Public Safety
Long Term Incentive Plan (LTIP)
Target Setting

January 11, 2021

PG&E Together, Building
a Better California

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Evolution of the LTIP metric from units of work completed to amount of risk being reduced

	2020-2022 LTIP Plan	2021-2023 LTIP Plan
System Hardening	• **Risk Exposure** - Count of circuit miles system hardening in High Fire Threat Districts (HFTD) and High Fire Risk Areas (HFRA). Goal was ~1,021 circuit miles over 3 years; 235 miles hardened YTD in 2020 221 (2020), 358 (2021), 442 (2022)	• **Risk Exposure** – Count of circuit miles system hardened in the HFTD and HFRA • **Risk Profile** - 80% of system hardening miles have to be highest-risk miles; 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)

Substation Enablement	• Number of substations out of possible 64 substations that are "energizable" during a Transmission-Level PSPS event
	• 62 high priority substations are now operationally ready within 48 hours (LTIP 3-yr 2.0 target = 50 substations)
		• Replace the Substation Enablement metric for the 2021-2023 LTIP Period with EVM Risk Reduction Public Safety Metric
		• Rational:
		    ▪ 3 Year target has been achieved
		    ▪ Improved weather forecasting capabilities reduces the criticality of number of substations needed to reduce PSPS impact

Enhanced Vegetation Management (EVM)	• No metric was established for EVM	• **Risk Exposure** – Count of EVM miles worked in the HFTD and HFRA • **Risk Profile** - 80% of EVM miles worked in the top 20% of the HFTD's includes Fire impacted areas • **Risk Effectiveness** – Execute work consistent with defined EVM scope

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Why System Hardening and Enhanced Vegetation Management?

System Hardening (SH) and Enhanced Vegetation Management (EVM) focus on mitigation of potential wildfire risk from Distribution Overhead Assets, which have resulted in a significantly higher number of ignitions (nearly 90% of the total CPUC Reportable ignitions from 2015 – 2020 YTD)

- Distribution assets represent high ignition risk due to a combination of high exposure area (overhead assets traversing HFTDs), proximity to risk factors (vegetation), and intrinsic asset characteristics
- SH and EVM mitigation work focus on mitigating these risk factors on Distribution Assets and are key mitigation programs to continue addressing potential wildfire risk

Initiating Cause	2015 - 2020 YTD[1] CPUC Reportable Ignitions in HFTD		Estimated Ignitions per 1,000 Circuit Miles in HFTD[2]	
	Distribution	Transmission	Distribution	Transmission
Equipment – PG&E	217	30	8.5	5.4
Vegetation	305	11	11.9	2.0
All Other[3]	195	34	7.6	6.1

For Equipment-driven ignitions, the Distribution Ignitions per Mile rate is 1.6x greater than Transmission
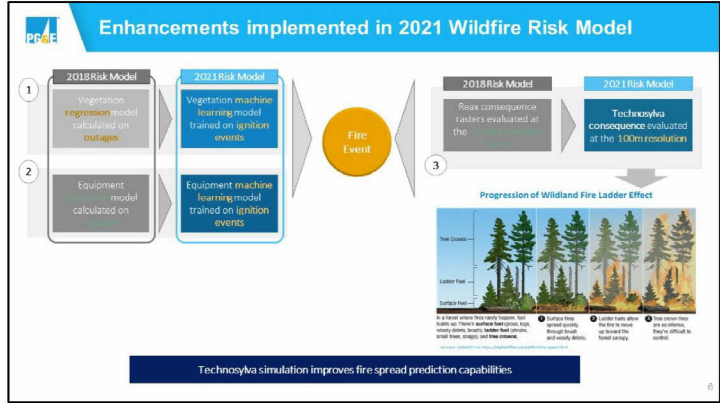
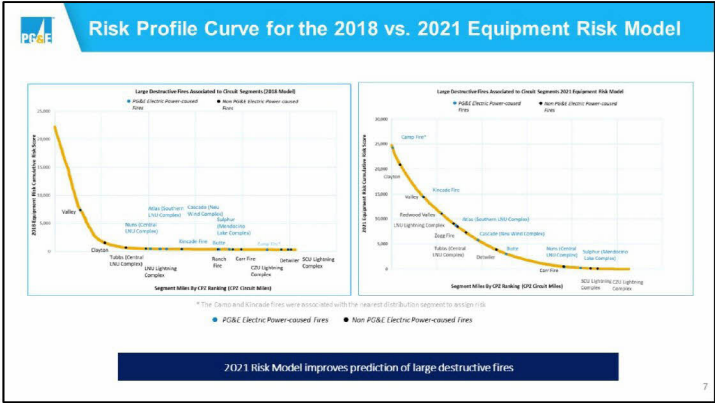For Vegetation-driven ignitions, the Distribution rate is 6x greater than Transmission

