

Wildfire Risk Governance Committee

Governance Committee

January 29th, 2021

Executive Sponsor(s): [REDACTED] (SVP and Chief Risk Officer)

Author(s) & Affiliation: [REDACTED] (Sr Director, Risk – Special Projects)

Safety



Earthquake

Duck, Cover, & Hold



Emergency Plan & Exit Strategy

Have a plan for yourself and your household



24/7 Nurse Care Line

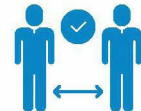
If you experience a work-related discomfort or injury, call [REDACTED] and notify your supervisor.



Wash your hands!



Wear a Mask



Practice social Distancing

California can stop the spread

Add your phone today to California's exposure notification system



<https://canotify.ca.gov/>

Meeting Agenda

Date	01/29/2021
Desired Outcomes	<ul style="list-style-type: none"> • Decision: Targeting Approach for Fuse Replacement Program • Inform: 6 Areas for improvement of Vegetation Management • Inform: Enhancements to 2021 Inspection and Repair Plan • Decision: Move forward with 3 Remote Grid Projects • Inform: ECOP Top 20% - Clayton Work • Inform: CWSP Top 50 – Bucks Creek Work • Inform: CWSP Top 250 – Volta Work • Inform: Full Vegetation Management Review

Meeting Agenda

What – Content	Who - Facilitator(s)	Slides
Agenda and Safety Moment	[REDACTED]	1-2
Fire Ignition Component Update	[REDACTED]	3-8
6 Areas for Improvement for Vegetation	[REDACTED]	9-12
2021 Enhanced Inspection Workplan and Repairs Update	[REDACTED]	13-15
System Hardening Project Approval	[REDACTED]	16-27
Vegetation Management Review	[REDACTED]	28-33
Action Item review	[REDACTED]	34-41

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FIRE IGNITION COMPONENT UPDATE

Fire Ignition Component: Expulsion Fuse Project Overview

Background

An earlier field visit highlighted gaps in the distribution inspection process such that it may not have captured the presence of non-exempt equipment such as the expulsion fuse. An expulsion fuse may cause an ignition event due to the venting of hot gases. The extent of the problem is unknown and requires further investigation.

Objective

The objective of this initiative is to determine the extent of condition, root cause analysis of missed non-equipment identification, recommendations for fuse replacement and adjustments to the inspections program.

Task No:	Description	Date
Extent of Condition	Identify the risk presented by an expulsion fuse being triggered.	12/7/20
	Quantify the number of Non-Exempt fuses in the PG&E service territory using ED-GIS Fuse Database.	12/9/20
	Assess cross-correlation between Inspection Records, Vegetation, and ED-GIS Systems to identify potential non-identified expulsion fuses and determine magnitude of issue.	12/11/20
	Compare 2019 and 2020 inspection forms to determine the discrepancies between years.	12/14/20
Rec's	Develop recommendations to replace non-exempt equipment in PG&E service territory in HFTDs.	12/24/20
	Develop recommendations for the inspection program to improve capture of Non-Exempt equipment.	

Team

Name	Position
[REDACTED]	Executive Sponsor
	Initiative Lead
	Data Strategy SME
	GIS Analysis
	Strategic Analyst
	System Inspections SME
	Data Analyst 1
	Data Analyst 2
	Standards SME
Distribution Planning SME	

In-Scope
<ul style="list-style-type: none"> Analysis of Inspection Data and GIS Data Recommendations to improve

Out-Scope
<ul style="list-style-type: none"> Other Non-Exempt Equipment Types

Progress to-date with this expulsion fuse initiative

Identified Expulsion Fuse Count

13,478

- **'Known'** volume of targeted and replaceable expulsion fuses
- ED-GIS system count of non-exempt fuses
 - **Filtered** down from 168k total ED-GIS fuses
 - Filtered by HFTD and **type T & K** specific **non-exempt models**

Fuse Count Identification Gap

5,741

- **'Known, unknown'** volume of expulsion fuses based on cross-comparison of both databases
- **Discrepancy** between ...
 - **Vegetation Management:** 19,219
 - And **ED-GIS:** 13,478

Unverified Expulsion Fuse Count

4 – 10K

- **'Unknown, unknown'** volume of expulsion fuses that exist in ED-GIS or Vegetation systems but not yet verified
- **4,622**, or **33%**, of ED-GIS non-exempt equipment lacking verification in 2020 re-inspections
- Extrapolating this to the Vegetation count means, possibly, another **6,270** are also categorized, but not verified

Differing figures highlight the fact that a sub-set of fuses exist that have not yet been verified either from database discrepancies or from issues with re-inspection (i.e., missing form field or transformer placement)

SOURCE(S): ¹ PG&E ED-GIS and Vegetation Management Database outputs and team analysis

Replacement planning and current progress result in 7 - 16 years of expected work before completion

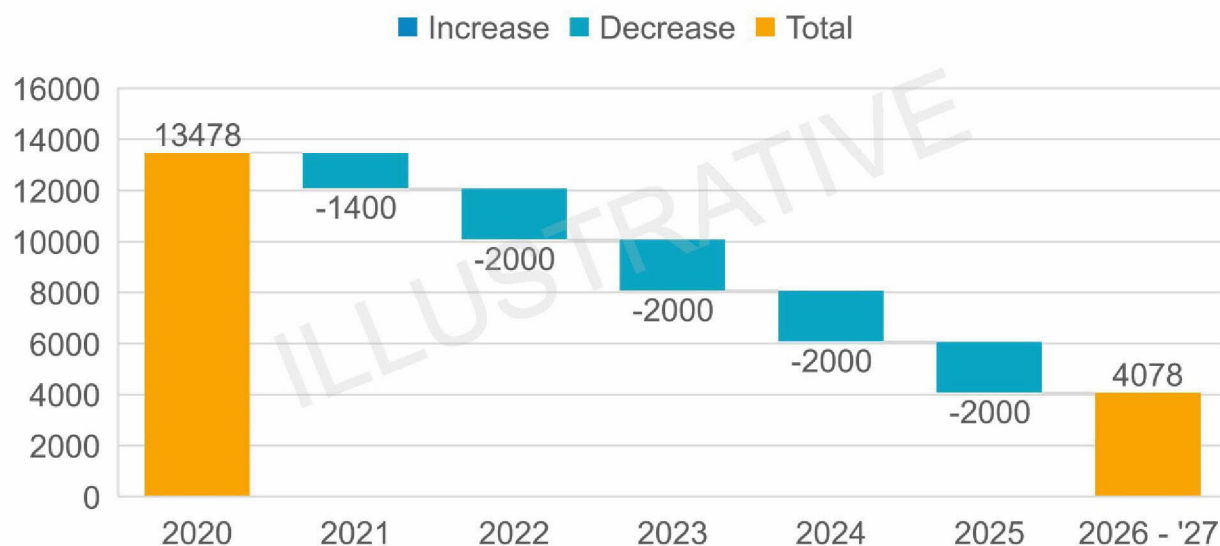
Executorial Analysis

• **2020 budget:** ██████ to replace fuses in 2021 at a cost of ██████/fuse

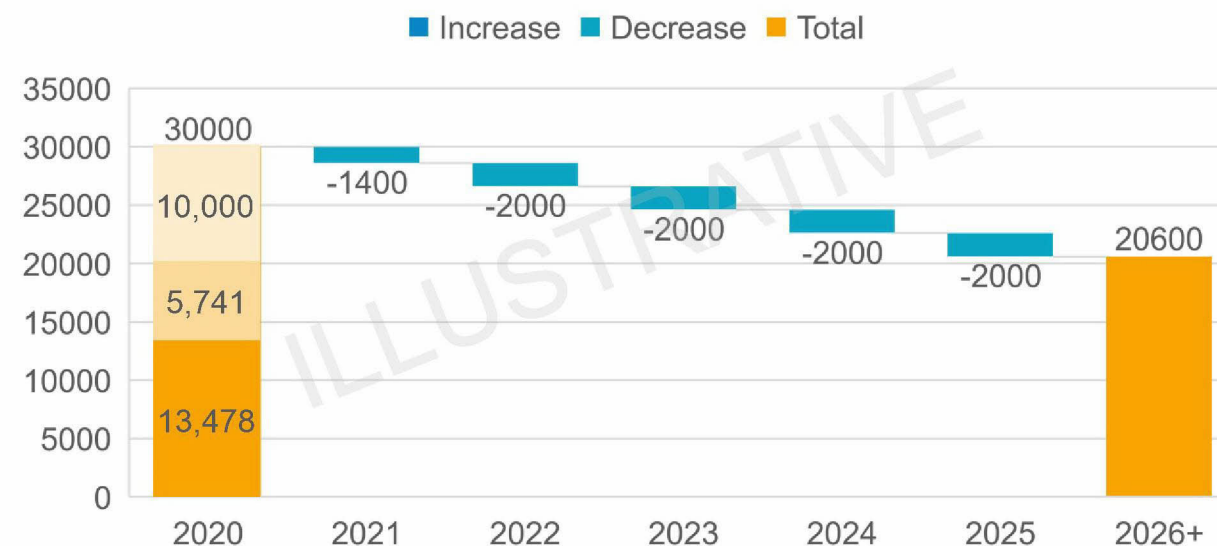
• **2021 goal:** 1,400 non-exempt fuses are targeted for replacement

