GridWise Alliance Technology Council Meeting Agenda

Fire-Resistant Technologies and Fire Prevention Systems

June 28, 2023 @ 3:00 PM ET

I.	Welcome & Antitrust Guidelines	**Josh Steinhardt**, Operations Director
II.	Presentations on Fire-Resistant Technologies and Fire Prevention Systems	**Eduardo Gomez Hennig**, Director Sales and Innovation / Grid Technologies – North America, Siemens Energy **Chris Guttman-McCabe**, Chief Regulatory and Communications Officer, Anterix **Mike Phillips**, CEO, Sense **Robert Maxwell**, Vice President of Engineering, United Power
III.	Questions and Discussion	**All**

GridWise Alliance
Antitrust Compliance Program Guidelines

It is the policy of the GridWise Alliance to comply fully with the antitrust laws. The Sherman Act and other applicable antitrust laws are intended to promote vigorous and fair competition and to combat various restraints of trade.

Each person who participates in GridWise Alliance activities has a responsibility to his/her employers and to the GridWise Alliance to avoid any improper conduct from an antitrust standpoint. The following guidelines will assist in meeting this responsibility:

1. GridWise Alliance meetings and discussions generally cover topics related to the generation, transmission and distribution of electricity. Should related discussions ever have any potential for competitive impact, all due care shall be taken to avoid such discussion between competitors.

2. In view of antitrust considerations and to avoid any possible restraints on competition, the following legally sensitive subjects must be avoided during any discussion between competitors:

   (a) Future marketing plans of individual competitors should not be discussed between competitors;

   (b) Any complaints or business plans relating to specific customers, specific suppliers, specific geographic markets or specific products, should not be discussed between competitors;

   (c) Purchasing plans or bidding plans of companies in competition should not be discussed (except privately between two parties with a vertical commercial relationship such as supplier and customer); and

   (d) Current and future price information and pricing plans, bidding plans, refund or rebate plans, discount plans, credit plans, specific product costs, profit margin information and terms of sale should not be discussed between competitors. All of the above are elements of competition.

3. Any question regarding the legality of a discussion topic or business practice should be brought to the attention of the GridWise Alliance legal counsel or a company's individual legal counsel for advice.

sense

Grid Edge Intelligence

Mike Phillips

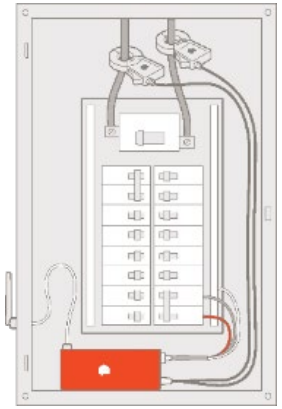
June 2023

Sense: intelligence at the edge of the grid

How does Sense work?

INSTALLATION

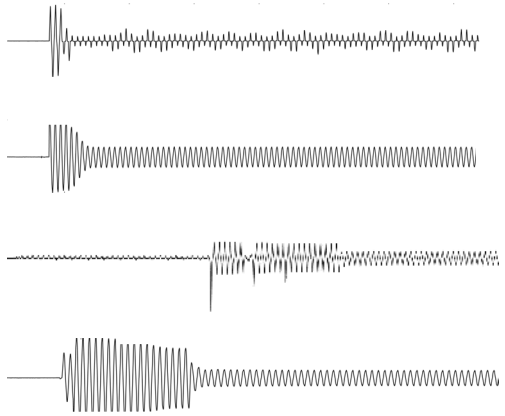
High Resolution data from Utility meters or hardware installed in electrical panels



MACHINE LEARNING

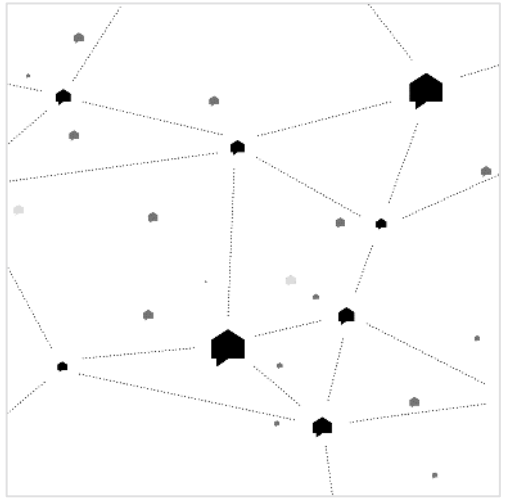
Sense samples each home's power up to one million times per second.

Sense uses machine learning to identify device activity in the home and also sees operation of the grid from the edge



NETWORK EFFECT

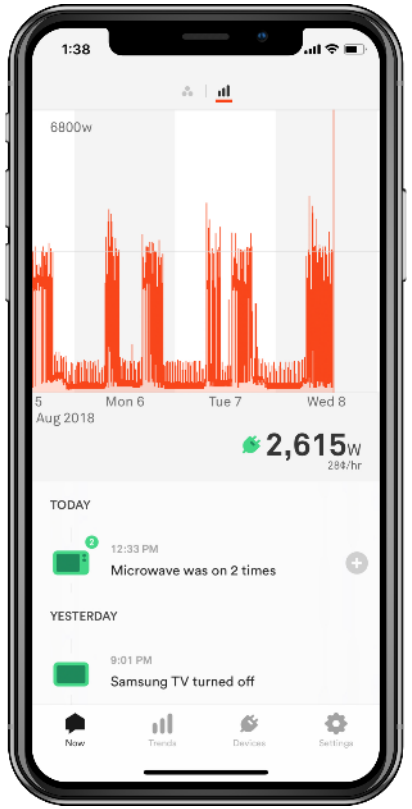
As Sense collects more data, is in more homes, and samples a diversity of appliances, the models are continuing to grow.



