Climate Change and the Risk-Based Decision-Making Framework

Safety Policy Division | Risk Assessment and Safety Analytics Section

Executive Summary

Safety Policy Division (SPD) recognizes that climate change creates unique risks for electric and gas investor-owned utilities (IOU) that need to be mitigated to keep California's citizens safe. This Staff Proposal provides for ensuring California's utilities can mitigate the risks caused by climate change. Decision (D.) 20-08-046 requires California's IOUs to file a Climate Adaptation Vulnerability Assessment (CAVA) with the Commission every four years. The assessment must include green and sustainable mitigations for infrastructure that is vulnerable to climate change. D.22-12-027 requires the IOUs to use a cost-benefit approach to assess the cost effectiveness of risk mitigations scheduled for investment over the next four years that are included in their Risk Assessment Mitigation Phase (RAMP) filings. Following these precedents, the current Staff Proposal will offer recommendations for how the IOUs can implement an approach to mitigating the risks posed by climate change. In doing so, the proposal reviews two different approaches to addressing the issue of climate change in the Risk-based Decision-Making Framework (RDF) Proceeding (Rulemaking [R.] 20-07-013): 1) by utilizing the data inputs to an IOU's CAVA filing and/or the CAVA results within an IOU's RAMP filing, or 2) by refining the RDF such that an IOU must demonstrate how they have drawn upon climate data, models and projections while creating their RAMP filing. The proposal concludes by reviewing the limitations of each approach.

Procedural Background

Beginning in 2014, the Commission directed the utilities to incorporate a risk-based decision-making framework within their General Rate Case (GRC).[1] D.14-12-025 established a regulatory process to refine the way utilities conduct risk assessment, the Safety Model Assessment Proceeding (S-MAP, Application [A.] 15-05-002 *et al*), and created a cyclical review process of risk reports submitted by the utilities, known as the "RAMP" process).[2] However, it was not until the creation of the so-called S-MAP II proceeding, better known as the "RDF Proceeding" (R.20-07-013), that the topic of climate change became a focus of risk-related rulemaking at the Commission.

In the RDF Proceeding, the Commission pointed out that refinements to the RDF adopted in D.18-12-014 should include consideration of "the need for coordination methods between the S-MAP, RAMP and related proceedings, such as…R.18-04-019, the Climate Change Adaptation proceeding".[3] Initially, the topic of climate change was delegated to Phase II of the RDF

[1] D.14-12-025, Decision Incorporating A Risk-Based Decision-Making Framework Into The Rate Case Plan And Modifying Appendix A of Decision 07-07-004,. The GRC is a proceeding that allows utilities to request approval from the Commission to recover costs through the billing of customers for the use of the utility's services.

[2] For more on the details of the RDF and the risk related proceedings at the Commission, see Battis, J. *California's Risk-Based Decision-Making Framework: How Predicating Ratesetting Approval on Energy Utility Risk Quantification Advances the State's Safety Goals*, Safety Policy Division White Paper, California Public Utilities Commission, (2022).

[3] Order Instituting Rulemaking to Further Develop a Risk-Based Decision-Making Framework for Electric and Gas Utilities R.20-07-013 at 15.

Proceeding, where staff recommended the Commission track utility climate mitigation activities associated with issues such as:

1. exposure of pipelines to coastal hazards and humidity leading to corrosion risks;
2. structural damage to pipelines and underground storage tanks due to rise in sea levels and extreme storms; and
3. exposure of electric assets to rising sea-levels, extreme storm events, amongst others.[4]

During Phase I of the RDF Proceeding, the Public Advocates Office also recommended that the results of the IOUs' CAVA submissions (discussed below) be incorporated in the IOUs' RAMP applications.[5]

Although climate change was not an explicit focus within Phase 2 of the RDF Proceeding, Environmental and Social Justice Pilots ordered in D.22-12-027 require IOUs to "evaluate how the selection of proposed mitigations in the RDF may impact climate resiliency in disadvantaged and vulnerable communities."[6] Building on these suggestions and pilots, Staff recommended climate change as a focus for Phase 3. In particular, Staff's Proposed Phase 3 Roadmap suggested the Commission consider requiring analyses or outputs from the IOUs' CAVA submissions to quantitatively inform risk modelling within the RAMP.[7] Subsequently, the *Assigned Commissioner's Phase 3 Scoping Memo* asked that consideration be given to how the outputs from the CAVA should inform risk modelling as well as general considerations for how climate hazards should be reflected in RAMP filings.[8] Before turning to Staff Recommendations on these topics, we first provide an introduction into the Climate Adaptation Proceeding (R.18-04-019).

