# CIDER: DERMS Deployment and Research Project

Cooperative Recruitment Kickoff

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# Project Goals, Timeline, Costs

**Project Goals:**

1. Deploy a lower cost and full featured DERMS (Distributed Energy Resource Management System) with 3-5 coops.
2. Measure cost savings for consumer members and cooperatives.
3. Study how a DERMS can help with reliability, not just cost.

**Rough Timeline:**

- Running from mid-2023 through mid-2026

**Cost to Participate:**

- Software license fee, integration costs, and 2 years of maintenance will be covered by the federal research grant.
- Some time required from the cooperative to guide deployment and provide feedback.

**Overview of the Research Aspect:**

- DOE Awards $2.9M to NRECA Community-Integrated DER Project

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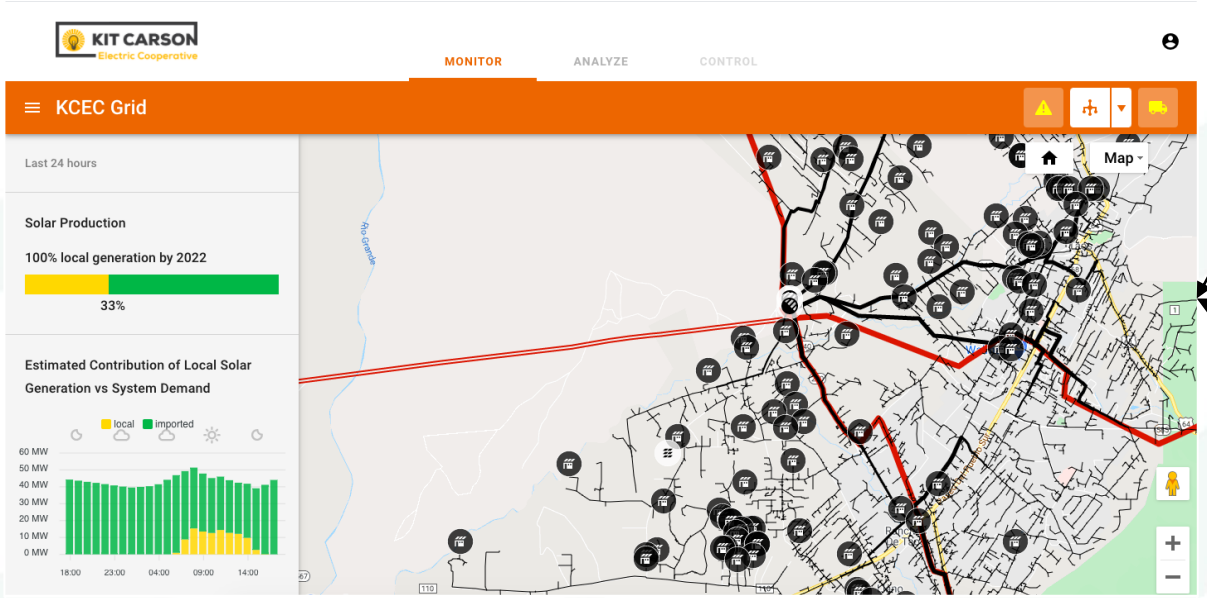
# Team

| NRECA America's Electric Cooperatives | CAMUS | EMULATE |
|---|---|---|
| • **Project management and reliability research**<br>• National research organization for over 900 rural electric utilities serving 65% of the landmass of the USA<br>• Delivered over $70 million in federally-funded research<br>• Team members: David Pinney (Analytics Program Manager), Lisa Slaughter (Sr. Data Scientist) | • **DER management platform**<br>• Ex-Google employees bringing modern software to grid transformation<br>• Enabling customers to achieve aggressive DER goals (e.g. 100% daytime load served via solar by 2022)<br>• Team members: Cody Smith (CTO), Birk Jones (Director, Customer Solutions) | • **Mobile device integration and battery-equivalent control**<br>• Initial customers in Europe being served with essential affordability and stability DER controls<br>• Proprietary method for aggregating many device types into a single battery-equivalent control<br>• Team members: Shwan Lamei (CEO), Dr. Daria Madjidian (Chief Scientist) |

# Technical Approach




Camus Platform: Visibility and Control over Grid and DERs
*Cloud-based, modern software*

Operational Systems (AMI, SCADA, OMS, etc.)

