Reducing Wildfire Risk for Our Customers and Hometowns

Enhanced Powerline Safety Settings: A Proven Wildfire Prevention Tool

Different Types of Outages

Supporting Customers with Resources and Information

Q&A

Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.
Reducing Wildfire Risk for Our Customers and Hometowns
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Who We Serve

By The Numbers

16M PEOPLE SERVED
5.5M electric accounts
4.5M gas accounts

70,000 SQUARE MILE SERVICE AREA
106,700 circuit miles of electric distribution lines
42,100 miles of natural gas distribution pipeline

More than 50% of our service area is in high fire-risk areas*

Data is approximate
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<table>
<thead>
<tr>
<th>Year</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
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</thead>
<tbody>
<tr>
<td><strong>CLIMATE CHANGE LEADING TO A PROLONGED AND INTENSIFIED WILDFIRE SEASON</strong></td>
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<td><strong>Drought-intensified wildfire risk</strong></td>
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<td><strong>Moderate drought conditions</strong></td>
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**Significant increase in wildfire activity on non-Red Flag Warning (RFW) days**

- **47%** of acreage burned by wildfires ignited on non-RFW days
- **95%** of acreage burned by wildfires ignited on non-RFW days
- **2nd driest year** in the last 128 years through peak wildfire season
- **~43%** of CA remains in drought even with 13th wettest January in 129 years

**Expansion of EPSS to all high fire-risk areas**

- 99% reduction in acres burned
- 68% reduction in ignitions

**Implementation of EPSS pilot**

**Adding additional protection and refining EPSS**
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**What Are Enhanced Powerline Safety Settings (EPSS)?**

**Fast Fault Detection**
Safety settings detect distribution primary faults quickly and automatically.

**Fuse Single-Phase Operation Reduction**
Detect faults beyond fuses to de-energize all three-phases.

**Higher Impedance Fault Detection**
Sensitive ground fault (SGF) elements implemented to help isolate for higher impedance faults.
Last year, we expanded the use of EPSS to all powerlines in high fire-risk areas. Expansion drove improvements and these settings effectively helped to prevent wildfires, even with higher risk conditions.

**2022 Program Expansion**

- **100%** of high fire-risk area line miles protected
- **1.82M** customers protected
  - **374%** increase compared to 2021

**Despite 31% more days in R3+ conditions we saw a:**

- **68%** reduction in ignitions*
  - **99%** reduction in ignition impact as measured by fire size**

Data is approximate; *Based on 2022 performance for CPUC-reportable ignitions in HFTD compared to 2018-2020 weather-normalized performance; **Relative to 2018-2020
Minimizing Customer Impacts

Through real-time and continuous improvements, we mitigated customer impacts, without compromising the wildfire prevention benefits of EPSS.

2022 System Performance

- **<3 Hours**
  - Average outage length

- **~770K**
  - Customers impacted

- **56%**
  - Average outage duration reduction compared to 2021

- **877**
  - Customers on average impacted per outage

1.82M Customers protected

Customers experiencing:

- 0 Outages
- 1-2 Outages
- 3-4 Outages
- 5-7 Outages
- 8-9 Outages
- 10+ Outages

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Data as of 12/31/22
Program Expansion and Improvement

By turning 2021 learnings into action, we simultaneously expanded and improved the EPSS Program last year.

Key 2022 improvements based on 2021 learnings:

- Engineered and installed coordinated settings
- Developed and executed circuit-level enablement to maximize risk reduction and reliability
- Refined circuit patrols and better identified fault locations
- Leveraged the Regional Service Model to institute daily outage reviews locally where trends and actions to reduce outages are identified

<table>
<thead>
<tr>
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<th>2021</th>
<th>2022</th>
<th>Improvements</th>
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<tr>
<td>Avg. outage length</td>
<td>~7 hrs</td>
<td>&lt;3 hrs</td>
<td>56% decrease</td>
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<tr>
<td>Avg. customers impacted per outage</td>
<td>~1,100</td>
<td>877</td>
<td>20% decrease</td>
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<tr>
<td>Customers protected</td>
<td>~380,000</td>
<td>~1.82M</td>
<td>374% expansion</td>
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<tr>
<td>Miles protected</td>
<td>45% of HFRA</td>
<td>100% of HFRA</td>
<td>122% increase</td>
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State-of-the-Art Tools to Prevent Wildfires

PG&E’s Fire Potential Index (FPI)

helps us identify wildfire risk by measuring:

Weather
Fuel Moisture
Topography
Fuel Model Type

FPI is calculated each day using:

