

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Project 2022-03

Energy Assurance with Energy-Constrained Resources

Industry Webinar
February 12, 2024

RELIABILITY | RESILIENCE | SECURITY



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Participants are reminded that this meeting is public. Notice of the meeting was widely distributed. Participants should keep in mind that the audience may include members of the press and representatives of various governmental authorities, in addition to the expected participation by industry stakeholders.

- Project Background
- Energy Reliability Assurance definition and Technical Rationale
- BAL-007-1 and Technical Rationale
- Implementation Plan
- Questions & Answers

Name	Entity
David Mulcahy (chair)	Illuminate Power Analytics, LLC
Ruth Kloecker (vice-chair)	ITC Holdings
Mike Knowland	New England Independent System Operator
Julie Jin	ERCOT
John Stevenson	New York Independent System Operator
John Brewer	United States Department of Energy
Layne Brown	WECC
Mark Kuras	PJM Interconnection, LLC

Name	Entity
Phillip Wiginton	Tennessee Valley Authority
Derek Hawkins	Southwest Power Pool, Inc.
Sean Boyle	Constellation Energy
Brent Duncan	Southern Company Service, Inc
Clyde Loutan	California Independent System Operator

- *White Paper: Ensuring Energy Adequacy with Energy-Constrained Resources*
 - Published in December 2020; Drafts circulated over a year prior
 - Introduced the problem statement concerning our ability to serve demand and ensure the reliable operation of the bulk power system with inconsistent output of generation relying on unassured fuel supplies
 - Posed the question of whether traditional capacity assessments were appropriate under the changing landscape from virtually unlimited fuel to one with more limitations on generator dispatchability
 - Brought forward the question the availability of fuel when needed
 - Proposed additional study in three timeframes: Mid- to Long-term Planning, Operational Planning, and Operations
 - Reviewed by the Reliability and Security Technical Committee (RSTC) at the December 2020 meeting, where volunteers were solicited to form a task force to address the issued raised in the white paper

- Energy Reliability Assessment Task Force (ERATF)
 - Proposed to the RSTC at the March 2, 2021 meeting
 - Scope and work plan were presented
 - Engage industry R&D organizations to develop tools and methods
 - Coordinate studies and plans with adjacent Balancing Authorities
 - Evaluate whether Standard Authorization Requests were needed for energy assurance
 - Membership was to include RSTC members, active participants, and observers
 - Leadership would be appointed by the RSTC chair
 - Observers were welcome, including NERC and Regional Entity staff
 - Requested approval of scope and work plan as well as identifying technical participants to support the goals of the ERATF
 - First met on March 8, 2021

- Further development of problem statement
 - Assessment of current activities in the space of energy reliability
 - Better understand if organizations are performing assessments already and how they are being performed
 - For those who were performing assessments, gather details on how modeling is done and what consistencies could be drawn between organizations
 - Answer the questions from the Energy Assurance white paper
 - Evaluation of existing NERC Standards
 - Determine if Standards had requirements that would be met by performing energy reliability assessments
 - Gap analysis of what activities would contribute to ensuring energy adequacy in all time horizons with energy constrained resources

- Standard Authorization Requests (SARs) development
 - Draft was completed in December 2021 for review and comment by the RSTC and Member Representative Committee (MRC)
 - Received feedback from both committees, which was then evaluated and incorporated into the SARs, and/or responses provided
 - Generally supportive feedback with concerns around locational differences and the ability to implement changes to how evaluations are performed
- Energy Analysis Workshop
 - Convened on February 16, 2022 via Webex with three panels to discuss Operations/Operational Planning, Mid- to Long-term Planning, and ongoing Research and Development efforts
 - Outreach with industry to gather comments for further development and refinement of the Energy Assessment SAR
 - Key takeaway was that energy reliability assessments are crucial, achievable, and essential
- Formally submitted two SARs to the Standards Committee (SC) for their meeting on June 15, 2022 (*Ops/Ops Planning and Planning Time Horizons*)
 - SARs were accepted by the SC for a 30-day informal comment period
 - SC authorized solicitation of a SAR Drafting Team

