RISK MITIGATION ACCOUNTABILITY REPORTS (RMAR)

R.20-07-013 PHASE 4 STAFF PROPOSAL FOR WORKSHOP 3

12/4/2024

California Public Utilities Commission

Thanks to:

Safety Policy Division Staff

Level 4 Inc.

Contents

List of Figures

List of Tables

Executive Summary

Risk Mitigation Accountability Report (RMAR) is a process that should enable regulators, intervenors, and other parties to determine how effectively the utilities are executing their mitigation plans. A strong RMAR is grounded in the following principles:

1. *Consolidation*. RMAR can be thought of as a "consolidated statement of risk" that presents a 360-degree perspective on risk for the utility as a whole and for major sub-categories such as attribute, risk event, and risk tranche, borrowing on established principles of business case development and financial reporting.
2. *Context*. RMAR answers "compared to what" – a starting point, a baseline, a plan, a forecast, a risk tolerance level, or other standards.
3. *Accuracy and relevance*. RMAR must not mislead, which means it must present risk information in an accurate and relevant manner.
4. *Transparency*. RMAR ensures clarity, consistency, and comparability.
    a. Clarity: Data is clearly defined and labeled to avoid misinterpretation.
    b. Consistency: Use of consistent methodologies and definitions to ensure "apples-to-apples" comparability over time.
    c. Comparability: Provides meaningful comparisons between forecasts and results, results over time, and across utilities.
5. *Comprehensiveness*. RMAR presents multi-dimensional views of risk reduction for all risks and must be capable of handling ten dimensions or more.
6. *Time exposure*. RMAR captures the timing, pacing, and sequencing of risk reduction. It combines aspects of business cases (forward looking) and financial reporting (backward looking.)
7. *Governance and Infrastructure*. RMAR requires utilities to have the infrastructure to ensure data integrity, hierarchy control, version control, and model control over multiple periods.

Principles 1-5 are covered in chapter 2, principle 6 in chapter 3, and principle 7 in chapter 4.

The content and structure of RMAR are consistent with financial and risk reporting in other industries. The International Financial Reporting Standards (IFRS) focus on consistency, comparability, transparency, and accuracy,[1] and the Bank of International Settlements (BIS) lists 14 principles for risk reporting, including accuracy and integrity, clarity, completeness, and comprehensiveness.[2]

The goal for RMAR is a better understanding of all the risks faced by utilities as well as creating a structured way to hold utilities accountable for the forecasted risk reduction benefit and cost they present to the Commission in a Risk Assessment Mitigation Phase (RAMP) application or General Rate Case (GRC) to justify investments in mitigations. To achieve this goal, later chapters will also discuss how the RMAR must

[1] https://www.wallstreetmojo.com/ifrs/

[2] https://www.bis.org/publ/bcbs239.pdf

address changes to risk models (Chapter 5), standards and methodologies for attributing actual risk reduction (Chapter 6), and an approach to holding the utilities accountable for RMAR infractions (Chapter 8).

1 Background and Current State

1.1 RMAR in the Risk-based Decision-making Framework

CPUC Decision (D.)14-12-025 in December 2014 recommends that the utilities should be required to prepare two new annual reports, the Risk Mitigation Accountability Report (RMAR) and the Risk Spending Accountability Report (RSAR).[3] According to the decision,

- RMAR "would compare the utility's General Rate Case (GRC) projections of the benefits and costs of the risk mitigation programs adopted in the GRC to the actual benefits and costs, and to explain any discrepancies between the projected risk mitigation and the actual risk mitigation."
- RMAR "would consist of a program-by-program comparison of the utility's GRC projections of risk mitigation programs – quantified as much as possible using the models examined in the Safety Model Assessment Proceedings (S-MAPs) and used to prepare the RAMP assessments – with measured results of actual risk mitigation programs, including a comparison of projected and actual Risk Mitigation Cost Ratios."

CPUC decision D.16-08-018 includes further discussion on RMAR, including a suggestion to develop a common set of performance metrics.[4] CPUC D.19-04-020 further discusses RMAR and recognizes some of the obstacles for producing an RMAR. In particular, the decision observes the timing issues created by the staggered RAMP schedule for the large IOUs as seen in Table 1.1:

[3] D.14-12-025 at 43.

[4] D.16-08-018 at 159.

Table 1.1: RMAR Timeline Based on Previous S-MAP Requirements[5]

Timeline to RMARs Comparing Risk Spend Efficiency (RSE) Scores Based on SA Methodology									
RAMP and GRC filings include RSE scores					**RAMP and GRC filings compare RSE scores**				
Test Year	Letter Requesting OII	RAMP Filing	GRC Filing	RMAR Report	Test Year	Letter Requesting OII	RAMP Filing	GRC Filing	RMAR Report
Sempra TY 2022	Sept 1, 2019	Nov 30, 2019	Sept 1, 2020	July and Sept 31, 2021	Sempra TY 2025	Sept 1, 2022	Nov 30, 2022	Sept 1, 2023	July and Sept 31, 2024
PG&E TY 2023	Sept 1, 2020	Nov 30, 2020	Sept 1, 2021	March 31, 2022	PG&E TY 2026	Sept 1, 2023	Nov 30, 2023	Sept 1, 2024	March 31, 2025
SCE TY 2024	Sept 1, 2021	Nov 30, 2021	Sept 1, 2022	May 31, 2023	SCE TY 2027	Sept 1, 2024	Nov 30, 2024	Sept 1, 2025	May 31, 2026

The Commission concluded by finding it "premature to approve specific RMAR requirements…at this time. Instead, it is reasonable to defer consideration of a specific RMAR methodology…until closer to the time when this can be accomplished given the schedule outlined in Table *1.1*."[6] (Table 1.1 above.) In the interim, IOUs are directed "to include in their annual Safety Performance Metrics (SPM) Reports some of the information originally envisioned as belonging in the RMARs, and in addition, the Commission "intends to revisit the program-by-program comparison of changes to Cost-Benefit Ratios in a future S-MAP proceeding".[7]

As is clear from the history of RMAR since 2014, implementation of a complex, multi-dimensional report that is at the same time backward-looking and forward-looking has proven elusive.

1.2 Current State of RMAR

The utilities have participated in working groups for developing and implementing RMAR. SDG&E's interpretation of an Interim RMAR was submitted with its 2021 SPM Report the results of which were reported in Tables 1.2 and 1.3 below for operating and maintenance (O&M) and Capital expenses of certain mitigations. The Interim RMAR is a high-level summary, which compares actual O&M expenses and capital expenditures for 2021 versus the "imputed authorized" expenses for that year, and calculates variances:

[5] D.19-04-020 at 31.

[6] Ibid., page 32.

[7] Ibid., page 32.

Table 1.2: SDG&E Interim RMAR for O&M Mitigations in 2021[8]

SDG&E O&M Details (2021 Direct $000)					
RAMP Chapter	RAMP Risk Description	2021 Actuals	2021 Imputed Authorized	$ Variance	% Variance
SDG&E-01	Wildfires Caused by SDG&E Equipment (Including Third Party Pole Attachments)	67,809	41,999	25,810	61%
SDG&E-02	Catastrophic Damage Involving Third Party Dig- Ins	7,112	4,760	2,351	49%
SDG&E-03	Employee, Contractor, and Public Safety	66,675	53,452	13,223	25%
SDG&E-04	Distributed Energy Resources – Safety and Operational Concerns	48	84	(36)	-43%
SDG&E-06	Fail to Blackstart	16	46	(30)	-65%
SDG&E-07	Cyber Security	12,799	8,643	4,156	48%
SDG&E-08	Aviation Incident	456	463	(7)	-1%
SDG&E-09	Workplace Violence	4,389	5,369	(980)	-18%
SDG&E-10	Catastrophic Damage Involving High-Pressure Gas Pipeline Failure	10,299	5,834	4,466	77%
SDG&E-11	Unmanned Aircraft System Incident	177	183	(6)	-3%
SDG&E-12	Electric Infrastructure Integrity	8,464	22,422	(13,958)	-62%
SDG&E-13	Records Management	6,338	9,664	(3,327)	-34%
SDG&E-14	Climate Change Adaptation	-	454	(454)	-100%
SDG&E-16	Catastrophic Damage Involving Medium-Pressure Gas Pipeline Failure	12,073	16,829	(4,756)	-28%
SDG&E-17	Workforce Planning	3,372	2,471	901	36%
New	Emergent RAMP	82,330	-	82,330	100%
	Total SDG&E RAMP	282,357	172,674	109,683	64%

[8] SDG&E 2021 Safety Performance Metric Report at 33-34.

Table 1.3: SDG&E Interim RMAR for Capital Mitigations in 2021[9]

SDG&E Capital Details (2021 Direct $000)					
RAMP Chapter	RAMP Risk Description	2021 Actuals	2021 Imputed Authorized	$ Variance	% Variance
SDG&E-01	Wildfires Caused by SDG&E Equipment (Including Third Party Pole Attachments)	189,368	92,414	96,954	105%
SDG&E-02	Catastrophic Damage Involving Third Party Dig- Ins	3	318	(315)	-99%
SDG&E-03	Employee, Contractor, and Public Safety	15,101	13,245	1,856	14%
SDG&E-04	Distributed Energy Resources – Safety and Operational Concerns	8	241	(233)	-97%
SDG&E-05	Major Disturbance to Electrical Service (e.g., Blackout)	0	1,726	(1,726)	-100%
SDG&E-06	Fail to Blackstart	34	2,051	(2,017)	-98%
SDG&E-07	Cyber Security	10,976	3,229	7,747	240%
SDG&E-08	Aviation Incident	0	1,980	(1,980)	-100%
SDG&E-09	Workplace Violence	5,061	4,185	876	21%
SDG&E-10	Catastrophic Damage Involving High-Pressure Gas Pipeline Failure	3,251	10,608	(7,358)	-69%
SDG&E-12	Electric Infrastructure Integrity	116,670	108,545	8,125	7%
SDG&E-13	Records Management	15,122	12,693	2,430	19%
SDG&E-16	Catastrophic Damage Involving Medium-Pressure Gas Pipeline Failure	123,334	45,431	77,903	171%
New	Emergent RAMP	218,856	32,282	186,574	578%
	Total SDG&E RAMP	697,783	328,946	368,837	112%

While a step in the right direction, the interim RMAR provides only one period of data and only for expenses. At this stage it is more a spending reconciliation than a risk report, which would focus on risk reduction as well as expenses.

In April 2024, SCE and SDG&E filed RSARs[10], which incorporate more dimensionality, such as granular spending categories and multi-year comparisons. The RSARs provide comparisons of actual and imputed authorized operating and capital expenditures for the five years spanning 2019 to 2023, for RAMP

[9] SDG&E 2021 Safety Performance Metric Report at 35.

[10] Risk Spending Accountability Report of SDG&E (U902M) and SCE (U904G) for 2023, April 30, 2024.

mitigation activities such as cybersecurity, substation reliability, records management, gas infrastructure resilience, etc.