- Over 8 billion data points leveraging advanced artificial intelligence and machine learning models
- 2x2 km grid cells across the entirety of our high-fire risk areas
- 129-hour look-ahead, rolling forecast

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Structured and Scientific Process to Continuously Evaluate Risk

Scientific Analysis
Using billions of data points to identify where wildfire risk is greatest

Governance (Wildfire Risk Governance Steering Committee)
Ensuring EPSS is maximizing wildfire prevention and minimizing customer impacts

Situational Awareness
Employing state-of-the-art models and our weather monitoring network to assess wildfire risk daily

Operational Capabilities
Enabling protection only during elevated wildfire risk and returning to normal when safe

Adaptation
Monitoring real-time wildfire activity to identify opportunities to further mitigate risk

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**PG&E Utility Fire Potential Index**

- **MOIST FUELS**
  - EPSS enabled if:
    - Wind speed 25+ mph
    - Relative humidity <20%
    - Dead Fuel Moisture <9%

- **EPSS enabled on all circuits**
  - EPSS enabled if:
    - Wind speed 22+ mph
    - Relative humidity <25%
    - Dead Fuel Moisture <9%

- **Transmission enabled R3 and above**

- **VERY DRY FUELS**
  - EPSS enabled during RFW / FWW / mFPC / PSPS adjacent conditions
  - PSPS considered if:
    - Wind gusts 30-40+ mph
    - Relative humidity <30%
    - Dead Fuel Moisture <9-11%

**Last Resort**

**Existing HFRA & HFTD Criteria**

- EPSS enabled during RFW / FWW / mFPC / PSPS adjacent conditions

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**Legend**

- **EPSS** = Emergency Power Shutoff System
- **EPSS Buffer**
- **EPSS enabled if**
- **Transmission enabled R3 and above**
- **R5** = Red Flag Warning
- **RWW** = Fire Weather Watch
- **mFPC** = Minimum Fire Potential Conditions
- **PSPS** = Public Safety Power Shutoff

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Different Types of Outages
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Total Outages in 2022

3.5% of all outages took place on EPSS protected powerlines

96.5% of outages took place on non-EPSS protected powerlines

<table>
<thead>
<tr>
<th>Outage Cause</th>
<th>Outages on Non-EPSS Protected Powerlines</th>
<th>Outages on EPSS Protected Powerlines</th>
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<tbody>
<tr>
<td>PLANNED</td>
<td></td>
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</tr>
<tr>
<td>System Resiliency Work</td>
<td>16,375</td>
<td>0</td>
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<tr>
<td>Maintenance</td>
<td>23,801</td>
<td>0</td>
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<tr>
<td>UNPLANNED</td>
<td></td>
<td></td>
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<tr>
<td>Company Initiated</td>
<td>0</td>
<td>106</td>
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<tr>
<td>3rd Party</td>
<td>2,611</td>
<td>225</td>
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<tr>
<td>Animal</td>
<td>1,871</td>
<td>391</td>
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<tr>
<td>Vegetation</td>
<td>3,068</td>
<td>265</td>
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<tr>
<td>Environmental Impact</td>
<td>443</td>
<td>12</td>
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<tr>
<td>Equipment Failure</td>
<td>11,770</td>
<td>293</td>
</tr>
<tr>
<td>Undetermined</td>
<td>6,427</td>
<td>1,083</td>
</tr>
</tbody>
</table>
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Responding to Outages on EPSS Protected Powerlines

If an outage occurs, we quickly and safely restore power.

We continue to take steps to improve restoration efforts by:

- Installing more fault indicators and line sensors to reduce outage lengths
- Ramping up our fleet of helicopters during wildfire season to expand our overall capabilities and rapidly respond in rough terrain
- Using strategic staffing of Safety and Infrastructure Protection Teams (SIPT) and qualified electric coworkers to enhance response efforts
- Exploring the opportunity to leverage our Grid Data Analytics Tool to streamline response and restoration efforts in real-time

Patrol protection zone if a hazard has not been tagged

Notify PG&E’s Control Center that it’s safe to restore

Prioritize response to hazard to reduce wildfire risk

Address hazard and notify emergency services

Restore power once safe to do so

Dispatch resource(s) to respond to outage within 60 minutes

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Sharing Information and Updates with Customers
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Sharing Outage Information and Updates with Customers

Updates and information for both planned and unplanned outages: pge.com/outages

PLANNED OUTAGES

With advanced notification

1. **Public Safety Power Shutoff**
   - Advanced notification and regular updates
   - Phone calls, texts, emails, social media, news releases, local/tribal government and CBO* outreach, PSPS Portal**