• **2022 goal:** 2,000 fuse replacements moving forward

Known Count: Annual Fuse Replacement Forecast



High Est.: Annual Fuse Replacement Forecast



Known Risk Reduction

- **2027 completion** (7 years) based on current identified fuse volumes with 2020 and future run rates
- Assuming no issues, the **current replacement** goals for 2020 account for **~10% of total** addressable expulsion fuses
- Further risk reduction by project overlap may improve the outlook (i.e., system hardening replaced fuses)

Possible Unknown Risk Reduction

- **2037 completion** (16 years) if total volume of replaceable fuses is actually higher based on current on 2020-2021 run rates
- Assuming no issues, the **current replacement** goals for 2020 account for **<5% of total** potential, addressable expulsion fuses
- Scope may be further expanded due to expulsion fuses mounted on transformers

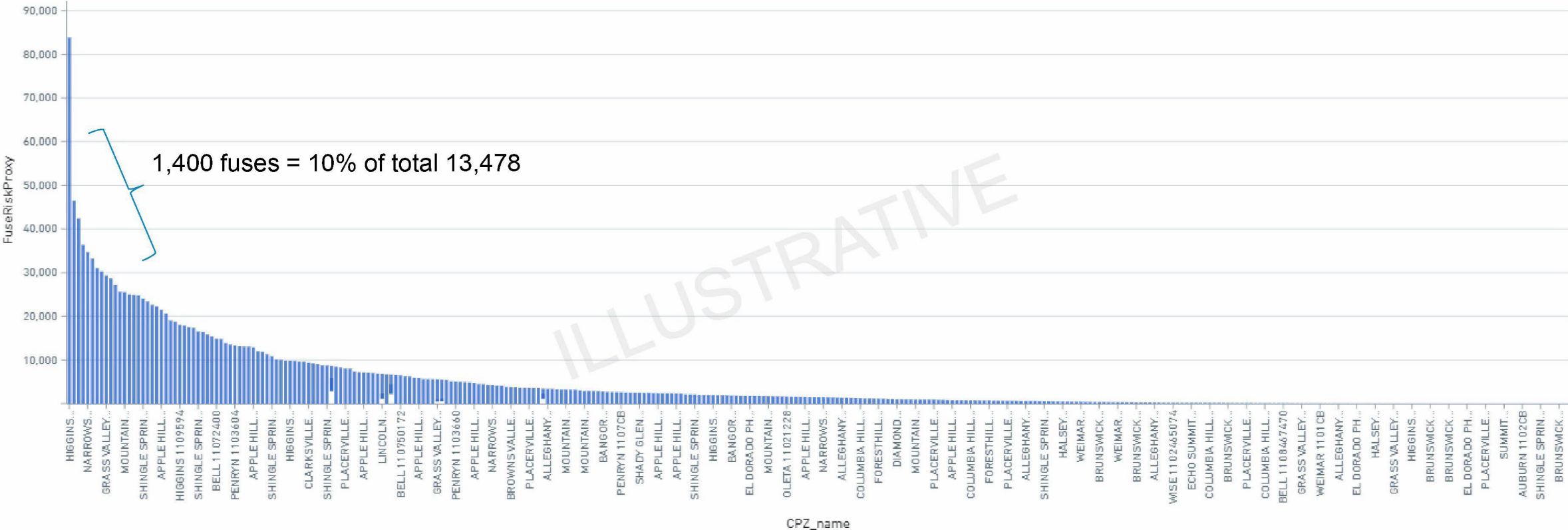
SOURCE(S): 1 PG&E team analysis;

NOTE(S): Future budget changes may reduce the anticipated replacement target. Additionally, a longer timeline may be beneficial because it provides the opportunity to leverage newer technology in years to come: i.e., the vacuum bottle fuse product

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Decisions approving the replacement plan for fuses

Expulsion Fuse Proxy Risk Results for Sub-prioritization by CPZ



Considerations

- The fuse risk proxy is the consequence value of the circuit multiplied by the volume of fuses on the circuit
- Proposed prioritization hierarchy addresses highest risk CPZ areas and fuses first
- The objective is to replace highest risk areas first to maximize risk buy-down once aligned with this approach

SOURCE(S): 1 PG&E's Palantir-generated analysis of fuse proxy risk by fuse concentration and fuse consequence for Sierra;
 NOTE(S): Risk buy-down assessment in progress; CPZ prioritization starts at division level and narrows down to circuit level

Key Decision – Ignition Component Replacement: Expulsion Fuses

Approval Status	On Hold
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Decision Detail
<p>This decision is seeking the approval of:</p> <ol style="list-style-type: none"> 1) The target volumes for the fuse replacement program, 2) The use of the fuse risk proxy (consequence X volume of fuses) to address the potential risk associated to expulsion fuses across the territory.

Concerns and Mitigations
<ul style="list-style-type: none"> • Additional volume of fuses may exist on the system in addition to the known volume in ED-GIS adding to potential exposure.

Approvals	

Action Items and Validations	
	Re-evaluate the targeting methodology with the RaDa team

6 AREAS FOR IMPROVEMENT FOR VEGETATION

Vegetation Management Six Areas of Improvement

Current Scope

	Enhanced Work Verifications	<ul style="list-style-type: none"> • Work verification is performed on all vegetation management work (T&D), in HFTD areas on a 100% basis and a 25% random sample of non-HFTD work. Shifting towards near real-time quality assessment rather than current average of 14 days following completed work • Current workforce encompasses a 1:5 ratio of QV inspector to tree crews with 100 QV contract inspectors staffed at peak. The proposed future workforce will be ~360 FTEs, steady-state, targeting a 1:3 ratio of QV inspector to tree crews
	Implementation of Defined Scope & UC for EVM & Tree Work	<ul style="list-style-type: none"> • Distribution Routine work was performed on a unit price basis and tree removal was performed on a T&E basis. Shifting towards both having a unit price basis • PG&E is responsible for contracting and coordinating both pre-inspection and tree crew work. Shifting towards contracts incentivizing to “trim beyond compliance” and own accountability • Contractors are assigned responsibility for the compliance of circuit bundles (zones) based on “defined scope”; 32 total zones encompass the entire system
	Process and Technology Improvements	<ul style="list-style-type: none"> • The VM technology and data/performance management team currently supports the development, integration and strategy of VM databases and tools on an ad hoc basis • Currently building towards a team including members from VM, IT and EO PI focused on both near term and long-term strategic process and technology fixes to close data collection and data management gaps
	Ground-Based LiDAR (GBL)	<ul style="list-style-type: none"> • PG&E conducted ground-based LiDAR pilots using vehicle, ATV and backpack mounted LiDAR technology in 2020. Shifting towards using ground-based LiDAR with vehicles as a post inspection review of completed circuits. Can address ~70% of HFTD circuits due to accessibility • Provide digital time-stamped TVAC record for work verification
	Vegetation Management Liaison	<ul style="list-style-type: none"> • Local teams dispatched to review findings as PG&E becomes aware of Regulatory observations • Shifting towards a dedicated centralized team of arborists/professional foresters to conduct reviews of all findings and ensure timely follow up and closure of each finding
	Vegetations Management Inspectors (VMI)	<ul style="list-style-type: none"> • Primarily rely on contractor expertise for observing contract tree crews performing work. Shifting towards VMI team with PG&E employees to ensure internal expertise on VM work, targeting a 1:20 ratio of VMI to tree crew

Vegetation Management Six Areas of Improvement

Forecast: Dec. 2020 – Q1 2021

Current Implementation: Q1 2021



Enhanced Work Verifications

- 9 VPMs
- 15 Internal Inspectors
- 15 Internal Support
- 75 Contract Inspectors

Recruiting

- 3 WV Managers: Reviewed all Manager resumes and selected 7 candidates for interviews. Working with recruiting to schedule interviews for late next week
- 14 WV Supervisors: Reviewed all supervisor resumes and selected 20 candidates for interviews. Working with recruiting to schedule the interviews for Feb. 10 – 19
- Recruiting will post the 21 Internal WV positions on Feb. 1
- 90 WV contractors currently on board with more starting on Feb. 1
- Started WV on select Routine Circuits In December (60 circuits in hand representing 5 of 6 regions)
- Receiving completed circuits from Defined Scope (Routine) and performing work verification
- Plan is to increase circuits as staff is ramped up
- HR posted positions to recruit nationally through UAA & ISA

Work Verification Progress

- Work verification completed 110 circuits in December
- 20 circuits completed YTD
- 16 more in progress
- 57 more in hand spanning 5 of 6 regions



Implementation of Defined Scope & UC for EVM & Tree Work

- All 32 Zones (circuit bundles) implemented for routine VM program

Defined Scope

- All 32 Defined Scope circuit bundles have been rolled out
- Leveraging Work Verification to provide feedback and assure quality of work

PI RFP

- EVM PI RFP was opened to contractors on Jan. 18, 2021
 - Pre-Bid Conference call was held Jan. 22, 2021
 - Contractors are preparing initial bids
- Continuing to partner with Sourcing Operations to execute on the EVM PI RFP



Process and Technology Improvements

- Stand up cross-functional team to identify and mitigate process controls that are high risk and performed manually
- 2 Internal FTEs

Priority Tag Application (P1/P2)

- Onboarded UDC and have established core project team. Performing technical and operational requirements due diligence week ending Jan. 30. Planning to have first draft schedule ready for leadership review week ending Feb. 6

On-Track for V9 Collector update on Feb. 1

- Incorporates upstream QC data validation. Updates TAT process. Updates WV visibility in tool for field

Vegetation Management Six Areas of Improvement

Forecast: Dec. 2020 – Q1 2021

Current Implementation: Q1 2021



Ground-Based LiDAR (GBL)

