How Much Fire Risk Is California Building?

A case study of the Manning–Metcalf 500 kV corridor and the data center transmission buildout

Igor Geyn · March 2026

Full analysis: igorgeyn.com/blog

Executive Summary

California's data center boom is driving the largest transmission buildout in a generation. The centerpiece is the **Manning–Metcalf 500 kV corridor** — ~36 miles of new 500 kV line through the Diablo Range foothills south of San Jose, with an estimated cost of $500–700M and an in-service target of 2034. Roughly **60% of the corridor passes through CPUC High Fire Threat Districts**, more than double the 25% average for PG&E's existing 500 kV network. Depending on routing, HFTD exposure ranges from 3% to 85% — fire-avoidant routes exist but require longer paths through the Central Valley.

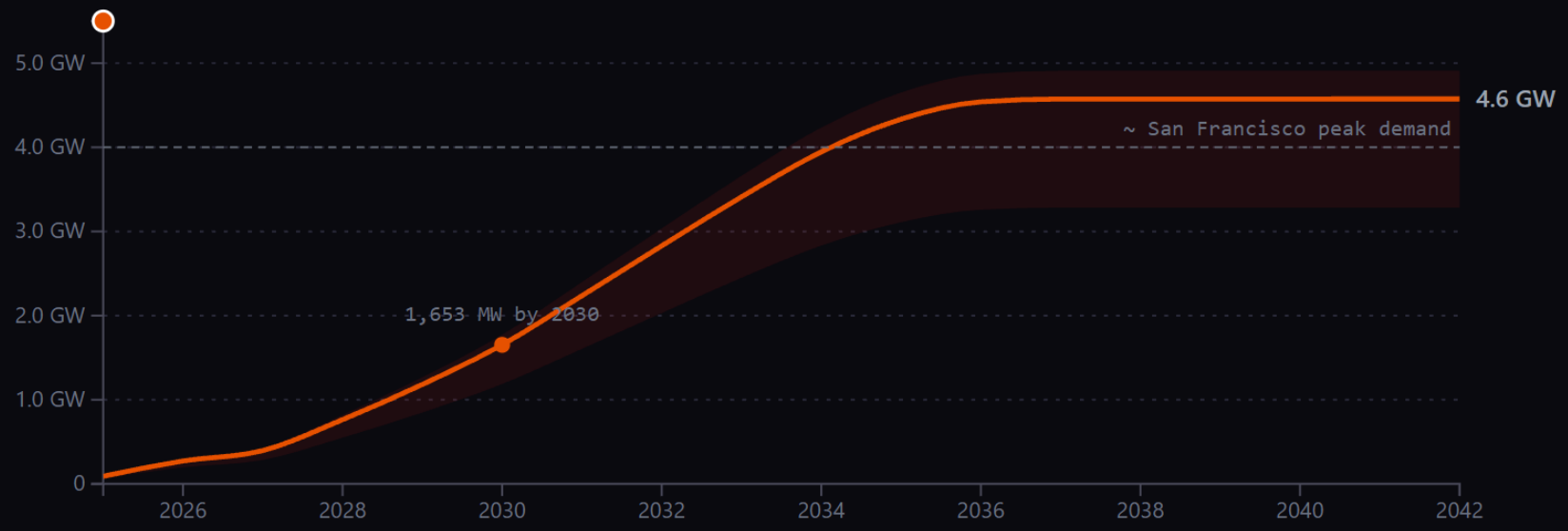
The cost consequences are large. Lifecycle cost differences between routes reach up to **$767M** over 50 years, driven primarily by PSPS outage risk and wildfire liability — categories that can account for up to 70% of total cost on high-fire routes. The corridor already experiences shutoffs: **58 PSPS events** on existing lower-voltage infrastructure since 2019, with a 41-hour median duration that far exceeds the 4–8 hours of battery backup most data centers carry. A single 24-hour shutoff on 500 MW of data center load represents roughly **$240M** in economic damage.

California's transmission approval process is sequential: CAISO determines need, the CPUC sets cost allocation, and a separate CEQA/CPCN proceeding selects the route and evaluates environmental impacts including fire. The Manning–Metcalf CEQA/CPCN application has not yet been filed — exact routing remains to be determined.

