Identification of Sufficient System Reliability Attributes

Resource Adequacy Subcommittee

RASC-2022-1

April 18, 2023

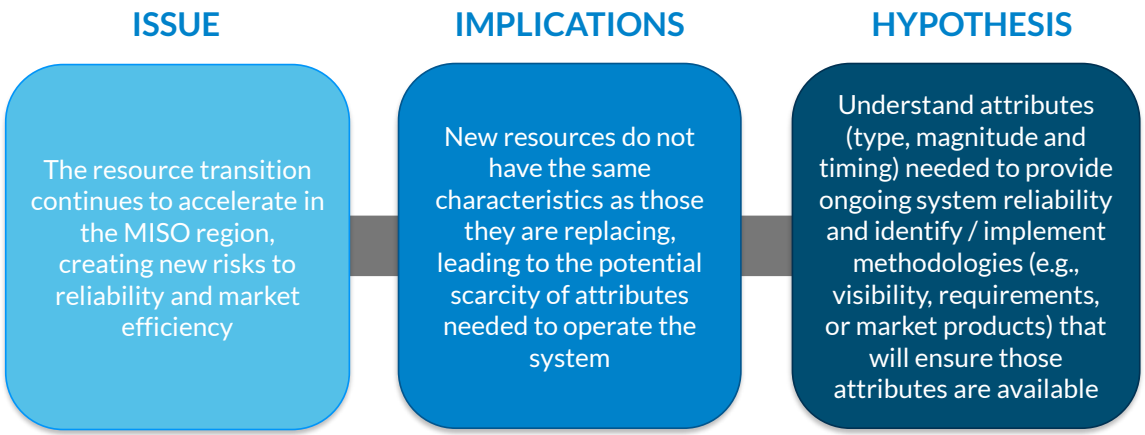
Schedule MM-D8

Purpose: To provide a workplan update on current System Reliability Attributes work

Key Takeaways:

- Evaluations of metrics are underway for the initial six priority attributes identified last September and initial results are expected to be complete in Q4
- A roadmap of next steps and system solutions for design priority are being developed in parallel with the analysis and is targeted for publication in Q4
- MISO is incorporating feedback and will provide multiple engagement opportunities to stakeholders throughout the project
- MISO will continue to make progress on near term related and supportive efforts to ensure attributes are available in the future

Work is underway to address the problem statement laid out at the end of last year



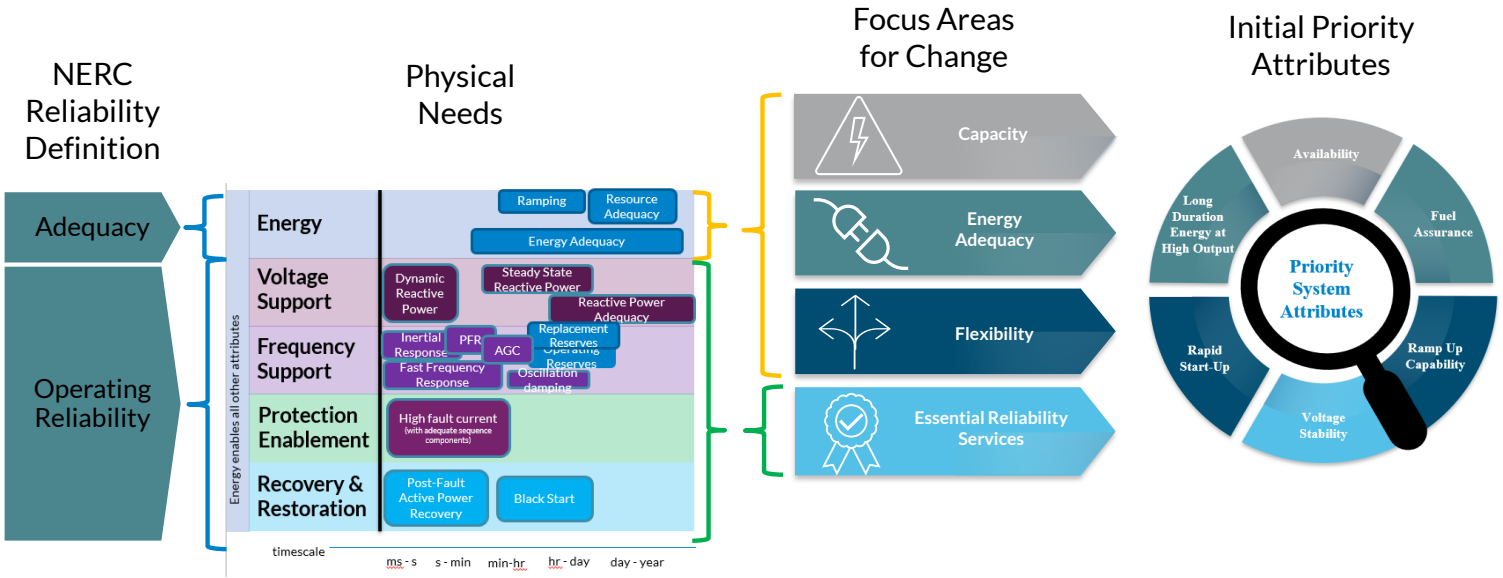
MISO is incorporating stakeholder feedback in its plan for 2023