In June 2024, PG&E filed its annual System Hardening Accountability Report (SHAR), which includes tables that forecast future risk reduction versus a target level of risk reduction, compares actual risk reduction results versus the forecast and the target.[11] The tables below show a four year forecast of risk reduction versus a target risk reduction (Table 1.4) and target miles of hardening (Table 1.5) as well as the actual risk reduction for the first year versus the target (Table 1.6). Actual risk reduction versus the forecast can be determined by comparing the two tables.

Table 1.4: PG&E SHAR Projected Risk Reduction Percentage: Summary by Year

Risk Model	2023	2024	2025	2026	Total 2023 - 2026
Total V2 Forecasted Annual Risk Reduction	2.4%	2.1%	1.1%	0.4%	6.1%
Total V3 Forecasted Annual Risk Reduction	0.1%	0.7%	6.5%	7.2%	14.5%
Sum of Total V2 + Total V3 Forecasted Annual Risk Reduction	2.5%	2.8%	7.6%	7.7%	20.6%
Sum of Total V2 + Total V3 Forecasted Cumulative Risk Reduction	2.5%	5.3%	12.9%	20.6%	20.6%
Cumulative Risk Reduction Target (D.23-11-069, OP 23)	2%	5%	10%	18%	18%

Table 1.5: PG&E 2023 SHAR Projected System Hardening Miles: Summary by Year

Risk Model	2023	2024	2025	2026	Total 2023 - 2026
Total V2 Forecasted Annual Mileage	394.7	266.8	171.0	53.5	886.0
Total V3 Forecasted Annual Mileage	28.3	56.0	508.6	575.1	1167.9
Sum of Total V2 + Total V3 Forecasted Annual Mileage	422.9	322.8	679.6	628.5	2053.9
Annual System Hardening Mileage Target	420	280	520	788	2008
Sum of Total V2 + Total V3 Forecasted Cumulative Mileage	422.9	745.7	1425.3	2053.9	2053.9
Cumulative System Hardening Mileage Target	420	700	1220	2008	2008

[11] Advice 7312-E, Attachment D - PGE SHAR 2023-Public.xlsx

Table 1.6: PG&E 2023 SHAR Risk Reduction Percentage for Completed Projects: Summary by Year

Risk Model	2023	2024	2025	2026	Total 2023 - 2026
Total V2 Annual Risk Reduction	2.4%	N/A	N/A	N/A	2.4%
Total V3 Annual Risk Reduction	0.1%	N/A	N/A	N/A	0.1%
Sum of Total V2 + Total V3 Annual Risk Reduction	2.5%	N/A	N/A	N/A	2.5%
Sum of Total V2 + Total V3 Cumulative Risk Reduction (Compare to Cumulative Target)	2.5%	N/A	N/A	N/A	2.5%
Cumulative Risk Reduction Target (D.23-11-069, OP 23)	2%	5%	10%	18%	18%

The SPM, RSAR and SHAR are encouraging signs of progress towards a full-fledged RMAR. However, the problem is that all these reports are disconnected and operate at different scales and time cycles.[12] The SHAR presents a multi-dimensional view of risk reduction, combining a time horizon, a forecast, a target, and actual results. Multi-dimensional views are a key feature of RMAR, and the following chapters will go into detail about what a full-fledged RMAR looks like.

[12] For an example of how extreme this problem is see Level 4 Report, *An Approach for Including Risk Mitigation Accountability Reporting into the RDF*, Section 12.2, pg. 53 https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/safety-policy-division/meeting-documents/rmar_level_4_final_12022024.pdf

2 Risk Reporting as a Consolidated Statement of Risk

2.1 The Idea of a Consolidated Statement of Risk

Consolidated financial reports provide evaluators with a holistic view of an organization and its major subgroups. The reports consist of tables that dissect different aspects of financial performance, yet always can be "consolidated" to the whole.

In a similar vein a consolidated statement of risk would provide evaluators with standardized tables that examine risk and risk reduction from a variety of perspectives, while answering the overarching questions:

1. Has utility risk been reduced to a tolerable level, and if not, when will it be reduced to that level?

2. How is the utility achieving other objectives such as cost-efficiency, safety and reliability improvements, and affordability?

Standardized tables ensure that risk information is presented in an internally consistent way, and that the results can be compared across utilities.

The primary purpose of a consolidated statement of risk is to present aggregated risk and risk reduction at the level of the enterprise and major subgroups ("macro reports"), but many of the principles apply for disaggregated reporting, for example at the Risk Reporting Unit (RRU) level ("micro reports"). Table 2.1 below describes some of the key differences between micro and macro risk reports.

Table 2.1: Differences Between Macro and Micro Risk Reporting

	Macro	Micro
Organization Level	Hierarchy Level, or major subgroup (Risk Event, Attribute, Tranche)	Risk Reporting Unit
Assessment	Decision-making, economic analysis	Compliance and control
Focus	Portfolio Analysis Stochastic Optimization	Risk Reporting Unit analysis Revenue and cost accounting

It would be infeasible to attempt both types of reporting in a single report. RMAR lends itself more to macro reporting.

Another reporting distinction is external, or publicly available reporting, versus reports for internal agency review only. This distinction can be accomplished by giving each table in the consolidated statement of risk a public or private designation.

In the following sections, we will provide sample tables from a fictitious consolidated statement of risk. These tables contain made-up, though internally consistent, data and are for illustrative purposes only. We will also use the terms consolidated statement of risk and RMAR interchangeably.

2.2 Context: "compared to what"

The most important principle of a consolidated statement of risk is the context principle, in which every presentation of data is geared towards answering the question "compared to what", along with a secondary question, "why".[13]

Every table in the consolidated statement of risk is comparative in nature. Comparisons may include actual results to goals, actual results to modeled results, modeled results to risk tolerance, results of one period to another period, how a mitigation plan changes from an old model version to a new one, and many more.

The following table (Table 2.2) from a hypothetical RMAR presents average risk reduction in the context of pre-mitigated risk and overall residual risk in year 3. Relevant comparisons include actual risk reduction versus plan, and overall residual risk versus risk tolerance.

Table 2.2: Example of RMAR Table Comparing Actual vs. Planned Risk Reduction

			Act B(W) Plan	
Risk reduction overview, average risk	**Actuals Y3**	**Plan Y3**	**$**	**%**
Pre-mitigated risk	$1,700	$1,700		
Risk reduction	**$168**	**$215**	**($47)**	**-22%**
Overall residual risk	$1,532	$1,485	($47)	-3%
Risk tolerance	$500	$500		
% Risk tolerance gap reduced	14%	18%		-4%

2.3 Accuracy and Relevance

The next key principle is that RMAR must never mislead. Faulty data, errors, and omissions often lead to inaccurate and misleading reports. Accuracy by itself may not be sufficient: including irrelevant information in tables and visuals can lead to obfuscation and confusion. An example of accurate but irrelevant reporting would be producing likelihood of cyber-attack using data since the 1990s, before cyberattacks became ubiquitous[14]. Even if accurately calculated and presented, it could steer evaluators to underestimate current and future cyber risk.

[13] Edward Tufte, The Visual Display of Quantitative Information. Graphics Press, 1983. Page 74.

[14] A Brief History of Cybercrime https://arcticwolf.com/resources/blog/decade-of-cybercrime/

Accuracy in RMAR is not the same as accuracy in risk modeling, though there are some common elements. Both require accurately capturing, storing, and retrieving data. Both require proper and judicious use of data. While the presence of errors is a fact of life in risk modeling – as long as the errors are unbiased (neither systematically understated nor overstated) – the reporting requires precision. Precision means that numbers are correctly retrieved from systems of record, classified properly, and presented appropriately. Modeled outputs can be "roughly right" but "roughly right reporting" does not exist. The governance and infrastructure to ensure accuracy will be covered in more detail in Chapter 6.

2.4 Transparency: Clarity, Consistency and Comparability

The principle of transparency means that the information contained in RMAR means what the evaluator is led to believe it means. Benefits include risk reduction and nothing else. Expenses include everything they should. Double-counting is avoided. *Clarity* depends on clear definitions and labeling so an evaluator understands what he or she is looking at. Defining units help provide clarity. Subtotals help provide clarity. The snippet from a hypothetical report in Table 2.3 lacks clarity because it fails to define the units of impact. Is it damage in dollars? Acres flooded? The amount of water volume released? An evaluator may not know what to do with the data provided and will move on, resulting in an opportunity to impart helpful information being wasted. Worse, the evaluator could misinterpret and inadvertently misuse the information.

Table 2.3: Insufficient Clarity Due to Poor Labeling

Modeled Flood Impact	2024	2025	2026
	250	150	80

Another common error in reporting is omission of helpful subtotals. Table 2.4 below shows the distribution of spending across mitigation categories over a three-year period. Without a subtotal, it is impossible to decipher (without forcing the evaluator to do the math) the purpose of the table. Is it presenting the allocation of spending by mitigation for each year (columns each add to 100%) or the three-year allocation for each mitigation (rows each add to 100%)?

Table 2.4: Mitigation Spending Allocation without Subtotals

Mitigation Spending Allocation	2024	2025	2026
Wildfire	40%	35%	35%
Cybersecurity	15%	30%	40%
Hydro power	25%	20%	15%
Other	20%	15%	10%

By contrast, the subtotal row in the otherwise identical Table 2.5 below makes it clear how to read and interpret the data. Subtotals make it clear that the data is aligned by column

Table 2.5: Mitigation Spending Allocation with Subtotals

Mitigation Spending Allocation	2024	2025	2026
Wildfire	40%	35%	35%
Cybersecurity	15%	30%	40%
Hydro power	25%	20%	15%
Other	20%	15%	10%
Total	100%	100%	100%

Consistency means that data that is presented together is "apples-to-apples"; it is defined in the same way and created using the same methodology. It would be inconsistent, not to mention incomprehensible, if the units in the 2024 column in Table 2.4 were in acres while those in the 2025 column were in dollars. More subtly, Table B (Table 2.5) would be compromised if the changes in percentages between 2025 and 2024 were solely due to an accounting change. An example of an accounting change would be a revised fixed expense allocation methodology for 2025 that shifted expenses to cybersecurity from the other risk events.

Eventually, RMAR may encompass many years, ten or more, so changes in organization, data, models, and methodologies are possible. Maintaining consistency despite such changes will be covered in Chapter 5.

Comparability follows from consistency and means that comparisons are meaningful and appropriate. Comparability is also the foundation for the context principle in section 2.2, so it is essential that all RMAR comparisons are legitimate and insightful. It would not ordinarily make sense to compare the full year results of one year against a quarterly result of another, or to compare the operating expenses of a cybersecurity mitigation with the capital expense of a hydro-power mitigation.

2.5 Comprehensiveness: Multi-Dimensionality

By its nature, a comprehensive analysis of risk is highly multi-dimensional and the Risk-based Decision-making Framework (RDF) examines risk in at least 10 dimensions:

1. **Hierarchy.** Based on organizational structure, e.g., circuit, substation, pipeline, watershed region, HFTD, region, division, enterprise. Hierarchy defines how reports and tables are grouped, the "parent-child" relationships.
2. **Scenario**. Actuals, plan, or forecast
3. **Version**. Model or methodology
4. **Risk events.** All risks, wildfire, gas incidents, cyber-attack, hydropower, etc.

