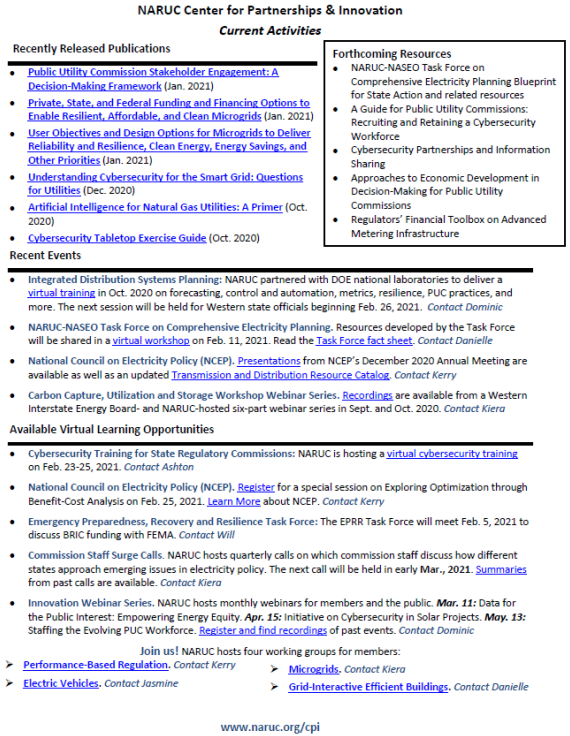
ABOUT NARUC

- The National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization founded in 1889.
- Our Members are the state utility regulatory Commissioners in all 50 states & the territories. FERC & FCC Commissioners are also members. NARUC has Associate Members in over 20 other countries.
- NARUC member agencies regulate electricity, natural gas, telecommunications, and water utilities.

ABOUT NARUC'S CENTER FOR PARTNERSHIPS & INNOVATION

- Grant-funded team dedicated to providing technical assistance to members.
- CPI identifies emerging challenges and connects state commissions with expertise and strategies to inform their decision making.
- CPI builds relationships, develops resources, and delivers trainings.



NARUC Center for Partnerships & Innovation

Current Activities

Recently Released Publications

- Public Utility Commission Stakeholder Engagement: A Decision-Making Framework (Jan. 2021)
- Private, State, and Federal Funding and Financing Options to Enable Resilient, Affordable, and Clean Microgrids (Jan. 2021)
- User Objectives and Design Options for Microgrids to Deliver Reliability and Resilience, Clean Energy, Energy Savings, and Other Priorities (Jan. 2021)
- Understanding Cybersecurity for the Smart Grid: Questions for Utilities (Dec. 2020)
- Artificial Intelligence for Natural Gas Utilities: A Primer (Oct. 2020)
- Cybersecurity Tabletop Exercise Guide (Oct. 2020)

Forthcoming Resources

- NARUC-NASEO Task Force on Comprehensive Electricity Planning Blueprint for State Action and related resources
- A Guide for Public Utility Commissions: Recruiting and Retaining a Cybersecurity Workforce
- Cybersecurity Partnerships and Information Sharing
- Approaches to Economic Development in Decision-Making for Public Utility Commissions
- Regulators' Financial Toolbox on Advanced Metering Infrastructure

Recent Events

- **Integrated Distribution Systems Planning:** NARUC partnered with DOE national laboratories to deliver a virtual training in Oct. 2020 on forecasting, control and automation, metrics, resilience, PUC practices, and more. The next session will be held for Western state officials beginning Feb. 26, 2021. *Contact Dominic*
- **NARUC-NASEO Task Force on Comprehensive Electricity Planning.** Resources developed by the Task Force will be shared in a virtual workshop on Feb. 11, 2021. Read the Task Force fact sheet. *Contact Danielle*
- **National Council on Electricity Policy (NCEP).** Presentations from NCEP's December 2020 Annual Meeting are available as well as an updated Transmission and Distribution Resource Catalog. *Contact Kerry*
- **Carbon Capture, Utilization and Storage Workshop Webinar Series.** Recordings are available from a Western Interstate Energy Board- and NARUC-hosted six-part webinar series in Sept. and Oct. 2020. *Contact Kiera*

Available Virtual Learning Opportunities

- **Cybersecurity Training for State Regulatory Commissions:** NARUC is hosting a virtual cybersecurity training on Feb. 23-25, 2021. *Contact Ashton*
- **National Council on Electricity Policy (NCEP).** Register for a special session on Exploring Optimization through Benefit-Cost Analysis on Feb. 25, 2021. Learn More about NCEP. *Contact Kerry*
- **Emergency Preparedness, Recovery and Resilience Task Force:** The EPRR Task Force will meet Feb. 5, 2021 to discuss BRIC funding with FEMA. *Contact Will*
- **Commission Staff Surge Calls.** NARUC hosts quarterly calls on which commission staff discuss how different states approach emerging issues in electricity policy. The next call will be held in early **Mar., 2021**. Summaries from past calls are available. *Contact Kiera*
- **Innovation Webinar Series.** NARUC hosts monthly webinars for members and the public. ***Mar. 11:*** Data for the Public Interest: Empowering Energy Equity. ***Apr. 15:*** Initiative on Cybersecurity in Solar Projects. ***May. 13:*** Staffing the Evolving PUC Workforce. Register and find recordings of past events. *Contact Dominic*

Join us! NARUC hosts four working groups for members:

- Performance-Based Regulation. *Contact Kerry*
- Electric Vehicles. *Contact Jasmine*
- Microgrids. *Contact Kiera*
- Grid-Interactive Efficient Buildings. *Contact Danielle*

www.naruc.org/cpi

Regularly updated CPI fact sheet with recent publications & upcoming events under Quick Links at:

https://www.naruc.org/cpi-1/

MODERATOR

COMMISSIONER LETHA TAWNEY, OREGON PUBLIC UTILITY COMMISSION

Speakers:

STEWART CEDRES, U.S. DEPARTMENT OF ENERGY

BILL MESSNER, PORTLAND GENERAL ELECTRIC

ARVIND SATYAM, PANO

U.S. Department of Energy Wildfire Mitigation Technologies

Stewart Cedres
Senior Technical Lead and Strategist for Grid Resilience Capabilities
U.S. Department of Energy

Wildfires are a National Threat

15 States Most Impacted by Wildfires (2020)

1. California	**6. Montana**	**11. Texas**
2. Oregon	7. Wyoming	12. Alaska
3. Arizona	8. Utah	13. New Mexico
4. Washington	9. Idaho	14. Oklahoma
5. Colorado	10. Nevada	15. Florida