Utility-Scale Generation Assets

Existing DER Controllers

Emulate Virtual Battery Platform


Consumer DERs Connected Via SmartHome APIs

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# Camus: Platform for DER Integration

Data + orchestration platform:

- Real-Time Monitoring
- Forecasting & Analytics
- Advanced Control of Local Resources

KIT CARSON Electric Cooperative

Providing the operational insight and visibility to manage 100% daytime solar.

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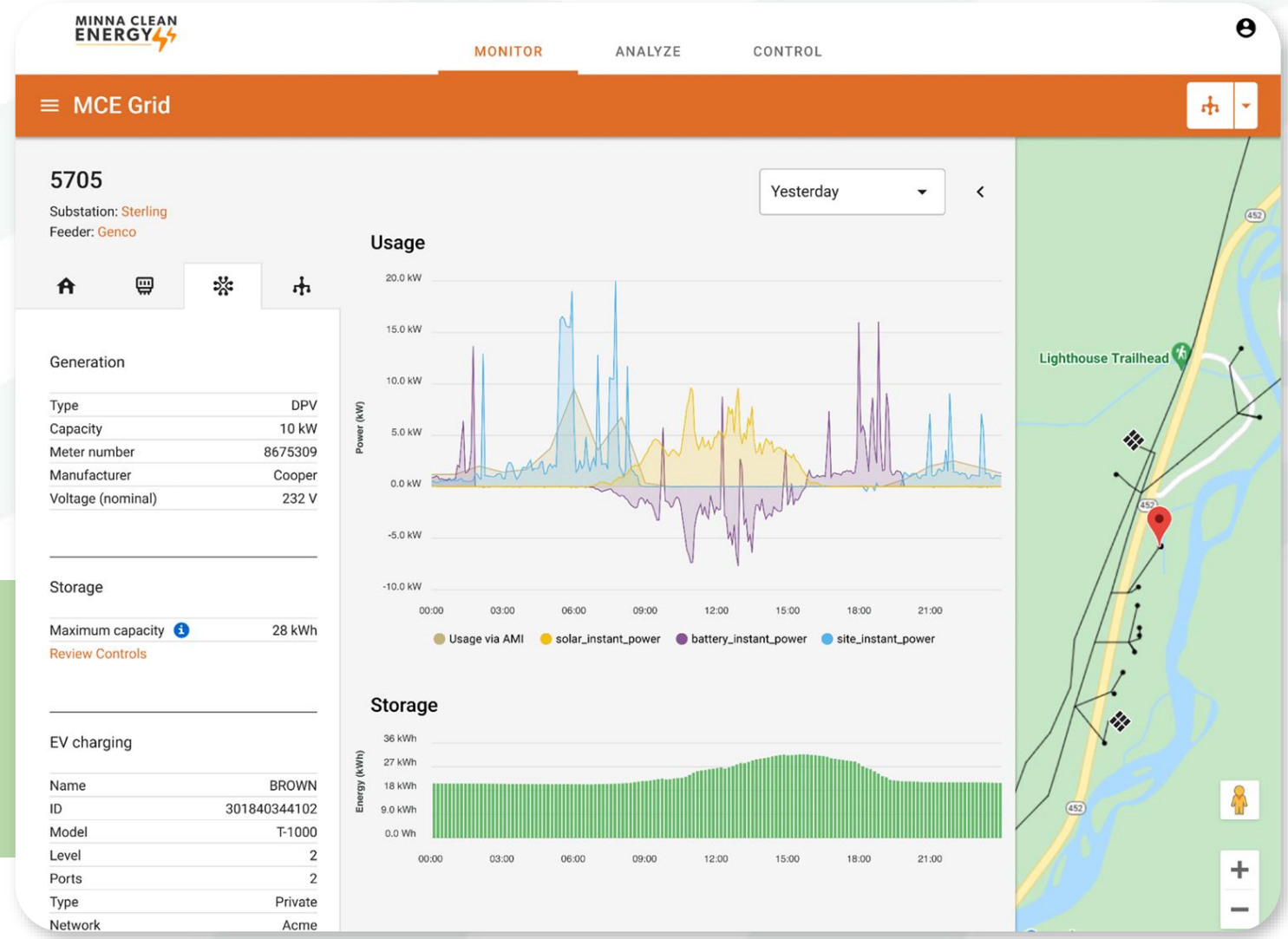
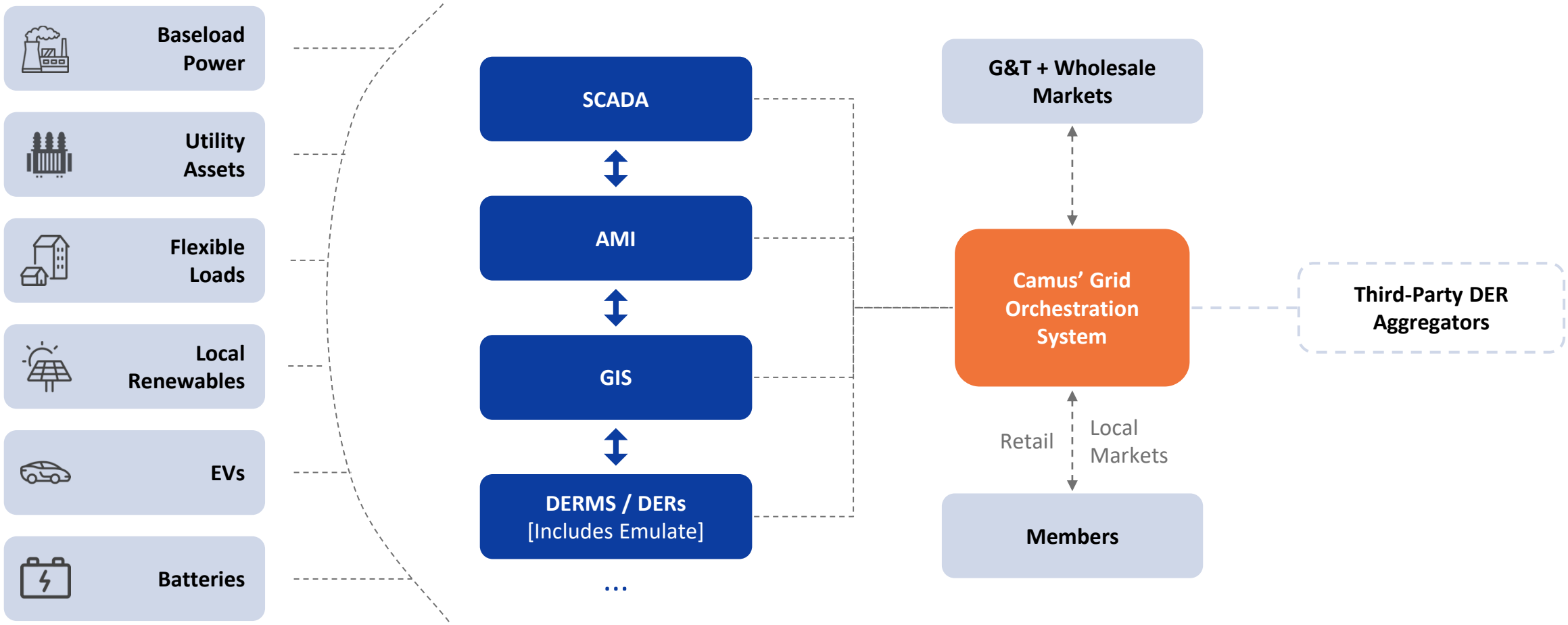


