



Initiative: Planning standards - remedial action scheme guidelines update

Stakeholder Comments Matrix and ISO Responses

Comments submitted July 09, 2021

1. Provide a summary of your organization's comments on the Planning Standards – Remedial Action Scheme Guidelines Update issue paper:		
Entity (Name)	Stakeholder Comment	ISO Response
Bay Area Municipal Transmission group (BAMx)	On June 24, 2021, the CAISO held a meeting to discuss its Planning Standards Remedial Action Scheme (RAS) Guidelines Update Issue Paper (Issue Paper, hereafter). The Bay Area Municipal Transmission group (BAMx)[1]	The comment is noted.

	<p>appreciates the opportunity to comment on the Issue Paper. In these comments, BAMx seeks the details on the CAISO existing “key” Special Protection Schemes (SPS) and the proposed future RAS. BAMx believes that the currently proposed timeline is too aggressive to achieve all the objectives laid out in the Issue Paper. BAMx recommends addressing only a subset of topics including the RAS guideline review updates as part of the currently proposed schedule - and table the topics that require more time and effort, such as potentially limiting the use of future RAS in certain areas and under certain conditions. This could be accomplished via a separate stakeholder process or part of the next planning cycle.</p>	
EDF-Renewables	<p>EDF-R appreciates that CAISO has opened this initiative. Like the CAISO, EDF-R is concerned with the proliferation of RASs on the CAISO system, both to date and planned. EDF-R is eager to better understand the current RAS implementation on the system and encourages the CAISO to do more with this initiative than clarify and remove redundancies from RAS planning guidelines. EDF-R is disappointed that the CAISO “is not expecting this initiative to have any material impacts to the RAS guidelines.” And encourages the CAISO to use this initiative as an opportunity to consider the current RAS implementation approach’s long-term outcomes and review other system operators’ best practices.</p>	<p>The CAISO has reviewed all North American ISO and RTOs best practices.</p>
Pacific Gas & Electric	<p>In general, PG&E supports the CAISO’s initiative to update the Remedial Action Scheme (RAS) guidelines. The CAISO’s Issue Paper mentioned that a review of RAS usage in other ISO/RTOs indicated that the CAISO relies far more on RAS’ use in lieu of transmission upgrades relative to other ISO/RTOs. PG&E agrees with the CAISO’s observation on RAS usage. PG&E also recommends that future RAS guidelines and planning requirements should consider the potential reliability risks and additional costs that RAS may introduce to system operations, equipment maintenance and modifications. Taking such factors into account will lead to a more comprehensive decision-making process when recommending future RAS. Below are PG&E’s comments and recommendations on the RAS guidelines update.</p> <ol style="list-style-type: none"> 1. The NERC Special Protection Systems Standard Drafting Team recommended that the term “RAS” be retained as the industry-recognized term and that the term “SPS” ultimately be retired. PG&E recommends the 	<p>This has been addressed in the revised issue paper.</p>

