Decision 18-12-014 December 13, 2018

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Application of San Diego Gas & Electric Company (U902M) for Review of its Safety Model Assessment Proceeding Pursuant to Decision 14-12-025.	Application 15-05-002
And Related Matters.	Application 15-05-003 Application 15-05-004 Application 15-05-005

PHASE TWO DECISION ADOPTING SAFETY MODEL ASSESSMENT PROCEEDING (S-MAP) SETTLEMENT AGREEMENT WITH MODIFICATIONS

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PHASE TWO DECISION ADOPTING SAFETY MODEL ASSESSMENT PROCEEDING (S-MAP) SETTLEMENT AGREEMENT WITH MODIFICATIONS

Summary

This decision approves the Settling Parties' May 2, 2018 unopposed motion for approval of a Settlement Agreement (SA) that achieves steps toward a more uniform and quantitative risk-based decision making framework in the Safety Model Assessment Proceeding (S-MAP).[1] The provisions of the SA constitute the minimum required elements for risk and mitigation analysis in the Risk Assessment and Mitigation Phase (RAMP) and General Rate Case pursuant to Phase Two of this proceeding.

Minimum required elements include:

- Building a Multi-Attribute Value Function (MAVF);
- Identifying Risks for Investor-Owned Utilities' Enterprise Risk Register;
- Risk Assessment and Risk Ranking in Preparation for RAMP;
- Selecting Enterprise Risks for RAMP; and
- Mitigation Analysis for Risks in RAMP.

Since Decision 16-08-018 (Interim Decision) was issued on August 18, 2016, this decision also adopts the following modifications or enhancements, which are compatible with the terms of the SA:

[1] Settling Parties include Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), Southern California Gas Company (SoCalGas), San Diego Gas & Electric Company (SDG&E), (collectively, the Joint Utilities or JU); The Utility Reform Network (TURN), and Energy Producers and Users Coalition and Indicated Shippers (EPUC/IS) (collectively, the Joint Intervenors or JI); and the Office of the Ratepayer Advocates. SB 854 (Stats. 2018, ch. 51) amended Pub. Util. Code § 309.5(a) so that the Office of Ratepayer Advocates is now named the Public Advocate's Office of the Public Utilities Commission. We will refer to this party as Cal Advocates.

- In the MAVF, establishes a minimum 40% safety weight unless Utilities can justify a lower weight based on their respective analyses;
- Enhances the current RAMP 10-major components;
- Updates the Lexicon; and
- Identifies future matters for an Order Instituting Rulemaking that will explore lessons learned from the first S-MAP, adopt a Long-Term Road Map, and develop a scope and timeline for successive S-MAP applications.

Remaining Phase Two Scoping Memo issues including reporting, metrics, and the application of S-MAP requirements to small utilities, will be resolved through a subsequent decision expected to be issued in early 2019.

This proceeding remains open.

1. Background

On November 14, 2013, the California Public Utilities Commission (Commission) opened Rulemaking (R.) 13-11-006 *Order Instituting Rulemaking to Develop a Risk-Based Decision-Making Framework to Evaluate Safety and Reliability Improvements and Revise the Rate Case Plan for Energy Utilities (the Risk OIR)*. The purpose of this rulemaking was to incorporate a risk-based decision-making framework into the Rate Case Plan (RCP) for the energy utilities' General Rate Cases (GRCs), in which utilities request funding for safety-related activities.[2] The RCP guides utilities on the type of information that is presented and the procedural schedule to be followed to address revenue requests in their GRCs.

[2] In addition, this would apply to jurisdictional gas corporations' Gas Transmission and Storage (GT&S) rate cases.

In response to the Risk OIR, and as a result of Senate Bill (SB) 705,[3] and its emphasis on making natural gas safety a top priority of this Commission, the existing RCP framework was modified in Decision (D.) 14-12-025 to incorporate a risk-based decision making approach into GRCs for the large energy utilities including Pacific Gas and Electric Company (PG&E), Southern California Gas Company (SoCalGas), and San Diego Gas & Electric Company (SDG&E). Such a framework and associated parameters assist the utilities, interested parties, and the Commission in evaluating how energy utilities assess their safety risk, and in managing, mitigating and minimizing such risks. D.14-12-025 recognized it will take some time to fully implement the Safety Model Assessment Proceeding (S-MAP) and Risk Assessment and Mitigation Phase (RAMP) procedures, and to have the outputs of those two procedures considered in the utilities' GRC proceedings.[4] D.14-12-025 ordered that during this transition, all of the large energy utilities, beginning February 1, 2015, are to include thorough descriptions of the risk assessment and mitigation plans that they use in their GRC in all future GRC applications.

For the large energy utilities, D.14-12-025 ordered that this take place through two new procedures, which feed into GRC applications, in which utilities request funding for safety related activities: 1) a May 1, 2015 filing of an S-MAP application by each of the large utilities, consolidated on June 19, 2015 and the subject of this proceeding; and, 2) a subsequent RAMP filing for each utility's next GRC, filed in the S-MAP approved report format describing how it

[3] SB 705 was codified into the Pub. Util. Code §§ 961 and 963 in Chapter 522 of the Statutes of 2011.

[4] D.14-12-025 at 26.

plans to assess, mitigate, and minimize its risks. The RAMP submission, as clarified and modified in the RAMP proceeding, is incorporated into each large energy utility's subsequent GRC filing. D.14-12-025 also required the large energy utilities to file updates to their S-MAP applications every three years and annual reports on risk spending and mitigation accountability following each GRC decision.

According to D.14-12-025, the twin purposes of the S-MAP are to: 1) allow parties to understand the models the utilities propose to use to prioritize programs/projects intended to mitigate risks; and 2) allow the Commission to establish standards and requirements for those models. Drawing on the format the Commission used to establish Long Term Procurement Plans proceedings, the idea is for each successive S-MAP to become more sophisticated, be able to respond to changing circumstances, and be able to build on its predecessor S-MAP to tackle increasingly difficult issues.

Based on the directives in D.14-12-025, the S-MAP is expected to accomplish several objectives:[5]

- Undertake a comprehensive analysis of each energy utility's risk-based decision making approach;
- Compare the different approaches used by each utility;
- Detect whether there are common elements among the approaches and models used by the utilities; and
- Assess whether elements of one utility's approach can be adapted for use by the other utilities.

[5] D.14-12-025 at 27.

As envisioned in D.14-12-025, the end-product of each S-MAP proceeding would be a Commission decision on whether a particular risk assessment approach or model that an energy utility is using, or a variant or alternative model, can be used as the basis for each utility's RAMP filing in its respective GRC. The S-MAP decision can also address whether uniform or common standards must be used by the energy utilities in their next S-MAP filings or direct the energy utilities to pursue this issue further.[6]

Consistent with Section (§) 963(b)(3) of the Commission's Public Utilities Code (Pub. Util. Code), the objective of the S-MAP is to fulfill the state's policy of ensuring that the Commission and the energy utilities place the safety of the public and utility employees as the top priority, and for the Commission to carry out this priority safety policy consistent with the principle of just and reasonable cost-based rates.[7] [8]

On August 18, 2016 the Commission approved D.16-08-018 or the *Interim Decision Adopting Multi-Attribute Approach (Or Utility Equivalent Features) and Directing Utilities to Take Steps Toward a More Uniform Risk Management Framework*. In the decision, among other things, the Commission directed the adoption on an interim basis of the Joint Intervener's (JI) multi-attribute approach (or utility equivalent features) and directed the utilities to take steps toward a more uniform approach to risk management in the second phase of this proceeding. D.16-08-018 directed utilities to "test drive" the multi-attribute approach using

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[6] D.14-12-025 at 30.

[7] D.14-12-025 at 25.

[8] As D.15-11-021 *On Test Year 2015 General Rate Case for Southern California Edison* at 13 states, the ultimate balance the Commission must strike is between safety and reasonable rate levels, or as expressed in that same decision, "between affordability and risk reductions."

real-world problems prior to the full scale adoption of any methodology and directed utilities to share results of pilots that compare equivalent features of the multi-attribute approach. It also adopted the Lexicon Working Group's proposal; adopted a modified version of the Commission's Safety and Enforcement Division's (SED's) RAMP recommendations and SED's suggested ten major components for inclusion in RAMP filings. Further, for RAMP filings, it explicitly asked for calculations of risk reduction and a ranking of mitigations based on risk reduction per dollar spent, and adopted an interim Road Map to migrate from relative risk scoring to more quantified methods for optimized risk mitigation, subject to review and revision in the second phase of this proceeding.[9]

1.1. Procedural Background[10]

On May 1, 2015, as ordered in D.14-12-025, SDG&E, PG&E, SoCalGas, and SCE (the Utilities) filed S-MAP Application (A.) 15-05-002, A.15-05-003, A.15-05-004, and A.15-05-005, which were consolidated on June 19, 2015 as A.15-05-002 and Related Matters. Phase One of this proceeding explored the models the Utilities proposed in these applications to identify and manage risks.

As described above in "Background," when the Commission approved the August 18, 2016 Phase One Interim Decision (D.16-08-018), it declined to approve the Utilities' applications as filed. Instead, D.16-08-018 adopted a Joint Intervenor "Multi-Attribute" Approach (JIA) (or utility equivalent features) and

[9] Interim Decision at 1-2.

[10] Procedural background omits reference to activities (i.e., reporting, metrics, S-MAP application to small utilities) that will be covered in a second decision in Phase Two of this proceeding.

directed the Utilities to take steps to develop a more uniform approach to risk management in Phase Two of this proceeding.

On November 16, 2016, a prehearing conference (PHC) was held to determine the parties, discuss the scope, schedule, and other procedural matters.

On December 13, 2016 the assigned Commissioner issued a Phase Two Scoping Memo addressing the scope of the proceeding and other procedural matters, and establishing the procedural schedule. The Phase Two Scoping Memo set forth a workshop schedule, directed the parties to meet and confer at least twice and established three working groups, including a "Technical Working Group (TWG)," a "Lexicon Working Group (LWG)" and a "Test-Drive Technical Working Group (TDWG)."[11] The TDWG met in over 20 working sessions during 2017.[12]

On July 5, 2017, the ALJ issued a ruling directing the Joint Utilities (JU) and JI to meet and confer and provide a joint status report regarding progress of five test-drives, documentation that would shed light on the nature of any dispute, and procedural options to resolve a perceived impasse by July 19, 2017.

On July 21, 2017, the JU and JI filed an initial Joint Status Report. On August 11, 2017, following meet and confer sessions on August 1 and August 4, 2018, the JU and JI filed a second status report including an updated schedule for the Commission's consideration. In addition to pleadings previously adopted in the Scoping Ruling, the proposed schedule provided for the JU to submit inputs and sources and for the JU and the JI to provide reports on test-drive results.

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[11] Phase Two Scoping Memo at 13-15.

[12] On October 5, 2017, the Administrative Law Judge (ALJ) updated the schedule in response to parties' comments.

On September 1, 2017, the JU filed a "Report on Joint Utility Approach (JUA) Safety Attribute Files." On September 29, 2017 and October 13, 2017, the JU also submitted a "Report on Input and Source Documents" and "Report on Multi-Attribute Function Test Drive," respectively.

On November 22, 2017, the JU and JI also moved to postpone the subsequent test- drive related deliverables (i.e., SED Evaluation Report on the JIA and JUA; Opening Comments on SED Evaluation Report; and Reply Comments on SED Evaluation Report). The JU and JI stated that they had decided to pursue settlement discussions to resolve the differences between the JUA and the JIA. On November 30, 2017, the ALJ granted this request.

On December 15, 2017, the JU, JI, the Public Advocates Office of the Public Utilities Commission (Cal Advocates), and Office of Safety Advocates (OSA) filed a Joint Status Report and indicated that they had entered into settlement discussions. On January 23, 2018, these same parties provided another status report

On February 27, 2018, JU and JI filed a Joint Status Report and indicated that they had made substantial progress towards a comprehensive settlement and included a schedule to conclude settlement discussions by holding a settlement conference by April 20, 2018 and filing a motion to adopt an executed settlement agreement by May 2, 2018.

On March 27, 2018, the JU, JI, and Cal Advocates (Settling Parties) filed a final Joint Status Report on settlement discussions and restated their intent to file a motion to adopt an executed settlement agreement by May 2, 2018.[13]

[13] At the date of this Status Report, Cal Advocates had not decided whether it would support a settlement agreement.

On April 13, 2018, pursuant to Rule 12.1(b), the Settling Parties noticed a telephonic settlement conference, which was held on April 30, 2018.

On May 2, 2018, the Settling Parties filed a "Joint Motion for Approval of Settlement Agreement Plus Request for Receipt into the Record of Previously Served Documents and for Expedited Comment Period (Joint Motion)."[14] The Settlement Agreement (SA) included an Appendix A that summarized the minimum required steps for the large Utilities to take to analyze risks and mitigations for the RAMP and GRC, and an Appendix B that contained a "Minimum Set of Documents that Form the Record for the Settlement Agreement." The Settlement Agreement and its Appendices A and B are appended to this decision as Attachment A.[15]

On May 4, 2018, an ALJ granted the Settling Parties' request for an expedited comment period, scheduled an informational webinar on the SA for the week of May 14-22, 2018, and directed SED Staff to convene a workshop on the SA. On May 24, 2018, OSA filed comments on the SA. No party filed reply comments on the SA.

On June 5, 2018, due to repeated requests for extensions to procedural deadlines to resolve issues (reported on the docket card), the Commission approved an Order Extending Deadline by 12 months to June 14, 2019. This additional time provides sufficient time to conclude the remaining deliverables

[14] *See* "Joint Motion for Approval of Settlement Agreement Plus Request for Receipt into the Record of Previously Served Documents and for Expedited Comment Period of Pacific Gas and Electric Company, Southern California Edison Company, Southern California Gas Company, San Diego Gas & Electric Company, Office of Ratepayer Advocates, the Utility Reform Network, and Energy Producers and Users Coalition and Indicated Shippers," May 2, 2018.

[15] These documents were subsequently entered into the record by the assigned ALJ on May 6, 2018.

in this case and adopt two final decisions by the Commission in Phase Two of this proceeding.

Phase Two Workshops:

In Phase Two of this proceeding, SED's Risk Assessment Section convened five workshops and parties provided comments on staff workshop reports and related presentation materials:

October 21, 2016: Review of Joint Intervenor Approach to Foundational Requirements and Test Drive Requirements

February 15, 2017: Utilities' Presentations of Alternative Methodologies

September 28, 2017: Joint Utilities' Approach to Safety Attribute Function

November 6 and 7, 2017: Review of Methodologies to Evaluate the Test Drives of the JIA and JUA Risk Assessment Approaches

July 6, 2018: Review of Settling Parties' (JI and JU and Cal Advocates) proposed SA

1.2. Phase Two Scoping Memo Issues

As referred to in the Procedural Background above, the Phase Two Scoping Memo includes the following high level questions:

1) **Should the JIA be adopted as a uniform approach?**

   As directed by the Interim Decision, answering this question would be accomplished by "test drives" of the JIA using at least five detailed problems. The goal of the test drives should be to allow the Utilities a sufficient opportunity to work with the JI's consultants to learn how the JIA works in real-world problems using actual or representative data from the utilities.

2) **Should any of the Utilities' Alternative Approaches be adopted as a Uniform Approach?**

   Among other things, if alternatives are identified, what are 1) similarities and differences and 2) relative advantages and challenges of each approach versus the JIA Approach so that the

Commission can have a complete record regarding which approach is best for uniform adoption among utilities?

3) **How should other issues presented in the Interim Decision be addressed?**

Other issues referred to in Phase Two of this proceeding are: ongoing RAMP evaluation, reporting, benchmarking/identification of industry-wide best practices, Lexicon, an S-MAP application appropriate for small utilities, and an interim and long-term action plan.[16] Most of these items will be addressed in either a second Phase Two decision expected to be issued in 2019, and/or an upcoming OIR. (*See* Section 2 for a discussion pertaining to an updated Lexicon and Section 5 for a discussion pertaining to "Long-Term Road Map.")

1.3. D.16-08-018 Short-Term Road Map

According to D.16-08-018, the following is a road map regarding what was intended to be accomplished in Phase Two of this proceeding. Most of these "sub-goals" were accomplished in either the first phase (e.g., adoption of Cycla 10-step evaluation method) or the second phase of this proceeding. (Asterisks below indicate "completion" of the respective goal in the second phase of this proceeding).[17] The sub-goals provide further context to the Phase Two Scoping Memo questions 1 and 2 discussed above. They also serve as a "yardstick" to help evaluate whether the Settling Parties successfully achieved both the Interim Decision's and Phase Two Scoping Memo's goals. D.16-08-018's Short-Term Road Map goals are:

[16] Phase Two Scoping Memo at 9-10.

[17] SED July 6, 2018 PowerPoint.

1. * Adopt Multi-Attribute Intervenor Model (or Utility Equivalent Features) subject to verification of "test runs" and review of utility current "pilots" that may offer alternative strategies.
2. * Adopt Cycla Corporation 10-Step Evaluation Method as a common yardstick for evaluating the maturity of utility risk assessment and mitigation models.
3. * Direct utilities to take steps toward a more uniform approach towards the calculation of risk reduction in second phase of this proceeding.[18]
    a. Consider eliminating the unnecessary step of converting the rates of failure events into scaled 1 to 7 Likelihood of Failure (LoF) values, and instead express LoF as a mathematical probability.
        i. LoF values should be based on a condition dependent hazard rate. The resulting LoF scale will be between 0% and 100%, linear, additive, and capable of measuring risk reductions associated with different mitigation strategies;
        ii. Utilities should move away from non-intuitive 1-7 logarithmic scales in favor of LoF values that range from 0-1 and Consequences of Failure (CoF) values that range from 0-100.
    b. Consider eliminating the existing discrete 1-7 CoF scale for failure events and replace it with a continuous rather than discrete scale and implement a more intuitive 0 to 100 scale.
    c. Consider a specific safety weight at a minimum of 40% to ensure that the safety attribute is weighted most heavily.