1. YTD represents data as of the end of September, 2020
2. Circuit mileage in HFTD areas source: 2020 Wildfire Safety Plan – 25,598 of distribution overhead mileage in HFTD areas, 5,542 of transmission overhead mileage
3. Other includes ignitions primarily driven by 3rd Party and Animal

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Risk Model and Risk Quantification

Wildfire Risk Models calculates risk units in CPUC framework

LoRE

- The 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

- The 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 when combined results in a multi-attribute score that can inform risk-based decision making

Methodology

Ignition Model	Fire Spread Model	
Likelihood of Ignition	**Likelihood of Spread**	**Consequence**
Ignition likelihood was determined based on 2021 modeling predicting ignitions at the circuit protection zone (CPZ)	Spread likelihood was determined based on a study conducted by PG&E and Technosylva	Consequence considerations focused on the potential impact of a wildfire

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Enhancements implemented in 2021 Wildfire Risk Model

Technosylva simulation improves fire spread prediction capabilities

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

2021 Risk Model improves prediction of large destructive fires

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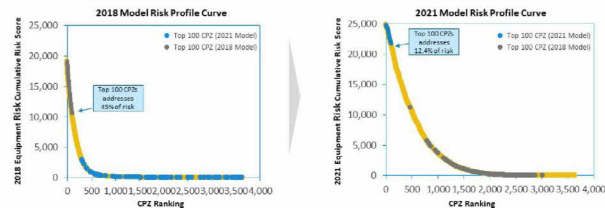
The improvement in the Risk Model results in a significant shift in the highest risk circuit protection zones

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Project Example

The top 50 highest risk-miles represent 1.4% of the total risk

Cumulative CPZ Risk

(Chart: MAVF Risk vs Circuit Protection Zone (CPZ) Ranked Miles)
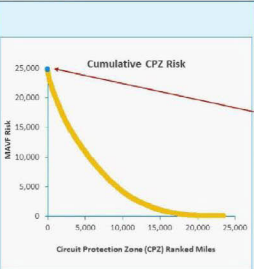
Protection Zone Name	Miles	Cumulative Miles	Mean MAVF Score	Total CPZ MAVF	% total risk reduced[1]
OREGON TRAIL	0.02	0.02	3.16	3.16	0.01%
CALPINE	0.01	0.03	1.88	1.88	0.01%
MARIPOS	0.08	0.12	1.69	1.69	0.02%
SHEPHER	0.01	0.13	1.44	1.44	0.02%
MIDDLET	0.05	0.18	1.30	5.20	0.03%
UPPER LA	1.00	1.17	1.26	3.77	0.04%
KESWICK	6.66	7.83	1.25	48.84	0.17%
MIDDLET 11023026	4.21	12.04	0.92	48.56	0.29%
KONOCTI	5.61	17.65	0.88	51.70	0.42%
MARIPOS	0.64	18.29	0.77	10.81	0.44%
BUCKS C	4.29	22.58	0.73	9.55	0.47%
DEL MAR	0.09	22.67	0.73	2.19	0.47%
MIDDLET	0.42	23.08	0.72	8.70	0.48%
MIDDLET	24.80	47.88	0.72	151.83	0.87%