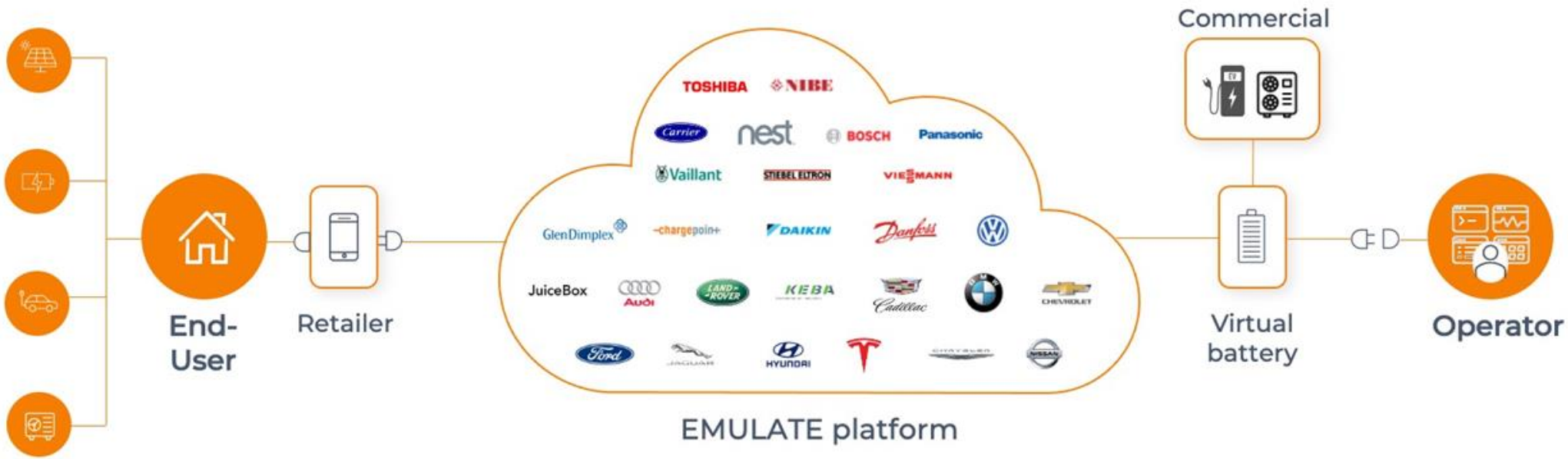
# FAQs - Camus

1. **What systems do you integrate with?**
   AMI, GIS, SCADA, DER vendors and/or aggregators [see next slide]
2. **After integration, how do you save co-ops money and improve quality of service?**
   Peak forecasting + management. Deferred capex (e.g. transformer upgrades). Faster / more flexible interconnections (esp. solar, storage).
3. **How long/hard is integration typically?**
   The long-pole = data access from the co-op. Typically ~3 months for visibility, 4-6 months for DER controls w/ testing.

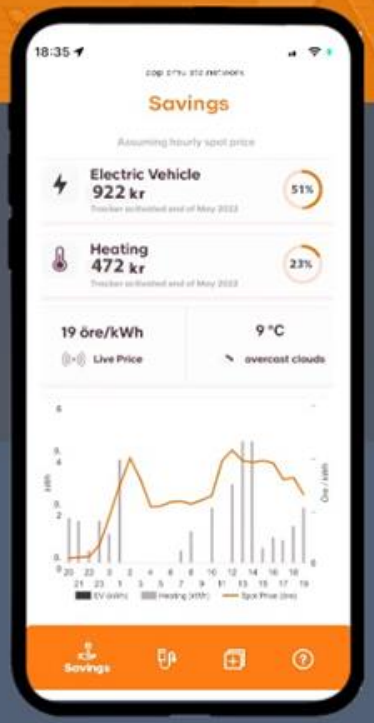
# Real-time, grid-wide orchestration from a single screen



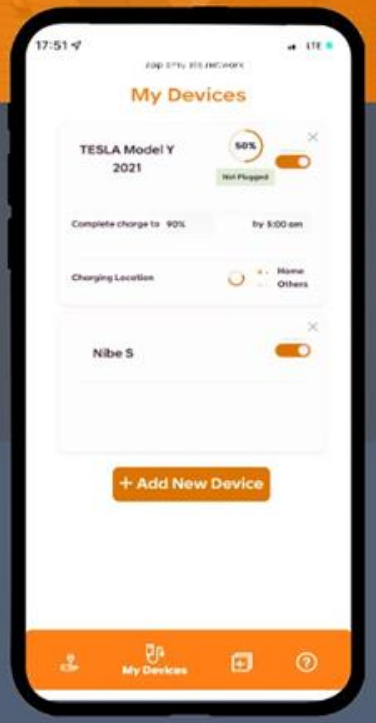
# Emulate: fast, easy, and affordable control for devices from over 50 vendors via smart home APIs