Consumer use cases

Able to control devices through software

Next Generation
Utility Meter



Google Home
Voice-activated speaker

ecobee

wemo

IFTTT

tp-link

hue personal wireless lighting

amazon echo

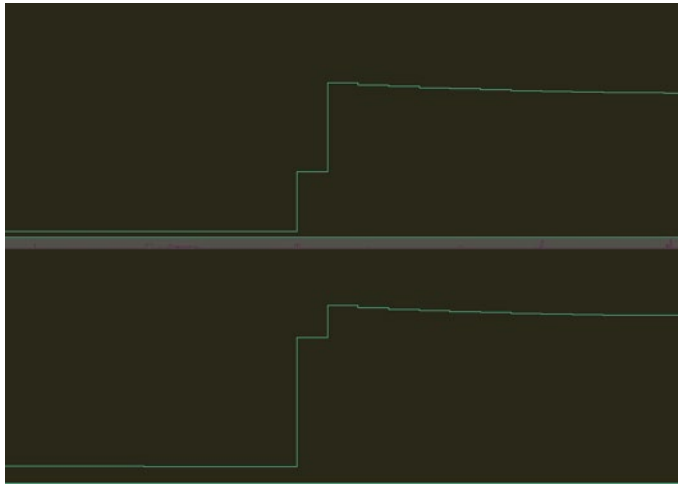
chargepoint

Why high resolution is needed

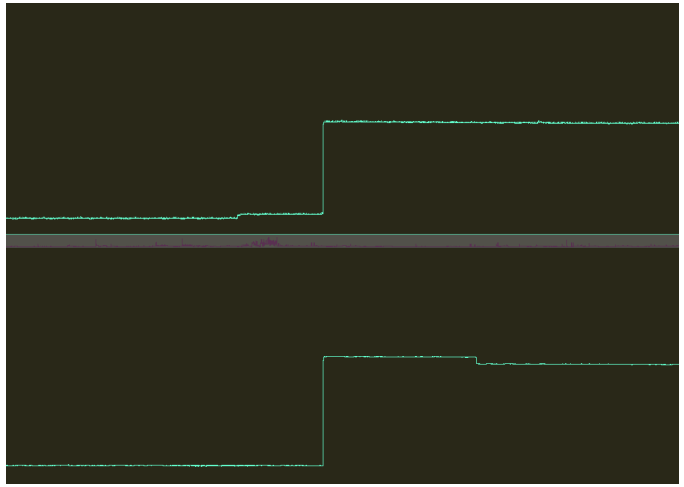
OVEN

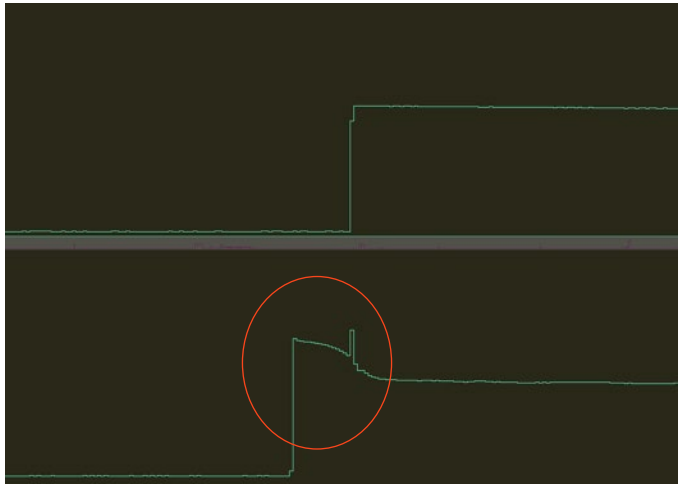