[1]Based on assuming an OH hardening risk mitigation (62% risk reduction effectiveness)

Key Takeaway

On each project a more granular risk spend efficiency evaluation will be performed on an NPV basis (total cost of ownership for the asset life) once the project is fully scoped similar to what is shown on the Keswick █████ circuit protection zone on the next slide

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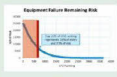Project Example: Keswick ▓▓▓▓ Circuit Protection Zone
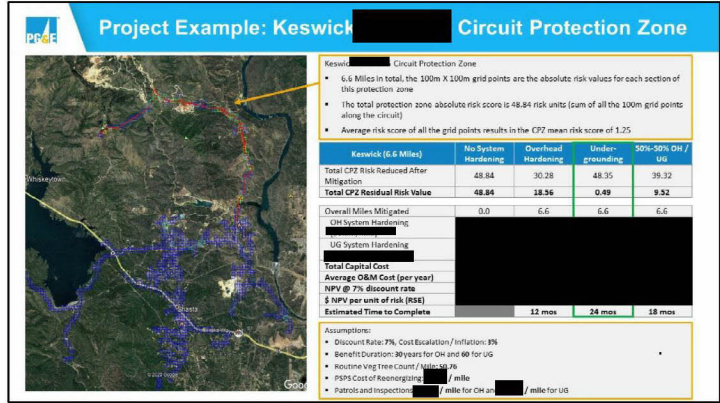
Target Setting

System Hardening

Conditions

Condition 1: 80%[3] of system hardening miles have to be highest-risk miles over the three-year period or LTIP is 0

Risk Profile (Highest Risk Miles defined as)
1. Top 20%[2] of risk buydown curve
2. Fire rebuild miles
3. PSPS mitigation miles

Condition 2: Minimum percentage of miles mitigated with either Line Removal or Undergrounding over the three-year period or LTIP is 0

Risk Effectiveness
- 10% of Undergrounding or Line Removal work in the System Hardening project portfolio[3]

Risk Exposure
- Count of circuit miles system hardened in the HFTD and HFRA

System Hardening Targets (Risk Miles)

	LTIP 0.5	LTIP 1.0	LTIP 2.0
2021	180	199	208
2022	423	464	485
2023	423	464	485
2021-2023	1,026	1,127	1,178

1. Basis of the 80% is to allow for operational execution considerations including permitting, weather related access, and mob/demob efficiencies
2. Basis of the top 20% correlates to ~70% of the risk on the risk buydown curve
3. Risk reduction effectiveness for Overhead Hardening is estimated at 62% and Undergrounding or Line Removal is estimated at 99%

System Hardening targets are set based on 2021 risk miles and program funding assumptions

Program Funding
- Forecast of ███ and ███ Wildfire Mitigation capital spend in 2021 and 2022, respectively, consistent with the Proposed Decision Revision for the 2020-2022 GRC. 2023 Wildfire Mitigation capital spend is forecasted at the 2022 level.

Unit Costs
- Assumes ███ per circuit miles of Overhead SH work and ███ for Underground work

Program Pace
- Get to steady pace of 450-500 high risk miles / year

System Hardening LTIP Targets

	LTIP 0.5	LTIP 1.0	LTIP 2.0
2021	180	199	208
2022	423	464	485
2023	423	464	485
2021-2023	1,026	1,127	1,178

Targets are miles of system hardening work for specific risk-prioritized work

- The total mileage of the proposed 2021 Project Portfolio was set as the threshold goal (LTIP 0.5) for 2021
- LTIP 0.5 goal in 2022 reflects escalation of program funding level; the 2023 LTIP 0.5 goal is set equal to the 2022 level based on the 2023 GRC funding level forecast
- The target and stretch goals (LTIP 1.0, 2.0) were set as 10% and 15% higher, respectively

1. ███ Includes scoping and engineering costs for future system hardening projects beyond 2021 and additional minor capital spend for other Wildfire Mitigation Programs