- Develop procedures and processes for GBL using vehicles
- 6 Internal Support FTEs

GIS Mapping of VM Projects

- VM Routine Operations are performed throughout the year in terms of VM Projects. VM Projects are defined by each division and stored as hard copies in local offices. To plan and schedule GBL collections, PG&E needs to digitize and geo-reference the VM Projects in the Master Maps
- Status: 1,252/3,587 (35%) VM Projects have been digitized. 8/3,587 (0%) have been geo-referenced

Near Term Goals

- A dependency was identified requiring digitized maps in order to capture LiDAR data in sync with Operations Teams. This work is in progress
- Contract LiDAR Vendor for Collection: Expected for Mid-February 2021
- Begin to collect LiDAR in Sierra Division: Expected in March 2021
- Deliver LiDAR results to Work Verification as part of Routine: Expected April 2021



Vegetation Management Liaison

- 4 Internal Support FTEs
- 7 External Arborist FTEs
- Stand up dedicated VM Federal Monitor Liaison team
- Oversight of all findings and associated action items

- Completed onboarding of 5 Expert Arborist (external) and began training on Jan. 7, 2021
- Team prepared to provide weekly feedback to Federal Monitor Team
 - Currently caught up on existing Monitor observations
 - Ready once Monitor field observations begin for 2021
- Currently performing QC audits of records for work performed in fire impacted areas (2020)

Near Term Goals

- Beginning interviews for 2 additional positions
- Setting up field benchmarks with monitor team when it is safe under Covid
- Supporting operations team with Work Verification findings on an ad hoc basis
- Creating a dashboard for third party finding tracking



Vegetation Management Inspectors (VMI)

- Complete hiring of all Vegetation Management Inspectors (30 Contract VMI by Jan. 31 / 13 Internal Support)

- Federal Monitor probation condition reequipment of making 30 offers was exceeded (39 offers made) as of Jan. 25, 2021
- VM Inspections are being performed in all Regions (27 in field plus 7 Supervisors)
- 17 Internal VMIs on board and 12 additional VMIs that are going through background checks
- 7 VMI Supervisors, 1 Manager, 1 DMS onboarded
- 9 Contractors on the field
- 2 contracts approved to add additional contract VMIs

2021 ENHANCED INSPECTION WORKPLAN AND REPAIRS UPDATE

HFTD Enhanced Inspection July 31st Deadlines

2021 Enhanced Inspection Workplan efforts are focused on July 31st deadline for Tier 3, Tier 2 and HFRA assets.

Targeted/Planned 2021 Enhanced Inspection Types

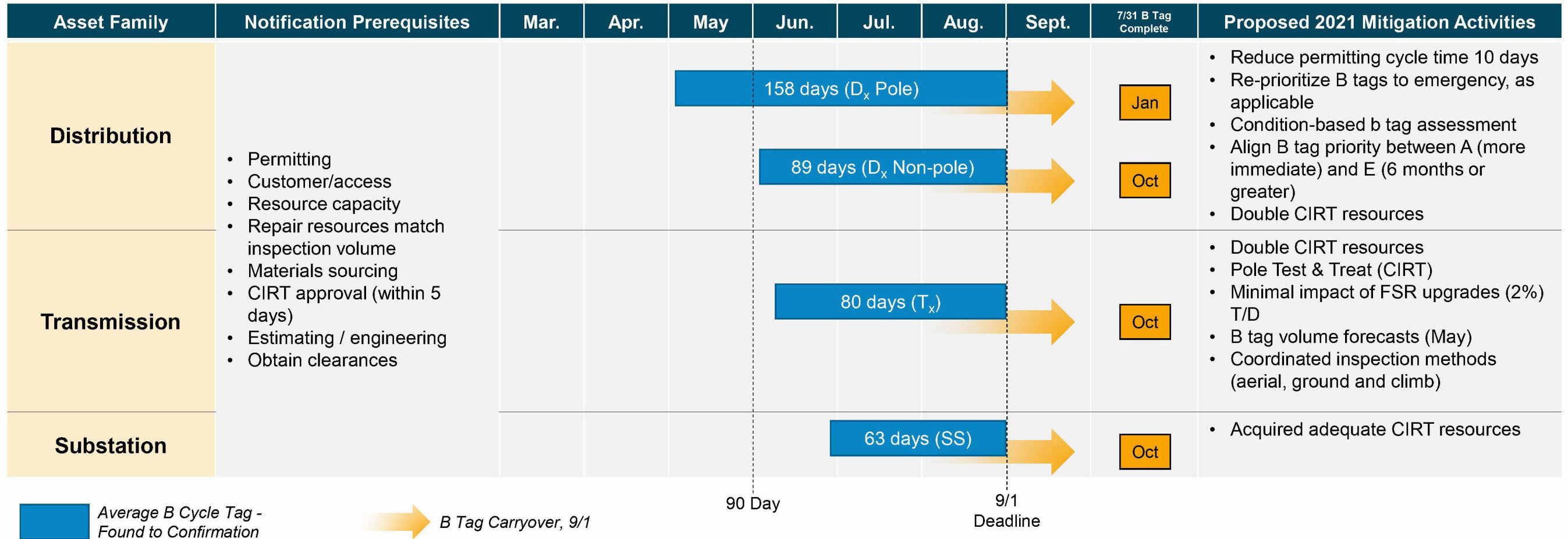
	Mar.	Apr.	May	Jun.	Jul.
Distribution (T2/T3)	60,000	120,000	120,000	120,000	60,980
Transmission Ground (T2/T3)	4,886	8,084	6,351	3,457	1,512
Transmission Climb (T2/T3)	302	381	325	247	
Transmission Aerial (All, T2/T3)	4,500	8,970	9,580	8,190	8,580
Substation Ground (T2/T3/3A)	23	32	22	23	
Substation Aerial (T2/T3/3A)	21	24	17	19	19

Targeted HFTD Inspection Completion Month

Timing of HFTD Repairs

Notification prerequisites can present challenges to completing repairs within B tag cycle times

Inspections will provide an update on 2/5 regarding progress against 2021 mitigation plan



SYSTEM HARDENING PROJECT APPROVAL

Today's discussion will include mitigation recommendations, as well as additional remote grid projects to be scoped for 2021

The following 3 projects have recommended mitigations:

Order No.	CPZ	Work Bucket	Total MAVF Core Risk Value	Mean MAVF Core Risk Rank	Recommendation	WGC Request
WGC Inform						
1	CLAYTON [REDACTED]	ECOP	32.63	377	Hybrid (OH/UG)	Inform
2	Bucks Creek 1101CB	CWSP - Top 50	9.55	11	Hybrid (OH/UG)	Inform
3	Volta [REDACTED]	CWSP - Top 250	13	39	OH	Inform

3 RG projects are requested for scoping:

#	CPZ	Work Bucket	Total MAVF Core Risk Value	Mean MAVF Core Risk Rank	Recommendation	WGC Request
1	299 Ellis/Old Turri Corning [REDACTED]	Hardening	21.6	413	RG	Scoping Decision
2	300 Main Turri Corning [REDACTED]	Hardening	21.6	413	RG	Scoping Decision
3	576 Stewart Oakhurst [REDACTED]	Hardening	40.9	183	RG	Scoping Decision

Proposed RG Project for Inclusion: #299 Ellis/Old Turri

Project Location and Overview

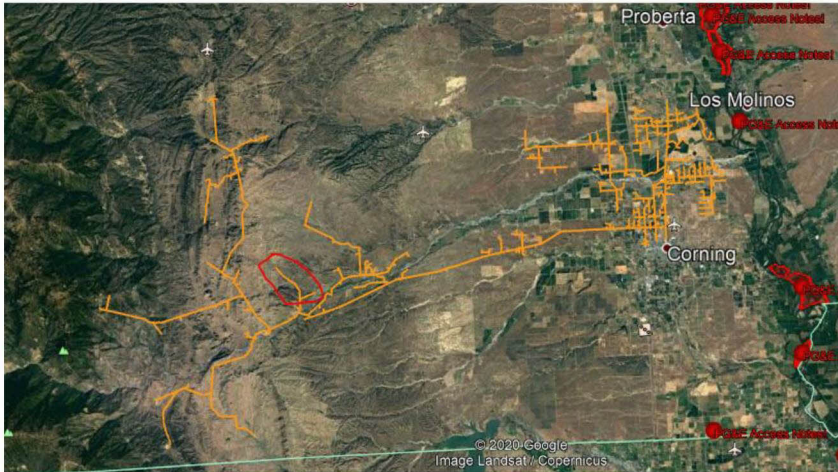
Work Bucket	Hardening
Circuit	Corning 1102
CPZ	CORNING [REDACTED]
County	Tehama
Project Miles	2.01

Risk Statistics

Mean Risk Score	0.175
Ignition Probability	4.46E-05
Conseq. Rank	4,517 (3%)
2021 Risk Rank	413 (11%)
2018 Risk Rank	1,844 (51%)