Independent analysis built on public geospatial data (HIFLD, CPUC HFTD v3), PSPS records, CAISO planning documents, and route/cost modeling. All scenarios are illustrative. Read the full analysis →

California Data Center Demand: 50x in 12 Years

The CEC projects CAISO-area data center peak load growing from ~100 MW today to nearly 5,000 MW by the late 2030s. PG&E received 34 applications for 4,400 MW of transmission-level service in 2023–2024 alone — a 3,000% increase over the prior nine years combined.

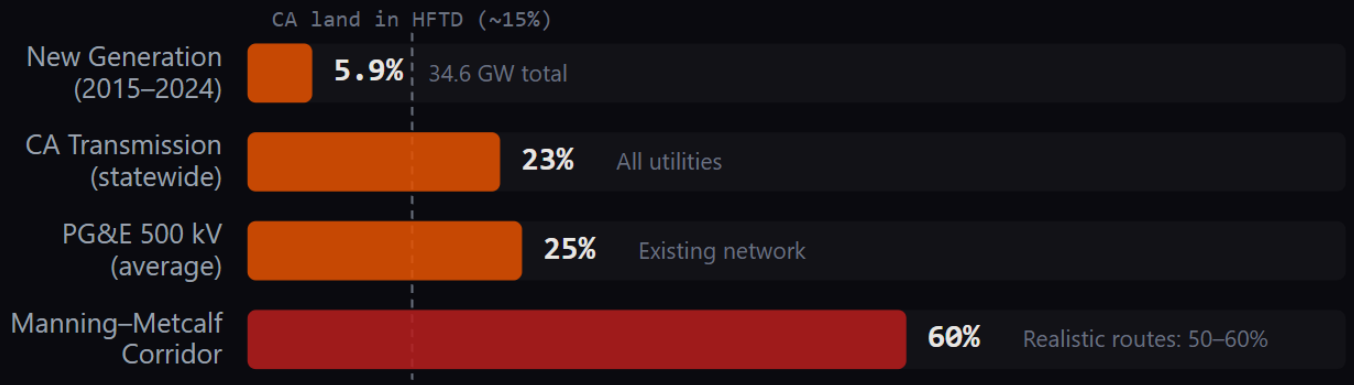


Why this matters: PG&E's 34 new transmission-level applications require 500 kV backbone upgrades through terrain where 15–60% of the land is classified as high fire threat. Demand at this scale doesn't just need more wires — it needs wires through the Diablo Range.

Data: CEC 2025 IEPR (Docket 25-IEPR-03). Band = low–high scenario range. PG&E Rule 30 (A.24-11-007).

Generation Avoids Fire Zones. Transmission Can't.

Only 5.9% of California's 34.6 GW of new generation since 2015 was sited in HFTD — solar and batteries go where land is cheap and flat. But transmission to Bay Area load centers must cross mountain foothills: 23% of statewide transmission mileage is in HFTD, rising to 50–60% for Manning–Metcalf.

