

Portland General Electric

From Climate Risk to Resilience

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Wildfire Operations Program Management

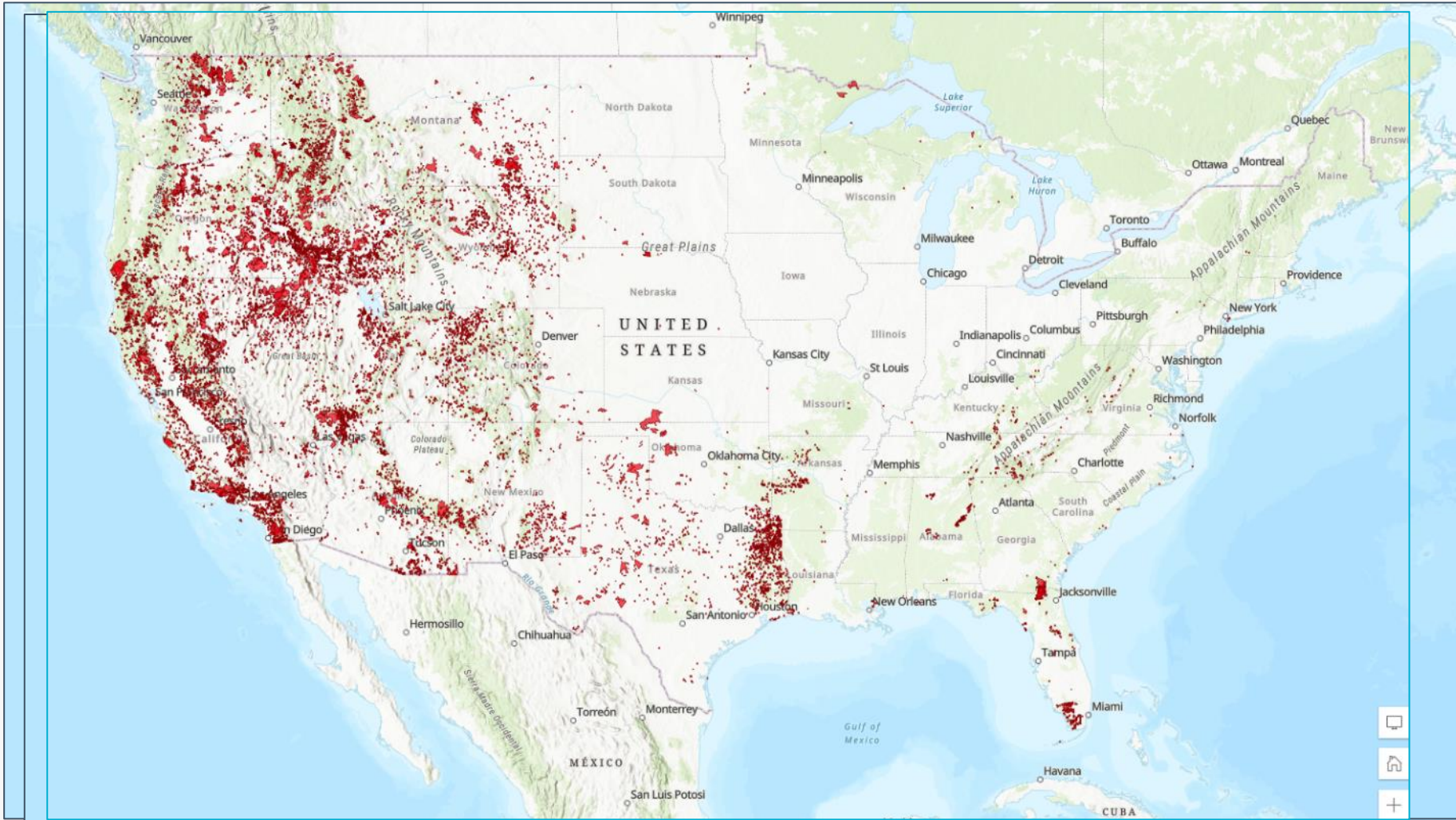


RIMS
OREGON CHAPTER

Agenda

- The effects of climate change on weather patterns and the rise of catastrophic wildfires in the West
- Portland General Electric (PGE) introduction
- State of Oregon regulatory action
- PGE's Wildfire Mitigation Plan (WMP)
 - WMP initiatives and actions