DRYER

One sample per second

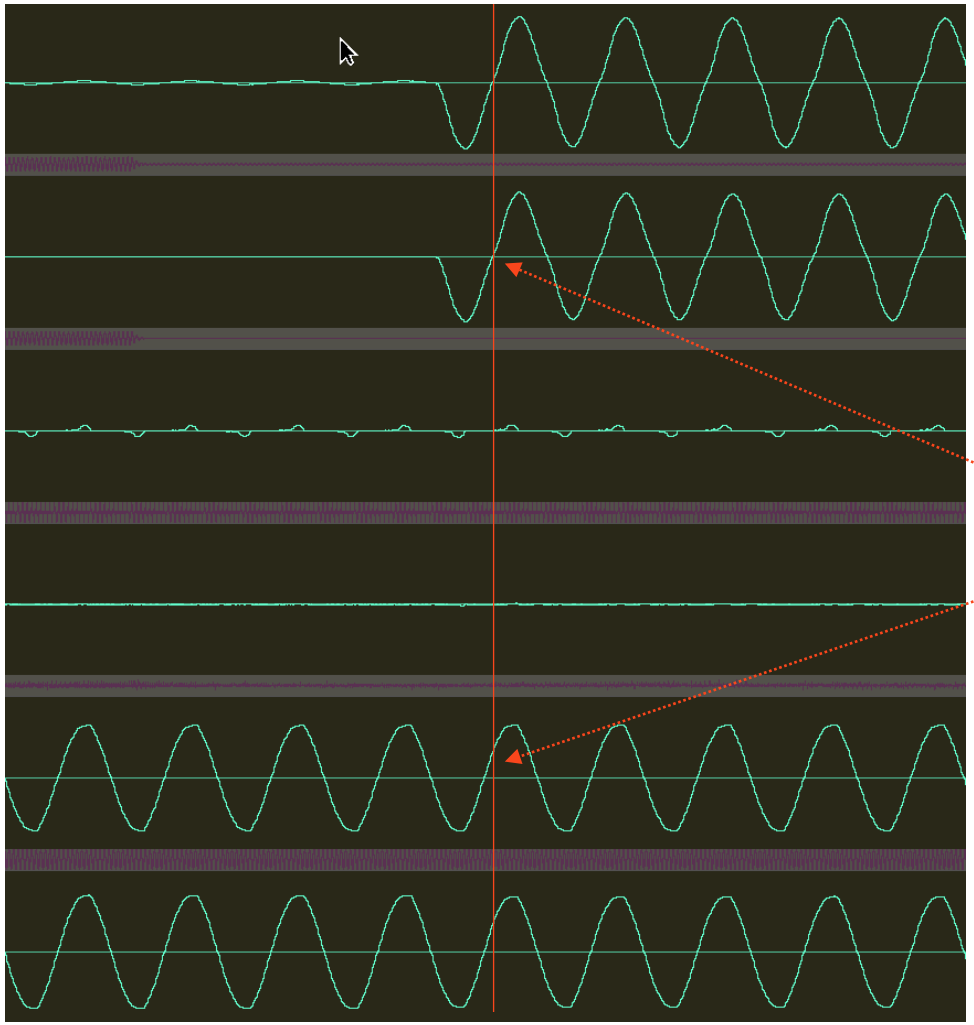


60 cycles per second





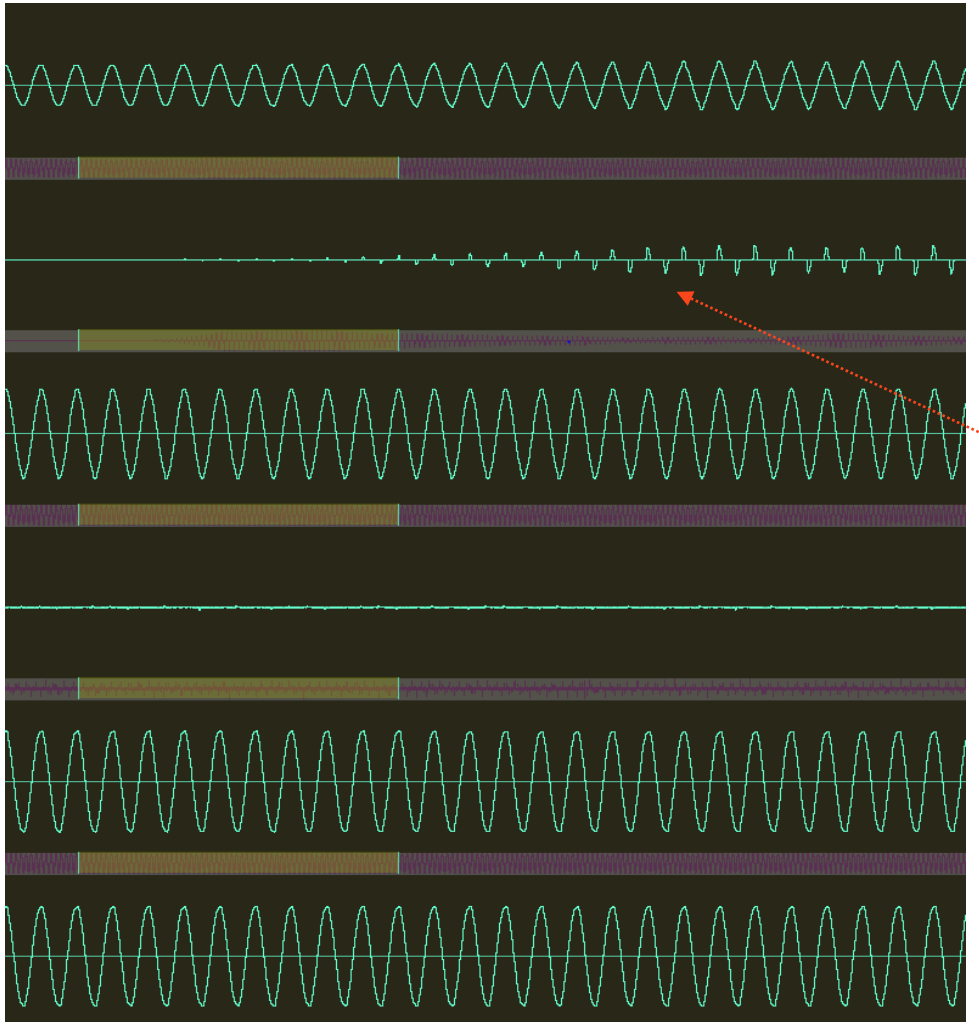
Waveform data



Phase offset =
Inductive motor!

Induction Motor

Details of device only available in waveforms



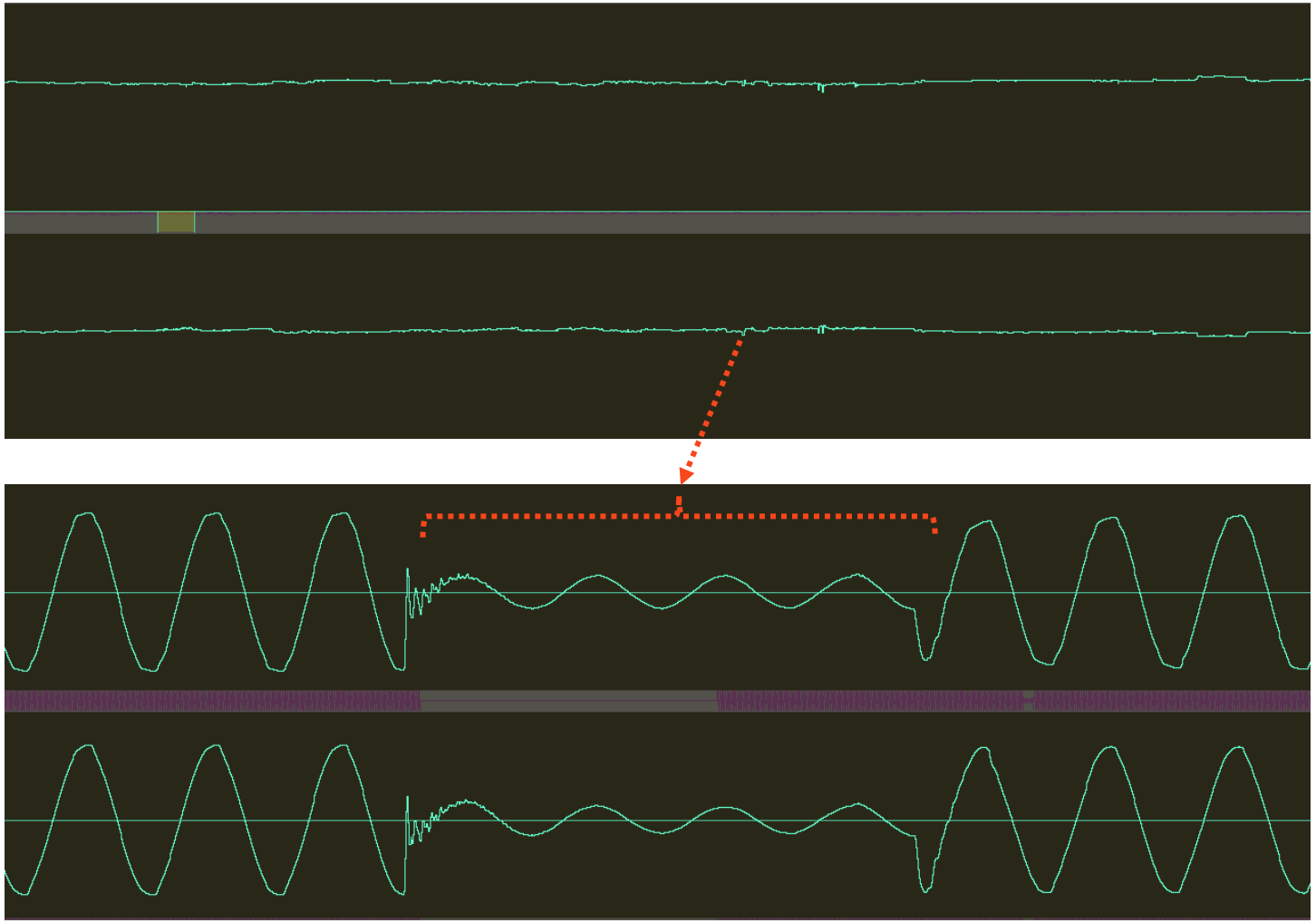
Front Load Washer

Distinct waveform =
Front-loader washer.

