SMAP Workshop

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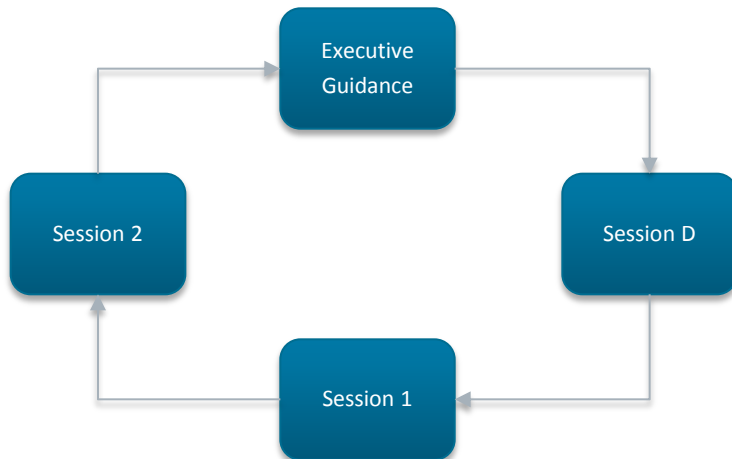# PG&E Risk Framework + Integrated Planning

Risk Management Culture

Consistency	Governance and Oversight	Communication	Embedded in Decision Making	Continuous Improvement

Risk Management Framework

Risk Assessment → Risk Response → Risk Monitoring

Integrated Planning Process

Executive Guidance → Session D → Session 1 → Session 2 → (Executive Guidance)

Output	
Executive Guidance	PG&E's 5-Year Goals
Session D	- Risk Register - Discussions on risk management plans and progress - Tools: RET, LOB-Specific models
Session 1	- LOB's 5-year Operating Plan: goals and strategies including risk management objectives - LOB preliminary prioritization of proposed work - Tools: RIBA, LOB-Specific models
Session 2	- LOB's 2-year Execution Plan: work plan, resource plan and detailed budget - LOB prioritization of proposed work - Metrics and targets - Sets the foundation for rate case forecasts - Tools: RIBA, LOB-Specific models

Risk Assessment: Risk Evaluation Tool & Risk Taxonomy

| Consistency | Governance and Oversight | Communication | Embedded in Decision Making | Continuous Improvement |

- PG&E benchmarked industry, consulted with experts, and worked with academia (UC Berkeley, Stanford) to solicit input and validate approach.
- Each LOB with functional responsibility for a criteria column (i.e., safety, compliance, environmental, reliability, financial, reputational) provided specific language to articulate each impact level in a consistent way
- Market and Credit Risk Management performed a validation of the model's mathematics and structure.

Risk Evaluation Tool (RET):

- The Company's 7x7 RET model features:
    - **6 impact categories**: Safety, Environmental, Compliance, Reliability, Trust, Financial
    - **7 impact levels**: Catastrophic, Severe, Extensive, Major, Moderate, Minor, Negligible
    - **7 frequency levels**: Common, Regular, Frequent, Occasional, Infrequent, Rare, Remote
- Log-based scale where each bucket is roughly 10x worse than the bucket directly below (frequency and impact).
- Four logs over seven frequency groups were used to increase separation between risks.
- **Weightings:** Weightings for each of the 6 impact categories are based on the company's goals around Safety, Reliability and Affordability.

- Frequency scale
- Objectives of the company
- Impact scale

Frequency	> 10 times per year	1 - 10 times per year	Once every 1 - 3 years	Once every 3 - 10 years	Once every 10 - 30 years	Once every 30 - 100 years	Once every 100 + years
	F = > 10	F = 1 - 10	F = 1 - 0.30	F = 0.20 - 0.10	F = 0.10 - 0.03	F = 0.03 - 0.01	F = <0.01
	Common (7)	Regular (6)	Frequent (5)	Occasional (4)	Infrequent (3)	Rare (2)	Remote (1)
Objectives	Safety						
	Environmental						
	Compliance						
	Reliability						
	Reputational						
	Financial						
Impact	Catastrophic (7)	Severe (6)	Extensive (5)	Major (4)	Moderate (3)	Minor (2)	Negligible (1)