Wildfires across the United States 2000 - 2018



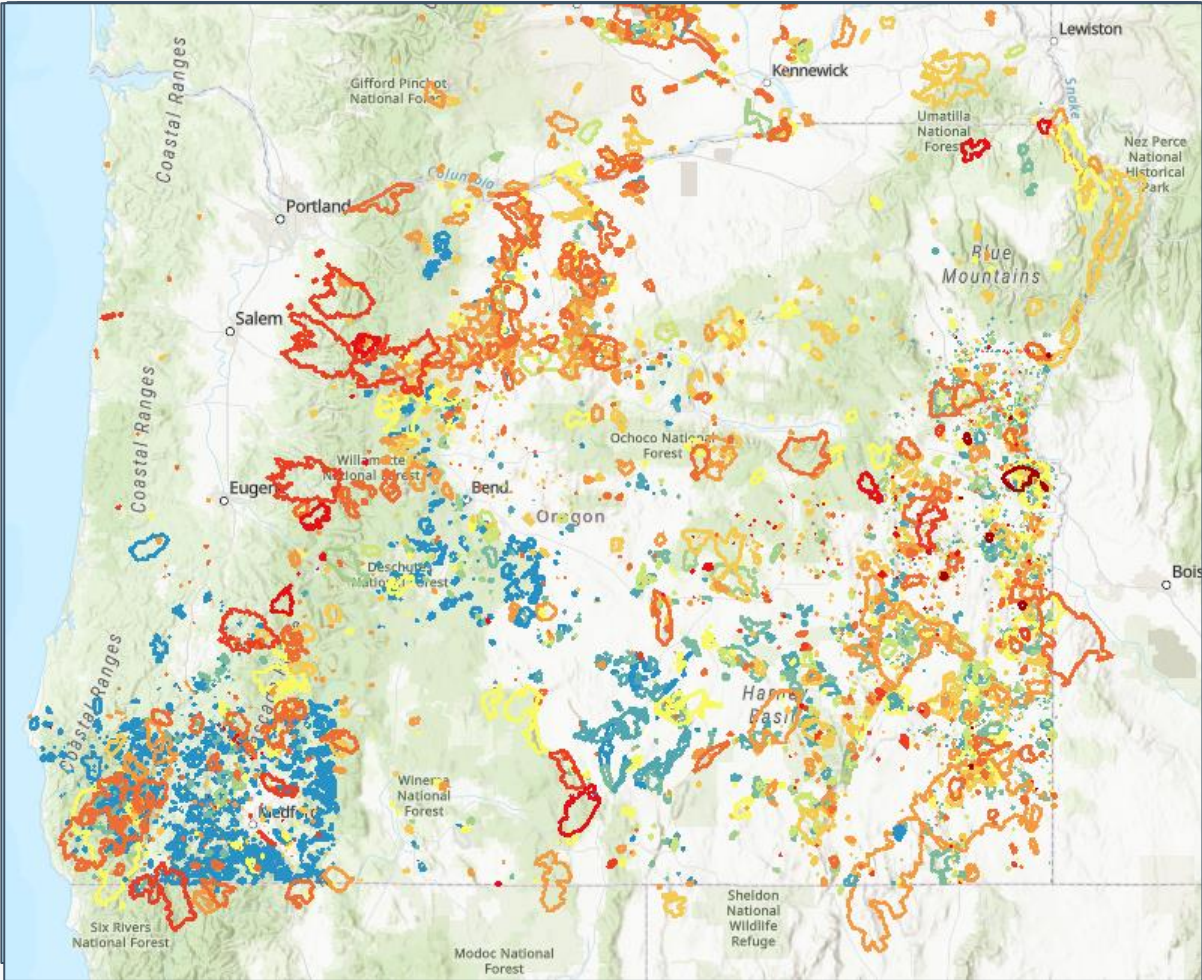
US Wildfires - 2000-2005

US Wildfires - 2006-2012

US Wildfires - 2013-2018

US Wildfires - 2000-2018

Wildfires across Oregon (Pre1980 - 2023)



Pre-1980

1980-89

1990-99

2000-09

2010-19

2020-23

All Time

PGE at a glance

3,300+ MWs of Generation

Quick facts

- Vertically integrated electric utility encompassing generation, transmission and distribution
- Approximately 926,000 retail customers within a service area of approximately 1.9 million residents
- Roughly half of Oregon's population lives within PGE service area, encompassing 51 incorporated cities entirely within the State of Oregon
- Roughly two-thirds of Oregon's commercial and industrial activity occurs in PGE service area



Leading the way to a clean energy future for Oregon

- Our goals align with the 100% clean energy by 2040 framework as mandated by ORS 469A.410. The targets to reduce baseline greenhouse gas emissions from power served to Oregon retail customers are:
 - 80% reduction in greenhouse gas emissions by 2030
 - 90% reduction in greenhouse gas emissions by 2035
 - 100% reduction in greenhouse gas emissions by 2040

Financial snapshot

- 2022 revenue: \$2.6 billion
- 2022 diluted earnings per share: \$2.60 GAAP, \$2.74 adjusted non-GAAP
- Net utility plant assets: \$8.0 billion⁽¹⁾

(1) As of December 31, 2022

Oregon's legislative and regulatory actions

Recognizing the rapidly increasing threat of wildfire due to climate change, Oregon has taken an all-hands on deck approach with several significant actions in the last four years to reduce wildfire risk throughout the state.

2019: Establishment of Governor's Wildfire Response Council tasked with reviewing Oregon's current model for wildfire prevention, preparedness and response. Work resulted in a recommendation report for action to improve the state's wildfire prevention and response.

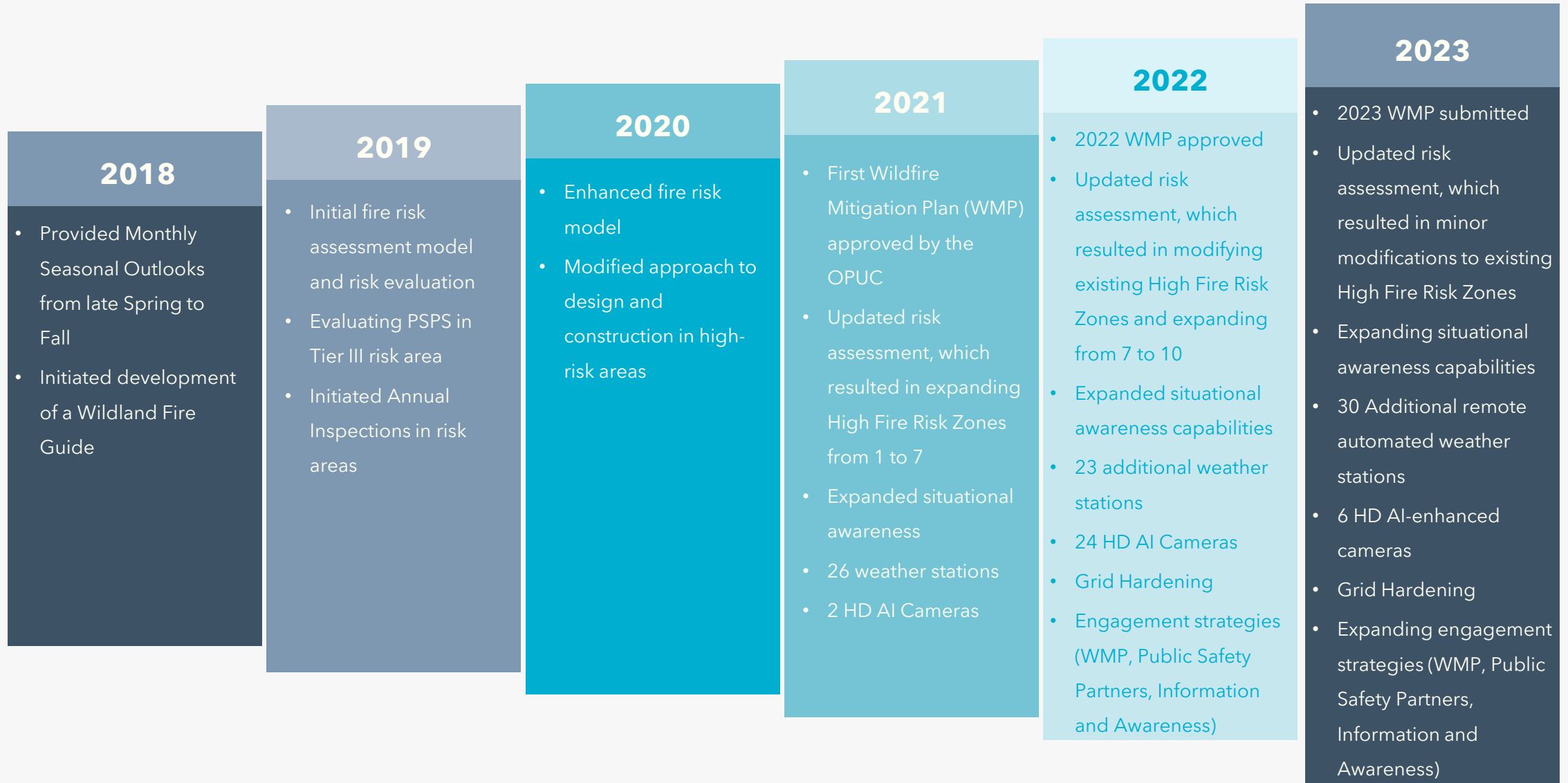
2020: Governor Brown issues EO 20-04 which, among other things, directs the Oregon Public Utility Commission (OPUC) to evaluate utility risk-based wildfire protection plans consistent with the Wildfire Response Council's report.

2021: Oregon Legislature passes SB 762, the state's comprehensive wildfire bill based on the recommendations of the Wildfire Council. The bill included direction to ten state agencies, including the OPUC. Electric utilities are required to submit risk-based wildfire mitigation plans to their governing body which includes wildfire risk analysis mapping and mitigation investments.

2022: OPUC completes rulemaking related to the implementation of SB 762.