[18] *See* Intervenor White Paper (Revised January 28, 2016) at 34.

With that weight set, the utilities can also implement a multi-attribute approach that correctly defines weights and attribute scales together.

4. Begin to implement optimization techniques by first requiring the Utilities to clearly identify and quantify the key constraints affecting them.[19]

5. * Direct the Test Drive Working Group to develop a small set of detailed test problems that are common across more than one utility, work through a risk reduction methodology and suggest refinements to the "Road Map" timeline.

6. * Along with the above, require utilities to provide a "showing" of "pilots" demonstrating the use of probabilistic models (e.g., probabilistic risk analysis, calibrated subject matter expertise, and the estimated risk reduction benefit per dollar) and comparing strategies with the JIA using the same or a similar set of problems.

7. * Direct the formation of a Technical Working Group (perhaps an outgrowth or continuation of the Metrics Working Group) to address data gathering, metrics, accountability reports, and to identify milestones and timelines for implementation (e.g., a "Road Map" of a quantitative methodology).

8. * Support SED's guidance for RAMP filings and the ten major components that should be included in the RAMP filings with limited changes. For RAMP and GRC filings, require risk reduction calculations and risk mitigated to cost rankings and use risk reduction per dollar spent to prioritize projects.

9. * While a common scoring algorithm need not be required at this time, develop requirements for calculating Risk Reduction in a useful way according to the direction provided above.

[19] According to the JI, the utilities could rely on commercially available software to identify the optimal sets of risk management activities given those constraints. As an interim step, however, the utilities should prioritize risk mitigation activities based on risk reduction per dollar cost.

10. * Adopt an original lexicon and direct the Lexicon Working Group to more thoroughly vet and reevaluate newly proposed SED definitions and MGRA's and others' suggestions.[20]

2. Lexicon

Lexicon refers to the terminology/list of definitions used for describing the concepts on which the risk-based decision making framework is based. The Phase Two Scoping Memo question on the topic of lexicon asks what additions and/or modifications should be made to the Lexicon approved in the Interim Decision and what direction should be provided to the utilities regarding its use. As the Interim Decision notes, parties have made great strides in developing a common understanding and/or definition of certain terms that pertain to a risk-based decision-making framework. The Lexicon adopted in the Interim Decision is designed for the benefit of both experts and non-experts and is intended to be a dynamic reference source.

2.1. Settling Parties' Proposal

The SA starts by defining its key terms. As part of this, the Settling Parties agreed to use the terms Likelihood of Risk Event (LoRE) and Consequences of Risk Event (CoRE) in place of the previously-used terms Likelihood of Failure (LoF) and Consequences of Failure (CoF). The Settling Parties also recommend a list of new terms as reflected in the discussion below. These terms will aid understanding of key concepts that Settling Parties offer in the SA as described in Section 2.

[20] Interim Decision at 173-175.

2.2. Discussion

Based on a reconciliation of the Interim Decision Lexicon and the SA's proposed Lexicon (See Appendix B), the following is a revised version of the lexicon used in this proceeding. These terms – especially new ones that are highlighted in italics or revised ones that are asterisked – reflect the progress that utilities and intervenors have made towards implementing a more probabilistic approach to risk-based decision making. For each successive S-MAP, we will add or change terms as necessary to support the work moving forward.

2018 S-MAP Revised Lexicon	
Term	**Definition**
Alternative Analysis	Evaluation of different alternatives available to mitigate risk.
Attribute	*An observable aspect of a risky situation that has value or reflects a utility objective, such as safety or reliability. Changes in the levels of attributes are used to determine the consequences of a Risk Event. The attributes in an MAVF should cover the reasons that a utility would undertake risk mitigation activities.*
Bow Tie	*A tool that consists of the Risk Event in the center, a listing of drivers on the left side that potentially lead to the Risk Event occurring, and a listing of Consequences on the right side that show the potential outcomes if the Risk Event occurs.*
Consequence (or Impact)	*The effect of the occurrence of a Risk Event. Consequences affect Attributes of a Multi Attribute Value Function (MAVF).*
Control	Currently established measure that is modifying risk.
*CoRE**	*Consequences of a Risk Event.*
CPUC	*California Public Utilities Commission*
Driver	*A factor that could influence the likelihood of occurrence of a Risk Event. A driver may include external events or characteristics inherent to the asset or system.*
Enterprise Risk Register (also	*An inventory of enterprise risks at a snapshot in time that summarizes (for a utility's management and/or stakeholders such as the CPUC) risks that a*

referred to as "risk registry" or "ERR")	*utility may face. The ERR must be refreshed on a regular basis and can reflect the changing nature of a risk; for example, risks that were consolidated together may be separated, new risks may be added, and the level of risks may change over time.*
Exposure	*The measure that indicates the scope of the risk, e.g., miles of transmission pipeline, number or employees, miles of overhead distribution lines, etc. Exposure defines the context of the risk, i.e., specifies whether the risk is associated with the entire system, or focused on a part of it.*
Frequency	*The number of events generally defined per unit of time. (Frequency is not synonymous with probability or likelihood.)*
General Rate Case (GRC)	*A CPUC proceeding that is denominated a general rate case, as well as PG&E's Gas Transmission and Storage (GT&S) rate proceeding.*
Inherent Risk	The level of risk that exists without risk controls or mitigations.
Likelihood or *Probability**	*The relative possibility that an event will occur, quantified as a number between 0% and 100% (where 0% indicates impossibility and 100% indicates certainty). The higher the probability of an event, the more certain we are that the event will occur.*
*LoRE**	*Likelihood of a Risk Event.*
Mitigation	Measure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event.
Multi-Attribute Value Function (MAVF)	*A tool for combining all potential consequences of the occurrence of a risk event, and creates a single measurement of value.*
Natural Unit of an Attribute	*The way the level of an attribute is measured or expressed. For example, the natural unit of a financial attribute may be dollars. Natural units are chosen for convenience and ease of communication and are distinct from scaled units.*
Outcome	The final resolution or end result.
Planned or Forecasted Residual Risk	Risk remaining after implementation of proposed mitigations.
Range of the Natural Unit	*Part of the specification of an Attribute. For an Attribute with a numerical natural unit, such as dollars, the smallest observable value of the Attribute is the low end of the range and the largest observable value is the high end of the range. Therefore, any Attribute level that results as a consequence of an event, or a risk mitigation action, or of doing nothing should be found within the range. For weighting purposes, the range of the natural units of*

	an Attribute should be able to describe any mitigation action. For an Attribute with a categorical natural unit, such as corporate image, the range of the Attribute is from the least desirable level to the most desirable level.
Residual Risk	Risk remaining after current controls.
Risk	The potential for the occurrence of an event that would be desirable to avoid, often expressed in terms of a combination of various outcomes of an adverse event and their associated probabilities. Different stakeholders may have varied perspectives on risk.
Risk Driver	Same as definition for Driver.
Risk Event	*An occurrence or change of a particular set of circumstances that may have potentially adverse consequences and may require action to address. In particular, the occurrence of a Risk Event changes the levels of some or all of the Attributes of a risky situation.*
Risk Score	Numerical representation of qualitative and/or quantitative risk assessment that is typically used to relatively rank risks and may change over time.
Risk Tolerance	Maximum amount of residual risk that an entity or its stakeholders are willing to accept after application of risk control or mitigation. Risk tolerance can be influenced by legal or regulatory requirements.
Scaled Unit of an Attribute: a value that varies from 0 to 100	*The scaled unit is set to 0 for the most desirable level of natural unit in the range of natural units. The scaled unit is set to 100 for the least desirable level of natural unit in the range of natural units. For any level of attribute between the most desirable and the least desirable levels, the scale unit is between 0 and 100. The benefit achieved by changing the level of an Attribute in natural units is measured by the corresponding difference in scaled units. In the special case of moving from the least desirable level to the most desirable level, the benefit is equal to 100 scaled units.*
Tranche	*A logical disaggregation of a group of assets (physical or human) or systems into subgroups with like characteristics for purposes of risk assessment.*
Settlement Agreement	*The entirety of the agreement between Pacific Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, and San Diego Gas & Electric Company, The Utility Reform Network, Energy Producers and Users Coalition, Indicated Shippers, and the Public Advocate's Office of the Public Utilities Commission.*

Settling Parties	*Pacific Gas & Electric Company (PG&E), Southern California Edison Company (SCE), Southern California Gas Company (SoCalGas), and San Diego Gas & Electric Company (SDG&E), The Utility Reform Network, Energy Producers and Users Coalition, Indicated Shippers, and the Public Advocate's Office of the Public Utilities Commission.*

Note: New terms added by the SA to those adopted in the Interim Decision are highlighted in italics; revised terms are asterisked.

3. S-MAP Settlement Agreement

3.1. Overview

The proposed SA represents a compromise between the JI and JU approaches to risk assessment and mitigation resulting from extensive negotiations among the parties. The centerpiece of the proposed SA are the steps set forth in Appendix A to the SA (appended as Attachment A to this decision) on the minimum required elements to be used by the large Utilities for risk and mitigation analysis in the RAMP and GRC.

According to the Settling Parties, the proposed SA captures key JIA goals (which in turn mirror S-MAP goals).[21] The SA:

1. Establishes uniform requirements across utilities;
2. Requires mathematically correct and logically sound methodologies;
3. Requires transparency and sufficient data for third parties to assess utility judgments; and
4. Provides for dynamic analysis when the LoRE and CoRE are expected to significantly change over time.

In this section we provide a general overview of the proposed SA, provide background on the JIA and JUA, explain similarities and differences between the proposed SA and JIA and JUA, and assess the impact of the SA on the RAMP.

[21] SED Staff Report at 8.

According to the Settling Parties: "In broad summary the JIA relies on a five-step process that, for each risk assessed, enables determination of pre- and post-mitigation risk for each mitigation under consideration."[22]

The five steps are:

Step 1: Develop a Multi-Attribute Value Function (MAVF), adhering to a specified set of principles, to be used for assessing Consequences of Failure (CoF) for all risks;

Step 2: Develop the condition-dependent hazard rates in order to determine Likelihood of Failure (LoF) for each asset group or system type.

Step 3: Develop probability distributions for the CoF for each asset group or system type.

Step 4: Identify risk mitigation alternatives and the impact of each mitigation alternative identified on either the LoF, CoF, or both.

Step 5: Analysis and ranking of risk mitigation alternatives.[23]

3.2. Background on the JIA and the JUA

The Settling Parties provide basic descriptions of the JIA and the JUA that form the basis of their compromise. The JIA was offered in Phase One of this proceeding while the JUA was not presented until Phase Two of this proceeding. In this Phase Two decision, it is reasonable to provide a high level summary of both approaches before assessing similarities and differences between the two.

[22] Joint Motion at 8.

[23] Joint Motion at 8-9. Settling Parties agreed to use the terms Likelihood of Risk Event (LoRE) and Consequences of Risk Event (CoRE) in place of the previously used terms Likelihood of Failure (LoF) and Consequences of Failure (CoF). (See a further discussion of "Lexicon" terms in Section 2.

As summarized in the Joint Motion:[24]

> The JIA uses a bottom-up analysis to evaluate risk and risk mitigation alternatives. As a result, the JIA allows ranking of mitigations targeted to particular groups of assets or particular systems that have common characteristics. The goal of this targeted approach is to provide the Commission and parties the kind of information that is needed to direct limited utility resources and ratepayer dollars to the mitigations and groups of assets that can produce the most risk reduction benefit. The JIA is a flexible methodology that can accommodate numerous types of problems that need to be confronted in assessment of risk and risk mitigation. Through the dynamic analysis, the JIA identifies optimal risk management strategies for assets and systems whose conditions change in time.

In contrast, the JUA was described by the Settling Parties in this manner:[25]

> In broad summary, the Joint Utilities Approach (JUA) is a comprehensive risk management framework that identifies and assesses risks, analyzes the effectiveness and efficiency of ways to reduce risks, and incorporates quantitative risk assessments into decision making. The JUA was developed to address several criteria that resulted from an analysis of CPUC decisions and materials including being risk focused, safety focused, probabilistic, simple, clear, and transparent, along with cost-effective and accurate. The JUA is a flexible methodology that can be adapted to different levels of sophistication and can be implemented with minimal delay. The JUA was meant to identify the top risks to the company for inclusion in RAMP and analyze the risk reduction provided by mitigations in a multi-attribute context.

[24] Joint Motion at 9.

[25] Joint Motion at 9.

Utilizing a "hybrid" of the two approaches, the SA introduces and moves row by row through the minimum required "steps" that the large Utilities will use to analyze risk and mitigation choices. These are (highlights only):[26]

- Step 1A- Building a Multi-Attribute Value Function (MAVF), a fundamental building block for the risk and mitigation analysis agreed to by parties (Rows 1-7);
- Step 1B- Identifying Risks for the Enterprise Risk Register (ERR) for purposes of determining which risks will be addressed in RAMP (Row 8)
- Step 2A- Risk Assessment and Risk Ranking in Preparation for RAMP (Rows 9 – 11). In steps 10 and 11, each utility will compute a Safety Risk Score for each ERR risk using the Safety Attribute of its MAVF. In this step, it is significant to note that for the risks with the top 40% Safety Risk Score, the utility will also then compute a Multi-Attribute Risk Score using at least the Safety, Reliability and Financial Attributes of its MAVF. These outputs will be used in the step below to identify the risks that RAMP will address.
- Step 2B- Selecting Enterprise Risks for the RAMP (Row 12). In this step the utility assesses which risks are the top ones to be addressed in the RAMP. With input from the above steps, the utility will host a publicly noticed workshop with interested parties and SED staff to gain additional input regarding appropriate risks. Based on input, the utility will make a final determination of risks and submit a rationale to accept or disregard input received during the workshop.
- Step 3- Mitigation Analysis for Risks in RAMP (Row 13 – 25). This step requires a detailed pre- and post-mitigation analysis to determine the risk reduction from mitigation. As specified in Row 14, in order to provide a more detailed or granular view of

[26] *See* Joint Motion at 10-13 and Appendix A-1 through A-18 for a more detailed review of these components and sub-components.

how mitigations will reduce risk, this analysis will be broken down by "tranches," defined as "subgroups of assets or systems with like characteristics, i.e., the same LoRE or CoRE values." For each of the mitigations, the utility will calculate the associated Risk Spend Efficiency (RSE), by dividing the mitigation risk reduction benefit by the mitigation cost estimate. Present values will be used for the numerator and denominator, and should be based on the full set of risk reduction benefits estimated from the incurred costs. A utility has the option to also provide an alternative to an "expected value computation," such as a "tail value,"[27] and parties to the RAMP or GRC retain the right to challenge these alternative assumptions.

- Global Items- Mitigation Strategy Presentation in the RAMP and GRC; Supplemental GRC Analysis; Data; and, Minimum Requirements (Row 26 – 33). Row 28 lists conditions under which each utility will engage in "Step 3" Mitigation Analysis for certain programs proposed in the utility's GRC to mitigate safety or reliability risks that were not otherwise addressed in the utility's RAMP submission.

Other "rows" of the SA set forth key implementation parameters of the agreement including direction to provide additional or updated analyses that exceed "minimum requirements," the promotion of data collection whenever practical or appropriate, an explanation of Subject Matter Expert (SME) processes that support risk determinations, direction to conduct sensitivity analysis if requested, and an emphasis on parties' rights to challenge the sufficiency of utilities' justifications for risk mitigation projects or programs proposed in the

[27] "Tail value" refers to some value at the tail end of a distribution function. For example, the 95th percentile of the Normal Distribution is a form of tail value. In PG&E's recent RAMP proceeding, the Tail Average is also a tail value. In that proceeding PG&E's Tail Average referred to the average of the worst 10 percent of simulated outcomes.

GRC for which the utility elects not to conduct a quantitative analysis of risk reduction and RSE as provided for in the SA.

The Settling Parties propose that the terms of Appendix A of the SA will be implemented within one year of a final Commission decision approving the SA and that "SoCalGas and SDG&E will implement those provisions in their RAMP to be submitted by November 30, 2019, provided that the Commission issues a decision by January 31, 2019."[28] The Settling Parties recommend that the Commission issue a stand-alone decision on the SA since doing so would resolve the "central, resource-intensive issues" in Phase Two.[29]

The Joint Motion indicates that the Settling Parties believe that the SA addresses the first two scoping memo questions set forth in the Phase Two Scoping Memo and several subcomponents of the third scoping memo question (See Section 1.2), namely:

- Ongoing RAMP Evaluation;
- Lexicon;
- Benchmarking/Identify Industry-Wide Practices; and
- Interim and Long-Term Action Plan.[30]

However, as the Settling Parties indicated, "the Settling Parties do not claim that the Settlement Agreement precludes further development through comments by the parties and further action by the Commission if the Commission so desires."[31]

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[28] Joint Motion at 13.

[29] Joint Motion at 14.

[30] Joint Motion at 14.

[31] Joint Motion at 14.