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Risk Evaluation Tool

| Consistency | Governance and Oversight | Communication | Embedded in Decision Making | Continuous Improvement |

The tool is comprised of the following features:

- Input fields that match the risk database (for easy upload/translation of data)

- Three scoring sections for:

    - Inherent residual score

    - Current residual score

    - Forecasted residual score

- Drop down selection boxes for each impact category to input impact level

- Frequency override option if data is available

- Justification boxes for each impact criteria + frequency

Risk Evaluation Tool

- As risks are evaluated, the drop down fields are used to record and track the impact levels
- Within each Impact category (Safety, Environmental, etc.) the user has the option to select from one of the 7 impact levels
- A justification field for each impact category is shown next to the drop down box. This field allows the users to input free form text and explain the reasoning behind the selected impact level
  - After all 6 impact categories + a frequency have been decided and selected in the RET, a risk score will populate (see image below)
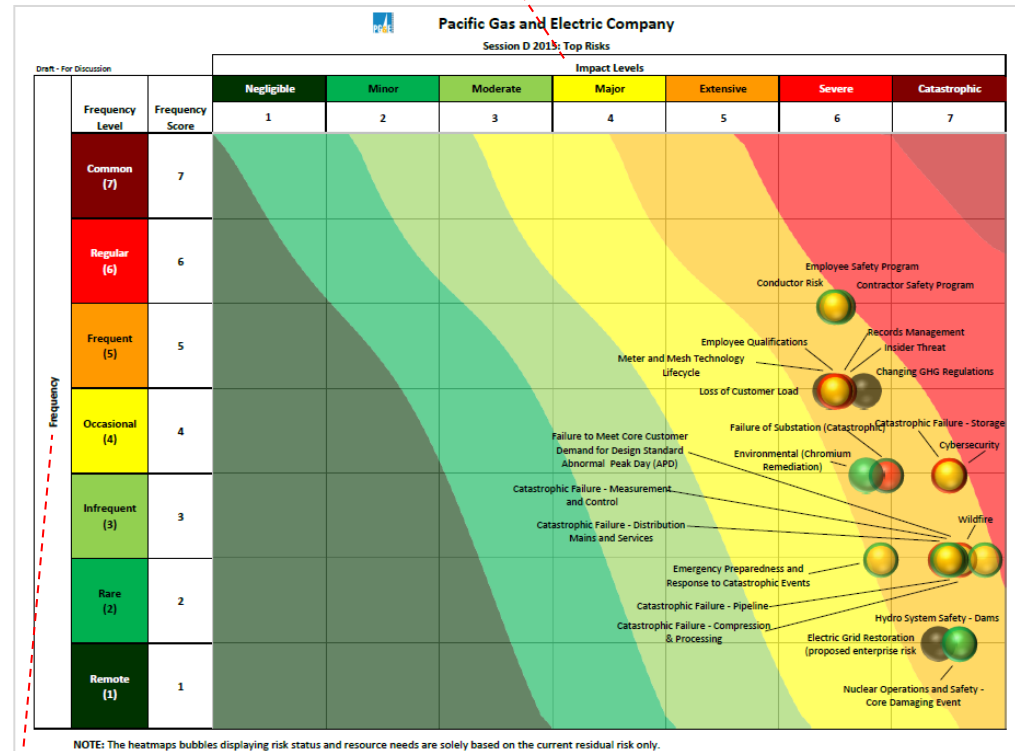 - The RET allows for users to input a "Frequency per Year Override" if the data exists to do so

Heat Map

Output of the Risk Evaluation Tool (RET):

- Once all risks have been scored using the RET, a heat map is generated

  - The Y-Axis is Frequency

  - The X-Axis is Impact

  - The different colors on the heat map represent the 7 levels of risk

- Each bubble on the heat map shows a control status (inner bubble color) and a resource status (outer ring color)

- The heat map provides a visual aid for Leadership discussion

- The heat map (at right) was used at PG&E's 2015 Session D meeting and show the company's Top 24 risks.

