Grid Resilience and Intelligence Platform (GRIP)

Linux Foundation Energy
Sept 25, 2023

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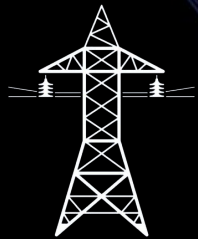
GRIP

SLAC NATIONAL ACCELERATOR LABORATORY

Problem

What if electrical utilities had a tool to help them better plan for extreme weather while also reducing costs and increasing customer safety?

GRIP

Value Proposition

With GRIP, Electrical utility stakeholders ...

Reduce grid resilience upgrades costs

Reduce liability costs and shareholder exposure

Lower electricity rates

Planning and scenario analysis tool for grid resilience

- Anticipation: proactively model the electrical distribution grid.
  - Detect grid problems ahead of the event
  - Reconfigure resources ahead of the event
- Absorption: scenario analysis during emergency behavior
- Recovery: scenario analysis to bring the system back online.

ANTICIPATION
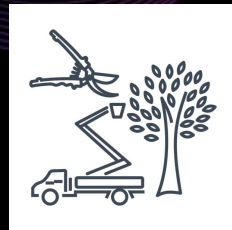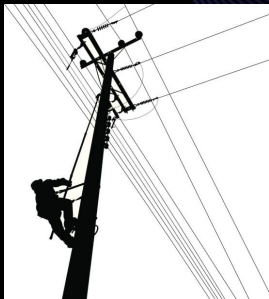
ABSORPTION

