Transmission Owners/Operators participate in another.

MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
Texas RE	Texas Reliability Entity
WECC	WECC

Introduction

The ERO Event Analysis Process (EAP) document is intended to be used as a guideline to promote a structured and consistent approach to performing event analyses in North America. This document outlines a process that will facilitate greater communication and information exchange between registered entities, Regional Entities, and NERC.

The ERO Event Analysis Program exists for review of major system events and other off-normal system occurrences. The program is forensic in nature and focuses on the near-term to real-time operating horizons. The program is derived from the NERC Rules of Procedure (ROP) authorities/requirements outlined in Section 800 – Reliability Assessment and Performance Analysis. Section 800 specifies the need for analysis of off-normal occurrences on the Bulk Electric System (BES) that do not rise to the level of major events as described in the ROP. For purposes of the Event Analysis Program an event is defined as a single incident or linked incidents due to a common initiating cause resulting in an undesirable impact to the BES.

The EAP is an approach specifically designed to address categorized events defined by the Event Analysis Subcommittee (EAS) in concert with the ERO that could result in adverse impacts to the BES, provide indication of future system risks, and/or confirm known risks to the BES. The process is a systematic approach to handle data collection and analysis of events as defined by the EAP category criteria. The main objective is for the ERO and industry to learn from the events and to develop corrective actions to prevent recurrence. Continuous improvement is the mindset that the process is designed to instill in industry design and operating practices.

The primary reason for participating in an event analysis is to determine if there are lessons to be learned and potential recommendations that can be shared with industry to mitigate the risk of recurrence. An effective EAP requires industry participation and support to assist in continuous improvement of BES performance.

Analyzed events feed the ERO Cause Code Assignment Process[1], which is used to identify trends. Trends help the ERO confirm known and expected reliability risks and identify emerging risks. Resulting mitigation efforts could include NERC Alerts[1] and/or recommended changes to Reliability Standards and/or disturbance reporting.

The NERC Reliability and Security Technical Committee (RSTC) will oversee the maintenance of the EAP document through the EAS and existing ERO documentation processes. The document will be periodically reviewed and updated by the EAS every three years or as needed. The RSTC may solicit comments from industry during the review process.

The EAP does not exempt the registered entity from mandatory reporting requirements governed by regulatory authorities or NERC Reliability Standards.[2]

[1] https://www.nerc.com/pa/rrm/ea/EA%20Program%20Document%20Library/CCAP_Manual_2023.pdf

[2] Rules of Procedure (ROP) Section 810

Process Overview

The EAP maintains three categories of pre-defined criteria that serve to drive data collection efforts for use in identifying system impacts and risks. Each category describes the impact to the BES and the EAP provides industry with the level of analysis necessary to accurately report the event to the ERO.

The event analysis process most often begins when the ERO receives notification of a potential event via receipt of an OE-417 or EOP-004 or receipt of a brief report. A foundation for success of EAP is in the initial communication and coordination between the registered entity and the Regional Entity described in the steps below. A primary reason for participating in an event analysis is to determine if there are practices and lessons to be learned and shared with the industry. The six steps below support this objective.

Step 1: The registered entity assesses an event, proposes the event category in accordance with the EAP, and reports the event to the Regional Entity.

Step 2: A planning meeting or coordination call (Appendix B) is held between the registered entity and the Regional Entity when possible.

Step 3: The registered entity submits a Brief Report (Appendix C) to the Regional Entity.

Step 4: The registered entity submits an Event Analysis Report (EAR) (Appendix D) to the Regional Entity, if needed.

Step 5: Lessons learned (Appendix E) are developed and shared with industry as appropriate.

Step 6: The EAP is closed.

Categorizing Events (Step 1)

When a registered entity experiences an event, that entity will propose an initial category for the event as outlined in this section. The categories listed in this section do not cover all possible events. The need for analysis may be discussed by all affected registered entities, the appropriate Regional Entities, and NERC.

Registered entities that reside in multiple Regional Entity footprints should notify all relevant Regional Entities of an event that spans those Regions. NERC and the Regional Entities will determine a lead Regional Entity for the event, and further communication will take place between the registered entity and the lead Regional Entity.[3]

If an event is experienced that meets Category 1-3 criteria the primary focus should be restoration and then communication with the Regional Entity on reporting per Appendix A. Qualifying events are assigned to one of three categories based on potential reliability impact to the BES. The event categories are intended to allow the registered entity and Regional Entity to objectively identify event thresholds. The highest category that characterizes an event should be used.

