

Establishment of the Regional Energy Shortfall Threshold (REST)



2024 REST Scope of Work

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Introduction to the Regional Energy Shortfall Threshold

- [Study results](#) from ISO's probabilistic energy adequacy study have informed the region on energy shortfall risks during extreme weather events over the next decade
- The Probabilistic Energy Adequacy Tool (PEAT) framework for risk analysis under extreme weather events will be essential for evaluating regional energy shortfall risk as the resource mix evolves and as climate projections are refined
- ISO's initial 2027 and 2032 energy adequacy study results are expected to help inform the development of a Regional Energy Shortfall Threshold (REST)
 - ISO expects that the REST will be a reliability-based threshold that reflects the region's level of risk tolerance with respect to energy shortfalls during extreme weather

Introduction to the Regional Energy Shortfall Threshold, cont.

- ISO expects to develop and share its initial REST proposal by May 2024 and complete the work necessary to establish a REST by the end of 2024
- This presentation reviews ISO's assessment of the scope of work associated with the establishment of the REST
 - Portions of this presentation highlighting ISO's current thinking regarding the REST are not intended as specific proposals, but are intended to prompt discussion and stakeholder feedback
- Following the establishment of the REST, a subsequent effort will evaluate if adherence to the REST requires development of specific regional solutions
 - Examples of possible solutions include market enhancements, responsiveness by end-use consumers, etc.



Management of Energy Shortfall Risk Assumes Awareness and Action

- The PEAT framework facilitates awareness of the energy shortfall risk in advance of weather conditions that pose a risk to the region's energy availability
- A key takeaway from ISO's 2027 and 2032 energy adequacy studies is that the winter energy shortfall risk appears *manageable* over a 21-day period
 - Deterministic sensitivity analysis of 2032 worst-case scenarios indicates an increasing winter energy shortfall risk profile between 2027 and 2032
 - No summer energy shortfall risk was identified in 2027/2032 studies, but the risk must be monitored as the system evolves
- The magnitude of energy shortfall risk that is expected to be manageable is a key consideration in the development of the REST
 - As part of its REST proposal, ISO plans to share further insights with respect to the magnitude of relief expected to be obtainable through existing risk mitigating actions

Management of Energy Shortfall Risk Assumes Awareness and Action, cont.

- The region's ability to effectively manage energy shortfall risk in advance of low probability 21-day winter events requires situational awareness of the risks and actions by ISO and regional stakeholders
 - ISO's 21-Day Energy Assessment forecast provides situational awareness of regional energy supplies, quantifies potential energy shortfall, and communicates advance warning that action may be necessary
 - With advance warning that action may be necessary, ISO anticipates that market participants will make reasonable efforts to replenish stored fuel supplies, as applicable
 - ISO's well-established emergency operating procedures facilitate additional relief in advance of any forecasted energy shortfalls
- At some level of energy shortfall risk, based on magnitude and/or probability, existing risk mitigating actions may be inadequate
- Establishment of the REST is intended to define the level of energy shortfall risk beyond which a set of additional, future solutions may be required



REST Scope of Work

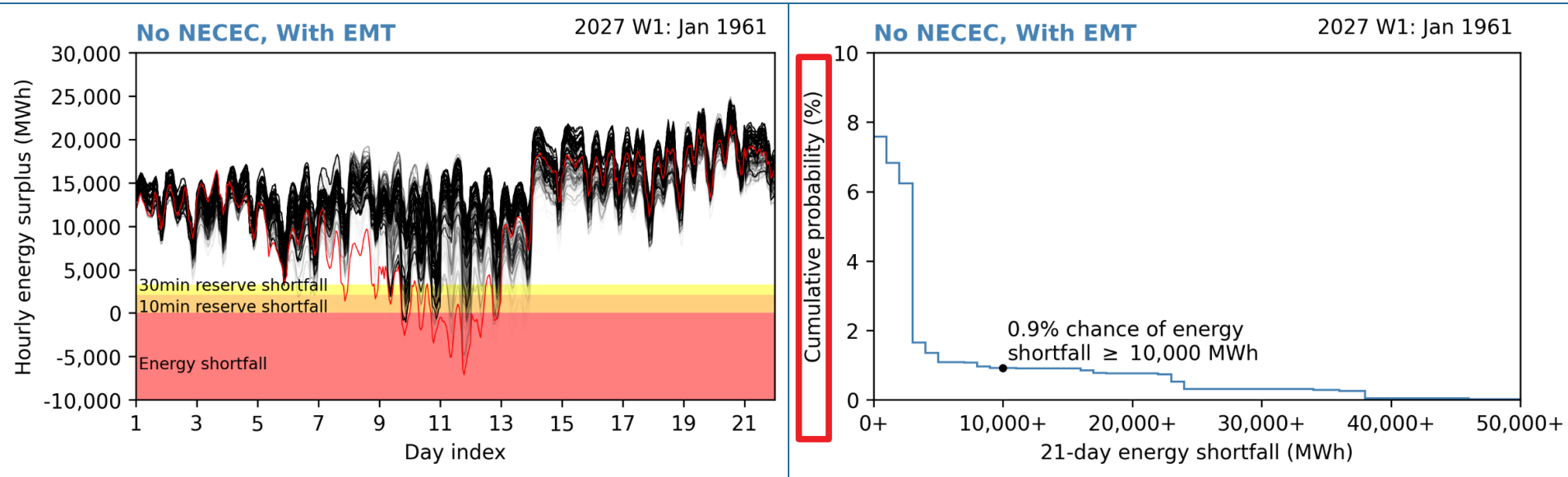
- The establishment of the REST is expected to be a collaborative process with regional stakeholders including the six New England states
- ISO anticipates that the REST scope of work will include, at a minimum, the following components:
 - **What:** Identify the key risk metrics and establish the “threshold(s)”, or criteria, that define the region’s level of risk tolerance with respect to energy shortfall in extreme weather
 - **When:** Determine the periodicity (*e.g.*, annual, seasonal, etc.) and, as applicable, specify the time horizon over which the region’s energy shortfall risk is assessed against the REST
 - **How:** Specify the event selection criteria to be used in determining the set of 21-day events to be considered when using the PEAT framework to assess the region’s energy shortfall risk against the REST
 - An additional item to determine as part of the 2024 work is the effective date for the threshold (*i.e.*, the date when the REST first becomes effective); the effective date is expected to represent the first season where the PEAT framework is used to measure energy shortfall risk against the REST

