2021 Wildfire Mitigation Plan Workshop

February 23, 2021

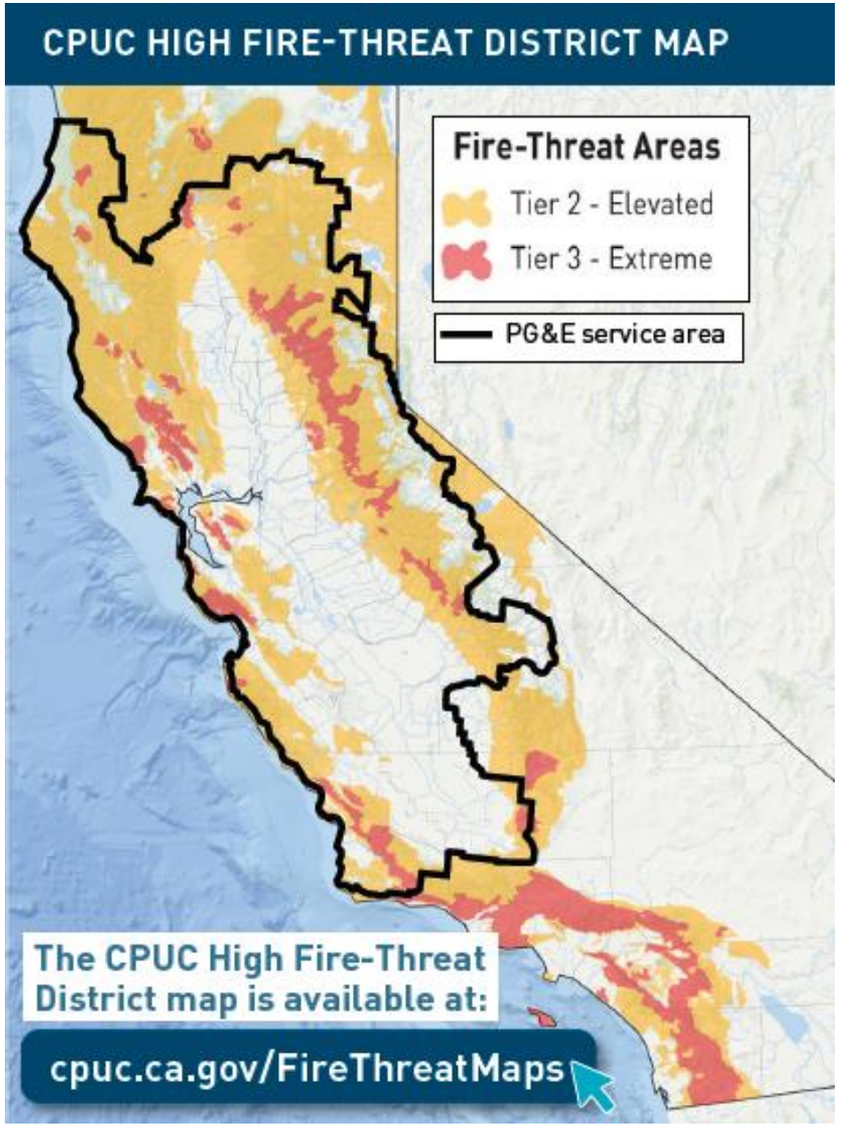
Grid Design and System Hardening

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Wildfire Risk Across PG&E's Service Territory

Wildfire Risk Across PG&E's Service Area	PG&E SYSTEMWIDE	HIGH FIRE-THREAT DISTRICTS
Electric customers served	5.5M	505,600
Overhead distribution line miles	81,000	25,500
Overhead transmission line miles	18,200	5,500

- Over half of PG&E's service territory lies in the High Fire Threat Districts (HFTD) Tiers 2 and 3
- Nearly one-third of the electric lines that provide power to our customers are now located in HFTD areas
- High temperatures, extreme dryness, and record-high winds have increased fire risks across the areas that PG&E serves
- 2020 was another unprecedented wildfire season with five of the six largest wildfires in California's history occurring in 2020, all in PG&E's service territory



Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.

