



# ISO Planning Standards – Remedial Action Scheme Guidelines Update

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Stakeholder Call  
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# Reminders

- Calls are structured to stimulate an honest dialogue and engage different perspectives with the expectation that stakeholders have read the proposal.
- Please keep comments professional and respectful.
- We encourage stakeholders to submit questions via the WebEx chat feature.
- Please refrain from repeating or reiterating what has already been said so that we can manage the time efficiently

# Instructions for raising your hand to ask a question

- If you are connected to audio through your computer or used the “call me” option, select the raise hand icon located  on the top right above the chat window. **Note: #2** only works if you dialed into the meeting.
  - Please remember to state your name and affiliation before making your comment.
- If you need technical assistance during the meeting, please send a chat to the event producer.
- You may also send your question via chat to either Elizandra Casillas or to all panelists.

# Agenda

- Initiative Scope & current SPS guidelines overview
- Updates on the ISO RAS guideline review process
- RAS modeling issues in the ISO Market discussion
- Potential changes to the ISO RAS guideline discussion
- Other issues and drivers
- Feedback request
- Proposed schedule and next steps

# Stakeholder Process



We are here

# Scope of the Review and Updates of the Current SPS Guidelines

## Scope

- Review and update the current System Protection Schemes (SPS) guidelines in the CAISO Planning Standards to align with and complement NERC Reliability Standards and to ensure a secure and reliable ISO infrastructure development.
- The SPS Guidelines will be updated as Remedial Action Schemes (RAS) guidelines in accordance with the NERC terminology.

# Background on the RAS Guideline Review Process

- The ISO initiated a stakeholder initiative in June 2021 to discuss potential revisions to the RAS guidelines. During the initiative discussions, it was discovered that the modeling of the RAS in the ISO Market needed to be considered as part of the initiative. Thus the initiative was put on hold to allow the ISO time to consider this additional scope.
- After further internal consultation with the Market and Operations Engineering team, the ISO proceeded with the revised Issues paper and the initiative.

# RAS modeling issues in the ISO Market

## **History of Generator Contingency and RAS Modeling (GCARM)**

Prior to implementation of GCARM in 2019, the ISO had the following mechanism for consideration of RAS in the ISO Market:

1. RAS that on their own can address reliability requirements without the need to coordinate with the market operations could be left outside of the market modeling, with the transmission limits based on anticipated RAS operation.
2. RAS that needed coordination with the ISO Market to address reliability requirements were modeled with the aid of using nomograms. However, this approach has the following issues:
  - The market cannot distinguish which generators are on the RAS and which generators not included in the RAS
  - This approach could defeat or limit the effectiveness of the RAS, resulting in over-curtailment of generation unless the ISO operators perform a manual intervention.

# RAS modeling issues in the ISO Market (cont'd)

- GCARM was developed and implemented to allow generation curtailment as part of contingency.
- However, as part of the implementation of GCARM, the ISO discovered that there are limits to the level of logic complexity that can be integrated into the market. The RAS that have the following attributes are found to be problematic in the ISO Market:
  - Any aspect that changes the problem formulation from iteration to the next,
  - Arming conditions that might be evaluated with different results from one iteration to the next,
  - Conditional actions that change the topology (thus affecting shift factors) during the iterations,
  - Conditional actions in the RAS logic that cannot be modeled accurately in the market optimization formulation
    - Actions that cannot be represented by linear constraints or those that present discontinuities in the variables or constraints

# RAS modeling issues in the ISO Market (cont'd)

- Overarching concern to the previous issues is the oscillatory behavior in the market solution, for example:
  - A resource is scheduled with a high output that could trigger the RAS;
  - To mitigate this issue, the resources are then rescheduled at a lower value to avoid triggering the RAS;
  - With lower schedule, the RAS is no longer needed to be applied;
  - However, without the RAS applied, the generating resources may be scheduled at a higher output in the next iteration; and
  - This contributes to the oscillatory nature of the generation dispatch, potentially contributing to non-convergence of the market solution.

# RAS modeling issues in the ISO Market (cont'd)

- Consideration of these issues suggests that the RAS with the following complex characteristics may not be reasonably accommodated in the GCARM implementation:
  - RAS operation (i.e., generation tripping) that is conditioned on the tripping of critical transmission element and a pre-contingency flow coupled with the use of distribution factors to calculate the amount of needed generation curtailment;
  - RAS that is monitoring actual post-contingency flows and keeps tripping generation blocks by blocks until some flow objective is achieved;
  - Actions that involve bypassing of series capacitors (mainly on 500kV lines) and modifying flows through generation curtailment can be problematic in the market operation.

# Other issues that arise due to implementation of the existing RAS

- Existing RAS that is modeled in the market includes all generation that is reasonably effective in mitigating identified reliability issues
  - This includes all generation at the same bus to address market pricing issues;
  - The original expectation was that only the amount of generation output, up to the planning guideline limits (1150/1400 MW), would be armed and tripped in the event of contingency;
  - However, the reality is that all connected generation is being armed and tripped
    - Connection of all generation to be armed and tripped causes this to exceed the RAS guideline limits
    - Large amount of generation tripping assumed in the market causes divergence in the market operation solution

## Other considerations related to implementing potential changes of RAS design in the market operation

- Modifying existing RAS to a fixed set of generators in terms of total Pmax within the 1150/1400 MW guideline limits may have the following consequences
  - Pros:
    - Improve overall reliability and security of the system, as well as efficacy of RAS
    - Avoid the need to dynamically add or remove the amount of generation to curtail in the market
  - Cons:
    - This may raise potential concern of generators perceiving different treatment in the market dispatch, especially if they funded their integration into the existing RAS
    - Could lead to lower amount of generation tripping, which could potentially put more downward pressure on the relevant path rating

## Other considerations related to implementing potential changes of RAS design in the market operation (cont'd)

- Consider selecting hybrid/co-located resources and energy storage projects first as part of the 1150/1400 MW limits rather than stand-alone solar and wind resources to avoid degrading Resource Adequacy deliverability.
- For resources connected at the same bus, separate fictitious buses may need to be created to separate resources that are on RAS or not on RAS.