5. **Tranches.** Risk event-dependent.[15]
6. **Mitigations.** Risk event-dependent. For wildfire – includes undergrounding, covered conductor, vegetation management, etc.
7. **Attribute.** Safety, reliability, financial.
8. **Risk measure.** Average risk, tail-average risk[16].
9. **Accounts (line-items).** This dimension contains all the calculations we are interested in: Pre-mitigated risk, mitigation value, overall residual risk, Benefit-Cost Ratios (BCR), risk tolerance, capital expenses, operating expenses, likelihood of risk event (LoRE), consequence of risk event (CoRE), natural units.
10. **Work Unit.** Corresponds to the work units presented in the GRC and RSAR.
11. **Time**. Periods under consideration, can be months, quarters, years, GRC Cycle (i.e. PG&E's 2027 GRC).

RMAR tables can comfortably handle 6-8 dimensions, which is why the consolidated statement of risk may require numerous tables to capture every dimension. Table 2.6 shows the dimensionality of a typical RMAR table:

[15] See D.24-05-064, Appendix A, Row 14

[16] As discussed in detail in the Phase 4 Workshop #2 Staff Proposal on Overall Residual Risk, Risk Tolerance and Simple Optimization, risk-based decisions should capture tail risk in addition to average risk. Correspondingly, RMAR must report on tail risk reduction.

Table 2.6: Reporting Table Layout in 8 Dimensions: Hierarchy, Risk Event, Version, Scenario, Risk Measure, Attribute, Line Item, and Time

Hierarchy **Risk Event** **Version**				
Scenario I		**Scenario II**		**"Compared to What?"**
Risk Measure	Time =>	Risk Measure	Time =>	SI B(W) S2
Attribute A		Attribute A		
Line 1		Line 1		
Line 2		Line 2		
Attribute B		Attribute B		
Line 1		Line 1		
Line 2		Line 2		

Table 2.7 below is a sample table based on a hypothetical RMAR. It presents risk information in seven dimensions and provides multiple comparisons – actuals to the original plan, new forecast to the original plan, and critically, progress towards meeting risk tolerance standards.

Table 2.7: Hypothetical RMAR Actuals vs Plan and Forecast

Hierarchy	Entity Level							
Scenario	Actuals/FC							
Version	Model 2.1							
Period	Actuals: Years 1-3; Forecast Years 4-10							
WILDFIRE RISK ACTUALS/FC VS. PLAN								
			A		**B**			
Table 1: Circuits			**Act B(W) Plan**				**FC B(W) Plan**	
Circuit Miles	**Actuals Y1-Y3**	**Plan Y1-Y3**	**#**	**%**	**Forecast**	**Plan**	**$**	**%**
UG	1,000	1,400	(400)	-29%	1,320	1,400	(80)	-6%
CC	380	400	(20)	-5%	380	400	(20)	-5%
Total	**1,380**	**1,800**	**(420)**	**-23%**	**1,700**	**1,800**	**(100)**	**-6%**
Table 2. Summary			**Act B(W) Plan**				**FC B(W) Plan**	
Average Risk	**Actuals Y1-3**	**Plan Y1-Y3**	**$**	**%**	**10Y Forecast**	**Plan**	**$**	**%**
Pre-mitigated risk	**$870**	**$870**			**$870**	**$870**		
Risk reduction	**$106**	**$143**	**($37)**	**-26%**	**$135**	**$143**	**($8)**	**-6%**
Overall residual risk at Y3	$764	$727	($37)	-5%	$735	$727	($8)	-1%
Risk tolerance	$200	$200			$200	$200		
% Risk tolerance gap reduced	16%	21%		-6%	20%	21%		-1%

Additional tables can be added to include other dimensions, which may require substituting out other dimensions to maintain readability. For example, a table designed to take a closer look at risk reduction by each risk event and attribute may need to collapse the time dimension.

Chapter 2 has examined the structure of the RMAR. The next chapter will discuss key concepts in creating the RMAR.

3 Creating the Consolidated Statement of Risk

There are three building-blocks for creating the consolidated statement of risk: The Risk Reporting Unit (RRU), which is the basic building block of the RMAR, was discussed in the Workshop #1 Staff Proposal.[17] The discussion regarding RRU in the Workshop #1 Staff Proposal is relevant to RMAR, however in this proposal we do update the unique identifiers to include roll-up points relevant to the RMAR (see also Section 2.5).

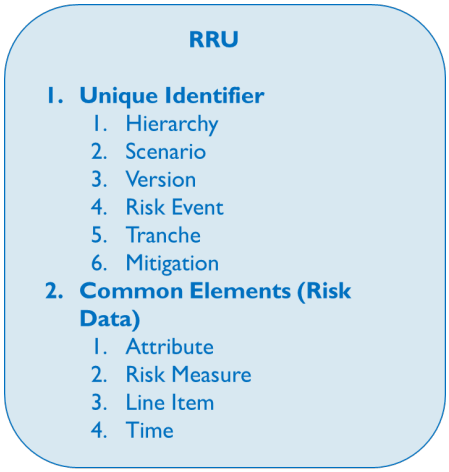

Figure 3.1 Updated RRU Organization.[18]

The rest of this section will focus on the other two building blocks, the plan phase and the results phase, which capture the relationship between projections (plans and forecasts) and results. The plan and results phase also present the time exposure to risk through the timing, pacing, and sequencing of risk reduction actions.

3.1 The Plan Phase

RMAR always starts with the Plan Phase. The beginning of any risk program starts with a plan or business case which is a set of projections and promises based on data, models, and subject matter expertise. The

[17] See Safety Policy Division, Definition of Scoped Work and the Risk Reporting Unit, October 16 2024 at 12-16

[18] This is updated from Figure 1 of SPD Workshop #2 Staff Proposal on the Definition of Scoped Work and the Risk Reporting Unit at 12. Hierarchy refers to a utility's organizational hierarchy, such as an Electric Distribution Division or a Gas Distribution Division as well as other ways of categorizing high risk assets and systems (i.e. HFTDs, circuits, regions etc.). Scenario refers to actuals, plan or forecast, which will be discussed later in the RMAR Staff Proposal. Version could refer to a risk model version.

plan phase must be carefully thought out, with all the relevant dimensions included. If a dimension is not included in the plan phase, it cannot be evaluated later in the results phase.

In the context of the RDF, the RAMP ideally would serve as the Plan Phase (which could be updated in the GRC) to avoid having two versions of mitigation plans. This would require modifying the RAMP and GRC to include all the dimensions discussed in Section 2.5 that will be reported in the RMAR.

The plan phase is entirely forward looking – there are no actual results to evaluate. It is part projection and part promise. Evaluators can analyze the plan phase to make sure that standards such as risk tolerance are met and BCR thresholds exceeded. Other techniques, such as reference class forecasting can be used to assess whether the projections are realistic.

Original RAMP Backcast. Given that the first RAMPs were filed in 2016, there has been significant risk "buy down" in the last eight years. Ideally, the risk reduction projections of future RMARs would reference the level of overall residual risk as of 2016, the risk reduction achieved since 2016, and the related mitigation capital and operating expenditures. The backcast would not need to be at the same level of detail as RMAR and would serve to capture a more holistic view of risk and risk reduction since the beginning of the RDF process. This backcasting approach will also be addressed through the presentation of overall residual risk, as discussed in the Phase 4 Scoping Memo. The presentation of overall residual risk is also crucial for the implementation of risk tolerance.

Figure 3.2 below is a visualization of what backcasting overall residual risk to 2016 levels compared to the RMAR period might look like.

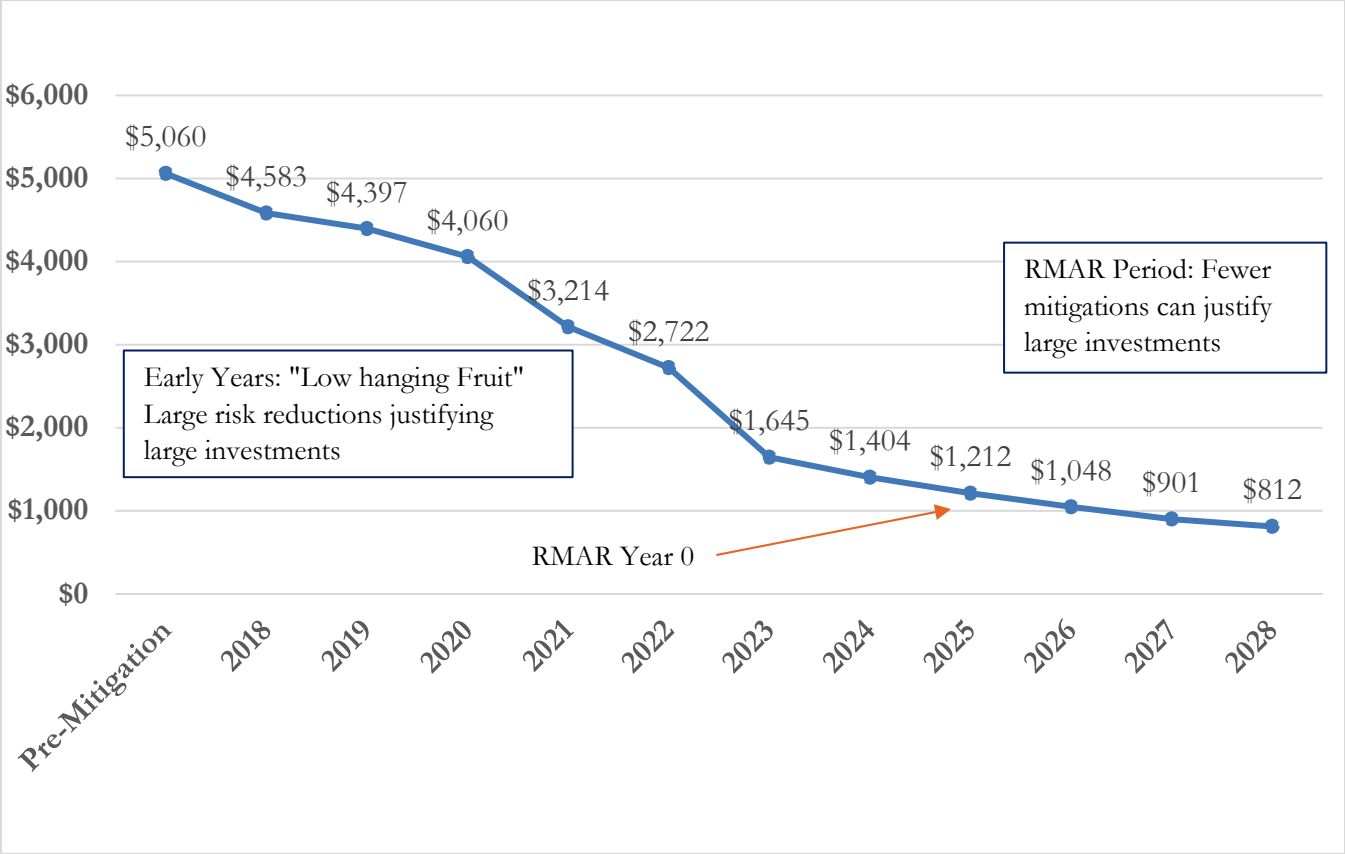

Figure 3.2: Backcasting Overall Residual Risk[19]

3.2 Results Phase

With the passage of time, projections turn into actual outcomes and results. Mitigations are implemented and modeled risk reduction is realized. Actual risk events – wildfires, cyber-attacks, threats to dams – occur. All the new information is captured and stored as risk data, models are improved and updated, and new projections of the future are made.