- *Energy Assessments with Energy-Constrained Resources in the Operations and Operations Planning Time Horizons (SAR)*
 - Industry needs focused on maintaining reliability using unassured fuel supplies and inconsistent output of variable energy resources
 - Noted that traditional capacity analyses, focusing on peak-demand with the assumption that generation was always available, was sufficient for their day and age
 - Looking forward, these capacity analyses would be insufficient through changes in the resource mix due to the variability of the replacement resources, emphasizing the reliance on dispatchable resources and their fuel supplies
 - Energy reliability assessment requirements would enhance reliability by giving entities the information needed and the foresight to develop plans to correct energy deficiencies

- *Energy Assessments with Energy-Constrained Resources in the Operations and Operations Planning Time Horizons (SAR)*
 - Requirements for an energy reliability assessment were scoped in the SAR to guide a Standard Drafting Team to include all that is necessary to perform the assessments
 - Definitions, time periods, time-coupled interaction (e.g., fuel depletion), outage modeling considerations, variability of resource output, energy storage, transmission capability, correlation between weather and load and generation, and extreme weather
 - Coordination between areas
 - Comparison of results to a pre-defined criteria and development of Corrective Action Plans, Operating Plans, or other mitigating actions
- SAR Drafting Team updates were accepted by the Standards Committee on January 25, 2023

- Standard Drafting Team published initial draft standard titled TOP-0XX-X
 - An informal comment period was held from September 13 – October 5, 2023 and responses were incorporated in drafting.
 - Among the comments were recommendations to move to BAL
- A Quality Review (QR) for BAL-007-1 was performed from November 3 – November 14, 2023. The QR team included NERC internal staff and experts from the industry.
- At the January 17, 2024 Standard Committee (SC) meeting, the SC authorized initial posting for this project.

- *BAL-007-1 – Draft 1*
 - Introduces 11 new Requirements, each of which being a component of energy reliability assessments (ERAs)
 - Designing and documenting the process, including scenarios, by which an ERA will be performed, documented, and reviewed
 - Development and review process of Operating Plans
 - Performing the ERA as it was designed
 - Determination of metrics and comparison to results
 - Implementation of the previously developed Operating Plan

- *BAL-007-1 includes requirements for two-time horizons*
 - Near-Term ERA
 - Seasonal ERA