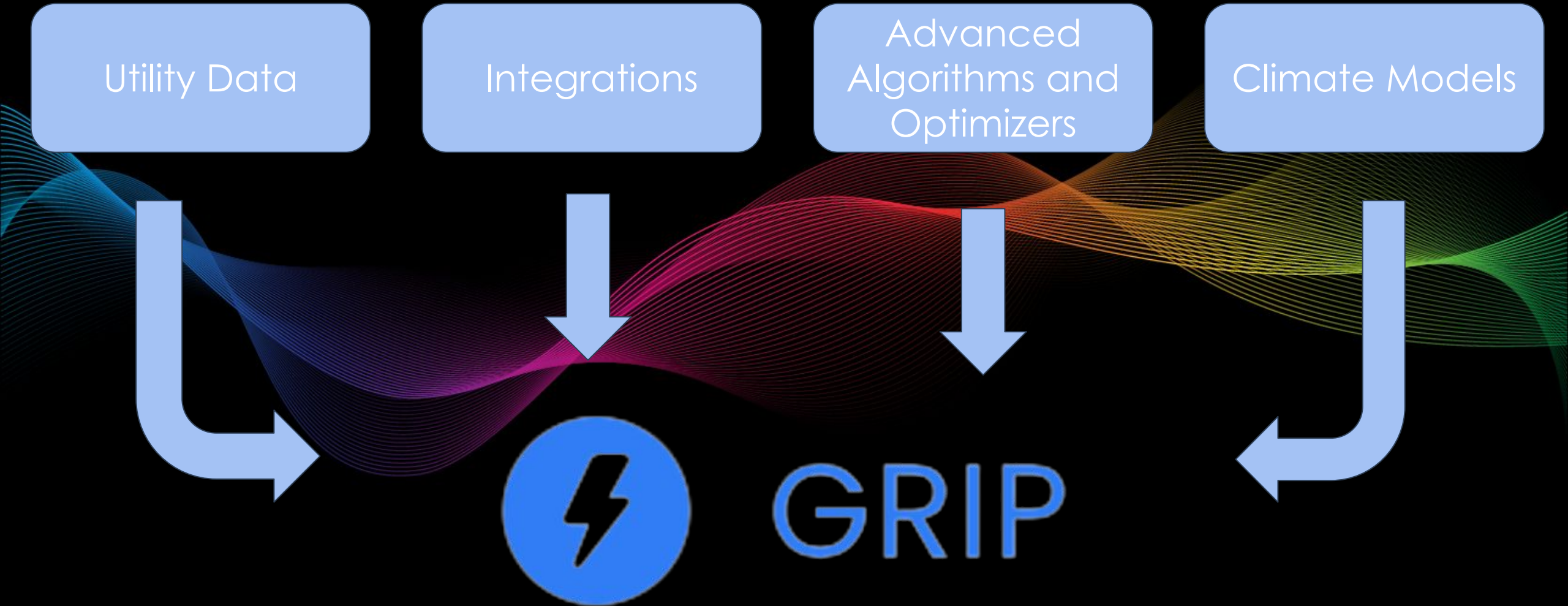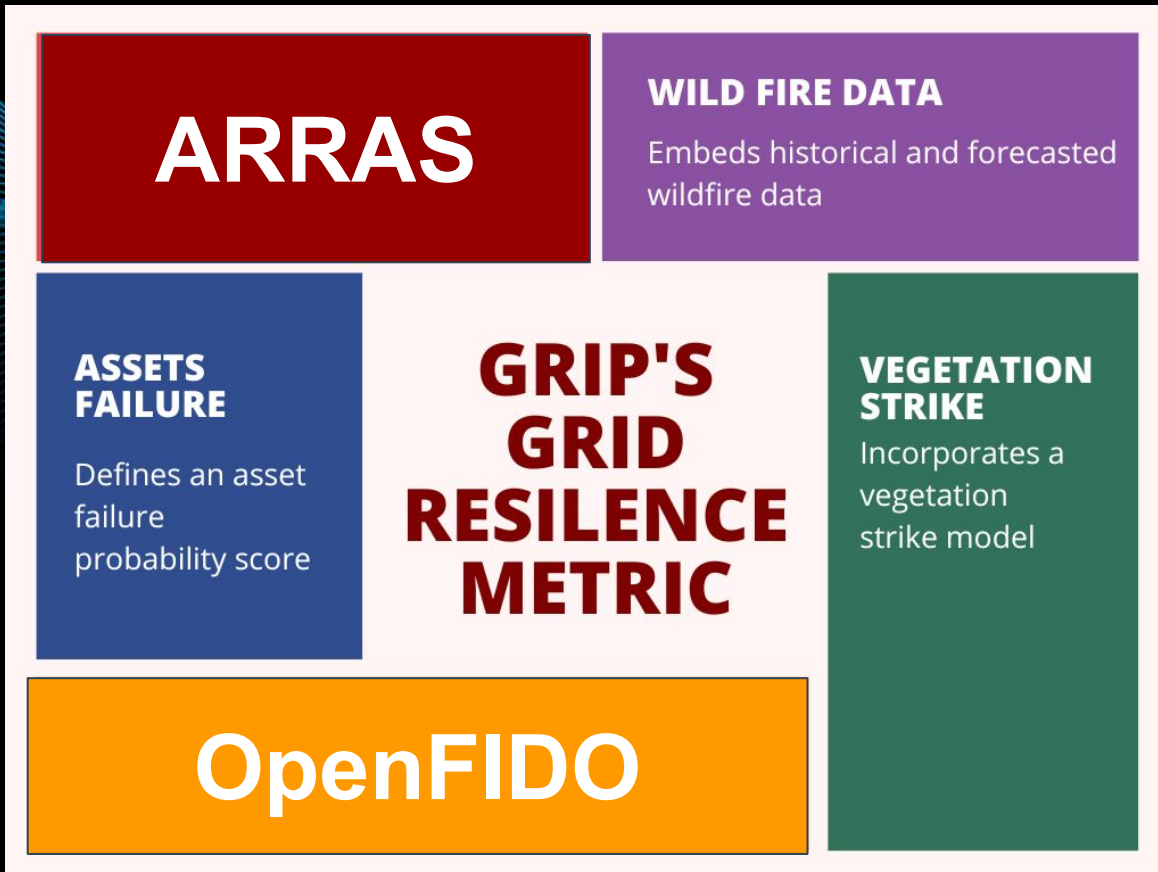**RECOVERY**

Bringing down data barriers

Capabilities

- **Bulk pole analysis due to extreme winds**
- **Pole analysis with distribution network impacts considering**
  - **Weather and conditions**
  - **Properties of poles**
  - **Load forecast and flexible demand curtailment**
  - **Integrated with commercial data management software utilities are currently using**
  - **Testing and validation on SCE data**
- **Vegetation contact risk**
  - **Testing and validation on SCE data, SLAC campus fed PG&E high voltage lines**
- **Wildfire risk mitigation protocols with GRIP**
  - **PSPS optimisation for distribution grids - minimization of households without power during high wind events. Considering DER locations, census / equity, critical loads, load forecasts and system characteristics (conductor insulation, weight etc).**
  - **Wildfire database integration that drives the optimization along with the resilience metrics as the objective function.**
  - **Upgrading computational efficiency via BAX optimisation.**

