

SVP / VP Reviewer: [REDACTED]	Date: 11/25/2020	<input type="checkbox"/> Action Requested
Law Reviewer: [REDACTED]	Date: 11/25/2020	<input checked="" type="checkbox"/> Information Only

12/2 CSO Team edits

## Wildfire Risk Model Improvements

### Full Board

December 10, 2020

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

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

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## Topic Summary

### Item Overview

- **Purpose of Presentation:** To provide an overview of the Wildfire Risk Model Improvements
- **Why:** System Hardening and Enhanced Vegetation Management (EVM) are two key wildfire risk reduction programs focused on ~25,000 electric distribution circuit miles in High Fire Threat Districts (HFTD). Wildfire Risk Models inform the highest risk miles and the 2021 - 2023 LTIP Public Safety metrics.
- **Proposed Board / Committee Action:** None

### Key Takeaways

- Wildfire Risk Models now incorporate the CPUC-approved risk framework of "Likelihood of a risk event" (LoRE) combined with "Consequence of the risk event" (CoRE)
- The models have continued to evolve with the use of advanced machine learning methods for predicting ignitions and improving fire spread simulations for determining consequence
- Improvements to risk models resulted in a significant shift in the risk ranking of the circuit segments, or circuit protection zones (CPZ) across HFTDs
- Enhanced risk models for Vegetation and Equipment coupled with subject matter expertise from PG&E's Public Safety Specialists with significant fire science and behavior experience, inform the 2021 workplan for wildfire risk reduction efforts

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## 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.

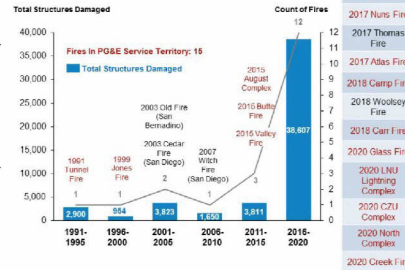
- PG&E's service territory classified as HFTD has grown from ~15% to over 50% from 2012 to 2018, which now includes nearly a quarter<sup>1</sup> of PG&E's electric T&D system in HFTDs.

PG&E continues to improve its risk modeling to identify areas of highest consequence and potential for fire ignitions.

### Objective

- Outline our process for assessing risk.
- Share the evolution of PG&E's risk modeling efforts to identify the highest potential wildfire risk areas within PG&E's service territory.
- Share where risk modeling has been operationalized for informing risk reduction activities.

California's 20 Most Destructive Fires<sup>2</sup>



<sup>1</sup> PG&E's total electric T&D system includes ~125,000 miles.  
<sup>2</sup> <https://www.fire.ca.gov/news/1437/most-destructive-fires>

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The framework to assess wildfire risk includes the likelihood and consequence of a potential ignition event

**LoRE (Likelihood of a Risk Event )**

- LoRE is the relative frequency of a specific risk event occurring
- In the case of **wildfire risk**, this is the relative **likelihood of an ignition occurring**

**CoRE (Consequence of a risk event)**

- CoRE is the average impact of the risk should it materialize across key outcomes (Safety, Reliability, Financial)
- In the case of wildfire risk, **consequence contains serious injuries, fatalities, property damage**, and impacts to reliability

**Risk = LoRE X CoRE**

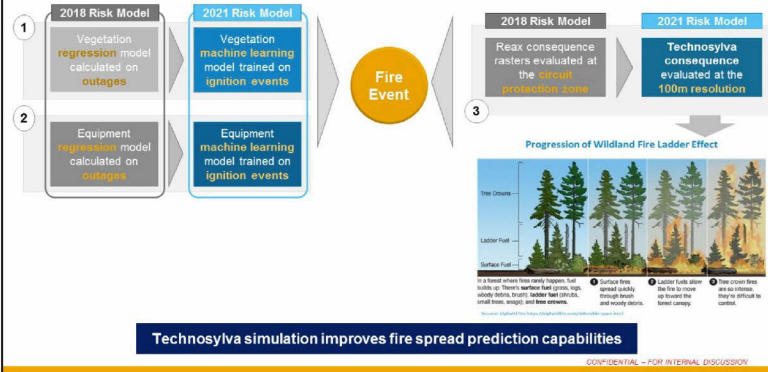
- Risk is the product of the likelihood and consequence of a risk event
- This method produces an expected value of impact across the consequence outcomes, and combined results in a multi-attribute score can inform risk-based decision making

**Methodology**

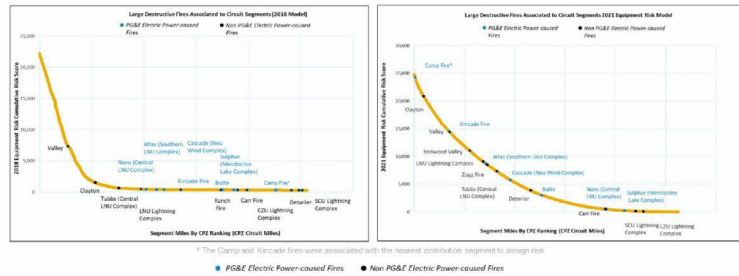


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### Enhancements implemented in 2021 Wildfire Risk Models



### Risk Profile Curve for the 2018 vs. 2021 Equipment Risk Model

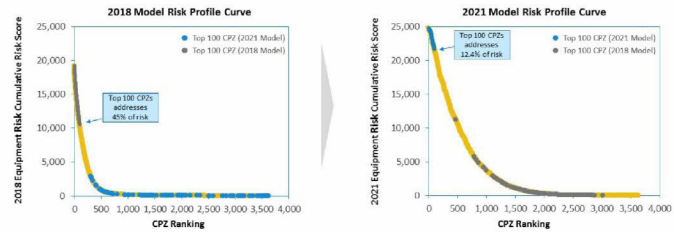


2021 Risk Model improves prediction of large destructive fires

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### Risk models provide risk profile curves to guide workplan

The risk profile curve shows **the amount of risk that can be addressed** with every subsequent mile within a Circuit Section or CPZ that is mitigated. This view illustrates the relative magnitude of risk associated with the top 100 CPZs and the visualization highlights the consolidation of risk by CPZ as you move down the prioritization list.