2. **Rotating Outages** (as directed by CAISO)
   - Advanced notification and regular updates
   - Phone calls, texts, emails, social media, news releases, local/tribal government outreach

3. **Planned Maintenance**
   - 10-day advanced notification
   - Phone calls, texts, emails

UNPLANNED OUTAGES

Without advanced notification

1. **Emergency Repairs, Active Wildfires, System Damage**
   - Notification during and after
   - Phone calls, texts, emails

2. **Outages Related to Enhanced Powerline Safety Settings (EPSS)**
   - Notification during and after
   - Phone calls, texts, emails, Outage Portal**
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### Public Safety Power Shutoff
- **Patrol** powerline by foot, vehicle and air for damage
- **Isolate** hazard
- **Repair** any damage by isolating the area
- **Restore** power once it is safe to do so

### Wildfire Safety Work and Maintenance
- **Complete** necessary work
- **Restore** power by PG&E crews*
  *For clearance jobs, crews will coordinate restoration with PG&E’s Control Center

### Outages Related to Enhanced Powerline Safety Settings
- **Patrol** powerline by foot, vehicle and air for damage
- **Isolate** hazard
- **Repair** any damage by isolating the area
- **Restore** power once it is safe to do so

### Emergency Repairs, System Damage and Active Wildfires
- **Patrol** powerline by foot, vehicle and air for damage
- **Isolate** hazard
- **Repair** any damage by isolating the area
- **Restore** power once it is safe to do so

### Efforts That Can Help Shorten Restoration Times
- Strategically staging dedicated helicopters
- Exploring opportunities to further bundle work
- Utilizing existing fault indicators and installing additional devices
- Strategically staging dedicated helicopters

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We have a longstanding outage review process to help drive reliability improvements...

Electric System Outage Review Process

- Ensure outage reviews are conducted in an efficient, consistent and timely manner
- Establish outage review requirements and procedures
- Identify opportunities for improvement to reduce future outages
- Monitor equipment and prioritize repairs

Implemented through our Outage Review Team

...and we’ve built on this to create an enhanced Multi-Outage Review for EPSS (MORE) process.

MORE Process

1. Monitor outage volumes
2. If multiple outages on the same circuit, perform MORE
3. Identify causes and potential actions
4. Make reliability improvements
5. Notify customers of actions

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Supporting Customers with Resources and Backup Power Options
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**EPSS & PSPS Support**

- **Portable Battery Program**
  No-cost portable backup battery solutions, mini-fridges, and insulin cooler wallets

- **Self-Generation Incentive Program**
  Rebates to help customers purchase permanent battery storage

- **Generator and Battery Rebate Program**
  Rebates with purchase of a portable generator or battery

- **Disability Disaster Access and Resources**
  Emergency preparedness planning, portable batteries, and support for Access and Functional Needs customers

- **Fixed Power Solutions**
  Permanent, long-term backup power solutions for the most impacted customers

- **Backup Power Transfer Meter**
  Devices that automatically connect a home to generator power during an outage