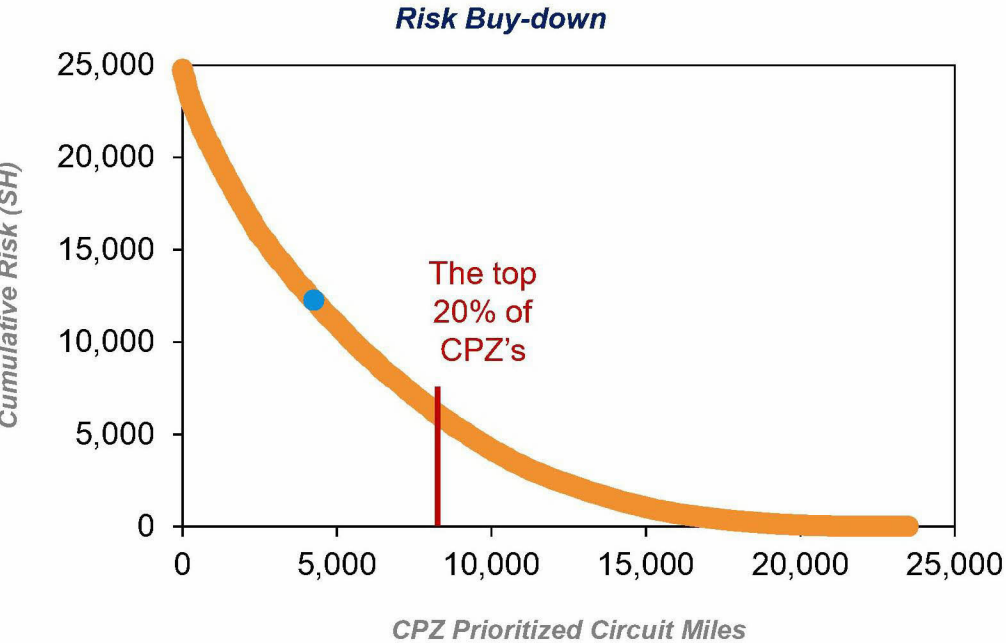
Operational Characteristics

Estimated Full Project Cost (Expected Case)	[REDACTED]
Actual and Committed Costs	[REDACTED]
Project Status	Initiating
In Service Date	12/1/2021
HFTD	Tier 2
Customer Count	2



High Risk Flags

PSPS Customer Impacts (Pre / Post) mitigation	2
Count of EC Tags	5
Tree Count	40
CPZ in Top 20% of Risk?	Yes
Fire Rebuild?	No



Mitigation Plan

PSS Concerns

- Egress:** Main travel route ~2 mile dirt road off main highway not maintained by county. Bad weather will make it difficult to traverse without 4x4. Minimal impact to civilian egress, but significant for fire resources
- Fire History:** Proximity to fires, but not on actual footprint

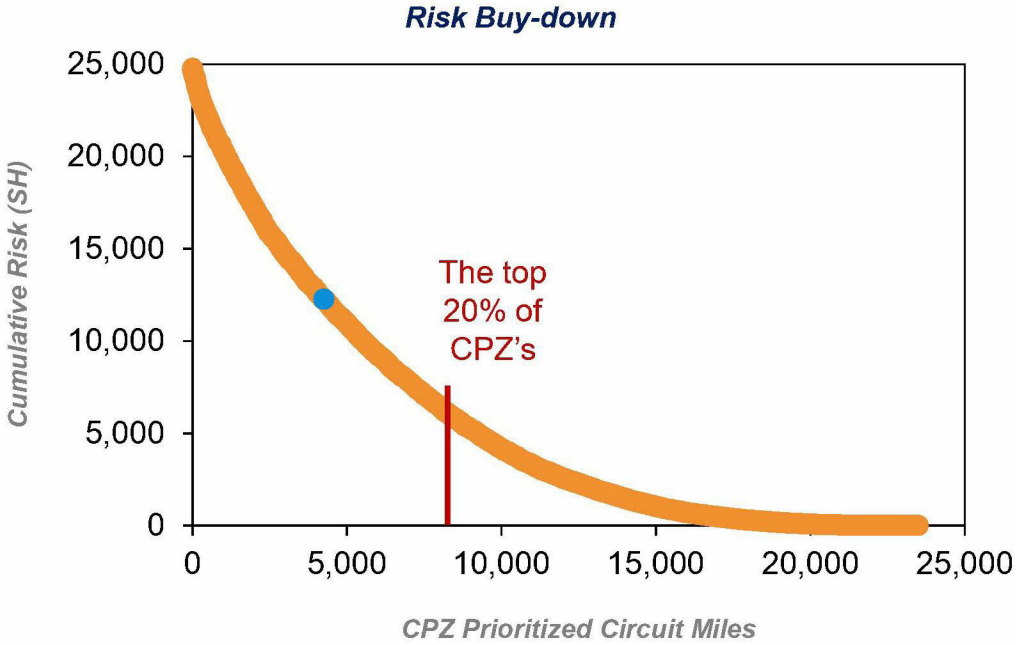
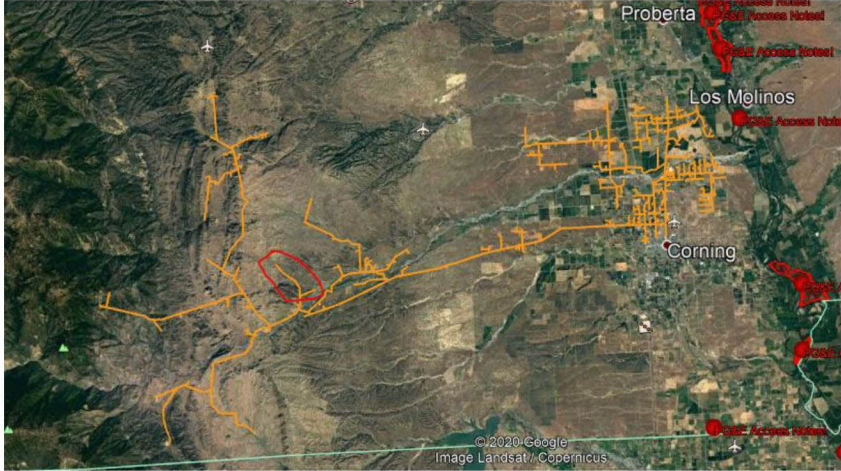
Mitigation Plan and Rationale

- 2.32 miles of line removed
- Eliminate line hardening requirement, reduce PSPS customer impacts, and savings of ~28% compared to Hardening
- Customer potentially will have ability to stay on during PSPS events
- Strong customer interest in project

Issues / Factors Influencing Timeline

Proposed RG Project for Inclusion: #300 Main Turri

Project Location and Overview	
Work Bucket	Hardening
Circuit	Corning 1102
CPZ	CORNING [REDACTED]
County	Tehama
Project Miles	1.04
Risk Statistics	
Mean Risk Score	0.175
Ignition Probability	4.46E-05
Conseq. Rank	4,517 (3%)
2021 Risk Rank	413 (11%)
2018 Risk Rank	1,844 (51%)
Operational Characteristics	
Estimated Full Project Cost (Expected Case)	[REDACTED]
Actual and Committed Costs	[REDACTED]
Project Status	Initiating
In Service Date	12/1/2021
HFTD	Tier 2
Customer Count	1



High Risk Flags	
PSPS Customer Impacts (Pre / Post) mitigation	1
Count of EC Tags	7
Tree Count	13
CPZ in Top 20% of Risk?	Yes
Fire Rebuild?	No

Mitigation Plan	
PSS Concerns	
<ul style="list-style-type: none"> Egress: Main travel route is long, one lane dirt road off main highway. Bad weather will make it difficult to traverse without 4x4. Minimal impact to civilian egress, but significant for fire resources 	
Mitigation Plan and Rationale	
<ul style="list-style-type: none"> 0.76 miles of line removed Eliminate line hardening requirement, reduce PSPS customer impacts Customer potentially will have ability to stay on during PSPS events and savings of ~12% compared to Hardening Strong customer interest in project 	
Issues / Factors Influencing Timeline	
<ul style="list-style-type: none"> Customer desires assistance with obtaining a second meter for barn Barn is located across county road, potential additional permitting issues Same owner as one of the customers in #299 Ellis/Old Turri. Likely need to do this project, despite minimal cost savings in comparison to Hardening, to keep larger #299 project active 	

Proposed RG Project for Inclusion: #576 Stewart

Project Location and Overview

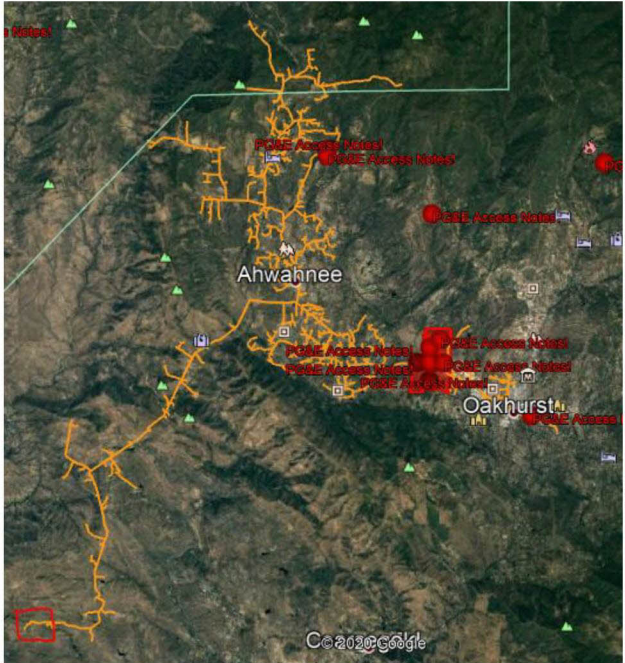
Work Bucket	Hardening
Circuit	Oakhurst 1101
CPZ	OAKHURST [REDACTED]
County	Madera
Project Miles	0.75

Risk Statistics

Mean Risk Score	0.267
Ignition Probability	5.04E-05
Conseq. Rank	45 (1%)
2021 Risk Rank	183 (5%)
2018 Risk Rank	3171 (87%)