	<p>future RAS guidelines to update the term “SPS” with the term “RAS.”</p> <p>2. PG&E currently has 51 existing RAS installed in its system. Concerns about reliability risks and additional costs from RAS installations exist when considering system operations, system protection and system maintenance. At times these concerns could go beyond what planning studies reveal, such as: multiple RAS in one area increases the operational complexity and the risk of adverse interactions; complex RAS equipment maintenance, testing, and reporting can be complicated, costly and added risks to mis-operations and/or inadvertent operations; transmission upgrades often triggers RAS modification(s) to accommodate system change which adds complexity and cost to the upgrades; large amount of RAS also adds intense NERC compliance burdens to both PTOs and the CAISO. These concerns should be incorporated in the future RAS guidelines when evaluating RAS as an alternative.</p> <p>3. Based on the information collected from the CAISO BPM generation modeling effort, there are still substantial amount of solar PV inverters that cannot eliminate momentary cessation and will continue to exhibit such behavior which has the potential to trigger large amounts of temporary loss of generation on the system. PG&E recommends the CAISO to further study this phenomenon when revisiting the maximum amount of generation tripping for a single element contingency and make comprehensive updates on both the CAISO SPS 3 guidelines and planning standards. In addition, as the 1150 MW criterion has been “built in” the California transmission system design in both operations and planning horizon, if no other firm reliability concern is identified, even after Diablo Canyon Power Plant’s retirement, PG&E recommends to keep the 1150MW criterion for consistency of the design of the system.</p> <p>4. PG&E recommends that the CAISO’s and PTO’s Operations, System Protection, and RAS groups collaborate to review past RAS events and root cause analyses. Together these teams can add critical RAS design guidelines/requirements to improve reliability of RAS, such as commonly accepted design for reliably detecting possible ways of equipment outages.</p> <p>5. In addition to the maximum number of contingencies and monitored system variables, the</p>	<p>The comment is noted.</p> <p>The ISO is working with the PTOs to ensure the power system models accurately reflect momentary cessation in legacy plants that cannot eliminate the use of momentary cessation.</p> <p>The comment on the 1150 MW limit is noted.</p> <p>The comment is noted</p> <p>The comment is noted.</p>
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	<p>CAISO SPS 6 guideline should also consider adding the maximum number of substations involved in the RAS.</p> <p>6. PG&E recommends the CAISO consider adding guidelines to evaluate the removal of existing RAS when designing a transmission project in the same vicinity.</p> <p>7. The CAISO mentioned there are 36 proposed future RAS. PG&E recommends the CAISO to review these proposed RAS following new RAS Guidelines as they are updated.</p>	<p>The comment is noted</p> <p>The comment is noted</p>
SDG&E	<p>SDG&E commends the CAISO for initiating this transparent stakeholder process which is needed to improve the adoption and implementation of RAS in the CAISO system. SDG&E offers the following comments and recommendations on the Issue Paper meeting held June 24, 2021.</p> <p>1- What are the potential issues with removal of SPS guideline #1,2,11,12,13 & 15 since they're covered in PRC-012-2?</p> <p>SDG&E supports the removal of SPS guideline #1,2,5,11,13, and 15 since they are already covered in PRC-012-2. SDG&E also supports the update of SPS4 with PRC-012-2. The purpose of PRC-012-2 is to ensure that Remedial Action Schemes (RAS) do not introduce unintentional or unacceptable reliability risks to the Bulk Electric System (BES). Therefore, these SPS guidelines are not intended to duplicate the PRC-012-2 NERC reliability standard, but to complement it where it is in the best interests of the security and reliability of the non-Bulk Electric System facilities under ISO operational control. SDG&E suggests capturing the following clarifications in the post straw proposal:</p> <ul style="list-style-type: none"> • Whether the PRC-012-2 standard will also be applied to non-BES schemes. This is an important clarification. Although SDG&E believes that the design of BES and non-BES schemes should follow the same principles, 	<p>The comment is noted.</p> <p>The PRC-012-2 standard applies to Bulk Electric System (BES) only.</p> <p>The comment is noted</p>