Only 2 of the 10 costliest wildfires on record occurred prior to 2017 (Insurance Information Institute)

U.S. DEPARTMENT OF ENERGY
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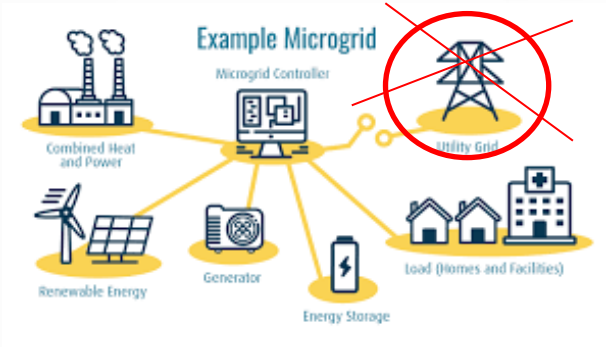
Power Grid Resilience Against Wildfires

Prevention and detection against equipment ignition

Mitigating against wildfires



Adapting against cascading failures

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DOE R&D Approach to Address Wildfires (8 Focus Areas within 3 Categories)

Detection - identification and detection of wildfire ignition from power equipment sources and the ability to visualize existing field conditions

- **Sensing & Detection**
- **Situational Awareness**

Mitigation - implementation of different approaches to minimize wildfire impacts

- **Modeling & Analytical Tools**
- **Advanced Protective Relaying**
- **Fire Suppression**
- **Rapid Response and Recovery**
- **Post Fire Analysis**
- **Fire Testing Capabilities**

Prevention - approaches and concepts that prevent the ignition of wildfires from power equipment

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Adaptability – ability to adjust to and minimize wildfires impacts

Adaptability

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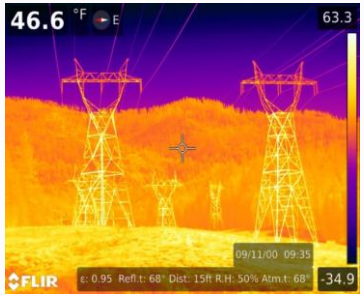
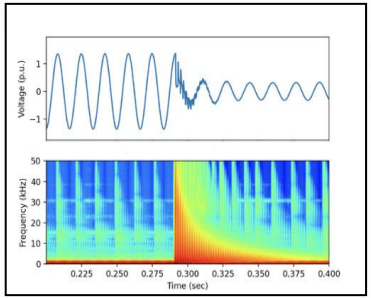
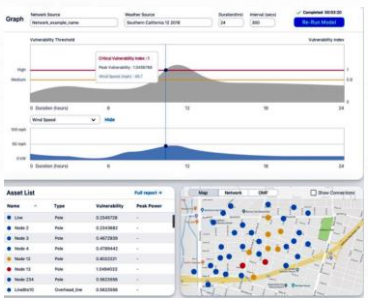
DOE Related Projects







Real-Time Aerial Sensors for Extreme Environment

ORNL combined their aerial sensors technology with a reliable and robust command, control, communication and computing platform to address beyond visual line of sight (BVLOS) to inspect transmission powerlines and equipment.

Distribution Arcing Fault Signature Library

ORNL is evaluating new sensors technology that could potentially be used to detect arcing faults, this sensors will be able to send a “signature” to ORNL Signature Library which catalogs grid events signature

GRID Resilience and Intelligence Platform

SLAC is utilizing artificial intelligence to predict where the electric grid is susceptible to disruption, while also reinforcing those spots in advance to recover faster when failures do occur,

Small Business Innovation Research

- Rapid Assessment of Distribution Line Damage via Autonomous UAV: Brains4Drones, LLC.
- Networked Powerline Monitoring System: Delphire Inc
- Distributed, Active Grid-Interrogation and Signal Analysis for Advanced Protective Relaying: Elintrix
- Advanced Visualizations for Smart Grid Data Analytics: Pacific Science & Engineering Group, Inc.

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AI Drones for Grid Inspection and Vegetation Management

- In May 2022, DOE awarded a Phase III SBIR cooperative agreement to Brains4Drones (Plano, TX) to apply their AI technology and machine recognition on drones to mitigate against wildfires.
- Brains4Drones (B4D), a woman-owned small business, adapted their technology to the unique needs of Central Electric Coop (CEC) in Redmond, OR and Consumers Power, Inc. (CPI) in Philomath, OR.
- This project focused on adapting B4D drone-based Gimbal+ and Shutter+ solutions to mitigated against the start of fires at distribution lines in hard-to-access terrain by performing powerlines, equipment and vegetation inspections.

- Brains4Drones developed AI algorithms, integrated the necessary sensors for defect detection and developed prototypes that specifically gathered and curated real-time information on potential hazards.

- The technology was adapted to each utility need. Neither utility had a trained drone pilot nor a drone program when this project started, however by September 7, 2022, CPI performed a demonstration of this capability at their service territory.

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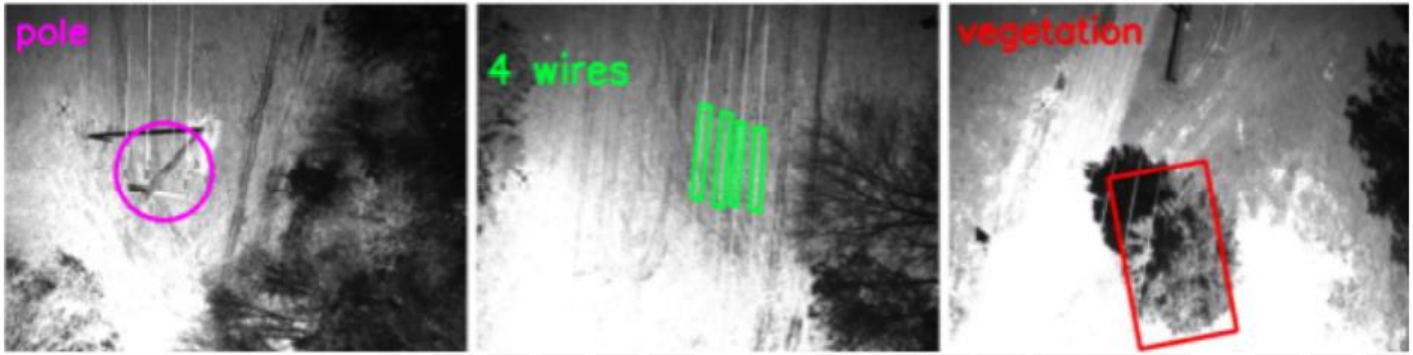
Brains4Drones Visual Detection and Inspections

Brains4Drones technology performing autonomous pole discovery and inspection wherein onboard algorithms successfully identified a mix of pole structures, mounted equipment, and background clutter – this includes thermal camera inspections.