The Commission established R.18-04-019 on April 26, 2018 to consider strategies to integrate climate change adaptation matters in relevant proceedings. As the Order Instituting Rulemaking states, climate adaptation planning in a time of worsening climate impacts is a prudent next step to ensure the safety and reliability of all IOUs.[9] The Commission adopted two substantive decisions in Phase I of R.18-04-019, D.19-10-054, *Decision Addressing Phase 1 Topics 1 and 2* and D.20-08-046, *Decision on Energy Utility Climate Change Vulnerability Assessments and Climate Adaptation in Disadvantaged Communities (Phase 1, Topics 4 and 5).*

D.19-10-054 defines climate change adaptation for Commission jurisdictional energy utilities and orders these utilities to use the climate scenarios in the most recent California Statewide Climate Change Assessment when analyzing climate risks. Specifically, the Commission noted that adaptation to climate change will entail:

> adjustment in utility systems using strategic and data-driven consideration of actual or expected climatic impacts and stimuli or their effects on utility planning, facilities

[4] D.21-11-009
[5] Opening Comments of the Public Advocates Office on Track 2 Proposed Safety and Operational Metrics, Safety Performance Metrics, and Track 1 Staff Recommendations at 34-35.
[6] D.22-12-027, Ordering Paragraph 5.
[7] Staff's Proposed Phase III Roadmap, March 13th 2023 at 2 https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M503/K589/503589059.PDF
[8] Phase III Scoping Memo at 8.
[9] Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), and Southern California Gas Company and San Diego Gas & Electric Company (collectively known as Sempra).

maintenance and construction, and communications, to maintain safe, reliable, affordable, and resilient operations.[10]

D.19-10-054 also orders use of the "business-as-usual" Representative Concentration Pathway (RCP) 8.5 for analytical, investment and operational purposes.[11]

D.20-08-046, amongst other actions:

- Defines Disadvantaged and Vulnerable Communities (DVCs) for purposes of the Climate Adaptation proceeding;
- Requires the large IOUs to prepare and file Community Engagement Plans (CEPs) regarding DVCs every four years;
- Requires the IOUs to conduct and file surveys of the effectiveness of their CEPs every four years;
- Requires IOUs to prepare and submit CAVAs via advice letter every four years, concurrent with RAMP applications required pursuant to D.18-12-014; and,
- Directs IOUs to use the Department of Water Resource's two-step vulnerability assessment methodology that 1) combines exposure and sensitivity to determine risk, and 2) combines risk and adaptive capacity to determine vulnerability.
- Requires analysis of temperature, sea-level rise, precipitation, wildfire, and cascading events for utility-owned infrastructure & contracts.
- Sets intermediate and long-term timeframes for analysis. The intermediate focuses on the next 10-20 years while the long-term addresses the next 30–50 years. The decision considers the "key time frame" as the next 20–30 years.

On May 21, 2021, SCE served and filed its CEP.[12] On May 13, 2022, SCE submitted its 2022 CAVA as a Tier 2 advice letter.[13] On May 16, 2023, PG&E served and filed its CEP.[14] Pursuant to D.20-08-046, PG&E's CAVA is due May 15, 2024 and Sempra's CAVA is due May 15, 2025.

On May 19, 2023, an *Assigned Commissioner's Phase 2 Scoping Memo* was issued in R.18-04-019 providing a timeline and series of issues that would receive focus in that proceeding. The relevant issues under discussion in Phase 2 include:

- Whether the CAVAs should be filed rather than submitted via advice letter;
- Whether the CAVA should adopt any ranking or prioritization criteria for possible adaptation proposals, including how utilities should prioritize climate adaptation investments

[10] D.19-10-054 at 21.
[11] D.19-10-054 at Ordering Paragraph 4.
[12] SCE's CEP: https://www.sce.com/sites/default/files/custom-files/R1804019-SCE%20Community%20Engagement%20Plan.pdf
[13] Submission of SCE's CAVA: https://edisonintl.sharepoint.com/teams/Public/TM2/Shared%20Documents/Forms/AllItems.aspx?id=%2Fteams%2FPublic%2FTM2%2FShared%20Documents%2FPublic%2FRegulatory%2FFilings%2DAdvice%20Letters%2FPending%2FElectric%2FElectric%5F4793%2DE%2Epdf&parent=%2Fteams%2FPublic%2FTM2%2FShared%20Documents%2FPublic%2FRegulatory%2FFilings%2DAdvice%20Letters%2FPending%2FElectric&p=true&ga=1
[14] https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M509/K080/509080987.PDF

to promote equity and to reflect the heightened vulnerabilities and decreased resources of DVCs;

- Whether the CAVA should include short-term (three to five years or five to 10 years) modeling outputs, in addition to the medium- and long-term timeframes adopted D.20-08-046, to better link the climate projections included in CAVAs to RAMP filings;
- Whether the CAVA requires guidance regarding the presentation of information in the CAVA to improve user friendliness to parties, local and tribal jurisdictions and other stakeholders as well as to other proceedings that may use CAVA information;
- Whether the CAVA should only focus on risk and vulnerability analysis (Step 1), with the identification of possible adaptation investments (Step 2) considered in a separate proceeding.