Wildfires have become more frequent and destructive in PG&E's service territory

Situation

Catastrophic wildland fires are a major threat throughout PG&E's service territory and represent a significant risk to the safety of our customers and the communities we serve

PG&E's electrical equipment has been the ignition source for a number of these fires and a multi-pronged approach has been developed to reduce the wildfire risk

Complication

The frequency and severity of catastrophic fire events have increased dramatically over the last 10 years

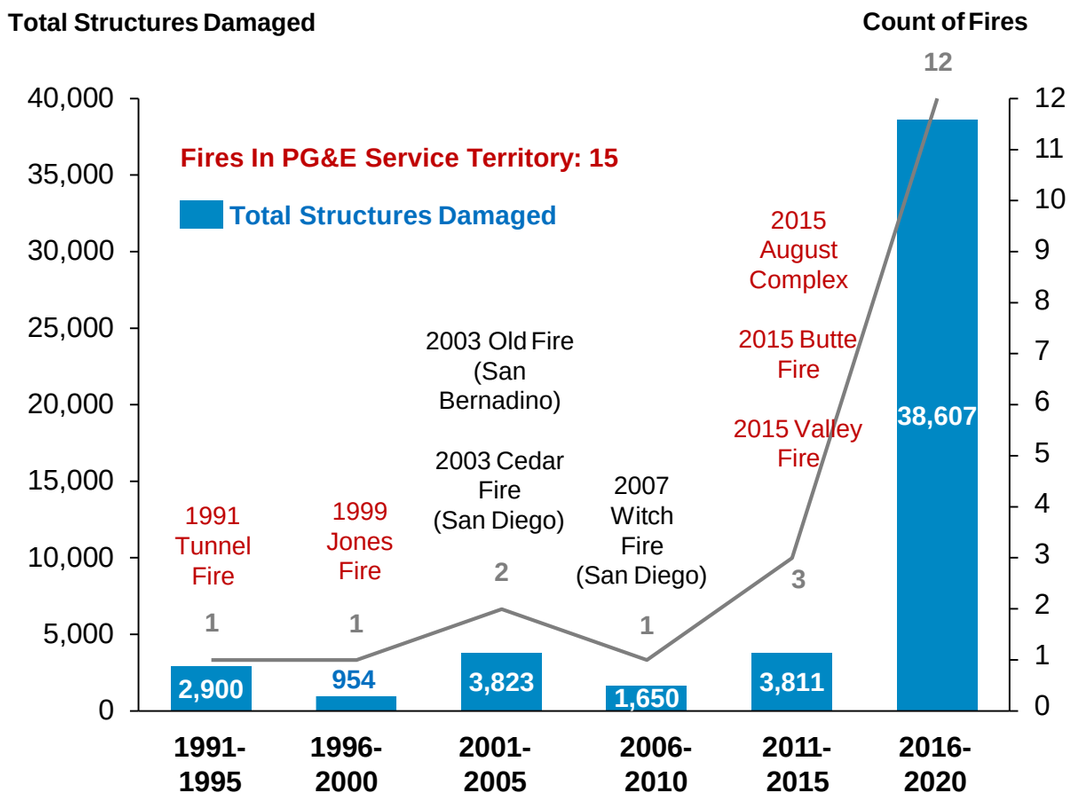
- PG&E's service territory classified as HFTD has grown from ~15% to over 50% from 2012 to 2018, which now includes nearly a quarter[1] of PG&E's electric T&D system in HFTDs

PG&E is focused on ensuring its risk assessment and operational work targets reducing wildfire risk as aggressively as possible

Objective

- Quick summary of the Risk Model Improvements
- Outline how the improved wildfire risk models shaped the 2021 work plan for System Hardening

California's 20 Most Destructive Fires[2]



2016 – 2020 Fires
2017 Tubbs Fire
2017 Nuns Fire
2017 Thomas Fire
2017 Atlas Fire
2018 Camp Fire
2018 Woolsey Fire
2018 Carr Fire
2020 Glass Fire
2020 LNU Lightning Complex
2020 CZU Complex
2020 North Complex
2020 Creek Fire

