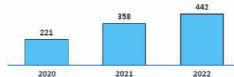**Public Safety**
**Long Term Incentive Plan (LTIP)**
**Target Setting**

**January 7, 2021**

Together, Building
a Better California

## 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<br><br>221 (2020) 358 (2021) 442 (2022) | • **Risk Exposure** – Count of circuit miles system hardened in the HFTD and HFRA<br><br>• **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<br><br>• **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<br><br>• 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<br><br>• Rational:<br>   • 3 Year target has been achieved<br>   • 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<br><br>• **Risk Profile** - 80% of EVM miles worked in the top 20% of the HFTD's includes Fire impacted areas<br><br>• **Risk Effectiveness** – Execute work consistent with defined EVM scope |

## 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

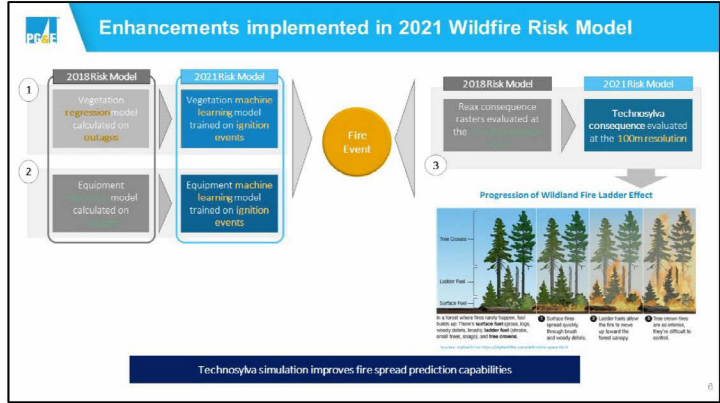For Vegetation-driven ignitions, the Distribution rate is 6x greater than Transmission

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

# Risk Model and Risk Quantification

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**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**

| Likelihood of Ignition |
| --- |
| Ignition likelihood was determined based on 2021 modeling predicting ignitions at the circuit protection zone (CPZ) |

**Fire Spread Model**

| Likelihood of Spread | Consequence |
| --- | --- |
| 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

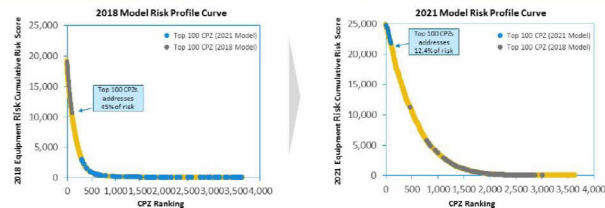Risk Profile Curve for the 2018 vs. 2021 Equipment Risk Model
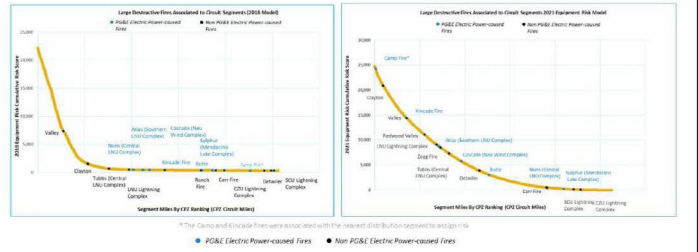
2021 Risk Model improves prediction of large destructive fires