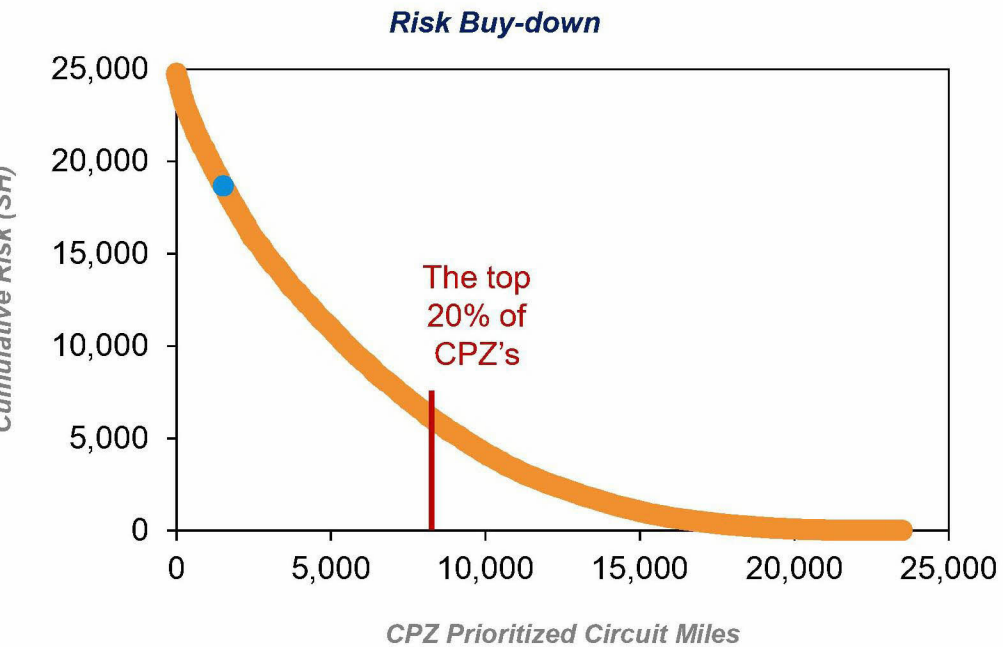
Operational Characteristics

Estimated Full Project Cost (Expected Case)	[REDACTED]
Actual and Committed Costs	[REDACTED]
Project Status	Initiating
In Service Date	12/1/2021
HFTD	Tier 2
Customer Count	1



High Risk Flags

PSPS Customer Impacts (Pre / Post) mitigation	1
Count of EC Tags	9
Tree Count	7
CPZ in Top 20% of Risk?	Yes
Fire Rebuild?	No



Mitigation Plan

PSS Concerns

- Egress:** Main travel route is long, one lane dirt road off main highway. Bad weather will make it difficult to traverse without 4x4. Minimal impact to civilian egress, but significant for fire resources

Mitigation Plan and Rationale

- 0.75 miles of line removed
- Eliminate line hardening requirement, reduce PSPS customer impacts, and savings of ~18% compared to Hardening
- Customer potentially will have ability to stay on during PSPS events

Issues / Factors Influencing Timeline

- House/property is on sale by owner

Key Decision – Approval to Scope Remote Grid Projects

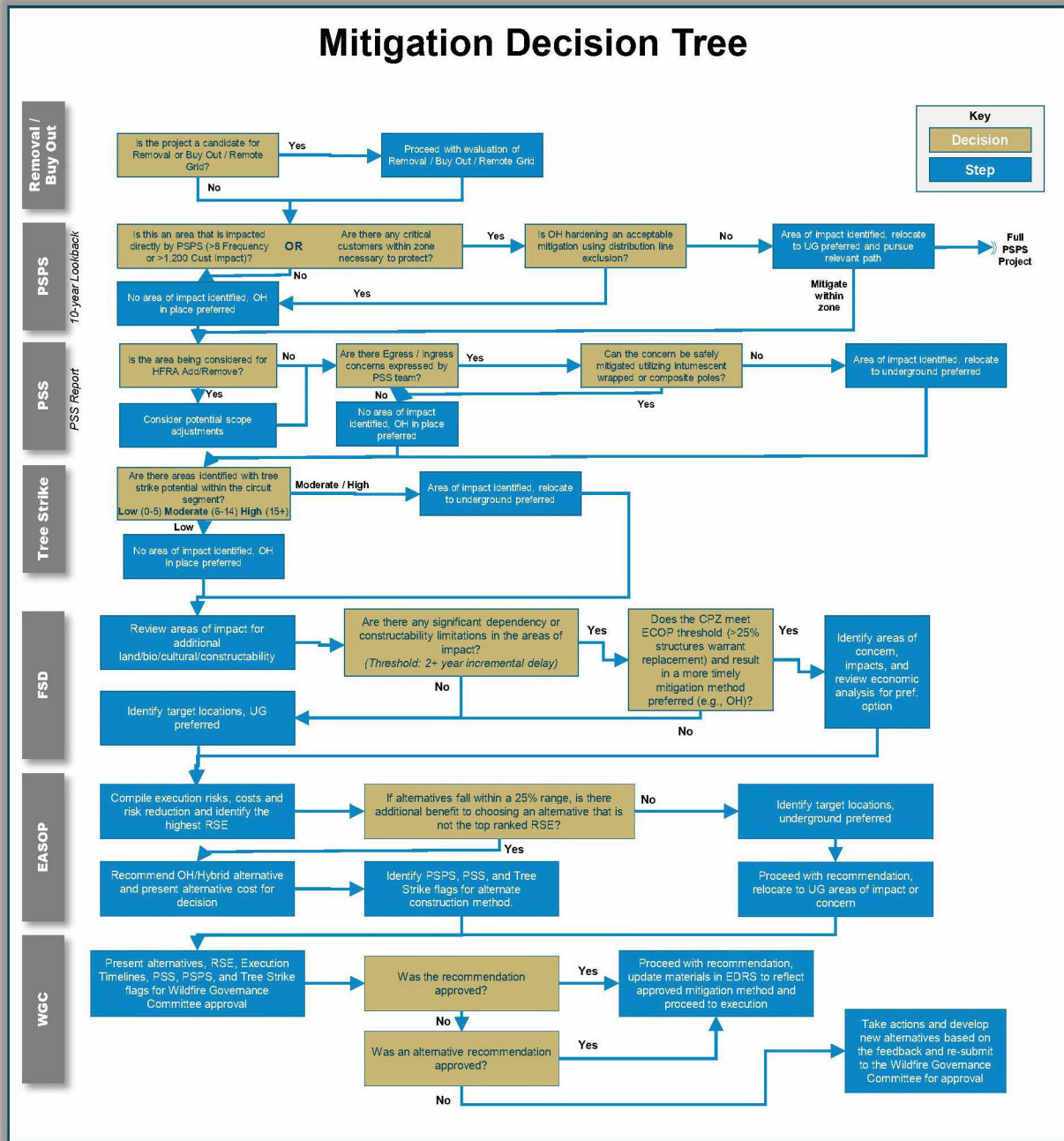
Approval Status	Approved
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Decision Detail
<p>Request to move forward with scoping three (3) remote grid projects totaling ~3.8 miles.</p> <ul style="list-style-type: none"> • #299 Ellis/Old Turri • #300 Main Turri • #576 Stewart

Concerns and Mitigations

Approvals	
	Approved
	Approved
	Approved
	Approved
	Approved
	Approved

Action Items and Validations	



Key Questions		Outcome		
PPSPS	Is this an area that is impacted directly by PPS (>8 Frequency or >1,200 Cust Impact)?	Y	N	1 event, OH preferred
	Are there any critical customers within zone necessary to protect?	Y	N	
	Is OH hardening an acceptable mitigation using distribution line exclusion?	Y	N	N/A
PSS	Is the area being considered for HFRA Add/Remove?	Y	N	
	Ingress/Egress concerns identified by PSS professionals cannot be mitigated by utilizing intumescent wrapped or composite poles.	Y	N	Ingress / Egress concerns
Tree Strike	Moderate (6-14) or high (15+) strike tree potential areas in the segment.	Y	N	
FSD	Are there any significant dependency or constructability limitations in the areas of impact? (Threshold: 2+ year incremental delay)	Y	N	
	Does the CPZ meet ECOP threshold (>25% structures warrant replacement) and result in a more timely mitigation method preferred (e.g., OH)?	Y	N	
EASOP	If alternatives fall within a 100% range, is there additional benefit to choosing an alternative that is not the top ranked RSE?	Y	N	Hybrid and UG within 100%