The results phase contains the plan, results, and revised projections, and makes comparisons between them. The components of the results phase will be covered in detail in Chapter 6. Figure 3.3 is a visualization of the plan phase and results phase of RMAR.

[19] A similar figure was discussed in the Phase 4 Staff Proposal on Overall Residual Risk, Risk Tolerance and Simple Optimization at 9.

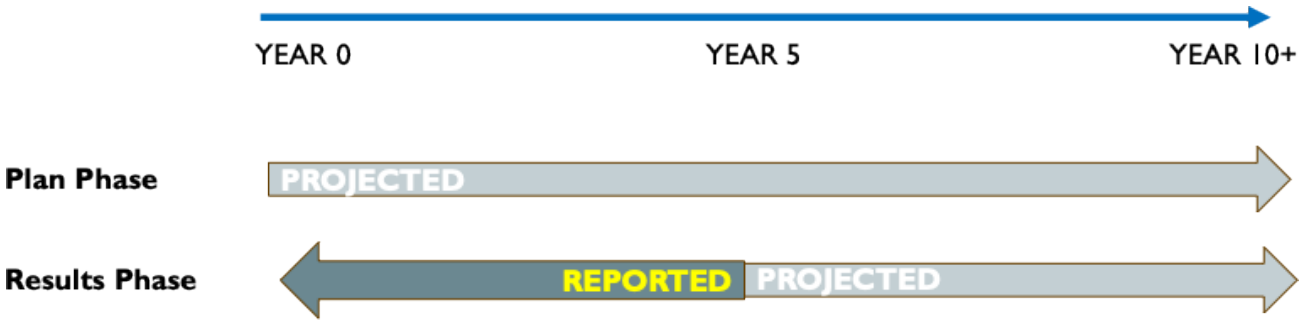

Figure 3.3 The Phases of RMAR

4 RMAR Report Structure

4.1 Scenarios and Classes

The RMAR report – the body of numerical tables and narrative – is made up of *scenarios* (which is an RMAR dimension). Scenarios include plan, outcomes, results, and forecasts.

- *Plan*. The plan scenario is the original plan from the base year.
- *Outcomes* are the impacts of risk events that have occurred during the report period and prior report periods.
- *Results* are the calculations of mitigation benefits and costs for the report period and prior report periods
- *Forecasts* are new projections based on new information based on outcomes, modeled results, and advancements in risk modeling.

The plan phase includes only the plan scenario, while the results phase includes all the scenarios. It is the relationship of the scenarios in the results phase that creates context in the RMAR, allowing it to answer the questions "compared to what?" and "why?" (see section 2.2).

Within each scenario, numerical tables are organized into two classes based on the concept of stock vs. flow.

- *Flow* data feature the mitigation benefits and costs. Flow can depict mitigation benefits for a given reporting period, the sum of all reporting periods, and the sum of the plan periods or forecast periods. Flow data are additive. BCRs are calculated from flow data.
- *Stock* data feature pre-mitigated risk, risk reduction, overall residual risk, and risk tolerance. Stock focuses on a point-in-time result, usually an end-of-period though sometimes the average between periods. Stock data are not additive.

Figure 4.1 below explains stock vs. flow, and how the two classes relate to each other. Stock line items are shown in blue in Table 4.1. We start with a level pre-mitigated risk at the point-in-time before any new mitigations are considered. Risk reduction is the point-in-time impact of mitigation activities. Overall residual risk is the point-in-time level of remaining risk after risk reduction. Risk tolerance is the maximum level of expected risk at a given point-in-time.

The interpretation of the stock items is that pre-mitigated risk begins at a level of $100, risk reduction is $10 in Y1 and $20 in Y2 and Y3, which results in overall residual risk of $90 in Y1 and $80 in Y2 and Y3. Overall residual risk remains above risk tolerance in all three years.

Flow items are shown in green in Table 4.1. Mitigation benefit and costs are the sum of those line-items over the three-year period, which for benefits is $50 and costs is $40. We calculate BCRs based on the flow of mitigation benefits and costs, which in this example is 1.25 (undiscounted for simplicity.)

Figure 4.1: Stock and Flow Example from Water Management

Table 4.1: Stock vs. Flow RMAR Table

	Y1	Y2	Y3	Total
Pre-mitigated risk	$100			
Mitigation benefit or Risk reduction	$10	$20	$20	$50
Mitigation cost	$40			$40
BCR				1.25
Overall residual risk	$90	$80	$80	
Risk tolerance	$60	$60	$60	

The dam visual in Figure 4.1 illustrates the relationship between stock and flow, where the change between before- and after- stock is equal to the flow. This leads to a critical observation: mitigation impact can be interpreted as either a stock (point-in-time) or flow (additive) line-item. This duality is what relates stock and

flow tables. To avoid confusion, when mitigation impact is used as a flow line-item, we will use the term "mitigation benefit", and when it used as a stock line-item, we will use the term "risk reduction" (Table 4.1).

4.2 RMAR Tables: Plan Phase

The plan phase is forward looking and contains only the plan scenario. There is no history of actual events to evaluate. The schema in Table 4.2 below describes the structure of plan phase reports. Y1 denotes the first year of the plan, and YZ the final year.

Table 4.2: Plan Phase Table Structure

I. Mitigation Cost and Benefit (Flow)	II. Risk Reduction (Stock)
Average Risk	**Average Risk**
Modeled benefit Y1-YZ	Pre-mitigated risk
Modeled cost Y1-YZ	Risk Reduction (YZ)
BCR	Overall residual risk (YZ)
	Risk Tolerance
	% of risk tolerance gap closed
Tail Average Risk	**Tail Average Risk**
Modeled benefit Y1-YZ	Pre-mitigated risk
	Risk Reduction (YZ)
	Overall residual risk (YZ)
	Risk Tolerance
	% of risk tolerance gap closed

The following examples from a hypothetical RMAR illustrate how plan phase tables might look. Table 4.3 below is a summary table for mitigation benefits and costs (flow) at the enterprise level. It tells an evaluator that the plan is for $1,930 mitigation benefit of average risk over four years at a cost of $1,155 for BCRs of 1.97 to 2.51 depending on discount method. Tail average risk mitigation benefit is projected to be $9,905.

Table 4.3: Hypothetical Plan Phase Mitigation Costs and Benefits Table

Mitigation Benefit Overview		
4 Year Plan Horizon	Average Risk	Tail Avg. Risk
Total mitigation benefit	$1,930	$9,905
Total mitigation cost	$1,155	-
Net mitigation benefit	$775	-
BCR:		
WACC discount	1.97	-
Social discount	2.51	-
Hybrid discount	2.32	-

Table 4.4 is the related risk reduction and risk tolerance (stock) table. It tells an evaluator the level of pre-mitigated risk for average risk and tail average risk, $1,700 and $8,400 respectively. Average risk reduction from mitigation activities is projected to be $215, while tail average risk reduction is projected to be $1,099. Overall residual risk is calculated for each risk measure and compared to risk tolerance.

Overall residual risk remains higher than risk tolerance for each risk measure; risk reduction in this round of mitigation planning has closed the gap between pre-mitigated risk and risk tolerance by 18% for average risk and 17% for tail average risk. More risk reduction will need to occur to meet risk tolerance.

Table 4.4: Hypothetical Plan Phase Risk Reduction and Risk Tolerance Table

Risk and Risk Tolerance Overview		
	Average Risk	**Tail Avg. Risk**
Pre-mitigated risk at time 1	**$1,700**	**$8,400**
Risk reduction	$215	$1,099
Overall residual risk, year 4	**$1,485**	**$7,301**
Risk Tolerance	$500	$1,800
% of risk tolerance gap reduced	18%	17%

Plan phase tables can add further dimensions such as time (years 1 through year 4), risk event, attributes, mitigation detail, and tranches. SPD recommends that Plan Phase tables with mitigation level of detail be required in RMAR tables.

4.3 RMAR Tables: Results Phase

In contrast to the plan phase, the results phase is backward and forward looking. It includes all four scenarios – plan, outcomes, results, and forecasts – and may include multiple comparisons between the scenarios.

Results phase tables may also have multiple views of the time dimension (report period, prior report periods, prior and future periods, etc.). We will use the following notation to describe the time dimension for the results phase:

- *Y1*. Base plan year.
- *YN*. Reporting year. For example, Y3 means the RMAR is discussing year 3 outcomes and results.
- *YZ*. Final year of the plan.
- *Y1YN*. The history of outcomes and results. Y1Y3 would include year 1 through year 3.
- *Forecast*. Includes results for Y1YN and projections after Y1YN through YZ.

4.3.1 Outcomes

Outcomes are the monetized impact of risk events that have occurred in a year. Wildfire outcomes would include the safety, reliability and financial of all wildfires in a year, multiplied by the monetized values for safety, reliability, and financial attributes. If the RMAR YN was Year 3, there would be wildfire outcomes for year 1, year 2, and year 3.[20]

The schema below depicts how outcomes should be reported in RMAR:

Risk Outcomes

Flow:

- Outcomes vs. Plan average modeled risk, Y1YN
- Outcomes vs. Plan tail averaged modeled risk, by year

Stock:

- Average Outcomes vs. Average Risk Tolerance Y1YN
- Outcomes vs. Tail Risk Tolerance YN

Risk outcomes can be presented as a flow and compared to the plan for modeled risk. Risk outcomes can also be presented as a stock and compared to risk tolerance.

The following examples from a hypothetical RMAR show how an outcomes table in the results phase might look. In Table 4-5 below, a flow table, risk outcomes across all risk events for the enterprise in year 3 was $3,100, and the total from year 1 through year 3 was $3,500. These outcomes are compared to the modeled risk in the Plan for average risk and tail average risk.

[20] Note that outcomes can be zero for a risk event.

Since risk outcomes can be lumpy, a single year result is best compared to tail average modeled risk to check for a "breach" – breaches of tail average should occur very rarely. Multiple year outcomes will smooth the lumpiness and can be compared to average modeled risk. In this example, both risk outcomes are less than 100% of their comparisons to modeled results used in the plan.

Table 4.5: Risk Outcomes Flow Table

Hierarchy	**Enterprise**			
Risk Events	All			
Version	Actuals/FC			
Model	Model 2.1			
Period	Year 3			
ACTUALS/FC VS. PLAN				
		Modeled Risk		**Actual %**
Risk Outcome	**Actual**	**Avg**	**Tail Avg**	**of Modeled**
Risk outcome, Year 3	**$3,100**		$7,301	**42%**
Risk outcome, Years 1-3	**$3,500**	$4,675		**75%**

Table 4.6 below presents the related outcomes stock table and expands the time dimension to include all three years of outcomes. This table makes clear that there was a major risk event in year 3 after two relatively low risk years. The average risk outcome over the three years is considerably higher than the average risk tolerance. The risk outcome in year 3 has breached tolerance for tail average risk, signaling that year 3 incurred an unacceptable level of risk.