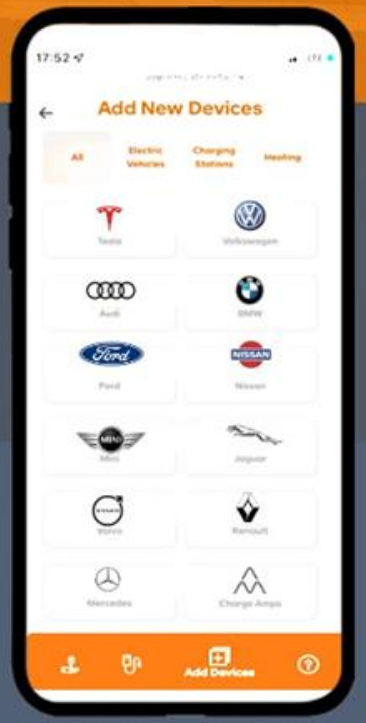
# Emulate will integrate with your existing co-op apps or launch a new one with your branding




Home Savings




Your Devices

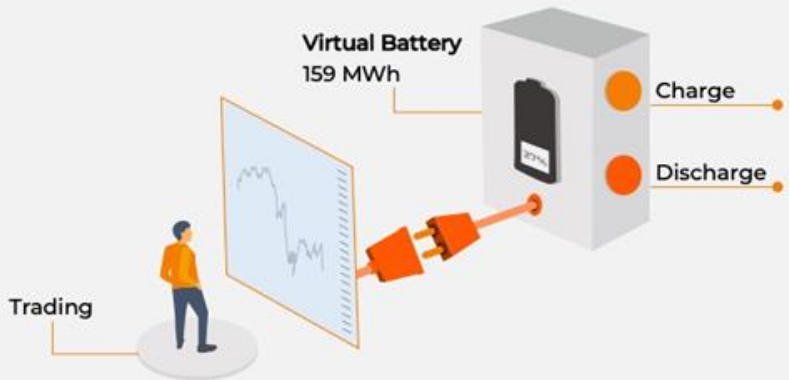



Add/ Remove


Support

# Emulate "Virtual Battery" makes controlling multiple types of DERs at the same time easier

Control could not be easier - the battery spec defines the limitations of what can be done without **user comfort** being affected negatively.



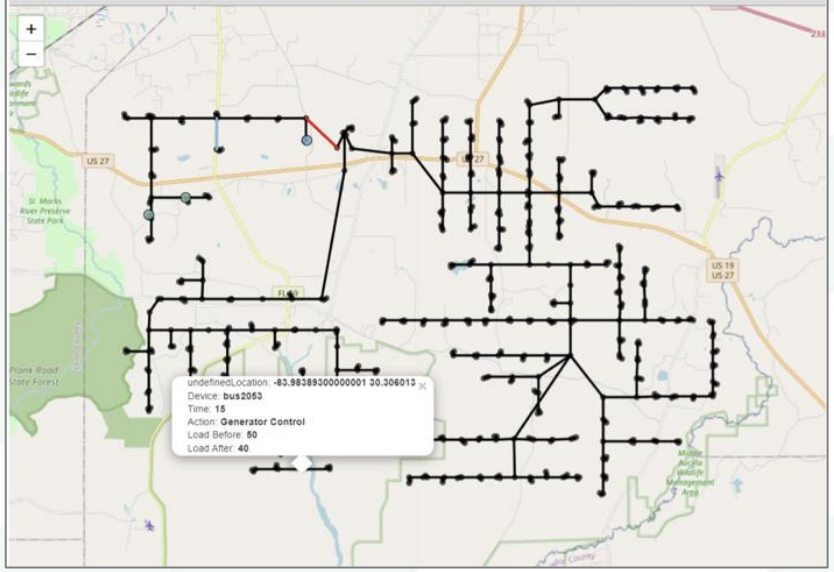

# NRECA's Resilient Operation of Networked Microgrids

- Restoration with DERs is a huge challenge (e.g. 3 steps become 20+)
- Leverage optimization-based approach to dispatching DERs, switching, and re-regulating.
- Per-meter impact calculation: are we meeting member needs?