Visual detection results from the nadir camera, which is pointing straight down from the UAV. Note how their prototype sees the world through monochromatic machine vision cameras..

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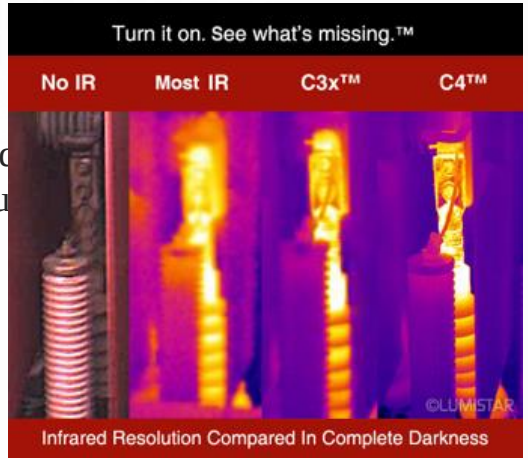
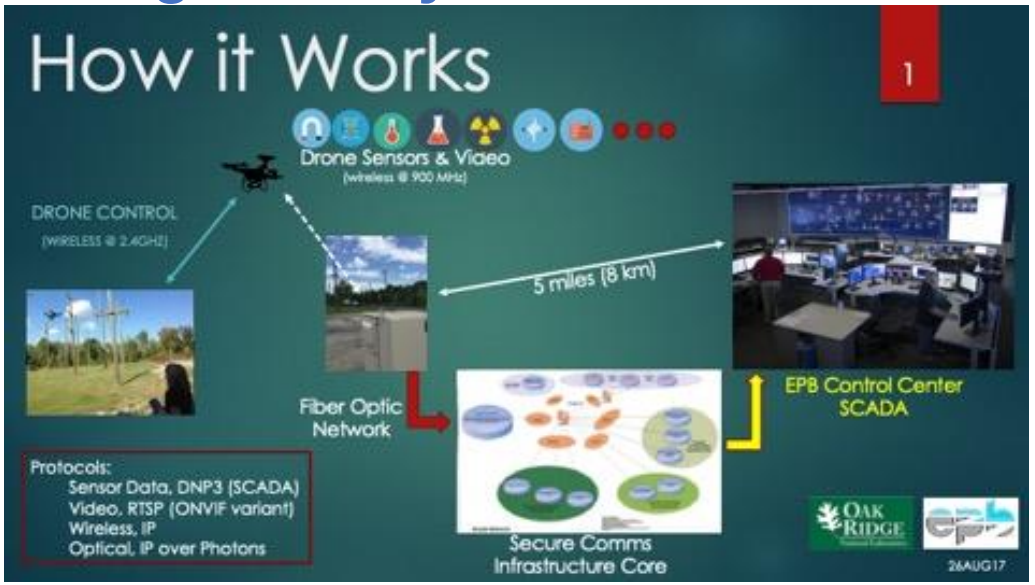
Real-Time Aerial Sensors for Extreme Environment

- ORNL Combined a reliable and robust command, control, communication, and computing for unmanned aerial vehicles (UAVs) with their “Real-Time Aerial Sensors for Extreme Environment”.
- Combined, it allows for transmission line inspection and vegetation management and is well-suited for beyond visual line of sight (BVLOS), swarm operations and a secu implementation of the Internet of Drones (IoD).
- Demonstrated UAVs mounted integrated sensor systems in transmission line inspection (BPA 115 kV, Libby to Troy Montana) and similarly in TN.
- Demonstrated in-house and commercially available BVLOS module.
- Tests included
  a. Arcing/cracked insulator inspection using instrument-laden drones. (Note: UASs are used to transport sensor packages from location to location. A companion activity has the sensor packages configured as a mesh network deployed at fixed locations)
  b. Vegetation management
  c. System measurements utilize various communication technologies and paths for data-in-motion placement of measurements into a cloud repository then transferred into the Signature Library
  d. Comparison of in-house with commercially available command control/BVLOS modules



Beyond Visual Line of Site UAS-based sensors, visual & thermal imaging realtime viewing in utility control center

Live viewing in utility control center



Video available at: https://youtu.be/xUhnmWIlJD4

DOE-OE Wildfire Seminars (April 2021)

- The DOE-OE Wildfire Seminar Series was designed to influence the rapid transfer or deployment of DOE Labs mature capabilities.
- The seminar series was designed to create the bridge to link DOE-Labs capabilities with stakeholder needs by sharing near-term solutions to wildfire detection, mitigation and prevention. This forum can introduce potential partnerships and define next steps for public-private collaboration to assist in technology transition.
- **AUDIENCE – 1,196 participants for all 4 webinars combined**
  - Electric utilities located in wildfires high-risk areas
  - Wildfires high-risk State/local government decision makers
  - Federal agencies such as HUD, FEMA, DHS, USDA (Rural Utilities Service, Wildfire Services)
  - NGOs, and vendors
  - Other research institutions as applicable
  - Congressional Staffers
- 33 capabilities were inventoried and identified -- all capable of being deployed immediately or within 6-10 months.