Questions and Answers

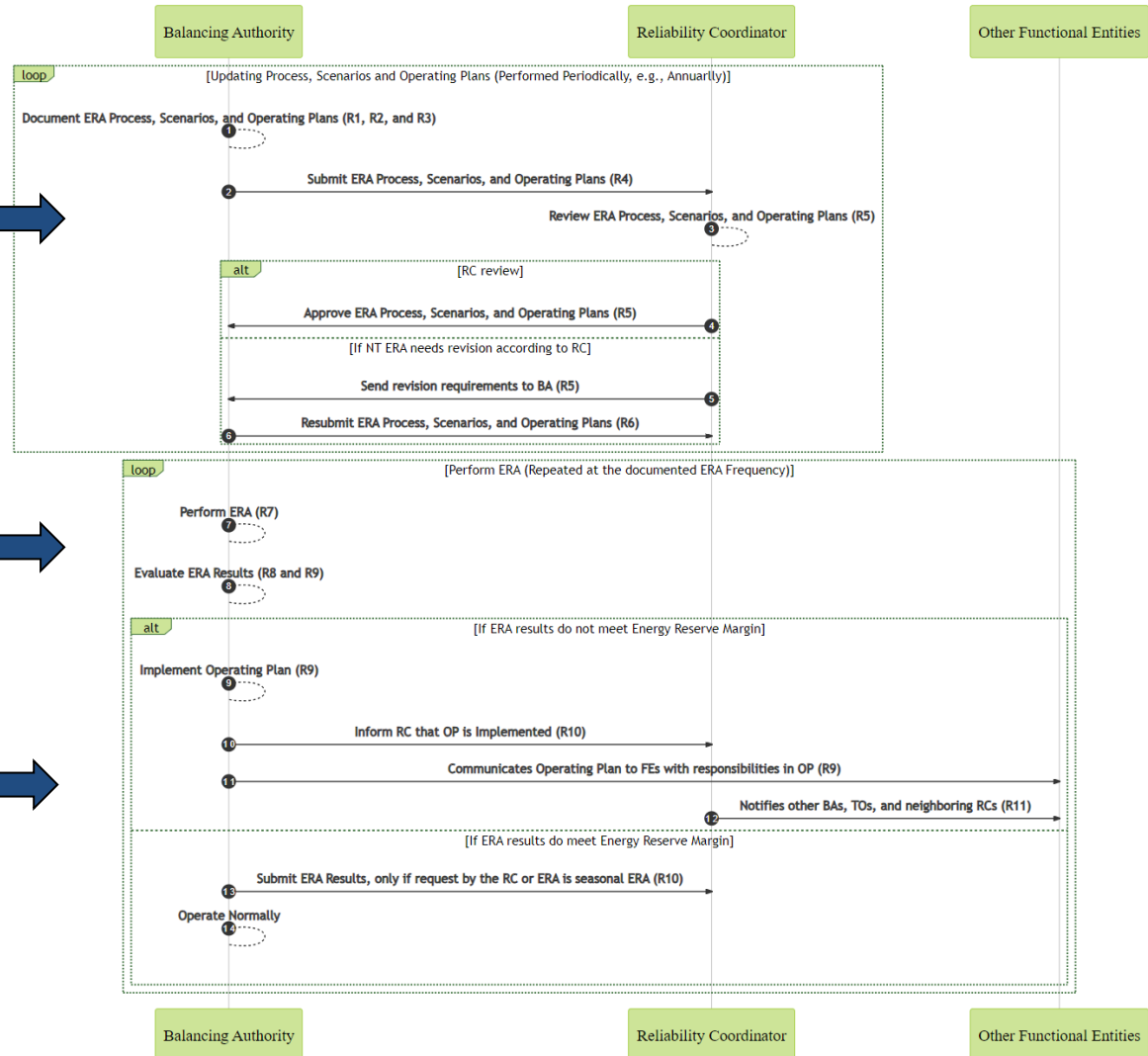
Develop and Document Process, Scenarios and Operating Plans



