

# Technical Rationale

## Project 2022-03 Energy Assurance with Energy-Constrained Resources Reliability Standard BAL-008-1 | May 2024

### **BAL-008-1– Seasonal Energy Reliability Assessments**

#### **Introduction**

This document explains the technical rationale and justification for the proposed Reliability Standard BAL-008-1. It provides stakeholders and the ERO Enterprise with an understanding of the technical requirements in the Reliability Standards. This Technical Rationale and Justification for BAL-008-1 is not a Reliability Standard and should not be considered mandatory and enforceable.

Updates to this document include the Project 2022-03 Energy Assurance with Energy-Constrained Resources Standards Drafting Team's (SDT's) intent in drafting new requirements.

#### **Overview**

Inconsistent output from variable energy resources, coincident with unassured deliverability of fuel supplies and volatility in load, can result in insufficient amounts of energy available from the Bulk Power System (BPS) needed to serve electrical Demand, maintain sufficient Operating Reserve, and ensure the reliable operation of the BPS. As part of ongoing operations planning, many entities have started incorporating some limited assessments of energy reliability into studies that produce key metrics; however, there is inconsistency among entities on how the assessments are performed. To achieve the level of consistency needed across the industry, to reliably predict the energy needed to serve the load, Energy Reliability Assessments for the operations time horizon and the minimization of identified risks are mandated and codified in these new standards. Project 2022-03 proposes two new Reliability Standards, BAL-007-1 and BAL-008-1, and the Energy Reliability Assessment (ERA) definition. The purpose of the proposed Reliability Standard BAL-008-1 is to identify and minimize the risks of forecasted Energy Emergencies in the operations planning time horizon by analyzing the expected resource mix availability and the expected availability of fuel. Seasonal ERAs provide additional time for actions beyond that provided with only a near-term ERA.

#### **Rationale for BAL-008-1**

As the BPS becomes more reliant upon energy constrained and variable resources, traditional capacity-based planning methods and strategies are being stretched and potentially do not identify energy-related risks to reliably operate and maintain the system. BAL-008-1 is being proposed as a step toward continuing to reduce these potential risks and with the transition to energy-based planning methods and strategies that incorporate critical time-based variables that are not captured in capacity-based processes. BAL-008-1 is intended to provide Balancing Authorities (BAs) and Reliability Coordinator (RCs) with the tools necessary to successfully navigate increasingly energy constrained and variable system operations. BAL-008-1 Operating Plans, while not intended to replace or supersede BAL-007, TOP-002 and/or EOP-011 Operating Plans, are intended to provide a list of actions implementable over a longer-term/earlier time period that can reduce the severity of or fully mitigate the need to implement BAL-007, TOP-002 and/or EOP-011 plans.

The new Reliability Standard can be separated into three basic activities:

- Developing and documenting an ERA process, Scenarios or a method for creating them, and Operating Plans (Requirements 1-3, 7-10)
- Requesting any needed data from the Resource Planner (Requirements 4-6);
- Performing ERAs and comparing to the levels of a forecasted Energy Emergency (Requirements 11-12); and
- If a forecasted Energy Emergency is identified, implementing Operating Plan(s) to minimize energy reliability risks (Requirements 13)

The purpose of these standards are to assess energy risk in the Operations Planning time horizon, determine if the identified risks are acceptable, and if not acceptable take actions to minimize. It should be noted that the standard offers the flexibility to allow for either a deterministic or probabilistic implementation of an ERA process. This has been left up to the BA to determine which method is right for their region. This standard improves reliability through identifying energy risks earlier and being able to implement longer lead time activities to mitigate those risks.

The diagram below gives an overview of the process with actions and communication between entities outlined.