1. PG&E's total electric T&D system includes ~125,000 miles
2. https://www.fire.ca.gov/media/11417/top20_destruction.pdf

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2021 Wildfire Distribution Risk Model resulted in a material adjustment of the risk buydown curve requiring a scope refresh for 2021 System Hardening plans

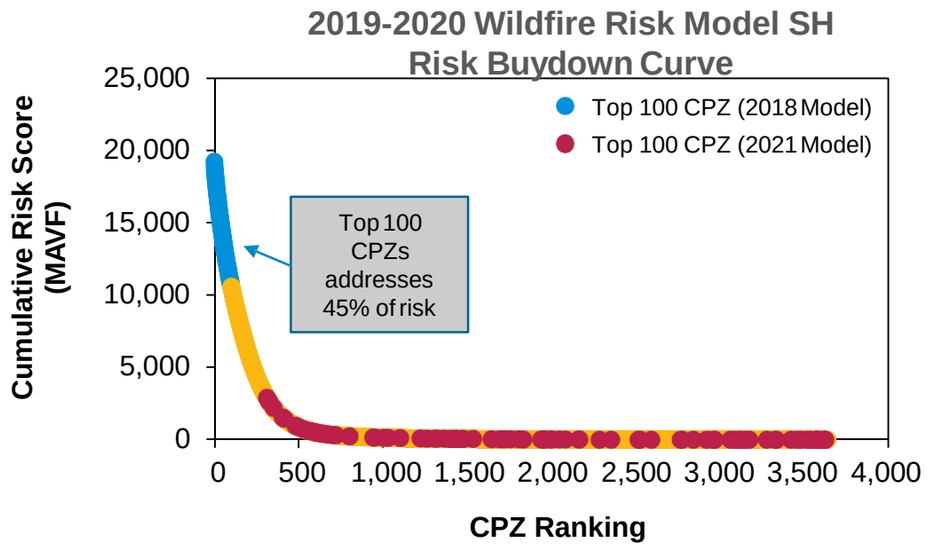
Updates to Risk Model

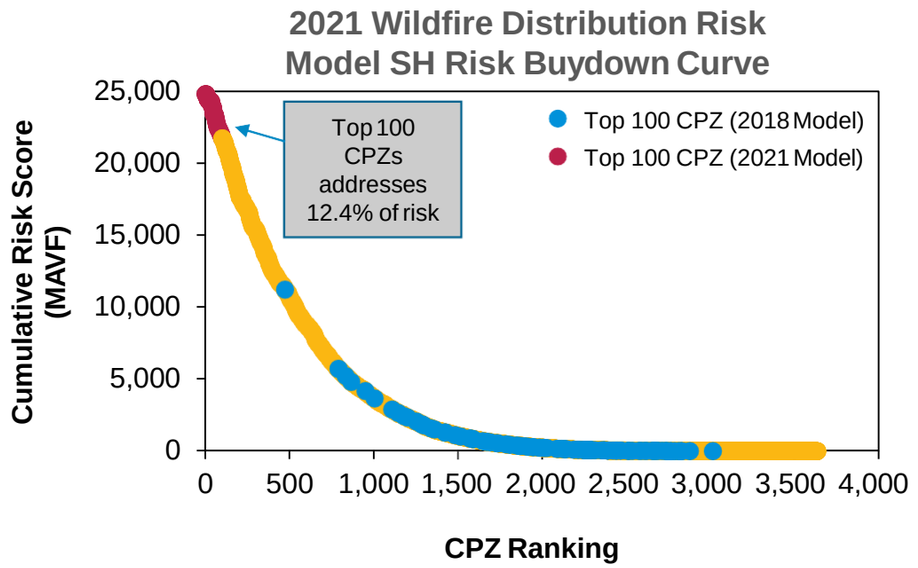
Three enhancements to components of the wildfire risk model, which were adopted individually or in tandem (2021 WMP, Section 4.5.1(b))