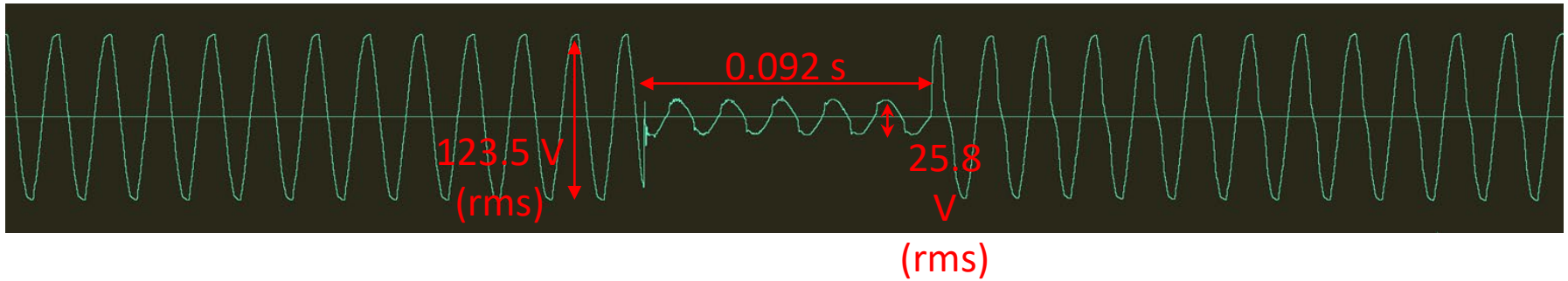
Many grid anomalies only detectable in waveforms

One Second Interval

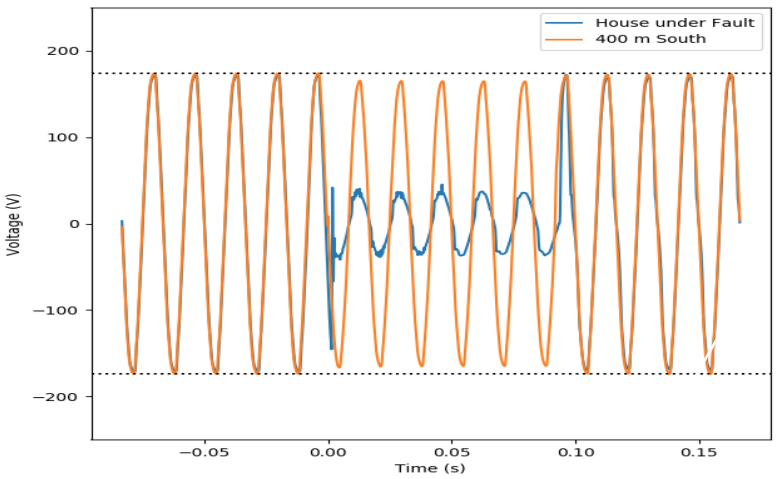
Voltage waveforms

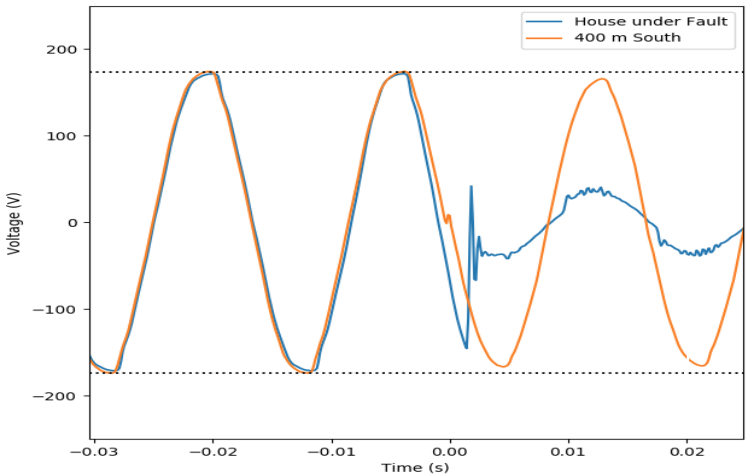


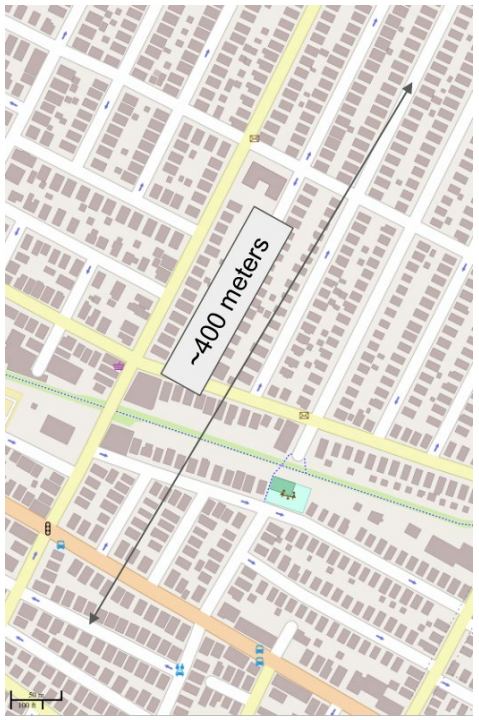
With enough monitors, can geo locate problem



