Standard Workpaper Template

In the March 10th, 2021 TWG, TURN presented a "Streamlined Format for Reporting Estimates and Assumptions." PG&E agreed to pilot the use of the Format (referred to herein as the Standard Workpaper Template) on one of the existing Risks from one of its 2020 RAMP report. Based on this experience, PG&E recommends that the Standard Workpaper Template be developed as relational data tables, consisting of a Risk Results table and a Risk Sensitivity Analysis table. These tables would be amenable to analysis with Excel Pivot Tables to generate the report envisioned in pages 10 & 11 of TURN's presentation, as well as other reports.

Accordingly, the analysis results for each Risk would be captured in separate data tables (one pair for each Risk), described below.

Risk Results Table

The Risk Results Table collects all the calculations associated with a Risk. It also represents the epistemic uncertainty[1] (due to data quality, etc.) inherent in the calculations in the Confidence Level field, which is determined based on the criteria described in the Confidence Level section below. The Risk Results table contains one row per Tranche-Year-Mitigation-Attribute-Result Type. The columns of the table are:

Column	Description
Risk	Name of Risk
Tranche	Name of Tranche
Year	Year for which the Value pertains to
Mitigation	One of: • Name of Mitigation • "Baseline": The Values represent baseline estimates • "All": Values are for Post Mitigation estimates assuming all the proposed mitigations are in place.
Attribute	One of: • Name of MAVF Attribute: For e.g., for PG&E it can be "Safety", "Reliability – Electric", etc. • "Overall": Values represent the overall MARS score, or are not related to Attributes (e.g. likelihood estimates are not related to Attributes)
Value	Numerical value
Result Type	See table below for valid Result Types
Confidence Level	"High", "Medium", "Low". The degree of confidence associated with the estimate/calculation. See discussion in the Confidence Level section below.

[1] "Epistemic uncertainties arise when making statistical inferences from data and, perhaps more significantly, from incompleteness in the collective state of knowledge ... The epistemic uncertainties relate to the degree of belief that the analysts possess regarding the representativeness or validity of the … model and in its predictions.", *NUREG-1855, Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision making, pp 12. United States Nuclear Regulatory Commission.*

Result Types

PG&E proposes the following Result Types. Additional Result Types can be added as necessary.

Result Type	Description
Risk Before	MARS value, present valued, before proposed mitigations are applied. If the Mitigation column is set to "Baseline", the value represents the Baseline risk score, calculated as Program Exposure x LoRE Before x CoRE Before for a given Risk-Tranche-Year-Mitigation-Attribute. If the Attribute is "Overall", the Value is the same as the sum of Risk Scores over all Attributes.
LoRE Before	Likelihood of Risk Event before proposed mitigations are applied. If the Mitigation column is set to "Baseline", the value represents the Baseline Likelihood.
CoRE Before	Expected Consequence in Scaled Units. If the Mitigation column is set to "Baseline", the value represents the Baseline CoRE.
Exposure Before	Total # of units (miles, etc.) for the Risk/Tranche/Year in the Baseline.
Risk After	MARS value after Mitigation is applied. This result is only available if Mitigation column is not "Baseline". This is calculated as Program Exposure x LoRE After x CoRE After for a given Risk-Tranche-Year-Mitigation-Attribute. If the Attribute is "Overall", the Value is the sum of Risk Scores over all Attributes.
LoRE After	Likelihood after Mitigation is applied. This result is only available if Mitigation column is not "Baseline". Note that the LoRE here is different from Tranche LoRE when the mitigation is not implemented for the entire tranche.
CoRE After	CoRE after Mitigation is applied. This result is only available if Mitigation column is not "Baseline".
Exposure After	Total # of units (miles, etc.) for the Risk/Tranche/Year after Mitigation is applied.
Mitigation Program Exposure Scope	The # of units (miles, etc.) for the Risk/Tranche/Year that the Mitigation will be applied to.
Cost	Present valued expected cost for the Year.

An example with illustrative values is provided in the Excel file titled "pge_std_wp_proposal_1.xlsx". Note that not all combinations of Mitigation, Attribute and Result Type are valid. For example, the combination of "Baseline", "Safety", and "LoRE Before" is not valid and will not be reported, because the likelihood of a risk event is separate from the consequence in the S-MAP Settlement Agreement framework.