Impact Levels

Pacific Gas and Electric Company
Session D 2015: Top Risks

Draft - For Discussion

Frequency Level	Frequency Score	Negligible 1	Minor 2	Moderate 3	Major 4	Extensive 5	Severe 6	Catastrophic 7
Common (7)	7							
Regular (6)	6							
Frequent (5)	5							
Occasional (4)	4							
Infrequent (3)	3							
Rare (2)	2							
Remote (1)	1							

NOTE: The heatmaps bubbles displaying risk status and resource needs are solely based on the current residual risk only.

Frequency

- Current controls are not adequate
- Controls are being strengthened
- Current controls are adequate
- Analysis in progress, status unknown or under evaluation

- Additional resources may be needed
- Additional resources not anticipated.
- Resource needs unknown

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Risk Assessment: Calibration

While preparing for Session D, many risk calibration scoring sessions are held to ensure the risk evaluation tool was applied consistently:

- **Horizontal Calibration:**

  - Analyzes all overall risk scores across all six impact categories

  - Compares and contrasts justifications, impact scores, and frequency scores

  - Provides LOBs with context, insight into other company risks, and assurance the criteria has been applied consistently

- **Vertical Calibration:**

  - With subject matter expertise for each impact category, a verification process is held to ensure scores in each impact were consistently applied

Risk Database: ECTS-Risk

Consistency | Governance and Oversight | Communication | Embedded in Decision Making | Continuous Improvement

ECTS-Risk homepage provides insight into LOB or Company risk register

The Enterprise Compliance Tracking System (ECTS) is currently PG&E's official system of record for all risk related data

- ECTS-Risk provides:

- A single repository for enterprise and operational risk data, across all LOBs (previously a manual and decentralized approach, including spreadsheets and word documents)

- Audit trail of risk data and decisions

- Management reports to facilitate oversight, monitoring and decision making

- A way to track and monitor progress on mitigations and response plans across the company

- A tasking function for Risk Managers within the LOBs to track progress to plan

- A scoring section that mirrors the risk evaluation tool

Scoring tool built In ECTS-Risk is modeled after the risk evaluation Tool

Monthly Report Out: Dashboard

Dashboard reporting:

- The dashboard to the right is one example of how PG&E utilizes ECTS to provide all LOBs visibility into their current data

- Provided monthly to Risk Managers in all LOBs and is available for officer-level Risk and Compliance Committee Meetings

Business Plan Review (BPR)

Consistency	Governance and Oversight	Communication	Embedded in Decision Making	Continuous Improvement

EO Risk Mitigation Progress

Variance Explanation

N/A - All Projects and Initiatives are green

Green By Date

Recovery Plan

Description

The overall Risk Mitigation Progress metric is based on the status of the mitigations shown under Key Projects & Initiatives. Leading Indicators are NOT taken into account for the overall status of the risk mitigation progress metric.

Key Project and Initiatives - Status of Mitigations:

RAG Status rules:

- 🟥 = Off track, not recoverable as of now
- 🟧 = Off track, recoverable
- 🟩 = On track

Risk Mitigation Progress - Overall Metric:

RAG Status rules:

- 🟥 = 1 or more key projects or initiatives are red
- 🟧 = All key projects or initiatives are amber or green
- 🟩 = All key projects or initiatives are green

The "Leading Indicators" section is inclusive of any risk metric associated to a given risk.