1. **Replacing the regression vegetation ignition likelihood with the 2021 machine learning vegetation ignition probability**
2. **Replacing the regression equipment ignition likelihood with the 2021 machine learning equipment ignition probability**
3. **Replacing the Reax consequence values with the 2020 Technosylva consequence values**

Main Improvements:

- Risk available in absolute values in 100m squares and values are now additive
- Increased model accuracy and efficacy
- Addresses “overfit” concerns
- Highlights importance of fast burning fuels
- Up to date prediction of fire behavior





Key Takeaways

- No CPZs in the top 100 overlap between the 2018 and 2021 approved model
- This resulted in significant change to the prioritization and expected risk buydown of mitigations
- The 2018 risk results were not distance weighted, where the 2021 prioritization included a distance factor.

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System Hardening is shifting to a more risk informed execution strategy; encompassing risk exposure and risk profile

System Hardening

Workplan Summary

- The 2021 Wildfire Distribution Risk Model was used to prioritize program efforts for the updated 2021 WMP (see 2021 WMP, pp. 9-10)
- System hardening miles prioritized based on risk buydown curve from the 2021 Wildfire Distribution Risk Model
- Hardening alternatives evaluated based on Risk Spend Efficiency (RSE), Ingress/Egress information, strike tree potential data, PSPS benefits, EC tags and time frame to execute

2021 Plan Miles	Risk Reduced
180	**198**

2021-2023 Plan (2021 WMP, Section 7.3.3.17.1)

Risk Exposure

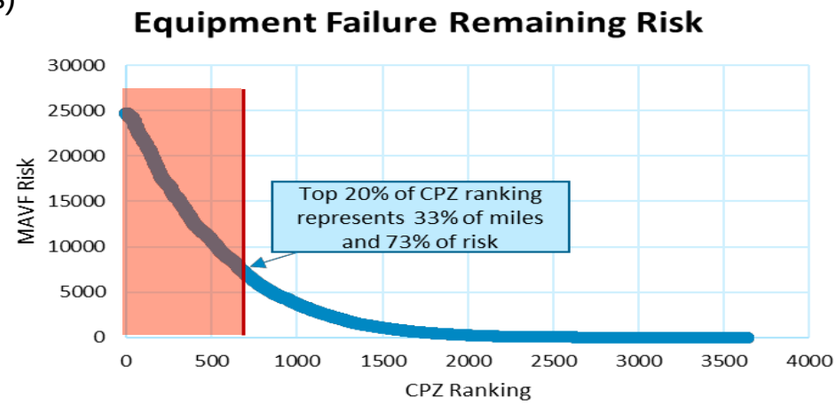
- Count of circuit miles system hardened in the HFTD and HFRA: Pace of ~450 – 500 miles per year for 2022 and beyond

Risk Profile

- 80% of system hardening miles have to be highest-risk miles based on the 2021 Wildfire Distribution Risk Model
- Highest risk miles include: 1) Top 20% of the risk buydown curve, 2) Fire rebuild and, 3) PSPS mitigation miles

Risk Effectiveness

- Prioritizes higher risk reduction mitigation options (Undergrounding and Line removals)



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The new plan approved by PG&E's Wildfire Risk Governance Committee effectively targets the highest risk miles, but has limitations on the executable miles for 2021

Category		2021 Plan (Miles) [1]	Notes
A	"In-flight" Projects	81	**"In-flight" Projects** represent projects which **already had authorization approval with approved mitigation methods**. These projects are more likely to be executed in 2021 due to their advanced start in the scoping and planning process.
B	New Projects	99	**New Projects** represent those projects which have **not yet had mitigation methods approved by the WFRG**. These projects may have a greater lead time for scope, and thus we expect fewer miles to be completed during 2021; reflected in the discount rates.
Totals		180	

Note: (1) Discount rates applied to reflect executability challenges in 2021

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Significantly more projects / miles need to be started to achieve a steady state between ~450 to ~500 miles per year

	Project Phase					
Work Readiness Funnel	**Scoping**	**Estimating**	**Dependency Clearing**	**Construction**	**Close-out**	**Totals**
Miles	447.3	2.9	29.4	42.1	-	**521.7**
Projects	114	3	9	26	-	**152**
Time in phase (Months – est.)	*3*	*2*	*4*	*3-4*	*2-4*	***14-17***

Where possible, projects in the work readiness pipeline are targeted for execution in 2021. However, some may be executed in subsequent years due to their phase maturity or mitigation selected.