PGE's Wildfire Mitigation Journey

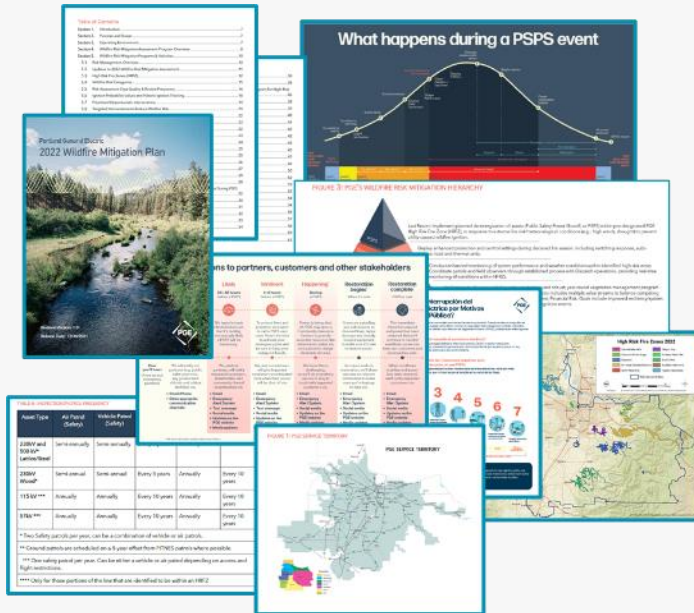


2023 Wildfire Mitigation Plan (WMP)

**Submitted to OPUC
12.22.22**

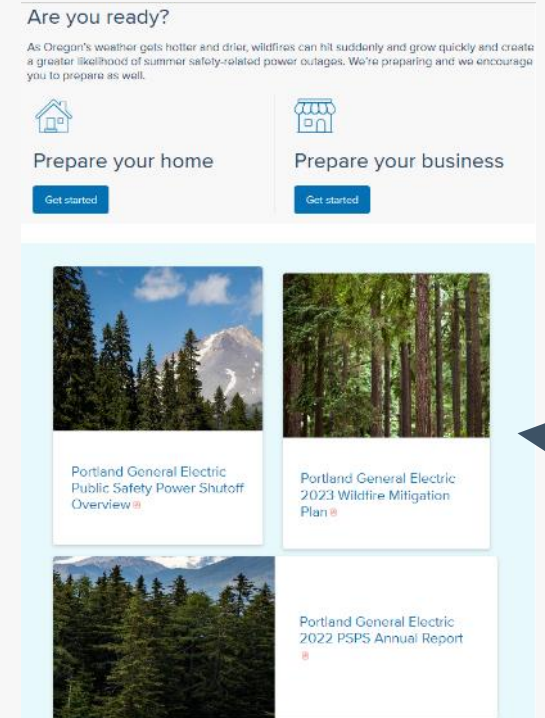
WMP Topics Include:

Available Online:



- ✓ Wildfire Risk Mitigation Programs & Activities
- ✓ Operating Protocols
- ✓ Operations During PSPS Events
- ✓ Asset Management & Inspections
- ✓ Vegetation Management
- ✓ Community Outreach & Public Awareness
- ✓ Research & Development

Approval expected no later than 06.19.23 (180 days from submission)



WMP on [Portlandgeneral.com](https://portlandgeneral.com)

Wildfire Risk Framework

$$\text{Risk (Wildfire)} = \text{Likelihood} * \text{Consequence}$$

Variables

- Likelihood of a spark
- Likelihood of fire propagation
- Likelihood of impact

Datasets*

- Asset health data/fault/outages
- Fire behavior (wind, burn probability, temperature, topology, humidity, moisture)
- Energy release component, fuel/land cover

Variables

- Safety
- Environment
- Reliability
- Financial

Datasets*

- Total costs of wildfire study
- Watershed/surface water
- Cultural/Historic areas
- Habitat/Species (Salmon, Wetlands etc.)
- Property
- Critical infrastructure (railways, highways etc.)
- Historic structures
- Population density/housing

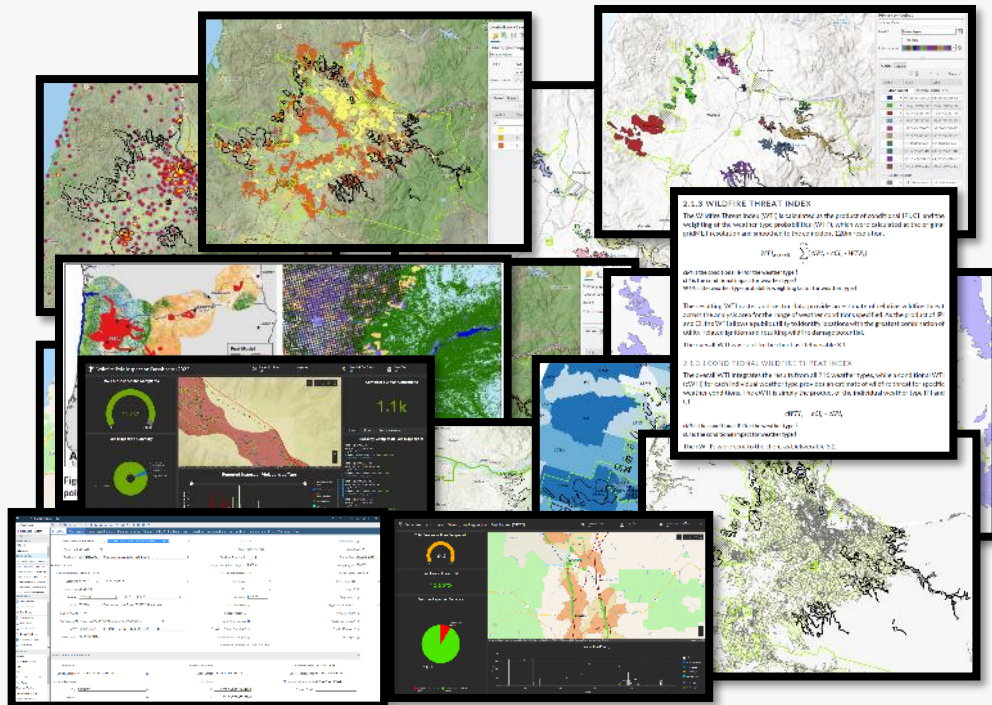
Risk of wildfire calculated at individual structure/pole location