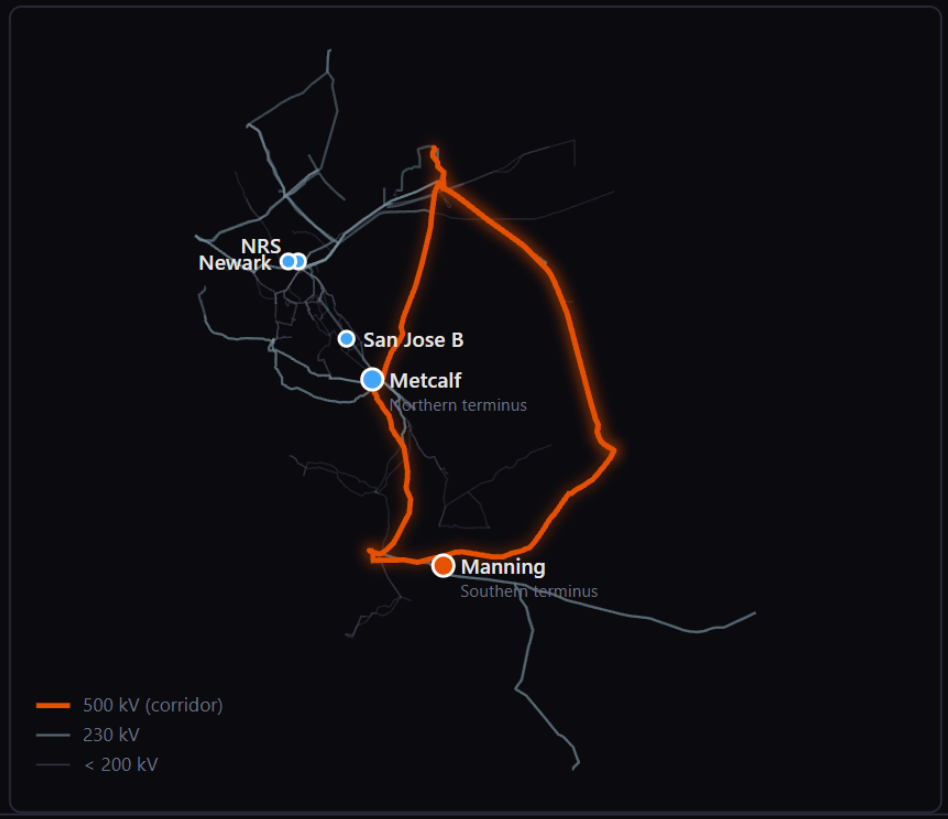


Why this matters: Solar and wind farms can be sited in flat, low-fire terrain. Transmission lines connecting them to load centers have no choice but to cross mountain corridors — concentrating fire risk in infrastructure that is hardest to harden and most expensive to shut down.

EIA Form 860 (2024). HIFLD (2025). CPUC HFTD v3. ~15% of CA land in HFTD.

The Largest New Line Crosses the Most Fire-Exposed Terrain

New 500 kV from Manning (Hollister) to Metcalf (south San Jose) through the Diablo Range foothills. Exact routing has not been finalized — every plausible corridor crosses significant fire-threat terrain.



500 kV — highest voltage class

~36 miles through Diablo Range

60% in HFTD (2.2x PG&E 500 kV avg)

$500–700M CAISO estimate

June 2034 in-service target

Largest project in CA DC buildout

Why this matters: Manning–Metcalf adds ~21 HFTD-miles of 500 kV in a single project — a 6% increase in PG&E's fire-exposed 500 kV network, serving the highest value-of-lost-load class in the grid.

HIFLD (2025). CAISO 2024–2025 TPP.

Fire Risk Clusters in 20 km of Foothills

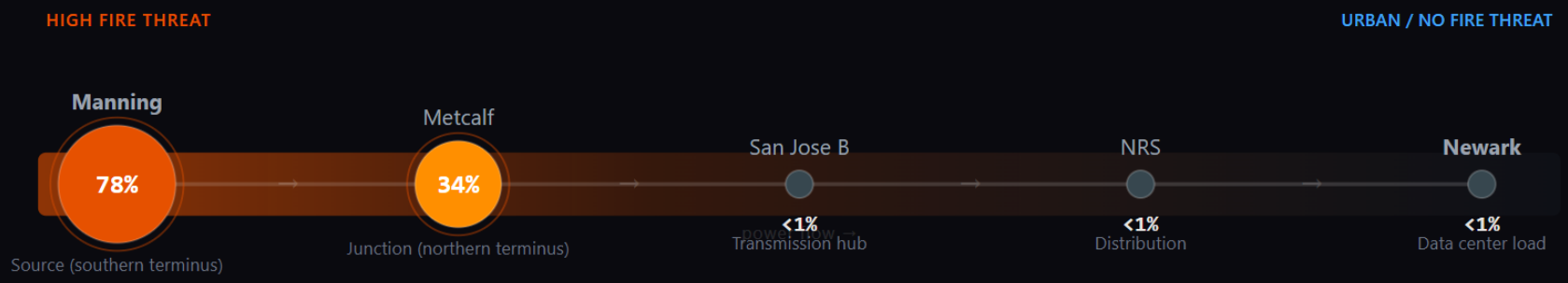
Sampling HFTD classification at 1 km intervals along the existing Moss Landing–Metcalf 500 kV proxy route, fire exposure concentrates in the middle third (km 15–35) where the line climbs through Diablo Range foothills. Modest detours around this 20 km stretch can cut exposure from 60% to under 5%.