3.3. Key Similarities Between SA and JIA and JUA

According to the JI and JU, the key similarities between the JIA, the JUA, and the SA are the following:

According to the JI:

- Calculates a risk score by multiplying Likelihood of Failure (LoF, or LoRE in SA) with the Consequence of Failure (CoF, or CoRE in the SA) (Row 13);
- Develops a MAVF to assess pre-and post- risk mitigation CoF (CoRE) (Rows 1-7);
- Uses single number probabilities to determine pre- and post- risk mitigation LoF (LoRE) for each asset group (Rows 17 and 20);
- Develops probability distributions for the CoF (CoRE) for each asset group and uses "expected value" for calculations (Rows 5 and 24);
- Estimates risk reductions from risk mitigations by taking the difference between the pre- and post-mitigation risk scores (Rows 16-24); and,
- Analyzes and ranks risk mitigation alternatives based on their estimated RSE (Rows 25-26).[32]

According to the JU:

The JU also provide a comparison of the JUA to the SA and state that similarities include the following: Both are risk-focused, safety focused, multi-attribute, "top-down," ensure transparency and uniformity, and are implementable.[33] Both the JI and JU embrace the concept of the MAVF and greater uniformity, practicality, and transparency in the application of risk-based

[32] July 6, 2018 Intervenor PowerPoint Workshop Presentation at 1.

[33] SED Staff Report at 8.

decision-making models. The similarities between the SA and JIA and JUA establish a strong foundation upon which the parties reached a negotiated SA.

3.4. Key Differences Between SA and JIA and JUA

From the JI perspective, the SA establishes reasonable minimum requirements and achieves most of the objectives of JIA, but is less prescriptive and detailed. In particular, the JIA recommended a "bottom-up" mitigation strategy whereas the SA uses the investor-owned utilities' (IOUs) ERRs as the starting point, and is thus "top-down." As workshop notes observe, "[i]n a top-down approach, during the early stages, risks that are deemed to have less impact do not have to go through a detailed analysis (more efficient, to save resources). Emphasis of the top down approach is to identify top risks."[34] As the Settling Parties observe, the expansion of the SA's proposed Step 3 to the identification and ranking of pre-mitigation Risk Events should be considered in future S-MAPs.[35]

From the JU perspective, the SA is less top-down than the JUA.

Key differences between the SA and the JUA include:

- How the MAVF is constructed, including how attribute weights are determined;
- The level of granularity of the analysis of assets and systems for purposes of determining LoRE and CoRE;
- The methodology for calculating RSE;
- How prescriptive the adopted methodology should be;

[34] SED Staff Report at 8.

[35] SED Staff Report at 8.

- Determinations on whether CoRE should be measured solely by the "expected value" of the distribution of potential consequences, or whether alternative measures, such as "tail value," may be used;
- The scope of risks to which the methodology is applied, *i.e.*, all risks or a subset of risks; and
- The methodology for taking into account changes in asset condition over time.[36]

Another difference is that although providing for uniformity, the SA is "customizable," in that it allows the application of different attributes identified in the MAVF to be applied to each risk to determine the primary potential negative outcomes of the risk, or the CoRE. The SA also establishes a workshop process for Utilities to finalize the risks that would be included in each RAMP. At least two weeks before each pre-RAMP workshop, the relevant utility would release a preliminary list of the risks it plans to include in the RAMP, the Safety Risk Score for each risk identified in the ERR and the Multi-Attribute Risk Score for the top 40% of ERR safety risks, considering, at minimum, safety, reliability and financial impacts. Parties attending the workshop could provide feedback on the preliminary list of risks that each utility intends to include in its RAMP.

The SA requires more granular analysis of risks than the JUA through the identification of "tranches" of risks that represent similar asset types and to which a single risk score is then applied.

Finally, the SA requires that projects justified on the basis of safety and reliability that meet a certain financial threshold level will still receive a RAMP risks analysis in what is called a "GRC Backstop" function (Row 28). As part of

[36] Joint Motion at 9-10.

this, the SA, as noted above, requires the IOUs to calculate the RSE of the risks considered in the GRC Backstop function differently than the JUA proposed. In the SA, the IOUs must calculate the RSE of each risk considered using the present value of the numerator and denominator, whereas the JUA did not use present value as part of the RSE calculation.

3.5. Advantages and Disadvantages of the SA Approach

The SED Staff Report on the July 6, 2018 Workshop and parties' responses form the basis of the following summary of advantages and disadvantages of the SA Approach (partial list):[37]

Advantages:

- The proposed SA Approach accomplishes the short-term objectives described in Section 14.4 of the Interim Decision with the exception of reporting, safety metrics and benchmarking, which remain ongoing efforts led by SED and Energy Division (ED) Staff;
- The proposed SA Approach is a "hybrid" approach that successfully moves the Commission towards a more rigorous quantitative approach to risk assessment and risk prioritization and provides information to help understand the cost-effectiveness of risk mitigations;
- While the addition of the MAVF does not break new theoretical grounds, its use is a "big improvement" and dramatically advances the utility's ability to assess and prioritize risks;
- The proposed SA Approach is consistent with current RCP, GRC, and "10-component" RAMP processes. (*See* discussion in Section 3.6 "Impact on Risk Assessment and Mitigation Phase (RAMP) process.)

[37] SED Staff Report at 4-5.

- Intervenors retain the ability to challenge the validity of how the utilities constructed their MAVF and computed risk scores and how they ranked and selected risk mitigations. Utilities understand that sensitivity analysis on mitigations will be expected of them to better understand the range of uncertainties;
- The proposed SA complies with the Commission's earlier directive in the Interim Decision that utility shareholders' financial interests be excluded from the GRC and RAMP risk evaluation and risk mitigation considerations;
- The proposed SA provides a common vocabulary and expectation of what is required in the utilities' GRC and RAMP submittals;
- The proposed SA will streamline discovery efforts in future RAMPs/GRCs as the successive steps of the proposed SA make utility decision-making more "explicit;"
- The proposed SA utilizes lessons learned from both asset-based and non-asset based risk test-drives that utilities conducted in Phase Two of this proceeding. Test drives included review of "workplace violence," "wires-down," and "gas transmission pipeline failure risk;"
- The proposed SA retains flexibility to add new features (e.g., optimization techniques) faster than would have otherwise been accomplished if the SA approach was not developed;
- The SA model will provide a window into the thought processes at the utility officer level (that can be reviewed by parties). This information has not always been available to other parties, or provided to the Commission;
- Adoption of the proposed SA will result in additional *transparency* and *participation* in how the safety risks for energy utilities are prioritized by the Commission and the utilities, and provide *accountability* on how these safety risks are managed, mitigated and minimized; and,
- From a staff perspective, due to the adoption of a common format, the SA minimizes the amount of resources and time

devoted to understanding the intricacies of the utility risk models.

Disadvantages:

- The proposed SA does not provide a procedure to produce comparable risk scores across utilities. This is theoretically possible but would require a uniform MAVF, common weights, and a great deal of normalization across the utilities, which would be difficult to achieve in practice;
- The proposed SA does not place a prescriptive minimum weight on the safety attribute. According to the Settling Parties, if the Commission adopts a minimum safety attribute weight, this would be a "purely cosmetic" action as the weight on an attribute is not independent of the range of the attribute and the range of all of the other attributes;[38]
- In the absence of complete data to assess risks, the SA models may over- rely on the value of subject matter expertise (SME). Accordingly, the models may give the impression of "false precision" in some cases; and,
- There is likely to be a steep initial learning curve to implement the SA at various levels of the utility organization, but application of the model should become easier and improve with time.

3.6. Impact on Risk Assessment and Mitigation Phase (RAMP) Process

D.14-12-025 provides guidance for assessing and mitigating risk in future GRCs.

The objective of RAMP is to incorporate the risk assessment approach used by each of the energy utilities, as developed in the S-MAP into the GRC process. This will provide a transparent process to ensure that the energy utilities are placing the safety of

[38] SED Staff Report at 16-17.

> the public, and of their employees, as a top priority in their respective GRC proceedings. Each energy utility would be required under the RAMP proposal to submit its RAMP report to the SED as part of the SED process. The purpose of the utility's RAMP report is to provide information about the utility's assessment of its key safety risks and its proposed programs for mitigating those risks.[39]

In response to D.14-12-025 directives, and in cooperation with parties, SED Staff developed a list of ten components that should be included in RAMP filings.[40] In general this framework suggests that Utilities should more fully explain their approaches to risk assessment in RAMP filings, demonstrate progress towards "risk-spend efficiency" calculations, show more progress toward probabilistic calculations, show whether utilities' executive and senior management are engaged in the risk-based decision-making process, and facilitate a process in which RAMP filings smoothly progress to GRCs.[41]

According to the Settling Parties, the SA provides a more robust and stronger version of the ten recommended RAMP components than was first introduced in the Interim Decision.

The following is a list of the SA's proposed refinements to the ten recommended RAMP components:

- Selection of risks: More information is available and more opportunities exist for collaboration regarding how potential RAMP risks are evaluated.
- Type of risks: There is a greater potential for the inclusion of risks that have major safety impact as well as reliability and financial impact(s).

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[39] D.14-12-025 at 35-36.

[40] Interim Decision at 146.

[41] *Ibid.* at 137-144.

- Mitigation selection: RSE calculations for risk mitigations are independent of RAMP risk selection; these are determined by the construction of the MAVF and the nature of mitigations identified for each RAMP risk.

More specifically, the Settling Parties state that revised Steps 1A and 2A (Row 9)[42] of the SA will help a utility to determine, in a more rigorous fashion, a preliminary list of RAMP risks using the safety attribute. This will be followed by the application of the MAVF using a minimum of two additional attributes (reliability and financial).[43] However, as discussed at the July 6, 2018 workshop, under the SA, the mechanics of the RAMP process remain the same,[44] as a similar number of risks are expected to be defined and analyzed under the proposed SA as is occurring in current RAMP filings.[45] According to D.14-12-025, while the S-MAP and RAMP processes provide specific requirements, the Commission retains the flexibility to take action to adjudicate the S-MAP and/or RAMP application process and/or alter schedules as appropriate.[46]

As specified in the SA, each utility must hold a public workshop to present the preliminary lists of RAMP risks in order to solicit input from interested parties.

The SA reflects incremental enhancements or additions rather than significant changes to the RAMP. The RAMP process as revised by the SA will

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[42] Step 1A and Step 2A, Row 9 of the SA refer to building a MAVF and risk assessment and risk ranking in preparation for RAMP.

[43] SED Staff Report at 12.

[44] *See* Interim Decision at 131-136.

[45] SED Staff Report at 12.

[46] *See* D.14-12-025 at 43.

become more robust by giving interested parties an early opportunity to provide feedback on the final list of RAMP risks.[47] Accordingly, the RAMP 10-step process is revised as follows:

Ten Major Components of RAMP Filings Adopted by the Interim Decision

(Steps adjusted or enhanced in response to the Proposed SA)

Step	Description
Overall, the utility should show how it will use its expertise and budget to improve its safety record. To do so, <u>each utility should</u>:	**The goal of the S-MAP proceeding is to make California safer by identifying the mitigations that can optimize safety**
1. Identify its top risks ***As modified by the proposed SA:***	Current: SED currently foresees this including those risks ranked 4 or higher on the 7x7 matrices *Proposed: The SA proposes a significant departure from the use of the 7 x 7 matrix by requiring that each utility build a more rigorous multi-attribute value function (MAVF) <u>(Step 1A, Rows 1-7)</u>[48] and performing risk assessments and ranking risks using safety, reliability, and financial attributes in preparation for the RAMP (<u>Step 2A, Rows 9-11</u>).*[49] *The SA also proposes identifying risks from the Enterprise Risk Register (<u>Step 1B, Row 8</u>)*[50] *and using analysis performed in Step 2A, to preliminarily select risks to be included in RAMP. (<u>Step 2B, Row 12</u>).*
2. Describe the controls or mitigations currently in place	Current: Creates a baseline for understanding how safety mitigation improves over time *Proposed: No change.*
3. Present its plan for improving the mitigation of each risk	Current: Includes analysis of execution feasibility, affordability, and any constraints *Proposed: No change, however the plan should be based on an analysis consistent*

[47] SED Staff Report at 11.

[48] Appendix A at A-5.

[49] Appendix A at A-8 through A-10.

[50] Appendix A at A-7.

	with the SA.
4. Present two alternative mitigation plans that it considered	Current: D.14-12-025 calls for the presentation of two alternative plans *Proposed: The SA methodologies provide for valuation using the MAVF and calculation of a RSE for each mitigation alternative.*
5. Present an early stage "risk mitigated to cost ratio" or related optimization	Current: Pilot calculations are attempting to measure this item, although they are in an early stage *Proposed: For purposes of performing mitigation analysis for risks in RAMP, among other things, the SA provides a more sophisticated calculation of risk by calculating the LoRE multiplied by the CoRE. The CoRE is the weighted sum of the levels of the individual Attributes using the utility's full MAVF (Step 3, Row 13).[51] Further, the SA requires a ranking of all RAMP mitigations by RSE Calculation (Step 3, Row 26) derived by dividing the mitigation risk reduction benefit by the mitigation cost estimate (Step 3, Row 25).[52] (See Step 3, Rows 14-24 for more detail and "Global Items" Rows 26-33.)*
6. Identify lessons learned in the current round to apply in future rounds	Current: Lessons learned by one company will also inform the RAMP filings of the other companies *Proposed: No change*
7. Move toward probabilistic calculations to the maximum extent possible	Current: While not all of a utility's lines of business may have the data needed, some areas can move toward these calculations in the short term *Proposed: Use the probabilistic analysis required by the SA and continue to move towards more probabilistic analysis.*
8. For those business areas with less data, improve the collection of data and provide a timeframe for improvement	Current: By beginning in S-MAP #1, the utilities can position themselves to make major improvements in risk assessment in S-MAP #2 and #3 *Proposed: Continue to move towards improved data collection. (See Global Items, Row 29, "Transparency in RAMP and GRC—Results can be*

[51] Appendix A at A-11.

[52] Appendix A at A-13.

	understood," Row 30, "Sensitivity Analysis, "Row 31, "Data Support and Data Sources" and Row 33, "Minimum Requirements.")
9. Describe the company's safety culture, executive engagement, and compensation policies	Current: Should show how compensation is tied to safety performance, board and executive engagement in safety, and organizational structure related to safety *Proposed: No change.*[53]
10. Respond to immediate or short-term crises outside of the RAMP and GRC process	Current: The RAMP and GRCs follow a three-year cycle and are not designed to address immediate needs; the utilities have responsibility for addressing safety regardless of the GRC cycle *Proposed: No change. (Also See "Global Items" Row 27 "Dynamic Analysis, "Row 28, "Step 3 "Supplemental Analysis in the GRC.")*

3.7. Utility RAMP Filing Schedules

The following is a schedule of completed and upcoming RAMP filings:

	Issue Letter Requesting Order Instituting Investigation (OII)*	**RAMP Filing**	**GRC Filing**
Sempra TY 2019[54]	*Sept 1, 2016*	*Nov 30, 2016*	*October 6, 2017*
PG&E TY 2020[55]	*Sept 1, 2017*	*Nov 30, 2017*	Jan 1, 2019[56]
SCE TY 2021	*Sept 1, 2018*	*Nov 15, 2018*	Sept 1, 2019

*italicized items have been completed

[53] SB 901 (Pub. Util. Code § 8386) signed by the Governor on September 21, 2018, directs the Commission to "require a safety culture assessment of each electrical corporation to be conducted by an independent third-party evaluator…. at least every five years."

[54] Sempra has a request pending before the Commission in their still open Test Year 2019 GRC proceeding (A.17-07-007/-008 consolidated) for a four-year GRC term. If the Commission adopts Sempra's request in the Sempra TY2019 GRC, the dates for future Sempra RAMP/GRCs filings in this table would change, probably shifting the schedule out by one additional year.

[55] PG&E RAMP submissions currently include all Commission-regulated systems including Gas Transmission and Storage (GT&S). (*See* Interim Decision COL 33 at 192.)

[56] PG&E requested that the original filing deadline of September 1, 2018 be extended to January 1, 2019. The extension request was granted by the CPUC Executive Director.

Consistent with the format established in the Interim Decision, the following is a schedule of upcoming RAMP filings:

	Issue Letter Requesting OII	**RAMP Filing**	**GRC Filing**
Sempra TY 2022	Sept 1, 2019	Nov 30, 2019	Sept 1, 2020
PG&E TY 2023	Sept 1, 2020	Nov 30, 2020	Sept 1, 2021
SCE TY 2024	Sept 1, 2021	Nov 30, 2021	Sept 1, 2022

4. Tests to Approve Settlement and CPUC Response

4.1. CPUC Requirements

The Commission's Rules of Practice and Procedure set forth the following standard for review of settlements:

> 12.1 (d) The Commission shall not approve settlements, whether contested or uncontested, unless the settlement is reasonable in light of the whole record, consistent with the law, and in the public interest.

4.2. Settling Parties' Comments

As detailed below, the Settling Parties provide a rationale regarding why they believe the SA is reasonable in light of the whole record, consistent with the law, and in the public interest.

4.2.1. Reasonable in Light of the Whole Record

Settling Parties assert that a substantial record has been developed since the utilities' applications were filed in May 2015. With the inclusion of additional documents identified in the SA and subsequently entered into the record, the existing record is even more robust. In addition to participating in multiple workshops, and technical working group meetings, the Settling Parties served an extensive set of analyses of their respective approaches to risk modeling, including detailed test drives of specific risks. According to the

Settling Parties, "[t]hey also engaged in 44 hours of settlement discussions during the period December 2017-March 2018."[57]

Second, Settling Parties argue that the Commission generally finds a settlement to be reasonable in light of the whole record when parties have made substantial concessions. They point out that the record includes detailed descriptions of the original JI and JU proposals. Settling Parties provided detailed justifications for their specific approach, related resource requirements or limitations and the potential outputs of their methodology. Although the original proposals had significant differences at the beginning of settlement negotiations, Settling Parties observed that they "needed to make material concessions from their initial position to achieve the negotiated result in the Settlement Agreement."[58]

Third, parties contend that the Commission should find that the SA is reasonable in light of the record because the "Settlement Agreement represents the collective best efforts of the Settling Parties, which include ratepayer advocates and electric and gas utilities."[59]

4.2.2. Consistent with Law

The Settling Parties believe that the SA is consistent with the law because it does not contravene a statute or prior Commission decision (e.g., D.17-03-005 at 6). They assert that SA terms are consistent with the Pub. Util. Code, prior Commission decisions, and other applicable laws.