**General Wildfire Safety Support**

- safetyactioncenter.pge.com
- 211ca.org
- pge.com/wildfiresafety
- pge.com/epss
- pge.com/psps
<table>
<thead>
<tr>
<th>Program</th>
<th>2022 Qualifications</th>
<th>2023 Qualifications</th>
<th>Customer Offerings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable Battery Program (PBP)</td>
<td>• Enrolled in PG&amp;E’s Medical Baseline Program (MBL) and</td>
<td>• Enrolled in MBL or Self-identified as Vulnerable and have assistive technology or durable medical equipment</td>
<td>No-cost portable battery, mini-fridge, and insulin cooler wallet</td>
</tr>
<tr>
<td></td>
<td>• Located in a Tier 2/3 HFTD or have experienced 2+ PSPS outages since 2020</td>
<td>• Must have experienced at least one PSPS outage in 2021 or 5 or more EPSS outages in 2022</td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Disability Disaster Access and Resources (DDAR)</td>
<td>• Must be an electricity-dependent individual with Access and Functional Needs (AFN*) and</td>
<td></td>
<td>No-cost portable battery, in-event support such as accessible hotel rooms, transportation, fuel cards for generators and food vouchers</td>
</tr>
<tr>
<td></td>
<td>• Located in a Tier 2/3 HFTD and experienced 2 or more PSPS outages since 2020</td>
<td></td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Self-Generation Incentive Program (SGIP)</td>
<td>• General market funds available to all customers, offsetting 15% - 20% of home battery cost</td>
<td>• Equity Resiliency Budget incentives are available for customers who:</td>
<td>$1,500 Incentive on permanent battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Live in Tier 2/3 HFTD or have experienced 2+ PSPS outages and</td>
<td>------------------------------------------------------------------------------------------------------</td>
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<tr>
<td></td>
<td></td>
<td>- Are a MBL, Low Income, SASH, DAC-SASH, MASH, SOMAH, or electric well pump customer</td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fixed Power Solutions: Residential Storage Initiative</td>
<td>• Must be enrolled in CARE and meet eligibility</td>
<td></td>
<td>No-cost permanent battery and installation</td>
</tr>
<tr>
<td>Generator and Battery Rebate Program (GBRP)</td>
<td>• Have a residential/business PG&amp;E electric account and</td>
<td>• Have a residential or business PG&amp;E electric account and</td>
<td>$300 rebate to offset cost of a portable generator or battery and</td>
</tr>
<tr>
<td></td>
<td>• Located in a Tier 2/3 HFTD, served by an EPSS-capable line and experienced 2+ PSPS outages and</td>
<td>• Located in a Tier 2/3 HFTD or served by an EPSS-protected circuit and</td>
<td>$200 rebate (or $500 total) if customer is CARE/FERA</td>
</tr>
<tr>
<td></td>
<td>• Products purchased must be on the qualified products list</td>
<td>• Products purchased must be on the qualified products list</td>
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</tr>
<tr>
<td>Backup Power Transfer Meter Program</td>
<td>• Focused on Tier 2 or Tier 3 HFTD and/or served by an EPSS-protected circuit</td>
<td></td>
<td>No-cost meter and installation</td>
</tr>
<tr>
<td></td>
<td>• Participant must be the PG&amp;E customer of record</td>
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<td></td>
<td>• Participant is the owner of the site or has the owner’s permission for the site’s participation</td>
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*Individuals who are at an increased risk of harm to their health, safety and independence during a PSPS
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<table>
<thead>
<tr>
<th>Program</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023 Year-To-Date</th>
<th>Total Inception-To-Date</th>
<th>2023 Target</th>
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</thead>
<tbody>
<tr>
<td>Portable Battery Program (PBP)</td>
<td>5,569</td>
<td>5,135</td>
<td>7,780</td>
<td>132*</td>
<td>18,616</td>
<td>4,700 batteries</td>
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<td>Disability Disaster Access and Resources (DDAR)</td>
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<tr>
<td>- 1,004 batteries</td>
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<td></td>
<td></td>
<td>158 batteries*</td>
<td></td>
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<tr>
<td>- 1,650 assessments</td>
<td></td>
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<td>574 assessments*</td>
<td></td>
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<tr>
<td>- 550 hotels</td>
<td></td>
<td></td>
<td></td>
<td>0 other in-event support (no PSPS in 2022)</td>
<td>4,200 batteries</td>
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<tr>
<td>- 900 food vouchers</td>
<td></td>
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<td>As needed in-event support</td>
<td>7,400 assessments</td>
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<td>898 hotels</td>
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<td>- 30 transportation</td>
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<td>1,248 food vouchers</td>
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<td>- 1,371 batteries</td>
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<td>- 158 batteries*</td>
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<td>- 574 assessments*</td>
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<tr>
<td>- 348 hotels</td>
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<td>348 food vouchers</td>
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<td>- 2 transportation</td>
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<td>2 transportation</td>
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<tr>
<td>Self-Generation Incentive Program (SGIP) Interconnections</td>
<td>608 ERB</td>
<td>1,785 ERB</td>
<td>1,816 ERB</td>
<td>198 ERB*</td>
<td>4,407 ERB</td>
<td>950 ERB</td>
</tr>
<tr>
<td>- 3,790 other SGIP</td>
<td>3,813 other SGIP</td>
<td>3,591 other SGIP</td>
<td>301 other SGIP</td>
<td>11,495 other SGIP</td>
<td>1,850 other SGIP</td>
<td></td>
</tr>
<tr>
<td>Fixed Power Solutions: Residential Storage Initiative</td>
<td>N/A</td>
<td>N/A</td>
<td>29 permanent battery storage installations</td>
<td>29 permanent battery storage installations</td>
<td>58 permanent battery storage installations</td>
<td>600 – 650 permanent battery storage installations</td>
</tr>
<tr>
<td>Generator and Battery Rebate Program (GBRP)</td>
<td>108</td>
<td>1,200</td>
<td>2,244</td>
<td>412*</td>
<td>3,964</td>
<td>1,300 rebates</td>
</tr>
<tr>
<td>Backup Power Transfer Meter Program</td>
<td>N/A</td>
<td>84</td>
<td>1,344</td>
<td>200*</td>
<td>1,628</td>
<td>3,000 installations</td>
</tr>
</tbody>
</table>

*As of February 2023, YTD
Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.