Metrics

- **Integration of data streams for resilience**
  - **Used for *prioritizing* the grid asset *hardening* due to extreme weather**
  - **Pole analysis use-case**
- **Using current and historical data to infer the impact forecast (i.e. resilience metric).**
- **Highlights infrastructure at risk of failure during an extreme event**
- **Allows for scenario analysis for mitigation planning.**
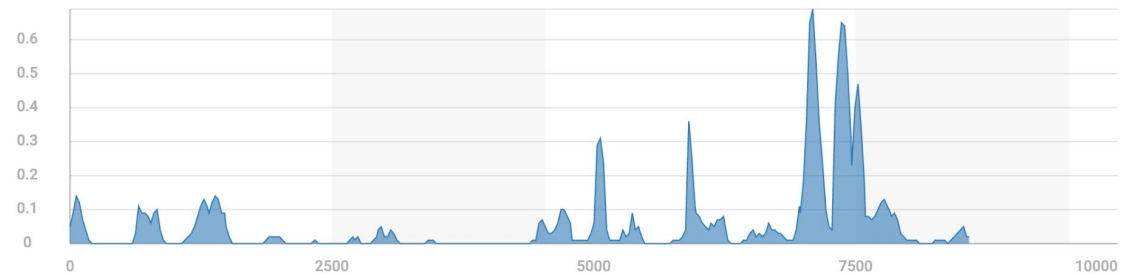- **Can be extended to planning and climate adaptation use-cases.**
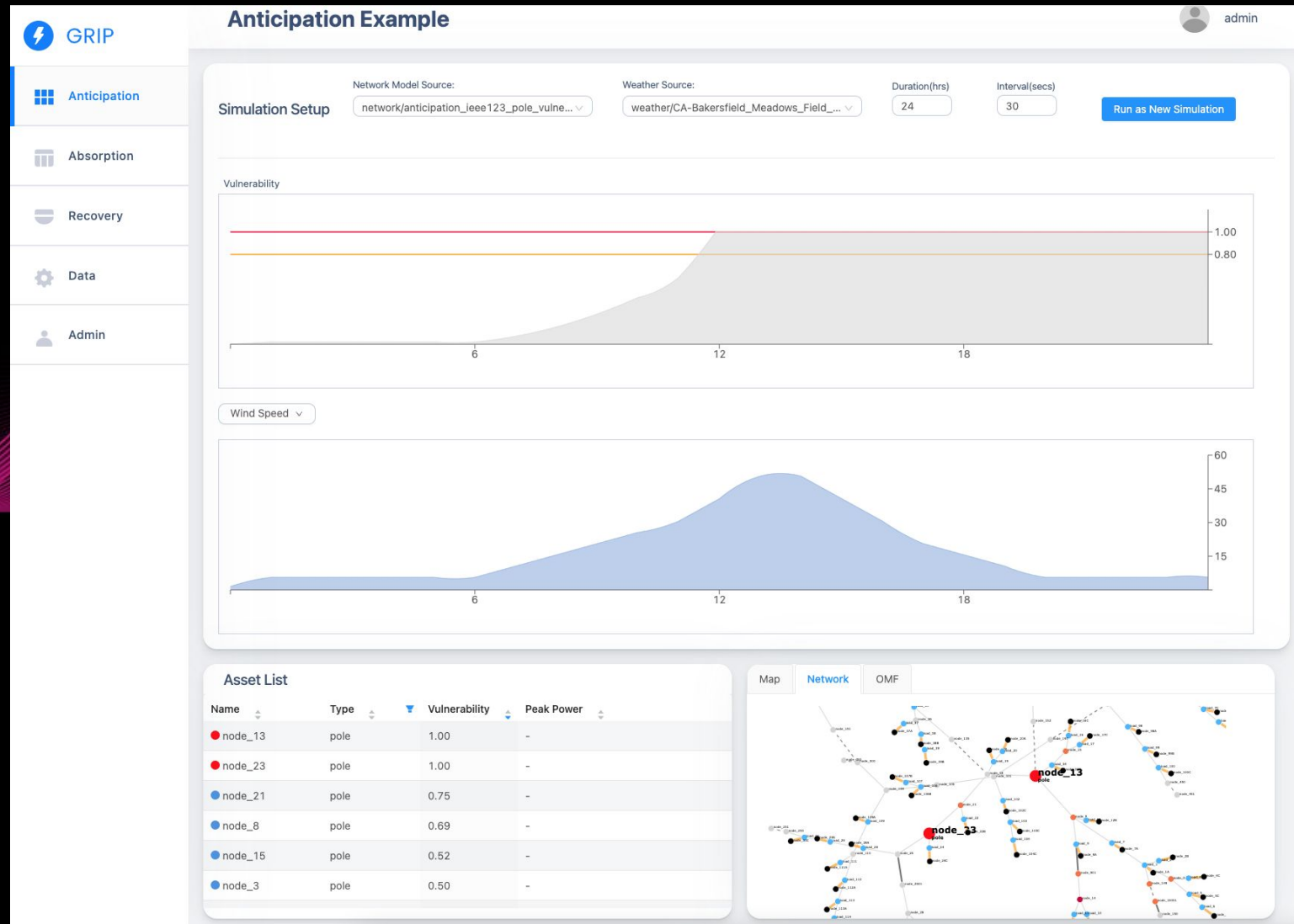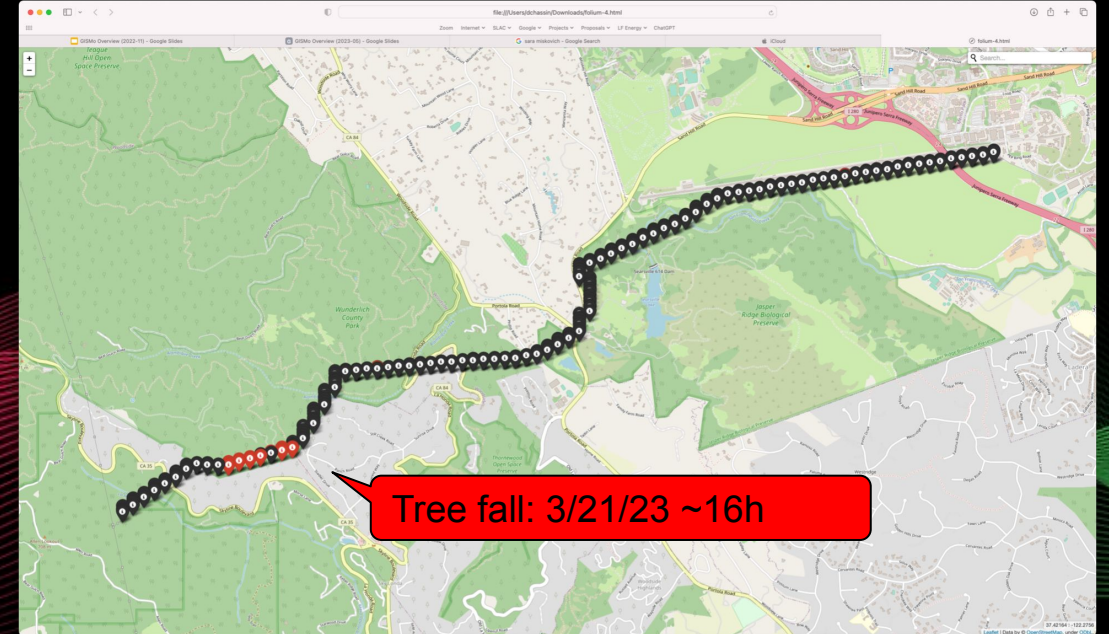
Vegetation