# Considerations in evaluating the need for RAS

- Whether RAS needs to be modeled in the market at all if it is sufficient in addressing the reliability concerns without further market coordination actions;
- Whether RAS would better be handled via nomograms rather than being modeled in the market;
- Whether RAS would best be modeled with GCARM capabilities;
- Whether other market constraints could be applied to market operation to achieve GCARM benefits on a more limited and focused basis;
- What gaps could be tolerated between RAS operation in real time and modeling in market operation.

# Previous identified issues related to RAS

- Increased transmission utilization that was enabled by the implementation of RAS potentially increases the exposure of not meeting applicable NERC system performance criteria if the RAS fails or inadvertently operates.
- Transmission outages can become more difficult to schedule due to increased flows on the system with the increased use of RAS, or nearby planned or unplanned outages that affect distribution of flows on the system.
- The system can become more difficult to operate due to proliferation of RAS that may cause coordination issue among RAS in the vicinity.

## Previous identified issues related to RAS (cont'd)

- Changes and updates to the NERC TPL and PRC standards: Changes in NERC standards require updates of the ISO RAS guidelines to align with the changes
  - The terms of single and double contingency in the guidelines do not align with the NERC TPL-001 standards language. This needs to be updated to align with the NERC standards.
  - The RAS guidelines regarding “failure”, “redundancy”, and “inadvertent operation” of the RAS may now become redundant requirements with the PRC-012-2 standard requirements.

## Previous identified issues related to RAS (cont'd)

- Currently planned retirement of Diablo Canyon nuclear generating facility:
  - Diablo Canyon outage of a single unit of 1150 MW corresponds to the maximum amount of reserve requirement in the event of a single transmission element contingency. Retirement may impact the maximum generation curtailment under a single contingency condition

## Previous identified issues related to RAS (cont'd)

- ISO SPS 6 guidelines about the maximum number of contingencies and maximum number of monitored variables will need to be reviewed and modified as necessary
  - Increased complexity in the RAS operation may pose significant challenges in ensuring reliable operation of the RAS, as well as ensuring reliable operation of the RAS
  - Implementation of the battery energy storage system (BESS) increases the complexity of the RAS design to monitor BESS whether in charging or generating mode of operation.

## Previous identified issues related to RAS (cont'd)

- Implementation of dual load-resource facility addition to the ISO-controlled grid
  - Battery energy storage system (BESS) can function as a load or a resource, depending on its mode of operation.
  - This introduces increased complexity in the RAS design and implementation to mitigate potential reliability concerns due to changing flows to the grid that caused by charging or discharging of BESS.

# Next steps

- Due to issues and challenges as outlined, the ISO plans to propose changes to the current RAS guidelines
  - To provide further clarify for RAS development
  - To explore opportunities to limit RAS in areas where it is saturated with existing RAS
- The ISO seeks comments from the stakeholders to identify any current and additional issues as feedback to this revised Issue paper
- The ISO will consider potential solutions to address these issues in the first straw proposal

# Proposed Schedule

Item	Proposed Dates
Post Revised Issue Paper	July 15, 2022
Stakeholder Call	July 22, 2022
Stakeholder Comments Due	August 5, 2022
Post Straw Proposal	August 31, 2022
Stakeholder Call	September 7, 2022
Stakeholder Comments Due	September 21, 2022
Post Revised Straw Proposal (tentative)	October 26, 2022
Stakeholder Call (tentative)	November 2, 2022
Stakeholder Comments Due (tentative)	November 16, 2022
Post Draft Final Proposal	January 4, 2023
Stakeholder Call	January 11, 2023
Stakeholder Comments Due	January 25, 2023

*\* Date is tentative and subject to change*

# Feedback Request

The ISO is requesting stakeholders to provide comments regarding the following:

- Potential issues with removal of some of the guidelines
- Any other RAS guideline issues that have not been captured in the current guidelines
- RAS Design guidelines such as SPS 6 & 7
  - Do the current guidelines give enough information regarding the design of the new RAS?
  - If not, what are the suggested enhancements
- Should some of the guidelines be converted to mandatory ISO planning standards?
- Are there any other RAS-related issues that need to be captured in the Issue Paper?

# Comments

- Comments due by end of day August 5, 2022
- Submit comments through the ISO's commenting tool, using the template provided on the initiative webpage:  
<https://stakeholdercenter.caiso.com/StakeholderInitiatives/Planning-Standards-Remedial-Action-Scheme-Guidelines-Update>.
- If you have any questions, please contact [isostakeholderaffairs@caiso.com](mailto:isostakeholderaffairs@caiso.com)



- The ISO is pleased to be hosting the Stakeholder Symposium in person at the Safe Credit Union Convention Center in downtown Sacramento on Nov. 9 – 10, 2022.
- Register on the Stakeholder Symposium page at: <https://californiaiso.swoogo.com/2022StakeholderSymposium>
- Please direct questions to [symposiumreg@caiso.com](mailto:symposiumreg@caiso.com)