**The improvement in the Risk Model results in a significant shift in the highest risk circuit protection zones**

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Additional factors inform the 2021 Wildfire Risk Reduction Workplans & Metrics

**Risk Models**

- 2021 Equipment Risk Model
- 2021 Vegetation Risk Model



**Additional Factors**

- LiDAR data on strike potential trees across the 25,000 miles of HFTDs
- Public Safety Specialist expertise regarding fire history by area and the details on specific locations in terms of terrain and egress routes
- Frequency and number of customers impacted by PSPS events in 2019 and 2020



**Workplans & Metrics**

- Enhanced Vegetation Management
- System Hardening
- 2021-2023 Public Safety Metrics

**Risk informed work plans align with public safety metrics**

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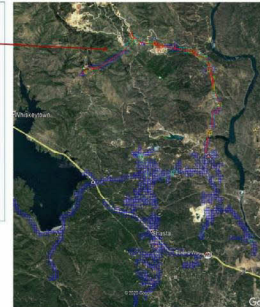
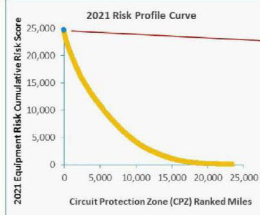
Appendix

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System Hardening Project Example: Keswick [REDACTED] Circuit Protection Zone

**Keswick [REDACTED] Circuit Protection Zone**

- This circuit protection zone is in the top 50 miles in the risk profile curve
- 6.6 Miles in total
- The 100m X 100m squares (blue, yellow and red) on the picture each have a risk score
- The total protection zone absolute risk score is 48.84 risk units (sum of all the 100m grid squares along the circuit)
- Average risk score of all the grid points results in the CPZ mean risk score of 1.25



**Risk model helps triangulate down to the highest risk area within a circuit protection zone**

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Selected list of most destructive fires in the past thirty years

Fire Name	Cause	Date	County	Acres	Structures damaged	Deaths	PG&E Electric Power-caused Flicks?
Tunnel - Oakland Hills	Refridra	Oct-91	Alameda	1603	2900	25	No
Jones	Undetermined	Oct-99	Shasta	25,200	954	1	No
Calder	Human Related	Oct-03	San Diego	27,016	2809	15	No
Old	Human Related	Oct-03	San Bernardino	51,281	1,903	6	No
Wich	Powefiras	Oct-07	San Diego	197,950	1,650	2	No
Valley	Electrical (Pnevo)	Sep-10	Lake, Napa, Sonoma	70,067	1,965	4	No
Butte	Powefiras	Sep-10	Amador, Calaveras	79,868	821	2	Yes
Clayton	Arson	Aug-16	Lake	3,325	300	0	No
Dahlke	Firearm	Jul-11	Mariposa	67,626	121	9	No
Tubbs	Electrical (Pnevo)	Oct-17	Napa and Sonoma	36817	5658	22	No
Nuns	Powefiras	Oct-17	Sonoma	44,382	1,365	3	Yes
Atlas	Powefiras	Oct-17	Napa, Sonoma	47,424	783	6	Yes
Redwood Valley	Powefiras	Oct-17	Medocina	36,523	546	9	Not
Cascade (New Wind Complex)	Powefiras	Oct-17	Yuba	9,365	264	4	Yes
Solano	Powefiras	Oct-17	Lake	2,297	162	0	Yes
Thomas	Powefiras	Oct-17	Ventura, Santa Barbara	281,893	1,963	2	No
Can	Human Related	Jul-18	Shasta County, Trinity	275,851	1,914	8	No
Camp Fire	Powefiras	Nov-18	Butte	1,53336	18604	85	Yes
Woodsay	Under Investigation	Nov-18	Ventura	56,949	1,643	3	No
Rincade	Powefiras	Oct-19	Sonoma	77,758	374	0	Yes
Ranch Fire	Human Related	Nov-19	Trinane	2,534	6	0	No
August Complex	Under Investigation	Aug-20	Medocina, Humboldt, Trinity, Tehama, Glenn, Lake, Colusa	1,632,649	935	1	No
North Complex	Under Investigation	Aug-20	Butte, Plumas, Yuba	3,0035	2,352	15	No
LNU Lightning Complex	Under Investigation	Aug-20	Lake, Napa, Sonoma, Yolo, Solano	353,220	1,491	6	No
CGU Lightning Complex	Under Investigation	Aug-20	Santa Cruz, San Mateo	85,599	1,490	1	No
SCJ Lightning Complex	Under Investigation	Aug-20	Santa Clara, Alameda, Stanislaus	338,654	223	0	No
Glass Fire	Under Investigation	Sep-20	Napa, Sonoma	67,484	1,520	0	No
Creek fire	Under Investigation	Sep-20	Fresno, Madera	377,653	856	0	No

\*Note: Numbers based on fires in relation to the ignition event  
 Yes: Fires caused by PG&E Electric power

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