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Enhanced Vegetation Management (EVM)

Conditions

EVM Targets (Risk Miles)

Condition 1: 80%[1] of EVM miles have to be highest-risk miles over the three-year period or LTIP is 0

Risk Profile (Highest Risk Miles defined as)
- Top 20%[2] of risk model buydown curve
- Fire impacted miles

Risk Effectiveness
- Execute work consistent with defined EVM scope
  - Achieve 12' recommended radial clearance
  - Assess strike potential trees including high risk species
  - Remove overhangs above and within 4 feet of power lines
  - Mitigate vegetative fuels under and adjacent to powerlines on targeted basis

Risk Exposure
- Count of EVM miles worked in the HFTD and HFRA

	LTIP 0.5	LTIP 1.0	LTIP 2.0
2021	1,800	1,890	2,070
2022	1,800	1,890	2,070
2023	1,800	1,890	2,070
2021-2023	5,400	5,670	6,210

1. Basis of the 80% is to allow for operational execution considerations including permitting, weather-related access and, customer approvals
2. Basis of the top 20% correlates to ~85% of the risk on the risk buydown curve

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EVM targets are set based on work to be completed over the remaining twelve years of the program

Program Duration
- Assumes execution of the 12-year Enhanced Vegetation management Plan **(2021-2032)**
- Evaluating viability of 10-year pace (2021-2030)

Program Funding
- Forecast of ▉▉▉▉ and ▉▉▉ spend on EVM program in 2021, 2022 and 2023 respectively (in alignment with POR)

Unit Costs
- Assumes ▉▉▉ per miles of EVM work

Enhanced Vegetation Management LTIP Targets

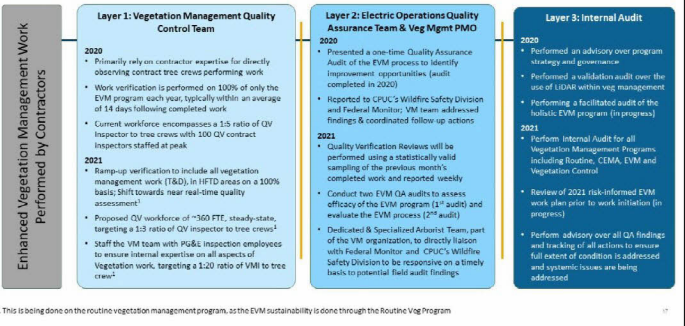|	LTIP 0.5	LTIP 1.0	LTIP 2.0
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2021-2023	5,400	5,670	6,210

Targets are miles of EVM work for specific risk-prioritized work.

- The total mileage of the proposed 2021 Project Portfolio was set as the threshold goal (LTIP 0.5) for 2021
- The target and stretch goals (LTIP 1.0, 2.0) were set as 5% and 15% higher, respectively

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EVM Quality Control – Layers of Defense

Enhanced Vegetation Management Work Performed by Contractors

Layer 1: Vegetation Management Quality Control Team

2020
- Primarily rely on contractor expertise for directly observing contract tree crews performing work
- Work verification is performed on 100% of only the EVM program each year, typically within an 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

2021
- Ramp-up verification to include all vegetation management work (T&D), in HFTD areas on a 100% basis; Shift towards near real-time quality assessment[1]
- Proposed QV workforce of ~360 FTE, steady-state, targeting a 1:5 ratio of QV inspector to tree crews[1]
- Staff the VM team with PG&E inspection employees to ensure internal expertise on all aspects of Vegetation work, targeting a 1:20 ratio of VMI to tree crew[1]

Layer 2: Electric Operations Quality Assurance Team & Veg Mgmt PMO

2020
- Presented a one-time Quality Assurance Audit of the EVM process to identify improvement opportunities (audit completed in 2020)
- Reported to CPUC's Wildfire Safety Division and Federal Monitor; VM team addressed findings & coordinated follow-up actions