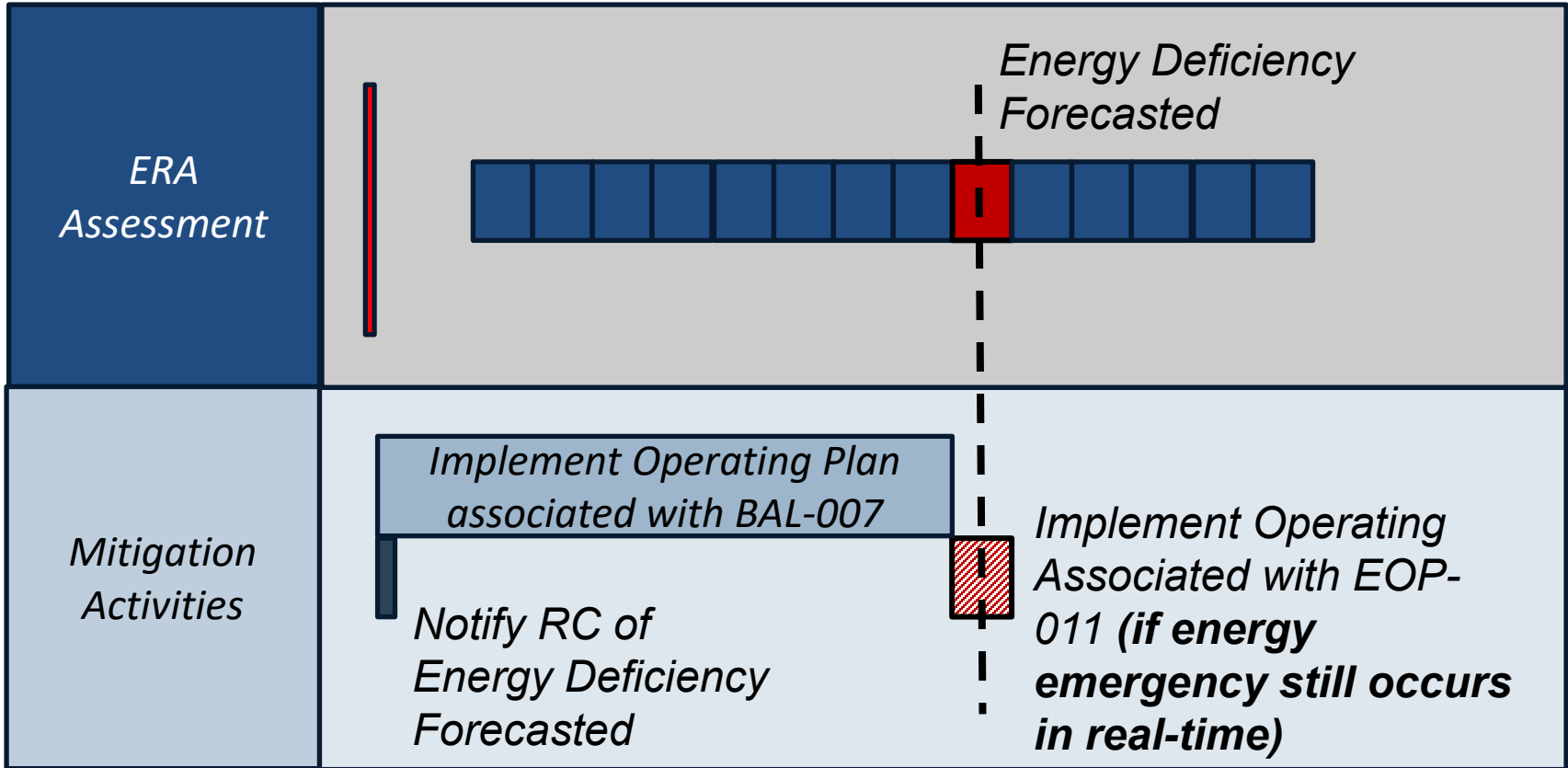
Performing ERAs and comparing to Energy Reserve Margin



If Energy Reserve Margins are not met, implementing Operating Plan to mitigate energy reliability risks



- BAL-007 requires Operating Plan to be developed as do other standards in similar horizons including TOP-002 and EOP-011
- The major difference in BAL-007 is the time horizon that extends over multiple days instead of just actions included in Operations time horizon
 - The purpose of this longer horizon is to include longer lead time activities
 - These activities should complement EOP-011 and TOP-002 Operating Plans by:
 - Avoiding an Energy Emergency or reducing the severity; and
 - Having better situational awareness and preparedness going into day-ahead and real-time operations
- The BAL-007 Operating Plans are also focused to reducing energy reliability risk instead of capacity risks.



BAL-007's Operating Plan is intended to cover activities up to the Operations time horizon

Energy Reliability Assessment (ERA) - Evaluation of the resources that supply electrical energy and ancillary services for the Bulk Power System to reliably meet the expected demand during the associated time period. ERAs account for the impact of actions that occur sequentially throughout the assessment period, including the depletion and replenishment of finite upstream resources (e.g., fuel).

Rationale:

- The definition fills need for a consistent definition as a basis for ERAs in multiple time horizons:
 - Near-Term and Seasonal in this proposed Standard and
 - Planning in future standard development work
- The definition separate ERA from capacity assessment by specifying that assessments need to look over a time period and include limited resources.