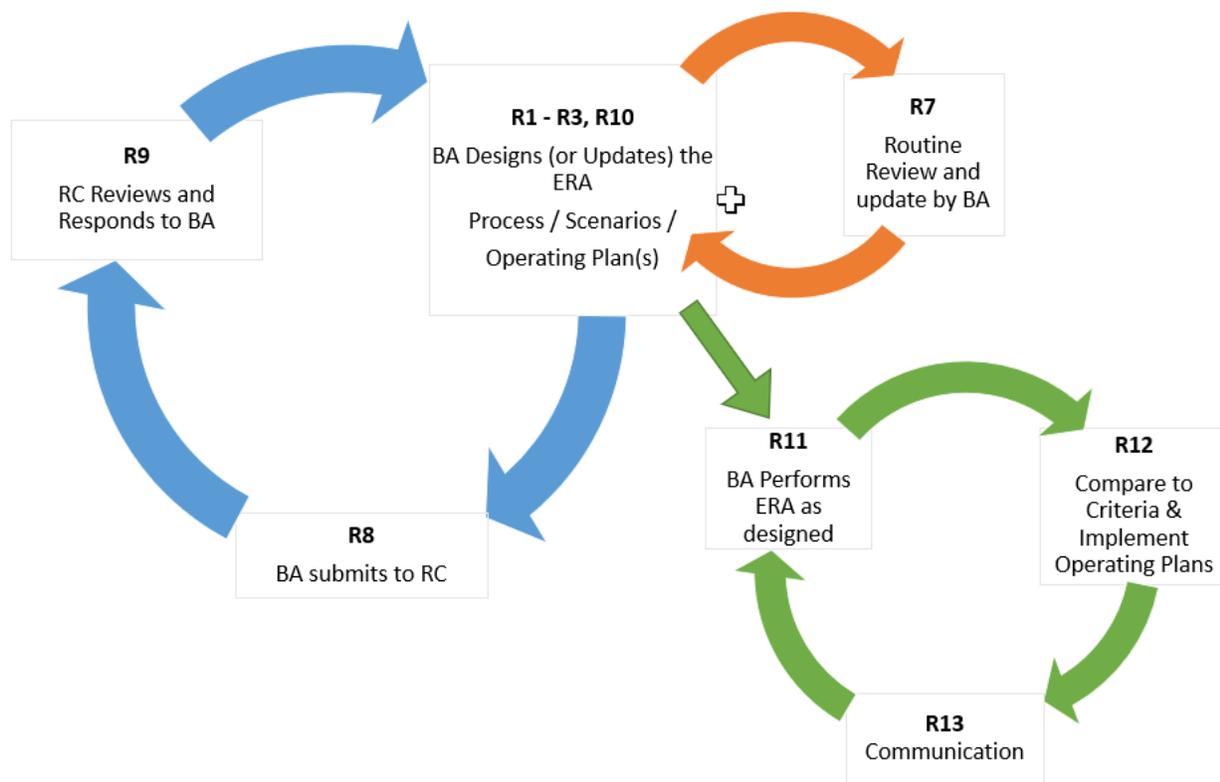


Figure 1. Process Diagram of ERA Requirements

### Relationship to Other Standards

While the proposed standard has similarities to other standards, especially BAL-007, TOP-001, TOP-002, and EOP-011 standards, the proposed standard addresses reliability risks due to gaps in the existing reliability standards by focusing on a different time horizon than current standards and energy risks which are not clearly addressed. In many cases, the language is intentionally similar to language in those requirements but applicable to different time horizons. The BAL-007-1 standard looks at a near-term and the BAL-008-1 looks at the seasonal time horizon which is longer than other operations planning assessment requirements. In terms of addressing energy risks, both BAL-007-1 and BAL-008-1 more clearly outline the assessment requirements to look at energy over an assessment period rather than capacity assessments, generally used to comply with current standards.

TOP-001, TOP-002, and BAL-007 provide requirements for assessments and Operating Plans in real-time and operations planning time horizons, but their requirements are limited to up to six weeks ahead which may limit the options that Balancing Authorities may take to respond. BAL-008-1's proposed language extends this outlook to greater than five days and out to a season ahead, so BAs have the time to implement mitigation actions with longer lead times (e.g., reschedule outages, conserve consumable fuel, source additional fuel) and have better situational awareness of potential reliability risks.

TOP-002, EOP-011, BAL-007-1, and BAL-008-1 all require Operating Plans to minimize or mitigate reliability risks, but they would likely differ in what actions that a BA would deem appropriate to be included in each. Since BAL-008-1 is assessing a longer time horizon, the projected conditions are more uncertain, and the Operating Plans developed under BAL-008-1 should reflect that. Instead of specifying specific steps that must be taken, the Operating Plan can have more general processes and incorporate longer lead time activities than Operating Plans in BAL-007-1. BAL-008-1 Operating Plans are not intended to replace TOP-002, EOP-011, and BAL-007-1 developed Operating Plans but to implement actions that can only be implemented when potential risks are identified with a longer lead time. The goal of these longer-term Operating Plans is to reduce the likelihood of an actual Energy Emergency occurring which would require an EOP-011 Operating Plan or at least, reduce the severity of the Energy Emergency. Actions that are taken as outlined in the BAL-008-1 Operating Plans would then lead into the near-term Operating Plans (BAL-007-1) through the establishment of more favorable initial conditions, rather than overlapping them. This standard is similar to the near-term ERAs; the seasonal assessments give situational awareness about a longer time horizon and allow for longer lead time activities which should reduce the risk of identifying risks in the near-term ERA and eventually real time. Ideally, the longer-term Operating Plan(s), both seasonal and near-term, would result in the EOP-011 Operating Plan not being needed but if an Energy Emergency still occurs, the Operating Plans should have reduced the severity of the Energy Emergency.