Top Risks

1. Wildfire
2. Failure of Substation (Catastrophic)
3. Hydro System Safety – Dams
4. Electric Grid Restoration
5. Emergency Preparedness and Response to Catastrophic Events
6. Changing GHG Regulations
7. Distribution Overhead Conductor Primary
8. Insider Threat

Key Projects & Initiatives

	Description	Dates
🟩	Wildfire: Continue build-out of SCADA infrastructure to support functionality. Identified 215 target locations requiring functionality. (12/31/2016)	5/5/15 - 3/31/16
🟩	Failure of Substation (Catastrophic): Implementation of physical security upgrades: Tier 1 by end of 2015—10 substations (12/31/2015) Tiers 2 and 3 by end of 2016 — 8 substations (12/31/2016)	5/5/15 - 5/29/15
🟩	Hydro System Safety – Dams: Install SCADA systems at high priority dams to complete gap 5 of ERM Hydro Operation Enterprise Risk Management dam safety improvement effort. (7/31/2015)	5/6/15 - 5/6/15
▬	Electric Grid Restoration: TBD	5/18/15 - 5/18/15
🟩	Emergency Preparedness and Response: Continue multi-year work plan – Emergency Management Advancement Program (EMAP) – to improve planning, coordination, and implementation of integrated gas and electric restoration capabilities (12/31/2016)	6/26/15 - 6/26/15
🟩	Changing GHG Regulations: Analyze the impacts of potential GHG regulations on key compliance, cost and reliability issues. (9/30/2015)	6/26/15 - 6/26/15
▬	Distribution Overhead Conductor Primary: TBD	6/26/15 - 6/26/15
🟩	Insider Threat: Create centralized view and company policy through working group, comprised of CSD, ETRM, IT Security Operations, HR, and Law (e.g. more extensive background checks for employees and contractor, monitoring technology, etc.). (3/31/2016)	6/26/15 - 6/26/15
▬	Risk Reduction (TBD)	6/26/15 - 6/26/15

Leading Indicators

🟩	Wildfire: T&D Overhead Wires Down
▬	Failure of Substation (Catastrophic): TBD
▬	Hydro System Safety – Dams: TBD
▬	Electric Grid Restoration: TBD
🟩	Emergency Preparedness and Response: EP&R Maturity Model
▬	Changing GHG Regulations: TBD
🟩	Distribution Overhead Conductor Primary: D Overhead Wires Down
▬	Insider Threat: TBD

Top Risks

Key mitigations For top risks

Metrics in place For top risks

The Business Plan Review (BPR) is a monthly report out by each LOB on their metric score card

- The BPR is directly aligned with Session D LOB commitments
- LOBs are able to provide insight and updates as performance to plan
- Top mitigations and risk metrics are tracked
- With Enterprise Risk oversight, each LOB self reports their status for the month

Integrated Planning & RIBA

Session D

This session focuses on PG&E's top risks and compliance issues

Session 1

Session 1 discusses strategies for managing LOB priorities, including plans for top risks

Session 2

This Session prioritizes resources needed in order to execute strategy

RIBA

RIBA ensures that risk informs prioritization discussions
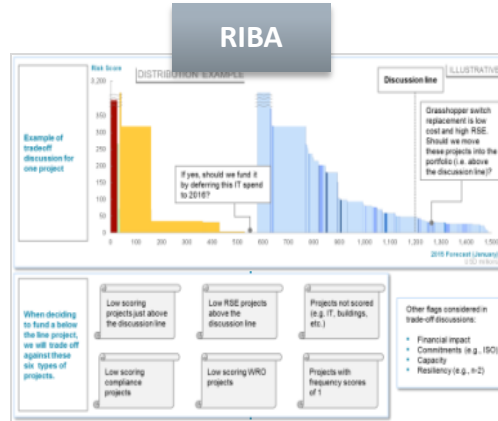
Risk Informed Budget Allocation (RIBA)

Consistency | Governance and Oversight | Communication | Embedded in Decision Making | Continuous Improvement

- Each project is risk-scored with a Subject Matter Expert
- Projects are scored along three dimensions
  - Safety
  - Reliability
  - Environmental

- Scorers present their methodology to the broader group to ensure standard application of scoring and flagging taxonomy
- Projects are calibrated across the LOB portfolios

- Prioritization discussions are based on risk scores and flags as well as other considerations (e.g. system and execution constraints)

- Confidence using the RIBA process to make budget decisions in current and future years