Table 4.6: Risk Outcomes Stock Table

Risk outcomes by year	**Actuals**				
	Year 1	**Year 2**	**Year 3**	**Total**	**Average**
Risk outcome	**$250**	**$150**	**$3,100**	**$3,500**	**$1,167**
Average risk tolerance					$500
Risk outcome B(W) than risk tolerance					($667)
Tail average risk tolerance	**$1,800**	**$1,800**	**$1,800**		
Risk outcome B(W) than risk tolerance	$1,550	$1,650	($1,300)		

Taken together, an evaluator can see that while the large risk occurrence in year 3 was within modeled expectations they also significantly breached tolerance for average and tail average risk. This is likely because the level of modeled risk after mitigations is significantly higher than risk tolerance as of year 3 (which was clear in the plan phase tables in Table 4.4.)

4.3.2 Mitigation Benefits and Costs

Mitigation benefits and costs are the modeled impacts of mitigations as flow tables. A mitigation activity such as replacing an old gas line segment can have a mitigation benefit over many years, for the life of the asset. The costs may include capital costs over a single year or multiple years, and operational costs over the life of the asset as well. The mitigation costs and benefits are discounted using an appropriate methodology to determine the BCR.

The schema below describes flow tables for mitigation benefits and costs:

Mitigation Benefit and Cost (Flow)

- Average Risk
  - Modeled benefit vs. Plan, YN
  - Modeled benefit vs. Plan, Y1YN
  - Forecast benefit vs. Plan, Y1YN
  - BCR based on Forecast
- Tail Average Risk
  - Modeled benefit vs. Plan, YN
  - Modeled benefit vs. Plan, Y1YN
  - Forecast benefit vs. Plan, Y1YN

Similar to outcomes, the mitigation benefit and cost flow tables cover YN and Y1YN. They may also include a forecast, if future projections have changed from plan due to outcomes and other changes since the base year, such as new learnings and improved models.

The next set of hypothetical RMAR tables will include the attribute dimensions. In Table 4.7, the mitigation benefits are shown by attribute for the reporting years (Y1YN) "actuals" and a new projection for year 4 through year 10. The tables include comparisons to the plan. The table shows that mitigation benefits were significantly below the plan for each attribute in year 2 and year 3 – by 50% in year 2 and over 20% in year 3. Based on new information, mitigation benefits are projected below the plan for the remainder of the plan period, though the variance will be lower. For the forecast as a whole, mitigation benefits will be worse than the plan by $249, which is about 12 times lower than the plan of $1,930. The largest variance to the plan is in the reliability attribute, which is forecasted to be $114 below the plan.

Table 4.7: Mitigation Benefits by Attribute

Mitigation Benefit Forecast vs. Plan	Actuals			Forecast			
Average Risk:	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Total
a. Safety: Actuals/Forecast	$19	$19	$51	$56	$56	$56	$481
Safety: Plan	$19	$37	$57	$57	$57	$57	$512
Actuals/Forecast B(W) Plan	**$0**	**($18)**	**($6)**	**($1)**	**($1)**	**($1)**	**($31)**
b. Reliability: Actuals/Forecast	$24	$24	$59	$71	$71	$71	$604
Reliability: Plan	$28	$50	$80	$80	$80	$80	$718
Actuals/Forecast B(W) Plan	**($4)**	**($26)**	**($21)**	**($9)**	**($9)**	**($9)**	**($114)**
c. Financial: Actuals/Forecast	$24	$24	$58	$70	$70	$70	$596
Financial: Plan	$28	$48	$78	$78	$78	$78	$700
Actuals/Forecast B(W) Plan	**($4)**	**($24)**	**($20)**	**($8)**	**($8)**	**($8)**	**($104)**
d. Total Actuals/Forecast	**$67**	**$67**	**$168**	**$197**	**$197**	**$197**	$1,681
Total: Plan	**$75**	$135	$215	$215	$215	$215	$1,930
Actuals/Forecast B(W) Plan	**($8)**	**($68)**	**($47)**	**($18)**	**($18)**	**($18)**	**($249)**

Table 4.8 shows mitigation benefits and costs by risk event and helps to determine why benefits are below the plan through year 3. An evaluator can quickly see that two risk events are driving the negative variances to the plan: Wildfire (lines a. and b. of Table 4.8) and Hydropower (lines e. and f. of Table 4.8). In particular, delays in the implementation of wildfire mitigation from year 2 to year 3 are apparent in line b, and delays in the implementation of hydropower mitigation from year 1 to year 3 are seen in line f. These delays are also reflected in the timing of mitigation benefits vs plan.

Table 4.8: Mitigation Benefits and Costs by Risk Event

Forecast Mitigation Benefit	Actuals			Forecast			
Average Risk:	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Total
Wildfire							
a. Wildfire benefit: actuals/forecast	$55	$55	$106	$135	$135	$135	$1,161
Wildfire benefit plan	$63	$63	$143	$143	$143	$143	$1,270
Actuals/Forecast B(W) Plan	**($8)**	**($8)**	**($37)**	**($8)**	**($8)**	**($8)**	**($109)**
b. Wildfire cost: actuals/forecast	$200	$310	$260	$10	$10	$10	$840
Wildfire cost plan	$200	$510	$10	$10	$10	$10	$790
Actuals/Forecast B(W) Plan	**$0**	**$200**	**($250)**	**$0**	**$0**	**$0**	**($50)**
Cyber							
c. Cyber benefit: actuals/forecast	$12	$12	$12	$12	$12	$12	$120
Cyber benefit plan	$12	$12	$12	$12	$12	$12	$120
Actuals/Forecast B(W) Plan	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
d. Cyber cost: actuals/forecast	$5	$5	$5	$5	$5	$5	$50
Cyber cost plan	$5	$5	$5	$5	$5	$5	$50
Actuals/Forecast B(W) Plan	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Hydro							
e. Hydro benefit: actuals/forecast	$0	$0	$50	$50	$50	$50	$400
Hydro benefit plan	$0	$60	$60	$60	$60	$60	$540
Actuals/Forecast B(W) Plan	**$0**	**($60)**	**($10)**	**($10)**	**($10)**	**($10)**	**($140)**
f. Hydro cost: actuals/forecast	$0	$200	$15	$15	$15	$15	$320
Hydro cost plan	$180	$15	$15	$15	$15	$15	$315
Actuals/Forecast B(W) Plan	**$180**	**($185)**	**$0**	**$0**	**$0**	**$0**	**($5)**
Total							
g. Total benefit actuals/forecast	**$67**	**$67**	**$168**	**$197**	**$197**	**$197**	$1,681
Total benefit plan	**$75**	$135	$215	$215	$215	$215	$1,930
Actuals/Forecast B(W) Plan	**($8)**	($68)	($47)	($18)	($18)	($18)	**($249)**
h. Total cost: actuals/forecast	$205	$515	$280	$30	$30	$30	$1,210
Total cost plan	$385	$530	$30	$30	$30	$30	$1,155
Actuals/Forecast B(W) Plan	**$180**	**$15**	**($250)**	**$0**	**$0**	**$0**	**($55)**

4.3.3 Risk Reduction and Risk Tolerance

Risk reduction and risk tolerance tables (stock) present the level of risk before and after mitigation and compare risk levels to risk tolerance. Table 4.9 below shows the format of risk reduction and risk tolerance tables, this time focusing on tail average risk. An evaluator can see how risk is reduced over time for each risk event, and progress towards meeting risk tolerance for each risk event.

For example, there is no tail average risk reduction for Hydro until year 3 when it is reduced by $325. This amount of tail average risk reduction closes the gap between pre-mitigated risk and risk tolerance by 12%.

Table 4.9: Risk Reduction and Risk Tolerance by Risk Event for Tail Average Risk[21]

Enterprise Level Forecast Table	Actuals			Forecast		
Forecast (actuals Y1-Y3, forecast Y4-Y10) Tail Avg. Risk	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10
Wildfire						
Pre-mitigated risk	$4,600					
Risk reduction	$250	$250	$528	$686	$686	$686
Overall residual risk	$4,350	$4,350	$4,072	$3,914	$3,914	$3,914
Risk tolerance	$800	$800	$800	$800	$800	$800
% of risk tolerance gap closed	7%	7%	14%	18%	18%	18%
Cyber						
Pre-mitigated risk	$1,160					
Risk reduction	$72	$72	$72	$72	$72	$72
Overall residual risk	$1,088	$1,088	$1,088	$1,088	$1,088	$1,088
Risk tolerance	$594	$594	$594	$594	$594	$594
% of risk tolerance gap closed	13%	13%	13%	13%	13%	13%
Hydro						
Pre-mitigated risk	$3,480					
Risk reduction	$0	$0	$325	$325	$325	$325
Overall residual risk	$3,480	$3,480	$3,155	$3,155	$3,155	$3,155
Risk tolerance	$766	$766	$766	$766	$766	$766
% of risk tolerance gap closed	0%	0%	12%	12%	12%	12%
Total						
Pre-mitigated risk	$8,400					
Risk reduction	$365	$365	$916	$1,061	$1,061	$1,061
Overall residual risk	$8,035	$8,035	$7,484	$7,339	$7,339	$7,339
Risk tolerance	$1,800	$1,800	$1,800	$1,800	$1,800	$1,800
% of risk tolerance gap closed	6%	6%	14%	16%	16%	16%

[21] Note that tail risk is not additive

4.3.4 Other Table Structures

RMAR supports reporting for other formats that may be useful for work units, tranches, or other views. In Table 4.10, the work unit for wildfire mitigations is reported in circuit miles and compared to the plan. It reveals that mitigations will be completed for 1,700 circuit miles, about 6% fewer than originally planned.

Table 4.10: Wildfire Mitigation Results by Work Unit

Wildfire: Actuals and Forecast Vs. Plan by Mitigation Type								
			Actuals B(W) Plan				Forecast B(W) Plan	
	Actual Y1-Y3	**Plan Y1-Y3**	**$**	**%**	**Forecast**	**Plan**	**$**	**%**
Circuit Miles								
UG	1,000	1,400	-400	-29%	1,320	1,400	-80	-6%
CC	380	400	-20	-5%	380	400	-20	-5%
Total Mitigated	**1,380**	**1,800**	**-420**	**-23%**	**1,700**	**1,800**	**-100**	**-6%**

4.3.5 RMAR Table Cohesion

An important feature of RMAR tables is how they relate to each other to tell a consistent and comprehensive story. An evaluator will easily see how the 23% shortfall in mitigated circuit miles as of Y3 in Table 4.10 relates to the delay of wildfire mitigation expenses and benefits in Table 4.8, and how the delay in wildfire mitigation benefits relates to the enterprise shortfall of mitigation benefits in Y2 and Y3 in line d. of Table 4.7.