	<p>SDG&E does not support applying PRC-012-2 compliance requirements to non-BES schemes.</p> <ul style="list-style-type: none"> • Will PRC-012-2's definition of limited impact RAS be included in the Planning standard and processes? • Will the WECC RAS Design Guide no longer apply with the removal of ISO SPS2? • Finally, it would be helpful if a table is added in the post straw proposal that maps the removed guidelines to the specific PRC requirements. This will ensure that nothing is missed. <p>2- Any other RAS guideline issues that have not been captured in the presentation/Current Guidelines</p> <p>SDG&E recommends that SPS16 should be updated to reflect a specific effectiveness factor (e.g.10%) and/or flow impact factor. Using low effectiveness and flow impact factors should be avoided as they provide little benefits to the reliability of the system. Furthermore, CAISO should also address how distributed resources should be treated with respect to RAS and non-BES schemes.</p> <p>3- RAS Design guidelines such as # 6 & #7.</p> <p>a. Do the current guidelines give enough information regarding the design of the new RAS?</p> <p>No, the current RAS guidelines do not give enough information regarding the design of new RAS. Complicated RAS which require remote monitoring of line contingencies and limiting elements, and tripping of relatively ineffective generation miles away from the limiting element adds complexity and decreases the effectiveness of the proposed RAS. Increased complexity introduces significant challenges to ensure a RAS operates correctly and whether it can be tested correctly</p>	<p>Yes, PRC-012-2's definition of limited impact RAS will be included in the updated ISO Planning standards.</p> <p>The RAS Design Guide will be replaced with the requirements in the PRC-012-2 for the Reliability Coordinator's approval.</p> <p>The comment is noted.</p> <p>Distribution factors as well as the overall all flow impact of large generating facilities on lower voltage facilities in parallel with the high voltage system should be reviewed to ensure the RAS is effective.</p>
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	<p>without risk of mis-operation. For instance, the RAS guidelines should include:</p> <ul style="list-style-type: none"> • Information regarding the monitoring location(s), preferably no more than one substation or switchyard away to reduce the complexity of RAS schemes. • Language regarding the complexity of communication requirements that might be needed. • At a minimum, loss detection for all contingencies, which are identified as triggering the RAS. The feasibility of this requirement must be evaluated when considering if a RAS is a suitable option. <p>SDG&E notes that several of its RAS and non-BES schemes do not follow the current CAISO guideline and recommends that the CAISO, in collaboration with SDG&E, review existing RAS and ensure they comply with the CAISO RAS guideline. For instance, certain SDG&E RAS trip more than the 1100 and 1400 MW limits specified in the standard. Another example is, several SDG&E's RAS require real-time operator actions to arm or disarm the RAS or change set points based on complex computations.</p> <p>For convenience, SDG&E lists below additional suggested edits to CAISO SPS6 and SPS7 guidelines.</p> <p><u>Edits to SPS6 guidelines:</u></p> <p>In alignment with SPS6 part (C), it is SDG&E's understanding of the term local as the substation or switchyard where the controllers are located/installed and monitoring elements. Beyond the remote end of a line terminating at the controller station is to be considered remote and should be avoided beyond the limits</p>	<p>The comment is noted</p> <p>The comment is noted</p> <p>The comment is noted</p> <p>This comment is addressed in the revised issue paper.</p> <p>ISO Planning would like to learn more about this.</p> <p>The comment is noted</p>
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specified herein. Therefore, SDG&E proposes deletion of loca in SPS6 part (A)

A) There should be no more than 4 ~~loca~~ contingencies (P1 ~~single~~ or credible ~~double~~ P7 contingencies) that would trigger the operation of a ~~SPS~~ RAS or non-BES scheme.

Edits to SPS7 guidelines:

SDG&E suggests that SPS7 be updated to specifically address RAS or non-BES schemes which are used to mitigate BESS charging issues. The high penetration and interconnection requests of storage projects, combined with the high selection of storage resources as part of the CPUC IRP and CEC SB 100 portfolios, are increasing charging challenges. SDG&E had to design a complex scheme recently to address reliability issues that required monitoring flow directions and multiple contingencies. We now have instances where a RAS will be used to simultaneously mitigate reliability issues due to volatile power injections and withdrawals for storage projects which may participate in the ancillary service market.

4- Making some of these guidelines as mandatory ISO planning standards

SDG&E supports making the guidelines a mandatory standard with regional differences on what the IOUs can't find a consensus on. This would be similar to the voltage criteria currently listed in the CAISO planning standard.

The comment is noted

The comment is noted

5- Any other general Issues that need to be captured in the Issue paper

SDG&E recommends that the following key items are also addressed as part of this initiative:

- Maintenance and testing challenges: SDG&E's Construction and Maintenance department experienced a lot of issues with Interconnection Customers (ICs) once the 6-year RAS testing requirements came due. There was a significant lack of understanding on the ICs part as to who was responsible for the equipment and testing. The ICs thought that the RAS panel at their generation site was PTOs ownership/responsibility. SDG&E will collaborate with the ISO to ensure better communication on who owns the RAS equipment located at customer-owned facilities.
- N-0 RAS must be avoided: SDG&E proposes to eliminate any RAS proposed to mitigate a PO overload in areas where we have capacity constraints with all lines in service. Building new transmission facilities, in this case, would be preferred in favor of RAS to maintain the overall reliability of the system. Special consideration should be taken especially in HFTD areas.
- Simplification of RAS by limiting the number of Nomogram associated with them and/or action taken by the RAS: Complex RAS that requires a nomogram or to trigger other RAS or opening a 500kV line can degrade system reliability hence not meeting system performance criteria if the RAS fails or

The comment is noted

The comment is noted.

The comment is noted.

inadvertently operates. A good example is the complex SDG&E TL23054/23055 RAS which is not effective on its own and requires a nomogram. The original design of this RAS contemplated opening one of the 500 kV lines and triggering SDG&E's South of SONGS Safety Net RAS. Situations like this show that a RAS addition may not be the best option to mitigate certain system issues. Furthermore, SDG&E recommends avoiding the removal of critical facilities (e.g., 500 kV lines) during a RAS operation. Removal of critical facilities by a RAS, during PSPS events which also coincide with peak loads, can lead to greater reliability issues.