April 2021 Wildfire Seminar Series[1]

- **Webinar 1: Sensing & Detection | Fire Testing Capabilities**
- **Webinar 2: Situational Awareness**
- **Webinar 3: Modeling & Analytical Tools**
- **Webinar 4: Modeling & Analytical Tools | Post Fire Analysis**

[1]*Webinars addressed 5 out of the 8 focus areas.*

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https://www.energy.gov/oe/office-electricity

stewart.cedres@hq.doe.gov

Follow the Office of Electricity (OE) on Twitter and LinkedIn

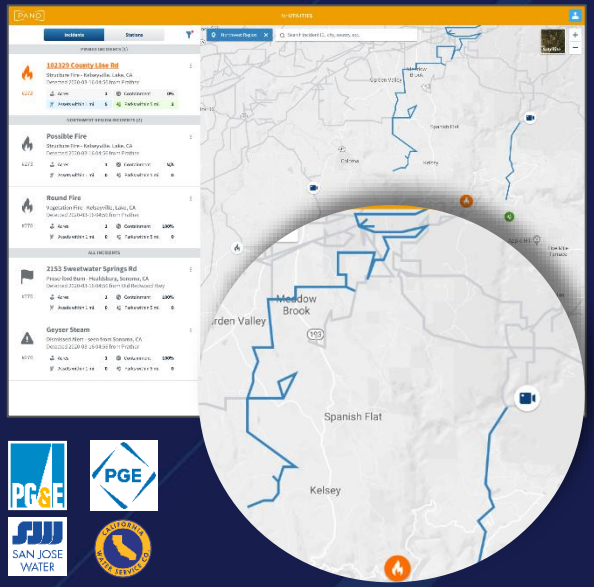
Pano AI Wildfire Situational Awareness

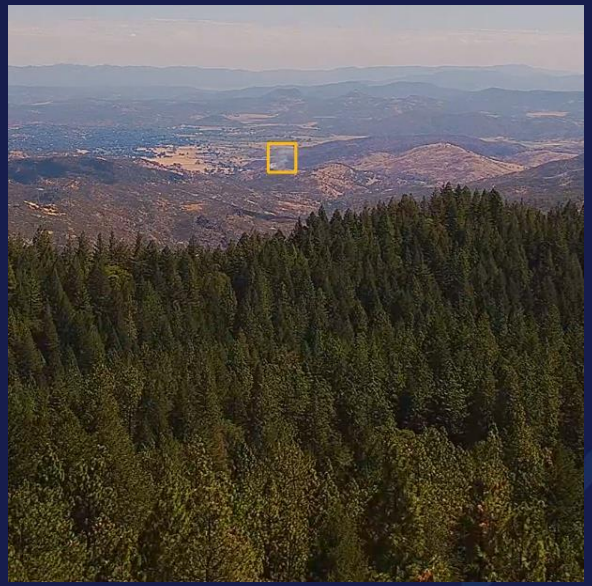
Innovative Wildfire Mitigation Technologies Roundtable

Arvind Satyam
Chief Commercial Officer, Pano AI

A Turnkey Wildfire Detection Solution Built for the Utility Industry

Combine expertise in software, AI, and hardware to enhance situational awareness





Easy-to-use Interface

unifies advanced features developed with partner utilities including asset proximity, zoom-to-investigate, incident triangulation, and alerts in a single platform

AI Detection Backed By Human Intelligence

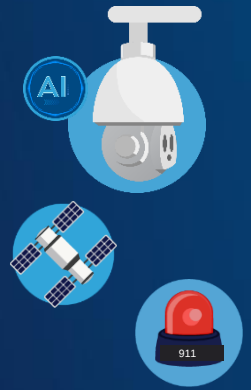
monitors for the first indications of smoke 24/7, across the entirety of the geographic coverage area

Cutting-Edge Hardware

provides advanced imagery via two rotating cameras, capturing an ultra-high-definition 360° panorama every minute

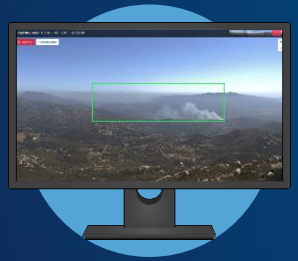
We Empower Utilities & First Responders to Tackle a New Generation of Threats

Detection



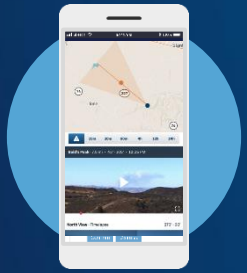
Pano detects smoke by continuously monitoring feeds from Pano Stations, satellites, and emergency services

Confirmation



Pano leverages the camera feeds to pinpoint threats and empowers monitoring centers to rapidly confirm fires

Dissemination

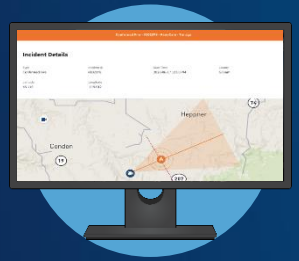


Pano 360 Alerts push live video and fire information to mobile devices, prepping responders for action

Response

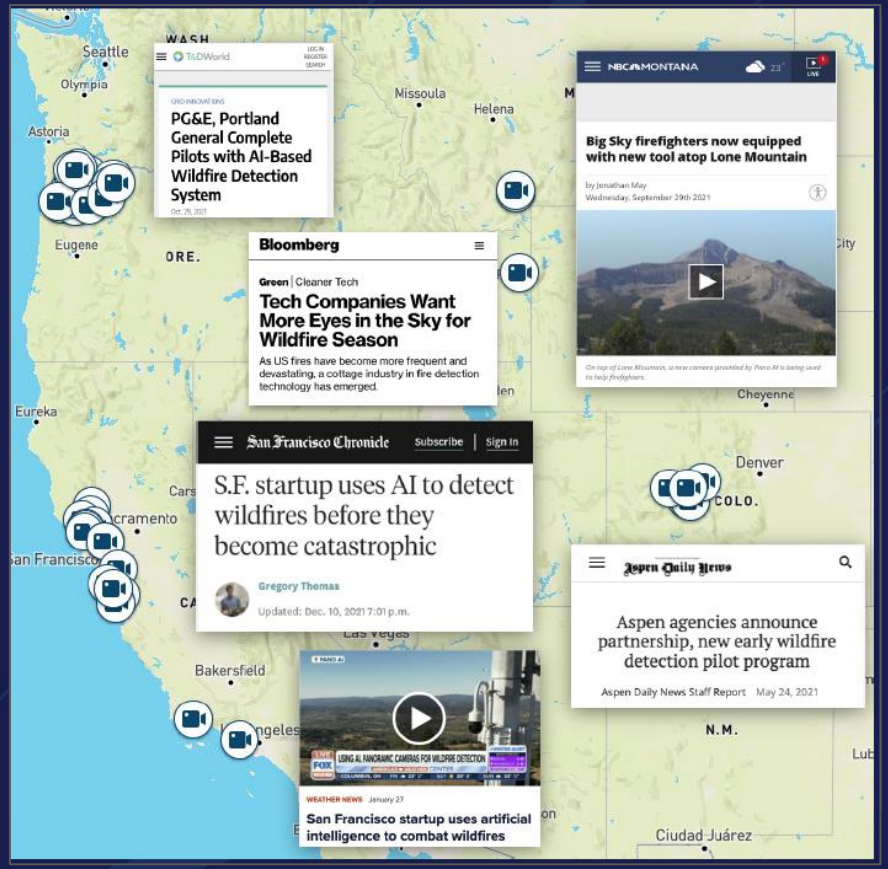
Pano speeds response through actionable intelligence