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[57] Joint Motion at 16.

[58] Joint Motion at 16.

[59] Joint Motion at 16.

Settling Parties argue that the SA is directly responsive to the mandates of SB 705, which is now codified in Pub. Util. Code §§ 961 and 963 as discussed in the December 16, 2016 Scoping Memo.

> In response to the Risk OIR, and as a result of Senate Bill (SB) 705, and its emphasis on making natural gas safety a top priority of this Commission, the existing [Rate Case Plan] was modified in Decision (D.) 14-12-025 to incorporate a risk-based decision-making framework into the [General Rate Cases] for the large energy utilities. Such a framework and associated parameters assists the utilities, interested parties, and the Commission in evaluating how energy utilities assess their safety risks, and to manage, mitigate, and minimize such risks.[60]

According to the Settling Parties, the SA adopts "a framework and associated parameters" that prescribe "detailed minimum requirements" for the utilities' risk and mitigation analyses. The SA requires "improved prioritization of safety risks and mitigations in the RAMP and GRC."[61] For these reasons, the SA should be considered consistent with the law, they state.

4.2.3. In the Public Interest

Finally, the Settling Parties believe the Commission should find that the SA satisfies the "public interest" criterion for approval of settlements. First, they contend that "[r]esolving complex issues through the SA avoids costly and protracted litigation."[62] They assert that the SA is a reasonable approach to evaluating the relationship between utility investments, with costs incurred by ratepayers, and reduction in utility and reliability risk, they argue.

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[60] Joint Motion at 17 quoting December 13, 2016 Scoping Memo and Ruling of the Assigned Commissioner at 2-3.

[61] Joint Motion at 17.

[62] Joint Motion at 18.

The Settling Parties also caution that the Commission should not necessarily substitute its judgment for that of parties to a settlement:

> We have acknowledged in prior decisions the strong public policy in California favoring settlements and propriety of settlement in utility matters. If our goal truly is to encourage settlements or stipulations, then we must resist the temptation to alter the results of a good faith negotiation process unless the public will be harmed by the agreement. Otherwise, parties will legitimately grow wary of our settlement process if we alter settlements as a matter of course. Substituting our judgment for that of parties is only appropriate if the public interest is in jeopardy.[63]

In this regard, the Settling Parties state: "Nothing in the Settlement Agreement would jeopardize the public interest."[64] The Settling Parties met regularly over an extended period of time and negotiated in good faith, they note.

Further, the Settling Parties point out that the SA is in the public interest because it achieves many of the Commission's objectives as stated in prior decisions (i.e., D.14-12-025 and D.16-06-018) and the December 16, 2016 Scoping Memo. Accordingly, the SA offers "uniform and common standards" by which the large utilities will evaluate and model risks and perform mitigation analysis, including the calculation of risk reduction, as the basis for future RAMP and GRC filings. The Settling Parties then list many of the benefits of adopting a common risk framework including the ability to streamline proceedings and

[63] Joint Motion at 18, citing Footnote 26.

[64] Joint Motion at 18.

minimize the amount of resources and time devoted to understanding the intricacies of various models.[65]

The Commission has urged increased quantification and sophistication with each successive S-MAP that includes considering a shift from logarithmic to linear scales in addressing consequences of failure, they note. The parties assert that "[t]he Settlement Agreement's risk management approach is significantly more sophisticated than the utilities' current approaches as it is more quantitative, data driven, and incorporates greater mathematical rigor into the methodology."[66] They support this conclusion by observing that, "Settling Parties have agreed to perform detailed pre- and post-mitigation analysis using LoRE and CoRE."[67] And, consistent with Commission objectives, they point out that the quantitative calculations agreed to in the SA do not include logarithmic scales.

Consistent with prior Commission objectives, the Settling Parties observe that the use of the SA's proposed risk-based decision-making framework will result in additional "transparency" and "participation" in how safety risks for energy utilities are prioritized by the Commission and utilities. Use of the SA proposed framework will provide "structured opportunities" for stakeholders to engage in processes pertaining to calculations of risk reduction and RSE, they assert.

Consistent with the Commission's prior goal that the utilities should "create risk models either at the asset level or structured by event and rolling

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[65] Joint Motion at 19.

[66] Joint Motion at 19.

[67] Joint Motion at 19.

them up into higher levels," the Settling Parties propose the use of "tranches" in the SA's Step 3 Mitigation Analysis.[68] Use of tranches "brings a granular focus on subgroups of assets with like characteristics, by calculating the LoRE and CoRE for each Tranche subject to the identified risk event."[69]

Consistent with the direction provided in D.14-12-025, the Settling Parties conclude by stating that the settlement addresses "minimum requirements" to be provided by the utilities. The utilities are free to provide additional information and justification, they state. Intervenors can still challenge proposed spending and request more information. The settlement does not adopt any specific revenue requirement or prejudge what is the appropriate level of spending, and the Commission is ultimately responsible for these determinations, they observe. Finally, the Settling Parties observe that the SA does not preclude other long-term goals of the Commission, such as "optimization" and "explicit risk tolerance standards."[70]

4.3. Discussion

The Settling Parties provide compelling reasons regarding how the SA meets the three criteria in Pub. Util. Code § 12.1.

1. The SA is reasonable in light of the record.

Regarding the first criterion, we agree with the Settling Parties' assessment that the SA is reasonable in light of the record. A substantial and robust record has been developed since utilities submitted applications in May 2015. For each approach considered, utilities and intervenors provided an extensive set of

[68] Joint Motion at 20.

[69] Joint Motion at 20.

[70] Joint Motion at 20.

written analyses that were supported by detailed test drives of asset and non-asset based risks. These were accompanied by justifications that included resource analyses, limitations, and potential outputs. The JI and JU approaches were thoroughly vetted in staff-led workshops that included an opportunity for parties to present a cross section of views. These intensive deliberations were captured in detailed workshop summaries that were subsequently entered into the record. Consequently, using this information as a foundation, the Settling Parties entered into 44 hours of extensive negotiations during the period of December 2017 and March 2018.

We agree that that the Settling Parties made substantial concessions during the negotiation process. As discussed at various workshops, at the outset of negotiations, the Settling Parties had widely divergent views in terms of the level of detail required to support a more probabilistic approach. As differences were acknowledged, the Settling Parties entered into good faith "give and take" negotiations that resulted in substantial concessions by both sides. As detailed in the procedural history, Settling Parties participated in five workshops, 20 technical working group sessions, and multiple meet and confer sessions; and provided six status reports to the Commission regarding their progress in test drives and/or settlement discussions.

The resulting compromise in the SA entailed a set of "minimum requirements" that not only conformed with previous S-MAP decision mandates (D.14-12-025 and D.16-08-018), but also allowed flexibility to enable the framework to become more sophisticated over time. The SA represents a reasonable compromise between the litigation positions of parties as developed in the extensive record of this proceeding.

2. The SA is consistent with applicable laws, the Pub. Util. Code, and prior Commission decisions.

No term of the settlement contravenes any statutory provisions or prior Commission decisions. Further, it is fully consistent with SB 705 and is consistent with Pub. Util. Code, prior Commission decisions, and other applicable laws.

3. The Settlement is in the public interest.

Finally, we are convinced the SA reflects the public interest for many reasons. We agree with the Settling Parties that with the benefit of a Settlement, the proceeding avoids costly and protracted litigation that would have impeded progress towards achievement of safety objectives.

We agree with the Settling Parties that the SA is a complete resolution of Issue 3.1 ("Should the JIA be adopted as a uniform approach?") and Issue 3.2 ("Should any of the Utilities' Alternative Approaches be adopted as a Uniform Approach?"). The SA partially addresses Issue 3.3 ("How should other issues presented in the Interim Decision be addressed?") since the SA is compatible with the enhanced 10-step RAMP process and updated Lexicon. As discussed in Section 1.3, the SA resolved most of the Interim Decision's short-term issues.

Other issues such as accountability reports and performance metrics, which were not addressed by the SA, will be addressed by a second Phase Two decision in early 2019. Benchmarking[71] and interim/long-term action plans will be addressed by an OIR to be initiated mid-2019 in lieu of a second round of S-MAP applications. (See Section 6 "Next S-MAP Phase: Application or OIR.")

[71] "Benchmarking" refers to comparing a utility's business processes (e.g., risk-based decision making in the context of general rate cases) and performance metrics to industry best and best practices from other utilities.

Broadly speaking, the SA satisfies the short-term Road Map laid out in D.16-08-018[72] including the adoption of a more uniform approach toward calculation of risk reduction and adoption of a MAVF subject to verification of test runs.

While the addition of the MAVF does not break new theoretical grounds, we agree that its use is a big improvement, dramatically advances the utility's ability to assess and prioritize risks, and offers many advantages as follows:

- The proposed SA demonstrates success towards moving toward a more rigorous, quantitative method to risk assessment and risk prioritization in providing information required to better understand the cost effectiveness of proposed mitigations.
- As the proposed SA prescribes only "minimum requirements," intervenors retain the ability to challenge the validity of the methodology used by the utilities to construct a MAVF and compute risk scores, and to rank and select mitigations.
- The proposed SA complies with the Commission's earlier directive in the Interim Decision that utility shareholders' financial interests be excluded from GRC and RAMP risk evaluation and risk mitigation considerations.
- The proposed SA will streamline discovery efforts in future RAMPS/GRCs.
- The proposed SA retains flexibility to add new features (e.g., optimization techniques) faster than it would have otherwise been accomplished.
- The model provides a window to the thought process at the officer level (that can be reviewed). This information has previously not always been available. It will thus result in additional *transparency* and *participation* in how the safety risks for energy utilities are prioritized by the Commission and the

[72] SED Staff Report at 12-13.

> energy utilities, and provide *accountability* for how these safety risks are managed, mitigated and minimized.[73]

We acknowledge Settling Parties' concerns that altering the results of the SA may jeopardize its status by potentially disrupting the negotiated balance of settling parties' interests. This does not, however preclude the Commission from revising certain elements of the settlement as part of its independent review of the agreement, and to best advance the public interest and goals of this proceeding. In particular, in this decision, the necessary adjustments that we made to the Lexicon and 10-Step RAMP process, as detailed in Sections 2 and 3.7, do not materially modify the existing terms and provisions of the SA and are consistent with stated goals of the proceeding. We consider these proposed changes as "reinforcements" or "enhancements" to the current Lexicon and 10 components of the RAMP process and therefore approve them as presented in Sections 2 and 3.7 of this decision. Similarly, we find it appropriate to modify the agreement to provide a minimum safety weight of 40% to ensure that the safety attribute is weighted most heavily.[74] During Phase One of this proceeding, parties were formally asked via ALJ ruling on January 29, 2016 for their opinion regarding this goal as reflected in an Intervenor White Paper:[75]

According to the Intervenor White Paper:

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[73] *See* D.14-12-025 at 3, 10.

[74] Interim Decision at 174.

[75] *See* "Intervenor Perspective Regarding an Improved Methodology to Promote Safety and Reliability of Electric and Natural Gas Service in California," prepared for the S-MAP Workshop January 25, 2016, by Charles D. Feinstein, Ph.D and Jonathan A. Lesser Ph.D. on behalf of the Utility Reform Network/Indicated Shippers/Energy Producers and Users Coalition (Revised January 28, 2016) at 34.

> The simplest method to ensure prioritization of safety is for the Commission to set a prioritized weight for safety and allow the utilities to identify all other attributes and develop all other weights. To the extent that the Commission elects to specify all consequence dimensions and the relative weights, it would similarly be required to set the attribute levels. While a public process could be established to identify attributes and set weights, this process would be time and labor intensive, and would significantly delay implementation of proper multi-attribute utility functions. To the extent that the Commission decides it is desirable to identify and weigh all attributes, either on its own or within a public process, that process is best suited for the next S-MAP proceeding.[76]

The utilities expressed concerns about the ability to easily implement such a goal, including that "these weights would all have to be set by the Commission before the methodology could be utilized, and they would be time consuming and controversial."[77] They also argue that the lack of data and subject matter expertise may entail "classifying risk at a coarse qualitative level"[78] and that the weighted criteria are unique to the preferences of the organization using them."[79] On the other hand, JI support having the Commission identify its "preferred attribute weight for a public and employee safety attribute."[80] This can be done in a thoughtful transparent way that allows the Commission and Intervenors to evaluate the weights and determine that they "align with decision maker preferences."[81]

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[76] Intervenor White Paper at 22.

[77] Utilities February 12, 2016 Comments on Intervenor White Paper at 16-17.

[78] *Also* see MGRA February 12, 2016 Comments on Intervenor White Paper at 8.

[79] Utilities February 26, 2016 Reply Comments on Intervenor White Paper at 7.

[80] JI February 12, 2016 Comments on Intervenor White Paper at 4.

[81] JI February 12, 2016 Comments on Intervenor White Paper at 4.

When asked by the ALJ at the July 6, 2018 workshop why a minimum 40% value for the safety attribute was not adopted by the SA,[82] the Settling Parties responded as follows. Mr. Mason Withers from SDG&E said that, "there is an interplay between selecting a weight for the attribute and the range of the attribute."[83] Withers further elaborated that there is nothing "magical" about the weights. "It's more of an optics thing. If you say it has to be 40%, it depends on what the range is."[84] Dr. Feinstein, consultant to the JI, reinforced this theme when he stated, "weight on an attribute is not independent of the range of the attribute and the range of all of the other attributes."[85]

In this decision, we reiterate the Commission's commitment to making safety its highest priority. In the application of the MAVF, and to ensure that the safety weight is more heavily weighted than financial, or reliability attributes, we concur with the JIs' earlier recommendation that it is reasonable for the Commission to establish a prioritized weight for the safety attribute, given its paramount importance. In this regard, we believe that a minimum weight of 40% for the safety attribute in the MAVF is reasonable unless the individual utilities clearly justify a lower weight based on their respective internal analyses of real-world project considerations that specifies a lower attribute weight while simultaneously considering the tradeoffs among the attribute ranges.[86] [87] We

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[82] Appendix A at A-6 ("MAVF Principle 6-Relative Importance").

[83] SED Staff Report at 17.

[84] SED Staff Report at 17.

[85] SED Staff Report at 17.

[86] *See* Intervenor White Paper at 22-23 that discusses how tradeoff analysis is accomplished using weights for "money" (which measures the value provided by incremental cash flows or cost savings), "reliability," and "safety."

agree with the JI that any perceived subjectivity is subject to review by the Commission, which has the authority to intervene and ensure that the assigned weights reflect Commission values. We do not believe that the existence of "perfect" data is needed to implement a MAVF. From a practical standpoint, the MAVF with a minimum safety weight can be implemented while the Utilities gather additional data to ensure implementation of improved risk management in the future. As Mr. Long from TURN observed at the July 6, 2018 workshop: "The perfect is the enemy of the good."

In this decision, by exception, we revisit Interim Decision issues related to the JI and JU multi-attribute risk assessment models and frameworks, Lexicon, RAMP, and the short and long-term Road Maps and provide appropriate guidance to Utilities. However, in this decision, we do not revisit other foundational broad policy and technical issues related to the Interim Decision. These include, but are not limited to, the Cycla Corporation (Cycla) 10-step evaluation method as a common yardstick for evaluating the maturity of utility risk assessment and mitigation models; other alternative models to promote uniformity (e.g., ALARP[88]); limitations of current Utility CoF Methodologies; the building blocks of probabilistic modeling; and, potential barriers to effective implementation of new frameworks for consideration. The key drivers of both

[87] It is conceivable that a utility could use more than one safety attribute in its MAVF, such as PG&E in its recent RAMP (I.17-11-003). Therefore, the combined value of safety attributes employed should be at least 40%.

[88] *See* Interim Decision at 65. According to SED Staff who authored an ALARP White Paper during Phase One of this proceeding, "ALARP is a systemic risk-informed decision framework used to decide whether risk mitigation is needed and, when it is needed, how much should be spent until the mitigation costs are deemed to be grossly disproportionate relative to the benefits. It is a framework used to address the tradeoff between safety and utility rate affordability."

the Interim Decision and this decision are the same even though implementation details related to the specific "hybrid" multi-attribute approach and "modified" RAMP processes are different or are enhanced.

5. Long-Term Road Map

5.1. D.16-08-018 Long-Term Road Map

The Scoping Memo for Phase Two of this proceeding asked the question regarding what constitutes an updated interim and long-term plan to migrate from relative risk scoring for prioritized tasks to a more quantitative method for optimized risk mitigation.

The Interim Decision adopted the following longer-term interim goals subject to review and revision in the second phase of this proceeding:

1. Implement the Joint Intervenor Multi-Attribute methodology (or utility equivalent features) and supplement it with more refined methods to optimize portfolio or risk mitigations.
2. Develop a Risk Tolerance Framework.
3. Develop methodology to produce comparable risk scores across utilities.
4. Perform ongoing review of other models (e.g., "ALARP/Loss Exceedance" Models).
5. Revisit utility RAMP filings and requirements.
6. Increase application of optimization.
7. Review CoF impact categories.
8. Review interacting risk drivers.[89]

[89] *See* Interim Decision at 175-176. Long-term goals were extensively vetted in parties' comments received on the Intervenor White Paper and Phase One Scoping Memo Question #13 on February 12 and February 28, 2016.