- RAS should not be used for Delivery Network Upgrades (DNU): It is SDG&E's understanding that the CAISO wants to incent the interconnection of Resource Adequacy (RA) resources at locations that have less system constraints and curtailments. Meaning, locations that have appropriate transmission capacity. Using RAS as DNU not only defeats this goal but can potentially distort the IRP portfolio designs by allocating resources where there is "artificial" transmission capacity. The current IRP process does not take into account that some of the RA resources are located in areas that have RASs. In addition, reliability of the IRP portfolio could be degraded as it does not consider significant curtailments due to RAS

The comment is noted.

2. Provide your organization's comments on the background and issues, as described in section 2

Entity (Name)	Stakeholder Comment	ISO Response
<p>Bay Area Municipal Transmission group (BAMx)</p>	<p>It appears that the Issue Paper and the CAISO's June 24th presentation use SPS and RAS terminology interchangeably. Does the CAISO distinguish between the two in terms of scope and complexity? Please explain how the CAISO uses these terms and how those definitions might differ from those of NERC, WECC, and others (such as the PTO's) to the extent the CAISO is aware of other entities use of those terms.</p> <p>The CAISO Issue Paper indicates that "(T)here are currently 69 NERC-related RAS on the BES system with 23 of those RAS being added in the last 10 years."</p> <p>Please clearly identify and provide details on how these existing 69 NERC-related RAS on the BES in the CAISO footprint compared to the existing "key" forty-three (43), twenty-two (22), and twenty-three (23) SPSs in the PG&E, SCE, and SDG&E Participating Transmission Operator (PTO) areas, respectively as identified in the 2021-2022 TPP Draft Study Plan.[2] Would the CAISO please also identify which of these are load-dropping versus generation-dropping SPSs/RASs?</p> <p>Although the Issue Paper does not refer to the 36 future proposed RAS's, the CAISO's presentation (page 7) during the June 24th call refers to them. Would the CAISO please provide details on these RASs, whether they were identified in the prior TPP's or the generation interconnection "Cluster" studies?</p>	<p>This comment has been addressed in the revised issue paper.</p> <p>They generally are the same RAS. The difference is probably the counting of non-BES RAS.</p> <p>The vast majority of RAS are generation dropping RAS</p> <p>These RAS can be found in the generation interconnection reports posted on the Market Participant Portal.</p>
<p>EDF-Renewables</p>	<p>EDF-R agrees with CAISO that increased use of RAS has been popular because RAS solutions allow for "faster implementation timeline, lower costs, increased utilization of existing facilities and a more efficient use of scarce transmission resources associated with the RAS" but have the negative impacts of increasing operating and outage complexity. RAS implementations can have the inadvertent effect of masking the need for significant transmission buildout.</p> <p>At this stage of the initiative EDF-R requests CAISO prepare and share more background information and</p>	

analysis on current RAS implementation on its system:

1. In a [2017 paper on a different RAS topic](#) the CAISO described the then RAS arrangements like this:

“Total generation-drop-related remedial action scheme installations have the capability to arm up to approximately 19,800 MW of generation. Northern California installations have the capability to arm up to 8,600 MW with a maximum single contingency loss of approximately 1,450 MW. Southern California installations have the capability to arm up to 11,200 MW with a maximum single contingency loss of approximately 2,300 MW.”

EDF-R requests the CAISO update this analysis with 2021 information.

2. EDF-R is also interested in better understanding the relationship between the system location of one or more RAS implementation as it compares to curtailment. The CAISO provides a daily look at renewable curtailment here: [California ISO - Managing Oversupply \(caiso.com\)](#) but the information is not at the appropriate granularity for correlating it to specific areas. EDF-R requests the CAISO provide some more data related to the congestion and curtailment for RAS zones, including specific areas where RAS schemes increase congestion and curtailment, how many MWh are curtailed annually, and what the cost to the system is.
3. Finally, EDF-R requests the CAISO provide a substantive update on the outcomes of the Generator Contingency and RAS Modeling initiative. The CAISO’s statement that it “has turned out to be more of a challenge than was expected and is

The comment is noted.