R1 requires BAs to document and maintain an ERA Processes for near-term and seasonal time horizons.

The purpose of the requirement is for BAs:

- To develop a documented process for performing ERA in the near-term and seasonal time
- To set minimum standards around what elements need to be part of the ERA processes
- To require ERAs in both the near-term and seasonal time horizons

R1. Each Balancing Authority shall document and maintain a Reliability Coordinator-reviewed Energy Reliability Assessment (ERA) process, which shall be reviewed *at least annually* and updated, if necessary. The ERA process document shall: [Violation Risk Factor: Medium] [Time Horizon: Operations Planning]

1.1 Identify the *frequency and duration* of the ERAs with a corresponding rationale for each *following time horizons*:

1.1.1 Near-term; and

....

1.1.2 Seasonal

....

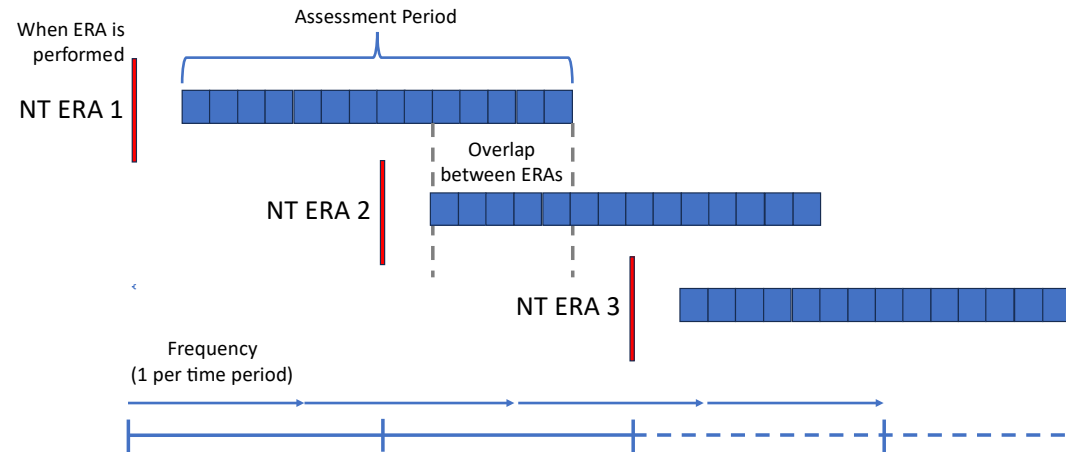
Rationale:

- R1 specifies that near-term and seasonal ERA processes need to be developed
- The processes should not become stale and thus maintained at least annually.
- R1 specifies the two-time horizons of ERA to support following requirements which apply to both.

1.1.1 Near-term; and

1.1.1.1 The end of the near-term assessment period shall be greater than **five days and less than six weeks** from the start of the assessment.

1.1.1.1 Each subsequent near-term assessment period **shall partially overlap** the previous near-term assessment period.



Rationale for Requirement:

- Set limits on the period of assessment so BAs have some clarity on what near-term time horizon means but flexibility to determine what work best for them
- Require overlap so no time period is not studied

1.1.2. Seasonal

*1.1.1.1. Seasonal ERAs shall be performed for a **minimum of two seasons** that is representative of seasonal risks for operations.*

*1.1.1.2. Document a deadline for completing each seasonal ERA **based on mitigation options for each seasonal ERA.***

Rationale for the Requirement:

- Set minimum number of times that Seasonal ERA should be performed
- Have a set deadline for completing the ERA with sufficient lead time to perform mitigation activities