The categories listed in this section do not cover all possible events. Events of interest that do not meet EAP reporting criteria may be identified by NERC, the Regional Entity, or the registered entity. In these cases, a report may be submitted or requested in an effort to share experiences and lessons learned with the industry. These unqualified events will be categorized as Category 0.

Category 1: An Event that Results in One or More of the Following:

a. An outage, contrary to design, of three or more BES Facilities caused by an event:
   i. The outage of a combination of three or more BES Facilities (excluding successful automatic reclosing)
   ii. The outage of an entire generation station of three or more generators (aggregate generation of 500 MW to 1,999 MW)[4]; each combined-cycle unit is counted as one generator.

b. ~~Intended and controlled system separation by the proper operation of a remedial action scheme (RAS) in New Brunswick or Florida from the Eastern Interconnection~~ Retired on January 1, 2024

c. Failure or misoperation of a BES Remedial Action Scheme (RAS)

d. ~~System-wide voltage reduction of 3% or more that lasts more than 15 continuous minutes due to a BES Emergency~~ Retired on January 1, 2024

e. BES system separation contrary to design results in an island of 100 MW to 999 MW. This excludes BES radial connections and non-BES (distribution) level islanding.

f. ~~Unplanned evacuation from a control center facility with BPS SCADA functionality for 30 minutes or more.~~ Retired on January 1, 2016

g. In ERCOT, loss of generation of 1,400 MW to 1,999 MW

[3] ERO Enterprise Guide for the Multi-Region Registered Entity Coordinated Oversight Program, March 2018, Section IX: System Events

[4] Gross MW output of the generators at the time of the outage.

h. Loss of monitoring[5] and/or control[6] at a Control Center such that it degrades[7] the entity's ability to make Real-time operating decisions that are necessary to maintain reliability of the BES in the entity's footprint for 30 continuous minutes or more.

   Some examples that should be considered for EA reporting include but are not limited to the following. Additional cases are provided in the Addendum for Category 1h Events found under reference materials for event analysis on the EA Program website.[8]

   i. Loss of operator ability to remotely monitor or control BES elements

   ii. Loss of communications from SCADA remote terminal units (RTU)

   iii. Unavailability of ICCP links, which reduces BES visibility

   iv. Loss of the ability to remotely monitor and control generating units via automatic generation control (AGC)

   v. Unacceptable state estimator or real time contingency analysis solutions

i. A non-consequential interruption[9] of inverter type resources[10] aggregated to 500MW or more not caused by a fault on its inverters, or its ac terminal equipment.

j. A non-consequential interruption[11] of a DC tie(s), between two separate asynchronous systems, loaded at 500 MW or more, when the outage is not caused by a fault on the dc tie, its inverters, or its ac terminal equipment.

Category 2: An Event that Results in One or More of the Following:

a. Complete loss of interpersonal communication and alternative interpersonal communication capability affecting its staffed BES control center for 30 continuous minutes or more.

b. ~~Complete loss of SCADA, control or monitoring functionality for 30 minutes or more.~~ Retired on January 1, 2016 refer to Category 1h

c. BES Emergency resulting in a voltage deviation of ≥ 10% difference of nominal voltage sustained for ≥ 15 continuous minutes.

d. Complete loss of off-site power (LOOP) to a nuclear generating station per the Nuclear Plant Interface Requirement

e. System separation contrary to design, that results in an island of 1,000 MW to 4,999 MW

f. Simultaneous loss of 300 MW or more of firm load due to a BES event, contrary to design, for more than 15 minutes

[5] The ability to accurately receive relevant information about the BES in Real Time and evaluate system conditions using Real-time data to assess existing (pre-Contingency) and potential (post-Contingency) operating conditions to maintain reliability of the BES.

[6] The ability to take and/or direct actions to maintain the reliability of the BES in Real Time via entity actions or by issuing Operating Instructions.

[7] For purposes of 1h categorization "degrades" means less-than required functioning of any monitoring/control component, process, or capability.

[8] https://www.nerc.com/pa/rrm/ea/Pages/EA-Program.aspx

[9] Interruption of resources caused by action of control systems on the resources in response to perturbations in voltage and/or frequency on the Interconnection, not including the control actions of a RAS.