4.4 Summary

The large number of dimensions in a consolidated risk statement means there are unlimited numbers of tables and comparisons that are possible. The Staff Proposal provides several key tables that should be included in an RMAR and the structure of those tables can be further explored.[22] RMAR designers will need to determine the most important issues that must be addressed and evaluated and design the tables for those issues. Over time, the issues may change, and the RMAR will change with them. For example, the statement

[22] For an Excel-based version of the tables seen in this Staff Proposal as well as others not discussed in detail, please see Level 4, RMAR Case Study Tables https://level4ventures.com/case_study/california-public-utilities-commission-2/.

of cash flows wasn't introduced into financial reporting until 1987. Significant new changes in reporting and disclosure requirements will be added in 2027.[23]

[23] https://www.ifrs.org/news-and-events/news/2024/04/new-ifrs-accounting-standard-will-aid-investor-analysis-of-companies-financial-performance/. Accessed 11/08/2024.

5 Version and Change Control Over Multiple Periods

5.1 Difference Between Financial Reporting and Risk Reporting

Unlike financial reporting, risk reporting is comparing results to an original plan over a period of four years or longer. This creates challenges given that organizations, models, and data change over time.

Financial reports are backward-looking and are generally concerned with data presented quarter-over-quarter and year-over-year. It is usually sufficient to restate the base year for organizational or accounting changes, but not years prior. In addition, financial reporting is primarily focused on actuals, not plans or forecasts.

By contrast, RMAR includes aspects of forward-looking business cases and backward-looking financial reporting. RMAR results phase reporting in a given year include actual risk events for the prior years, modeled risk reduction for the prior years, the original risk reduction plan for prior years and future years, and new risk reduction forecasts for future years. It will be no surprise if the result phase ends up differing from the plan phase, which may have been completed years earlier. Variances to the original plan phase occur for two reasons:

1. *Real changes to the risk environment*. These include changes to pre-mitigated risk, possibly due to new data regarding climate change; changes in mitigation timing, changes in mitigation effectiveness, perhaps due to improved technology; variances in capital and operating expenditures, etc.
2. *Changes due to organization, models and data, or subjective factors such as assumptions or opinions related to risk modeling*. These changes have nothing to do with real changes in risk or real mitigation impact. They are inevitable over the long periods covered by RMAR and may be necessary – we should integrate improvements to risk models and data collection, even if it complicates reporting.

The purpose of RMAR is to enable evaluation based on the first type of change, real changes to the risk environment. We need to capture and adjust for the second type of change, potentially impacting many years retroactively and many years into the future, which is the subject of the following sections.

5.2 Organization Changes

Organizations are in constant flux. In electrical distribution, circuit segments can be merged or renamed. Territory boundaries and risk tranches can be redefined. All of which would make comparisons to original mitigation portfolios problematic. The onus is on the utility to make sure that historical comparison remains possible.

RRU structure. The first line of defense against muddled reporting due to organization changes is a thoughtful RRU definition. Establishing RRUs at the optimal level of granularity enables more reporting flexibility. When the organization changes, RRUs can be re-arranged to reflect the new organization while the freezing the original arrangement allows recasting.

Hierarchy freeze. Freezing and storing the hierarchy at plan submission is a requirement and makes recasting possible.

Tranches. Tranches provide an interesting organization challenge, since by design they will change as risk reduction occurs. We expect – and want – highest risk tranches to be targeted by risk mitigations, which could reshuffle the tranches. Tranches may change for other reasons as well, they may be redefined or added or subtracted. Utilities must preserve the original tranche structure and provide a "bridge" to new structures to preserve the ability to make meaningful comparisons through time. If the utility introduces a new tranche structure in a future RAMP or GRC Cycle, they must maintain a key to act as a bridge between the two tranche structures. This key must be submitted with a RAMP application and reported on in an RMAR narrative section.

5.3 Model Changes

Models are updated and improved, and new or better data sources developed over time. These are positive changes, but can make comparisons to pre-change plans, forecasts, and results difficult. How would an evaluator know whether a variance was caused by an unexpected change in mitigation effectiveness or simply a change in a model or data?

For recasting purposes, utilities would be required to maintain all models used to create the original plan. The utilities will have to develop the following capabilities:

- *Model and data storage*: Models and data from the original plan phase will need to be kept for use in later recasts. Given RMAR requirements for probability distributions, this means the ability to store probability distributions and preserve the interrelationships between them.
- *Data capture and validation*. As much as possible, data must continue to be captured in the form that it was used in the plan phase. This may become increasingly difficult, even impossible, as models and data evolve and improve over time. Great care must be taken to ensure data consistency with the plan phase for as long as possible.

As utilities develop better, more accurate models, they may want to develop the ability to perform backcasts, applying the new models to prior data and controlling for any other changes. Backcasting is an RMAR requirement, but the onus is on the utility to develop and maintain the ability to backcast.

Model and data management, including the management of probability distributions, will be covered more in depth in the Guidance on Interrelationships Report.

5.4 Subjective Changes

All models include subjective elements and assumptions that may change over time. Any subjective inputs used in risk models, such as structured scorecards or meeting minutes, should be documented and stored. As with organizational and model changes, the utilities must be able to restore the original subjective inputs from the plan phase for change management.

5.5 A Program for Multi-Period Change Management

Utilities will have to develop infrastructure and processes, including audits, to manage risk reporting through changes over time. This will include:

1. Storing and accessing each scenario of a plan, forecast, actual results as well as each version of a model.

2. The ability to compare and report on current vs. original plan phase scenario and current vs. prior forecast scenario. This latter requirement becomes necessary if the original plan is updated with new forecasts multiple times, which is possible over an RMAR period that spans many years.

It will likely be infeasible to report every possible change from version to version and back to the original. To do so would require a replica RMAR for each combination of version changes. Instead, RMAR should include "bridging" tables and narratives that capture the key impacts of the changes, and establish that RMAR trends, variances and comparisons are truthfully representing the risk environment, not organizational and methodology changes. The processes to enable theses "bridging" tables and narratives include:

- *Recasting*. Recasting is modeling the current scenario as if the original state of the organization was still in place. Recasting ensures that the current scenario is "apples-to-apples" with original baselines, business cases and plans. Any variances and other changes can be attributed to real changes in the risk environment. SPD's Disposition to Advice Letter 7150-E-A to PG&E requires the utility to "describe how baseline risk and risk reduction will be calculated…and explain how PG&E will use its Wildfire Distribution Risk Model version (v)2, v3, or any future risk model to calculate baseline risk and forecasted risk" - this is recasting.[24]
  Recasting requires organizations to maintain organizational hierarchies, models, and data from the original plan, which ordinarily should not be a problem. The downside to recasting is it fails to capture any useful information due to improved models, data, and new learnings about the risk environment.
- *Backcasting*. Backcasting achieves the same "apples-to-apples" comparison with the original plan, this time by restating the history in terms of current models, data, and knowledge. Backcasting has the advantage of incorporating the most current views on the risk environment. Models and data must

[24] SPD Disposition of AL 7150-E-A, May 30 2024, Page 2.

be backward-compatible with risk modeling history and the original plan for backcasting to be possible.

- *Replanning*: In rare circumstances, drift over time from the original plan due to numerous model changes and unforeseen events may require a restatement of the plan. The original plan, including history and future years, is restated based on current reality. There must be strict regulatory approval processes for a Replan.

The Safety Policy Division (SPD) believes that preserving the ability to recast and backcast is mandatory, and that utilities should be required to have the processes and controls in place to perform recasts and backcasts. SPD recommends that the Commission develop specific guidelines and approval processes for replanning.

6 Mitigation Selection and Impact Analysis

Just as a consolidated financial statement includes a management discussion of financial results, the consolidated statement of risk should include a rigorous discussion of risk mitigation selection and results. The details for how utilities validate their data and model results, and perform statistical testing of outcomes and results, are beyond the scope of the RMAR. RMAR is a vehicle for disclosing these validation processes and tests, and for providing evaluators key information on how these disclosures may impact RMAR reports, via a thoughtful management discussion section.

6.1 Standards, Criteria, Methodologies, and Benchmarks

Perhaps no decision matters more for reducing risk than the choice of mitigation portfolio[25]. It is critical for evaluators to understand the standards, criteria, methodologies, and benchmarks used in the selection process.

Standards. Standards include risk tolerance levels for average risk and tail risk, and minimum BCR thresholds. RMAR should discuss how the chosen mitigation portfolio achieves these standards, compared to alternative portfolios.

Criteria. Criteria for mitigation selection can include factors such as safety vs. reliability trade-offs and time exposure. RMAR should discuss how decision criteria and others factored into the mitigation portfolio selection.

Methodologies. RMAR should discuss key methodologies for use in calculating mitigation benefits and costs. Examples include how weighted average cost of capital is calculated for discount rates, and how useful life was estimated for assets.

Benchmarks. Risk models are only as good as the quality of their inputs and assumptions. Techniques such as reference class forecasting[26] compare model results to a database of results for similar RRUs and have been shown to reduce systematic errors in planning and forecasting.

RMAR should present the utility's case for the chosen mitigation and why it is optimal compared to next best alternatives. This narrative should instill confidence that the utility's process was rigorous and free of bias.

---

[25] SPD's Phase 4 Staff Proposal on Overall Residual Risk, Risk Tolerance and Simple Optimization describes why risk reduction should be evaluated based on a portfolio of mitigations rather than by individual mitigation.

[26]Batselier and Vanhoucke, "Practical Application and Empirical Evaluation of Reference Class Forecasting for Project Management". https://www.or-as.be/sites/default/files/files/blog_files/Batselier%20and%20Vanhoucke%2C%20PMJ%2C%202016.pdf

6.2 Evaluating Real Mitigation Impact

In the plan phase, utilities should discuss their confidence in model results. For example, how confident are they in the mitigation impact assumptions used, based on internal data or industry norms? What is the confidence interval for key results such as total risk reduction and BCR?

Similarly, in the results phase, utilities should discuss the extent that observed results were due to mitigation effectiveness as opposed to other factors such as chance, or changes in models, data, assumptions, or impacts from other risk drivers.

- *Outcome and results analysis*. How to interpret risk event outcomes in context of mitigations in place.
- *Input analysis*. For rare events there may not be sufficient volumes of outcomes to analyze, so indirect methods such as evaluating up-stream drivers can help impute mitigation impact.
- *Statistical techniques* such as hypothesis testing where applicable.

Figure 6.1 summarizes different methods for evaluating real mitigation impact.