Wildfire mitigation

- Objective: Avoid or minimize the impact of wildfires

- Approach: Optimization function that uses the in-house developed resilience metric to prioritize and sectionalize the power shut offs given a set of constraints

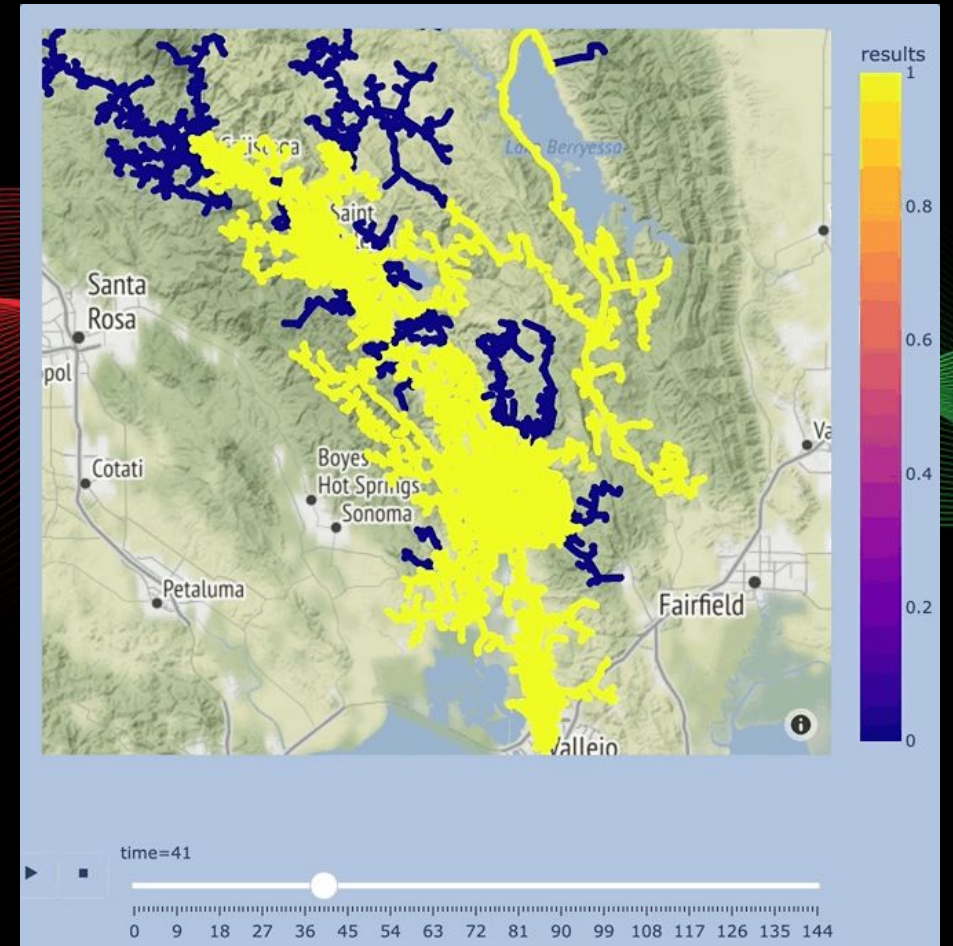- Constraints: DER availability, load criticality, equity, weather, wildfire probability risk, land-use.