* Does not reflect comprehensive inventory

Factors considered in High Fire Risk Zone designation

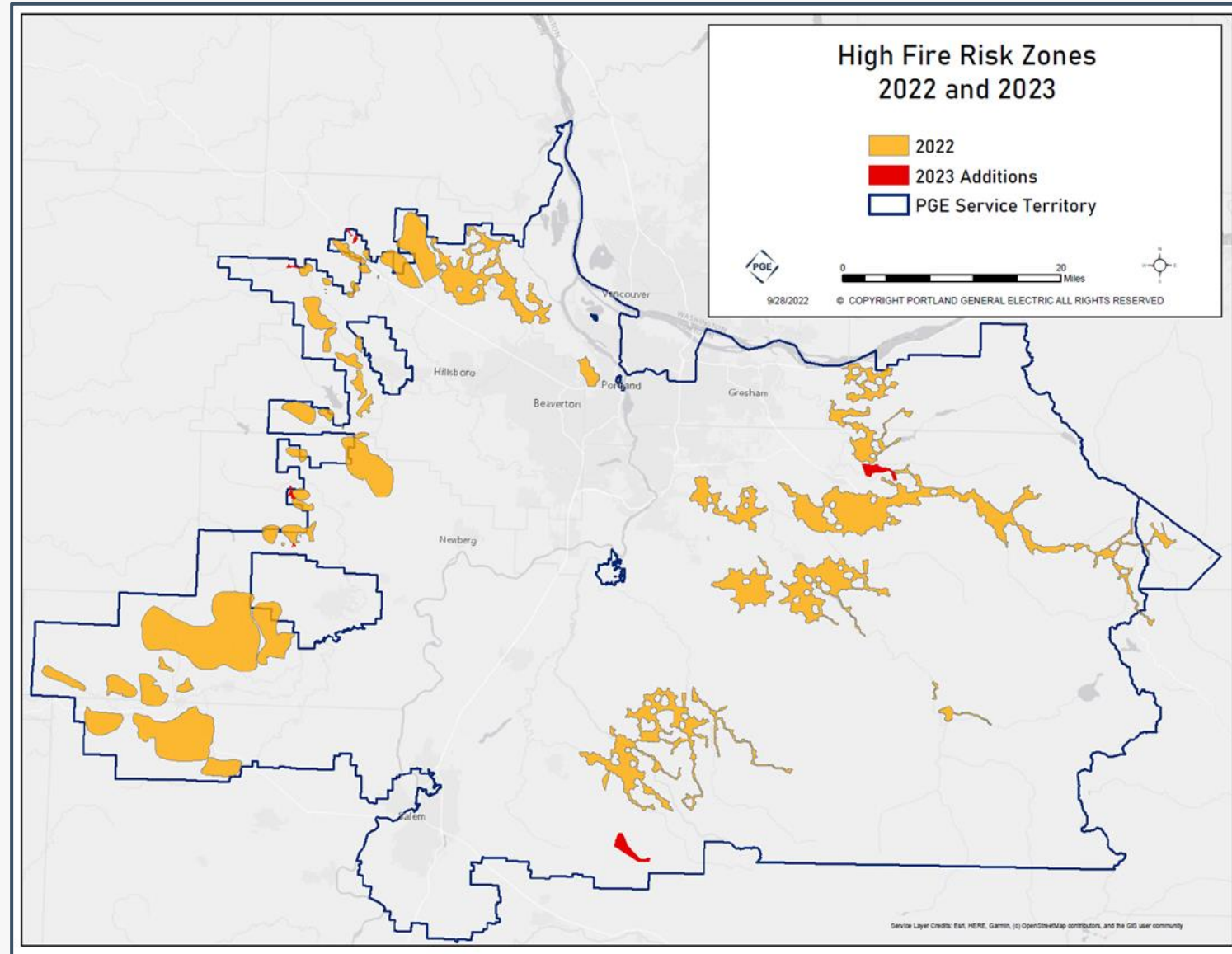
HFRZ are the areas where there is the highest risk, both in likelihood and consequence, of PGE equipment starting a wildfire

More than two dozen data sets are assessed to determine these areas



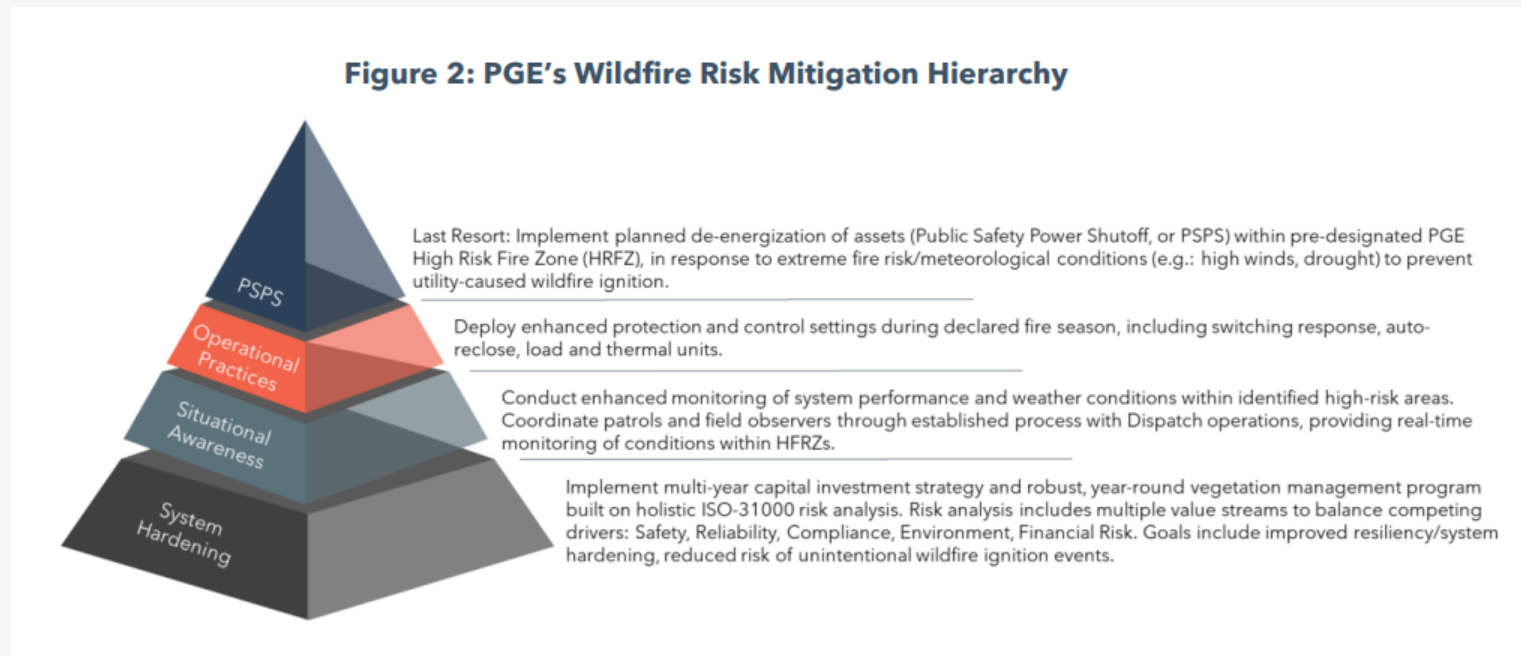
- Service territory & PGE structures
- Existing structure type & load
- Assessments from nationally recognized experts
- Consultations with local fire chiefs
- Current asset health
- Population & meter density
- Terrain slope & aspect
- Road/egress access & condition
- USDA's WF Risk to Communities
- Drinking water & watersheds
- CDC's social vulnerability indices
- Fire station proximity & access
- Road/egress access & condition
- Critical habitats
- WU boundaries
- Cultural & scenic landmarks
- Meteorology benchmarks
- Outage history
- Comparative metrics

High Fire Risk Zones (2023)