5.2. Parties' Comments

As to future matters to be considered in the next S-MAP, Section 1.E. of the SA identifies two issues for future consideration by the Commission.[90] First, the SA recommends that a future S-MAP or other appropriate proceeding formally review the lessons learned from implementation of the SA and in particular consider the need for changes and refinements to Row 28 of the "Global Items" section of the SA. Row 28 identifies the required steps for a "GRC Backstop" process to apply the SA analysis process to risks not contained in the RAMP but for which the GRC proposes mitigations and related funding. Row 28 requires the Utilities to conduct a mitigation analysis as set forth in Step 3 (Mitigation Analysis of Risks in RAMP) of the SA for any program, unless otherwise provided, that it proposes in its GRC that meets the following criteria:[91]

> (a) the program was not addressed in the RAMP; (b) the utility justifies the program primarily on the basis of reducing a safety or reliability risk; (c) the program is associated with the portion of the electric system under CPUC jurisdiction ("Electric Operations") or with the natural gas transmission or distribution pipeline system or storage facilities ("Gas Operations"); and (d) the CPUC jurisdictional forecast cost of the program in the GRC equals or exceeds the following thresholds: (ii) For PG&E, SCE, and SoCalGas: cumulative $75 million over three years for capital programs and $15 million in the test year for expense programs; (ii) for SDG&E, cumulative $37.5 million over three years for capital programs and $7.5 million in the test year for expense programs.

Second, the SA indicates that the Settling Parties propose that the next S-MAP consider the need for modifications to several steps (Steps 1B, 2A, 2B of Row 28) by which risks are identified and ranked for assessment in the RAMP.

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[90] SA at 3-4.

[91] Appendix A at A-14-15.

These should be modified to (1) use a consistent definition of "Risk Events," as defined in the SA; and/or (2) define the identified risks and/or to use the Settlement Step 3 Approach (i.e. rows 13-25 of Appendix A) for identification and ranking of pre-mitigation Risk Events.[92]

SoCalGas/SDG&E recognized the need to address topics "such as risk tolerance, consistently using risk events, etc."[93]

In comments on the July 6, 2018 workshop, several parties expressed views regarding S-MAP priorities following the conclusion of the first S-MAP. SCE said that the following issues should be considered following the first S-MAP:

- Scope of risk analysis (safety risks only or safety and non-safety risks);
- Overcoming challenges with risk quantification and data availability;
- Incorporating concepts of uncertainty into analysis;
- Potential redundancy between the risk analysis performed in RAMP filings and the risk analysis that would be required in the GRC if the SA is adopted.[94]

In comments on the July 6, 2018 workshop, TURN stated that the following items identified in the Long-Term Road Map discussion in D.16-08-018 warrant consideration in a potential Rulemaking:

- Further consideration of the necessity for a risk tolerance and development of that tolerance (D.16-08-018 at 176, Item 2);
- Identification of additional changes required to make risk scores more comparable across utilities (D.16-08-018 at 176, item 3); and
- Development of methodologies for addressing interacting risk drivers (D.16-08-018 at 176, item 8)[95]

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[92] SA at 3-4.

[93] SoCalGas/SDG&E September 24, 2018 Comments at 9.

[94] SCE September 24, 2018 Comments at 10.

In comments on the SA, OSA notes that matters identified in the SA for consideration in future S-MAP proceedings do not include the need to address Safety Management System Standards. Therefore, OSA recommends that safety management systems and standards, and the implementation and evaluation of such systems and standards, be included in the next S-MAP proceeding.[96]

5.3. Discussion

Settling Parties have made tremendous progress in the development of a MAVF (#1 existing goal bolded below), an enhanced and more robust RAMP process (#5 existing goal bolded below), and review of CoF impact categories (#7 existing goal bolded below). In the longer term, it is reasonable that future RAMP activities continue to aim for further progress and refinement on these same eight topics, in varying degrees as necessary, as originally envisioned in D.16-08-025, and reemphasized below. We also agree with TURN that subject to verification in a subsequent OIR Scoping Memo, emphasis could be placed on developing a risk tolerance framework, developing comparable risk scores across utilities, and reviewing interacting risk drivers (#2, #3, #8 existing goals italicized below).

Existing Goals:

1. **Implement the Joint Intervenor Multi-Attribute methodology (or utility equivalent features) and supplement it with more refined methods to optimize portfolio or risk mitigations.**
2. *Develop a Risk Tolerance Framework.*
3. *Develop comparable risk scores across utilities.*

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[95] TURN September 24, 2018 Comments at 8.

[96] OSA Comments on SA at 2.

4. Perform ongoing review of other models (e.g., "ALARP/Loss Exceedance" Models).[97]
5. **Revisit utility RAMP filings and requirements.**
6. Increase application of optimization.
7. **Review CoF [CoRE] impact categories.[98]**
8. *Review interacting risk drivers*.[99]

Additional Goals:

The following list is a summary of other issues highlighted by parties that could be considered in in future S-MAP proceedings in addition to the original eight issues listed in D.16-08-018:

1. Consider changes and refinements to GRC "Backstop" which applies SA analysis process to certain risks not contained in a Utility's RAMP (Settling Parties);
2. Consider modifying SA processes for selecting risks to be assessed in RAMP by consistently using Risk Events to define utility identified risks and using SA "Step 3" methodology to identity and rank risks (JI);
3. Assess the appropriate scope of risk analysis (safety risks only or safety and non-safety risks) (SCE);
4. Overcome challenges with risk quantification and data availability (SCE);
5. Incorporate concepts of uncertainty into risk and risk mitigation analysis (SCE);

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[97] See Interim Decision at 62-81 for a discussion of these models.

[98] As previously mentioned, as part of the SA, the Settling Parties agreed to use the term Consequences of Risk Event (CoRE) in place of the previously-used term Consequences of Failure (CoF).

[99] Interim Decision at 175-176.

6. Address potential redundancies between the risk analysis performed in RAMP filings and the risk analysis that would be required in the GRC if the SA is adopted (SCE);[100] and,
7. Develop safety culture metrics to evaluate utilities' safety performance that can enhance the reliability of risk and risk analyses pertaining to rate cases (OSA).

In a continued iterative fashion, we caution that more work will likely be done on *each* of these original eight issues. For example, while the parties resolved widely diverging views and proposed a common MAVF, the construction of scaled units for each Attribute of a risky event (as defined in the SA) can be refined over time. In cooperation with parties, the Commission will have a key role in establishing or evaluating value functions, the relative weighting of these functions and ratifying how these values are determined within the utility. Similarly, based on lessons learned, we expect Commission requirements for RAMP filings to be further refined over time.

While Utilities have made great strides in moving towards more uniform and quantitative risk assessment in the SA, much of the assessment remains subjective. For instance, it was clear from discussions at the July 6, 2018 workshop, that the weight of each attribute in the MAVF is largely determined on a subjective basis by SMEs within each utility. Given how fundamental these weights are to the outcomes of utility risk assessment, the Commission and parties need to consider potential alternative methodologies to minimize the subjectivity and variability inherent in choosing these weights in favor of more quantitative assessment. This will also allow for more consistency across utilities, in line with the overarching objectives of the SMAP proceeding.

[100] SCE September 24, 2018 Workshop Comments at 10.

Following is a discussion of some of the topics to be considered in a Long-Term Road Map:

40% Minimum Safety Weight:

Future SMAPs should consider the 40% minimum weight for safety attributes mandated by this decision to see how well it is working and whether a different weight is more appropriate. (See a discussion of this topic in Section 4 "Tests to Approve the Settlement and CPUC Response.")

Risk Tolerance & ALARP:

These topics were discussed at some length in the Interim Decision, and were presented as a more sophisticated approach. The Interim Decision did not adopt the SED Staff #1 recommendation related to recommended adoption of risk tolerance standards primarily because the decision states that the building blocks of probabilistic analysis need to be developed first.[101] The SA does not address this topic in any fashion but these two topics remain a priority topic for the Commission to address in the anticipated new OIR or future S-MAPs, starting with the next cycle—namely, to consider adopting explicit risk tolerance levels.

As the Interim Decision observes, establishing risk tolerance levels is not an easy task. There are three essential components in a full ALARP framework:[102]

1. The upper and lower risk tolerance limit lines define three regions: the intolerable region, the ALARP region, and the broadly acceptable region;

[101] Interim Decision at 78-81.

[102] Interim Decision at 62.

2. The cost/benefit gross disproportionality ratio.

3. "FN" curves (also known as loss exceedance curves).[103]

For a full ALARP framework to work, all three components have to be present. Both the risk tolerance limit lines and the disproportionality ratio have to be established by regulatory action. However, the risk tolerance limit lines and the gross disproportionality ratio can be adopted separately or together. If only one component was adopted (i.e., either risk tolerance limits or gross disproportionality ratio), either component could still find application in the S-MAP proceeding outside of the ALARP framework.

Optimization of a Portfolio of Risk Mitigation Activities and Absolute Risk Scores:[104]

In tandem with ALARP, "optimization" of a portfolio of risk mitigation activities is necessary to "1) minimize total cost at fixed level of total risk reduction, 2) maximize total risk reduction at fixed portfolio cost, or 3) to produce some other optimal outcomes subject to constraints."[105] As Settling Parties point out, the SA does not preclude consideration of the following in the future: 1) the need for optimization of a portfolio of risk mitigation activities;

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[103] The definition of frequency-fatalities exceedance curves, or FN curves is that for any threat that can affect public safety, an FN curve plots the frequency (measured in deaths/person-year) of accidents with **N or more** fatalities per year caused by that threat on the vertical axis against different values of N on the horizontal axis. In essence, an FN curve describes the accident-causing potential (measured in frequency of N or more fatalities) of an identified threat, as that threat applies to a utility operator based on the operator's unique circumstances.

[104] According to the Interim decision (page 119, footnote 119), an "absolute risk score" is based on "a representation of the magnitude of risk based on a linear-scale risk formula, often expressed by risk=LoF x CoF." *See* "Section 5.4 General Observations on Risk Scores." Since this definition was not defined in the SA, this definition may be refined in a subsequent OIR of this proceeding.

[105] Interim Decision at 74 quoting TURN Comments on ALARP White Paper at 2.

and 2) moving from relative to absolute risk scores.[106] On optimization, the Interim Decision noted that we need several more years of evolving utility models, data collection, identification of constraints, and assessments to make substantive progress on a potential common approach.[107] As the SED Staff Report notes, "Dr. Feinstein pointed out [at the workshop] that although the utilities are not performing rigorous optimization yet, the Proposed Settlement process of ranking mitigation alternatives based on risk spending efficiency is in fact an 'optimization heuristic.' It's an approximate method, but they are beginning to do it."[108] As the SED Staff Report observes, "[t]he path to implementing optimization techniques can best be described at an embryonic stage."[109]

On absolute risk scores, the absence of discussion around absolute risk scores could be perceived as a gap in the SA. However, the dimensionless risk scores produced by the SA are linear-scale and have a direct (and arguably "absolute") relationship to the defined risk attributes. However, we acknowledge that this issue requires much more groundwork and attention in the future.

Benchmarking:

The SA does not address the topic of benchmarking. During the very first webinar held by the Settling Parties to explain the SA, Settling Parties remarked, in response to a question, that they hadn't yet had the opportunity to address

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106 Joint Motion at 20 citing Interim Decision at 41.

107 Interim Decision at 93.

108 SED Staff Report at 13.

109 SED Staff Report at 13.

this issue and that comparable statistics across the country are not readily available. The Interim Decision and Second Phase Scoping Memo envisioned benchmarking by utilities in future S-MAPs.[110]

As detailed in the Interim Decision, "[Benchmarking] also means reaching out to industry associations, utilities in other states, or possibly to other non-utility companies, to understand how and to what extent those companies use risk-informed decision making, how they inject it into their GRCs, how they measure and evaluate the results, and what success or failure they have had. Benchmarking will likely provide valuable input into the next S-MAP."[111] Benchmarking should be included in any discussion related to the Long-Term Road Map.

The issue regarding whether longer-term goals for the S-MAP should be further prioritized and resolved via the existing S-MAP application process or a new OIR is addressed in the following section.

6. Next S-MAP Phase: Applications or OIR

6.1. D.14-02-025 Requirements

D.14-02-025 directed the four large utilities to file separate S-MAP applications to describe the approaches, models, and methodologies they plan to use to assess the risks in their utility operations and systems that pose a safety risk to the public and utility employees, and how they plan to manage, mitigate, and minimize such safety risks, in the context of GRC proceedings.[112] D.14-12-025 directed that the 2015 S-MAP would be the first proceeding of this

[110] Interim Decision at 163, Phase Two Scoping Memo at 10.

[111] Interim Decision at 163.

[112] D.14-12-025 at 2-3.

type and that at least one additional S-MAP proceeding would occur. The Commission's intent, as set forth in that decision, is "for each successive S-MAP to become more sophisticated, be able to respond to changing circumstances, and be able to build on its predecessor S-MAP to tackle increasingly difficult issues."[113] The next S-MAP applications by large utilities are due May 1, 2019.

6.2. Parties' Comments

At the July 6, 2018 workshop, parties discussed the idea that rather than submitting a second round of S-MAP applications on May 1, 2019,[114] an OIR would be the best vehicle to direct continued development of utility risk-based decision-making processes for future S-MAP application cycles. In post-workshop comments, PG&E stated, "PG&E is open to the idea [of a rulemaking] and believes that direction from the Commission on what to discuss in the next S-MAP is the most productive course of action moving forward."[115] Similarly, SCE supports the idea of an OIR for two primary reasons. First, it explains that a collaborative approach undertaken through workshops has been productive since it resulted in a SA. They further opine that a similar approach will enable parties to refine processes used to prioritize programs and projects intended to mitigate safety risks.[116] Second, "SCE supports a rulemaking because SCE will not have sufficient time before the next S-MAP proceeding is currently due to be filed to fully implement and test the processes described in the

[113] Interim Decision at 23.

[114] On March 14, 2018, the Commission's Executive Director granted the JU/JI's March 12, 2018, request to extend the filing date for second S-MAP applications from May 1, 2018 to May 1, 2019. Also *see* D.18-05-044 "Order Extending Deadline" issued June 5, 2018.

[115] PG&E September 24, 2018 Comments at 3.

[116] SCE September 24, 2018 Comments at 9.

Settlement Agreement."[117] Similarly, SoCalGas/SDG&E support the idea of converting the second-S-MAP to an OIR instead of an application.[118] They assert that "[i]n the second S-MAP proceeding, the Commission can decide whether the S-MAP proceeding should continue in the future or be terminated."[119] SoCalGas/ SDG&E agree with SCE that "even with additional time to submit the next S-MAP applications for review by May 1, 2019, the utilities will not have additional approaches, models, and methodologies they plan to use to assess the risks that are not already described or developed in accordance with the pending S-MAP settlement."[120] They conclude that there is no need to file second S-MAP applications on May 1, 2019 and that the proper vehicle to address long-term issues such as risk tolerance, consistently using risk events and related matters is an OIR.

TURN agrees that "an OIR is the best vehicle."[121] TURN asserts that the SA reflects the best efforts of parties to resolve many issues. However, "[a]t this point, direction from the Commission would be beneficial to move forward on other outstanding issues of concern to the Commission."[122] At the July 6, workshop, Mr. Tom Long of TURN expressed understanding for the utilities' desire to slow things down to "digest this and work through this and not to simultaneously produce a new application to revise what they haven't started

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[117] SCE September 24, 2018 Comments at 9.

[118] SoCalGas/SDG&E September 24, 2018 Comments at 8.

[119] SoCalGas/SDG&E September 24, 2018 Comments at 9.

[120] SoCalGas/SDG&E September 24, 2018 Comments at 9.

[121] TURN September 24, 2018 Comments at 6.

[122] TURN September 24, 2018 Comments at 7.

implementing yet on May 1, 2019."[123] He said that it would be "entirely appropriate" for the Commission to state "there are certain issues (such as optimization, risk tolerance) that haven't been addressed."[124]

6.3. Discussion

We support the consensus of parties that initiation of an OIR rather than a second round of applications currently due May 1, 2019, is the best vehicle to advance both short-term and long-term S-MAP objectives. By engaging in a highly collaborative approach, parties achieved a great deal in the first and second phases of this proceeding, through multiple workshops, technical working group efforts, meet and confer sessions, and negotiations. We expect that momentum gained through these efforts will help accomplish any unresolved issues moving forward. We agree that there is insufficient time for the Utilities to thoroughly implement and test the SA approach before submitting a second round of S-MAP applications on May 1, 2019. We see the benefit of allowing sufficient time to assess lessons learned from the first S-MAP so that future activities can be adjusted as necessary to further advance the objectives of the S-MAP proceeding. Because the parties have invested significant resources to understand alternative, quantitative, risk-based decision-making models and "test runs," learned a new vocabulary to communicate ongoing opportunities and challenges, and developed new technical skills and the expertise necessary to carry out this important work, it makes sense to ensure this significant investment is properly leveraged to ensure

[123] SED Staff Report at 14.

[124] SED Staff Report at 14.

the ongoing success of S-MAP. Given the vast scope and complexity of the S-MAP, especially in its early "startup" stages, it would be difficult for Commission staff with limited resources to concurrently support a challenging short-term application process and an OIR initiative. Concentrating first on an OIR will ensure that lessons learned during it can help prioritize and resolve the issues associated with a both a short- and long-term Road Map.