Why this matters: The fire risk isn't spread evenly — it clusters in ~20 km of the Diablo Range foothills. A route that detours around km 15–35 can drop HFTD exposure from 60% to under 5%, at the cost of 10–15 additional miles through the Central Valley.

HIFLD geometry × CPUC HFTD v3. 1 km segments. Moss Landing–Metcalf as geographic proxy.

Data Centers See No Fire Risk. Their Power Supply Does.

Manning Substation (southern terminus) has 78% HFTD within 5 km. Moving north, exposure drops sharply — Metcalf 37%, San Jose B 14%, and effectively 0% at Newark and Ravenswood where data centers connect. The fire risk is upstream and invisible at the point of consumption.

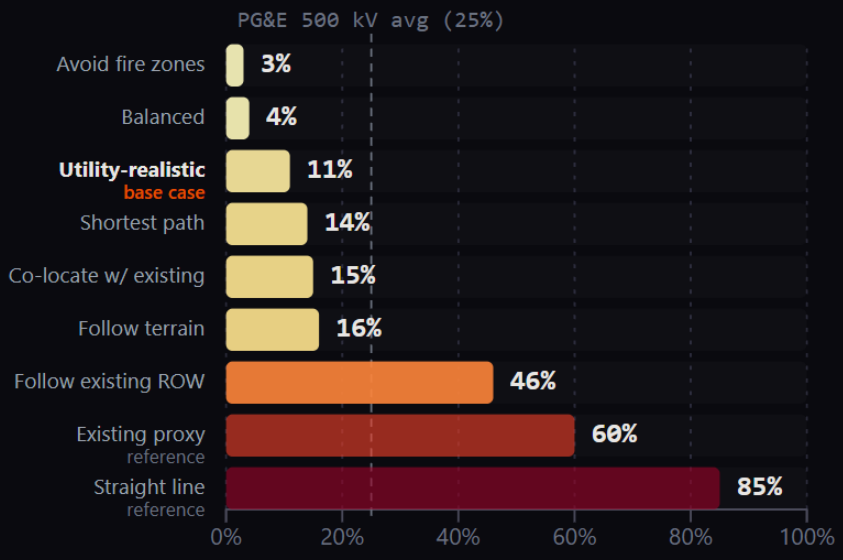


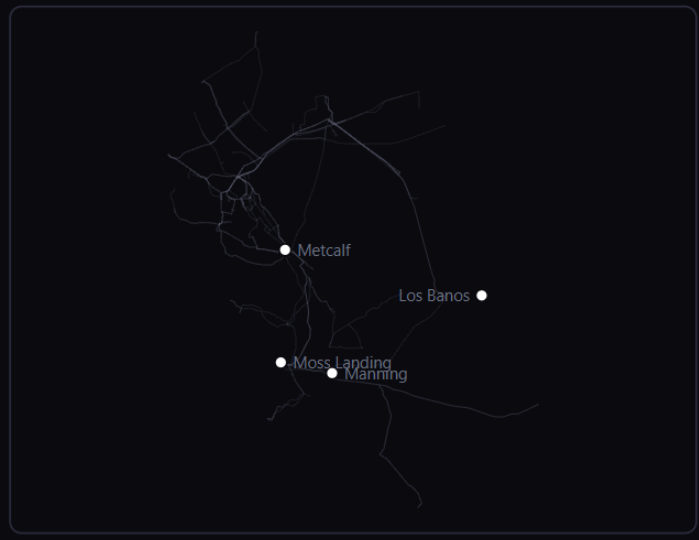
Why this matters: A data center operator in Newark sees 0% HFTD at their substation, but their power flows through a corridor that is 78% HFTD at the source end. The fire risk is real but invisible at the point of consumption.

5 km buffer analysis. HIFLD substations × CPUC HFTD v3.

Route Choice Determines Fire Exposure: 3% to 85%

Seven least-cost-path scenarios with varying weights on slope, distance, ROW co-location, and HFTD avoidance, plus two reference cases. Fire-avoidant routes (3–4% HFTD) exist but require Central Valley detours. The utility-realistic base case (11% HFTD) follows existing right-of-way.