WMR | Purpose and Goals

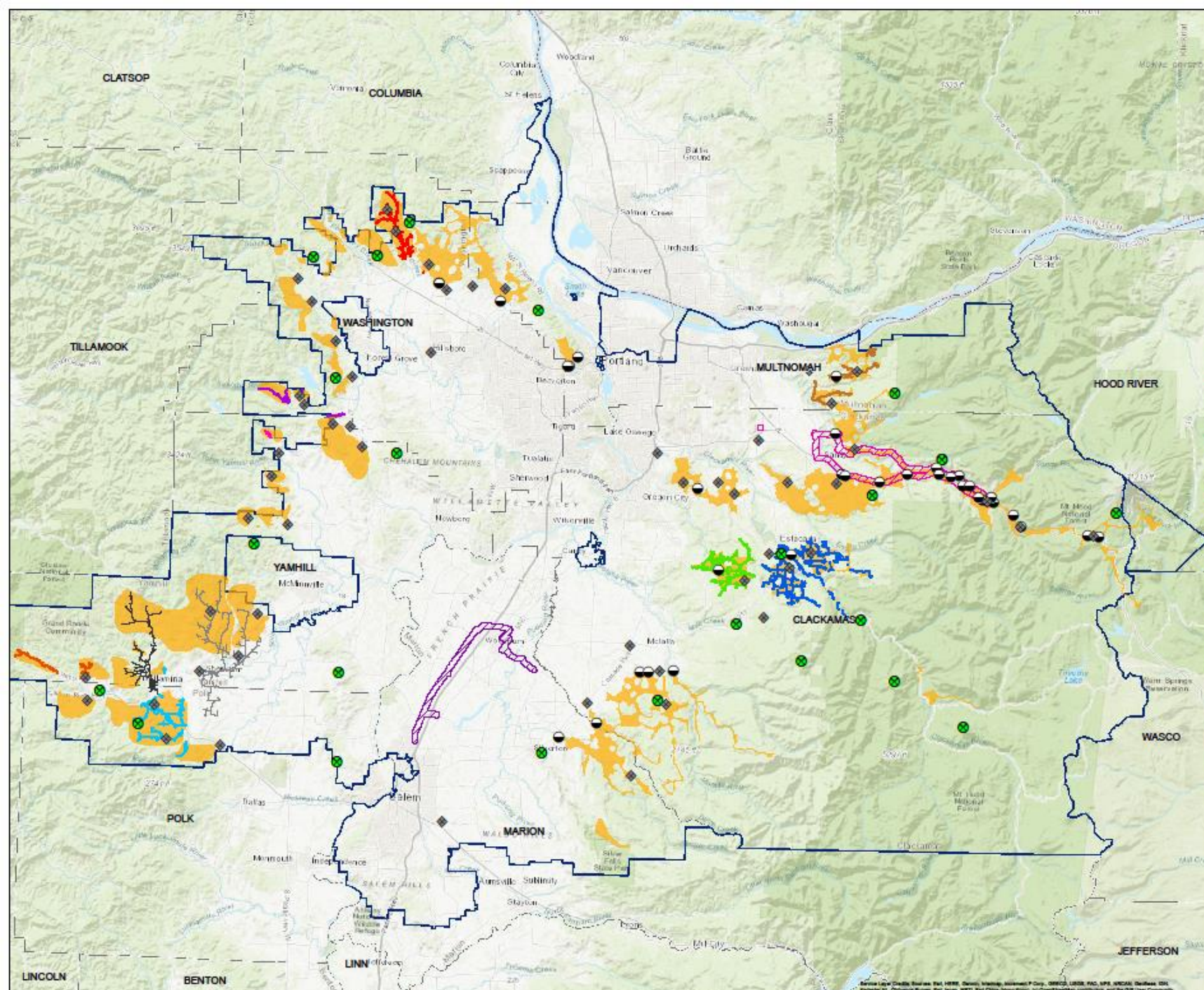
PGE's Wildfire Mitigation & Resiliency (WM&R) organization plans and implements the Wildfire Mitigation Program, developing and coordinating wildfire mitigation activities across the company.



PGE's goal is to improve regional safety by reducing the risk that PGE's electric utility infrastructure could cause a wildfire, while limiting the impacts of Public Safety Power Shutoff (PSPS) events and other mitigation activities on customers and increasing the resiliency of PGE assets to wildfire damage.



Planned Wildfire Mitigation Programmatic Investments



- ◆ PGE Weather Stations
 - ⦿ Viper Reclosers in HRFZ
 - Wildfire Cameras
- Wildfire Mitigation Projects**
- ESTACADA-NORTH FORK (81.88 mi)
 - GRAND RONDE-AGENCY (9.75 mi)
 - LELAND-CARUS (43.69 mi)
 - NORTH PLAINS-NORTH PLAINS 13 (23.65)
 - ORIENT-OXBOW (19.47 mi)
 - SCOGGINS-CHERRY GROVE (8.39 mi)
 - WILLAMINA-BUELL (33.28 mi)
 - YAMHILL-YAMHILL 13 (1.21 mi)
- Fuse Replacement Projects**
- SHERIDAN-EAST (67.54 mi)
 - WILLAMINA-BRIDGE (43.02 mi)
- High Fire Risk Zone
 - ▨ Building Resilient Infrastructure & Communities Project
 - ▨ Willamette Valley Resiliency Project
 - PGE Service Territory





Advanced Wildfire Risk Reduction (AWRR)

AWRR reduces the risk and impacts of wildfire within our service territory through annual inspection cycles, prescriptive trimming, and enhanced vegetation control techniques. Initiated during Q2 2019, the program is continuously evaluated for efficacy and strategic expansion. With the (10) HRFZ's today, PGE inspects over 571,000 trees.



An Asplundh tree crew member ascends a tree during pruning operations in Mt. Hood National Forest to remove dead and dying limbs, mitigating impact to the lines below.



An Asplundh crew member removing dead branches during a tree removal operation in Mt. Hood National Forest.