- 1.2. Include a process for the development of the base case that includes but is not limited to the following up-to-date data:*
 - 1.2.1. Time series demand;*
 - 1.2.2. Demand response, as appropriate;*
 - 1.2.3. Generator capability considering known constraints of:*
 - 1.2.3.1. Availability, including planned outages, and flexibility;*
 - 1.2.3.2. Fuel supply and inventory concerns;*
 - 1.2.3.3. Fuel switching capabilities; and*
 - 1.2.3.4. Environmental constraints.*
 - 1.2.4. Documented energy transfer assumptions; and*
 - 1.2.5. Energy storage capability.*
- 1.3. Include a documented rationale for the base case elements chosen in Requirement R1.2.*

Rationale:

- R1 provides basis to support for the rest of the standard by specifying what near-term and seasonal ERAs processes need to include and that the rest of the standard applies to both ERAs
- What elements are part of ERA need to be defined for consistency and to ensure the ERAs process covers expected risk
- The requirement to document the rationale for assessment choices such as frequency are important so that BAs consider what are appropriate to balance uncertainty of data and having sufficient lead time to implement mitigation activities



Questions and Answers

- Each Balancing Authority shall develop, document, and maintain a set of Reliability Coordinator-reviewed ERA scenarios for both the near-term and seasonal time horizons, as follows:
 - R2.1 Each Balancing Authority shall develop, document, and maintain a set of Reliability Coordinator-reviewed ERA scenarios for both the near-term and seasonal time horizons, as follows:
 1. Projected system load for the interval being studied with system normal (no contingency) conditions;
 2. Projected system load for the interval being studied with an energy contingency as described in Attachment 1;
 3. Projected system load for the interval being studied with fuel supply contingency as described in Attachment 1;
 4. High load for the interval being studied with system normal (no contingency) conditions;
 5. High load for the interval being studied with energy contingency as described in Attachment 1;
 6. High load for the interval being studied with fuel supply contingency as described in Attachment 1; and

7. If appropriate for the seasonal time horizon, a scenario(s) with a likely event of occurring within the interval being studied that may include seasonally appropriate historical events, generation specific fuel or energy contingency scenarios, and weather events that are projected to occur if appropriate for the seasonal time horizon only.
- R2.2 The Balancing Authority shall document the rationale for the scenarios identified in Requirement R2.1.

- Rationale
 - Outlines a minimum set of scenarios to be included in the Assessment
 - There are two load scenarios (normal typically 50/50 and high typically 90/10)
 - There are 3 contingencies to be analyzed
 - System Normal
 - Energy Contingency
 - Removes the largest energy resource from the base case and runs it again
 - Set of Resources Contingencies
 - removes a set of resources that are supplied by the same fuel supply.
 - » This could be a natural gas pipeline
 - » could also be a set of wind turbines that a closely situated where a storm could render them unavailable for a period of time, or
 - » solar panels that could be covered by snow

- R3 Each Balancing Authority shall develop, maintain, and document one or more Operating Plan(s) to mitigate unacceptable risk(s) associated with ERA scenario(s) with a likely event of occurring.
- Rationale:
 - Requires BAs to develop plans ahead of time to mitigate potential energy deficiencies identified through ERAs
 - These Operating Plans are developed so that if an ERA shows that a BA will or may have insufficient energy, they will have an Operating Plan ready to implement
 - Each Operating Plan is intended to be developed ahead of time so that it can be reviewed and updated before system conditions are unfavorable and be ready for later implementation
 - Operating Plans are expected to include actions that can be performed by the BA within the time horizon for which the ERA is designed

- Rationale (Cont)
 - Mitigating Actions included in Operating Plans will help identify how long the assessment period of the ERA would need to be so that they can have time to accomplish the actions within:
 - as a set of prescribed notifications to a set of stakeholders that can impact the energy landscape
 - as complicated as targeted load shed to save energy for when it is most needed.
 - An example is provided in the Technical Rationale
 - These actions are meant to prevent an energy emergency or reduce the energy deficiency that might be identified in day-ahead (TOP-002) or occurring in real-time (EOP-011)
 - Prepare the BAs to implement an emergency Operating Plan



Questions and Answers

R4 The Balancing Authority shall submit the following information to its Reliability Coordinator for review on a mutually agreed-upon schedule:

- 4.1 The ERA process;
- 4.2 The ERA scenarios; and
- 4.3 Operating Plan(s).