Analyze



Pano creates an institutional memory enabling review of incidents, timelapses and data

Pano Stations Have Been Deployed Across the Western US and Abroad



Power & Water Utilities

PG&E · PGE · San Jose Water · California Water Service Co. · Portland Water Bureau · Xcel Energy · Holy Cross Energy (Est. 1939)

Fire Agencies

- Aspen FPD
- Big Sky FPD
- Felton FPD
- Hoodland FPD
- Scotts Valley FPD
- Sonoma FPD
- South Lake Cty FPD
- Woodside FPD
- CALFIRE
- ODF - Bullrun Fed Lands
- USFS (ID, CO, OR, CA, MT)

Governments

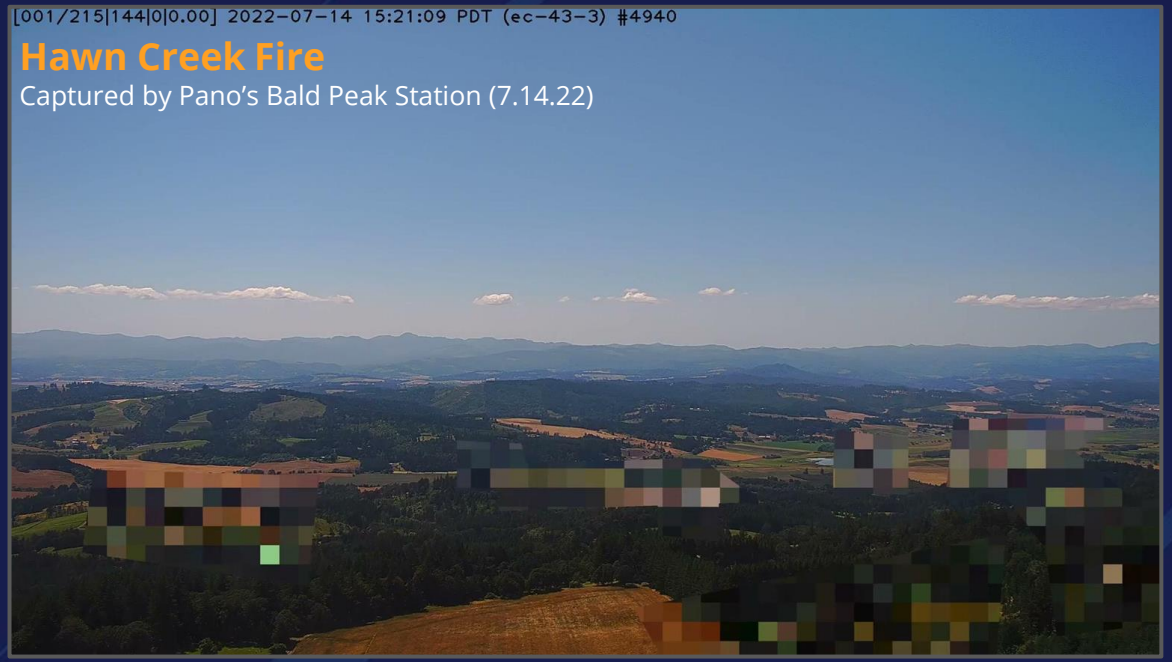
- USFS-Caribou Targhee NF
- Gallatin County, MT
- Gresham County, OR
- LA County, CA
- Pitkin County, CO
- Madison County, MT
- Boulder County, CO
- Santa Clara County, CA
- San Mateo County, CA
- Santa Cruz County, CA
- Sonoma County, CA
- City of Aspen
- City of San Bruno
- City of Malibu
- Redwood City
- City of Portland
- USDA | CA Parks

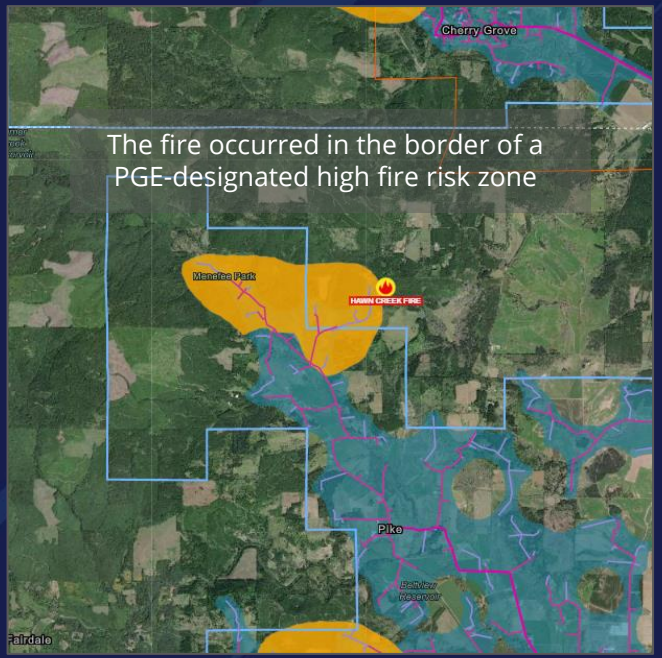
Private Landowners, Resorts, & Other Stakeholders

- Big Sky Ski Resort
- Lone Mountain Land Co.
- Southern Cross Forests
- Aspen-Snowmass

What Does All of This Really Mean? The Hawn Creek Case Study

For the 2022 fire season, Pano deployed 20+ Stations in Oregon in partnership with Portland General Electric



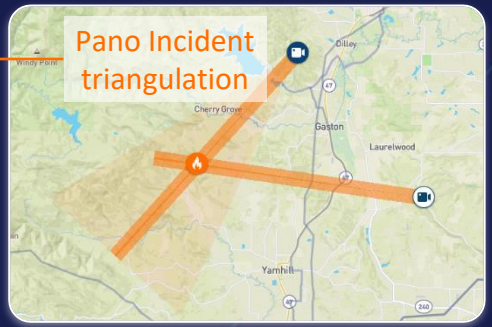


After the Pano Stations were installed <u>but</u> before we went live, Pano's AI captured the first minutes of the Hawn Creek Fire