Fig: PSPS event with PG&E Napa, CA Feeder Network

Ecosystem

Researchers

- Earliest adopters; includes National Labs and universities

Utility planners

- Long term system forecasting, resilience analysis, climate change impacts studies, decarbonization planning
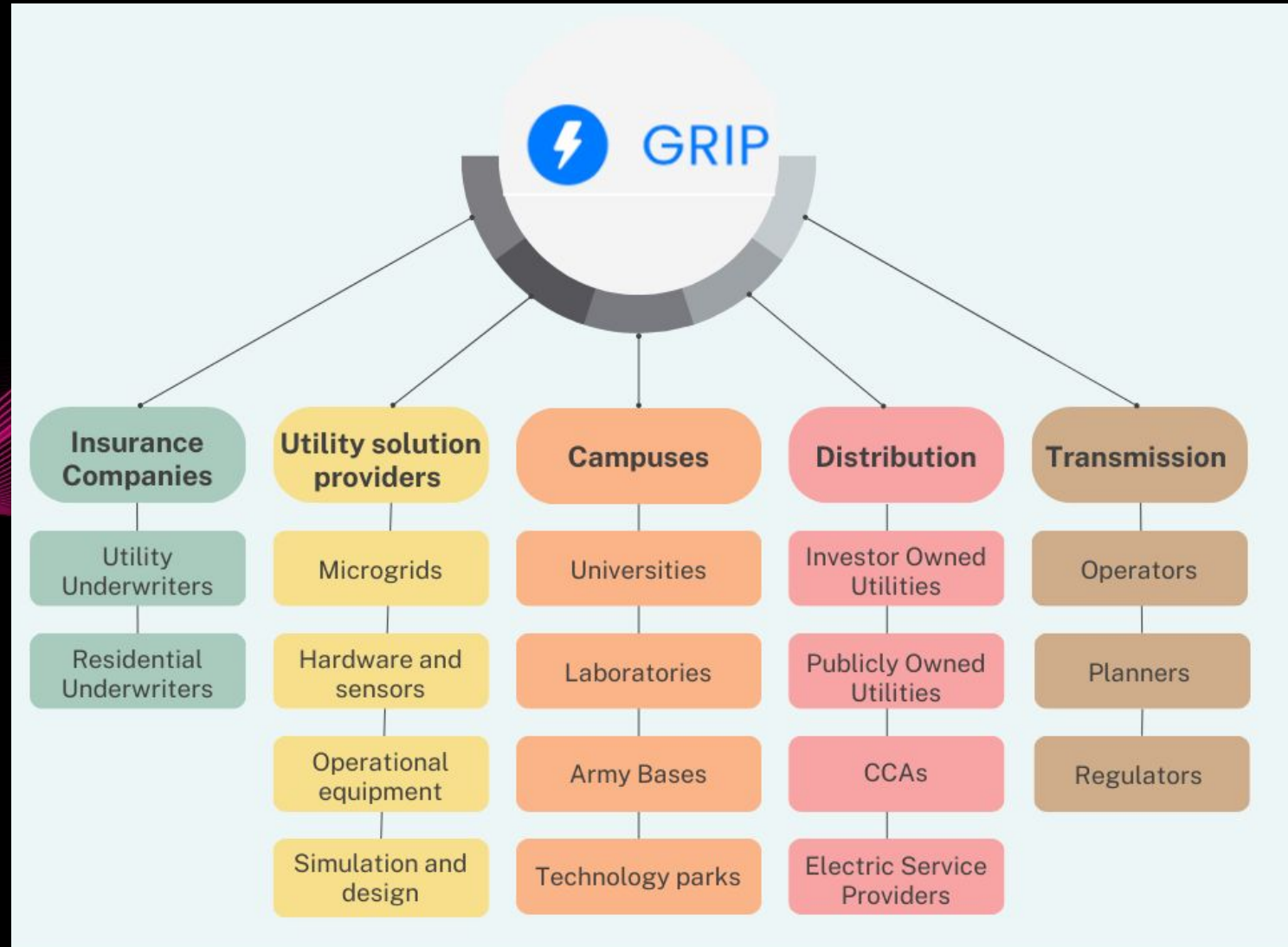
Utility operators

- System maintenance and hardening
- Wildfire preparation

Policy-makers

- Climate goals

Regulators

- Wildfire mitigation plan evaluation

Competition

	GRIP	SIEMENS / PowerWorld / GE / ABB	etap / EATON	Typhoon HIL / OPAL-RT / MathWorks	NEPLAN	Palantir
Power Systems Modeling	✔	✔	✔	✔	✔	
Infrastructure Modeling	✔			✔		
Custom Algorithms	✔					
Data Integration	✔	✔	✔	✔	✔	✔
Water/Gas Modeling	✔				✔	
Vegetation	✔					
Power Electronics Modeling			✔	✔	✔	

Mindset transition

- Extreme events are more frequent than ever
- Changing the narrative for how utilities approach the change in climate
  - Proactive Approach to resilience
- Standardized and transparent insights

Future Work

Roadmapping

Case studies

- Additional utility data

Training programs

Developer community

Increased support

Commercialization

New proposals

New use-cases

- Long term forecasting
- Additional weather scenarios
- New geographic regions
- Cascading events
- Cyber / physical interfaces

Partners

Parent: Edison International, one of the largest utility companies in US.