[10] In most cases, inverter-based generating resources refer to Type 3 and Type 4 wind power plants, and solar photovoltaic (PV) resources. Battery energy storage is also considered an inverter-based resource. Many transmission-connected reactive devices such as STATCOMs and SVCs are also inverter-based. Similarly, HVDC circuits also interface with the AC network though converters.

[11] Interruption of resources caused by action of control systems on the resources in response to perturbations in voltage and/or frequency on the Interconnection, not including the control actions of a RAS.

g. Interconnection Reliability Operating Limit (IROL) exceedance for greater than 30 minutes

Category 3: An Event That Results in One or More of the Following:

a. Loss of firm load, contrary to design, of 2,000 MW or more.

b. System separation contrary to design, that results in an island of 5,000 MW or more

c. System separation (without load loss) contrary to design, that islands Florida from the Eastern Interconnection

d. Loss of 2,000 MW or more provided by DC tie(s) connected to asynchronous resources

e. Loss of generation (including inverter-based resources) of 2,000 MW or more. This excludes RAS action that performed as designed.

Event Analysis Planning Meeting/Coordination Call (Step 2)

Following an event, the Regional Entity and/or NERC will determine if a planning or coordination meeting is required between the registered entity(ies) and the applicable Regional Entity. More than one planning meeting may be conducted based on the registered entity's experience level with the EAP, the scope of the event, or the number of registered entities involved.

The planning meeting (when held) should:

1. confirm the event category;
2. determine the level of analysis;[12]
3. identify the roles for the registered entity(ies), Regional Entities, and NERC;
4. establish milestones, coordination of target dates, and determine reporting entity(ies) for completing reports, lessons learned, and other necessary analysis for events requiring detailed analysis, or the analysis itself would take longer to complete than the target dates set in the appendices. Should additional time be needed beyond the target dates to complete the analysis, this can be granted by the Regional Entity on a case-by-case basis as necessary;
5. identify the need for a data retention hold; and
6. identify data and information confidentiality issues.

Registered entities should capture relevant data for the event analysis. Regional Entities will formally send a Data Retention Hold[13] Notice for events in Category 3, if deemed necessary by the Regional Entity or NERC.

The Appendix B: Planning Meeting Scope Template can be used as an outline in the planning meeting.

Event Analysis Process Reports (Steps 3 and 4)

Timeframes for submitting the requisite reports are found in Appendix A: Target Timeframes for Completion of Brief Reports, EARs, and Lessons Learned.

The brief report is prepared by the impacted registered entities for all qualifying events and then sent to the applicable Regional Entity for review. The Regional Entity then forwards it to NERC. A brief report includes items

[12] Although the category of the event provides general guidance on the level of analysis needed, these guidelines may be adjusted by the EA team, based on the overall significance of the event and the potential for valuable lessons learned.

[13] BPS users, owners, and operators are required, upon request, to produce any requested data pursuant to Title 18 of the Code of Federal Regulations (CFR) Part 39.

identified in Appendix C: Brief Report Template. The brief report template may also be used for non-qualifying events that produce useful lessons learned for the industry.

An EAR is required for Category 3 events and may be requested for lower-level events. An EAR is prepared by the impacted entity, a group of impacted entities, or relevant members of an event analysis team as defined in the planning meeting. It addresses in detail the sequence of events as they happened, the identified causal factors, and the appropriate corrective actions. Appendix D: Event Analysis Report Template can be used as a guideline. Once completed, the EAR is sent to the applicable Regional Entities for review. These documents are sent to NERC upon completion.

In the brief report or EAR, registered entities are encouraged to include one-line diagrams or other diagrams and representations of the facility(ies) involved in the event.

The final EAR should address corrective actions and recommendations related to the event's causal factors and any identified lessons learned. Positive outcomes identified during an event should be documented.

If any applicable governmental authorities (AGAs) initiate a formal review process in conjunction with NERC,[14] the decision on the composition of the event analysis team, the team lead, the information needed from affected registered entities, and the required scope of the analysis will be discussed and agreed upon by the AGAs and NERC executive staff.