- While numerous stakeholders supported MISO's efforts to prioritize system attributes, stakeholders requested more detailed quantitative analysis, better understanding, and continued engagement with the process, attribute definitions, and rationale for prioritization.

- Stakeholders recommended that MISO consider the impact of system attributes across all changes and portfolios in addition to market-driven solutions.

- Several stakeholders stressed the urgency of this issue, requesting that MISO expedite progress.

MISO must reform some of its requirements and products by expanding the set of Adequacy related attributes in order to ensure the reliability of the system going forward



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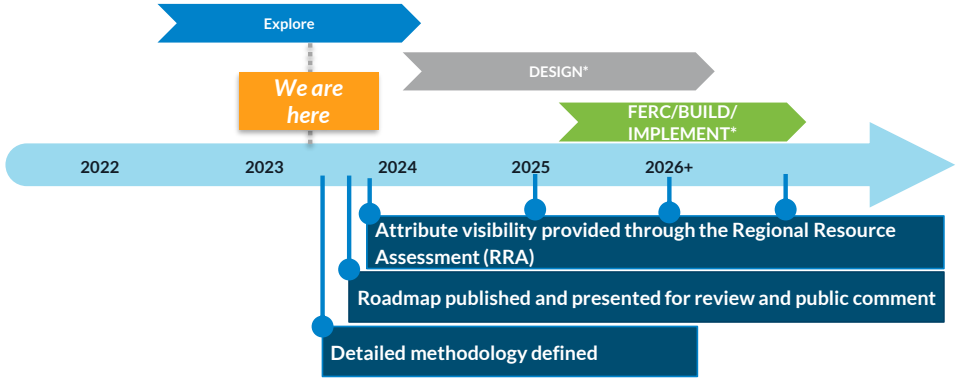
The solutions to ensure system reliability attributes are expected to be a multi-year journey and three key milestones are expected in 2023

1. Develop a detailed methodology to define and measure reliability attributes
2. Develop a detailed roadmap (action plan) to ensure reliability attribute sufficiency
3. Employ a process to forecast attribute needs to provide visibility to MISO and its members to coordinate and take additional actions



GOAL: Understand attributes (type, magnitude and timing) needed to provide ongoing system reliability and identify/implement methodologies (e.g., visibility, requirements, or market products) that will ensure those attributes are available

*The timing for the design and implementation of each attribute will be dependent on the results of the evaluation