Background to Staff Proposal

The purpose of this Staff Proposal is to offer recommendations for how the IOUs can reflect climate hazards in their RAMP filings. By climate hazards we mean changes in the historical frequency, extent or variability of wildfires, flooding, precipitation, cascading events and sea level rise that are expected to occur in the future, and that are already occurring, as a result of climate change.[15] To ensure consistency with R.18-04-019, development of guidance regarding addressing climate hazards within the RDF should consider experience with the CAVA submissions ordered in D.20-08-046. Additionally, the RDF could be refined to require that the IOUs properly and transparently integrate climate data, models and projections into their RAMP filings.

Before addressing the two approaches outlined in this proposal, we provide some contextual background related to the RDF Proceeding. The following section introduces the risk bowtie modelling approach that the IOUs must use to structure their risk assessments, as well as the key terms and kinds of data that informs the way bowties are used to create risk assessments.

Bowties

The risk bowtie provides a simple and effective means of visualizing and conceptualizing a particular risk event according to its likelihood and consequence, as well as the data informed components that allow us to calculate a monetized risk value. Figure 1 provides a conceptualized example of a bowtie to frame our discussion:

[15] See D.20-08-046, Ordering Paragraph 9.11 for a list of the climate hazards that the IOUs are required to consider in the CAVAs ordered in that decision.

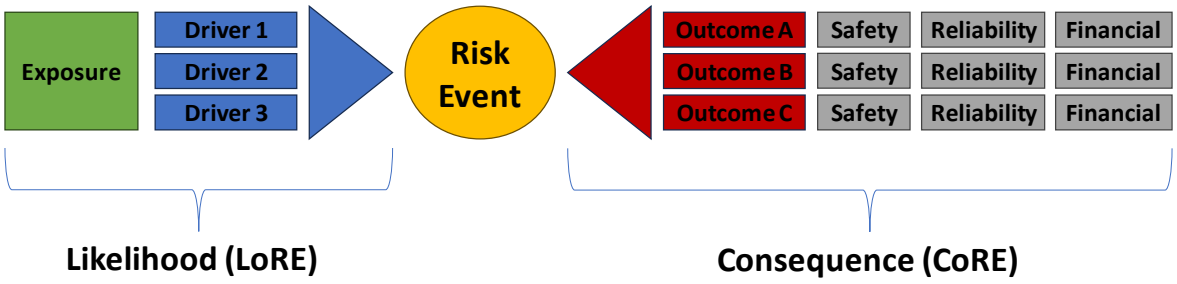

Figure 1 Conceptualized Bowtie

In the center of the bowtie is the Risk Event, which is a well-defined, single, observable, and measurable event caused by the Drivers (characterized by Exposure) on the left-hand side, which brings about the Outcomes on the right-hand side. The Drivers can be measured to calculate the Likelihood of a Risk Event (or LoRE), which the IOUs typically express as a Frequency. The Outcomes have implications for the three Attributes required to be considered in the IOUs' risk assessments: Safety, Reliability and Financial Attributes. Outcomes will affect the Levels of an Attribute, which are then used to calculate the Consequence of a Risk Event (or CoRE), which is expressed as a monetary value. A monetized risk score is the Likelihood multiplied by the Consequence or:

$$\text{LoRE} \times \text{CoRE} = \text{Monetized Risk Score}$$

Within a RAMP filing, the IOUs then suggest mitigations that once implemented can reduce this monetized risk score. The level of risk reduction is considered a Benefit, which would also be expressed as a dollar value. To demonstrate the cost effectiveness of a mitigation program, IOUs will divide the Benefit by the cost of implementing the mitigation, which is expressed as a Cost-Benefit Ratio. This in simplified terms is how the RDF conceptualizes risk modelling and how the IOUs use the RDF to prepare their RAMP filings. After being evaluated by SPD Staff, this same risk modelling approach found in RAMP filings is used to justify investments in mitigations in a GRC.

Definitions and Differences of Risk Assessment Components

D.22-12-027, Appendix A provides specific definitions for each of the components discussed in the previous section. It is important to note that the terminology used in the RDF Proceeding is distinct from that in the Climate Adaptation Proceeding. For instance, within the RDF, the concept of Risk is estimated as a discrete moment in time, conceptualized as a Risk Event. In contrast, the Climate Adaptation Proceeding requires the IOUs to frame their CAVAs in terms of Hazards, which have safety implications that can be estimated over a continuous amount of time. Specifically, the CAVA draws upon the two-step vulnerability assessment used by the Department of Water Resources that 1) combines exposure and sensitivity to determine risk, and 2) combines risk and adaptive capacity

to determine vulnerability.[16] That said, it is possible for the continuous estimates of climate hazards to be downscaled so that the impacts of climate change can be integrated within the risk modeling outlined in the RDF. Examples of downscaling will be discussed below.