This provided a rare, side-by-side comparison of how Pano's technology can reduce response times

Save Critical Time in Detecting and Locating Fire Threats

Hawn Fire Case Study - 14 July 2022, Portland (OR, USA) - Pano AI vs 911 Process



Smoke
first visible

Pano

15:19 15:25 15:35

15:00 +6m +16m 16:00 17:00 +110m +141m 18:00 +178m

911 Process

17:09 ~17:40 18:17

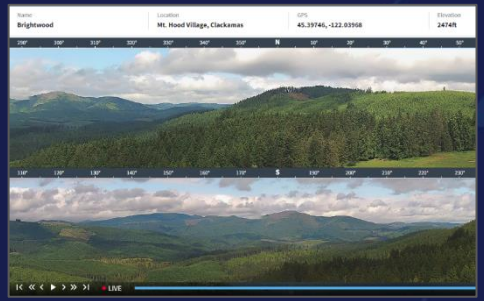
First 911 Call Received & IRWIN Alert Issued

Engine 433 in area and attempting to locate

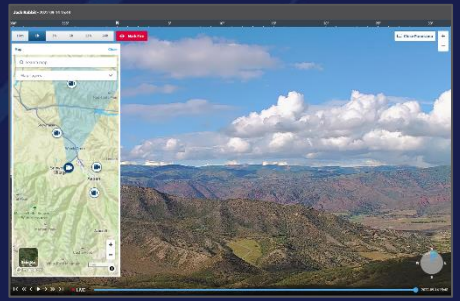
Fire Located and Engine 433 On Scene

If Pano's technology was utilized for this incident, first responders could have been on the scene significantly faster

Functionality for Both Situational Awareness & Ancillary Benefits

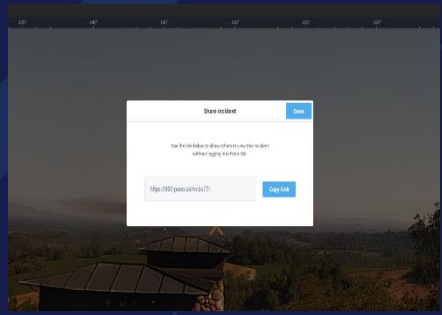


360-degree panoramic visibility at all times

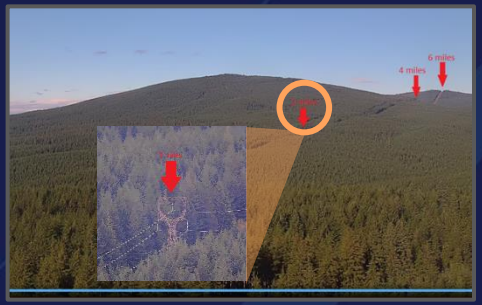


Digital pan/tilt/zoom for simultaneous multi-user access

Multi-camera incident location triangulation

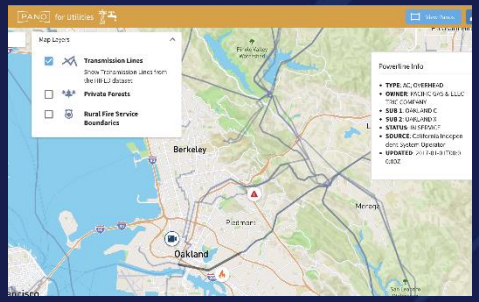


Seamless sharing of information with partners



Real-time utility asset Inspection

Tactical intelligence for both line crews & partner agencies



Utility asset & infrastructure overlay

Monitoring vegetation conditions

Improving Real-Time Situational Awareness For PGE

1. Immediate Alerting

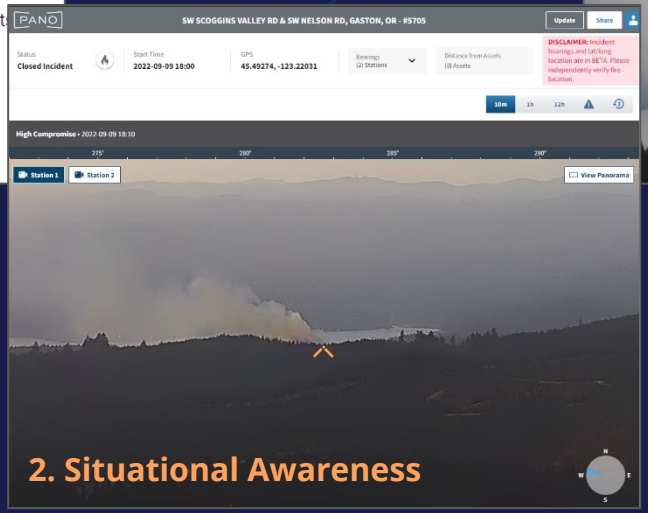
PANO

Pano has detected smoke from High Compromise Station, Forest Grove, Washington, OR.

Please view Incident #5705 here: https://360.pano.ai/i/awrszpy.

This email is sent from an account we use only for sending incident alert
To receive assistance, please email support@pano.ai.