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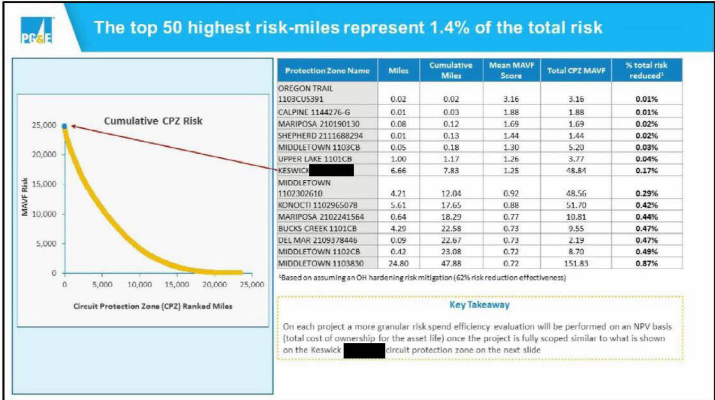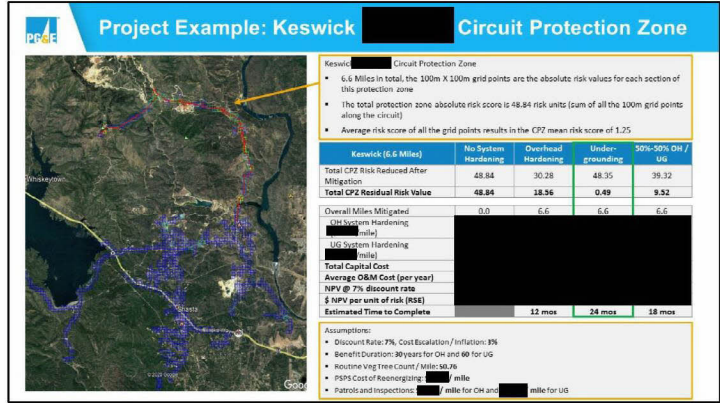
The improvement in the Risk Model results in a significant shift in the highest risk circuit protection zones
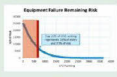
**Project Example**

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

Cumulative CPZ Risk

| Protection Zone Name | Miles | Cumulative Miles | Mean MAVF Score | Total CPZ MAVF | % total risk reduced[1] |
|---|---|---|---|---|---|
| OREGON TRAIL 1103CUS391 | 0.02 | 0.02 | 3.16 | 3.16 | 0.01% |
| CALPINE 1144276-G | 0.01 | 0.03 | 1.88 | 1.88 | 0.01% |
| MARIPOSA 210190130 | 0.08 | 0.12 | 1.69 | 1.69 | 0.02% |
| SHEPHERD 2111688294 | 0.01 | 0.13 | 1.44 | 1.44 | 0.02% |
| MIDDLETOWN 1103CB | 0.05 | 0.18 | 1.30 | 5.20 | 0.03% |
| UPPER LAKE 1101CB | 1.00 | 1.17 | 1.26 | 3.77 | 0.04% |
| KESWICK ▉▉▉ | 6.66 | 7.83 | 1.25 | 48.84 | 0.17% |
| MIDDLETOWN 1102302610 | 4.21 | 12.04 | 0.92 | 48.56 | 0.29% |
| KONOCTI 1102965078 | 5.61 | 17.65 | 0.88 | 51.70 | 0.42% |
| MARIPOSA 2102241564 | 0.64 | 18.29 | 0.77 | 10.81 | 0.44% |
| BUCKS CREEK 1101CB | 4.29 | 22.58 | 0.73 | 9.55 | 0.47% |
| DEL MAR 2109378446 | 0.09 | 22.67 | 0.73 | 2.19 | 0.47% |
| MIDDLETOWN 1102CB | 0.42 | 23.08 | 0.72 | 8.70 | 0.48% |
| MIDDLETOWN 1103830 | 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

Keswick ▮▮▮ Circuit Protection Zone
- 6.6 Miles in total, the 100m X 100m grid points are the absolute risk values for each section of this protection zone
- The total protection zone absolute risk score is 48.84 risk units (sum of all the 100m grid points along the circuit)
- Average risk score of all the grid points results in the CPZ mean risk score of 1.25

| Keswick (6.6 Miles) | No System Hardening | Overhead Hardening | Under-grounding | 50%-50% OH / UG |
|---|---|---|---|---|
| Total CPZ Risk Reduced After Mitigation | 48.84 | 30.28 | 48.35 | 39.32 |
| **Total CPZ Residual Risk Value** | **48.84** | **18.56** | **0.49** | **9.52** |
| | | | | |
| Overall Miles Mitigated | 0.0 | 6.6 | 6.6 | 6.6 |
| OH System Hardening ( /mile) | | | | |
| UG System Hardening ( /mile) | | | | |
| **Total Capital Cost** | | | | |
| **Average O&M Cost (per year)** | | | | |
| **NPV @ 7% discount rate** | | | | |
| **$ NPV per unit of risk (RSE)** | | | | |
| **Estimated Time to Complete** | | 12 mos | 24 mos | 18 mos |