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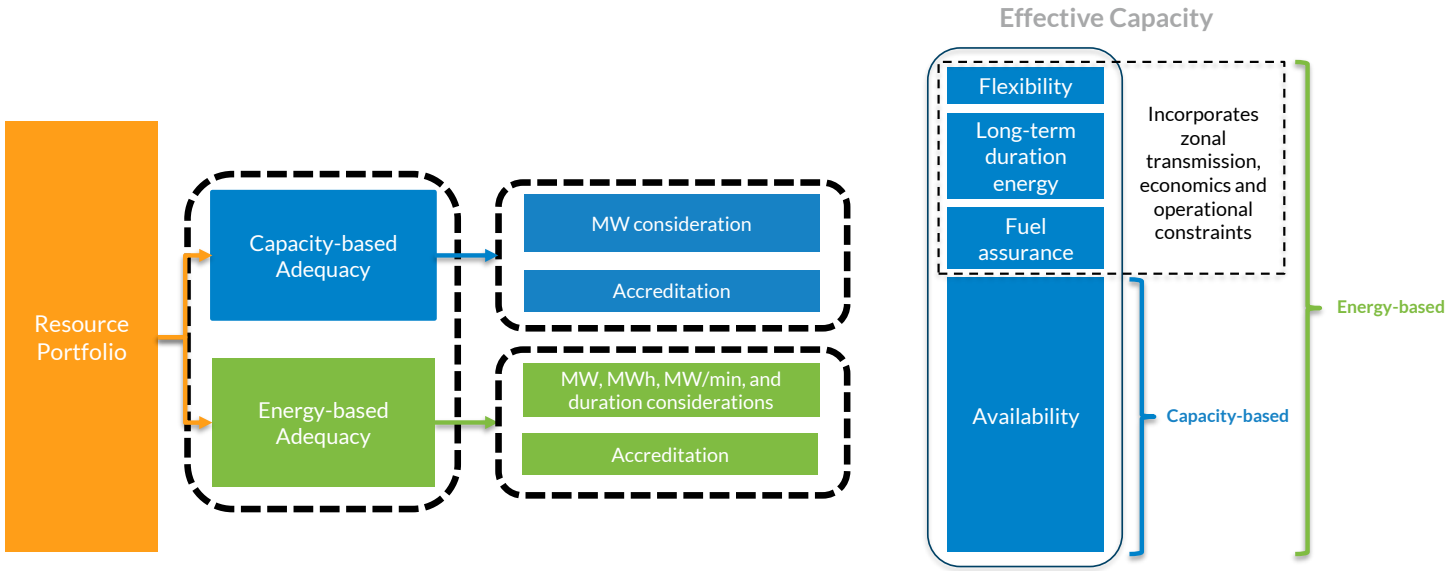
MISO's goal is to create a set of methods, models and metrics to understand the evolving attribute needs, and be able to test potential solutions against that need across planning and operational timeframes

- Complication:
  - Current practice for planning adequacy doesn't incorporate detailed operational considerations
  - Current practice for operational analysis doesn't look across a broad set of potential system conditions using a common set of metrics
  - Current practice for stability modeling analyzes a very narrow set of conditions making it very hard to quantify the emerging need for this attribute
- A new way of measuring emerging reliability attributes needs to be developed
  - Expanding scope in Planning Adequacy is needed to fully incorporate energy and flexibility adequacy
  - Reframing operational analysis through the lens of system adequacy allows us to measure the impact of operational constraints on attribute needs
  - Simplifying stability analysis to get a holistic view of the stability needs of the system
  - Enabling adaptation of our tools and processes is needed

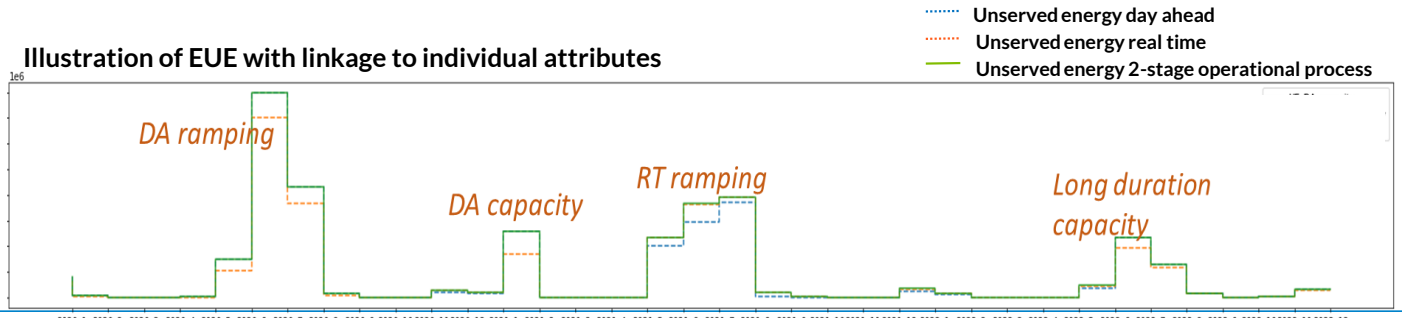
Expanding scope in Planning Adequacy is needed to fully incorporate energy and flexibility adequacy



Reframing operational analysis through the lens of resource adequacy allows us to measure the impact of operational constraints on attribute needs

- Incorporate a common reliability metric with Planning Adequacy such as Expected Unserved Energy (EUE)
- Quantifying EUE from various operational stages and identifying constrained attributes

Illustration of EUE with linkage to individual attributes



RT: Real-time | DA: Day ahead

Adequacy analysis will incorporate two different domains to understand attribute needs from differing perspectives