Additionally, the BAL-008-1 assessment requires considering energy risk which can only be performed by looking at an assessment over a period with multiple timesteps and considering the depletion of stored energy and the production from just-in-time, variable energy resources. BAL-008-1 explicitly requires including these elements in an assessment and set criteria regarding when risks need to be addressed through Operating Plans.

The Balancing Authority (BA) may require additional data from other entities and should consider this when documenting the process. While BAL-008-1 does not require other entities to provide necessary data, TOP-003 requires the BA to “maintain a documented specification for the data necessary for it to perform its analysis functions...” in Requirement R2 and requires the other entities to provide the data in Requirement R5. Since these TOP-003 Requirements broadly give the BA the ability to request data “to perform its analysis functions” and does not limit that to assessments to a specific time horizon, TOP-003 should provide a mechanism for BAs to request and receive the necessary data for ERAs.

### **Requirement R1**

Requirement R1 identifies the basis for defining what a seasonal ERA is. Time horizons and basic input assumptions in the seasonal assessment are specifically designed by each BA according to their risks and their supply and demand profiles. Because of differences in risks and in supply and demand profiles between regions, rather than requiring a set of prescriptive elements to assess, each BA is provided with minimum assessment requirements which they will use to define the scope for performing their ERAs and document a rationale.

Balancing Authorities may perform the required ERAs for just their area or a group of BAs may jointly perform their ERAs. Should a deficiency be identified, the BAs, regardless of whether they performed their assessment jointly or individually, can utilize their energy reserve sharing group of available resources. The goal of the ERA is to determine if sufficient energy is available. A review of the energy reserve sharing group should be performed to verify that it is sufficient to meet the groups combined needs. Again, the goal of the ERAs is to improve reliability for the system and the load.

The ERA process will include definitions for a duration, frequency, how they account for the necessary parameters to determine what the energy needs are, what resources can be used, and when to meet them. The duration should be a specified representative range for each season as identified by the BA, again providing for regional flexibility. It is understood that specific regions will have a different set of concerns and risks. Some regions have a resource mix that may include a large percentage of variable energy resources. Others may have risks due to either a non-firm fuel supply issue (e.g. non-firm gas supply) or non-firm transmission service due to system congestion. For example, a region that is heavily dependent on resources requiring more maintenance may need to look further into the future to manage these outages to confirm that there will be sufficient energy available. An entity with more variable energy resources with possible congestion may need to look more closely at the weather forecast and review their energy supply mix more frequently.

The process is intended to ensure that as changes in the resource mix or demand profiles become reality, they are captured appropriately and intentionally. New resource types are being introduced into the power system more frequently compared to years past, a trend that is expected to continue. Each new resource type comes with subtleties of how they perform and operate that may require a change to the way resources are portrayed in an ERA. Forecasted weather events that occur within a BA's footprint (e.g., droughts, storms, calm and cloudy stretches) will also change the expected resource availability when an ERA is performed. Seasonal ERAs are intended to be performed on a routine basis and assess the time period that covers a season, making sure to study periods of concern. The time horizon of a season assessment offers a different vantage point verses the near-term assessment. Seasonal ERAs will tend to be more of a risk assessment with an array of possible conditions which a BA can evaluate.

Demand profiles will be determined by the BA as well. Entities will have a number of items to consider prior to determining their demand profile. It is up to the BA to determine exactly how Demand will be modeled, including considerations of how the variety of types of demand response are treated. A BA may choose to include market based or dispatchable demand response but it is recommended that other forms of demand response should not be included, which would leave load reduction options as a last resort (e.g., voltage reduction, load cycling, etc.). Each BA will need to identify what their type of demand response is and when, if ever, to consider it. Load shed should only be identified as part of a plan if this is the last resort.