Identify Risk Metrics and Establish Thresholds

- ISO anticipates that the work associated with establishment of the REST will include the identification of key risk metrics and establishment of the REST “threshold”, or criteria
- The REST “threshold” will be a reliability-based criteria that quantifies the amount of regional energy shortfall risk above which requires the implementation of pre-defined solutions (*i.e.*, additional, future solutions identified following the establishment of REST) beyond existing protocols
- The industry standard “1-in-10” criteria provides a threshold for procurement of resource capacity to meet resource adequacy; no defined energy shortfall threshold exists either regionally or nationally
- ISO’s initial analysis of 2027 and 2032 events quantified energy shortfall risk in terms of the magnitude (MWh) of energy shortfall over 21-day periods and the probability of specific cases or energy shortfall
 - Metrics such as “worst-case” 21-day total energy shortfall, probability weighted average 21-day energy shortfall, probability of the worst-case, and cumulative probability were provided for each event (*see next slide for an example*)

Identify Risk Metrics and Establish Thresholds, cont.

Example Metrics From ISO's 2027 Analysis



The **red text boxes above and below** highlight just a few of the metrics shared as part of the ISO's initial analysis of 2027 and 2032 events; these metrics highlighted the **worst-case (or max) 21-day total energy shortfall, probability of the case with the maximum 21-day energy shortfall, cumulative probability, and expected average 21-day total energy shortfall per case** – note that this metric is a probability-weighted average, akin to an expected unserved energy (EUE) metric.

# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
233	111,353	36	421	7.60%	0.0006%

Identify Risk Metrics and Establish Thresholds, cont.

- ISO expects that the REST may incorporate additional risk metrics that are not explicitly considered in the ISO's initial study of 2027 and 2032
- Additional metrics may include concepts such as (*the list below is intended only as examples and is not intended to reflect ISO's current thinking*):
 - Maximum exposure to energy shortfall per day (*i.e.*, the depth of shortfall)
 - Maximum number of energy shortfall hours per day or maximum number of energy shortfall days per study period (*i.e.*, the duration of shortfall)
 - Season-specific thresholds (varying criteria based on summer or winter seasons)
- For each metric selected to be part of the REST, appropriate thresholds will be established; thresholds are expected to be informed by the relief expected to be obtained by existing risk mitigation actions

Determine the Periodicity of Energy Shortfall Risk Assessments Against the REST

- ISO anticipates that the work associated with establishment of the REST will include the definition of the periodicity and, as applicable, time horizon at which the PEAT framework will be used to assess the region's energy shortfall risk against the REST
- ISO's initial 2027 and 2032 energy adequacy study was a one-time study evaluating the region's energy shortfall risk over a ten-year horizon
- The PEAT framework enables the evaluation of energy shortfall risk at various periodicities (*e.g.*, annual, seasonal, in-season) over several possible time horizons
- ISO is considering a number of ways to utilize the PEAT framework to perform assessments of the region's evolving energy shortfall risk; possible alternatives include:
 - Annual assessments of one or more years in the future (*longer-term*)
 - Seasonal assessments of the upcoming winter or summer operating periods (*mid-term*)
 - In-season assessments (*near-term, much like the existing 21-day Energy Assessment forecast*)

Determine the Periodicity of Energy Shortfall Risk Assessments Against the REST, cont.