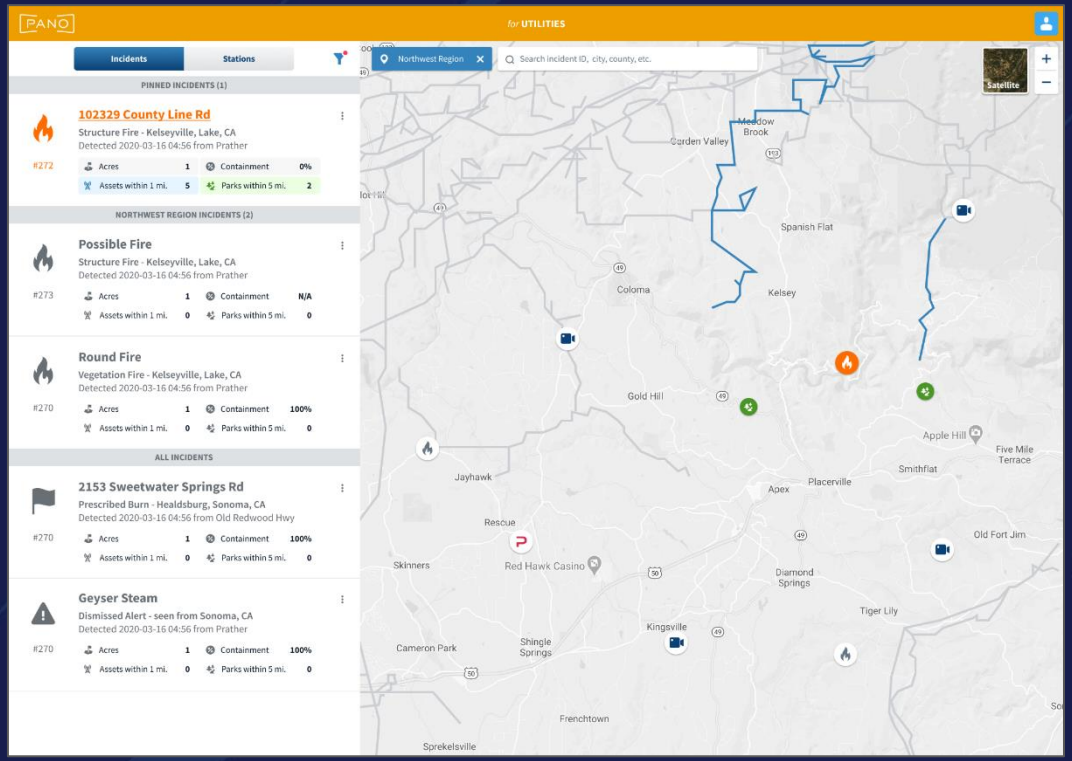
Thank you,
Pano 360 Team

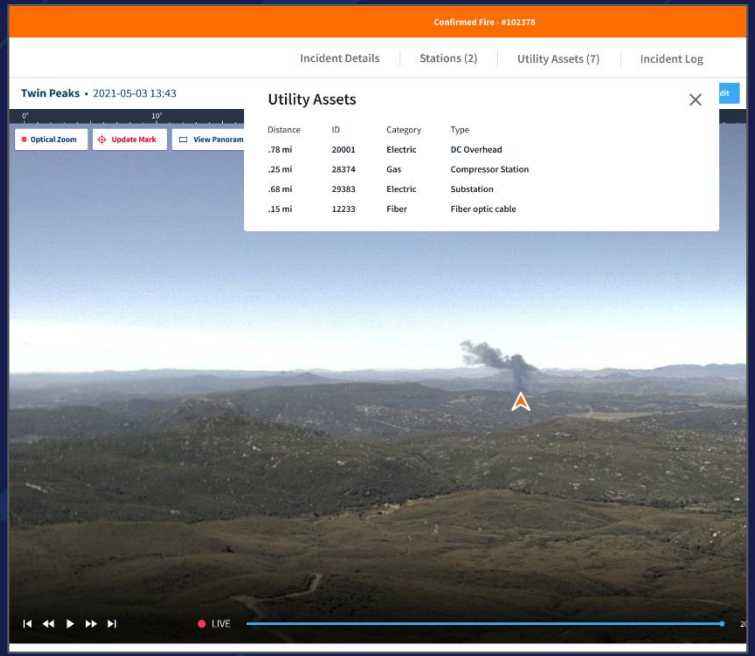


3. Enhanced Intelligence

Further Advances in Real-Time Situational Awareness

Pano continues to work closely with our partner utilities to improve situational awareness as soon as fire starts are detected





Thank you.

For more information, contact:

Arvind Satyam
Chief Commercial Officer
Pano AI
arvind@pano.ai

PGE at-a-glance

Quick facts

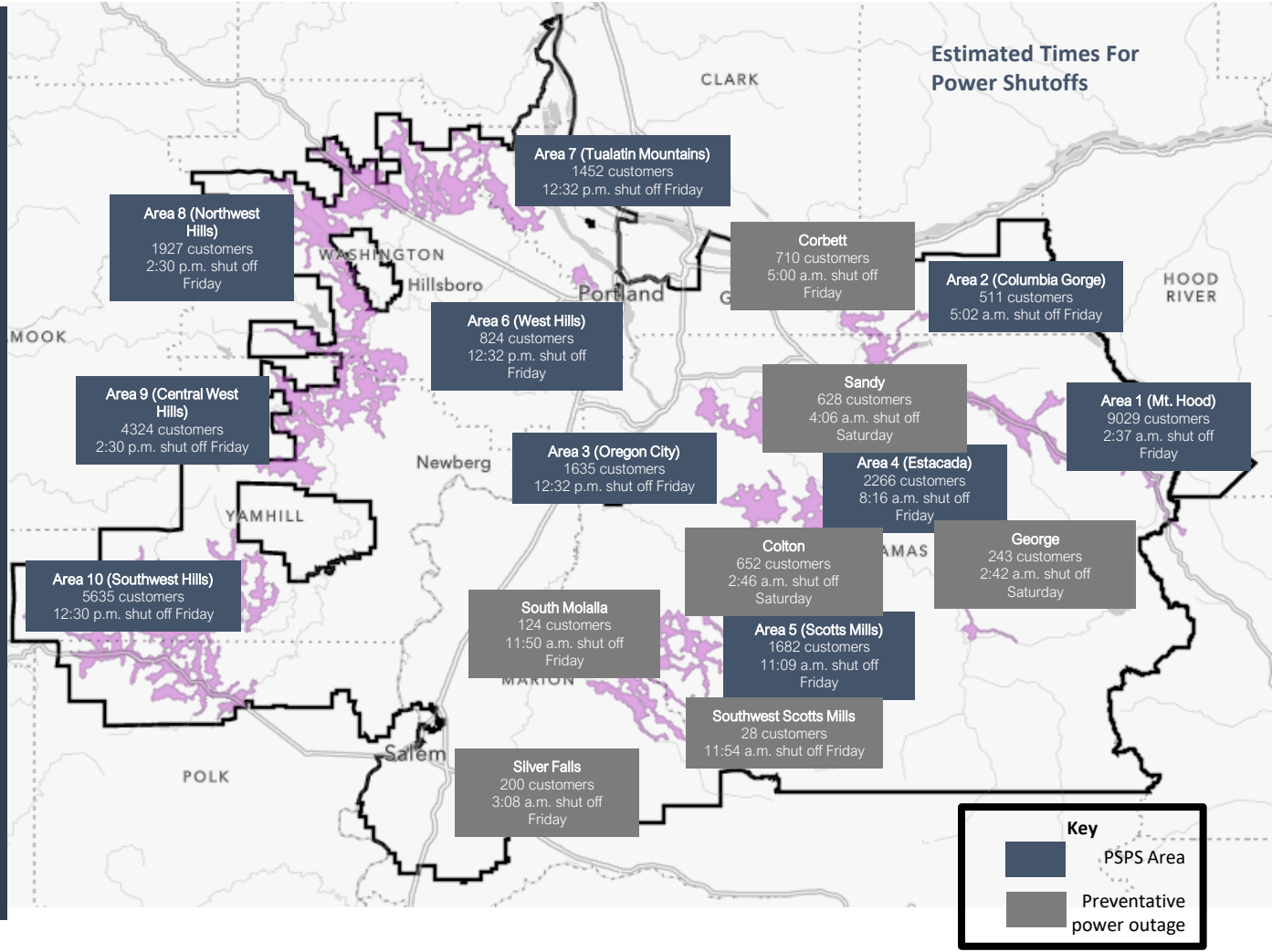
- We are Oregon's largest energy provider, serving nearly half of the state's population and three quarters of all businesses in the state.
- 900,000+ retail customers within a service area of 2 million residents
- 46 percent of Oregon's population lives within PGE service area, encompassing 51 incorporated cities entirely within the state of Oregon
- 75 percent of Oregon's commercial and industrial activity occurs in PGE service area
- We are committed to serving all our customers in a fair and equitable manner, keeping our energy safe and reliable, and our electricity affordable. We are equally dedicated to racial justice and support a diverse and inclusive workplace where our differences are celebrated.