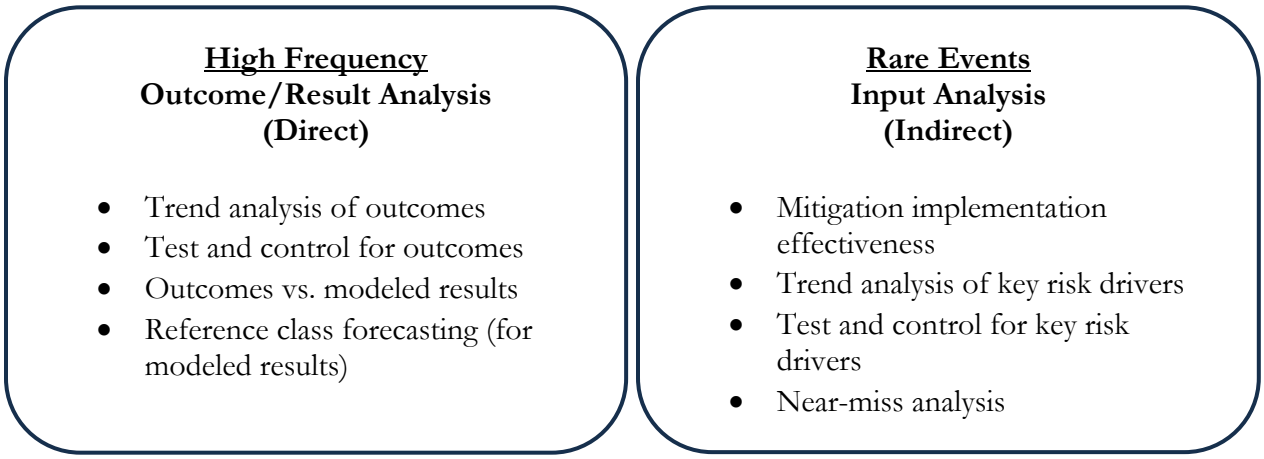

Figure 6.1: Evaluating Risk Mitigation Impact Vs. Chance, Based on Volume of Risk Events

Outcome/results analysis (direct). If risk events, outcomes or modeled results, have sufficient sample size, then trend analysis, test and control processes, or reference class forecasting can be used. For the first two methods, the actual or modeled results are compared to a baseline representing what would've occurred absent the mitigations. For trend analysis, the baseline is the pre-mitigated level of risk, and for test and control the baseline is measured by the control group. Reference Class Forecasting is a different approach, the comparison is to results based on a database of similar RRUs, including comparison of both the costs and the benefits (i.e. risk reduction) across RRUs.

An example of a risk event amenable to outcome analysis is wildfire ignitions due to utility equipment. PG&E reports 4,197 ignitions between 2015 and 2021.[27]

[27] PG&E 2023 WMP, table 6.2.1-2, page 160.

Input analysis. Some risk events are so rare, there isn't enough data to analyze. An example is cybersecurity, where actual attacks in any year are few, and can be zero. Physical attacks on hydropower facilities are another example of rare events that would be zero in most years. For such risk events, we can infer mitigation effectiveness by analyzing the risk drivers, which may have sufficient volumes for statistical analysis. In cybersecurity, risk drivers such as attempted and successful phishing attacks may have suitable volumes.

There are several ways to infer mitigation effectiveness based on risk drivers. One is to assess the implementation itself. A common mitigation for cybersecurity is training employees to recognize and avoid phishing attacks – what percentage of employees have completed the training? Trend analysis and test and control methodologies can be used. "Near misses" are not technically risk drivers but may be considered a close proxy for risk events and can be analyzed if sufficient in number.

Statistical analysis. The goal of the statistical analysis is to determine whether the observed differences between actual or modeled risk and the baseline could have occurred by chance. There is a group of statistical techniques under the umbrella of hypothesis testing that can help us determine if risk reduction is real and due to mitigation efforts. SPD may address this in a follow-on Resolution where the technical details of reporting on hypothesis testing can be discussed.

6.2.1 Risk Reduction: Attribution

Assigning attribution for risk reduction is a two-step process. The first is to determine whether there was any real risk reduction in the first place as described in section 6.2 above. If risk reduction is deemed to be real, then we look for ways to infer attribution.

A basic way to infer attribution is to examine the completeness and effectiveness of mitigation implementation. Did 100% of employees successfully complete the training on avoiding phishing attacks? Were all the safety inspections on the portfolio of dams performed on schedule? If the mitigation was not implemented, or implemented in an incomplete or ineffective way, we would be less inclined to attribute much or any risk reduction to it.

Attribution also requires examining whether fluctuations in risk drivers have more to do with changes in risk driver volumes. Could an unexpectedly low level of wildfire ignitions be the result of cooler, wetter weather patterns?

Hypothesis testing as described in section 6.2 above could be one method to determine whether a change in risk can be attributed to mitigation efforts.

6.3 Sensitivity Analysis

Since RMAR depends heavily on modeled results as well as modeled plans and forecasts, sensitivity analysis should be performed on each model. Sensitivity analysis helps evaluators (and the modelers) to understand whether mitigation decisions would change if model inputs and assumptions are changed. Suppose a risk

model relies on an input for which data is sparse either because of low quality or portions are missing altogether. If it turns out that the model is sensitive to this data, meaning that a small change in the accuracy or completeness of the data could result in a different choice of mitigation, it may be worth investing in improving the data.

Sensitivity analysis could also be used to address version control that was discussed in section 5.3. For instance, sensitivity analysis can help determine the impact of a new model version on risk model output.

Transparency pilots. CPUC decision D21-11-009 and modified by D24-05-064 authorized transparency pilots for the utilities to test quality of assumptions, models, and results for risk modeling. These pilots are a form of sensitivity analysis and could be used to provide tables and structure to an RMAR section on sensitivity analysis.

7 Generally Accepted Risk Mitigation Accountability Reporting Principles

Over time as RMAR process matures, the CPUC will learn where there are differences in data quality, counting methodologies, definitions, and other factors that lead to discrepancies in reporting between utilities – and possibly even within utilities.

Principles leading to standards and rules will be developed to resolve these discrepancies, much as they have in financial reporting over the years via GAAP (Generally Accepted Accounting Principles) for financial reporting. The process to develop standards and principles for better reporting will not be simple or quick, but that should not delay the launch of RMAR. After all, the standards for financial reporting have been evolving for 90 years!

Table 7.1: Major Milestones in the Continuous Improvement of Financial Reporting Standards[28]

Year	Milestone
1934	**In response to stock market crash, Securities and Exchange Commission (SEC) created by the Securities Exchange Act.**
1938	**"Generally Accepted Accounting Principles" introduced.**
1973	**Creation of independent Financial Accounting Standards Board (FASB)**
1978-2000	**Development of the "Conceptual Framework", seven statements of financial accounting concepts.**
2002 – ongoing (in fits and starts)	**Norwalk Agreement – convergence of principles between FASB and the Internation Accounting Standards Board (IASB).**

As part of RMAR, the Commission should create a risk reporting standards development process, with the mission to standardize risk reporting where it is most critical to do so.

[28] https://corpgov.law.harvard.edu/2022/07/20/the-long-and-winding-road-to-financial-reporting-standards/

8 Accountability and the Art of Holding Accountable

Accountability is a key feature of RMAR and separates it from run-of-the-mill informational reporting. Investments in risk reduction are determined from business cases which are uncertain projections into an uncertain future. But more than that, they are promises and commitments to spend limited resources judiciously and effectively.

Utilities – and individuals within the utilities - should be held accountable to these promises and commitments, recognizing that some errors in projections are "good faith" due to the nature of uncertainty. Good faith errors have the characteristic of being randomly positive and negative, and over time can partially self-cancel which reduces their impact. However, other errors are due to biases that lead to systematic underestimating (of costs) and overestimating (of benefits.) Systematic errors tend to increase in magnitude over time. Sadly, errors due to intentional deception and fraud cannot be ruled out. The CPUC needs to have a layered approach to enforcing accountability:

The following table in Table 8.1 lays out an approach for determining seriousness of infractions and levels of corrective action. Responses by the Commission range from warnings to financial penalties and other enforcement actions. Corrective actions by the utility include fixing errors in time for the next RMAR cycle, to restating and the current RMAR and overhauling internal processes related to RMAR.

Table 8.1: Framework for Determining Corrective Action

Error Type	Materiality	Impact	Corrective Action
I. "White flag": (delays in reporting, one-time blips, unintentional.) II. "Yellow flag": repeated delays, repeated errors, suggestive of poor control environment. III. "Red flag": systematic errors, refusal to comply.	**Immaterial** – errors would not change how report is viewed and interpreted. **Material** – errors could change how report is viewed and interpreted.	**Decision**. Would the error have impacted important decisions, such as mitigation portfolio selection? **Financial:** Would the error have caused financial harm to any stakeholder?	**Next cycle**. Root causes are fixed and corrections in place for subsequent RMAR. Additional penalties possible based on error type. **Restate**. Root causes are fixed, RMAR is restated based on materiality and impact thresholds. Additional penalties possible based on error type and impact of errors.

Table 8.2 below lists hypothetical examples of RMAR infractions along with possible CPUC enforcement actions and utility corrective actions.

Table 8.2: Hypothetical Infractions and Enforcement and Corrective Actions

Hypothetical Infraction	Error Type	Materiality	Impact	Commission Action	Utility Action
1) Staff evaluators discover risk accounting errors	I	Immaterial	None	Staff sends Warning Email.	Utility will submit corrective action plan for next RMAR cycle within seven (7) days.
2) Lack of supporting data in workpapers	I	Immaterial	Decision	Staff issues Notice of Violation.	Utility will submit corrective action plan within twenty-one (21) days.
3) Staff evaluators discover incorrect aggregation of risk data	II	Material	Decision, Financial	Staff sends Warning Email to utility. Based on utility response, determines whether restatement is necessary.	Utility will submit workpapers related to the aggregation errors within seven (7) days. May have to restate RMAR.
4)Utility files incomplete RMAR and misses deadlines for submitting corrections and data requests, even after extensions granted	II	Material	Decision	Staff issues Notice of Violation, automatic fines for non-compliance are triggered.	Utility must pay automatic fine and will submit justification for delay within 7 days and corrective action plan within 21 days.
5) The utility demonstrates insufficient progress towards achieving any of the following metrics adopted in a GRC Decision: a) Risk Reduction b) Benefit-Cost Ratio	II	Material	Decision	Staff sends Warning Email requiring utility to justify the insufficient progress or issues Notice of Violation directing utility to issue a corrective action plan.	a) Utility will submit justification for insufficient progress and corrective action plan within twenty-one (21) days to Staff. b) A letter must also be sent to the Commissioners, the Governor's Office and the California State Assembly's Committee on Utilities and Energy explaining how the utility intends to make progress towards risk reduction and benefit-cost ratios goals.

Hypothetical Infraction	Error Type	Materiality	Impact	Commission Action	Utility Action
					c) Within six months the utility must host a CPUC workshop/en banc detailing the progress they have made, or lack thereof, to the Commissioners.
6) The utility knows in advance that it will fail in some material respect to comply with the requirements and conditions adopted in a GRC Decision related to Risk Mitigations	II	Material	Decision, Financial	Automatic fines for non-compliance are triggered.	Utility must pay an automatic fine and will submit corrective action plan within twenty-one (21) days to Staff
7) Repeated instances of infractions 1,2, and 3 above.	III	Material	Decision, Financial	Staff issues an Administrative Enforcement Order with appropriate penalties. Based on utility response, determines whether restatement is necessary.	Utility will submit corrective action plan within 21 days. Utility can file a Request for Hearing within 30 days. May have to restate RMAR.
8) Utility refuses to comply with data requests.	III	Immaterial	Decision	Staff issues an Administrative Enforcement Order with appropriate penalties.	Utility must pay the penalty and issue a corrective action plan. The utility can file a Request for Hearing within thirty (30) days
9) Utility fails to meet conditions of Corrective Action Plan within deadline.	III	Material	Decision, Financial	Staff issues an Administrative Enforcement Order with appropriate penalties	Utility must pay the penalty and issue a corrective action plan. The utility can file a Request for Hearing within thirty (30) days

The hypothetical infractions in Table 8.2 above are listed in order of increasing severity. There should always be a path for the utility to make amends and fix the root causes of systematic errors, though the bar for remediation is higher at each stage.