ERAs must ensure that all periods of time are assessed. For the seasonal ERA, entities may choose to study only a shorter duration, representative subset of a season which could occur at any point during the season being evaluated and represents periods that they have identified to be a higher risk. For example, while the entity is evaluating a five month summer season, they may only look specifically at a three week period

that they have identified as posing a higher risk. All five months are considered to be assessed in this example. The determination of how long to study will be based on several factors such as a typical cold snap or heat wave duration, system or generation outage recall timing, accuracy of forecast information beyond the near-term, duration of periods with low variable energy resource production, or lead time for fuel procurement and replenishment.

The seasonal ERA should be designed to look at the upcoming seasons within the next 12 months. Only evaluating one season for the year is likely not sufficient for the seasonal ERAs. BAs in North America experience some level of differentiation between time periods (seasons) over the course of a year and those differences must be considered in seasonal ERAs. It is not required that a full 90-120 day season is included in an seasonal ERA, but does require that the BA performing the ERA documents the rationale for why the time horizon and duration were selected.

The minimum amount of information that must be included in every ERA is identified in the standard. Based on the region of the BA performing the ERA, more information might be needed than for others. The standard does not contain an all-inclusive list. If other parameters are necessary for a BA to fully model the energy landscape for the ERA, they should be included and documented with a rationale for inclusion and selection.

### **Requirement R2**

Requirement R2 outlines a minimum set of scenarios to be included in an ERA. The intent is to provide a mechanism for each BA to gauge how close to an Energy Emergency they may be in certain situations. Credibility of the Scenarios is for the BA to define and document.

There are four types of scenarios, three for supply and one Demand, that can be studied independently or in combination with each other. At least one parameter should be varied enough to stress the system to determine if the available resources are robust enough to meet the Demand and Operating Reserves. A possible load Scenario could be raising Demand from a 50/50 profile to a higher profile, such as a 90/10 or maximum load Scenario, to measure the impact to the system and determine if shortfalls are detected. There are three supply side Scenarios to be studied. The first is a credible energy contingency that removes one of the largest energy resources from the base case and runs it again. Large energy resources may be the same as large capacity resources, but not necessarily in all ERA study cases. The second supply Scenario removes a credible set of resources that are supplied by the same fuel supply. This is traditionally thought of as natural gas supplying multiple generating stations and may be just that, but could also be a set of wind turbines that are closely situated where a storm could render them unavailable for a period of time or solar panels that are covered by snow or smoke from a fire. The final scenario is a generator outage for an unplanned outage. Regardless of the chosen energy and fuel Scenarios, it is up to the BA to determine which resource or set of resources are included in the ERA. The choices by the BA in Scenarios should be documented and identified in their rationale.

In addition to the above defined scenarios, Requirement R2 specifies the consideration of “Other Scenarios with a credible or historical risk of occurring based on the best information available at the time of Scenario

creation.” An example of these Scenarios in a seasonal ERA includes a Scenario that stressed the System such as the impacts of a winter storm from the previous five years in the ERA for the next winter.

### **Requirement R3**

The seasonal time horizon specified in BAL-008-1 offers a different vantage point than the near-term ERA. The actions that a BA can take due to an identified risk of an energy shortfall are different when identified weeks to months earlier than if waiting for a near term assessment. An example of actions that could be taken based on the results of a seasonal assessment that may not be available for a near-term assessment could include forward procurement of fuel, prioritizing or advancing key storage projects that are potentially available by the start of the season, requesting energy resources to update maintenance or construction plans to incorporate more flexibility that would then be available for use in near-term assessment Operating Plans is risks persist, postponement of major planned generation outage(s), or to change the sequencing of a transmission outage. If an entity were to wait for the near-term assessment to identify a risk, fewer options for the BA to avoid an energy risk in real time would be available.

Requirement R3 requires BAs to develop Operating Plans prior to forecasting Energy Emergencies through ERAs to minimize their effects. These Operating Plans are developed so that in the event that an ERA shows that a BA may have insufficient energy, they will have an Operating Plan ready to implement, per Requirement R3, that has been 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 seasonal time horizon for which the ERA is designed. The actions that BAs may include in Operating Plans will also provide information to the BA regarding how far in advance the ERA might need to be completed (Requirement R1) such that they can have time to accomplish the actions identified. For example, if actions that could minimize potential Energy Emergencies take two months to accomplish, the BA should consider completing the seasonal ERA at least two months ahead of the season so that those options would be available.