Risk Sensitivity Analysis Table

The purpose of the Risk Sensitivity Analysis Table is to collect all the assumptions and input parameters used in Risk calculations. It also represents the epistemic uncertainty (due to data quality, etc.) inherent in the parameter in the Confidence Level field, which is determined based on the criteria described in the Confidence Level section below. Parameters are described in the "Parameter" field and grouped into two general types, Baseline or Mitigation Program, depending on whether they are used to calculate Baseline Risk Scores, or represent the effectiveness of mitigation programs (e.g., the amount of reduction, in percentages, that a mitigation will reduce the mean by). The sensitivity of the Risk score to changes in the value of the parameter is also provided. Formally, this is the partial first derivative of the Risk score with respect to the reported parameter:

φ: The reported parameter

$\lambda_1, \lambda_2, \ldots$: Other parameters used to calculate the Risk score

$R(\varphi, \lambda_1, \lambda_2, \ldots)$: Calculated Risk score

Sensitivity = $\frac{\partial R(\varphi, \lambda_1, \lambda_2, \ldots)}{\partial \varphi}$, the partial first derivative with respect to φ. This may be approximated by numerical methods.

Column	Description
Risk	Name of Risk
Tranche	Name of Tranche
Outcome	Outcome, or "Overall".
Attribute	One of: • Name of MAVF Attribute: For e.g., for PG&E it can be "Safety", "Reliability – Electric", etc. "Overall": Values represent the overall MARS score, or are not related to Attributes (e.g. likelihood estimates are not related to Attributes)
Year	Year
Mitigation	One of: • Name of Mitigation • "Baseline": The Values represent baseline estimates
Distribution	E.g.: "Poisson", "Log-normal", "N/A", etc.
Parameter	The type of parameter and what it applies to: • Baseline LoRE mean • Baseline CoRE mean • Baseline CoRE stdev • Mitigation LoRE Effectiveness • Mitigation CoRE Effectiveness • Etc.
Value	Assumed value of the Parameter
Sensitivity	Numerical value representing the change in Risk score when the Parameter is changed by an incremental amount.

Confidence Level	“High”, “Medium”, “Low”. The degree of confidence associated with the estimate/calculation. See discussion in the Confidence Level section below.
Justification	Tag that contains the criteria that lead to the Confidence Level determination. E.g., “Quantitative-Limited Internal Data”. See Confidence Level section below
Reference	Text field providing reference to further documentation, if necessary.

Confidence Level

PG&E proposes the use of a qualitative Confidence Level to describe the uncertainty inherent in Risk calculations and input assumptions. This is a valid incremental step towards a more rigorous treatment of data and modeling uncertainty and will provide parties with valuable experience and perspective for developing a more comprehensive and quantitatively-based methodology.

The Confidence Level for the parameters in the Risk Analysis table is determined according to the following tiered criteria.

Overall, How Parameter was Determined	Detailed Description of Method Used	Confidence Level
Quantitative	Bayesian or other formal analysis incorporating industry data with internal data.	High
	Internal data only, no available industry data or industry data was not used.	High
	Limited internal data.	Medium
SME-Judgment	Multiple SMEs with consensus utilizing proxy data.	High
	Multiple SMEs with uncertainty, or single SME with high confidence in proxy data.	Medium
	Single SME with uncertainty or high level of interpretation of proxy data.	Low

The criteria can be expanded by IOUs to incorporate other methods used to determine Parameters.

The Confidence Levels of calculations that depend on input parameters are directly related to the Confidence Levels of the input parameters themselves. For example, if the CoRE of a Risk uses input parameters that have a Low Confidence Level, the CoRE will have a Low Confidence Level itself, i.e., the Confidence Level of the CoRE will be the same as the lowest Confidence Level of its input parameters. For Post-Mitigated Risk scores, the Confidence Level depends on both the Mitigation program input parameters and the Baseline risk distribution parameters and is set to the lowest Confidence Level of its inputs, as follows.

Confidence Level of Post-Mitigated Risk Scores	Type: Mitigation Parameter Confidence Level		
Type: Driver or Baseline Parameter Confidence Level	**High**	**Medium**	**Low**
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Low