Additional differences include the use of the concept of mitigation to discuss the reduction of a risk event at a particular moment in time within the RDF, while the CAVA requires IOUs to preliminarily identify potential "adaptation options". These adaptation options are climate-related investments that serve to offset the impacts of climate hazards over a certain length of time.

Finally, the RDF requires IOUs to identify and assess enterprise risks,[17] while the Climate Adaptation Proceeding requires the IOUs to consider and identify climate risks to IOU operations and service as well as to utility assets over which the IOUs have direct control.[18] This means that in contrast to a RAMP filing, an IOU's CAVA submission would not, for instance, assess a risk caused by a utility's assets, operations and services (i.e. utility caused wildfires).

Types of Data for Risk Assessment

The conceptual differences discussed above also have implications for the kinds of data that lend themselves to risk assessment. Most prominently, although the measurement units of risk drivers may be expressed as a likelihood (i.e. for calculating LoRE), the IOUs tend to draw upon historically observed data points to arrive at a frequency of annualized risk events.[19]

In their 2022 RAMP filing, SCE recently justified this approach with the following example:

> …if the annualized historical average number of wire down events is 800, conveying that information in a likelihood/probabilistic manner would likely provide little to no value to the reader. The reader would only know that the likelihood of a wire down event is near 100%. Furthermore, if one wished to forecast how many wire downs events would happen given a certain level of mitigation deployment, a frequency approach would convey that the number of wire down events decreased from 800 to 750; this is an easy-to-understand metric. In contrast, with a likelihood approach, the reader would only know that the likelihood of a wire down event dropped from 100% to some slightly smaller percentage.[20]

Typically, the IOUs evaluate few Risks that have an annualized frequency of less than one; notable exceptions would be hydro dam failure and seismic Risk Events.

In contrast, due to the nature of global climate models (GCM), the Climate Adaptation Proceeding draws upon probabilistic data, the analytical results of which would be appropriately expressed in a likelihood. Climate models deal with a large amount of uncertainty and can generally only express the potential impacts of climate change in the form of a probability. At present, the results of a

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[16] See D.20-08-046 at 63. Details on this methodology can be found in Department of Water Resources Climate Action Plan, Phase 3: Climate Change Vulnerability Assessment, pg. 22-25. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Climate-Change-Program/Climate-Action-Plan/Files/CAP-III-Vulnerability-Assessment.pdf

[17] See D.22-12-027, Appendix A, Step 1B, Row 8

[18] D.20-08-046 at OP 9(1).

[19] See also D.22-12-027, Appendix A, Step 2A, Row 11.

[20] Application of Southern California Edison Company (U 338-E) Regarding 2022 Risk Assessment Mitigation Phase (RAMP), Chapter 2, pg. 3

CAVA have been expressed either as "at-risk" assets, operations and services, and a list of adaptation options.[21]

Addressing Climate Change in Risk Assessment

Despite the conceptual differences and different approaches to data analysis in the RDF and Climate Adaptation Proceedings, the IOUs have taken steps to address climate change in their risk assessments. As noted in the R.20-07-013 *Assigned Commissioner's Phase 3 Scoping Memo and Ruling*, with a few exceptions, the IOUs have primarily addressed climate change qualitatively in their RAMP applications. For instance, SCE's 2022 RAMP filing included no proposed mitigation programs aimed at reducing safety risks related to climate change. Instead, SCE listed potential (rather than proposed) mitigation options that had been identified in SCE's CAVA that could be further refined for the 2025 to 2028 GRC application.[22] In its recent 2025 GRC filing, SCE listed a refinement of the options presented in SCE's CAVA that are under consideration in the GRC.[23] As an example, for the climate hazard "Wildfire", SCE identifies a potential risk as "Distribution Outages" and have requested $80 million for an adaptation option described as "New underground wires solutions to create ties between exposed circuits for increased operational flexibility". SCE also included a list of options that were in the CAVA but are not under consideration in the GRC along with a rationale for excluding them from the GRC.[24] An example is the "Precipitation and Flooding" hazard that lists a "substation outage" as a potential risk. In this case SCE decided not to include the "floodwalls" adaptation option because the locations were deemed not At-Risk following a detailed hydrology study.