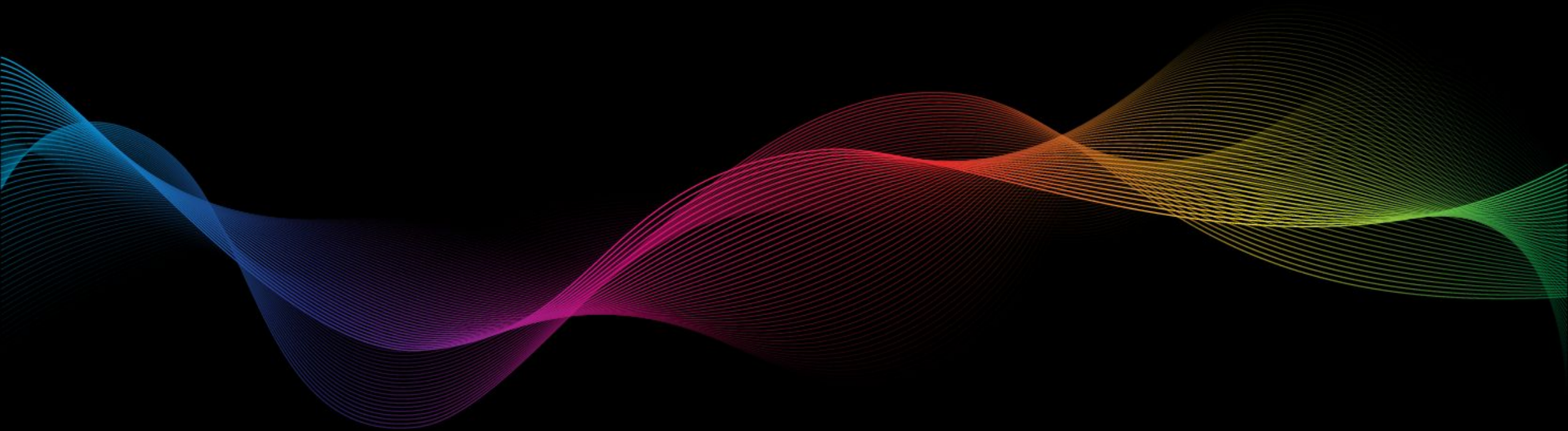# Thank you

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Extra slides

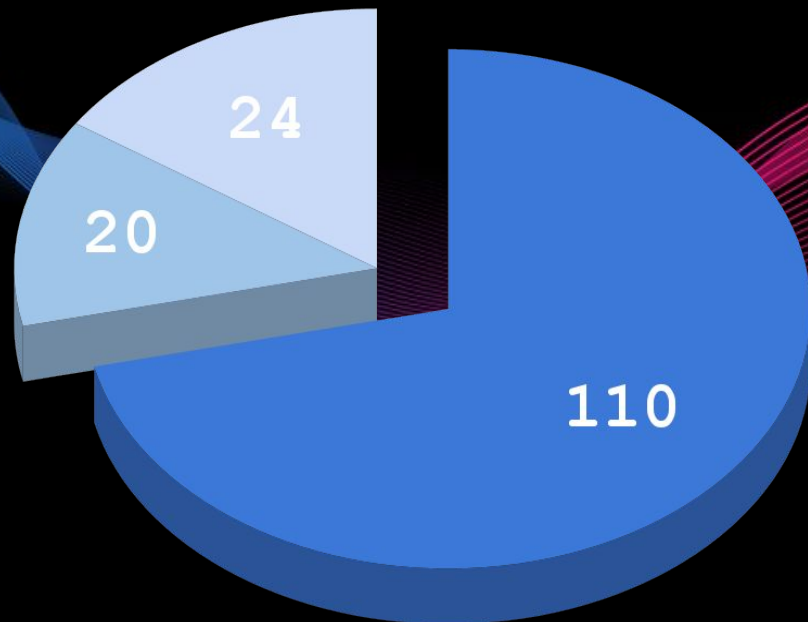# Market Sizing

US electric utility customers by ownership (in Million)

- Investor Owned Utility
- Cooperatives • Publicly Owned Utilities

Pie chart values: 110, 20, 24

TAM: Global Power Sector Investment $760B

SAM: Global Power System Simulations $1.1B

SOM: Software for power system analytics $750M

Financials

$2M

Scale GRIP to multi-utility deployment

Hire a team of developers

Financial planning

Item	Cost
Front End Developer	200k
Back End Developer	200k
Cloud Developer / Database Developer	200k
UI / UX	200k
Product Manager	200k
COO / CTO	200k
Cybersecurity	200k
M&S (hosting, hardware etc)	100k
Sales	300k
CEO	200k

Team

Alyona Teyber, CEO

Staff Engineer, SLAC, PI on DOE / DHS
GRIP ($7M prior investment)

5+ years of modeling distribution grid
systems.

Gustavo Cezar, CTO

Staff Engineer, SLAC &
PhD Stanford University

Technical Lead, Rhumbix (spinoff from
Stanford)

+ **Access to top tier scientists and researchers from Stanford and SLAC who
are willing to join the team**