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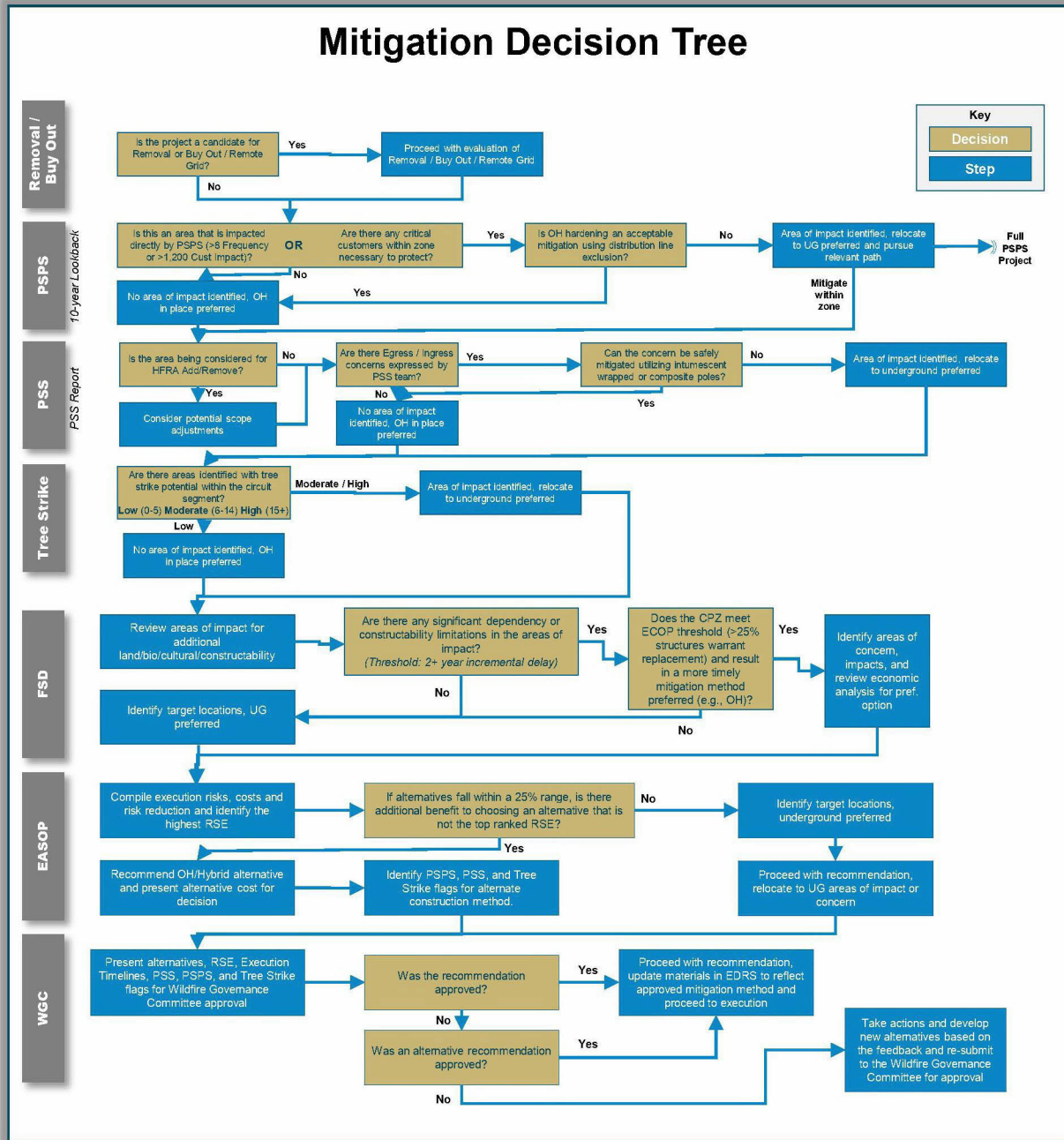
Hybrid Preferred

INFORM: ECOP Top 20% - PM [REDACTED] – Clayton [REDACTED] H01

Clayton 2212 (1.42 Miles)		No System Hardening	Overhead Hardening	Under-grounding	Hybrid
Project Scope Risk Reduced After Mitigation		-	1.48	2.36	1.99
Project Scope Residual Risk Value		2.39	0.91	0.03	0.40
Overall Miles Installed		1.42 Existing OH	1.42	3.15	2.82
OH System Hardening Cost	[REDACTED] /risk-mile	-	[REDACTED]		
UG System Hardening Cost	[REDACTED] /risk-mile	-			
Line Removal Cost	-	-			
Total Capital Cost					
Average O&M Cost (per year)					
NPV @ 6.8% discount rate					
Primary Filter	\$ NPV per unit of risk (RSE)	-			
	PSS Preference (Ingress/egress/fire history)	Not Preferred	Satisfactory	Preferred	Preferred
Secondary Filter	Strike Tree Potential	Moderate Fall-in Risk	Low Fall-in Risk	N/A	Low Fall-in Risk
	Ingress/Egress – Preferred option	Moderate	Not Preferred	Preferred	Preferred
	PSPS Mitigation (26 Customers)	26 / 26 (0%)	26 / 26 (0%)	26 / 26 (0%)	26 / 26 (0%)
	Execution timeline (2021, 2022, 2022+)	-	2021	2022+	2022+
Recommended					

Supporting Detail for Recommended Alternative (EDRS Routing [2021-02769](#)) :

- **Public Safety Specialist:** Surrounded by grass oak. Population density is low. The area around this project has some fire history. Preference for action to be taken based on increased risk of ignition on tagged equipment.
- **Strike Tree Potential:** 636 total strike potential trees in the CPZ, LOW (0-5) tree strike potential in this segment does not suggest UG hardening is required.
- **Egress Considerations:** This road is not a main thoroughfare on a daily basis but is a route of egress for citizens from the Clayton Valley area when fire impacts the Clayton Valley area. The road is used for ingress for fire and emergency services from the south.
- **PSPS Mitigation:** No mitigation potential due to limited scope of this hardening project; no critical / essential customers in this segment. To achieve PSPS reductions, additional scope would have to be included.
- **Execution Timeline (Land/Bio/Cultural/Constructability):** OH hardening could be accomplished by 12/31/2021; 1.2 miles of CA red-legged frog habitat, CA tiger salamander, and Alameda Whipsnake; Pre-activity survey for cultural constraints (more significant impact for UG options); UG options include additional cost for easements, soil conditions, & expected bio risk.



Key Questions		Outcome		
PPSP	Is this an area that is impacted directly by PPS (>8 Frequency or >1,200 Cust Impact)?	Y	N	9 events, UG Preferred
	Are there any critical customers within zone necessary to protect?	Y	N	
	Is OH hardening an acceptable mitigation using distribution line exclusion?	Y	N	
PSS	Is the area being considered for HFRA Add/Remove?	Y	N	HWY 70, UG preferred
	Ingress/Egress concerns identified by PSS professionals cannot be mitigated by utilizing intumescent wrapped or composite poles.	Y	N	
Tree Strike	Moderate (6-14) or high (15+) strike tree potential areas in the segment.	Y	N	
FSD	Are there any significant dependency or constructability limitations in the areas of impact? (Threshold: 2+ year incremental delay)	Y	N	
	Does the CPZ meet ECOP threshold (>25% structures warrant replacement) and result in a more timely mitigation method preferred (e.g., OH)?	Y	N	
EASOP	If alternatives fall within a 100% range, is there additional benefit to choosing an alternative that is not the top ranked RSE?	Y	N	PPSP and Ingress/Egress