In its 2020 RAMP filing, PG&E considered climate change a cross-cutting factor with implications for eight out of twelve risks under assessment. Even then, only three of those eight risks (Failure of Electric Distribution Network Assets, Dam Failure and Wildfire) were impacted in a quantitative manner by PG&E's use of a "consequence multiplier" and/or an "escalation of frequency" to represent increased risks as a result of climate hazards. In a recent presentation to Commission Staff[25], PG&E clarified that an escalation of frequency refers to the adjustment of a driver where the baseline frequency changes overtime. Then based on the time profile of that driver, PG&E utilized Cal-Adapt climate models to escalate the frequency of said driver thereby quantitatively affecting the calculation of LoRE.[26] The climate-related workpapers that accompanied PG&E's 2020 RAMP filing show that frequency is escalated on a 5-year stepwise basis. This is due to the way the Cal-Adapt climate models are structured. In the same presentation, PG&E explained that the concept of "consequence multiplier", which was only used to affect the Wildfire Risk Event in PG&E's 2020 RAMP filing, did not directly affect the quantitative calculation of CoRE. Instead, PG&E escalated

[21] See Southern California Edison Company's Climate Change Vulnerability Assessment. Note that SCE focuses on the at-risk assets associated with vulnerability to temperature, sea-level rise, precipitation and flooding, and wildfires.
[22] Application of Southern California Edison Company (U 338-E) Regarding 2022 Risk Assessment Mitigation Phase (RAMP), Appendix B, Page 2 & Page 10, Table III-1.
[23] Application of SCE General Rate Case Risk Policy, Climate Change Policy, and Environmental & Social Justice Goals A.23-05-010 Exhibit SCE-01 Vol. 2, pg 37-39, see Table V-3
[24] Application of SCE General Rate Case Risk Policy, Climate Change Policy, and Environmental & Social Justice Goals A.23-05-010 Exhibit SCE-01 Vol. 2, pg 37-40, see Table V-4
[25] Climate Change in the 2020 RAMP and Wildfire Mitigation Plan, PG&E Presentation to CPUC Staff, August 14, 2023
[26] For the 2020 RAMP, this escalation of frequency only impacted the Risk Events titled Failure of Electric Distribution Network Assets and Dam Failure.

the frequency of drivers associated with Wildfires that might occur during a Red Flag Warning day.[27] Since Red Flag Warning days have higher consequences than non-Red Flag Warning days, PG&E decided to somewhat confusingly describe the quantitative impact on the LoRE as a "consequence multiplier". PG&E did mention that in its 2023 GRC filing, the multiplier now directly affects the calculation of CoRE on Red Flag Warning days rather than the likelihood, but Staff have been unable to review this material.

PG&E proposed alternative mitigations for addressing climate change for just five of the risks identified in the 2020 RAMP as being impacted by climate change.[28] Additionally, in a recent briefing to the full Commission, PG&E explained that they are exploring the results of their CAVA modeling to consider how the impacts of climate change could influence the future geographical structure of High Fire Threat Districts. A PG&E representative stated that PG&E could, in turn, use this information to inform the identification of risks within their Enterprise Risk Register and the mitigations they develop to address those risks.[29]

Beyond RAMP filings, the IOUs have sometimes integrated climate change into risk assessment and mitigation programs that they file with the GRC. For instance, SCE recently submitted an exhibit to the GRC that stated starting in 2025 they will begin downscaling multiple GCMs to a higher resolution with hourly temporal resolution of various weather and fuel conditions.[30] This data could help SCE determine trends in the number of Power Safety Power Shutoffs events in the future, demonstrating how an IOU can use probabilistic data to estimate a discrete risk event.

Some integration between the CAVA and the IOUs' Wildfire Mitigation Plans (WMP) has occurred. For instance, SCE's recent WMP noted that the CAVA report primarily studied "the risks wildfires pose to utility infrastructure and operations, and not the risks from ignitions associated with utility equipment."[31] With this in mind, SCE's 2023 WMP proposed to add 200 structures to its sub-transmission pole brushing activity in High Fire Risk Areas based on analysis conducted in their CAVA on the highest projected burn areas in 2030. SCE noted these additional 200 structures, which are subject to approval in the GRC, would be "incremental" to the pole brushing activity that was already included in its WMP.[32]

Recently, PG&E has argued that further integration of the CAVA and RAMP filings would be difficult due to the conceptual and data differences described above.[33] While these concerns are valid both for practical and scientific reasons, the review above demonstrates that the IOUs are already starting to draw upon the CAVA and probabilistic climate models to influence their RAMP filings.

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[27] As designated by the National Weather Service, a Red Flag Warning means warm temperatures, very low humidities, and stronger winds are expected to combine to produce an increased risk of fire danger. https://www.weather.gov/mqt/redflagtips

[28] Application of Pacific Gas and Electric Company (U39m) to Submit Its 2020 Risk Assessment and Mitigation Phase Report, pg. 20-AtchA-7

[29] Comments of Sumeet Singh, Executive Vice President, Operations and Chief Operating Officer, Pacific Gas and Electric at Third Annual Safety Update Briefings on Utility Safety Practices (BVES and PG&E), July 6th 2023. Recording of briefing available as of July 26, 2023 at: https://www.adminmonitor.com/ca/cpuc/hearing/20230706/.

[30] SCE 2025 General Rate Case, Wildfire Management Part 4: PSPS and Other Wildfire Activities, A.23-05-010, SCE-04 Vol. 05 Pt. 4, pg. 93.

