

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Electric Reliability Organization Event Analysis Process Version 4.0

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RELIABILITY | RESILIENCE | SECURITY



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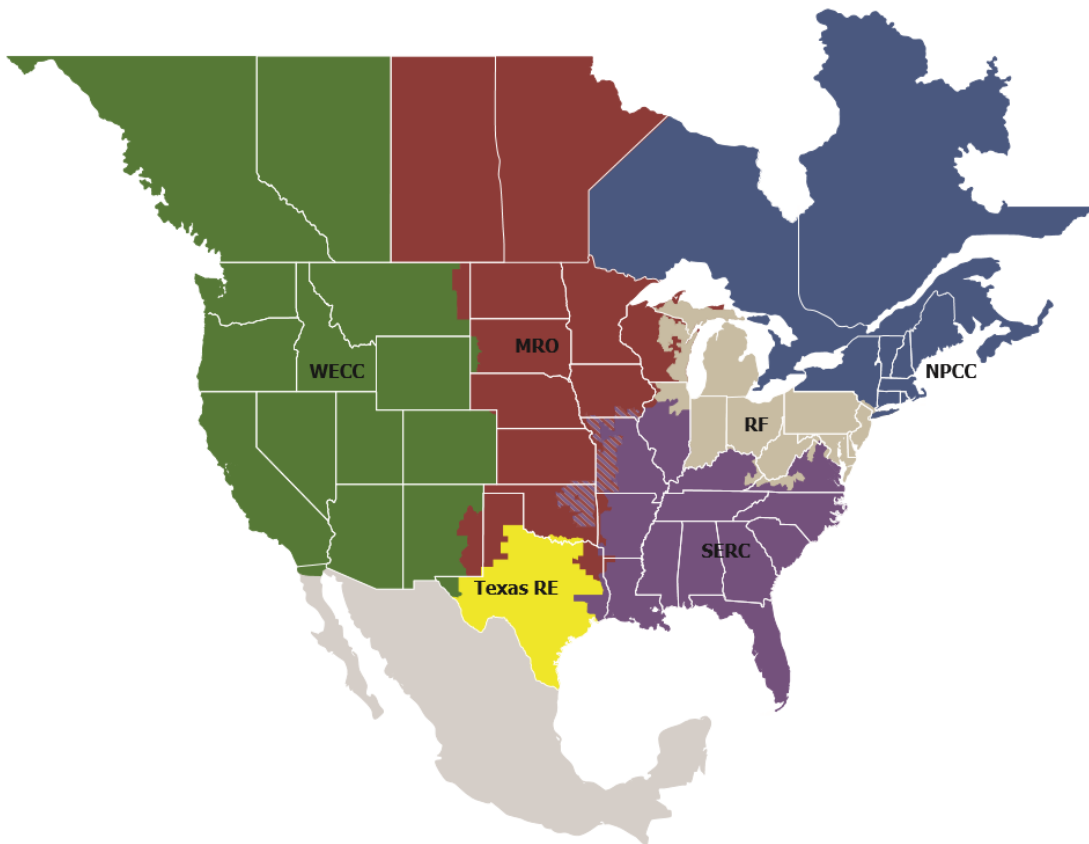
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Preface

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 the North American Electric Reliability Corporation (NERC) and the six Regional Entities (REs), is a highly reliable 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 divided into six RE boundaries as shown in the map and corresponding table below. The multicolored area denotes overlap as some load-serving entities participate in one Region 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	Western Electricity Coordinating Council

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, REs, and NERC.

The primary reason for participating in an event analysis is to determine if there are lessons to be learned and shared with the industry. The analysis process involves identifying what happened, why it happened, and what can be done to prevent reoccurrence. Identification of the sequence of events answers the “what happened” question and determination of the root cause of an event answers the “why” question. It also allows for events to have cause codes or characteristics and attributes assigned, which can then be used by the Event Analysis Subcommittee (EAS) to identify trends. Trends may identify the need to take action, such as a NERC Alert¹, or may support changes to Reliability Standards.

The NERC Operating Committee (OC) will maintain the EAP document under the existing ERO documentation process. The document will be reviewed and updated by the EAS, as needed. The NERC OC will 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 Rules of Procedure (ROP), Section 810

² The purpose of the voluntary EAP is to determine the how, what, and why of an event vs. the notification process required in the current version of NERC Standard EOP-004. This difference in the purpose of the EAP vs. EOP explains the similar but different reporting criteria in part. Reporting (notification) under EOP is mandatory, immediate, and brief, and is intended to notify other entities that an event has taken place on the Bulk Electric System (BES) or BES control facilities. Reporting through the EAP is intentional, analytic, methodic, and detailed.