CONFIDENTIAL

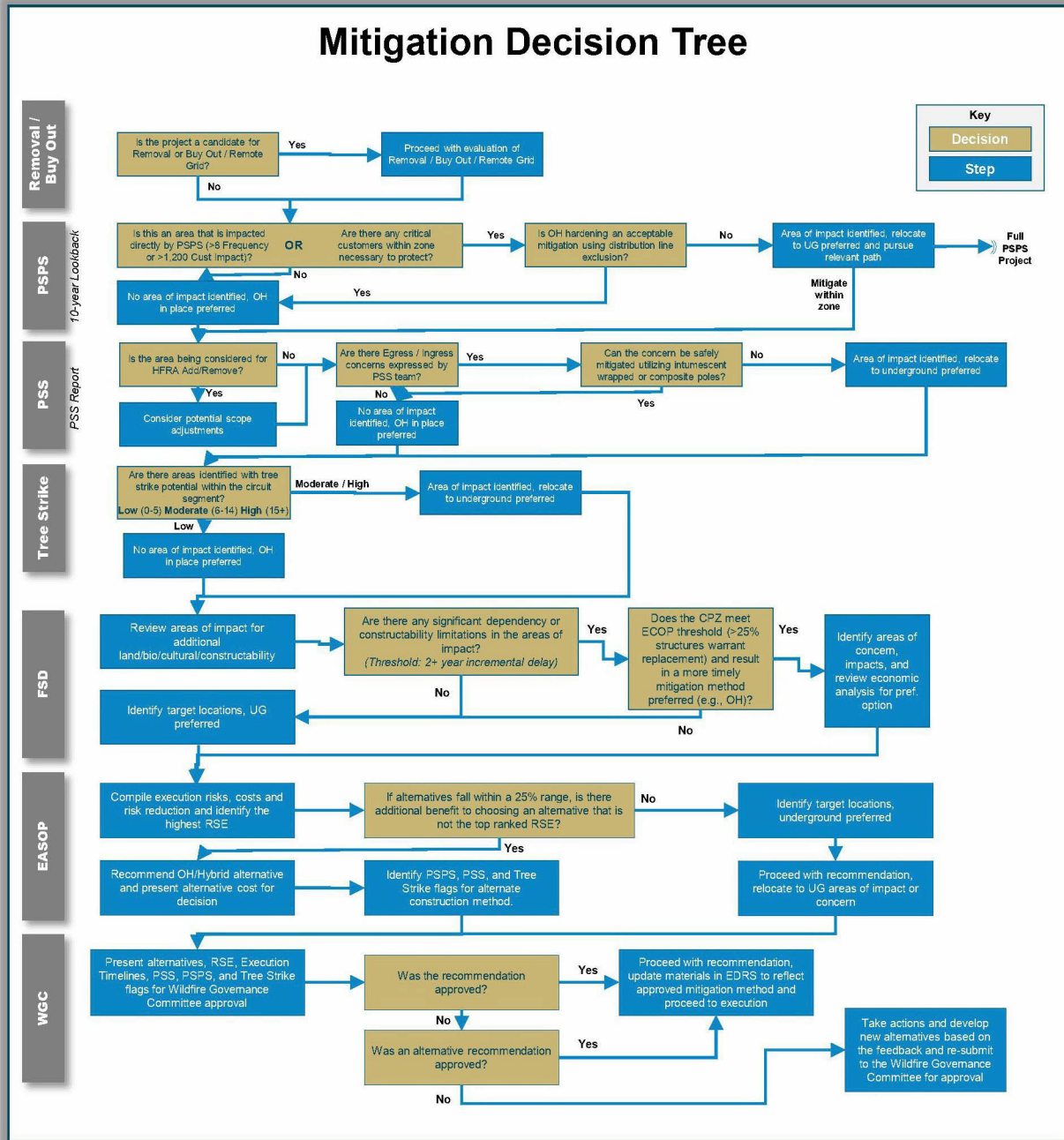
Hybrid 1 Preferred

INFORM: CWSP Top 50 - PM [REDACTED] – Bucks Creek 1101 CB

Bucks Creek 1101 (4.73 miles)		No System Hardening	Overhead Hardening	Hybrid 1	Hybrid 2
Project Scope Risk Reduced After Mitigation		-	4.73	9.14	8.95
Project Scope Residual Risk Value		9.55	3.63	0.41	0.61
Overall Miles Installed		4.73 Existing OH	4.73	5.42	4.73
OH System Hardening Cost	[REDACTED]/risk-mile	-	[REDACTED]		
UG System Hardening Cost	[REDACTED]/risk-mile	-			
Line Removal Cost	[REDACTED]/risk-mile	-			
Total Capital Cost (AACE Class 5)					
Average O&M Cost (per year)					
NPV @ 6.8% discount rate					
Primary Filter	\$ NPV per unit of risk (RSE)	-			
	PSS Preference (Ingress/egress/fire history)	-	Non-satisfactory	Preferred	Non-satisfactory
Secondary Filter	Strike Tree Potential	Moderate Fall-In Risk	Low Fall-In Tree Risk	Low Fall-In Tree Risk	Low Fall-In Tree Risk
	Ingress / Egress	Moderate	Non-satisfactory	Preferred	Non-satisfactory
	PSPS Mitigation (5 customers)	45 / 45 (0%)	45 / 45 (0%)	45 / 45 (0%)	45 / 45 (0%)
	Execution timeline (2021, 2022, 2022+)	-	2021	2022+	2022+
	Other (Operational Considerations, etc.)	-	-	-	-
			Recommended		

Supporting Detail for Recommended Alternative (EDRS Link [2021-03744](#)):

- **Public Safety Specialist:** Fuel types are consistent with moderate to heavy brush and mixed conifer, however the general area has been heavily fire scared and the fire scar areas are intermixed with a significant amount of standing and down dead fuel.
- **Strike Tree Potential:** 105 total strike potential trees in the CPZ, Moderate (6-15) tree strike potential.
- **Egress Considerations:** This project crosses HWY 70 near the Bucks Creek Powerhouse and then parallels the highway for a roughly 2-mile stretch, and then runs along Storrie Rd. paralleling the Feather River on the canyon opposite side of Highway 70. HWY 70 is a main thoroughfare for ingress/egress for emergency responders and to the few residents who live in that direct area; it is also a major route for commerce both by vehicle and railroad. If Highway 70 was closed in this area it would make ingress and egress difficult if not impossible for responders and citizens and economically be a substantial hit to commerce. There are no alternative routes within the Feather River Canyon.
- **PSPS Mitigation:** No mitigation potential due to limited scope of this hardening project; no critical / essential customers in this segment. Cannot achieve PSPS reduction due to required overhead conductor over the water crossing near the substation.
- **Execution Timeline (Land/Bio/Cultural/Constructability):** Work required during the dry season (May 15 – Oct 15) and/or biomonitoring, and potential Heli restrictions (Feb 2 – July 15) due to owl activity centers. CALTRANS ROW, easement restrictions, and 1 culturally sensitive areas in Hybrid 1. Butte work further down HWY 70 is under-grounding line consistent with the Hybrid 1 alternative.



Key Questions		Outcome	
PSPS	Is this an area that is impacted directly by PSPS (>8 Frequency or >1,200 Cust Impact)?	Y	N
	Are there any critical customers within zone necessary to protect?	Y	N
	Is OH hardening an acceptable mitigation using distribution line exclusion?	Y	N
PSS	Is the area being considered for HFRA Add/Remove?	Y	N
	Ingress/Egress concerns identified by PSS professionals cannot be mitigated by utilizing intumescent wrapped or composite poles.	Y	N
Tree Strike	Moderate (6-14) or high (15+) strike tree potential areas in the segment.	Y	N
FSD	Are there any significant dependency or constructability limitations in the areas of impact? (Threshold: 2+ year incremental delay)	Y	N
	Does the CPZ meet ECOP threshold (>25% structures warrant replacement) and result in a more timely mitigation method preferred (e.g., OH)?	Y	N
EASOP	If alternatives fall within a 100% range, is there additional benefit to choosing an alternative that is not the top ranked RSE?	Y	N
CONFIDENTIAL		OH Preferred	

INFORM: CWSP TOP 250 - PM [REDACTED] – Volta 1101 LR 49742

Volta 1101 (3.55 miles)		No System Hardening	Overhead Hardening	Under-grounding	Hybrid
Project Scope Risk Reduced After Mitigation		-	8.06	12.87	10.79
Project Scope Residual Risk Value		13	4.94	0.13	2.21
Overall Miles Installed		3.55 Existing OH	3.55	6.66	5.29
OH System Hardening Cost	[REDACTED]/risk-mile	-	[REDACTED]	[REDACTED]	[REDACTED]
UG System Hardening Cost	[REDACTED]/risk-mile	-			
Line Removal Cost	-	-			
Total Capital Cost (AACE Class 5)					
Average O&M Cost (per year)					
NPV @ 6.8% discount rate					
Primary Filter					
\$ NPV per unit of risk (RSE)		-			
PSS Preference (Ingress/egress/fire history)		-	Satisfactory		
Secondary Filter					
Strike Tree Potential		Low Fall-In Risk	Low Fall-In Risk	N/A	Low Fall-In Risk
Ingress / Egress		LOW	Satisfactory	Satisfactory	Satisfactory
PSPS Mitigation (19 customers)		38 / 38 (0%)	38 / 38 (0%)	38 / 38 (0%)	38 / 38 (0%)
Execution timeline (2021, 2022, 2022+)		-	2021	2022+	2022+
Other (Operational Considerations, etc.)		-	-	-	-
			Recommended		

Supporting Detail for Recommended Alternative (EDRS Link [2021-03779](#)):

- **Public Safety Specialist:** Fuel types are consistent with mainly grass/oak woodland, brush, and intermixed patches of conifers/Gray Pints. Area has a significant fire history but not directly in the project footprint but shows the ability of the area fuels to resist containment and become a major fire.
- **Strike Tree Potential:** 2 total strike potential trees in the CPZ, LOW (0-5) tree strike potential in this segment does not suggest UG hardening is required. Tx under-build for most of job.
- **Egress Considerations:** Evacuees have multiple ways out of the area, depending on the location of the fire. 1st responders will have 2 access roads.
- **PSPS Mitigation:** No mitigation potential due to limited scope of this hardening project; no critical / essential customers in this segment. To achieve PSPS reductions, additional scope would have to be included. 2 PSPS operations in 10-year lookback.
- **Execution Timeline (Land/Bio/Cultural/Constructability):** Work required during the dry season (May 15 – Oct 15) and/or biomonitoring. Mitigation expenses should be considered for ground disturbance. Potential permitting for multiple waterways. Tribal monitoring may be required. Cultural resources work and reporting may need be required, 1-2 days of SME time.

VEGETATION MANAGEMENT REVIEW

Distribution Routine VM

Description of Program



- Programs require clearances of 4 feet around power lines in HFTDs with recommended minimum clearances of 12 feet or more at the time of prune to ensure compliance year-round
- Program is funded at ████████ of expenses

How Program is Targeted



- Full system annual patrol, which includes identification of dead & dying facility protect trees (1st Patrol - CEMA) and trees that require accelerated mitigation before scheduled trim cycle (Priority Tags)
- The annual tree work funding is informed by forecasts of next year tree work and by Priority Tag rates

Program Targets



- Target Mileage: ~80k total project miles (100% Project Miles completed through the VMBA program patrols)
- Target Tree Units: 1,491,625 units (VMBA program tree work unit count)

Current Timeline



- Pre-inspection work is scheduled for 100% completion by patrols by 11/15/21, with a commitment target of the end of 2021
- Planned Tree work is scheduled for completion by 12/31/2021. A concurrent commitment is to maintain timeliness of accelerated tree work – Priority 1 Tag – next day from inspection and Priority 2 Tag – within 30 days from inspection (excluding external constraints)

Risks & Concerns Related to the Program



Weather, environmental conditions, fire season and PG&E's corresponding response i.e., PSPS Events, Safety Shutdowns



Increased Compliance Burden e.g., wood management scope, PSPS Tag work completion



Defined Scope Implementation & Potential for Change Order Requests

CEMA (Drought and Tree Mortality Work VM)

Description of Program

- Program mitigates dead and dying trees that may impact PG&E facilities
- Program is funded at [redacted] of incremental expenses