Enhancing Situational Awareness

Early Fault Detection System

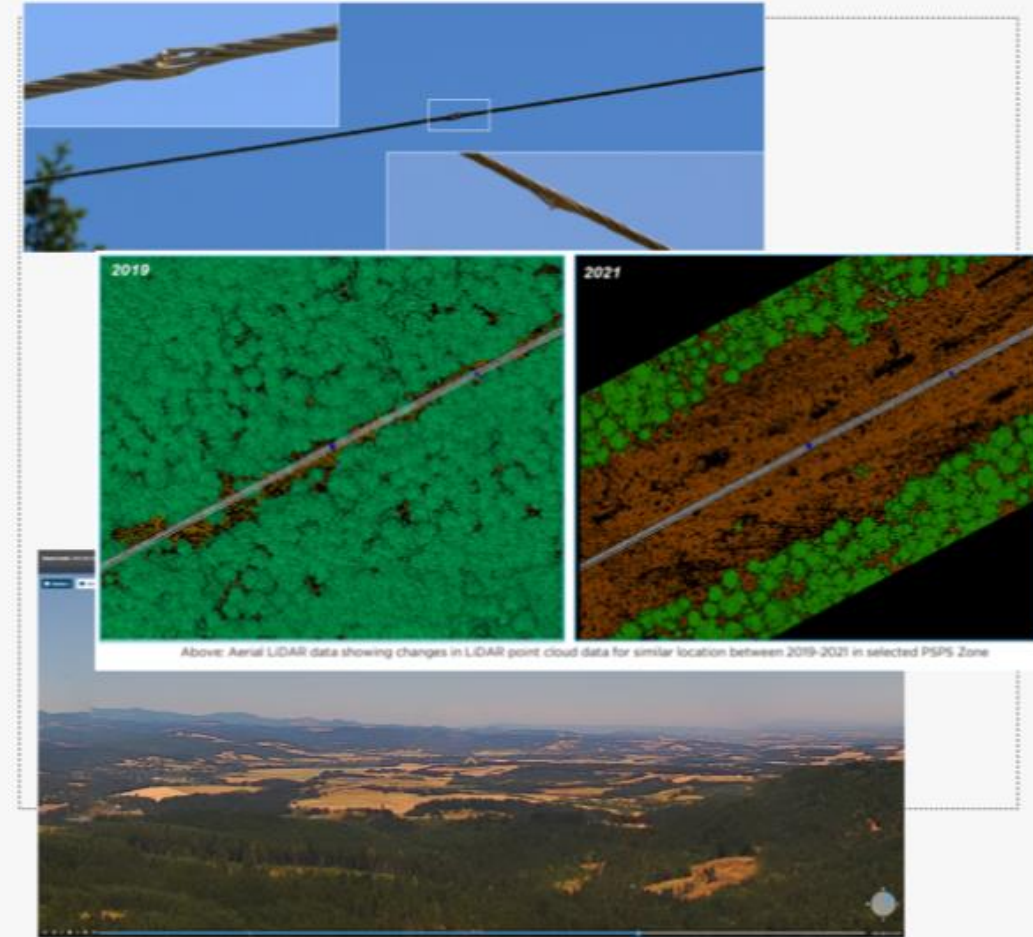
Detects energy detection signals on the distribution system that are present when equipment on the circuit begins to fail, but has not escalated to an arcing fault

Artificial Intelligence Cameras

Detects ignitions and triangulates their location within 100m accuracy to fire agencies in real-time

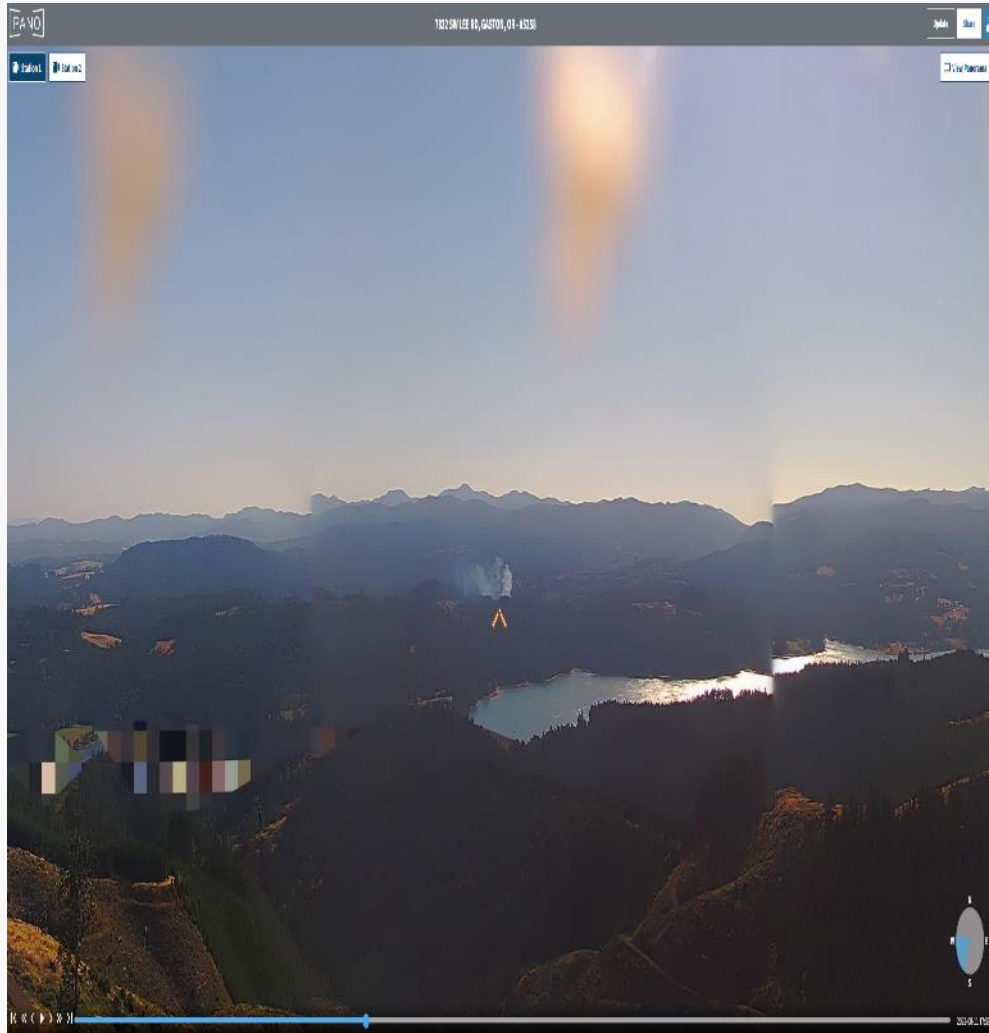
Wildfire/Asset Management Technology and Processes

Using drive by and aerial inspection data including hyper-spectral imagery/Lidar to perform both-as-built records and inform design