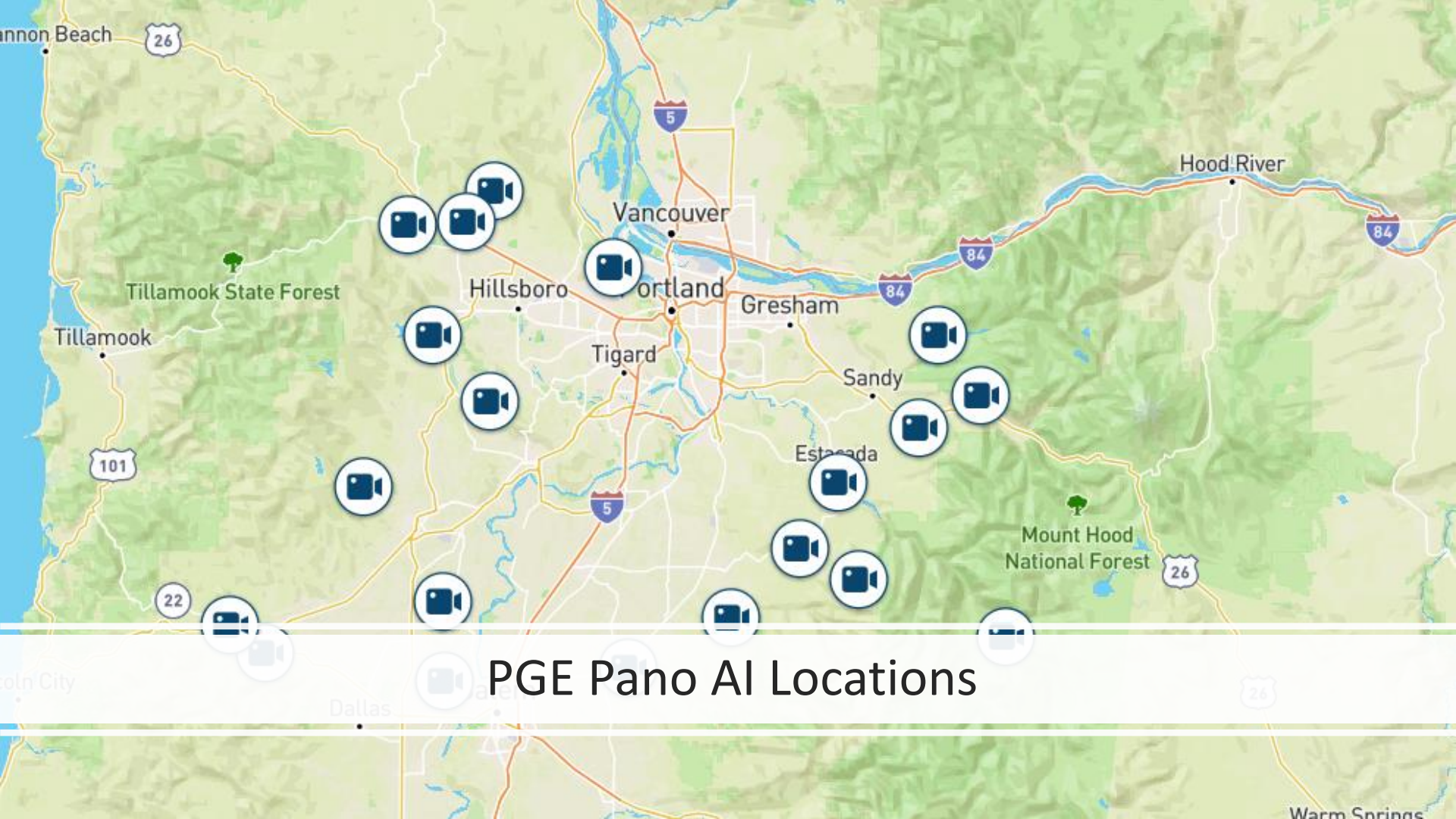
PGE's Boardman generating plant was retired in late 2020

3,300+ MWs of Generation

Critical fire weather conditions highly likely Friday through Saturday

- Not Sept. 2020 but comparable to 2017 (Eagle Creek Fire)
- All PGE PSPS Zones are forecasted to meet criteria
- **Max Gust Potential**
  - **Cascades** 35-45mph w/gusts 50-55mph
  - **Cascade Foothill** 35-45mph w/gusts 45-50
  - **Exit Region of Gorge** 35-45mph, w/gusts 45-50
  - **I-5 Corridor** 23-35mph, w/gusts 40mph
  - **Coastal Range** 35-40mph w/gusts 45mph
- **Timing**
  - Gusty Friday sunrise to Saturday sunset
- **Strongest Wind Potential**
  - Cascades & Foothills: 8PM Friday – 5am Saturday
  - Willamette Valley 11am – 6pm Friday





PGE Pano AI Locations

NARUC Innovation Webinar series

One Thursday most months

All NARUC members and stakeholders are invited

Long Duration Storage: What's on Tap?

October 12, 2022 | 4:00 – 5:00 PM EST

Green Bank: Financing a Reliable Future

November 17, 2022 | 3:00 – 4:00 PM EST

More webinar information will be added soon!

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