Process Overview

- Step 1: The registered entity assesses an event, determines the event category, and notifies the RE.
- Step 2: A planning meeting or coordination call ([Appendix B](#)) is held between the registered entity and the RE when possible.
- Step 3: The registered entity submits a Brief Report ([Appendix C](#)) to the RE.
- Step 4: The registered entity submits an Event Analysis Report (EAR) ([Appendix D](#)) to the RE, if needed.
- Step 5: Lessons learned ([Appendix E](#)) are developed and shared with industry as appropriate.
- Step 6: The EAP is closed.

ERO Event Analysis Process

Categorizing Events (Step 1)

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

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

If a weather-related occurrence falls within any of the categories, it should be communicated to the RE. The affected registered entities should focus on restoration efforts. For weather-related events, highest category that characterizes an event should be used, even though the cause may be determined to be limited to weather.

For Category 3 and above weather-related occurrences, the RE will collaborate with affected registered entities to determine if any additional information or event analysis steps are needed for the purposes of learning from these events.

For weather-related events, the primary reason for participating in an event analysis is to determine if there are good practices and lessons to be learned and shared with the industry.

Qualifying events are assigned to one of five categories based on reliability impact to the BES. The event categories are intended to allow the registered entity and RE 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. NERC encourages registered entities to report events of significance in an effort to share experiences and lessons learned with the industry. When such events are reported, these events will be categorized as unqualified or category 0.

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

- a. An unexpected outage, that is contrary to design, of three or more BES Facilities caused by a common disturbance⁴:
 - 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)⁵; 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
- c. Failure or misoperation of a BES RAS

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

⁴ As defined in the NERC Glossary of Terms: Disturbance - 1. An unplanned event that produces an abnormal system condition. 2. Any perturbation to the electric system. 3. The unexpected change in ACE that is caused by the sudden failure of generation or interruption of load.

⁵ Gross MW output of the generators at the time of the outage.

- d. System-wide voltage reduction of 3% or more that lasts more than 15 continuous minutes due to a BES Emergency
- e. Unintended BES system separation that 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, unintended loss of generation of 1,400 MW to 1,999 MW
- h. Loss of monitoring or control at a control center such that it significantly affects the entity's ability to make operating decisions for 30 continuous minutes or more.

Some examples that should be considered for EA reporting include, but are not limited to the following:

- 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 interruption⁶ of inverter type resources⁷ aggregated to 500MW or more not caused by a fault on its inverters, or its ac terminal equipment.
- j. A non-consequential interruption⁶ of a dc tie, 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 01, 2016 refer to Category 1h
- c. BES Emergency resulting in a voltage deviation of $\geq 10\%$ 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. 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 for time greater than T_v

⁶ 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.

⁷ 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 circuit also interface with the AC network through converters.

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

- a. Unintended loss of load, generation (including inverter type resources), or dc tie to asynchronous resources of 2,000 MW or more.
- 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 islands Florida from the Eastern Interconnection

Category 4: An Event that Results in One or More of the Following:

- a. Unintended loss of load, generation (including inverter type resources) 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. Unintended loss of load of 10,000 MW or more
- b. Unintended loss of generation of 10,000 MW or more

Event Analysis Planning Meeting/Coordination Call (Step 2)

Following an event, the RE and/or NERC will determine if a planning or coordination meeting is required between the registered entity(ies) and the applicable RE. 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;⁸
- 3. identify the roles for the registered entity(ies), REs, 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 RE 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. REs will formally send a Data Retention Hold⁹ Notice for events in Category 3 or higher, if deemed necessary by the RE(s) or NERC.

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

⁸ 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.

⁹ 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.

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 RE for review. The RE then forwards it to NERC. A brief report includes items 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 more significant events (Category 3 and above) 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 REs 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,¹⁰ 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 RE. 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.

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 RE any potential lessons learned that could be useful to others in the industry.

¹⁰ 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.

Event Closure (Step 6)

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

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 REs. 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](#)

See the Addendums below on the EA Program page for further data submission regarding particular events

- [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 (under development)

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 Reliability Risk Management 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