How Program is Targeted

- Patrols: 100% Mid-Cycle of Tier 2/Tier 3 HFTD areas mitigating to identify dead/dying trees, generally six months after Routine patrols
- Tree Work: Planned work volume of dead and dying trees identified on Routine (1st Patrol) and Mid-Cycle to be completed in calendar year based upon annual estimates


Program Targets


- Target Mileage: 43,664 miles through Mid-Cycle patrols
- Target Tree Volume: 65,000 tree units

Current Timeline

- Mid-Cycle Patrols which started 11/15/2020, are scheduled to be complete by 11/15/2021
- The 2021 operational focus is shifting to 180/360 day completion timelines for work in Tier 2 and 3 / Tier 1, respectively. Previously, VM targeted completion of all work identified through 9/30 by end of year

Risks & Concerns Related to the Program

 Tree inspection volume is subject to external factors – drought, climate change, and path of beetle infestation. No mitigation is available aside from monitoring inspection progress and incidence rate

 Maintaining spacing of Mid-Cycle Patrols from Routine Patrols to avoid program overlap / insufficient spacing. Patrols are scheduled generally 6 months apart. This can be mitigated by change control of initial Routine Patrol plan which will review Mid-Cycle timing

Description of Program



- Transmission VM has 4 primary programs:
 - (1) Routine Clearance Maintenance
 - (2) Existing ROW Management (Integrated Vegetation Management (IVM))
 - (3) ROW Expansion, including PSPS projects
 - (4) Orchard Tree Removal
- Program is funded at a 90/10 ratio between capital and expense. The total funding is ██████████ for the CBP Plan/RES Plan

How Program is Targeted



- (1) Routine Clearance Maintenance targets 100% of Transmission system annually
- (2) IVM is scope-driven from IP annual planning
- (3) ROW Expansion is scope-driven from IP annual planning
- (4) Orchard tree removal has remaining scope of 10-year full system abatement program

Program Targets



- Target Routine Clearance Maintenance: ~100k trees
- Target IVM: ~10k acres
- Target ROW Expansion (includes PSPS): ~310k trees
- Target Orchard Removal: ~8k trees


Current Timeline




- Routine Clearance Maintenance is scheduled for completion by 11/15/2021, all other patrols support tree work completion in 2021
- All identified tree work on NERC lines, ~20% of annual Routine tree work volume, must be completed in calendar year under NERC requirements. Remaining 80% and other program's planned tree work volume are targeted for completion in 2021

Risks & Concerns Related to the Program



 External factors, including weather and contractor safety performance, can delay tree work progress

 Pending regulatory decision regarding capital funding of ROW expansion activities is a potential risk. If unsuccessful, it may materially increase demand for currently funded expense amounts

EVM – Utility Defensible Space (UDS)

Description of Program



- UDS is defined as creating an area around PG&E electrical facilities that, in an event of a wire-down scenario, would reduce the likelihood of an ignition and/or spread of a fire
- [REDACTED] will be managed as a part of the program

How Program is Targeted



- The program will leverage the 2021 Wildfire Distribution Risk Model developed by the Asset Strategy team to identify high risk CPZs to prioritize projects for performing modification of vegetative fuels
- Any projects identified outside the Model will be locations based on a combination of local knowledge and a cohesive strategy to work with Cal Fire, USFS, and Municipalities on wildfire prevention initiatives

Program Targets



- The process of building the framework for UDS is currently ongoing so no targets or metrics have been created for this program at this time. Targets and metrics will most likely be based off funding in 2021

Current Timeline



- PG&E is actively exploring fuel management in more detail to represent its risk reduction benefits and effectiveness. Since this is a new program, PG&E continues to explore ways to provide an estimation of RSE. As PG&E will be one of the first utility companies developing an official fuel reduction program, we believe incoming data will help identify preliminary effectiveness, cost estimations and help drive a schedule, and cycle time.

Risks & Concerns Related to the Program



Environmental planning and permitting to allow for execution of work, since scope can be beyond PG&E's land rights



Obtaining approvals from private property owners to allow for the incremental work outside of PG&E's compliance programs, such as Routine VM and EVM

EVM – Wood Management

Description of Program

- Program safely disposes of wood from drought-impacted dead trees at no cost to PG&E customers
- Program is available to property owners located within counties where emergencies were declared due to drought and bark beetle infestation
- Funding is ██████ for 2021 for all programs (92% of funding coming from EVM)

How Program is Targeted

- Wood Management is offered in EVM program as an incentive to allow PG&E to perform their work
- Other programs are offered on a case-by-case basis to assist customers with defensible space
- That's the programmatic WM. The Wildfire piece is a net zero program outside of the administrative costs


Program Targets

- Target Mileage: 1,890 miles (same as for the overall EVM program in 2021)

Current Timeline

- Timeline of program is the same as for the overall EVM program

Risks & Concerns Related to the Program

 Due to the 2020 wildfires, wood and woody debris is being generated by agencies beyond PG&E. Some co-generation facilities with Power Purchase Agreements are currently unable to accept the overwhelming amounts of wood and woody debris generated by all entities in working in HFTDs

ACTION ITEM REVIEW

Risk Models – Open Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Target Resolution Date	Resolution Date
Risk Models	Model process documentation	Bring the Model Process Level Documentation to this forum for an official approval		In progress	2/5/2021	

System Hardening – Open Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Target Resolution Date	Resolution Date
System Hardening	Open Tags	Follow up with open tag issue		In progress	2/5/2021	
System Hardening	Total Cost of Ownership For Mitigations	Do a deep dive into the Total Cost of Ownership Calculations for the SH Mitigations – Hold a separate review with SH team and Operational Observer		In Progress	2/5/2021	
System Hardening	Follow up meetings on execution plan for SH	Coordinate follow up meeting on execution plan for SH		In Progress	2/12/2021	

Overhead Inspections – Open Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Target Resolution Date	Resolution Date
Overhead Inspections	Structure count	Number of structures in Tier 3, Tier 2 and HFRA		Completed	2/5/2021	
Overhead Inspections	Lessons Learned	Review and understand lessons learned from the 2019 and 2020 Tier 3 and Tier 2 Inspections that have been completed.		In Progress	2/5/2021	
Overhead Inspections	Rate of Degradation Trends	Utilize the data-mining platforms available at PG&E (Palantir) to understand the rate of degradation of the assets in the different climatic or other appropriate zones. Need location-specific degradation		In Progress	2/12/2021	
Overhead Inspections	Structures below 500KV	What is the volume of structures below 500KV that are similar in design to the 500KV structures - we are climbing 500KV structures to inspect guy wire tensioning		In Progress	2/5/2021	
Overhead Inspections	Pilots being done in inspection	Summary slide on all the pilot projects		In Progress	2/5/2021	
Overhead Inspections	Transmission Probability of Failure Model	Evaluate the outputs of Transmission Probability of Failure model and potential impacts to additional structures incorporated into 2021 plan		In Progress	2/5/2021	

Enhanced Vegetation Management – Open Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Target Resolution Date	Resolution Date
Enhanced Vegetation Management	Replace miles from PSS recommendation	Miles that were removed via PSS recommendations need to be replaced with new miles from EVM recommendations		In progress	2/12/2021	

PSPS– Open Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Target Resolution Date	Resolution Date
PSPS	2020 PSPS Event – Locations where vegetation or debris came into contact with Electrical Assets	Understand the degree of asset damage from vegetation or other debris that came into contact with distribution assets during the 5 PSPS events in 2020.		Completed	1/19/2021	1/19/2021
PSPS	Distribution PSPS Ranking	Rank PSPS projects based off of customer types (e.g., customer criticality)		In Progress	2/12/2021	
PSPS	PSPS Mitigation Strategy	Need to develop overall PSPS mitigation strategy (e.g. temporary generation, commit to improvement in percentage)		In Progress	2/12/2021	
PSPS	Incorporation of open vegetation tags in PSPS strategy	Need to state how open vegetation tags will be incorporated in PSPS strategy. Additionally, need to state how E&F tag repair work will inform any PSPS decisions		In Progress	2/12/2021	
PSPS	PSPS Mitigation Strategy	Need to establish target thresholds for 2021 that account for 2021 weather expectations and determine appropriate communication strategy for these thresholds		In Progress	2/12/2021	

Fire Ignition Component Program – Open Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Target Resolution Date	Resolution Date
Fire Ignition Component Program	Formulization and Scope	Formulize the fire ignition component program and outline the scope		In Progress	1/29/2021	1/29/2021

Anticipated close date of today

2021 Wildfire Mitigation Plan – Open Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Target Resolution Date	Resolution Date
2021 wildfire mitigation plan	HFRA incorporation in inspection plan	Inspections needs to explicitly state HFRA incorporation in inspection plan		In Progress	2/5/2021	
2021 wildfire mitigation plan	Volume of inspections to be completed by 9/1	Inspections needs to explicitly state the volume of inspections to be completed by 9/1		In Progress	2/5/2021	
2021 wildfire mitigation plan	Include candid areas where PG&E did not meet expectations in WMP	Include in Executive summary Candid areas where PG&E did not meet expectations in WMP. For example, Veg work not risk based prioritized, gaps on systems inspections, and gaps in quality of veg management		In Progress	2/5/2021	
2021 wildfire mitigation plan	Fire risk replacement components Program	Frame up Fire Risk Replacement Components Program in to WMP		In Progress	2/5/2021	
2021 wildfire mitigation plan	Comparison of original SH program with current SH program	Imbed comparison of original SH program with current SH program and explicitly explain the reduction in miles to 180 miles		In Progress	2/5/2021	

APPENDIX