Score → Calibrate → Prioritization ↔ Risk-Informed Discussion
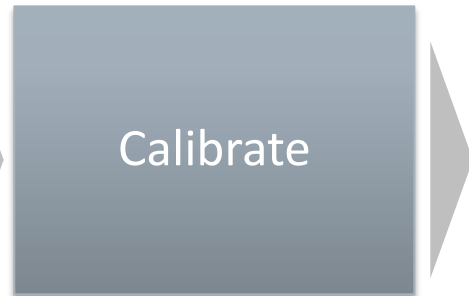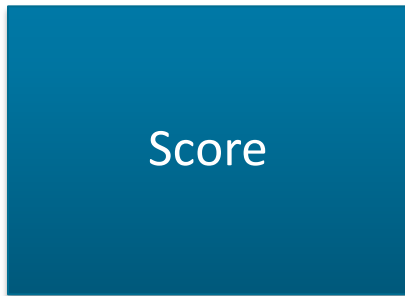
- Projects are flagged based on the driver(s) of the work

- RIBA expanded scoring team participates

- Leadership across the LOB participates

- Executive leadership

Risk Informed Budget Allocation (RIBA)

Consistency	Governance and Oversight	Communication	Embedded in Decision Making	Continuous Improvement

Step 1 – General and Scoring Information

GENERAL INFORMATION											
LOB Project Identifier 1	LOB Project Identifier 2	Project Name	Project Description	MWC	MWC Group	MAT	MAT Description	Project Manager	Asset Engineer	Asset Supervisor
19.4	31047788	Madera 1104 – Reconductor *[Location]*	NA	08	E Dist Relia	08J	Annealed Con	*[Name]*	*[Name]*	*[Name]*

SCORING INFORMATION				
Project Scorer	Interviewee (e.g. name of asset engineer)	Scoring Date	Bundle # or Tier # if part of a program	Project Notes
[Name]	*[Name]*	5/20/14	NO	Reconductor 1440' of #6 Cu. Due to number of splices

Risk Informed Budget Allocation (RIBA)

Step 3 – Risk Scores

SAFETY RISK SCORE					
Impact Score	**Impact Notes**	**Time-to-impact / Frequency Score**	**Frequency Override (1/T)**	**Frequency Notes**	**Total Safety Risk Score**
6	Possibility for Live wire down causing fatality. Right across the street from *[School]*	1		Per Calculation: 11 fatalities / 14 year = 0.79. 0.79 /2700 WD outages = 0.0003 for a frequency of 1.	178

ENVIRONMENTAL RISK SCORE					
Impact Score	**Impact Notes**	**Time-to-impact / Frequency Score**	**Frequency Override (1/T)**	**Frequency Notes**	**Total Environmental Risk Score**
1	Urban neighborhood. Right across the street from *[School]*	1			1

RELIABILITY RISK SCORE					
Impact Score	**Impact Notes**	**Time-to-impact / Frequency Score**	**Frequency Override (1/T)**	**Frequency Notes**	**Total Reliability Risk Score**
4	Broken Wires. CESO = 3161. Duration 6+ hours. Impacts *[School]*.	6		4 WD outages in 3 years	178

Total Risk Score

356

Risk Informed Budget Allocation (RIBA)

Step 4 – Flags

	COMMITMENTS AND OTHER CONSIDERATIONS								
Commitment	If a "4 – Public/Regulatory commitment," then state who the commitment is to	Due date for compliance (MM/DD/YYYY)	Inflight YES OR NO	Inter-relationships with other projects YES OR NO	Capacity YES OR NO	Financial Benefits (Select: hard, soft, none)	Benefit Amount ($000)	Support YES OR NO	Notes for other commitments and requirements
			NO	NO	NO				

Continuous Improvement

- **Continue to enhance Session D** to focus on progress from the past year as well as goals for the upcoming year

- **Continue to refine the EORM process in accordance with PG&E's EORM Vision 2020, beginning with:**
  - Increase use of data in risk assessments , including using PRA and other methods for risk quantification
  - Increase use of alternatives analysis
  - Increase use of risk metrics to determine effectiveness of risk mitigations
  - Strengthening connections within Integrated Planning