Accordingly, the Commission's Executive Director, in cooperation with the SED, and ED, shall initiate an OIR to identify both "lessons learned" from the first S-MAP, more concretely identify and develop a "Long-Term Road Map" as outlined in Section 5, address other critical, broader, policy questions that have yet to be implemented in this proceeding, and propose a scope and timeline for successive S-MAP applications. Ideally, the initiation of the OIR would take place within 90 to 120 days of issuance of this decision.[125]

During Phase Two of this proceeding, technical working groups (e.g., Performance Metrics, Lexicon, Test Drives), comprised of utility representatives, parties and stakeholders, met frequently to accomplish proceeding objectives. For example, as directed in the Scoping Memo, the JI (e.g., IS, EPUC, TURN), in cooperation with consultants[126] and utilities, organized and facilitated over 20 working group sessions to review and evaluate the results of test

[125] D.14-12-025 left it up to the Commission's executive management and staff to decide whether it has the internal resources and expertise to participate in the S-MAP, or if it needs to retain outside consultants. During the second phase of this proceeding, Commission consultants were not available for this purpose. For an expansive discussion of relevant staffing issues, see Interim Decision at 128-131.

[126] Drs. Feinstein and Lesser.

drives.[127] The TDWG met regularly and consulted with SED staff, subject matter experts, and other intervenors to identify how to conduct test drives of alternative methodologies, including the selection of test problems and a schedule. In addition, active parties met and conferred, as a precursor to settlement discussions, to help resolve an impasse, provide regular status reports to the Commission, and develop a "hybrid" risk-based decision-making model SA that satisfies proceeding objectives and demonstrates a reasonable compromise between the competing JI and JU approaches.

In summary, the parties' and outside consultants' work went "above and beyond" what is typically the norm in a startup program due to the specialized knowledge and expertise necessary to work through and complete a review of alternative multi-attribute approaches and test drive deliverables. We expect strong collaboration between and among parties and Commission staff to continue throughout successive S-MAP proceedings.

The submission of successive S-MAP applications consistent with the provisions of D.14-12-025 is held in abeyance until the Commission provides a future direction in the pending OIR and a subsequent OIR decision.

7. Categorization and Need for Hearing

The Commission preliminarily categorized this proceeding as ratesetting with a need for hearings pursuant to Rule 7.1 (Resolution ALJ 176-3357, dated May 2015). In the interest of promoting transparency, open dialogue among parties, and shared learning about high-level policy considerations and implications in the "start up" or initial phase of the S-MAP program, the

[127] Phase Two Scoping Memo at 13.

Assigned Commissioner determined that this proceeding would be categorized as quasi-legislative. Technical working groups, meet and confer process, and workshops, rather than evidentiary hearings, constituted the primary venues to vet intervenor and utility approaches and conduct associated test drives of them.

8. Comments on Proposed Decision

The proposed decision of the assigned Commissioner in this matter was mailed to parties in accordance with § 311 of the Public Utilities Code and comments were allowed under Rule 14.3 of the Commission's Rules of Practice and Procedure. The Settling Parties filed opening comments on the proposed decision on November 29, 2018. OSA filed reply comments on December 4, 2018.

In opening comments, Settling Parties accept the minor modification to the proposed SA to provide a minimum safety weight of 40% to ensure that the safety attribute is weighted most heavily in the MAVF. The Settling Parties also accept limited changes to the risk lexicon and 10-step RAMP process, which the proposed decision characterizes as "reinforcements" or "enhancements" to current processes. In response to comments, the proposed decision is revised to reflect minor changes that clarify future interpretation of the adopted SA and implementation of the Commission decision.

In response to OSA's reply comments, we believe that a description of a pending OIR is broad enough to encompass OSA's stated concerns pertaining to potential refinement of the RAMP process for GRC and non-GRC proceedings, ongoing review of performance metrics, assessment of additional tools to perform risk analysis, and consideration of alternative approaches to address different types of uncertainty (e.g. data collection). Further, parties will have an opportunity to refine the proposed OIR topics when a new proceeding is initiated following Commission approval of this decision. As mentioned

previously, performance metrics and reporting requirements will be addressed in a second Phase Two decision that will be issued in early 2019.

9. Assignment of Proceeding

Clifford Rechtschaffen is the assigned Commissioner and Colette E. Kersten and Cathleen A. Fogel are the assigned Administrative Law Judges in this proceeding.

Findings of Fact

1. The May 2, 2018 SA is an uncontested settlement.
2. While the SA was not an "all party" settlement that commands the unanimous sponsorship of all parties, it was entered into by the majority of parties to Phase Two of the proceeding and the settlement is thus fairly representative of the affected interests.
3. No term of the SA contravenes statutory provisions or prior Commission decisions.
4. The SA is compatible with the current Rate Case Plan, and existing GRC and RAMP processes.
5. In the application of the MAVF, the simplest method to ensure prioritization of safety is for the Commission to set a safety weight that is more heavily weighted than financial or reliability attributes.
6. The revised Lexicon and enhanced 10-step RAMP process reflect the progress that utilities and intervenors have made towards implementing a more probabilistic approach to risk-based decision making.
7. Settling Parties made significant progress towards accomplishing a short-term Road Map but more work needs to be accomplished in the long-term to migrate from relative risk-scoring for prioritized tasks to a more quantitative method for optimized risk mitigation.

8. The SA is 1) reasonable in light of the record; 2) consistent with the law; and 3) in the public interest.

Conclusions of Law

1. The May 2, 2018 SA should be approved because it is 1) reasonable in light of the record; 2) consistent with the law; and 3) in the public interest.

2. The May 2, 2018 SA, including its Appendices A and B appended to the decision as Attachment A, should be approved with the modification to the minimum safety weight described in Ordering Paragraph 2.

3. No hearings are necessary.

4. The Lexicon and ten major components of the Risk Assessment and Mitigation Phase (RAMP), as modified or enhanced by the Settlement Agreement, and as further set out in Sections 2 and 3 of this decision, should be approved.

5. Given the Commission's focus on safety, it is reasonable to approve a minimum 40% safety weight in the approved MAVF, as contained in the SA, unless utilities can justify a lower weight based on their respective analyses.

6. The Long-Term Road Map that outlines steps to continue to migrate from relative risk scoring to more quantitative methods of optimized risk mitigation, as detailed in Section 5 of this decision, should be adopted subject to further consideration in a subsequent Order Instituting Rulemaking.

7. The Executive Director, in cooperation with SED and ED, should take steps to promote an OIR to identify lessons learned from the first S-MAP, further consider and refine a Long-Term Road Map proposed in this decision, if needed, and develop a scope and timeline for successive S-MAP applications.

8. Today's decision, which adopts parameters of the S-MAP and RAMP processes, does not prevent the assigned ALJs in either of those proceedings from taking any other action to adjudicate a Utility's S-MAP application or RAMP application.

9. The submission of successive S-MAP applications consistent with the provisions of D.14-12-025 should be held in abeyance until the Commission provides future direction in an OIR.

10. The SA should be effective immediately.

11. Applications 15-05-002, 15-05-003, 15-05-004 and 15-05-005 should remain open.

O R D E R

IT IS ORDERED that:

1. The Joint Motion of Pacific Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, San Diego Gas & Electric Company, Public Advocates Office, The Utility Reform Network, and Energy Producers and Users Coalition and Indicated Shippers dated May 2, 2018 is granted. The Settlement Agreement and its Appendices A and B are appended to this decision as Attachment A and are adopted with modifications or enhancements as detailed below.

2. Given the Commission's priority on safety, a minimum weight of 40% for the safety attribute in the approved Multi-Attribute Value Function contained in the Settlement Agreement, shall be utilized, unless the Utilities can justify a lower weight based on their respective analyses. This requirement supersedes other specifications listed in Step 1A – "Building a Multi-Attribute Value

Function," Row 7, "MAVF Principle 6-Relative Importance" (Appendix A at A-6).

3. The Lexicon and ten major components of the Risk Assessment and Mitigation Phase, as modified or enhanced by the Settlement Agreement, and as further set out in Sections 2 and 3 of this decision, are adopted.

4. The Long-Term Road Map that outlines steps to continue to migrate from relative risk scoring to more quantitative methods for optimized risk mitigation, as detailed in Section 5, is approved subject to modification in a subsequent Order Instituting Rulemaking.

5. The Commission's Executive Director, in cooperation with the Safety and Enforcement Division and Energy Division, will take steps to promote an Order Instituting Rulemaking to identify lessons learned from the first Safety Model Assessment Proceeding, further consider and refine a "Long-Term Road Map" as detailed in Section 5 of this decision, and develop a scope and timeline for successive Safety Model Assessment Proceeding applications.

6. The submission of successive Safety Model Assessment Proceeding applications consistent with the provisions of Decision 14-12-025 is held in abeyance until the Commission provides future direction in an Order Instituting Rulemaking.

7. No evidentiary hearings are necessary.

9. Applications 15-05-002, 15-05-003, 15-05-004 and 15-05-005 remain open.

This order is effective today.

Dated December 13, 2018, at San Francisco, California.

MICHAEL PICKER
President
CARLA J. PETERMAN
LIANE M. RANDOLPH
MARTHA GUZMAN ACEVES
CLIFFORD RECHTSCHAFFEN
Commissioners

Attachment A

Settlement Agreement

SETTLEMENT AGREEMENT AMONG PACIFIC GAS AND ELECTRIC COMPANY, SOUTHERN CALIFORNIA EDISON COMPANY, SOUTHERN CALIFORNIA GAS COMPANY, SAN DIEGO GAS & ELECTRIC COMPANY, THE UTILITY REFORM NETWORK, ENERGY PRODUCERS AND USERS COALITION, INDICATED SHIPPERS, AND THE OFFICE OF RATEPAYER ADVOCATES

Pacific Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, and San Diego Gas & Electric Company (jointly, the "Joint Utilities"), and The Utility Reform Network ("TURN"), Energy Producers and Users Coalition, and Indicated Shippers (with TURN, the "Joint Intervenors"), and the Office of Ratepayer Advocates (all collectively, the "Settling Parties") hereby agree to settle and resolve certain issues, as specified in Section I.B below, within Phase 2 of the Safety Model Assessment Proceeding, Applications (A.)15-05-002 and Related Matters (A.) 15-05-003, 15-05-004, and 15-05-005 ("Proceeding" or "SMAP").

I. AGREEMENT

A. Utilities' Risk and Mitigation Analysis

Attached to this Settlement Agreement as Appendix A is the Agreement of Settling Parties Regarding Required Elements for Risk and Mitigation Analysis in the Risk Assessment Mitigation Phase (RAMP) and General Rate Case (GRC) Pursuant to Phase 2 of the Safety Model Assessment Proceeding (A.15-05-002). Appendix A is hereby incorporated by reference in this Settlement Agreement, so that the entirety of Appendix A should be deemed to be a part of this Settlement Agreement.

The provisions of Appendix A constitute minimum required elements agreed to by the Settling Parties applicable to risk and risk mitigation analysis in RAMP and GRC proceedings, as described in Appendix A. As set forth in Appendix A, the minimum required elements apply to the following steps in the risk and mitigation analysis for RAMP and GRC proceedings:

- Building a Multi-Attribute Value Function (MAVF) – Step 1A in Appendix A
- Identifying Risks for the Enterprise Risk Register – Step 1B in Appendix A
- Risk Assessment and Risk Ranking in Preparation for RAMP – Step 2A in Appendix A
- Selecting Enterprise Risks for RAMP - Step 2B in Appendix A
- Mitigation Analysis for Risks in RAMP – Step 3 in Appendix A

Appendix A also includes several "Global Items" setting forth additional minimum requirements applicable to the risk and mitigation analysis addressed in Appendix A. In addition, Row 28 of Appendix A sets forth the conditions under which each of the Joint Utilities will engage in the "Step 3" Mitigation Analysis for certain programs (as delineated in Appendix A) proposed in the utility's GRC to mitigate safety or reliability risks not otherwise addressed in the utility's RAMP submission.

Nothing in Appendix A prevents any of the Joint Utilities from engaging in additional risk analysis activities with respect to the RAMP and GRC beyond the required elements set forth in Appendix A. Nothing in Appendix A requires any of the Joint Utilities to perform any of the required elements set forth in Appendix A other than in those situations specifically identified in Appendix A; however, each of the Settling Parties reserves the right to advocate, in any situation to which this Settlement Agreement and Appendix A do not apply, that analysis of the type set forth in Appendix A could or should have been used by a utility as a matter of sound risk and mitigation analysis. Other than documents, information, or analysis required to be provided by Appendix A, nothing in Appendix A requires any of the Joint Utilities to make any new formal filings with the California Public Utilities Commission ("Commission") beyond what the Commission otherwise already requires in the RAMP and GRC proceedings.

B. Phase 2 Issues Addressed in the Settlement

The Settling Parties agree that the Settlement Agreement addresses the issues identified in the *Scoping Memo and Ruling of Assigned Commissioner*, dated December 13, 2016, in Phase 2 of SMAP ("Phase 2 Scoping Ruling"), as follows:

(1) The Settling Parties intend the Settlement Agreement to be a complete resolution of Issue 3.1 ("Should the JIA be adopted as a uniform approach?") and Issue 3.2 ("Should any of the Utilities' Alternative Approaches be adopted as a Uniform Approach?").

(2) With respect to Issue 3.3 ("How should other issues presented in the Interim Decision be addressed?"), the Settling Parties agree that the Settlement Agreement addresses the following headings (and only these headings) in that section of the Phase 2 Scoping Ruling:

- Ongoing RAMP Evaluation,
- Lexicon,
- Benchmarking/Identify Industry-Wide Practices, and
- Interim and Long-Term Action Plan.

The Settling Parties agree that it would be appropriate for the Commission to view this Settlement Agreement as sufficiently addressing these issues for purposes of this SMAP proceeding. However, subject to I.D below, the Settling Parties do not take the position that the Settlement Agreement precludes further record development through comments by parties and further action by the Commission on these issues if the Commission so desires.

C. Record Supporting Agreement

The Settling Parties agree that the record supporting this Settlement Agreement includes, but is not limited to, the documents listed in Appendix B, attached hereto, which have been previously served on the service list of A.15-05-002 et al. The Settling Parties request that the Commission enter into the record of A.15-05-002 et al., the documents listed in Appendix B that have not already been filed or otherwise entered into the record, which are marked by an asterisk (*). This agreement that the documents listed in Appendix B are part of the record supporting this Settlement Agreement does not constitute an admission by any of the Settling Parties that did not submit a particular document regarding the content of such document.

D. Implementation Timeline and Importance of Prompt Commission Action on Settlement Agreement

This Settlement Agreement shall become effective upon issuance by the Commission of a decision adopting the Settlement Agreement.

The timeline for the implementation of the required elements in Appendix A shall be as set forth in Row 32 of Appendix A. Row 32 provides in part that Southern California Gas Company and San Diego Gas and Electric Company will implement the provisions of Appendix A in their RAMP to be submitted by November 30, 2019, provided that the Commission issues a final decision adopting this Settlement Agreement by January 31, 2019. The Settling Parties are mindful of this timeline and believe that adoption of the Settlement Agreement, while not resolving all issues in Phase 2, would resolve the central, resource-intensive issues in Phase 2. Accordingly, the Settling Parties recommend that the Commission issue a standalone decision on just this Settlement Agreement and that such decision should be issued without undue delay and prior to any other decision addressing Phase 2 issues.

E. Future Matters

(1) The Settling Parties agree that the requirements set forth in Row 28 of Appendix A should apply unless modified by a future Commission decision. The Settling Parties recommend that, in a future SMAP or other appropriate proceeding, there should be a formal review process of lessons learned to determine appropriate changes and refinements to the agreed upon terms in Row 28.

(2) The Joint Intervenors recommend that the following issues be addressed in the next SMAP proceeding:

(a) Whether the processes described in Steps 1B, 2A, and 2B of row 28 of Appendix A concerning identifying and ranking risks for purposes of selecting risks to be assessed in RAMP should be modified in either or both of the following ways:

i. Consistently using Risk Events (as defined in Appendix A) to define the identified risks.

ii. Using the "Step 3" methodology (i.e. rows 13-25 of Appendix A) for identification and ranking of pre-mitigation Risk Events.

The Joint Utilities reserve the right to challenge the inclusion of any of these issues in the next SMAP proceeding.

II. OTHER MATTERS

A. Regulatory Approval

The Settling Parties agree to seek prompt approval of this Settlement Agreement and to use their reasonable best efforts to secure Commission approval of it without change, including by filing a joint motion seeking approval of this Settlement Agreement and any written filings, appearances, and other means as may be necessary to secure Commission approval. The Settling Parties agree to actively and mutually defend this Settlement Agreement if its adoption is opposed by any other party in proceedings before the Commission.

Should any Proposed Decision (PD) or Alternate Proposed Decision (APD) seek a material modification to this Settlement Agreement, and should any Settling Party be unwilling to accept such modification, that Settling Party shall so notify the other Settling Parties within five business days of issuance of the PD or APD. The Settling Parties shall thereafter promptly discuss the modification and negotiate in good faith to achieve a resolution acceptable to the Settling Parties, and shall promptly seek Commission approval of the resolution so achieved. The Settling Parties agree to oppose any modification of this Agreement proposed in a PD or APD not agreed to by all Parties.