Some projects can be scoped in time for 2021 execution

2021 Target

180 Miles

Projects which will not be scoped in time or the mitigation selected necessitates additional time

2022 Target

450-500 Miles

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2021 mileage limitations are driven by both internal and external factors, which enables us to efficiently and safely take system hardening projects through planning to execution

Although the new 2021 work plan will result in more risk reduction than the previous plan, there will be significantly fewer miles hardened due the lead time required to go through permitting and dependency clearing processes.

1 Permitting Cycle Times

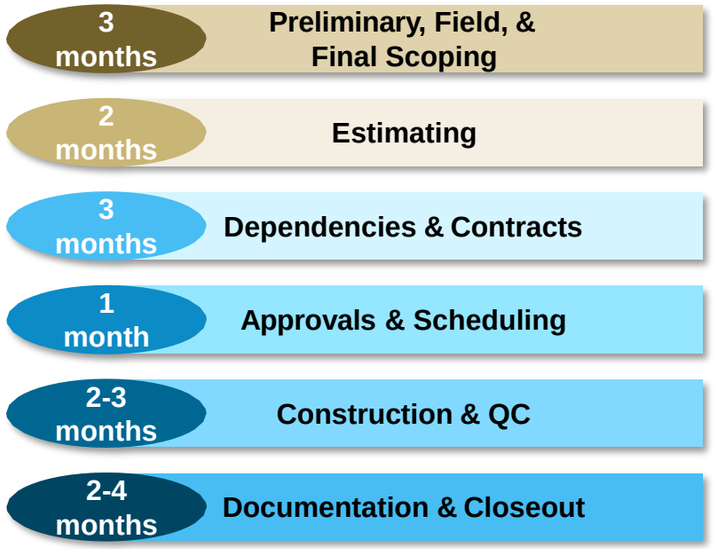
Both county and Cal Trans permitting take a significant amount of time. Further, the average number of days to receive a Cal Trans permit doubled from 2019 to 2020.