[31] SCE 2023-2025 Wildfire Mitigation Plan, Pg. 410.

[32] It is not clear what SCE means by incremental here. *Ibid.* pg. 410.

[33] PG&E Opening Comments on R.18-04-019 Phase 2 Scoping Memo, pg. X.

That said, it appears there is a need for further guidance to ensure climate change is quantitatively integrated within the IOU's risk models.

In this proposal we consider two different approaches to refining the RDF so that climate change is appropriately addressed by the IOUs in their RAMP filings. The first approach calls for further integration of the CAVA and RAMP filings, while the second approach suggests refining the RDF such that the IOUs must demonstrate how they have drawn upon climate data, models and projections while creating their RAMP filing. We discuss these two approaches in the following two sections.

Staff Approach 1: Further RAMP-CAVA Integration

The first approach incorporates data inputs into the CAVA and/or CAVA results within future RAMP applications. The benefit of this approach is that it will harmonize RAMP applications with climate-related regulatory requirements found in proceedings across the Commission. Staff have three recommendations: 1) adjust language within the RDF, 2) create a procedure for incorporating data inputs into the CAVA and/or CAVA results within the RAMP, and 3) create a reporting template for CAVA results. The following sections discuss these three recommendations at length.

Suggested Language Changes in the RDF

To ensure the IOUs properly incorporate data inputs into the CAVA and/or CAVA results within future RAMP applications, Staff recommend the following changes to the RDF found within Appendix A of D.22-12-027. Proposed additional language is underlined:

Step 1B: Row 8:

> Utilities' risks are defined in their respective Enterprise Risk Registers (ERR). The ERR is the starting point for identifying the risks that will be included in the RAMP. The process for determining these risks will be described in the RAMP.
>
> The RAMP will consider risks using the same risk definitions as in the ERR.
>
> Each RAMP filing will highlight any changes to the ERR from the previous RAMP or GRC filings.
>
> <u>The ERR must consider any risks associated with hazards identified in the Climate Adaptation Vulnerability Assessment as defined by D.20-08-046 or any future decision that refines the requirements of the Climate Adaptation Vulnerability Assessment. See the Procedure for Incorporating Inputs into the CAVA and/or CAVA results in the RAMP for details.</u>

Step 2A: Row 11:

> The identified Frequency of a Risk Event should reflect the unique characteristics of the utility. For each enterprise risk, the utility will use actual results and/or [Subject Matter Expert] SME input to determine the annual Frequency of the Risk Event. The utility should use utility specific data, if available. If data that is specific to the utility is not available, the utility must supplement its analysis with subject matter expertise. In addition, if data reflecting past results are used, that data must be supplemented by SME judgment that takes

into account the Benefits of any Mitigations that are expected to be implemented prior to the GRC period under review in the RAMP submission.

The utility will take into account all known relevant Drivers when specifying the Frequency of a Risk Event.

Drivers should reflect current and/or forecasted conditions and may include both external actions as well as characteristics inherent to the asset. For example, where applicable, Drivers may include: the presence of corrosion, vegetation, dig-ins, earthquakes, windstorms or the location of a pipe in an area with a higher likelihood of dig-ins. When considering what data inputs into the CAVA and/or CAVA results are appropriate inputs for calculating the impact of climate change on the Frequency of a Risk Event, Drivers should reflect both current and forecasted conditions and may include both external actions as well as characteristics inherent to the asset.

Step 3: Row 16:

The effects of a Mitigation on a Tranche will be expressed as a change to the Tranche-specific pre-mitigation values for LoRE and/or CoRE. The utility will provide the pre- and post-mitigation values for LoRE and CoRE determined in accordance with this Step 3 for all Mitigations subject to this Step 3 analysis.

When calculating the effects of Mitigations, utilities must also consider the mitigation of risk achieved by "adaptations projects" included in their CAVAs that were funded through a GRC that will continue to have an effect during the four-year RAMP cycle. See the Procedure for Incorporating Inputs into the CAVA and/or CAVA results in the RAMP for details.

Draft Procedure for Incorporating Inputs into the CAVA and/or CAVA Results in the RAMP

To accompany the above recommendations, staff propose the following procedures to guide IOU preparation and Commission review of RAMP filings:

1. Collect hazards identified in the CAVA into a list.
2. Identify any risks associated with the CAVA hazards and compile into a list.
3. Compare the list of risks related to CAVA hazards with the ERR used to prepare the RAMP as outlined in Step 1B: Row 8 of the RDF.[34]
4. Add any unique risks related to CAVA hazards to the ERR.
5. Complete Step2A: Rows 9-11, Step 2B: Row 12 and Step 3: Rows 13-15 as outlined in the RDF.
6. Consider what data inputs into the CAVA and/or CAVA results are appropriate data to use when completing Step 2A: Row 10 to calculate potential Consequences of a Risk Event that properly reflects the impact of climate change, including how such data can affect the Outcome of a Risk Event.