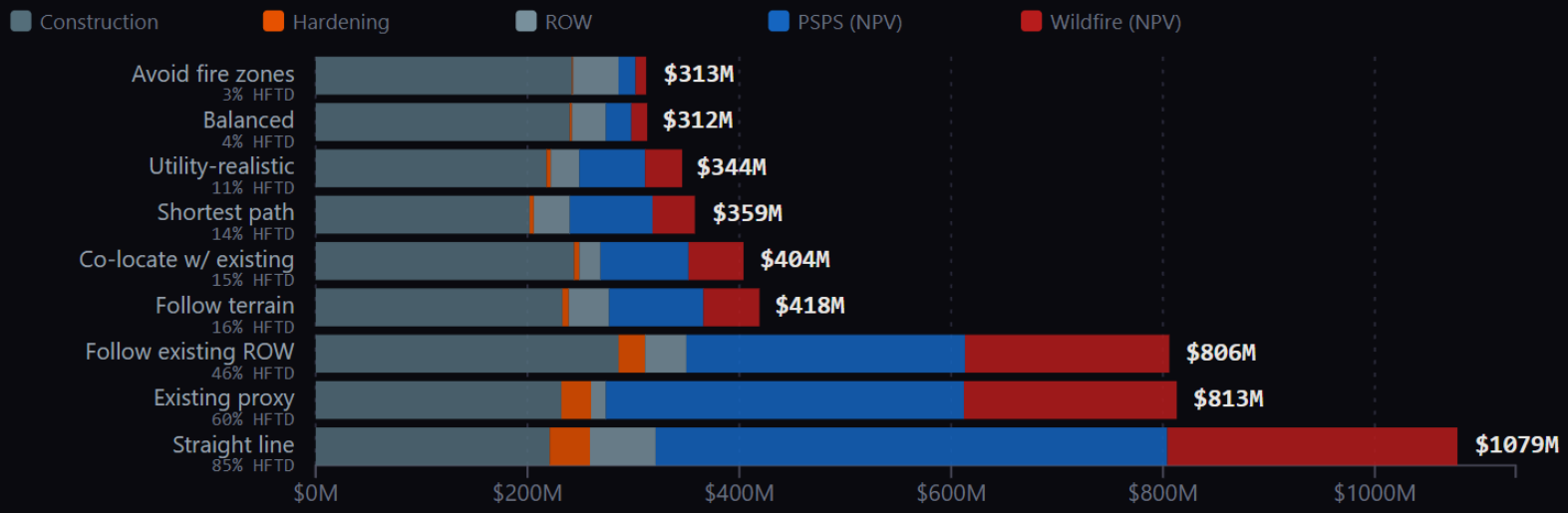
Hover a scenario to highlight its approximate corridor.

Why this matters: Choosing a 4% HFTD route over a 60% route avoids ~$500M in lifecycle fire costs, but adds ~$30M in construction for a longer path — a 17:1 benefit-cost ratio for fire avoidance.

Least-cost-path with Gilroy/Morgan Hill waypoints. **Illustrative envelopes, not engineering designs.**

High-Fire Routes Add Up to $767M in Lifecycle Costs

Lifecycle costs include hardening, PSPS outage damages, and wildfire liability — categories that can dwarf construction cost. Over 50 years, total cost ranges from $312M (4% HFTD route) to $1,079M (85% HFTD). PSPS and wildfire account for up to 70% of lifecycle cost on high-fire routes.