Planning analysis of current portfolio
PLEXOS adequacy assessment with added operational considerations
Perfect foresight
Monte Carlo simulation with probabilistic scenario Add additional weather, fuel, locational, flexibility considerations and uncertainties
• Derive adequacy metrics (EUE, LOLH, D-LOL, etc.) • Distribution of available margin from simulation

Operational analysis of current portfolio
Operational simulation tools (benchmarked with production data)
Multi-stage with uncertainties from forecasts, outages, etc.
Historical problematic days (proxy of actual Unserved Energy days).
• Derive adequacy metrics (EUE, LOLH, D-LOL) • Aggregate from 2-stage Day-Ahead and Real-Time • Distribution of available margin from production

Gap analysis on quantifying operational attribute needs

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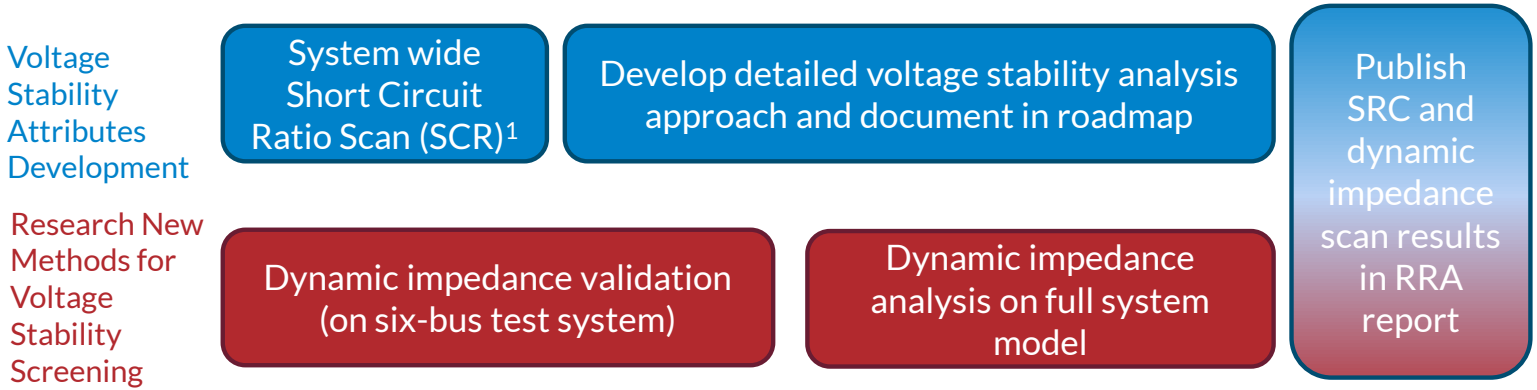
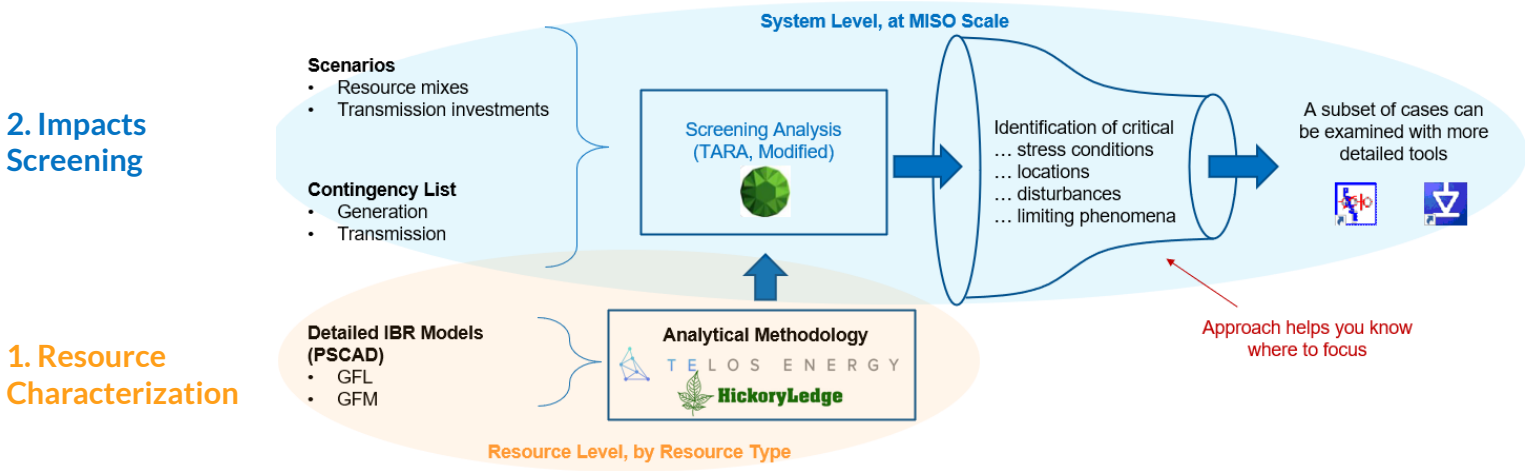
Voltage stability work in 2023 focuses on applying existing and research-grade screening methods