[34] Appendix A of D.22-12-027.

7. Consider what data inputs into the CAVA and/or CAVA results are appropriate data to use when completing Step 2A: Row 11 to calculate the Frequency of a Risk Event that properly reflects the impact of climate change, including how such data can affect the Exposure and/or Drivers of a Risk Event.
8. Collect "adaptation options" identified in the CAVA (relative to the 10-year timeframe) that tie back to a specific risk(s) in the ERR into a list.
9. Compile a list of CAVA "adaptation options" that were funded through a previous GRC that also serve to reduce near-term risk (10-year timeframe).
10. Calculate the risk reduction effects of the CAVA "adaptation options" in Step 9 of this procedure that will continue to have an effect during the current four-year RAMP cycle.[35]
11. Include these "adaptation options" within Step 3: Row 16 denoting them as a mitigation as outlined in the RDF and note in the narrative description of these mitigations that their funding has already been incorporated into the GRC.[36]
12. Complete Step 3: Rows 17-25 as outlined in the RDF.

Draft Reporting Template of CAVA Results for Inclusion in the RAMP

Because CAVA results are structured using concepts common to the field of climate science, such as hazard and adaptation, a degree of translation may be necessary to facilitate the incorporation of CAVA results within the RAMP. For this reason, Staff recommend the adoption of a Reporting Template within the IOUs' CAVA submissions that clearly demonstrates how hazards defined within a CAVA report have implications for risk events or enterprise risks found within the RAMP. Similarly, the Reporting Template could highlight how the adaptation options implemented by the IOUs to address a given climate hazard also have implications for mitigations implemented by the IOUs to mitigate risk. Finally, Staff feel it will be helpful for decision-makers and evaluators of the RAMP to know the time horizon of a given climate hazard. The time horizon of a given climate hazard has implications for understanding the benefit of a given mitigation, since some mitigations have a longer use-life than others. The following is a draft version of a potential Reporting Template, with illustrative examples, that Staff suggest could be included as an Appendix to an IOU's CAVA report:

HAZARDS	RISK EVENT OR ENTERPRISE RISK	TIME HORIZON (years)	ADAPTATION OPTION	MITIGATION
Flooding	Transmission Substation Outage	70 (2030-2100)	Floodwalls around substations or Flood Monitoring Devices	Real-time mitigation (?) and Floodwalls
Wildfire	Distribution Outage	2025-2028	Undergrounding	Undergrounding

[35] Note that the risk reduction benefits from these GRC-funded adaptation options will not begin until the adaptation options have been implemented thereby affecting future RAMP filings.
[36] Note that since the cost of these adaptation options is already incorporated into the GRC, it will not be necessary to Complete Step 3: Row 25 for these mitigations.

This Reporting Template can facilitate Steps 1, 2, 6 and 7 found in the above Draft Procedure for incorporating the CAVA results within the RAMP.

Staff Approach 2: Refining the RDF to Incorporate Climate Data, Models and Projections

A second recommended approach aims to build upon the approaches already used by the IOUs to incorporate climate data, models and projections into their RAMP filings. The benefit of this approach is that it allows the IOUs the flexibility to incorporate cutting-edge climate science, which may also be more relevant to a given Risk Event than the data inputs into the CAVA and/or CAVA results. Staff have two recommendations within this approach: 1) adjust language within the RDF and 2) create a procedure for incorporating climate data, models and projections within the RAMP. The following sections will discuss these two issues at length.

Suggested Language Changes in the RDF

To ensure the IOUs incorporate climate change-related data, models and projections within future RAMP applications, Staff recommend the following changes to the RDF found within Appendix A of D.22-12-027:

Step 1B: Row 8:

> Utilities' risks are defined in their respective ERR. The ERR is the starting point for identifying the risks that will be included in the RAMP. The process for determining these risks will be described in the RAMP.
>
> The RAMP will consider risks using the same risk definitions as in the ERR.
>
> Each RAMP filing will highlight any changes to the ERR from the previous RAMP or GRC filings.
>
> <u>The ERR must consider any risks that can be identified through the use of climate data, models and projections. See the Procedure for Incorporating climate data, models and projections in the RAMP for details.</u>

Step 2A: Row 11:

> The identified Frequency of a Risk Event should reflect the unique characteristics of the utility. For each enterprise risk, the utility will use actual results and/or SME input to determine the annual Frequency of the Risk Event. The utility should use utility specific data, if available. If data that is specific to the utility is not available, the utility must supplement its analysis with subject matter expertise. In addition, if data
>
> reflecting past results are used, that data must be supplemented by SME judgment that takes into account the Benefits of any Mitigations that are expected to be implemented prior to the GRC period under review in the RAMP submission.
>
> The utility will take into account all known relevant Drivers when specifying the Frequency of a Risk Event.