Generation dropping via RAS is generally infrequent and of a short duration, so it would be a negligible portion, if it is included at all, of the renewable curtailment numbers provided by the ISO.

This comment has been addressed in the revised straw proposal.

	considered a work in progress” is perplexing and opaque.	
Pacific Gas & Electric	see above	
3. Provide your organization’s comments on the next steps, as described in section 3:		
Entity (Name)	Stakeholder Comment	ISO Response
BAMx	BAMx appreciates the CAISO proposed changes to the current guidelines to clarify RAS development, implementation, and ongoing maintenance. The CAISO, in consultation with the stakeholders, needs to develop specific guidelines in its attempt to explore opportunities to potentially limit the use of future RAS in an area that is saturated with existing RAS. Such guidelines may include criteria such as a load-dropping RAS versus a generation-dropping RAS, a tradeoff between feasibility and complexity of RAS versus the cost of alternatives, whether reliability or economic concerns, etc. drive the decision to limit RAS in some instances.	The comment is noted.
EDF-Renewables	On the topic of “explore[ing] opportunities to potentially limit the use of future RAS in an area that is saturated with existing RAS.” EDF-R encourages the CAISO to heavily weight the negative effects of RAS implementation (operational, outage complexity, and the procrastination of initializing development of clearly needed system upgrades) when analyzing the appropriateness of a RAS solution in its transmission planning and generator interconnection studies. CAISO’s supply need is growing by leaps now and the upcoming procurement of 11.5 GW by 2026 (as recently directed by the CPUC) is much more likely to be the beginning of a major procurement boom than the end of one. ?As an example of a transmission planning approach that appropriately caps RAS usage, EDF-R notes that in SPP RASs are assumed permanent by design. For example, SPP is currently going through the process of defining general guidelines for RASs and the general direction that guideline is headed in is that RASd should be typically approved for 2 years, then re-evaluated (link to download relevant SPP May 3, 2021 meeting materials) EDF-R also requests that in straw proposal the CAISO more clearly list the specific changes it is proposing alongside some level of analysis regarding the expected outcome of those changes, including when and how new	The comment has been noted.

	<p>RAS planning guidelines will be implemented, for example, if the planning standards will spur new upgrades in the next GIDAP cycle and borne by generators, or if they will be considered in the TPP and cost born in those processes. EDF-R believes this is the correct level of scrutiny to apply to proposed changes considering the potential outcomes. EDF-R also requests the CAISO clarify if after the review and change to RAS guidelines is complete, will CAISO look retroactively at the 21 RAS added in the last decade? And reconsider the 36 planned? EDF-R would like to better understand potential exit solutions, ultimately it does not serve generators or the system if RASs are eliminated and then have curtailment previously born by generators under RAS be socialized in the market as congestion.</p>	<p>The GIDAP limits the cost exposure to generation projects that have already been studied.</p> <p>Existing and planned RAS will need to be reviewed on a case by case basis.</p>
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Pacific Gas & Electric	see above	
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4. Provide your organization’s comments on the proposed initiative schedule, as described in section 4.1:

Entity (Name)	Stakeholder Comment	ISO Response
BAMx	<p>BAMx believes that the current proposed schedule - that envisions presenting the proposal to the CAISO Board of Governors in November 2021 - is highly compressed and not conducive to meaningful stakeholder participation. A subset of topics proposed by the CAISO, such as the alignment of RAS with NERC Reliability Standards and revisiting the maximum amount of generation tripping for single and double element contingency in light of Diablo retirement, could be achieved by the proposed timeline. However, other more complex issues, such as potentially limiting the use of future RAS in certain areas and under certain conditions, would likely require a considerably more significant level of effort and stakeholder involvement, and in turn, more time.</p>	The comment is noted.
EDF-Renewables	<p>CAISO has not included a timeline for the “final proposal” on its schedule. Final proposals are now common in CAISO’s stakeholder initiatives (rather than stopping at the “draft” stage) and are important policy documents, and EDF-R requests CAISO complete that element for this proposal as well.</p>	The comment is noted.
Pacific Gas & Electric	see above	

5. Additional comments on the Planning Standards – Remedial Action Scheme Guidelines Update issue paper

Entity (Name)	Stakeholder Comment	ISO Response
BAMx	No additional comments at this time.	
EDF-Renewables	None at this time.	
Pacific Gas & Electric	see above	