Average County WSHP Encroachment Permit Cycle Time (2019-2020) — **50 days**

Average Cal Trans Permit Cycle Time (2019-2020) — **56 days**

2 Internal Project Scoping Process

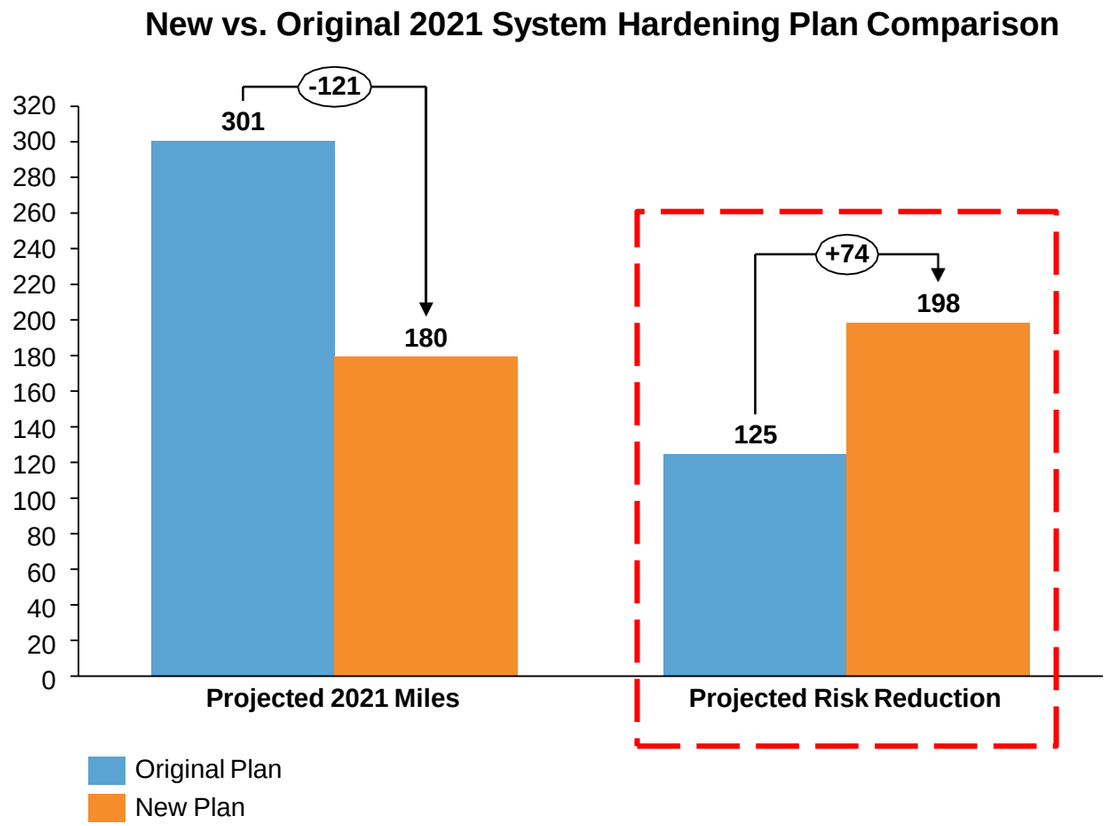
The processes in place to execute a system hardening project take around 13-16 months to complete. The recent change in work plan does not allow enough lead time to add additional miles to the 2021 work plan.



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The newly proposed system hardening plan more effectively addresses risk than the originally proposed plan

Although the new 2021 System Hardening plan includes **121 fewer miles**, it reduces risk by an additional **74 risk units**



Key Takeaways

- The new system hardening plan is 40% fewer projected miles than the originally proposed 2021 plan.
- The total amount of risk being addressed by the plan is ~60% greater than the amount in the original plan.
- The risk per mile of the newly approved plan is ~2.5X greater than the original plan.
- No discounts applied to the original plan mileage due to the work readiness of the original portfolio.

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Appendix

Approved 2021 System Hardening Plan

				Condition 1 (80% of system hardening miles have to be highest-risk miles over the three-year period)	Condition 2 (Minimum percentage of miles mitigated with either Line Removal or Undergrounding over the three-year period)
				Meets Condition 1	Meets Condition 2
Scoped - Approved	**Total Miles**	**Discount Rate[1]**	**2021 Plan Miles**		
Fire Rebuild	29.5		29.5	29.5	24.6
In-Construction	39.8		39.8	5.11	-
Subtotal	***69.3***		***69.3***	***34.6***	***24.6***
Not Scoped - Approved					
Line Removal	31.5	10%	28.3	28.3	28.3
Highest Risk 250 Miles - Top 50	50	50%	25	25	-
Top 20% MAVF	41.3	50%	20.7	20.7	-
ECOP Projects In Estimating - In Top 20%	49.0	50%	24.5	24.5	10
Subtotal	***171.8***		***98.5***	***98.5***	***38.3***
Scoped - Not Yet Approved					
PSPS Mitigation	3.6	98%	0.1	0.1	0.1
ECOP Projects In Estimating - Not Top 20%	6.9	50%	3.5	-	-
Remote Grid	5.7	50%	2.8	1.4	2.8
DSDD	5.0		5	-	-
Subtotal	***21.2***		***11.3***	***2.9***	***2.9***
Not Scoped - Not Yet Approved					
PSPS Mitigation	12.5	98%	0.25	0.25	0.25
Subtotal	***12.5***		***0.25***	**0.25**	**0.25**
Total					
Total - By Category	**274.8**		**179.4**	**136.25**	**66.05**
			Percent of Plan	**76%**	**37%**

Note: (1) Discount rates applied based on the likelihood of completing work in 2021 due to executability issues

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