As discussed in the Relationship to other Standards section, the Operating Plans developed based on this requirement are not intended to supersede Operating Plans associated with TOP and EOP standards or BAL-007-1, but to complement them and include actions that will reduce the likelihood or severity of an energy deficiency occurring in real-time. To that end, the BA develops an appropriate Operating Plan for a forecasted Energy Emergency that is identified by an ERA. Depending if the ERA is completed weeks or months prior to the forecasted Energy Emergency, the BA decides on suitable plans to reduce the impact. Since the Operating Plans are being implemented based on assessments looking weeks to months ahead, considering the associated uncertainty of the results, BAs may decide to exclude actions in the BAL-008-1 Operating Plans which would only need to occur much closer to the projected event or only plan to implement those actions if the projected conditions of the ERA appear that they will still occur. For example, an Operating Plan for a seasonal ERA may include increasing the frequency and duration for the associated near-term ERAs in order to monitor whether the forecasted Energy Emergency is more or less likely as the uncertainty of input data to the assessment decreases and other actions in the Operating Plan have been implemented. Again, the goal of performing an ERA is to identify those times when a forecasted Energy

Emergency might occur. The developed Operating Plan should have steps that can be taken to minimize, or mitigate, the forecasted Energy Emergency.

The ERA Operating Plans should be designed to be adaptable to unfolding conditions and proactive enough to possibly avoid an energy shortage through advanced actions. As an example, to illustrate the Operating Plan uses, when an ERA is completed 31 days ahead of a calculated shortfall then potential actions have a four-week timeline to perform the appropriate action plans as well as monitor if the identified risk conditions have changed. For instance, if the results of a three week-duration ERA that focuses on an extremely cold period determines an energy emergency may occur, the BA's Operating Plan could include the following actions:

- Facilitate the forward purchase of additional fuel to be available when a near-term ERA identifies the same shortfall using more accurate input data.
- Survey scheduled outage system to determine if any generation currently out for maintenance can return earlier than planned.
- Survey if any transmission outages affect either generation deliverability or import capability. If yes, can they be returned to service prior to the Energy Emergency.
- Survey if generation and transmission scheduled to go out can execute their outage plans in a manner that would minimize recall times.
- Notify RC and relevant entities of the projected risk (e.g., Generator Operations, relevant government authorities for assessing the need and strategy for public appeals or other BAs to account for expected imports or exports).
- Make sure all energy storage units can be fully available to help mitigate energy shortfalls.
- Increase frequency of performance of near-term ERAs, assess energy availability and have Operating Plan actions conditional on the level of risk.

Ideally, these actions will minimize or prevent an Energy Emergency that might occur in real-time. However, if the Energy Emergency still occurs, these actions should reduce the energy shortfall and better prepare the BAs to implement an emergency Operating Plan. This scenario is intended only to be one simple illustrative example that does not reflect all potential Operating Plan actions or actions that BAs in all regions can do.

While scheduling increased imports can be a part of the Operating Plan, it is imperative that the BA verify that the resources they have scheduled will continue to be there to solve their Energy Emergency. It should not be assumed that once imports are scheduled, this energy is a firm supply. Both BAs may be impacted by the event causing an Energy Emergency for both. The supplying entity may not be able to honor their agreement to provide this energy.

## **Requirement R4**

The drafting team identified that BAs may need to request data necessary for them to complete their analysis functions, including the completion of an ERA, from the entities identified in TOP-003. However, as some BAs may also need information from the Resource Planner (RP) for the work associated with BAL-008-1, three requirements have been included in BAL-008-1. Requirement R4 identifies that the BA shall develop a data specification for the Resource Planner should they determine they need information for the completion of the seasonal ERA. Requirement R4 identifies three parts to the data specification: the data needed by the BA from the RP to support its seasonal ERA, how frequently the data should be provided, and the deadline for providing the information.

#### **Requirement R5**

Requirement R5 identifies that the BA shall distribute its data specification to all of the Resource Planners that they determine they need information from for the completion of their seasonal ERA in accordance with Requirement R4.

#### **Requirement R6**

Requirement R6 requires the Resource Planner to work with any BAs that provide a data specification for their seasonal ERA. The RP and the BA are to identify a mutually agreeable format, process for resolving data conflicts, and data security protocol for the Resource Planner, for the work associated with BAL-008-1.

#### **Requirement R7**

Requirement R7 requires that the BA review their process, Scenarios or method for creating, and Operating Plans, in Requirements R1 through R3, to determine if any changes are needed. The BA shall review this documentation no less than once every 24 months. Due diligence during the design and review phases is very important, as the BA is required to identify potential risks and possible actions that could minimize those risks that would lead to an energy shortfall in the seasonal timeframe.