High resolution data from two homes



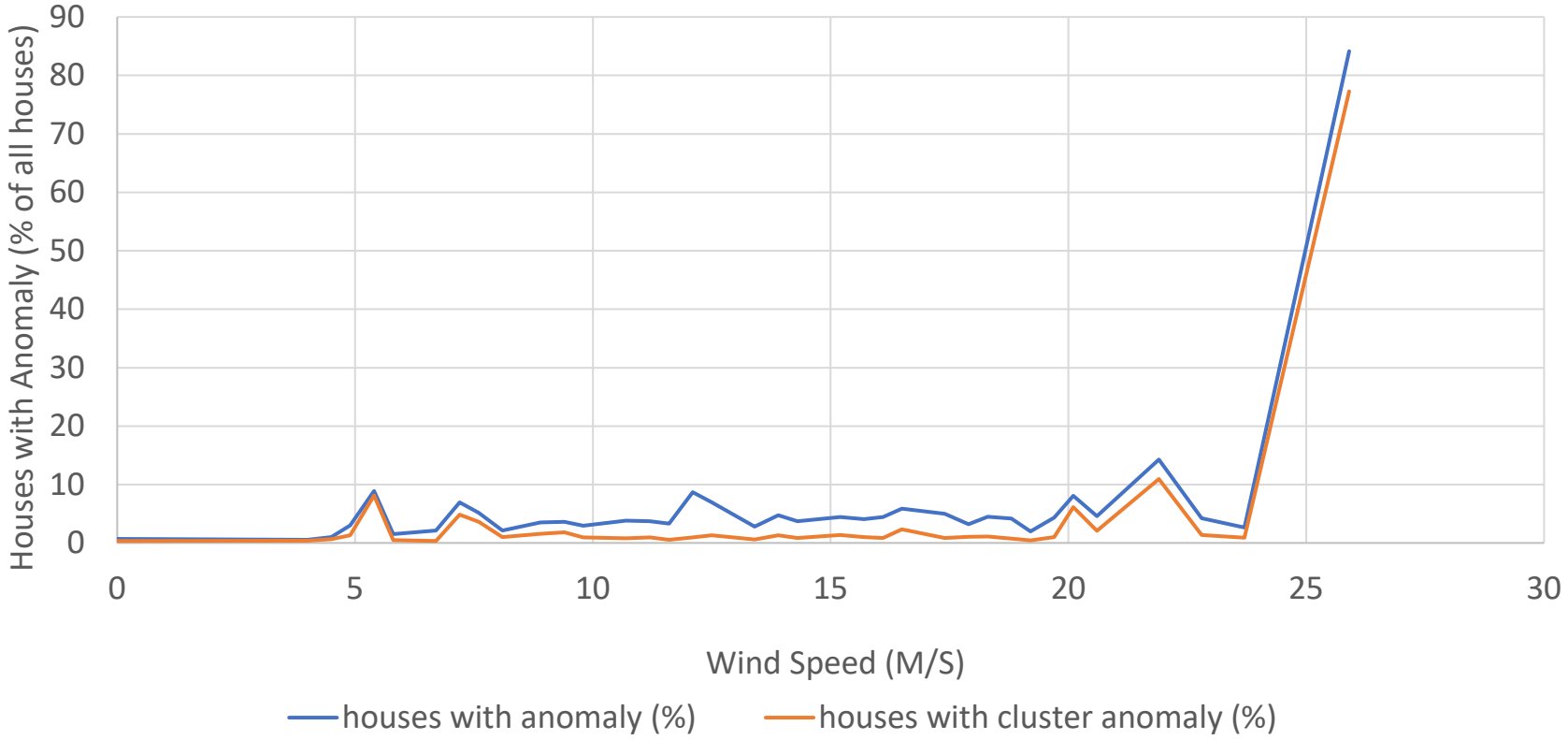




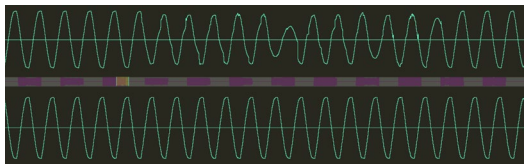
Voltage anomalies related to weather

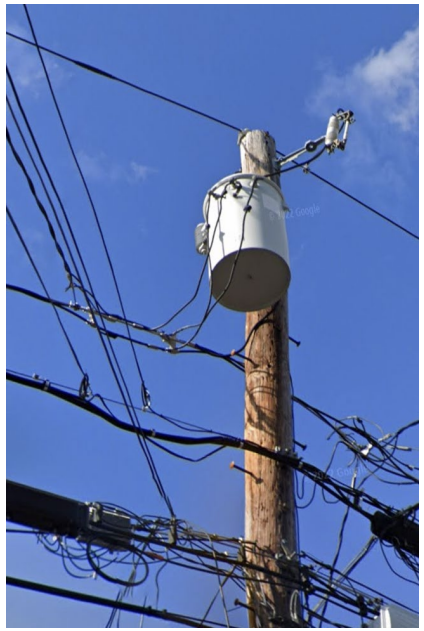
Given correlation with windspeed, likely due to vegetation hitting power lines

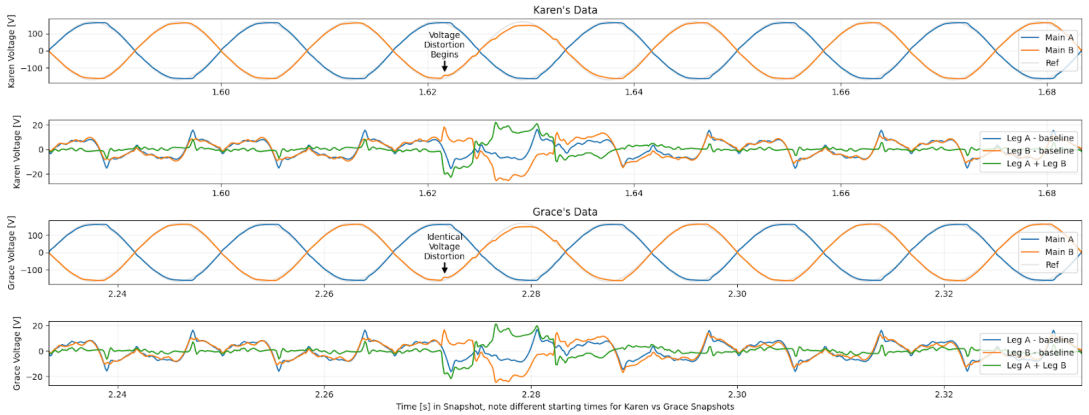
Varies by region (Colorado shown in this example)