2021
- Quality Verification Reviews will be performed using a statistically valid sampling of the previous month's completed work and reported weekly
- Conduct two EVM QA audits to assess efficacy of the EVM program (1st audit) and evaluate the EVM process (2nd audit)
- Dedicated & Specialized Arborist Team, part of the VM organization, to directly liaison with Federal Monitor and CPUC's Wildfire Safety Division to be responsive on a timely basis to potential field audit findings

Layer 3: Internal Audit

2020
- Performed an advisory over program strategy and governance
- Performed a validation audit over the use of LIDAR within veg management
- Performing a facilitated audit of the holistic EVM program (in progress)

2021
- Perform Internal Audit for all Vegetation Management Programs including Routine, CEMA, EVM and Vegetation Control
- Review of 2021 risk-informed EVM work plan prior to work initiation (in progress)
- Perform advisory over all QA findings and tracking of all actions to ensure full extent of condition is addressed and systemic issues are being addressed

1. This is being done on the routine vegetation management program, as the EVM sustainability is done through the Routine Veg Program

Governance and Oversight

Wildfire Risk Governance Committee

- System Hardening project lists (by CPZ) consistent with the Target Setting methodology will be formally approved annually by the Chief Risk Officer
- Enhanced Vegetation Miles (by CPZ) consistent with the Target Setting methodology will also be formally approved annually by the Chief Risk Officer
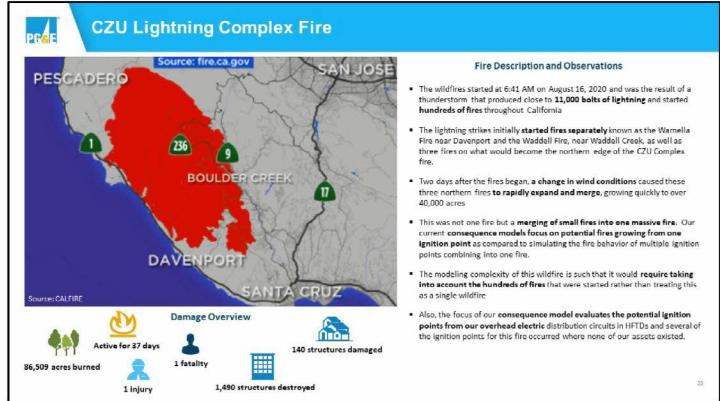
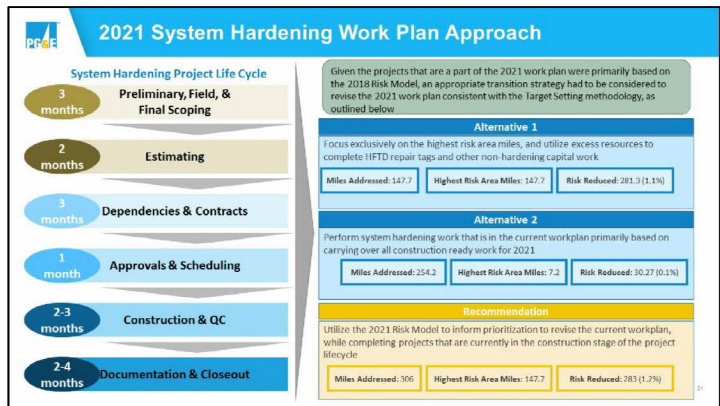### PG&E Board – SNO and Compensation Committees

- Annual submission of a) System Hardening project list and b) specific locations of the Enhanced Vegetation Management miles to the SNO and Compensation Board Committees by the Chief Risk Officer
- Monthly progress updates on plan vs. actual for both System Hardening and Enhanced Vegetation Management including completed work quality performance will be submitted to the SNO and Compensation Board Committees by the Chief Risk Officer

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Appendix

2021 System Hardening Work Plan Approach

System Hardening Project Life Cycle

- **3 months** — Preliminary, Field, & Final Scoping
- **2 months** — Estimating
- **3 months** — Dependencies & Contracts
- **1 month** — Approvals & Scheduling
- **2-3 months** — Construction & QC
- **2-4 months** — Documentation & Closeout