- **Continue to strengthen RIBA process and alignment with EORM**
  - Ensure that improvements made in the EORM program are incorporated into the RIBA process, as appropriate

- **Continue to benchmark to inform and refine future direction:**
  - Asset intensive, industry leading companies in utilities and beyond
  - 3rd party peer reviewers

Consistency	Governance and Oversight	Communication	Embedded in Decision Making	Continuous Improvement

2015 Company Risk Portfolio

Example of ability to calibrate the entire portfolio of risk based on RET enhancements
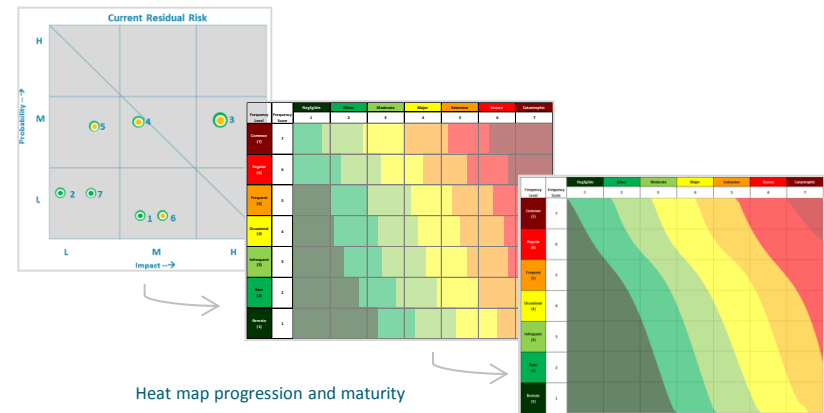
Heat map progression and maturity
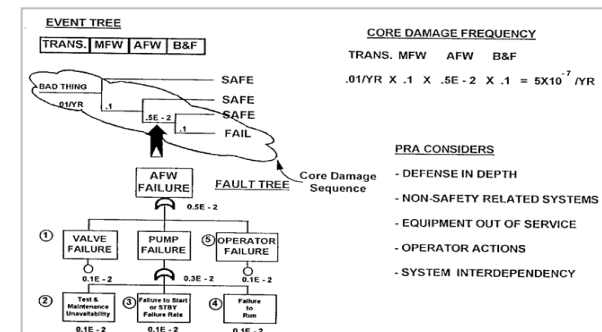
Example of Nuclear PRA Overview

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Enterprise and Operational Risk Management

- Data-driven, risk-based decision making to support safe, reliable, and affordable electric and gas service that is integrated into our planning process and becomes the foundation for our regulatory rate cases.

Consistency	Governance and Oversight	Communication	Embedded in Decision Making	Continuous Improvement

- PG&E leads the utility industry in the evolution of enterprise and operational risk management (EORM) by integrating EORM into the culture, strategic decision, regulatory processes, and operational business execution that is supported through a balance of quantitative and qualitative analysis.

- EORM will continue to improve its transparency and accountability of its business through the full integration of its risk management, asset management and investment management processes with the objective of safe, reliable, and affordable electric and gas service.