- **Rationale:**

- Provides a channel of communication between a BA and their associated RC
- The BA and the RC shall develop a mutually agreed-upon schedule for when the BA shall submit the information from R1-3 to the RC
- The ERA has not yet been performed, but only designed
- The design, along with the base case, scenarios, and Operating Plan(s) are all part of the package that is provided to the RC

- R5. Within 60 calendar days of receipt of the information identified in Requirement R4, the Reliability Coordinator shall:
 - R5.1. Review each submittal for coordination with other Balancing Authorities' ERA information to avoid risks to Wide Area reliability; and
 - R5.2. Notify each Balancing Authority of the results of its review and if the need for revisions is identified to address any reliability risks.

- Rationale
- R5 is the complimentary requirement to R4 where the BA submits the package of ERA information to the RC
 - The RC review is intended to identify risks to Wide Area reliability and ensure all identified risks are communicated to the BA
 - The RC review provides reliability benefits by comparing the BA's ERA information to that of other BAs, allowing for identification and mitigation of discrepancies and/or opportunities for enhancements to strengthen the contents of a BA's ERA package
 - For example, an assumption by two BAs sharing a common transmission interface of an import condition from the other BA during the same time period would result in an infeasible allocation of energy resources and would trigger an RC notification
- Once a review is complete, the RC notifies the BA, and any necessary changes occur within Requirement 6

- R6. Within 60 calendar days of receipt of the Reliability Coordinator's notice of the results of the review conducted under Requirement R5, each Balancing Authority shall address any reliability risks identified by its Reliability Coordinator and resubmit the updated information required in Requirement R4 to its Reliability Coordinator, unless otherwise specified by its Reliability Coordinator.

- Rationale
- Requirement 6 is the third part of the communication between the RC and BA where the BA is required to address issues identified by the RC and resubmit the ERA process, ERA scenarios, and Operating Plan(s)
- This requirement ensures the closing of the communication loop and documentation that review comments generated in Requirement 5 are addressed
- Requiring the BA to address and document responses to feedback generated by the RC review ensures that the reliability benefits described in Requirement 5 of an RC's cross-comparison of packages from multiple BAs are enshrined and potential wide area reliability risks avoided

- R7. Each Balancing Authority shall perform ERAs according to the process documented in Requirement R1 using the scenarios documented in Requirement R2.
- Rationale
- Requirement 7 simply specifies that the near-term and the seasonal ERAs must be performed.



Questions and Answers

- R8. Each Balancing Authority shall determine energy reserve margins calculated for each time step of an ERA scenario according to the following:
 - 8.1. For the ERA scenarios identified in Requirement R2.1.1 and Requirement R2.1.4, the energy reserve margin is at least 150% of the largest N-1 Contingency within each Balancing Authority's footprint plus at least 2% of the load forecast for the near-term ERA or at least 5% of the load forecast for the seasonal ERA;
 - 8.2. For the ERA scenarios identified in Requirement R2.1.2 and Requirement R2.1.5, the energy reserve margin is at least the larger of 150% of the largest N-1 Contingency within each Balancing Authority's footprint or 2% of the load forecast for the near-term ERA or at least 5% of the load forecast for the seasonal ERA; and
 - 8.3. For the ERA scenarios identified in Requirements R2.1.3, Requirement R2.1.6, and Requirement R2.1.7, the energy reserve margin is at least 125% of the largest N-1 Contingency within each Balancing Authority's footprint.