#### **Requirement R8**

Requirement R8 provides a channel of communication between a BA and their associated RC. Requirement R8 is simply a BA providing their ERA process documentation, as defined by R1, R2, and R3, to the RC. The BA and the RC shall develop a mutually agreed-upon schedule, no greater than every 24 months. Depending on the RC, this may be requested more frequently. The designed process, along with the base condition, Scenarios or method for their creation, and Operating Plan(s) are all part of the package that needs to be reviewed.

#### **Requirement R9**

Providing ERA information to the RC under Requirement R8 is paired with this Requirement for the RC to review each package within 60 days of receipt. The RC review is intended to identify risks that may not have been considered for Wide Area reliability and ensure all identified risks are communicated to the BA. Coordination is required to ensure that there are no conflicting assumptions between BAs. Once a review is complete, the RC notifies the BA, and any necessary changes that occur within Requirement R9. For example, an assumption by two BAs, sharing a common transmission interface, each identifying an import

condition during the same time period would result in an infeasible allocation of energy resources and would trigger an RC notification. The RC review provides additional reliability benefits, by comparing the BA's ERA information to that of other BAs, allowing for identification and clarification of discrepancies and/or opportunities for enhancements to strengthen the contents of a BA's ERA package.

It is the intention for implementing BAL-008-1 that the routine review of each ERA package by the RC can be accomplished within the required timeframe. However, it is understood that when ERAs are newly designed, along with Scenarios and Operating Plans, that more time will be needed by the RC to perform a thorough review. For this reason, implementation of Requirements 7 through 13 have an additional six months.

### **Requirement R10**

Requirement R10 is the third part of the communication between the RC and BA where the BA is required to address any issues identified by the RC and resubmit their ERA process, ERA Scenarios or the method for creation, and Operating Plan(s). This requirement ensures the closing of the communication loop and documentation that the RC's review comments generated in Requirement R9 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 9 of an RC's cross-comparison of packages from multiple BAs are enshrined and potential wide area reliability risks minimized or avoided.

### **Requirement R11**

Requirement R11 specifies that the seasonal ERAs be performed as designed, reviewed, and approved.

### **Requirement R12**

Requirement R12 specifies what constitutes three different circumstances that identify a forecasted Energy Emergency. The forecasted Energy Emergency conditions are intended to be a clear threshold where the ERA results identify levels of impending risk and require actions be performed to minimize the potential they will occur. The definitions of what constitutes a forecasted Energy Emergency are in alignment with the Energy Emergency Alert (EEA) definitions in EOP-011. The difference for BAL-008-1 is that instead of being a real time Energy Emergency, these would be forecasted events. The goal here is that if an Energy Emergency is forecasted in an ERA, the associated Operating Plan will have targeted steps to help minimize the Energy Emergency before it gets to next day and real time.

There are three EEA levels and three levels of forecasted Energy Emergencies. The criteria for a forecasted Energy Emergency apply also to Scenarios identified in Requirement R2 and studied in Requirement R11. This level of granularity allows for the BA to design an Operating Plan that fits the specific situation. Given Scenarios may be expected to enter the lower levels of an Energy Emergency, and the actions in an Operating Plan should be appropriate for that combination.

Finally, by leveraging the existing terms used in EOP-011 for EEA, clear and well-understood definitions are already in place which require little to no training, beyond the advanced timing associated with BAL-008-1. BAs have existing interpretations of how they respond when nearing or entering an EEA and the existing interpretations are expected to be used, including those that involve interaction with Reserve Sharing Groups.

### **Requirement R13**

After receipt of notification from the BA that an Operating Plan is being implemented, Requirement R13 requires communication between the RC and Transmission Operators, other BAs within their footprint, and neighboring RCs. The time requirements for the notifications for the seasonal ERAs is seven calendar days. This action should require no more than an hour but may require some additional internal discussion or communication between the BA and RC, thus the additional time. The purpose of these communication requirements is to provide situational awareness from the RC to other entities that may be impacted by a forecasted Energy Emergency in a BA. With this information, other BAs and Transmission Operators can better plan for their own reliability risk, especially if they expected to rely on neighboring BAs for imports. Additionally, the RC receiving this information from multiple BAs allows the RC to have a wide area view of the energy risk and provide any insight they may have to minimize it. This communication is required only after the RC receives notification, which is one of the provisions required in the development of Operating Plans in Requirement R3.