	2016	2017	2018	2019	2020
Consistency	• Risks across the organization are of an equivalent level to assist in a consistent management approach across all lines of business • Risk tolerance is further explored during risk assessments and response plan approval and alternatives analysis review	• Asset investment strategies are evaluated in a probabilistic environment • PG&E is able to develop a RAMP proceeding that is consistent with commission expectations • Process is developed to establish risk tolerance within each LOB RCC	• The investment management process has evolved to include uncertainty analysis and demonstrate ALARP • Plan is implemented to consistently drive risk tolerance discussions within LOB	• The process for establishing risk tolerance within the regulatory process is in established and serves as a guide for additional risk mitigation activities	• PG&E can demonstrably show actual risk reduction benefits • Risk tolerance is enabling PG&E to better manage its portfolio of risks
Quantification	• Practical and effective methods for quantifying risks have been identified and tested through pilots in gas operations and electric operations. • Outcomes of risks are discussed in terms of uncertainty, including worst, best and most likely values	• The ability to utilize data models and methods for risk quantification continues to build upon successes and lessons learned during 2016 pilots • LOBs are actively identifying data gaps and have plans to acquire data for enhanced risk quantification and assessment for top risks, as a matter of process	• Top risks and corresponding mitigations are supported by data that can be used to demonstrate baseline performance	• All top risks are quantified, performance targets have been established, and progress towards them is being made • Key risk indicators are in place and are able to provide insights on risk reduction across the company's risk portfolio	• Risks are quantified to the level appropriate for making trusted risk-informed, financially prudent decisions • Risk reduction can be measured and is effectively communicated to stakeholders
Culture	• The company discusses projects and initiatives in terms of risk reduction value.	• Risk reduction value is explicitly considered within investment planning Decisions.	• Risk reduction value is discussed during integrated planning sessions.	• Risk reduction value is clearly understood and is a determining factor in investment decisions.	• Management has independent assurance of risk management practices and outputs.

Appendix

Electric Operations 2015 Top Risks (Placemat)

Consistency | Governance and Oversight | Communication | Embedded in Decision Making | Continuous Improvement

Top LOB Risks		Risk Owner	Current Residual Risk Score	2014 Session D Status	2015 Session D Status as of 4/1/15	2016 EOY Forecasted Status	Response Plan Status Explanation as of 4/1/15	Top Associated Compliance Requirements
1) Wildfire	PG&E assets may initiate a wildland fire that is not easily contained and that endangers the public, private property, sensitive lands, and/or leads to long-duration service outages.	[Name]	626	🟡	🟡	🟡	GREEN	PRC 4292-4296, CPUC GO 95, CPUC GO 165, NERC FAC-003-3, CPUC D.14-02-015
2) Failure of Substation (Catastrophic)	Complete loss of a substation may result in significant wide-scale/prolonged outages, public or employee safety issues, significant environmental damage, or significant property damage.	[Name]	401	🔴	🔴	🟢	GREEN	NERC CIP-014 CPUC GO 174
3) Hydro System Safety	A failure of a PG&E dam, conveyance, or penstock may result in significant damage to third parties, the environment, and PG&E.	[Name]	349	🟡	🟡	🟢	GREEN	FERC 18 CFR Part 12, CA Water Code Division 3, US EPA Clean Water Act
4) Electric Grid Restoration	In the event of a system-wide disturbance requiring the deployment of black-start resources, PG&E's restoration plan may not meet current customer or community expectations resulting in trust issues.	[Name]	283	N/A	🟢	TBD	N/A	NERC COM-001-1.1 NERC EOP-001-2.1B NERC EOP-003-2 NERC EOP-005-2 NERC EOP-008-1 NERC NUC-001-2
5) Emergency Preparedness and Response to Catastrophic Events	The risk of inadequate plans and poor response execution to a catastrophic emergency may result in safety concerns, extended outages, regulatory action, and reputational damage. This risk includes business continuity for the enterprise outside of the event.	[Name]	280	🔴	🟡	🟢	GREEN	CPUC GO 166
6) Changing GHG Regulation	Incompatible and/or stringent state and federal GHG regulations may result in increase in costs to customers.	[Name]	417	N/A	⚫	TBD	N/A	AB 32; US EPA Clean Air Act Section 111(b) and 111(d)
7) Distribution Overhead Conductor Primary	Failure of or contact with, energized electric distribution primary conductor may result in public or employee safety issues, significant environmental damage (fire), prolonged outages, or significant property damage.	[Name]	408	🟢	🟡	🟢	GREEN	CPUC GO 95, CPUC GO 165, PRC 4293, NERC FAC-003-3

NOTE: Text in red denotes an enterprise risk. Electric Grid Restoration is currently a proposed Enterprise risk.

All black risks presented in Session D are scheduled for a formal "black-to-color" risk assessment in 2015.