Assumptions:
- Discount Rate: 7%, Cost Escalation / Inflation: 3%
- Benefit Duration: 30 years for OH and 60 for UG
- Routine Veg Tree Count / Mile: $0.76
- PSPS Cost of Reenergizing: ▮▮▮ / mile
- Patrols and Inspections: ▮▮▮ / mile for OH and ▮▮▮ mile for UG

**Target Setting**

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## System Hardening

### Conditions

**Condition 1: 80%[1] 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%

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## 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. ▉ ncludes 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

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

### EVM Targets (Risk Miles)

| | 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

**PGE-DIXIE-NDCAL-000012700**

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
- Proposed QV workforce of ~360 FTE, steady-state, targeting a 1:3 ratio of QV inspector to tree crews
- 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

**Layer 2: Electric Operations Quality Assurance Team**

**2020**
- Performed a one-time Quality Assurance Audit of the EVM process to identify improvement opportunities
- Liaison with CPUC's Wildfire Safety Division and Federal Monitor – address findings & follow up actions in coordination with the VM team

**2021**
- Quality Assurance Assessments to be performed on a weekly basis using a statistical sampling approach for completed work
- 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**
- Internal Audit performed on Routine Vegetation Program

**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
- Review of all QA findings and tracking of all actions to ensure full extent of condition is addressed and systemic issues are being addressed

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## 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

**Appendix**
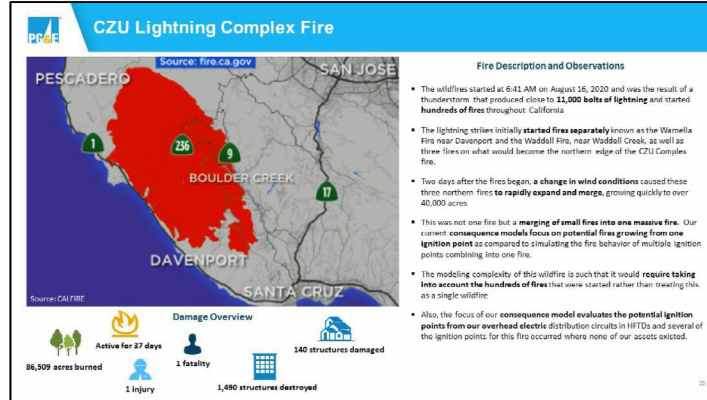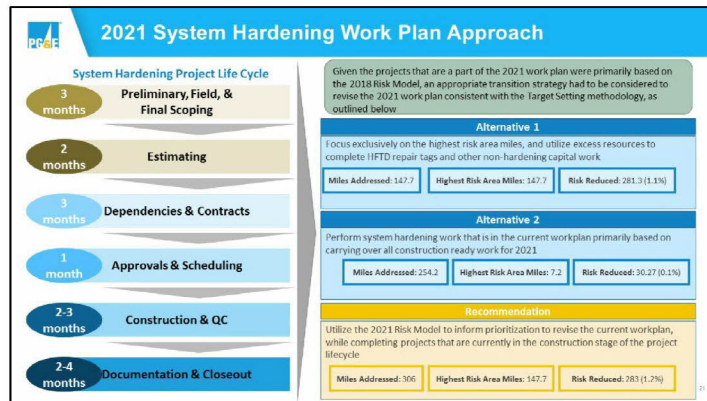
## Selected list of most destructive fires in the past thirty years

| 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 | Under-mined | Oct 99 | Shasta | 26,200 | 954 | 1 | No |
| Cedar | Human Related | Oct-03 | San Diego | 273240 | 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 | 76,067 | 1,955 | 4 | No |
| Butte | Powerlines | Sep-15 | Amador, Calaveras | 70,868 | 921 | 2 | Yes |
| Clayton | Arson | Aug 16 | Lake | 3,929 | 300 | 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 | 153336 | 18804 | 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 | 318931 | 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 |

*PG&E found to have blown no gun in relation to the ignition event

Fires caused by PG&E Electric power