Recent Example

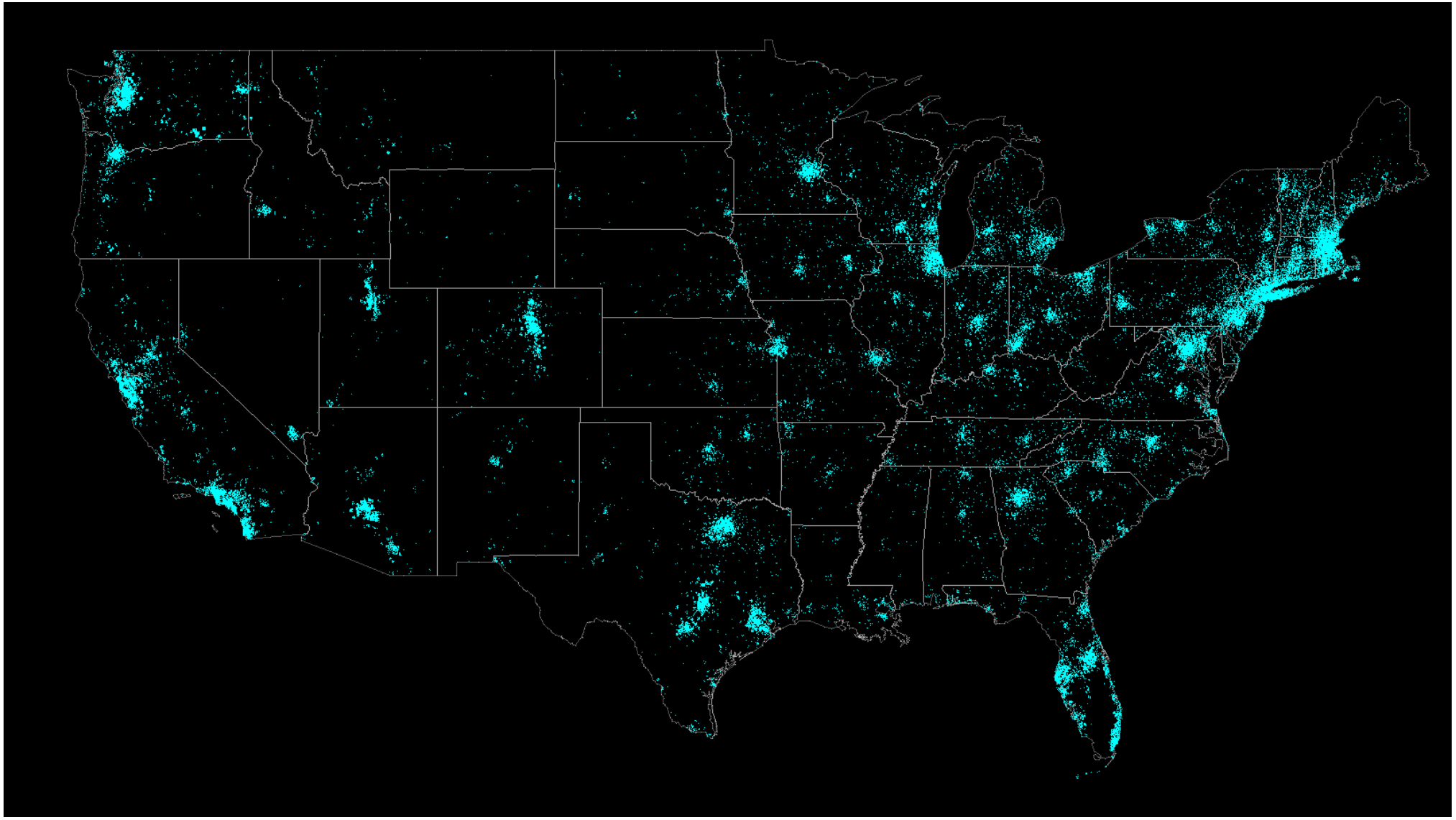


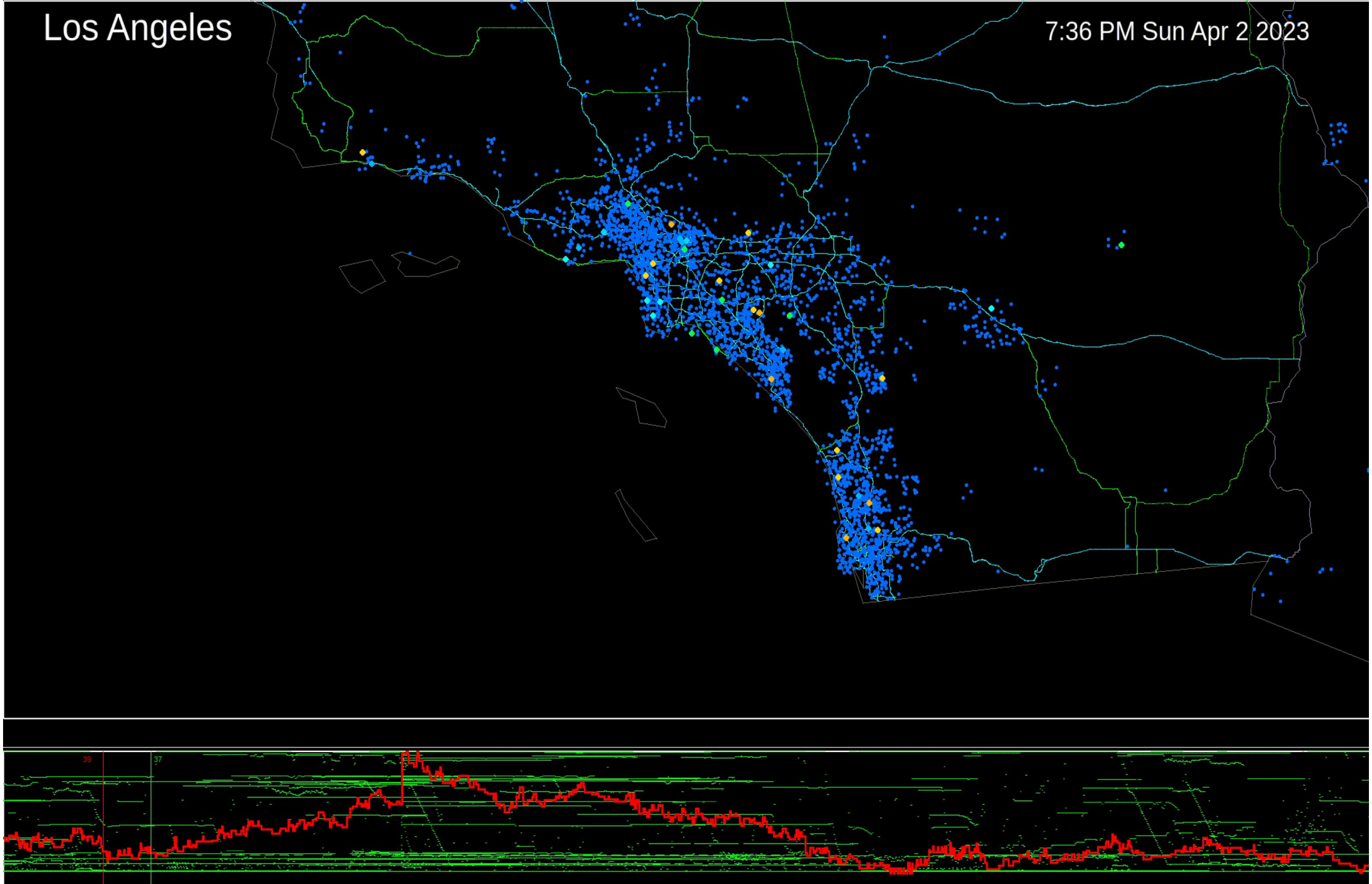




Edge Data at Scale

Currently in approx. 100,000 homes throughout US. Meter rollouts starting in 2023




Los Angeles
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Edge data at Scale

With next generation meter upgrades (AMI 2.0) high resolution data will be available from all homes

Even lowest resolution Sense data is 50 million times existing AMI data (15 minute interval data)

What can be done with 50 million times as much data?