* Risk status is preliminary and has not been approved by Risk and Compliance Committee

🔴 Current controls are not adequate   🟡 Controls are being strengthened   🟢 Current controls are adequate   ⚫ Analysis in progress, status unknown or under evaluation

⭕(red) Additional resources may be needed   ⭕(green) Additional resources not anticipated.   ⭕(black) Resource needs unknown

Response Plan Status:
RED: <50% of Mitigations on Track
AMBER: 50%-80% of Mitigations on Track
GREEN: 80% of Mitigations on Track
N/A: New risk/no plan in progress

Consistency	Governance and Oversight	Communication	Embedded in Decision Making	Continuous Improvement

Risk Name: Wildfire
Risk Description: PG&E assets may initiate a wildland fire that is not easily contained and that endangers the public, private property, sensitive lands, and/or leads to long-duration service outages.

P(95) Scenario: A utility-related fire near a national park resulting in fire of greater than 10,000 acres, property damage, multiple loss of life and significant fines, claims, and law suits as well as extended regulations.

2014 SD Status	🟡
Current Risk Status as of 4/1/15	🟡

Risk Response Plan Status	🟩	Risk Response Plan Owner	Eric Back	Alternatives Analysis Evidenced	Yes	Metrics in Place	Yes

Comments: The last three years have made up the driest three-year period in recorded California history back to 1850 resulting in a higher risk posture for Wildfire. Electric operations is pursuing and executing on mitigations to reduce the short-term and long-term risk profile including infrastructure replacement, increased inspections, and increased non-exempt pole clearing.

Strategy to Manage Challenges:
- Develop coalition of stakeholders to determine most effective wildfire reduction strategies
- Utilize coalition of government agencies to effectively deploy wildfire mitigation strategies
- Continue to align proactive mitigations with drought conditions and identified wildfire risk areas

Risk Response Plan Mitigations

Mitigation	Completion Date (From Risk Assessment)	% Complete as of 4/1/15	Next Steps
Implement remote capability to disable reclose in wildfire areas	12/31/16	25%	Continue build-out of SCADA infrastructure to support functionality. Identified 215 target locations requiring functionality.
Continued asset management programs focused on wildfire risk zones	12/31/18	On-going	Review exempt surge arrestors for use in distribution system and develop implementation strategy. Implement infrared strategy and develop bridging strategy for transmission lines with focus on wildfire areas.
Continued enhanced Vegetation Management in repeat outage locations	12/31/15	On-going	Public Safety & Reliability tree program directly considers repeat vegetation-related outages in planning criteria. Execute on five year plan for targeted historic locations. Also mitigates the Overhead Conductor risk.
Formalize corporate tracking of annual fire season safety awareness training completion	6/30/15	75%	Complete implementation by identifying and assigning training to field personnel.
Develop algorithms to provide identification of poor performing conductor	6/30/14	100%	Algorithm was implemented in STAR prototype. Also mitigates the Overhead Conductor risk.

Metrics

Metric Description	Metric Legend	Metric Status
T&D Overhead Wires Down	RED: Over 2615 AMBER: 2615 or less GREEN: 2540 or less	🟩
911 response time	GREEN: 93.5% of Target AMBER: 92.6-93.4% RED: Less than 92.6%	92.6% through Feb
Vegetation Miles Worked	GREEN: 97% of Target AMBER: 95-96.9% RED: Less than 95%	🟩
Distribution Wildfire Detailed Inspections	TRACKING	EOY target of 178
Electric Asset Related Fires	UNDER DEVELOPMENT	N/A
T&D Infrared Inspection Miles	UNDER DEVELOPMENT	N/A

🔴 Current controls are not adequate
🟡 Controls are being strengthened
🟢 Current controls are adequate
⚫ Analysis in progress, status unknown or under evaluation

🔴 (outline) Additional resources may be needed
🟡 (outline) Additional resources not anticipated
⚪ Resource needs unknown

Response Plan Status:
RED: <50% of Mitigations on Track
AMBER: 50%-80% of Mitigations on Track
GREEN: 80% of Mitigations on Track
N/A: New risk/no plan in progress

Thank You

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