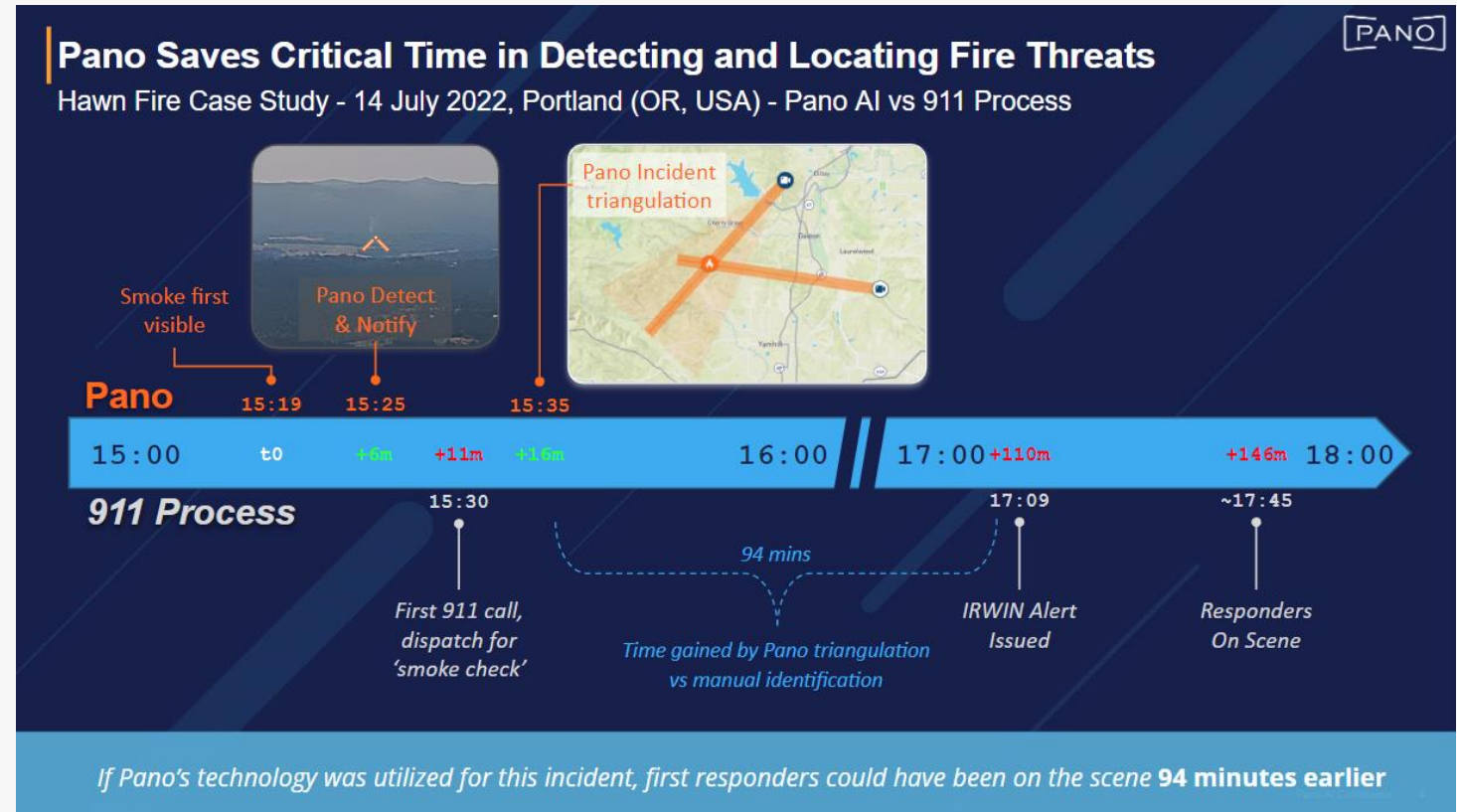


From top to bottom: a damaged conductor flagged by early fault detection sensors; LIDAR data of vegetation density/health; a fire detected by AI cameras

World leading ignition detection



Hawn fire 7.14.22 zone 9



Case study of ignition timing vs historical

Operating Protocols

1

Device Settings



Normal



Fire Season



Red Flag Warning

2

Fire Season Work Practices

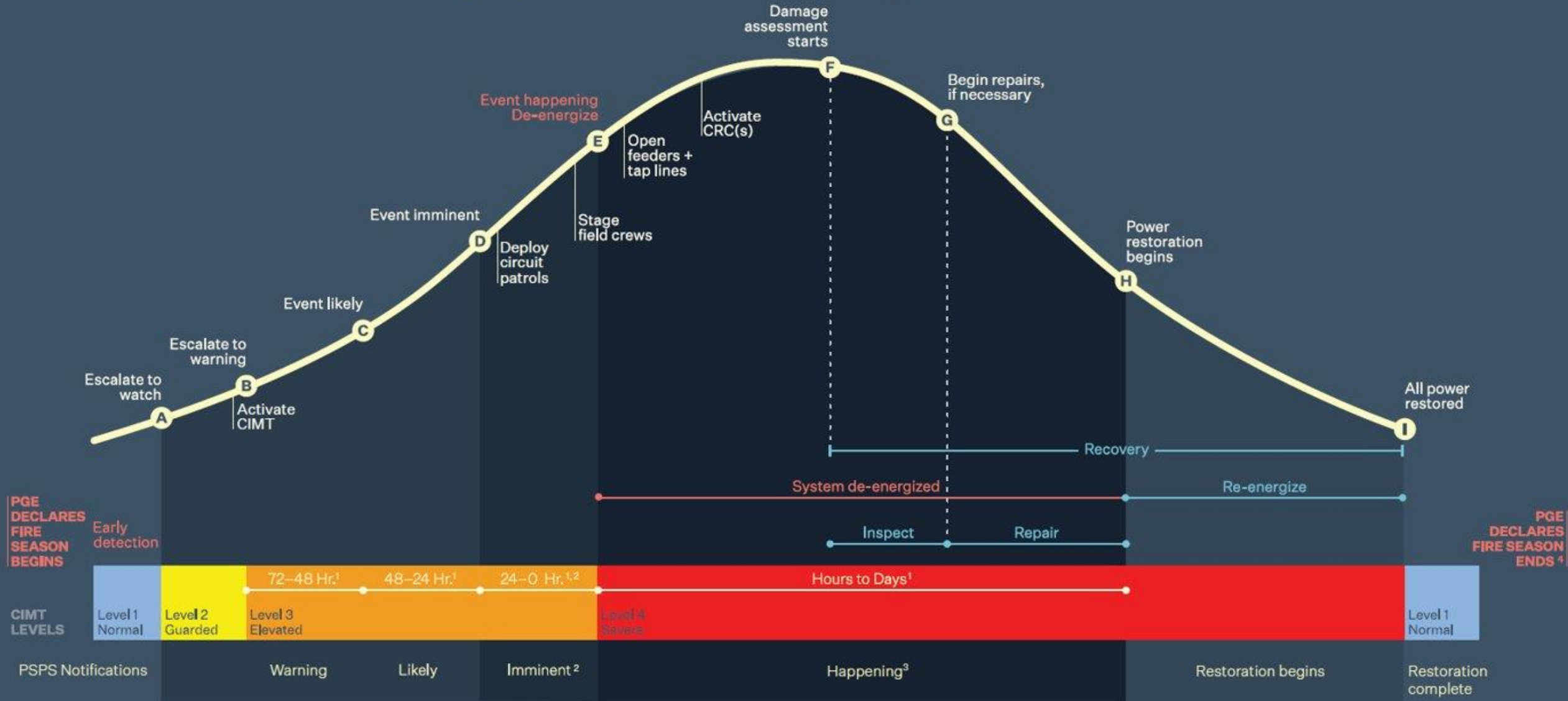
- Fire Trailer
- Fire Season Suppression Tools and Equipment
- Fire Season Tailboard Supplement
- Red Flag Warning