It is important that consequences are directed towards systematic errors and not good faith errors. Otherwise, the pendulum will swing entirely the other way, with costs systematically overstated (sandbagging) and benefits under-promised. The unintended outcome will be fewer positive BCR business cases will make the cut, and those that do will be implemented less efficiently.[29]

Finally, there is the issue of organizational versus individual accountability. At some point, individuals must be held accountable for continued or egregious systematic errors and failure to comply with Commission requirements.[30]

[29] Projects with sandbagged budgets have a way of coming in on budget anyway. The sandbagged portion ends up being spent.

[30] Several examples of holding individuals accountable for gross neglect or gross misrepresentation in Flyvbjerg, Bent, and Dirk W. Bester. "The cost-benefit fallacy: Why cost-benefit analysis is broken and how to fix it." *Journal of Benefit-Cost Analysis* 12, no. 3 (2021): 395-419.

9 SPD Recommendations

These recommendations are based on the preceding sections and assume the reader has read and understood those sections. Text in red-underline (deletions) and blue-underline (additions) represent proposed changes to the Risk-Decision Framework.

1. The Commission should require the Risk Mitigation Accountability Report (RMAR) be integrated into the Risk-based Decision-making Framework (RDF) and require the utilities to file updates to the RMAR on a regular basis. Definitions and terminology used in the RDF should all apply and be used consistently by the utilities when they produce the RMAR. Safety Policy Division (SPD) will file a follow-on Resolution that will address the following topics:
    a. Determine the timing of the RMAR and regular updates.
    b. Provide guidance for how the utility will demonstrate its confidence that observed results were due to mitigation effectiveness as opposed to other factors.
    c. Establish detailed change control procedures for maintaining consistency and comparability between prior and future periods, and between plan, outcomes, results, and forecasts. The Resolution will include details about how and when recasts, backcasts and replans should occur.
    d. Expand upon the list of required elements as outlined in Section 10.1.
    e. Review and update the enforcement and corrective actions in Section 10.2.
    f. Allow for future changes to Appendix A to be made by SPD without the need for opening a proceeding or issuing a new Resolution.
2. In a future Resolution, SPD should consider identifying and reducing duplication in other reporting processes, including the Risk Spend Accountability Report RSAR and Safety Performance Metric SPM Report.
3. In a future Resolution, SPD should work with the Utility Audits Branch to establish procedures and objectives for conducting an audit of an RMAR, as well as an audit of the internal process and controls for producing the RMAR and its updates
4. Each utility should be required to conduct a backcast of the risk reduction achieved since its first RAMP filing using the RMAR structure. The original RAMP backcast must at a minimum provide an Average Risk Mitigation Benefit by Attribute Table for every mitigation and control included in a RAMP and General Rate Case (GRC) application (see Table 4.7).
5. Require that a summary of the RMAR Results Phase be included in a utility's RAMP and GRC filing. This requires making the following change to the RDF:

9.	Risk Assessment	Using the Cost-Benefit Approach developed in accordance with Step 1A, for each Risk included in the Enterprise Risk Register, the utility will compute a monetized Safety Risk Value using only the Safety Attribute. The utility will sort its ERR Risks in descending order by the monetized Safety Risk Value. For the top 40% of ERR risks with a Safety Risk Value greater than zero dollars, the utility will compute a monetized Risk Value using at least

		the Safety, Reliability and Financial Attributes to determine the output for Step 2A. 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 output of Step 2A must include a summary of the Risk Mitigation Accountability Report Results Phase for each risk the utility intends to address in its RAMP application. This summary must include a copy of the utility's RMAR Outcomes Flow Table and Outcomes Stock Table. A narrative description must accompany these tables explaining any discrepancies between the modeled risk and the actual outcomes recorded during the previous GRC Cycle. The Risk Assessment in preparation for RAMP will follow the steps in Rows 10 and 11.

10 Appendices

10.1 List of Required Elements to be Included in an RMAR

1. Aside from the original RAMP backcast, the first RMAR must at a minimum be four years of reporting, including the Report Year, the Report Years to date and the Forecast years.
2. All tables should include the following roll-up points:
    a. **Hierarchy.** Based on organizational structure, including, but not limited to, circuit, substation, pipeline, watershed region, High-Fire Threat District, region, division, enterprise. Hierarchy defines how reports and tables are grouped, the "parent-child" relationships.
    b. **Scenario**. Actuals, plan, or forecast
    c. **Version**. Model or methodology
    d. **Risk events.** All risks included in RAMP and GRC Applications
    e. **Tranches.** Risk event-dependent.[31]
    f. **Mitigations.** Risk event-dependent.
3. All tables should include the following common elements:
    a. **Attribute.** Safety, reliability, financial.
    b. **Risk measure.** Average risk, tail-average risk.
    c. **Accounts (line-items).** This dimension contains all the key calculations in an RMAR, including, but not limited to, pre-mitigated risk, mitigation value, overall residual risk, BCR, risk tolerance, capital expenses, operating expenses, likelihood of risk event, consequence of risk event, natural units.
    d. **Work Unit**. Corresponds to the work units presented in the GRC and RSAR.
    e. **Time**. Periods under consideration, can be months, quarters, years, GRC Cycle (i.e. PG&E's 2027 GRC).
4. Plan Phase Tables that must be included in the RMAR:
    a. Plan Phase Mitigation Costs and Benefits Table by Mitigation
    b. Plan Phase Risk Reduction and Risk Tolerance Table by Mitigation
5. Results Phase Tables that must be included in the RMAR:
    a. Risk Outcomes Flow Table

[31] See D.24-05-064, Appendix A, Row 14

   b. Risk Outcomes Stock Table
   c. Average Risk Mitigation Benefit and Cost by Risk Event Table
   d. Average Risk Mitigation Benefit and Cost by Tranche Table
   e. Average Risk Mitigation Benefit and Cost by Attribute for each Risk Event Table
   f. Average Risk Mitigation Benefit and Cost by Mitigation for each Risk Event Table
   g. Average Risk Reduction and Risk Tolerance by Risk Event Table
   h. Tail Average Risk Reduction and Risk Tolerance by Risk Event Table
   i. Average Risk Reduction and Risk Tolerance by Portfolio Table
   j. Tail Average Risk Reduction and Risk Tolerance by Portfolio Table
   k. Mitigation Work Unit Results by Risk Event Table
6. Include a narrative description of every table listed in Item 3 and Item 4. Explain any deficiencies or negative variances to the plan found in these tables. Explain what steps the utility intends to take to address these deficiencies and negative variances.
7. Include a narrative description of a Risk Reporting Unit (RRU) which enables aggregation of reports.
8. Include a narrative description of any discrepancies between the modeled risk and the actual outcomes recorded during the previous GRC cycle.
9. Include a narrative section that describes any new tranche structures that were not used in a previous RAMP or GRC Cycle. Provide details of the key that is used as a bridge between the old and new tranche structures.
10. Include a narrative description of any subjective elements and assumptions related to each mitigation that have changed during the most recent update to the RMAR. The narrative must explain how the change has affected any RMAR information from the Plan Phase.
11. Include a narrative justification for assigning attribution for risk reduction from each mitigation. The utility must explain the causal mechanism that allows them to infer attribution. The utility must also highlight any additional factors other than the mitigation itself that could have contributed to any apparent risk reduction. Any assumptions or SME judgements must be made transparent.
12. Include a narrative discussion describing the model and data quality as well as certifies that internal quality control requirements have been met. This section should include description of any sensitivity analysis that was conducted on various model inputs or assumptions for each mitigation. This section can draw from the results of the Transparency Pilot or whatever sensitivity analyses are required by a future Decision in this or a successor proceeding or a Staff Resolution. The utility must also provide tables or workpapers to back up any sensitivity analysis results discussed in this narrative section.

10.2 Enforcement and Corrective Actions for Infractions

Hypothetical Infraction	Error Type	Materiality	Impact	Commission Action	Utility Action
1) Staff evaluators discover risk accounting errors	I	Immaterial	None	Staff sends Warning Email.	Utility will submit corrective action plan for next RMAR cycle within seven (7) days.
2) Lack of supporting data in workpapers	I	Immaterial	Decision	Staff issues Notice of Violation.	Utility will submit corrective action plan within twenty-one (21) days.
3) Staff evaluators discover incorrect aggregation of risk data	II	Material	Decision, Financial	Staff sends Warning Email to utility. Based on utility response, determines whether restatement is necessary.	Utility will submit workpapers related to the aggregation errors within seven (7) days. May have to restate RMAR.
4)Utility files incomplete RMAR and misses deadlines for submitting corrections and data requests, even after extensions granted	II	Material	Decision	Staff issues Notice of Violation, automatic fines for non-compliance are triggered.	Utility must pay automatic fine and will submit justification for delay within 7 days and corrective action plan within 21 days.
5) The utility demonstrates insufficient progress towards achieving any of the following metrics adopted in a GRC Decision: a) Risk Reduction b) Benefit-Cost Ratio	II	Material	Decision	Staff sends Warning Email requiring utility to justify the insufficient progress or issues Notice of Violation directing utility to issue a corrective action plan.	a) Utility will submit justification for insufficient progress and corrective action plan within twenty-one (21) days to Staff. b) A letter must also be sent to the Commissioners, the Governor's Office and the California State Assembly's Committee on Utilities and Energy explaining how the utility intends to make progress towards risk reduction and benefit-cost ratios goals.

Hypothetical Infraction	Error Type	Materiality	Impact	Commission Action	Utility Action
					c) Within six months the utility must host a CPUC workshop/en banc detailing the progress they have made, or lack thereof, to the Commissioners.
6) The utility knows in advance that it will fail in some material respect to comply with the requirements and conditions adopted in a GRC Decision related to Risk Mitigations	II	Material	Decision, Financial	Automatic fines for non-compliance are triggered.	Utility must pay an automatic fine and will submit corrective action plan within twenty-one (21) days to Staff
7) Repeated instances of infractions 1,2, and 3 above.	III	Material	Decision, Financial	Staff issues an Administrative Enforcement Order with appropriate penalties. Based on utility response, determines whether restatement is necessary.	Utility will submit corrective action plan within 21 days. Utility can file a Request for Hearing within 30 days. May have to restate RMAR.
8) Utility refuses to comply with data requests.	III	Immaterial	Decision	Staff issues an Administrative Enforcement Order with appropriate penalties.	Utility must pay the penalty and issue a corrective action plan. The utility can file a Request for Hearing within thirty (30) days
9) Utility fails to meet conditions of Corrective Action Plan within deadline.	III	Material	Decision, Financial	Staff issues an Administrative Enforcement Order with appropriate penalties	Utility must pay the penalty and issue a corrective action plan. The utility can file a Request for Hearing within thirty (30) days