- Rationale Requirement 8
 - Quick and easy to calculate margin above the baseline and scenarios to allow for possible errors
 - Specifies the energy reserve margin calculations for three different scenarios
 - Sets up energy reserve margin thresholds
 - The energy reserve margin calculation is a function 150 % of the largest source of energy in a given case plus allowances for load forecast error
 - Requirement 8.1 applies to ERA cases with no contingencies
 - Requirement 8.2 applies to ERA cases with the largest N-1 contingency scenario
 - Requirement 8.3 applies to ERA cases with a fuel supply loss scenario
 - Requirements 8.1 through 8.3 are progressively lower in the amount of energy that must be held in reserve

- R9. Each Balancing Authority shall compare results of the ERA to the energy reserve margins in Requirement R8 and, if the energy reserve margins are not met, the Balancing Authority shall implement an Operating Plan(s) developed in Requirement R3.

- Rationale - Requirement 9
 - The BA shall perform ERA analysis in Requirements 8.1, 8.2, and 8.3
 - Then look at the results of the ERA to determine what resources are available but not utilized in each iteration (e.g., hour) of the assessment, then compare the actual studied quantity to the requirements in R8
 - This concept is similar to Operating Reserve
 - Different in that all resources would be assumed to be available, ignoring temporal requirements to start generation

- Rationale (Cont)

- If the energy reserve margins in R8 are not met, the BA is expected to implement an approved Operating Plan
 - Looking at ERA Operating Plan to reduce the severity of or fully mitigate the need to implement TOP-002 or EOP-011 operating plans before their triggering conditions are met in the shorter time horizon
 - Because ERA time horizons are longer, they provide BAs with a number of options which may be unavailable or unreasonable in a shorter time horizon, however, with this also come options that may not be concrete, such as advance notifications and opening lines of communication with regulators and other entities



Questions and Answers

- R10. Each Balancing Authority shall provide the results of the ERA and the comparison of results from Requirement R9 to its Reliability Coordinator under the following conditions:
 - 10.1. The ERA comparison to the energy reserve margin requires implementation of an Operating Plan(s) to mitigate risk within 24 hours for the near-term time horizon or;
 - 10.2. The ERA performed is a seasonal ERA within 14 calendar days or;
 - 10.3. The Reliability Coordinator has requested the results.

- R11. Each Reliability Coordinator that receives results of a near-term ERA and the comparison of results from Requirement R9 pursuant to Requirement R10 Part 10.1 from a Balancing Authority within its Reliability Coordinator Area shall notify, within 24 hours from the time of receiving notification, other Balancing Authorities and Transmission Operators in its Reliability Coordinator Area, and neighboring Reliability Coordinators of the implementation of an Operating Plan(s).

- Rationale - Requirements 10
 - After the ERA has been performed and it is known whether actions are required per the Operating Plan that was exchanged earlier
 - All about communication between the RC and BA
 - Keeping the RC in the loop
 - There are different requirements for near term ERAs than there are for seasonal ERAs
- Rationale - Requirements 11
 - Communication from the RC to other BAs and RCs
 - Keeping the RC focused on the wide-area situation and communicating widely

- Initial Performance of Periodic Requirements in BAL-007-1
 - BAL-007-1 shall become effective on the first day of the first calendar quarter that is 12 months after the effective date of the applicable governmental authority's order approving the standard.
- Phased-in Implementation Date for BAL-007-1, Requirements 7-Requirements 11
 - Entities shall not be required to comply with Requirements R7 –R11 until six months after the effective date of Reliability Standard BAL-007-1.

- Posting
 - Project Page [2022-03](#)
 - 45-day formal comment period from January 25 – March 11, 2024, with ballot pools formed in the first 30 days.
 - Initial ballots and non-binding polls on the Violation Risk Factors (VRFs) and Violation Severity Levels (VSLs), conducted during the last 10 days of the comment period (March 1 – March 11, 2024.)
- Point of Contact
 - Dominique Love, Standards Developer
 - Dominique.Love@nerc.net or call 404-217-7578



Questions and Answers

- [Project Page 2022-03](#)
- [2022-03 Operations and Operations Planning Time Horizon SAR](#)
- [BAL-007-1](#)
- [Technical Rationale](#)
- [Implementation Plan](#)

Backup Slides