- In this way, visibility informs the potential magnitude of the need for voltage stability attribute investigation that follow which can leverage LRTP models.
- The team is coordinating with the LRTP dynamics team to understand approaches and analysis timing

Additional information on the SCR screening method and results in available in MISO's Renewable Integration Impact Assessment report at: https://cdn.misoenergy.org/RIIA%20Summary%20Report520051.pdf

MISO recognizes the limits of the commonly applied SCR screening method and is working with industry partners on new approaches



The approach performs a detailed resource characterization using EMT analysis, feeding more accurate inverter-based plant responses into standard screening tools

More information on Dynamic Impedance approach presented by Telos at the ESIG Spring Technical Workshop. Presentation available here: https://www.esig.energy/download/session-5-project-overview-ac-stability-concepts-in-support-of-ltrp-matt-richwine/?wpdmdl=10030&refresh=6426fae69d5311680276198

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Exploration of the system solution space in 2023 will proceed in parallel to the analytical work

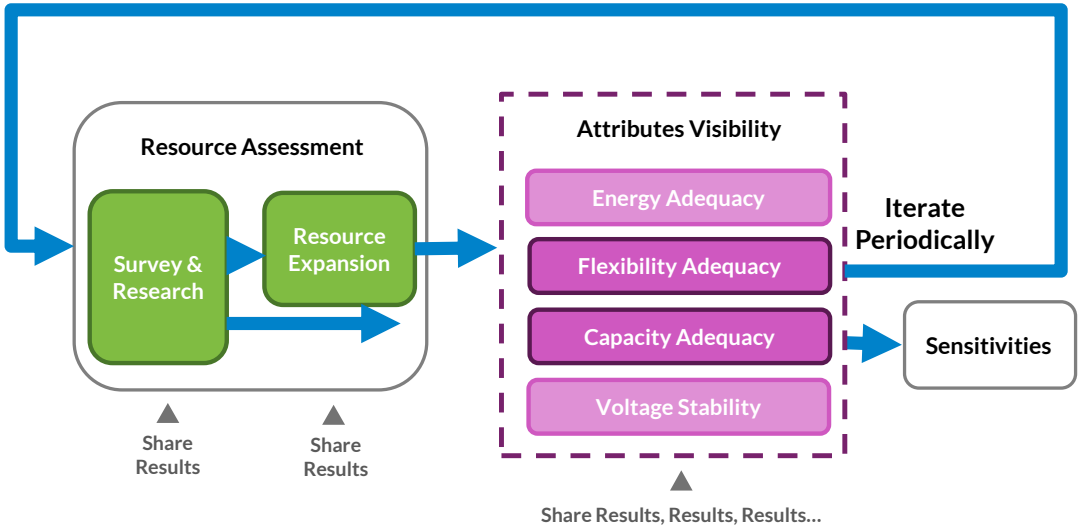
Explore solution methodologies (visibility, requirements, market products)

- Findings from adequacy and voltage stability teams
- Internal discussions across businesses
- Collaboration with expert consultants
- External discussions with stakeholders
- Frame solution methodologies
  - Visibility – An analytical view shared with others for the purpose of informing behavior
  - Requirements – For participation as a part of MISO interconnection, and various market constructs
  - Market products – New or adapted products in the ancillary services, resource adequacy or other domains

Publish roadmap

- What future analytical work is needed?
- What tools and process improvements are needed?
- What should the long-term solution prioritization look like?
- What should be solved for in Resource Adequacy vs. Ancillary Services vs. System Planning vs. something in between?
- Review and feedback from stakeholders

Visibility into the evolving reliability attribute needs of MISO can be provided through future iterations of the Regional Resource Assessment



2022 RRA Report

Included in 2022 Scope

Added in 2023 Scope

Scoping in progress

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Contact Information

Jordan Bakke: jbakke@misoenergy.org

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