Any party signing this Agreement may withdraw from this Agreement if the Commission issues a final decision that materially modifies, deletes from, or adds to the disposition of the matters settled herein, except for resolutions of modifications agreed to by the Settling Parties as discussed in the previous paragraph. However, the Settling Parties agree to negotiate in good faith with regard to any Commission-ordered changes, in order to restore the balance of benefits and burdens, and to exercise the right to withdraw only if such negotiations are unsuccessful. To accommodate the interests related to various issues, the Settling Parties acknowledge that changes, concessions or compromises by one or more Settling Parties in one section of this Agreement could result in changes, concessions or compromises by one or more Settling Parties in other sections of this Agreement.

Notwithstanding Section I.D, the provisions of this Section II.A. shall impose obligations on the Settling Parties immediately upon the execution of this Settlement Agreement.

B. Incorporation of Complete Agreement

This Settlement Agreement embodies the entire understanding and agreement of the Parties with respect to the matters described herein, and, except as described herein, supersedes and cancels any and all prior oral or written agreements, principles, negotiations, statements, representations or understandings among the Settling Parties. This Settlement Agreement is to be treated as a complete package and not as a collection of separate agreements on discrete issues.

C. Unified Agreement

The Settling Parties have bargained in good faith to reach the agreement set forth herein. The Settling Parties intend the Settlement Agreement, to be interpreted as a unified, interrelated agreement. The Settling Parties agree that no provision of this Settlement Agreement shall be construed against any Settling Party because a particular party or its counsel drafted the provision.

D. Successors and Assigns

The rights conferred and obligations imposed on any of the Settling Parties by this Settlement Agreement shall inure to the benefit of or be binding on that Settling Party's successors in interest or assignees as if such successor or assignee was itself a party to this Settlement Agreement.

E. Disputes Regarding Agreement

Should any dispute arise among the Settling Parties regarding the manner in which this Settlement Agreement or any term shall be implemented, the Settling Parties agree, prior to initiation of any other remedy, to work in good faith to resolve such differences in a manner consistent with both the express language and the intent of the Settling Parties in entering into this Settlement Agreement. The terms and conditions of the Settlement Agreement may only be modified in writing subscribed to by the Settling Parties.

F. Non-Precedential

The Settling Parties hereby agree that this Settlement Agreement is entered into as a compromise of disputed issues in order to minimize the time, expense, and uncertainty of continued litigation in the Proceeding. This Settlement Agreement should not be considered precedent in any future proceeding before this Commission unless the Commission expressly provides otherwise, as set forth in Rule 12.5 of the Commission's Rules of Practice and Procedure. In the event that this Settlement Agreement is rejected by the Commission, each Settling Party expressly reserves its right to advocate, in other current and future proceedings, or in this proceeding, positions, principles, assumptions, arguments and methodologies which may be different from those set forth in this Settlement Agreement.

G. Non-Waiver

None of the provisions of this Settlement Agreement shall be considered waived by any Settling Party unless such waiver is given in writing. The failure of a Settling Party to insist in any one or more instances upon strict performance of any provision of this Settlement Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provision or the relinquishment of any such rights for the future, and the Settlement Agreement shall continue and remain in full force and effect.

H. Governing Law

This Agreement shall be interpreted, governed and construed under the laws of the State of California, including Commission decisions, orders, and rulings, as if executed and to be performed wholly within the State of California.

I. Captions and Paragraph Headings

Captions and paragraph headings used herein are for convenience only and are not a part of this Agreement and shall not be used in construing it.

J. Signatures

This Settlement Agreement may be executed in counterparts. The representatives of the Settling Parties signing this Settlement Agreement are fully authorized to enter into this Settlement Agreement.

IN WITNESS WHEREOF, the Settling Parties hereto have duly executed this Settlement Agreement.

Entity: Pacific Gas & Electric Company	By: Stephen Cairns Chief Risk Officer	Date: 30, April, 2018
Entity: Southern California Edison Company	By: Caroline Choi SVP of Regulatory Affairs	Date: __, April, 2018
Entity: Southern California Gas Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: San Diego Gas & Electric Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: The Utility Reform Network	By: Thomas J. Long Legal Director	Date: __, April, 2018
Entity: Energy Producers and Users Coalition	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: Indicated Shippers	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: The Office of Ratepayer Advocates	By: Elizabeth Echols Director	Date: __, April, 2018

IN WITNESS WHEREOF, the Settling Parties hereto have duly executed this Settlement Agreement.

Entity: Pacific Gas & Electric Company	By: Stephen Cairns Chief Risk Officer	Date: __, April, 2018
Entity: Southern California Edison Company	By: Caroline Choi SVP of Regulatory Affairs	Date: 25 April, 2018
Entity: Southern California Gas Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: San Diego Gas & Electric Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: The Utility Reform Network	By: Thomas J. Long Legal Director	Date: __, April, 2018
Entity: Energy Producers and Users Coalition	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: Indicated Shippers	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: The Office of Ratepayer Advocates	By: Elizabeth Echols Director	Date: __, April, 2018

IN WITNESS WHEREOF, the Settling Parties hereto have duly executed this Settlement Agreement.

Entity: Pacific Gas & Electric Company	By: Stephen Cairns Chief Risk Officer	Date: __, April, 2018
Entity: Southern California Edison Company	By: Caroline Choi SVP of Regulatory Affairs	Date: __, April, 2018
Entity: Southern California Gas Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: 30, April, 2018
Entity: San Diego Gas & Electric Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: 30 April, 2018
Entity: The Utility Reform Network	By: Thomas J. Long Legal Director	Date: __, April, 2018
Entity: Energy Producers and Users Coalition	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: Indicated Shippers	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: The Office of Ratepayer Advocates	By: Elizabeth Echols Director	Date: __, April, 2018

IN WITNESS WHEREOF, the Settling Parties hereto have duly executed this Settlement Agreement.

Entity: Pacific Gas & Electric Company	By: Stephen Cairns Chief Risk Officer	Date: __, April, 2018
Entity: Southern California Edison Company	By: Caroline Choi SVP of Regulatory Affairs	Date: __, April, 2018
Entity: Southern California Gas Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: San Diego Gas & Electric Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: The Utility Reform Network	By: Thomas J. Long Legal Director	Date: __, April, 2018
Entity: Energy Producers and Users Coalition	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: Indicated Shippers	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: The Office of Ratepayer Advocates	By: Elizabeth Echols Director Elizabeth Echols	Date: 25, April, 2018

IN WITNESS WHEREOF, the Settling Parties hereto have duly executed this Settlement Agreement.

Entity: Pacific Gas & Electric Company	By: Stephen Cairns Chief Risk Officer	Date: __, April, 2018
Entity: Southern California Edison Company	By: Caroline Choi SVP of Regulatory Affairs	Date: __, April, 2018
Entity: Southern California Gas Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: San Diego Gas & Electric Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: The Utility Reform Network	By: Thomas J. Long Legal Director	Date: __, April, 2018
Entity: Energy Producers and Users Coalition	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: Indicated Shippers	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: The Office of Ratepayer Advocates	By: Elizabeth Echols Director	Date: __, April, 2018

IN WITNESS WHEREOF, the Settling Parties hereto have duly executed this Settlement Agreement.

Entity: Pacific Gas & Electric Company	By: Stephen Cairns Chief Risk Officer	Date: __, April, 2018
Entity: Southern California Edison Company	By: Caroline Choi SVP of Regulatory Affairs	Date: __, April, 2018
Entity: Southern California Gas Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: San Diego Gas & Electric Company	By: Diana Day VP Enterprise Risk Management & Compliance	Date: __, April, 2018
Entity: The Utility Reform Network	By: Thomas J. Long Legal Director	Date: 27, April, 2018
Entity: Energy Producers and Users Coalition	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: Indicated Shippers	By: Katy Morsony Counsel	Date: __, April, 2018
Entity: The Office of Ratepayer Advocates	By: Elizabeth Echols Director	Date: __, April, 2018

Appendix A

Agreement of Settling Parties Regarding Required Elements for Risk and Mitigation Analysis in the Risk Assessment Mitigation Phase (RAMP) and General Rate Case (GRC) Pursuant to Phase 2 of the Safety Model Assessment Proceeding (A.15-05-002 et al.)

Table of Contents

Definitions

- Attribute: an observable aspect of a risky situation that has value or reflects a utility objective, such as safety or reliability. Changes in the levels of attributes are used to determine the consequences of a Risk Event. The attributes in an MAVF should cover the reasons that a utility would undertake risk mitigation activities.

- Bow Tie: a tool that consists of the Risk Event in the center, a listing of drivers on the left side that potentially lead to the Risk Event occurring, and a listing of Consequences on the right side that show the potential outcomes if the Risk Event occurs.

- Consequence (or Impact): the effect of the occurrence of a Risk Event. Consequences affect Attributes of an MAVF.

- CoRE: Consequences of a Risk Event.

- CPUC: California Public Utilities Commission.

- Driver: a factor that could influence the likelihood of occurrence of a Risk Event. A driver may include external events or characteristics inherent to the asset or system.

- Enterprise Risk Register (also referred to as "risk registry" or "ERR"): an inventory of enterprise risks at a snapshot in time that summarizes (for a utility's management and/or stakeholders such as the CPUC) risks that a utility may face. The ERR is not intended to be static as risks are dynamic in nature. As such, the ERR must be refreshed on a regular basis and can reflect the changing nature of a risk; for example, risks that were consolidated together may be separated, new risks may be added, and the level of risks may change over time.

- Exposure: the measure that indicates the scope of the risk, e.g., miles of transmission pipeline, number of employees, miles of overhead distribution lines, etc. Exposure defines the context of the risk, i.e., specifies whether the risk is associated with the entire system, or focused on a part of it.

- Frequency: the number of events generally defined per unit of time. (Frequency is not synonymous with probability or likelihood.)

- General Rate Case (GRC): a CPUC proceeding that is denominated a general rate case, as well as PG&E's Gas Transmission and Storage (GT&S) rate proceeding.

- Likelihood or Probability: the relative possibility that an event will occur, quantified as a number between 0% and 100% (where 0% indicates impossibility and 100% indicates certainty). The higher the probability of an event, the more certain we are that the event will occur.

- LoRE: Likelihood of a Risk Event.

- Multi-Attribute Value Function (MAVF): a tool for combining all potential consequences of the occurrence of a risk event, and creates a single measurement of value.

- Natural Unit of an Attribute: the way the level of an attribute is measured or expressed. For example, the natural unit of a financial attribute may be dollars. Natural units are chosen for convenience and ease of communication and are distinct from scaled units.

- Range of the Natural Unit: part of the specification of an Attribute. For an Attribute with a numerical natural unit, such as dollars, the smallest observable value of the Attribute is the low end of the range and the largest observable value is the high end of the range. Therefore, any Attribute level that results as a consequence of an event, or a risk mitigation action, or of doing nothing should be found within the range. For weighting purposes, the range of the natural units of an Attribute should be able to describe any actual situation that can be mitigated and the result of implementing any mitigation action. For an Attribute with a categorical natural unit, such as corporate image, the range of the Attribute is from the least desirable level to the most desirable level.

- Risk Event: an occurrence or change of a particular set of circumstances that may have potentially adverse consequences and may require action to address. In particular, the occurrence of a Risk Event changes the levels of some or all of the Attributes of a risky situation.

- Scaled Unit of an Attribute: a value that varies from 0 to 100. The scaled unit is set to 0 for the most desirable level of natural unit in the range of natural units. The scaled unit is set to 100 for the least desirable level of natural unit in the range of natural units. For any level of the attribute between the most desirable and least desirable levels, the scaled unit is between 0 and 100. The benefit achieved by changing the level of an Attribute in natural units is measured by the corresponding difference in scaled units. In the special case of moving from the least desirable level to the most desirable level, the benefit is equal to 100 scaled units.

- Settlement Agreement: the entirety of the agreement between Pacific Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, and San Diego Gas & Electric Company, The Utility Reform Network, Energy Producers and Users Coalition, Indicated Shippers, and the Office of Ratepayer Advocates, which includes the agreement and appendices A and B.

- Settling Parties: Pacific Gas & Electric Company (PG&E), Southern California Edison Company (SCE), Southern California Gas Company (SoCalGas), and San Diego Gas & Electric Company (SDG&E), The Utility Reform Network, Energy Producers and Users Coalition, Indicated Shippers, and the Office of Ratepayer Advocates.

- Tranche: a logical disaggregation of a group of assets (physical or human) or systems into subgroups with like characteristics for purposes of risk assessment.

Summary

The provisions of this document, Appendix A of the Settlement Agreement, constitute the minimum required elements agreed to by the Settling Parties applicable to risk and risk mitigation analysis in RAMP and GRC proceedings. The minimum required elements apply to the following steps in the risk and mitigation analysis for RAMP and GRC proceedings, which are set forth in detail in this Appendix:

- Building a Multi-Attribute Value Function (MAVF) – Step 1A
- Identifying Risks for the Enterprise Risk Register – Step 1B
- Risk Assessment and Risk Ranking in Preparation for RAMP – Step 2A
- Selecting Enterprise Risks for RAMP – Step 2B
- Mitigation Analysis for Risks in RAMP – Step 3

Also included herein are several "Global Items" setting forth additional minimum requirements applicable to the risk and mitigation analysis addressed herein. In addition, Row 28 of this Appendix sets forth the conditions under which each of the Joint Utilities will engage in the "Step 3" Mitigation Analysis for certain programs (as delineated herein) proposed in the utility's GRC to mitigate safety or reliability risks not otherwise addressed in the utility's RAMP submission.

Step 1A – Building a Multi-Attribute Value Function

No.	Element Name	Element Description and Requirements
1.	MAVF	A utility's MAVF should be constructed by following these six principles (see Rows 2-7, below). The MAVF is required to be built once but the utility may adjust its MAVF over time. Any changes to the MAVF must adhere to the principles of construction set forth in Rows 2 through 7 below.
2.	MAVF Principle 1 – Attribute Hierarchy	Attributes are combined in a hierarchy, such that the top-level Attributes are typically labels or categories and the lower-level Attributes are observable and measurable.
3.	MAVF Principle 2 – Measured Observations	Each lower-level Attribute has its own range (minimum and maximum) expressed in natural units that are observable during ordinary operations and as a consequence of the occurrence of a risk event.
4.	MAVF Principle 3 – Comparison	Use a measurable proxy for an Attribute that is logically necessary but not directly measurable. This principle only applies when a necessary Attribute is not directly measurable. For example, a measure of the number of complaints about service received can be used as a proxy for customer satisfaction.
5.	MAVF Principle 4 – Risk Assessment	When Attribute levels that result from the occurrence of a risk event are uncertain, assess the uncertainty in the Attribute levels by using expected value or percentiles, or by specifying well-defined probability distributions, from which expected values and tail values can be determined. Monte Carlo simulations or other similar simulations (including calibrated subject expertise modeling), among other tools, may be used to satisfy this principle.
6.	MAVF Principle 5 – Scaled Units	Construct a scale that converts the range of natural units (from Row 3) to scaled units to specify the relative value of changes within the range, including capturing aversion to extreme outcomes or indifference over a range of outcomes.

		The scaling function can be linear or non-linear. For example, the scale is linear if the value of avoiding a given change in Attribute level does not depend on the Attribute level. Alternatively, the scale is non-linear if the value of avoiding a given change in Attribute level differs by the Attribute level.
7.	MAVF Principle 6 – Relative Importance	Each Attribute in the MAVF should be assigned a weight reflecting its relative importance to other Attributes identified in the MAVF. Weights are assigned based on the relative value of moving each Attribute from its least desirable to its most desirable level, considering the entire range of the Attribute. One means of incorporating a weighting process was presented in the February 17, 2017 Report of Joint Intervenor Test Drive Step 1 Results, "Specifying the Multi-Attribute Value Function," by Drs. Feinstein and Lesser.[1] Weights are assigned based on actual Attribute measurement ranges, not a fixed weight arbitrarily assigned to an Attribute. *However, given the Commission's focus on safety, a minimum 40% safety weight is established unless the Utilities can justify a lower weight based on their respective analyses. This requirement supersedes the other specifications stated above.* For example, the Attribute weights will reflect the relative importance of moving the safety outcomes from the least to the most desirable levels as compared with moving financial outcomes from the least to the most desirable levels in a risky situation.

[1] Reference to this document is not intended to indicate that the settling parties are requiring the exact process specified in this report be followed.

Step 1B – Identify Risks for the Enterprise Risk Register

No.	Element Name	Element Description and Requirements
8.	Risk Identification and Definition	Utilities' risks are defined in their respective Enterprise Risk Registers. The Enterprise Risk Register 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.

Step 2A – Risk Assessment and Risk Ranking in Preparation for RAMP

No.	Element Name	Element Description and Requirements
9.	Risk Assessment	Using the MAVF developed in accordance with Step 1A, for each risk included in the Enterprise Risk Register, the utility will compute a Safety Risk Score using only the Safety Attribute. The utility will sort its ERR risks in descending order by the Safety Risk Score. For the top 40% of ERR risks with a Safety Risk Score greater than zero, the utility will compute a Multi-Attribute Risk Score using at least the Safety, Reliability and Financial Attributes to determine the output for Step 2A. Whenever the full set of MAVF Attributes developed in accordance with Step 1A is not used to compute a set of scores, the weights for that set of scores will be re-calibrated to reflect only the Attributes that are used. The output of Step 2A, along with the input from stakeholders described in Row 12 below, will be used to decide which risks will be addressed in the RAMP. The Risk Assessment in preparation for RAMP will follow the steps in Rows 10 and 11.
10.	Identification of Potential Consequences of Risk Event	The identified potential Consequences of a Risk Event should reflect the unique characteristics of the utility. For each enterprise risk, the utility will use actual results, available and appropriate data (e.g., Pipeline and Hazardous Materials Safety Administration data), and/or Subject Matter Experts (SMEs) to identify potential consequences of the risk event, consistent with the MAVF developed in Step 1A. 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. Similarly, 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.
11.	Identification of the Frequency of the Risk Event	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.