Real time localized view of entire grid – including loads and DERS in homes

Ability to see faults and failures, and anomalies leading up to these in real time

Ability to see and manage load (through automation of devices in homes – with consumer adoption of apps like Sense)

Demand management can become localized and real-time

Thank you

sense.com

Wildfire Prevention and Mitigation Strategies at United Power

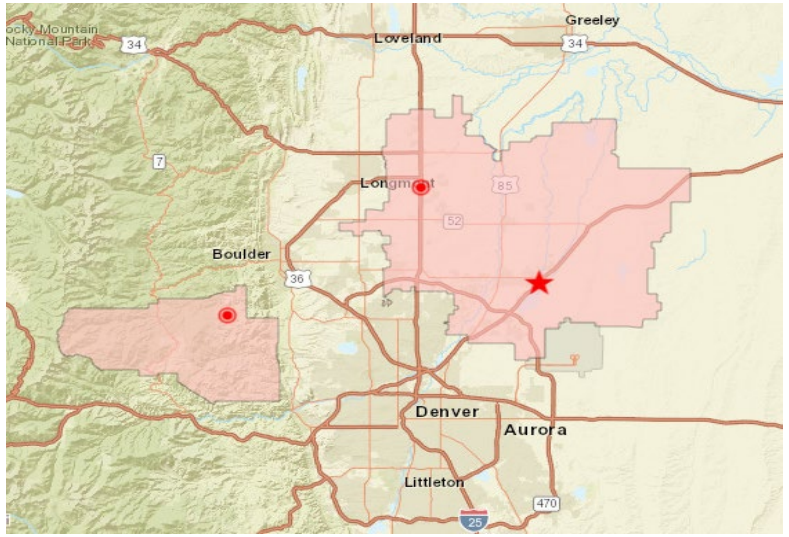
Robert Maxwell, P.E.
Vice President of Engineering

June 28, 2023

UNITED POWER
Your Touchstone Energy® Cooperative

United Power Background

- United Power is a rapidly growing electric cooperative, providing service to approximately 107,000 meters, through 7000 miles of distribution lines, in a service territory of approximately 900 square miles near Denver, Colorado.



Our service territory is divided into two non-contiguous areas. Our Mountains District, representing about one-third of our total area but less than five percent of our electrical load, is the primary driver for our wildfire mitigation practices. Colorado's most destructive wildfire, 2021's Marshall Fire, originated about 2 miles to the northeast of our Mountains District.

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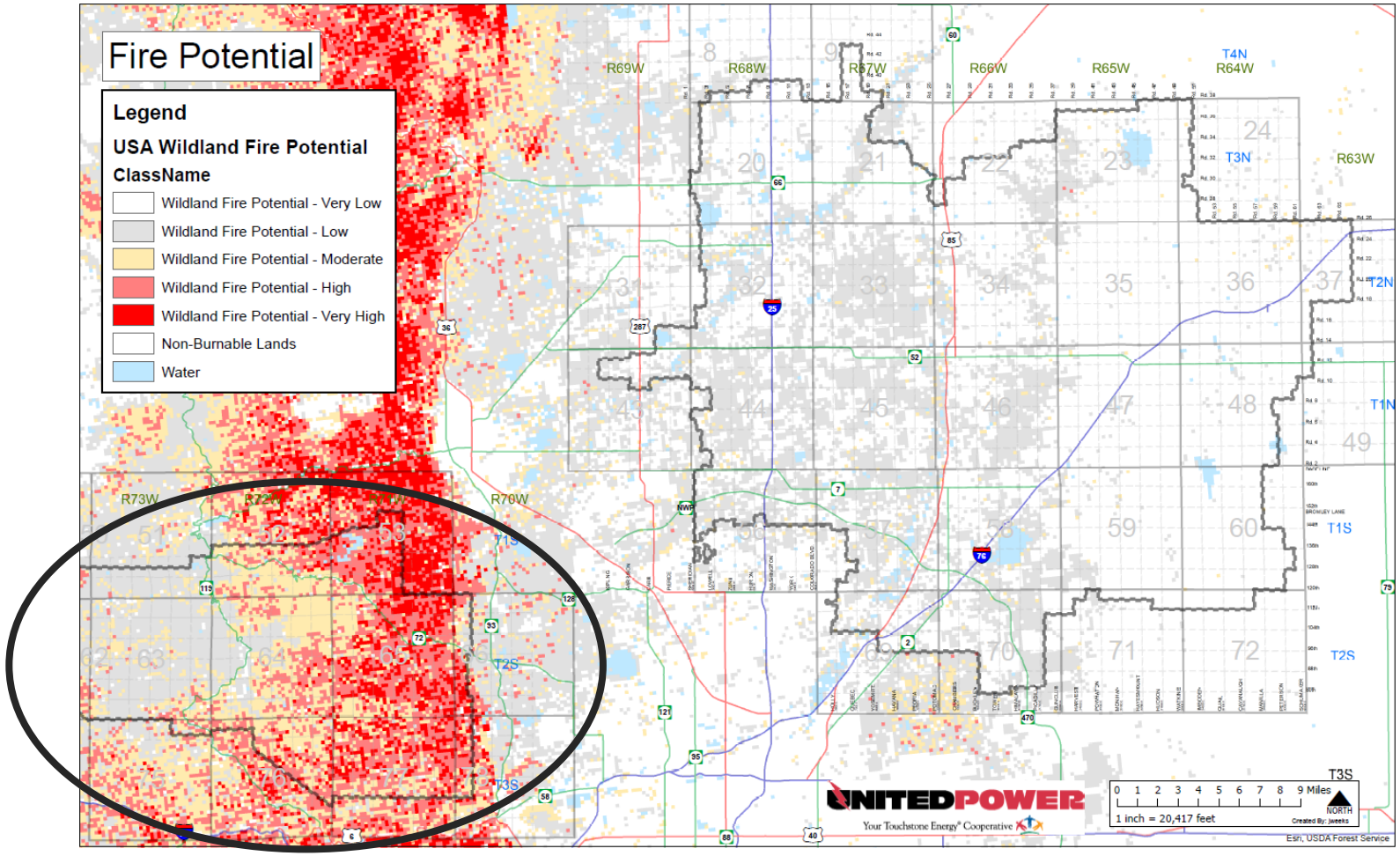
Wildland Fire Potential Within United Power's Service Territory