Given the projects that are a part of the 2021 work plan were primarily based on the 2018 Risk Model, an appropriate transition strategy had to be considered to revise the 2021 work plan consistent with the Target Setting methodology, as outlined below

Alternative 1

Focus exclusively on the highest risk area miles, and utilize excess resources to complete HFTD repair tags and other non-hardening capital work

| Miles Addressed: 147.7 | Highest Risk Area Miles: 147.7 | Risk Reduced: 281.3 (1.1%) |

Alternative 2

Perform system hardening work that is in the current workplan primarily based on carrying over all construction ready work for 2021

| Miles Addressed: 254.2 | Highest Risk Area Miles: 7.2 | Risk Reduced: 30.27 (0.1%) |

Recommendation

Utilize the 2021 Risk Model to inform prioritization to revise the current workplan, while completing projects that are currently in the construction stage of the project lifecycle

| Miles Addressed: 306 | Highest Risk Area Miles: 147.7 | Risk Reduced: 283 (1.2%) |

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 fires?
Tunnel - Oakland Hills	Re-kindle	Oct-91	Alameda	1600	2900	25	No
Jones	Undetermined	Oct-99	Shasta	26,200	954	1	No
Cedar	Human Related	Oct-03	San Diego	273,246	2820	15	No
Old	Human Related	Oct-03	San Bernardino	91,281	1,003	6	No
Witch	Powerlines	Oct-07	San Diego	197,990	1,650	2	No
Valley	Electrical (Private)	Sep-15	Lake, Napa, Sonoma	76,007	1,955	4	No
Butte	Powerlines	Sep-15	Amador, Calaveras	70,868	921	2	Yes
Clayton	Arson	Aug-16	Lake	3,929	500	0	No
Detwiler	Firearms	Jul-17	Mariposa	81,826	131	0	No
Tubbs	Electrical (Private)	Oct-17	Napa and Sonoma	36807	5636	22	No
Nuns	Powerlines	Oct-17	Sonoma	54,382	1,355	3	Yes
Atlas	Powerlines	Oct-17	Napa, Solano	51,624	783	6	Yes
Redwood Valley	Powerlines	Oct-17	Mendocino	36,523	546	9	No*
Cascade (New Wind Complex)	Powerlines	Oct-17	Yuba	9,989	264	4	Yes
Sulphur	Powerlines	Oct-17	Lake	2,207	162	0	Yes
Thomas	Powerlines	Dec-17	Ventura, Santa Barbara	281,893	1,063	2	No
Carr	Human Related	Jul-18	Shasta County, Trinity	229,651	1,614	8	No
Camp Fire	Powerlines	Nov-18	Butte	153936	18806	85	Yes
Woolsey	Under Investigation	Nov-18	Ventura	96,949	1,643	3	No
Kincade	Powerlines	Oct-19	Sonoma	77,758	374	0	Yes
Ranch Fire	Human Related	Nov-19	Tehama	2,534	0	0	No
August Complex	Under Investigation	Aug-20	Mendocino, Humboldt, Trinity, Tehama, Glenn, Lake, Colusa	1,032,648	935	1	No
North Complex	Under Investigation	Aug-20	Butte, Plumas, Yuba	318935	2,352	15	No
LNU Lightning Complex	Under Investigation	Aug-20	Lake, Napa, Sonoma, Yolo, Solano	363,220	1,491	6	No
CZU Lightning Complex	Under Investigation	Aug-20	Santa Cruz, San Mateo	86,509	1,490	1	No
SCU Lightning Complex	Under Investigation	Aug-20	Santa Clara, Alameda, Stanislaus	396,624	222	0	No
Glass Fire	Under Investigation	Sep-20	Napa, Sonoma	67,484	1,520	0	No
Creek Fire	Under Investigation	Sep-20	Fresno, Madera	377,650	856	0	No

*Note: found to have broken conductor, to replace to the ignition event

▨▨▨ Fires caused by PG&E Electric power

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