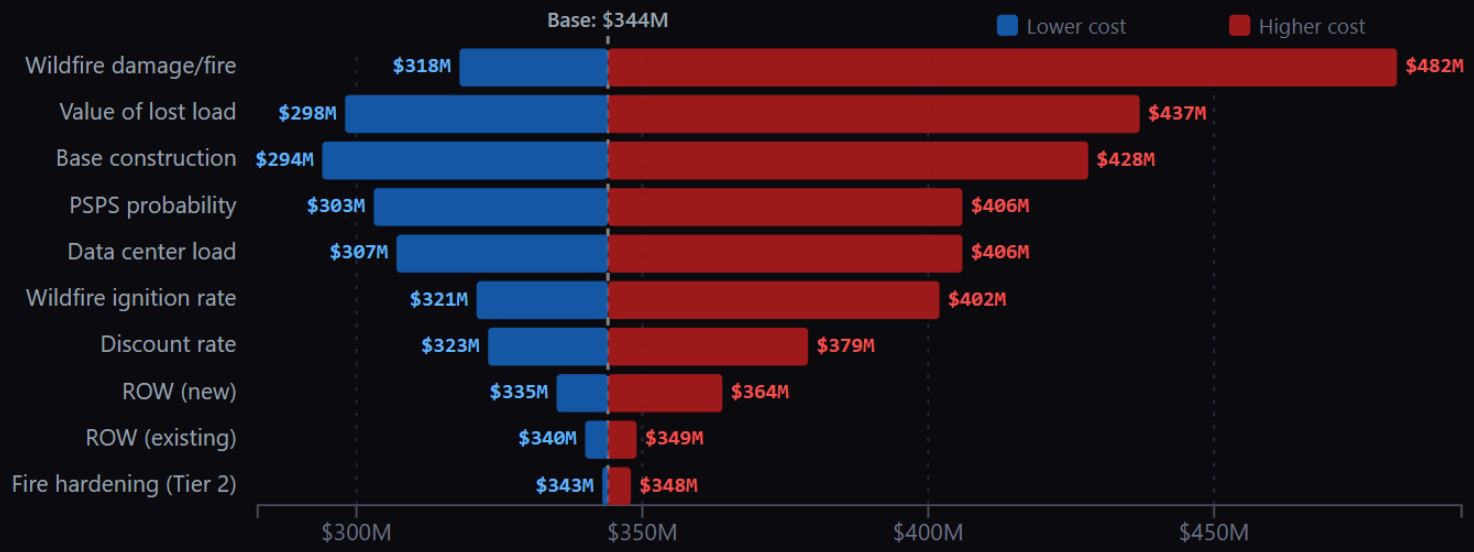


Why this matters: Construction cost alone understates total cost on high-fire routes. PSPS outage damages and wildfire liability can account for up to 70% of lifecycle cost — categories that scale directly with HFTD exposure.

Construction $6.5M/mi. Hardening $1–2M/mi (est.). PSPS: 15%/yr, 24-hr, 500 MW, $20k/MWh.
Wildfire: 0.003 fires/HFTD-mi/yr, $200M/fire. **Illustrative.**

Wildfire Risk Dominates Cost Uncertainty

Each parameter varied independently between low and high bounds. The three largest drivers: wildfire damage per fire ($164M swing), value of lost load ($139M), and construction cost ($134M). The cost ranking is stable — higher-fire routes cost more under every combination tested.



Why this matters: The cost ranking is robust: high-fire routes cost more under every parameter combination tested. Even zeroing out PSPS (the bull case for 500 kV exemption) only saves $62M — wildfire liability alone keeps fire-zone routes $100M+ more expensive.

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One parameter swings low-high, others at mid. No PSPS saves $62M; liability cap saves
$26M. NPV understates tail risk.
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The Corridor Already Triggers Shutoffs

Since 2019, 58 PSPS events have affected 33 circuits in the Manning–Metcalf region with a 41-hour median duration. PG&E has never applied PSPS to 500 kV, but the weather conditions that trigger shutoffs don't respect voltage class — the Oct 2019 Metcalf–Monta Vista 230 kV shutoff lasted 41 hours.