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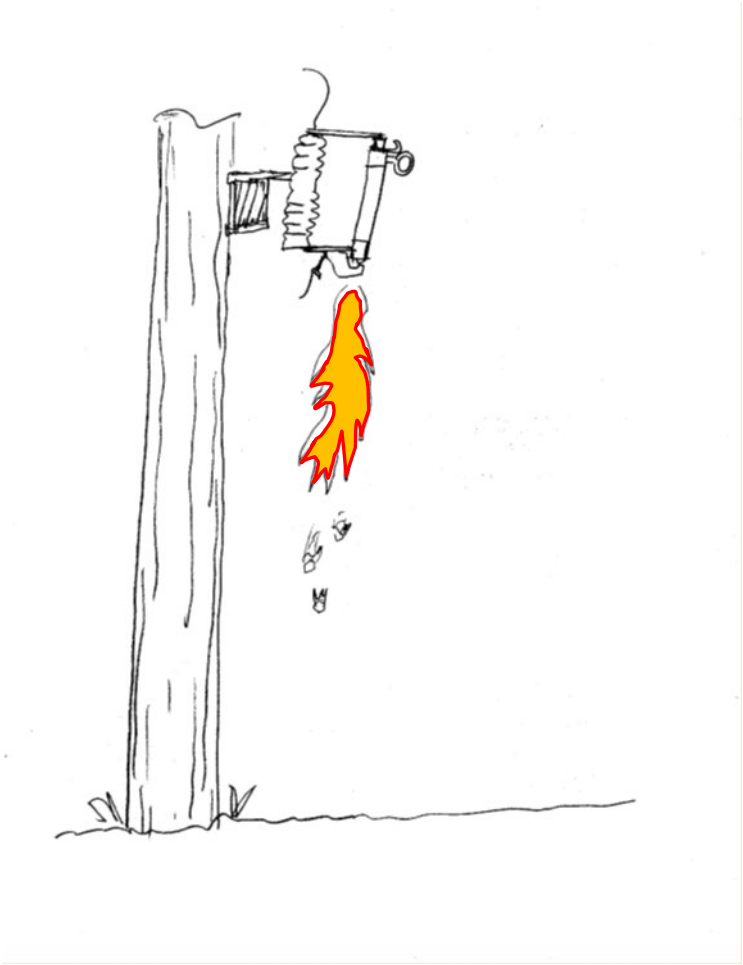
Wildfire Prevention and Mitigation Strategies Applied So Far

- Application of current limiting fuses
- Alternate relay settings during periods of high fire risk
- Intelligent Vegetation Management System, augmented by satellite imaging, to plan trimming cycles and identify problem trees
- Application of durable fire-retardant barriers to wood poles
- Undergrounding of primary distribution lines

Current Limiting Fuses

- All fused taps in our Mountains District are now protected by current limiting fuses
- Fault energy let-through is reduced and fault current interruption within the unit eliminates potential for fire ignition from ‘expulsion violence’

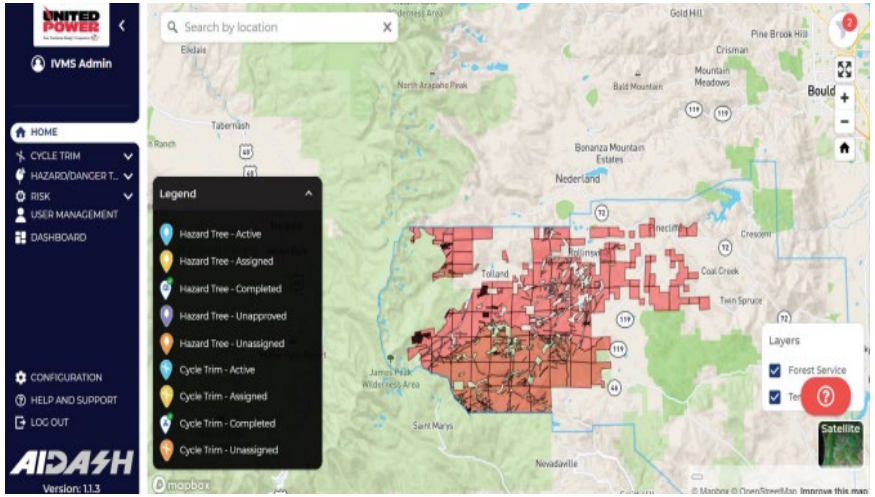


Alternate Relay Settings

- System Operators review National Weather Service alerts each day
- When a Red Flag Warning is issued for elevated fire risk, reclosing is disabled for all overcurrent relays in our Mountains District
- System Operators can disable reclosing for all relays in the district with a single command through SCADA
- In the event of a device lockout, without the benefit of reclosing, troubleshooters follow a modified line patrol procedure
- United Power employs a ‘fuse sacrifice’ coordination scheme, and reclosing block does not affect our time-current curves, so coordination between devices is maintained
- Feeder relays also utilize a high impedance fault detection algorithm to look for potential arcing. In order to avoid nuisance operations and miscoordination, however, this algorithm triggers generation of an event report but does not issue a trip command

Intelligent Vegetation Management System

- United Power's vegetation management system from AiDash utilizes satellite imagery to identify hazardous trees that could contact distribution lines, model vegetation growth rates, and estimate maintenance costs more accurately
- New satellite imagery is currently obtained and analyzed annually, but moving to semi-annually
- Tree contacts have been reduced significantly, along with their potential for wildfire ignition



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Fire Retardant Application to Wood Poles

- United Power began applying fire retardant to distribution poles in our Mountains District in 2021.
- Installation crew applies fire retardant barrier from below groundline to a height that is appropriate to protect the pole from ignition due to burning vegetation
- The retardant is expected to provide approximately 10 years of protection before reapplication is needed

Undergrounding of Primary Distribution Lines

- Approximately 40 line-miles of 12.5 kV and 34.5 kV facilities have been converted from overhead to underground, or their conversion is in progress
- Higher capital cost of underground primary is offset by reduced ongoing maintenance expenses and improved reliability
- Focus is on converting aged/fully-depreciated conductors
- We have applied for a Grid Resilience and Innovation Partnership grant to replace all remaining copper-clad steel conductors in our Mountain District, a total of 225 line-miles, with underground distribution.

Contact Me

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