Step 2B – Selecting Enterprise Risks for RAMP

No.	Element Name	Element Description and Requirements
12.	Risk Selection Process for RAMP	Using the analysis performed in Step 2A, the utility will preliminarily select risks to be included in the RAMP. The utility will host a publicly noticed workshop, to be appropriately communicated to interested parties and at a minimum, should include the CPUC's Safety and Enforcement Division (SED), to gather input from SED, other interested CPUC staff, and interested parties to inform the determination of the final list of risks to be included in the RAMP. At least 14 days in advance of the workshop, the utility will provide to SED and interested parties at least the following information: (1) its preliminary list of RAMP risks; and (2) the Safety Risk Score for each risk in the ERR and the Multi-Attribute Risk Score for the top ERR risks identified through the process in Row 9. The utility will make its best effort to timely respond to reasonable requests for additional information prior to the workshop. Based on input received from SED, other interested CPUC staff, and interested parties, the utility will make its determination of the final list of risks to be addressed in its RAMP. The rationale for taking or disregarding input during the workshop will be addressed in the utility's RAMP.

Step 3 – Mitigation Analysis for Risks in RAMP

No.	Element Name	Element Description and Requirements
13.	Calculation of Risk	For purposes of the Step 3 analysis, pre- and post-mitigation risk will be calculated by multiplying the Likelihood of a Risk Event (LoRE) by the Consequences of a Risk Event (CoRE). The CoRE is the weighted sum of the scaled values of the levels of the individual Attributes using the utility's full MAVF.
14.	Definition of Risk Events and Tranches	Detailed pre- and post-mitigation analysis of mitigations will be performed for each risk selected for inclusion in the RAMP. The utility will endeavor to identify all asset groups or systems subject to the risk and each Risk Event associated with the risk. For example, if Steps 2A and 2B identify wildfires associated with utility facilities as a RAMP Risk Event, the utility will identify all drivers that could cause a wildfire and each group of assets or systems that could be associated with the wildfire risk, such as overhead wires and transformers. For each Risk Event, the utility will subdivide the group of assets or the system associated with the risk into Tranches. Risk reductions from mitigations and risk spend efficiencies will be determined at the Tranche level, which gives a more granular view of how mitigations will reduce risk. The determination of Tranches will be based on how the risks and assets are managed by each utility, data availability and model maturity, and strive to achieve as deep a level of granularity as reasonably possible. The rationale for the determination of Tranches, or for a utility's judgment that no Tranches are appropriate for a given Risk Event, will be presented in the utility's RAMP submission. For the purposes of the risk analysis, each element (i.e., asset or system) contained in the identified Tranche would be considered to have homogeneous risk profiles (i.e., considered to have the same LoRE and CoRE).
15.	Bow Tie	For each risk included in the RAMP, the utility will include a Bow Tie illustration. For each mitigation presented in the RAMP, the utility will identify which element(s) of its associated Bow Tie the mitigation addresses.

16.	Expressing Effects of a Mitigation	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.
17.	Determination of Pre-Mitigation LoRE by Tranche	The pre-mitigation LoRE is the probability that a given Risk Event will occur with respect to a single element of a specified Tranche over a specified period of time (typically a year) in the planning period, before a future mitigation is in place.
18.	Determination of Pre-Mitigation CoRE	The pre-mitigation CoRE is the weighted sum of the scaled values of the pre-mitigation levels of the individual Attributes using the utility's full MAVF. The CoRE is calculated using the full MAVF tool constructed consistent with Step 1A above.
19.	Measurement of Pre-Mitigation Risk Score	The pre-mitigation risk score will be calculated as the product of the pre-mitigation LoRE and the pre-mitigation CoRE for each Tranche subject to the identified Risk Event.
20.	Determination of Post-Mitigation LoRE	The post-mitigation LoRE calculation will be conducted at the same level of granularity as the pre-mitigation risk analysis within Step 3. The calculated value is the probability of occurrence of a Risk Event after the future mitigation is in place.
21.	Determination of Post-Mitigation CoRE	The post-mitigation CoRE calculation will be conducted at the same level of granularity as the pre-mitigation risk analysis. The post-mitigation CoRE is the weighted sum of the scaled values of the post-mitigation levels of the individual Attributes using the utility's full MAVF.
22.	Measurement of Post-Mitigation Risk Score	The post-mitigation risk score will be calculated as the product of the post-mitigation LoRE and post-mitigation CoRE for each Tranche subject to the identified Risk Event.
23.	Measurement of Risk Reduction Provided by a Mitigation	The risk reduction provided by a risk mitigation will be measured as the difference between the values of the pre-mitigation risk score and the post-mitigation risk score.
24.	Use of Expected Value for CoRE;	The utility will use expected value for the MAVF-based measurements and calculations of CoRE in Rows 13, 18, 19, 21, 22, and 23. If a utility chooses to present alternative calculations of pre- and post-mitigation CoRE using a computation in addition to the expected value of the

	Supplemental Calculations	MAVF, such as tail value, it does so without prejudice to the right of parties to the RAMP or GRC to challenge such alternative calculations.
25.	Risk Spend Efficiency (RSE) Calculation	RSE should be calculated by dividing the mitigation risk reduction benefit by the mitigation cost estimate. The values in the numerator and denominator should be present values to ensure the use of comparable measurements of benefits and costs. The risk reduction benefits should reflect the full set of benefits that are the results of the incurred costs. For capital programs, the costs in the denominator should include incremental expenses made necessary by the capital investment.

Global Items

No.	Element Name	Element Description and Requirements
26.	Mitigation Strategy Presentation in the RAMP and GRC	The utility's RAMP filing will provide a ranking of all RAMP mitigations by RSE. In the GRC, the utility will provide a ranking of mitigations by RSE, as follows: (1) For mitigations addressed in the RAMP, the utility will use risk reduction estimates, including any updates, and updated costs to calculate RSE and explain any differences from its RAMP filing; (2) For mitigations that require Step 3 analysis under and consistent with Row 28, the utility will include the RSE, calculated in accordance with Step 3, in the ranking of mitigations by RSE. In the RAMP and GRC, the utility will clearly and transparently explain its rationale for selecting mitigations for each risk and for its selection of its overall portfolio of mitigations. The utility is not bound to select its mitigation strategy based solely on RSE ranking. Mitigation selection can be influenced by other factors including funding, labor resources, technology, planning and construction lead time, compliance requirements, and operational and execution considerations. In the GRC, the utility will explain whether and how any such factors affected the utility's mitigation selections.
27.	Dynamic Analysis	If LoRE or CoRE is expected to change substantially over time due to factors such as asset age, asset condition, and varying effect of mitigation over time, these changes should be specified and incorporated into the calculation of pre- and post-mitigation risk scores and RSE. One means of incorporating these changes is by the use of the dynamic analysis demonstrated by the Joint Intervenors in the test drive problems for high pressure gas pipelines for PG&E and SoCalGas/SDG&E in Phase 2 of A.15-05-002 et al.
28.	Step 3 Supplemental Analysis in the GRC	(1) Except as provided in (2), the utility will conduct a Step 3 analysis in the GRC of any program included in the GRC Application that meets all of the following criteria: (a) the program was not addressed in the RAMP; (b) the utility justifies the program primarily on the basis of reducing a safety or reliability risk; (c) the program is associated with the portion of the electric system under CPUC jurisdiction ("Electric Operations") or with

		the natural gas transmission or distribution pipeline system or storage facilities ("Gas Operations"); and (d) the CPUC jurisdictional forecast cost of the program in the GRC equals or exceeds the following thresholds: (i) For PG&E, SCE, and SoCalGas: cumulative $75 million over three years for capital programs, and $15 million in the test year for expense programs; (ii) For SDG&E, cumulative $37.5 million over three years for capital programs and $7.5 million in the test year for expense programs. (2) A Step 3 analysis is not required for the following: (a) administrative and general programs; (b) work requested by others programs; (c) a program that meets a compliance obligation under applicable law, or regulation, (including but not limited to any general orders), provided that this exclusion shall not apply if the utility chooses to exceed the minimum requirements of the compliance obligation or if the terms of the compliance obligation allow the utility to exercise discretion regarding the pace or scope of the program to meet the obligation; (d) a program that is justified solely or primarily as necessary to satisfy the utility's obligation to serve or to fulfill a mandatory customer request or load growth, provided that this exclusion shall not apply if the utility chooses to exceed the obligation to serve or customer request or if the terms of the obligation or customer request give the utility discretion regarding the pace or scope of the program to meet the obligation to serve; or (e) an expense program that is associated with routine operations and maintenance or restoring service after events such as emergency conditions, storms, and unplanned outages. (3) For any program for which a Step 3 analysis is required under the foregoing provisions, the results of the analysis will be provided in the utility's GRC showing. (4) For purposes of determining whether a program in the GRC falls below the dollar thresholds in (1)(d), the utility shall not break up the program into component parts in order to avoid performance of the Step 3 analysis. (5) For purposes of this row, "program" is defined as a CPUC jurisdictional effort within Electric Operations or Gas Operations consisting of projects, activities, and/or functions with a defined scope

that is intended to meet a specific objective or outcome. Program will be specifically defined for each utility as follows:

- **PG&E:** For PG&E's gas operations and electric distribution operations, programs are defined at the Maintenance Activity Type (MAT) level and not at levels that further subdivide activities within the MAT. For example, if the MAT includes two sets of activities, both activities together comprise a program for purposes of Row 28. Any existing MAT codes for a capital or expense program are subject to change as new programs or projects are developed and previous programs or projects are discontinued or modified.

- **SCE:** Programs are defined at the GRC Activity and Work Breakdown Structure (WBS) levels for expense and capital, respectively, as shown in pages 1 to 19 in the workpapers for SCE-01 in its 2018 GRC Application, A.16-09-001, and not at levels that further subdivide activities within the GRC Activity code and the WBS level. For example, if the GRC Activity code or WBS includes two sets of activities, both activities together comprise a program for purposes of Row 28. The activities in each GRC may be different from the ones noted here as new programs or projects are developed and previous programs or projects are discontinued or modified.

- **SoCalGas/SDG&E:**
  - **Capital Programs:** Capital programs are defined at the budget code level and not at levels that further subdivide activities within the budget code. For example, if the budget code includes two sets of activities, both activities together comprise a program for purposes of Row 28. Sometimes a capital program is presented as a series of budget codes. If a capital program is represented by multiple budget codes, SoCalGas and SDG&E will add the sum total of the budget codes for each of the respective capital programs to determine applicability under the capital program dollar threshold in Row 28.
  - **Expense Programs:** An expense program is presented by workpaper, which typically contains a single cost center or a group of cost centers. For purposes of determining applicability under Row 28 for an expense program, SoCalGas and SDG&E will respectively review the Test Year request for each workpaper for each utility and if the total expense for the workpaper meets the applicable expense

		threshold in Row 28, SoCalGas and SDG&E will then determine whether any amounts within the selected workpaper relate to activities that are not required to undergo Step 3 analysis in accordance with the exclusions in Row 28. Such amounts will be deducted from the total Test Year costs for the workpaper for purposes of determining whether the dollar threshold in Row 28 is met. ▪ **General:** Any existing budget codes or workpapers for a capital or expense program are subject to change as new programs or projects are developed and previous programs or projects are discontinued or modified.
29.	Transparency in RAMP and GRC – Results can be understood	Inputs and computations for the Steps described in this document should be clearly stated and defined in RAMP and, when applicable, the GRC. The sources of inputs should be clearly specified. When SME judgment is used, the process that the SMEs undertook to provide their judgment should be described. Any questionnaire or document used to solicit SME judgment will be made available to the CPUC and parties upon request. The utility should specify all information and assumptions that are used to determine both pre- and post-mitigation risk scores. The methodologies used by the utility should be mathematically correct and logically sound. The mathematical structure should be transparent. All algorithms should be identified. All calculations should be repeatable by third parties using utility data and assumptions recognizing that, dependent on the models used, some variation of result may occur. This requirement is subject to practicality and feasibility constraints of sharing data and models (such as confidentiality, critical energy infrastructure data, volume of information and proprietary models). If these constraints arise, the utility will walk through the calculations in detail when requested by intervenors or the CPUC staff.
30.	Sensitivity Analysis	The utility will identify critical parameters and assumptions made in performing the risk analysis and explain why such parameters are critical. The utility will be prepared to complete a sensitivity analysis of its results when requested. Intervenors may request sensitivity analyses via the discovery process.

31.	Data Support and Data Sources	All estimates should be based on data whenever practical and appropriate. However, the available data should not restrict the application of the risk assessment methodologies. SME judgment should be used if the methodologies require use of data that is not available. Over time, SME judgment should be increasingly supplemented by data analysis as the methodologies mature. Data can include company-specific data or industry data. Whether use of a type of data is appropriate depends on the issue under consideration. If a utility relies on industry data, the utility will provide justification for applying those data to the specific circumstances of the utility. Data can be combined with SME judgment to provide inputs to the risk methodology. Data can be information derived from, but not limited to, observations, models, records, analysis, or measurements.
32.	Implementation of Settlement	The methodology and agreed-upon items herein will be implemented by the utilities within one year following a final CPUC decision. The settling parties agree that SoCalGas and SDG&E will implement these provisions in the RAMP to be submitted by November 30, 2019, provided that the CPUC issues a decision by January 31, 2019.
33.	Minimum Requirements	This document outlines the minimum requirements for the RAMP and the mitigations presented in the GRC for which Step 3 analysis is required under Row 28. The utilities may provide additional data and information as they see fit and/or view as necessary to justify their GRC request. Parties reserve the right to challenge the sufficiency of the justification for risk-justified projects or programs proposed in the GRC for which the utility elects not to conduct a quantitative analysis of risk reduction and RSE.

Appendix B

Minimum Set of Documents that Form the Record for the Settlement Agreement

As set forth in Section I.C of the Settlement Agreement, the Settling Parties agree that the record supporting this Settlement Agreement includes, but is not limited to, the following documents (* denotes documents that have not yet been entered into the formal record of A.15-05-002 *et al.*):

- *Joint Intervenor Slide Presentation at October 21, 2016 Workshop #1 in Phase 2, "Applying the Joint Intervenor Approach to Utility Risk Management" and accompanying paper by Joint Intervenor consultants Drs. Feinstein and Lesser, "Joint Intervenor Multi-Attribute Model: Defining and Evaluating the "Test-Drive" (both documents distributed to service list on October 20, 2016)
- *Joint Intervenor Slide Presentation at December 6, 2016 Test Drive Working Group Session, "Applying the Joint Intervenor Approach to Utility Risk Management: Constructing a Multi-Attribute Value Function" (distributed to service list on December 6, 2016)
- *Joint Intervenor Slide Presentation at January 31, 2017 Test Drive Working Group Session, "Applying the Joint Intervenor Approach to Utility Risk Management: Optimal Risk Reduction Methodology" (distributed to service list on January 30, 2017)
- *Joint Utilities Slide Presentation at February 15, 2017 Workshop #2 in Phase 2, "Joint Utilities Uniform & Probabilistic Risk Assessment Methodology" (distributed to service list on February 13, 2017)
- *Report of Joint Intervenor Test Drive Step 1 Results, "Specifying the Multi-Attribute Value Function," by Drs. Feinstein and Lesser (distributed to service list on February 17, 2017)
- Staff Report on Workshop 2 in Phase 2 of SMAP, dated April 3, 2017, entered into record by April 7, 2017 Administrative Law Judge Ruling, and parties' comments on the Staff Report filed on April 25, 2017
- (Revised) Staff Report on Workshop 2 in Phase 2 of SMAP, dated May 16, 2017, entered into record by October 5, 2017 Administrative Law Judge Ruling
- Joint Status Report, filed July 21, 2017
- Joint Status Report of Pacific Gas and Electric Company, Southern California Edison Company, Southern California Gas Company, San Diego Gas & Electric Company, The Utility Reform Network, and Energy Producers and Users Coalition and Indicated Shippers, filed August 11, 2017
- Submission of JUA Safety Attribute Input Files, filed September 1, 2017
- *Updated Summary Report on the Joint Utilities' Approach Safety Attribute Test Drive Results (distributed to service list on September 8, 2017)
- Input and Source Documents of Pacific Gas and Electric Company, Southern California Edison Company, Southern California Gas Company, and San Diego Gas and Electric Company, filed September 29, 2017

- Joint Utilities Report on JUA Multi-Attribute Function Test Drive, filed October 13, 2017
- *Joint Intervenor Test Drive Report (distributed to service list on October 13, 2017)
- *Joint Intervenor Test Drive: Detailed Report on SCE Overhead Conductor Test Drive Problem (distributed to service list on October 13, 2017)
- *Joint Intervenor Test Drive: Detailed Report on Sempra Pipeline Test Drive Problem (distributed to service list on October 13, 2017)
- *Joint Intervenor Test Drive: Detailed Report on San Diego Gas & Electric Workplace Violence Test Drive Problem (distributed to service list on October 13, 2017)
- *Joint Intervenor Test Drive: Detailed Report on PG&E Workforce Adequacy Test Drive Problem (distributed to service list on October 13, 2017)
- *Joint Intervenor Test Drive: Detailed Report on PG&E Pipeline Test Drive Problem (distributed to service list on October 13, 2017)
- *Joint Intervenor Test Drive Results Slide Presentation for November 6-7, 2017 Workshop in Phase 2 (distributed to service list on November 2, 2017)
- *Joint Utilities Approach (JUA) to Risk Assessment, Slide Presentation for November 6-7, 2017 Workshop in Phase 2 (distributed to service list on November 2, 2017).

(End of Attachment A)