Resource and support offerings are available to all customers, dependent on eligibility, and we are doing even more for our more frequently impacted and vulnerable customers who have not previously participated in resiliency offerings.

**Broad Support For All Customers**
Resource and support offerings are available to all customers, dependent on eligibility.

**Additional, Targeted Support**
In addition, we provide targeted outreach, enhanced offerings and have expanded eligibility for our more frequently impacted customers.

**Customers More Frequently Impacted**

- **110,000 General Market Customers**
  (6.5% of population)

- **17,000 CARE/FERA Customers**
  (6.1% of population)

- **8,700 Medical Baseline Customers**
  (8.5% of population)

- **3,200 Self-Identified Vulnerable customers**
  (10% of population)

*More Frequently Impacted Customers: *Customers who experienced 2+ PSPS or 5+ EPSS outages in 2022. **Customers who experienced a PSPS outage in 2021 or 5+ EPSS outages in 2022.

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

Refined Daily Enablement Process

Improvements to operational capabilities, allowed us to enable EPSS only during elevated wildfire risk and return to normal when safe to do so.

Avoided Customer Impact by Projected CESO*

Had we left each enabled circuit on for the duration of wildfire season, CESO impacts would have been **292% higher***

Actual 2022 CESO

CESO: Customers Experiencing a Sustained Outage

*Data through 2/13/2023. “Avoided Outages” aggregates increased customer impact based on presumed upstream EPSS device operation for unplanned outages on downstream fuses, trip savers and reclosers when EPSS was not enabled. Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.
Operational Improvements Based On Outage Reviews

Based on outage review findings, specific improvements were made to circuits to improve reliability.

Sample Improvements

**60+ days without an outage after MORE**

- **Konocti 1102**
  - Fault indicators installed to improve restoration times
  - Refinements to settings to limit outages

**Data as of 12/21/22**

**65+ days without an outage after MORE**

- **Curtis 1705**
  - Switch and line recloser replacements identified based on fault origins
  - Adjusted line recloser sensitivity to reduce outages

**Data as of 12/5/22**

**36+ days without an outage after MORE**

- **Templeton 2110**
  - Adjusted line recloser settings to better identify faults
  - Installed 15 fault indicators to improve restoration times

**Data as of 12/5/22**

**60+ days without an outage after MORE**

- **Tassajara 2103**
  - Installed fault indicators to improve restoration times
  - Implemented new circuit configuration to reduce frequency of EPSS enablement
  - Completed load transfer to limit outages

**Data as of 12/5/22**

Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.
To improve EPSS and further enhance wildfire risk reduction, we have implemented two innovative solutions.

47% of ignitions in high fire-risk areas while EPSS were enabled resulted from low-current, high-impedance faults. Because these faults occur at a low-current, they may not be caught with existing EPSS protection.

Solutions to mitigate this risk:

Down Conductor Detection (DCD)
- Uses sophisticated harmonic analysis to detect arcing during high-impedance faults and provides enhanced ground fault protection

Partial Voltage Force Out (PVFO)
- Leverages our existing SmartMeter network to support the identification and response to low- and very-low high-impedance faults
Improved Communications with Customers

We improved customer communications through expanded engagement and implementation of a Community Outreach and Support Program last year.

Community Outreach and Support Program

Implemented for circuits experiencing multiple interruptions on EPSS-enabled zones.

1. Planning Prioritization
   Circuits identified for review based on five reliability criteria

2. Operations Review
   Operations initiates a cross-functional review of the circuit

3. Customer Outreach
   We conduct community outreach to communicate findings and mitigating actions

Outreach and Engagement

- 114 local government forums with cities and counties
- 70 customer IVRs
- 53 social media posts across channels
- 44 county-specific EPSS maps
- 43 public webinars and town halls
- 15 emails/direct mail items to customers
- 12 local government agency emails
- 9 community-focused EPSS webinars

Data through 1/18/23

Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.
Efforts To Improve Reliability and the Customer Experience

We are continuing to engage and provide resources to all customers and increasing our efforts with those customers most impacted. This includes:

- **TARGETING** additional outreach and engagement to the most impacted customers
- **EXPANDING** backup power support for vulnerable and highly impacted customers
- **INSTALLING** more fault indicators and line sensors to reduce outage lengths
- **IMPROVING** outage notifications so they are clearer and more accurate
- **CONDUCTING** targeted vegetation management and animal mitigation work
- **IMPROVING** reliability using our Multi-Outage Review for EPSS process
- **SUPPORTING** customers through our partnerships with community-based organizations

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