


# Lunchtime Technology Spotlight Series



# Richard Brody

CTC Global





How can the right conductor choice today  
prepare you for an uncertain tomorrow?



## The Problem in View

Utilities are working to upgrade existing infrastructure for increased capacity, reliability, and resilience while dealing with rapidly changing market demands.

### Which of these impacts you the most?

“ Every project has its own issues – It can take years of planning and yet, we still don’t have a crystal ball. It’s hard to know what’s going to work in the near term and the far term. ”

James Berger, Managing Director - Transmission Projects, American Electric Power



WHAT CAN BE DONE TO ADDRESS YOUR CHALLENGES?

# ACCC<sup>®</sup> Conductor – Increased Capacity, Reliability, Resilience, and Efficiency

## ACCC<sup>®</sup> CONDUCTOR VS CONVENTIONAL CONDUCTORS WITH THE SAME OVERALL DIAMETER & WEIGHT

*Data is representative of standard Drake size conductors at maximum recommended operating temperature*



### Proven and measurable results

Greater Strength - Lower Thermal Expansion / Sag

Higher Capacity - Reduced Line Losses - Improved Reliability & Resilience



WHERE HAS ACCC<sup>®</sup> CONDUCTOR BEEN USED?

# ACCC Project Examples

## Reconductor Project

Project Name: PacifiCorp 90 South to Oquirrh, Utah  
Project Goal: Increase Ampacity (use existing structures)  
Conductor Size: Drake  
Conductor Length: 30 km  
Voltage: 138 kV  
Energized: 2005  
Over 100 existing structures saved

## Heavy Ice Application

Project Name: NV Energy Line 107 (Reno to Carson City)  
Project Goal: Increase Ampacity (existing structures)  
Conductor Size: Linnet  
Conductor Length: 90 km  
Voltage: 120 kV  
Energized: 2009

## New Line

Project Name: Kingman to Cunningham, Kansas  
Project Goal: Install New Line  
Conductor Size: Hawk  
Conductor Length: 108 km  
Voltage: 34.5 kV  
Energized: 2006

## Corrosive Marine Environment

Project Name: CFE Carmen to Noreste  
Goal: Increase ampacity reduce line sag, avoid corrosion  
Conductor Size: Hawk  
Conductor Length: 32 km  
Voltage: 230 kV  
Energized: 2009

## Wind Farm Link

Project Name: NEO Energia 80 turbine upgrade  
Project Goal / Type: Increase Ampacity (existing structures)  
Conductor Size: Amsterdam  
Conductor Length: 57 km  
Voltage: 66 kV  
Energized: 2008

## Long Span Application

Project Name: Chilectra El Salto to Torre 8 Line  
Project Goal: Increase Ampacity – (existing structures)  
Conductor Size: Linnet  
Conductor Length: 28 km  
Voltage: 110 kV  
Energized: 2009

## Extra High Voltage Application

Project Name: Amprion GmbH  
Project Goal / Type: Trial Line  
Conductor Size: Oslo (bundled)  
Length: 8.6 km  
Voltage: 400 kV  
Energized: 2009

## River Crossing

Project Name: River Mondego  
Project Goal: Increase Amps - Reduce Sag  
Conductor Size: Amsterdam  
Span Length: 475 Meters  
Voltage: 60 kV  
Energized: 2012

## HVDC

# Jessica Harrison

VEIR





# Unlocking Transmission Capacity with High Temperature Superconductors

**May 2024**

Jessica Harrison  
VEIR, Executive Director of Strategy and Growth  
[jessica@veir.com](mailto:jessica@veir.com)