- **Annual assessments** performed with a 1 or more year look ahead, and including ISO's most recent forecasts (*e.g.*, BTM PV, heating and transportation electrification) as inputs, are well-suited for providing insight into longer-term trends with respect to regional energy shortfall risk
 - Results of annual assessments may provide directional insight into trends of energy shortfall risk when compared to the REST
- **Seasonal assessments** performed three to six months in advance of summer and winter, performed with relatively robust clarity of resource mix and demand expectations, are well-suited for accurately measuring energy shortfall risk just prior to the summer and winter operating periods
 - ISO intends to perform a winter seasonal assessment of Winter 2024/25 using the PEAT framework; however, given that the REST will still be in development, this is not intended to be used as an assessment of energy shortfall risk against the REST

Determine the Periodicity of Energy Shortfall Risk Assessments Against the REST, cont.

- **In-season assessments** (*i.e.*, the existing 21-day Energy Assessment forecast), performed weekly in winter (and bi-weekly in non-winter months) are highly effective when used to provide enhanced situational awareness, advance warning to stakeholders, and relief through the implementation of ISO's emergency procedures
 - Results of in-season assessments could be compared against the REST, though once in-season it may be too late to implement additional solutions other than those contained within existing protocols
- As observed in ISO's initial 2027 and 2032 energy adequacy assessments, the PEAT framework also enables the performance of **ad-hoc energy shortfall assessments** covering longer time horizons, as necessary and on-demand
- ISO's current thinking is that the seasonal assessment of energy shortfall risk may be best suited for triggering the implementation of additional, future solutions when the measured risk exceeds the REST

Specify the Event Selection Criteria

- ISO anticipates that the work associated with establishment of the REST will include the specification of event selection criteria to be used in determining the set of 21-day events to be studied when using the PEAT framework to assess the region's energy shortfall risk against the REST
- In ISO's 2027/2032 analysis of extreme weather events, the PEAT framework was used to select three 21-day events from each cluster* with each of the three events selected based on different risk-based criteria
 - 21-day events were selected based on highest average risk, highest severity index, and medoid criteria

*to avoid studying very similar events, clustering techniques are used to group similar events into clusters; in ISO's 2027/2032 analysis several clusters were identified for each year of study

Specify the Event Selection Criteria, cont.

- Consistently throughout ISO's 2027/2032 analysis of extreme weather events, the 21-day period beginning with January 22, 1961 was identified as the riskiest winter 21-day period from the perspective of energy availability
- 21-day events selected for study by the PEAT framework are dependent on weather inputs, expectations for the resource mix, and demand forecasts
 - As a result, depending on the period being studied, the January 22, 1961 event may not always be identified as the riskiest 21-day period for study
- Facets of the event selection process to consider include the consideration of whether additional criteria should be considered in selecting events and/or if additional events (*i.e.*, more than three) should be studied

Definition of the REST Facilitates Development of Solutions to Energy Shortfall Risk

- Following the initial establishment of the REST, ISO anticipates a subsequent effort that would evaluate if adherence to the REST requires development of specific regional solutions
- In general, pending development of the REST, in the event that the specified energy assessments demonstrate levels of risk beyond the REST, these pre-defined solutions (*i.e.*, additional, future solutions identified following the establishment of REST) can be implemented in advance of the applicable time period in order to restore the risk to within the acceptable criteria (*i.e.*, within the REST)
- Possible solutions to reducing energy shortfall risk to within REST tolerances could range from market designs to infrastructure investments to dynamic retail pricing and responsiveness by end-use consumers
- Further analysis of scope, timing, and feasibility of any such solutions is not part of the REST scope of work in 2024, but is expected to follow in late 2024 and into 2025

Expectations for the REST Stakeholder Process

- ISO expects that the initial development of the REST will be a collaborative process that will take place throughout 2024
- ISO expects to share its initial REST proposal in May 2024; as part of developing its initial REST proposal ISO plans to solicit stakeholder feedback in Q1 2024 (details to be announced)
- ISO envisions a multi-month process spanning several RC meetings to allow for proposals, feedback, counter-proposals, and finalization of the REST toward the end of 2024
- ISO also anticipates that periodic discussions with representatives from the New England states will be critical to development of the REST

Stakeholder Schedule

**Schedule is subject to change based on progress*

Stakeholder Committee and Date	Scheduled Project Milestone
Reliability Committee December 18, 2023	Presentation of REST Scope of Work by ISO
Reliability Committee May 14, 2024	Initial presentation by ISO including an initial proposal for the REST
Reliability Committee June 18, 2024	Responses to feedback on initial REST proposal and gather feedback with respect to initial REST proposal
Reliability Committee August 13-14, 2024	Opportunity for stakeholders to present alternative proposals or provide more detailed feedback on ISO's REST proposal
Reliability Committee October 22, 2024	ISO responses to alternative REST proposals and presentation of any modifications to ISO REST proposal based on feedback
Reliability Committee November 19, 2024	Gather any additional feedback on ISO's current REST proposal
Reliability Committee December 17, 2024	Presentation of final REST proposal