3

Employee and Supplier Training

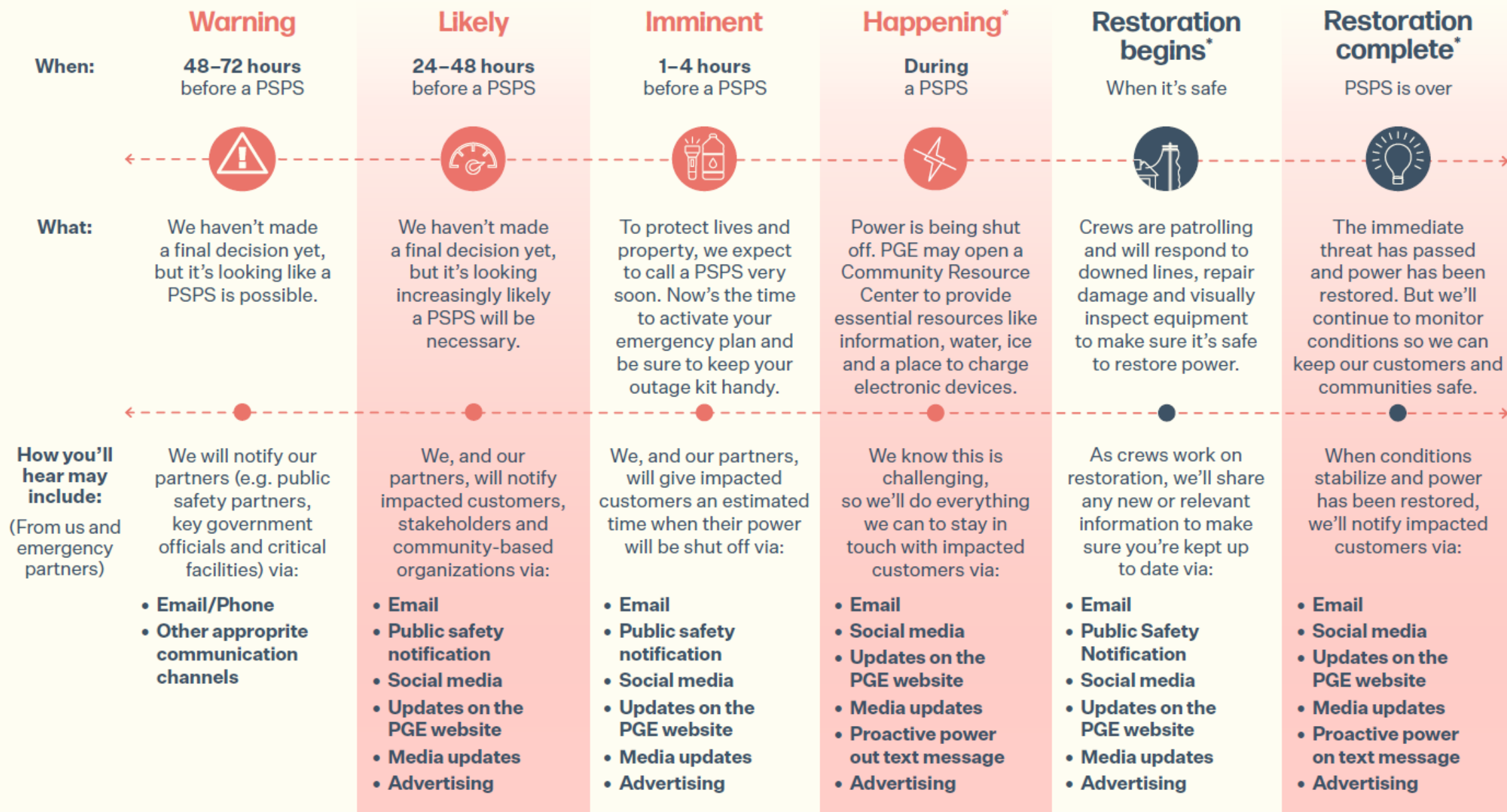
- Fuels, weather and topography impact on wildfire ignition and spread
- Fire weather zone forecasts
- Suppression tools and equipment
- Basic suppression tactics
- Lookouts, communications, escape routes, and safety zones

What happens during a PSPS event



1. Actual timeline dependent on severity of factors. 2. In this phase we communicate status to all customers, per compliance, 1-4 hours prior to the outage. 3. In this phase PGE will provide status updates at least every 24 hours. 4. PGE will submit an Annual OPUC Report no later than December 31st.

PSPS notifications to partners, customers and other stakeholders



*PGE will provide status updates at least every 24 hours

Recharge Relief Activation Strategy



WHAT IS RECHARGE RELIEF?

- Nimble Mobile Readiness Units (MRUs) deployed within hours of a Public Safety Power Shut-off serving impacted communities
- PGE branded trailer providing support and information, staffed by experienced emergency management professionals, and adaptable to everchanging weather conditions, variety of terrains, and spaces

HOW DOES IT WORK?

- A Recharge Relief MRU will be at a predetermined location as a Public Safety Power Shut-off is activated
- Recharge Relief MRUs are approachable by walk-up, have tables and chairs under an awning, and drinkable water for consumption all while customers charge and get the information they need

WHERE IS IT LOCATED?

- PGE's goal is for Recharge Relief MRUs to be in or near active PSPS zones where vulnerable customers need us most
- A diversity, equity, and inclusion lens was used to determine where to locate and we're making sure the places we choose are fully accessible, on or near main roads, and likely known locations within the community
- Locations will be shared with impacted consumers when the PSPS is activated, on PGE's wildfire PSPS page
- Some PSPS areas may need to share a Recharge Relief MRU depending on availability and staffing

Proposed Project: Portable Battery Pilot

Budget: \$100,000

Objective: Increase resilience for
vulnerable customers affected by PSPS



- Small scale study to provide portable batteries to med cert customers affected by PSPS
 - Note: These are not grid tied batteries, which would be about 10x the cost to provide.
- PGE will study the procurement, distribution, and customer experience
- Initial intent is to provide backup for medical devices, but possible expansion could include devices for keeping medication cold
- Extensive research was conducted prior to proposing this pilot
 - In-depth interviews with adults living with disabilities, caregivers, and community service providers
 - Quantitative survey research of adults with disabilities and caregivers
 - Secondary research of peer utilities in California, interviews with battery manufacturers, and technical studies by EPRI



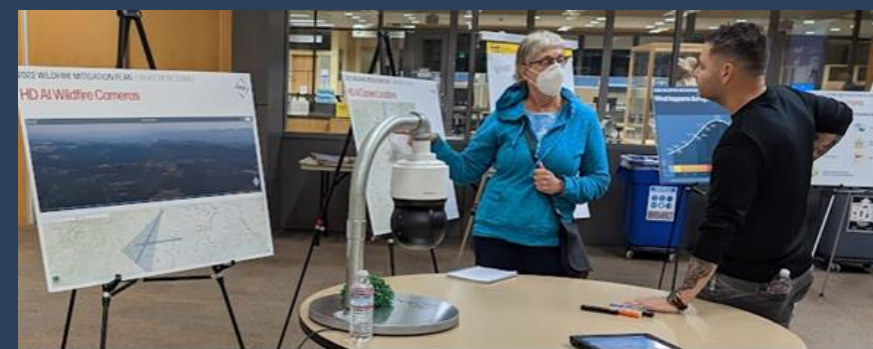
WMP Engagement Strategy

2022 Lessons Learned

- Timing of sessions, and location of in-person sessions, is critical
- Issues and concerns were broader than utility wildfire mitigation

2023 Plan

- Increase quantity of in-person sessions
- In-person sessions will be within, or adjacent to, PSPS areas
- Hold sessions as early as June 2023
- A wider range of stakeholders, both internal and external, will be invited to participate in each event
 - Create a more community-centric and holistic experience for customers



**Let's
meet the
future
together.**