Drivers should reflect current and/or forecasted conditions and may include both external actions as well as characteristics inherent to the asset. For example, where applicable, Drivers may include: the presence of corrosion, vegetation, dig-ins, earthquakes, windstorms or the location of a pipe in an area with a higher likelihood of dig-ins. When considering what climate data, models and projections are appropriate inputs for calculating the impact of climate change on the Frequency of a Risk Event, Drivers should reflect both current and forecasted conditions and may include both external actions as well as characteristics inherent to the asset.

Step 3: Row 16:

The effects of a Mitigation on a Tranche will be expressed as a change to the Tranche-specific pre-mitigation values for LoRE and/or CoRE. The utility will provide the pre- and post-mitigation values for LoRE and CoRE determined in accordance with this Step 3 for all Mitigations subject to this Step 3 analysis.

When calculating the effects of Mitigations, utilities must also consider the mitigation of risk achieved by climate-related investments[37] identified in a previous GRC or other cost recovery venue that will continue to have an effect during the four-year RAMP cycle. See the Procedure for Incorporating Climate Data Models and Projections in the RAMP for details.

Draft Procedure for Incorporating Climate Data, Models and Projections in the RAMP

Building on this, the Commission could adopt the following procedures to guide IOU preparation and Commission review of RAMP filings:

1. Identify any risks associated with the results of climate change-related data, models and projections relevant to the IOU's service territory and compile into a list.
2. Compare the list of risks related to climate change-related data, models and projections with the ERR used to prepare the RAMP as outlined in Step 1B: Row 8 of the RDF.[38]
3. Add any unique risks related to climate change-related data, models and projections to the ERR.
4. Complete Step2A: Rows 9-11, Step 2B: Row 12 and Step 3: Rows 13-25 as outlined in the RDF.
5. Consider what climate change-related data, models and projections are appropriate inputs for inclusion in completing Step 2A: Row 10 to calculate potential Consequences of a Risk Event that properly reflects the impact of climate change, including how the climate change-related data, models and projections can affect the Outcomes of a Risk Event.
6. Consider what climate change-related data, models and projections are appropriate inputs for inclusion in completing Step 2A: Row 11 to calculate the Frequency of a Risk Event that

[37] Climate-related investments are projects that serve to offset the impact of climate hazards over a certain length of time. This includes the "adaptation options" from the CAVA as discussed in Approach 1.
[38] Appendix A of D.22-12-027.

properly reflects the impact of climate change, including how the climate change-related data, models and projections can affect the Exposure or Drivers of a Risk Event.

7. Collect climate-related investments identified in a previous GRC or other cost recovery venue that tie back to a specific risk(s) in the ERR into a list.
8. Compile a list of climate-related investments that have cost forecasts that were approved in the IOU's previous GRC or other cost recovery venues and serve to reduce near-term risk (10-year timeframe).
9. Calculate the risk reduction effects of the climate-related investments in Step 8 of this procedure that will continue to have an effect during the current four-year RAMP cycle.[39]
10. Include these climate-related investments within Step 3: Row 16 denoting them as a mitigation as outlined in the RDF and note in the narrative description of these mitigations that the associated costs will be excluded from consideration in this RAMP filing because their funding has already been approved by a previous GRC or other cost recovery venue.[40]
11. Complete Step 3: Rows 17-25 as outlined in the RDF.

Limitations

This section briefly reviews the limitations to each of the two approaches discussed throughout the proposal.

Approach 1

1. Because the CAVA is focused on the impact of climate change on assets, this means that the CAVA results will often only be directly relevant to calculating the Reliability Attribute of the CoRE. It may be possible to use inputs into the CAVA or a reanalysis of CAVA results to consider a consequence multiplier for Safety and Financial Attributes, but that will need to be evaluated by each utility.
2. Because the CAVA is focused on the vulnerability of assets to climate change, CAVA results are primarily presented as a probabilistic degree of impact over time, which does not translate directly into a Frequency or Likelihood of a Risk Event. This is also the result of the CAVA being focused on Hazards, which are temporally continuous, where as the Risk Events within the RAMP are discrete moments in time.

Approach 2

1. While this approach allows for the incorporation of the cutting edge of climate science, every time there is an advancement in climate modeling that allows for greater precision in risk assessment, it may require the Commission and parties to re-evaluate the way climate change is addressed within the RDF.
2. An analyst reviewing the RAMP would not have advance access to the climate change modeling assumptions used by the IOU before the RAMP is filed.

[39] Note that the risk reduction benefits from these GRC-funded climate-related investments may not begin until the climate-related investments have been implemented thereby affecting future RAMP filings.

[40] Note that since the cost of these climate-related investments is already incorporated into the GRC or a Memorandum Account, it will not be necessary to Complete Step 3: Row 25 for these mitigations.