Lessons Learned from Events (Step 5)

Lessons learned as a result of an event analysis should be shared with the industry in accordance with timing, as referenced in Appendix A. Proposed lessons learned should be drafted by a registered entity utilizing Appendix E: Lessons Learned Template and should be submitted to the applicable Regional Entity. The lessons learned should be detailed enough to be of value to others but should not contain data or information that is deemed confidential. When possible, one-line diagrams or other representations should be included to enhance the information provided in the lessons learned. Vendor-specific information should not be included unless it is discussed and coordinated with the vendor. If dissemination of vendor-specific information is beneficial, it may be pursued outside the EAP.

Lessons learned will be reviewed by selected technical groups and NERC staff for completeness and appropriateness prior to posting.

Event Closure (Step 6)

Following the receipt of final reports, NERC and the Regional Entity will evaluate and close the event upon review and analysis of brief reports, EARs, and lessons learned. The Regional Entity will notify the registered entity(ies) involved that an event has been closed upon notification from NERC.

Lessons Learned from Other Occurrences

Any occurrence on the BES may yield lessons of value to the industry. Lessons learned can include the adoption of unique operating procedures, the identification of generic equipment problems, or the need for enhanced personnel training. In such cases, an event analysis would not be required, but the ERO EAP encourages registered entities to share with their Regional Entity any potential lessons learned that could be useful to others in the industry.

[14] As specified in the ERO ROP, Section 807.f, the NERC president and chief executive officer has the authority to determine whether any event warrants analysis at the NERC level. A Regional Entity may request that NERC elevate an analysis of a major event to the NERC level.

Confidentiality Considerations

Information and data designated as confidential by the entity supplying the data/information in the course of an event analysis shall be treated as confidential. In addition, all Critical Energy Infrastructure Information (CEII) shall be treated accordingly and may be designated as CEII by the entity supplying the information or by NERC or its Regional Entities. By participating in the EAP, a United States entity acknowledges that any of its brief reports, EARs, or both may be disseminated to an AGA, upon request, in accordance with Section 1500 of the Rules of Procedure.

Appendices and Other Suggested References

Appendix A: Target Time Frames for Completion of Brief Reports, EARs, and Lessons Learned

Appendix B: Planning Meeting Scope Template

Appendix C: Brief Report Template

Appendix D: Event Analysis Report Template

Appendix E: Lessons Learned Template

Other References:

- Attributes of a Quality Event Analysis Report
- Attributes of a Quality Lessons Learned
- NERC Blackout and Disturbance Analysis Objectives, Analysis Approach, Schedule, and Status – Attachment D from Appendix 8 of NERC Rules of Procedure
- Cause Analysis Methods for NERC, Regional Entities and Registered Entities

For additional data submission information regarding particular event categories see the supporting documents below on the EA Program page under reference materials.

- Addendum for Category 1h Events
- Addendum for Category 1a Events
- Addendum for Events with Failed Station Equipment
- NEI-NERC White Paper: Nuclear Power Plant Loss of Offsite Power Events - NERC Reporting Guidelines
- Addendum for Determining Event Category)

The EAP, appendices, and reference documents are posted on the EA Program page on the NERC website. To access the EA Program page on the NERC website, click on the Program Areas & Departments tab at the top of the NERC home page, then Event Analysis, Reliability Assessment, and Performance Analysis on the left side of the page, then EA Program under Event Analysis. The latest versions of the appendices are posted under the Current Event Analysis Process Documents tab.

Revision History

Rev.	Date	Reviewers	Revision Description
1	December 2011	Event Analysis Working Group (EAWG), NERC Management, Operating and Planning Committees.	Document endorsed by Operating and Planning Committees January 2012. Document endorsed by NERC Board of Trustees February 2012.
2	July 2013	Event Analysis Subcommittee (EAS), NERC Management, NERC Operating Committee.	Document endorsed by Operating Committees June 18, 2013.
3	September 2015	Event Analysis Subcommittee (EAS), NERC Management, NERC Operating Committee.	Document endorsed by Operating Committees September 16, 2015.
3.1	December 2016	Event Analysis Subcommittee (EAS), NERC Management, NERC Operating Committee.	Document endorsed by Operating Committees December 13, 2016.
4	December 2019	Event Analysis Subcommittee (EAS), NERC Management, NERC Operating Committee.	Document endorsed by Operating Committees December 10, 2019
5	September 2023	Event Analysis Subcommittee (EAS), Reliability and Security Technical Committee (RSTC)	Document accepted by the Reliability and Security Technical Committee September 20, 2023