Timeline

| Device | Time | Action | Load Before | Load After |
|---|---|---|---|---|
| l_1006_1007 | 1 | Switching | 50 | 0 |
| load_1003 | 3 | Load Shed | 20 | 10 |
| load_1016 | 7 | Load Pickup | 10 | 20 |
| bus1014 | 10 | Battery Control | 50 | 60 |
| bus2053 | 15 | Generator Control | 50 | 40 |

Outage Map (Original Faults Marked in Blue, New Faults Marked in Red)

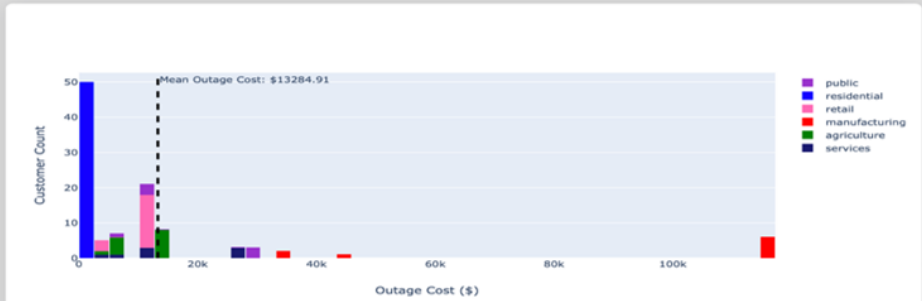



Spatio-temporal plan for control actions for restoration

Per-meter outage duration and economic impact calculation

| Customer Name | Duration | Season | Average kW/hr | Business Type | Load Name | Outage Cost |
|---|---|---|---|---|---|---|
| 964693 | 2 | summer | 26.76 | agriculture | 964693 | $6,344.02 |
| new_c014230_from_a | 2 | summer | 6.74 | residential | new_c014230_from_a | $9.42 |
| new_c014230_from_c | 2 | summer | 0.05 | residential | new_c014230_from_c | $5.38 |
| 962261 | 2 | summer | 10.80 | retail | 962261 | $4,206.62 |
| new_c014230_to_a | 2 | summer | 9.30 | residential | new_c014230_to_a | $9.42 |
| new_c014230_to_b | 2 | summer | 0.05 | residential | new_c014230_to_b | $5.38 |
| 964836 | 2 | summer | 9.00 | residential | 964836 | $9.42 |
| 964833 | 2 | summer | 4.20 | residential | 964833 | $9.42 |
| 964829 | 2 | summer | 33.72 | agriculture | 964829 | $6,344.02 |
| 964688 | 2 | summer | 15.24 | retail | 964688 | $4,206.62 |
| 962204 | 2 | summer | 22.20 | agriculture | 962204 | $6,344.02 |
| 962206 | 2 | summer | 9.12 | residential | 962206 | $9.42 |

Customer Outage Histogram

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# DERMS Benefits for Reliability (Research)

- **Research question:** once we can reliably monitor and control DERs, how can they contribute to system reliability and resilience?
- **Potential ideas:**
  - Backup power offerings - for critical loads, can backup power be offered more affordably? (e.g. control during normal operations generating savings)
  - Outage response for critical loads - can we provide backup power on-demand to critical loads? (e.g. can EVs used for mobile restoration.)
  - DER in restoration - with good control and visibility can we energize parts of the system for some hours during multi-day bulk system outages? (e.g. during daytime with solar + storage.)
- **Implementation:** DERMS systems once deployed will give us the data to answer this question.

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# Questions for the Cooperative

- What DERs do you currently control in your service territory? (e.g. thermostat program w/100 devices enrolled, a utility 1 MWH utility scale battery, etc.)
- For the DERs in your service territory that you don't control, which ones are you most interested in and why? (e.g. thermostats to shave peaks, EV identification to avoid transformer overload, etc.)
- What is the energy cost structure for your cooperative? (e.g. energy at %0.05/kWh and simple monthly peak demand at $10/kw)
- Do you offer your consumer members a time of use rate, and approximately how many take advantage of it?
- What reliability challenges does your system face? (e.g. wildfires, ice storms, bulk system outages, etc.)
- Do you offer a smartphone or web app to your members to view e.g. usage, rates, etc.?

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# Next Steps

## 2023

**Select coop partners, define the deployment process.**

## 2024

**First 2 coops deployment complete.**

**Measurement of benefits begins.**

## 2025

**3-5 additional coops deployed, study complete on resilience benefits of DERs.**

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