58

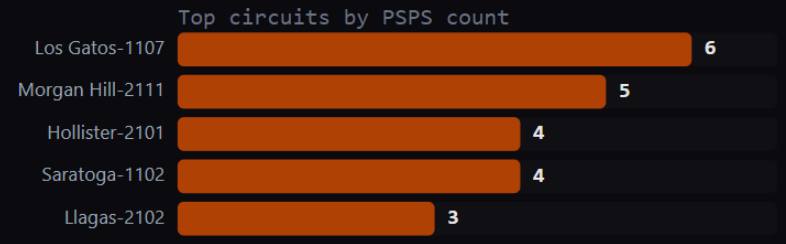
PSPS events since 2019

33

circuits affected

1.7M

customer-hours of shutoff

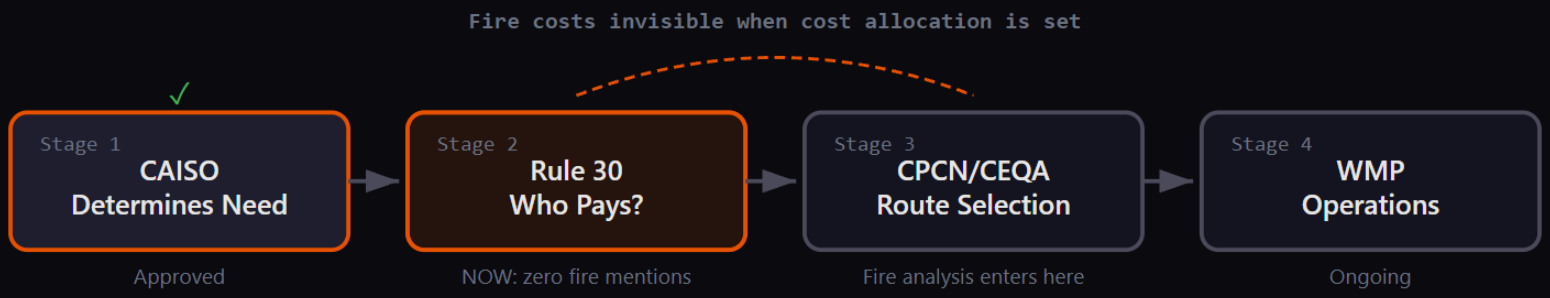


Why this matters: A single 24-hr PSPS on 500 MW at data-center VoLL ($20k/MWh) = **$240M** in economic damage. The 41-hr median shutoff creates a 33–37 hour gap beyond battery backup, and diesel generators face air quality restrictions during the fire weather events that trigger PSPS in the first place.

PG&E PSPS reports (2019–2025). Metcalf–Monta Vista 230 kV: 41-hr shutoff Oct 2019.

How California Approves Transmission Lines

California's transmission approval is sequential: CAISO determines need, the CPUC sets cost allocation via Rule 30, then a separate CEQA/CPCN proceeding selects the route and evaluates environmental impacts including fire. Fire exposure and hardening costs become visible at the CEQA/CPCN stage, after the cost allocation framework is established.



PG&E budgeted **$30.6M** for all transmission hardening in 2025. Manning–Metcalf alone might require **$25–38M** depending on the route selected.

Why this matters: Cost allocation is set at Step 2; fire exposure becomes visible at Step 3. Route decisions for lines operating 50+ years are downstream of cost decisions.

Rule 30 (A.24-11-007). CPUC ALJ Feb 2026. CAISO TPP. PG&E 2025 WMP (GH-11).

Key Takeaways

1. **Fire-avoidant routes exist** (3–4% HFTD) but require longer paths. The corridor's fire exposure is a route-selection decision, not a given.

2. **Realistic routes cross 50–60% fire-threat territory** — 2.2x the PG&E 500 kV avg. Lifecycle cost differences reach hundreds of millions of dollars.

3. **PSPS and wildfire costs can dwarf construction costs.** On high-fire routes, outage damages and liability account for up to 70% of lifecycle cost — categories that scale with HFTD exposure.

4. **58 PSPS events already** on existing infrastructure. 41-hour median shutoff far exceeds battery backup (4–8 hrs).

Methodology & Data Sources

Data Sources

Fire threat zones: CPUC HFTD Map v3 (Tiers 2 & 3)

Transmission: HIFLD, 2025 release

Generation: EIA Form 860 (2024)

Load forecast: CEC 2025 IEPR (Docket 25-IEPR-03)

PSPS records: PG&E shutoff reports, 2019–2025

Transmission planning: CAISO 2024–2025 TPP

Cost allocation: PG&E Rule 30 (A.24-11-007)

Key Limitations

Route scenarios are illustrative envelopes, not engineering designs — PG&E has not published the final geometry.

No public cost data for 500 kV fire-hardening; estimates extrapolated from lower-voltage precedents.

No historical 500 kV PSPS; shutoff probability based on corridor weather-event frequency.

NPV compresses tail risk into expected values, understating low-probability, high-damage wildfire events.

Scope: one corridor in PG&E territory. Does not address SCE or SDG&E service areas.

Read the Full Analysis

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