**AI is driving a surge in data center power demand...**



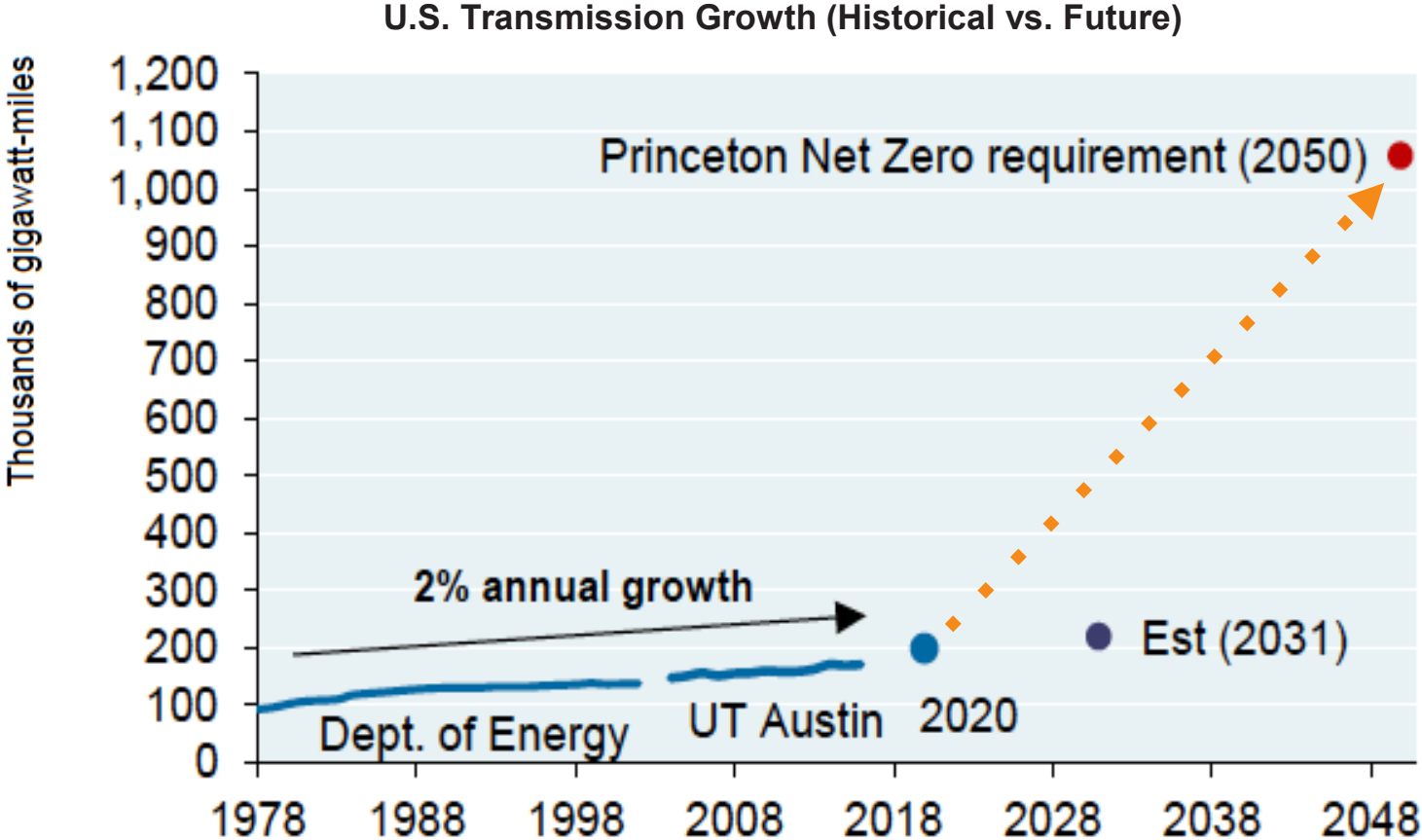
**Renewable generation is growing rapidly...**



**Electrification is arriving fast...**

# Market forces driving need for > \$20T in grid investment

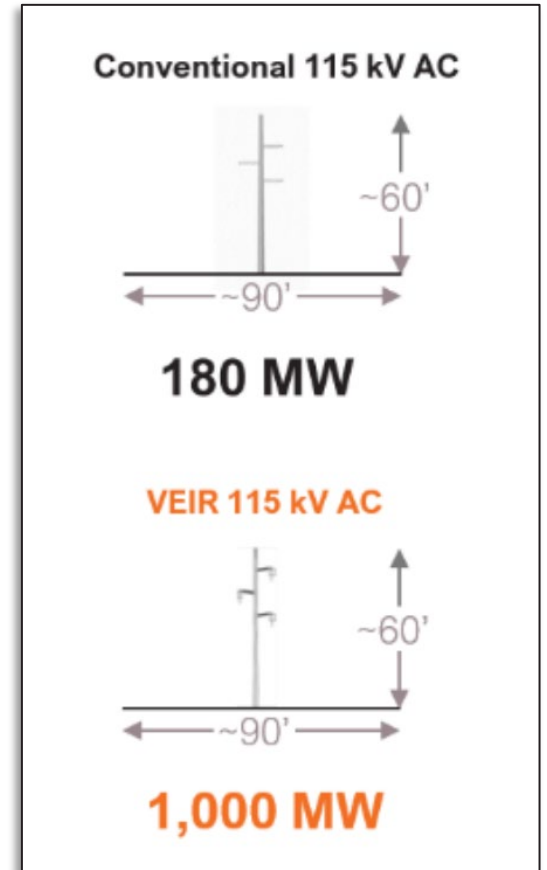
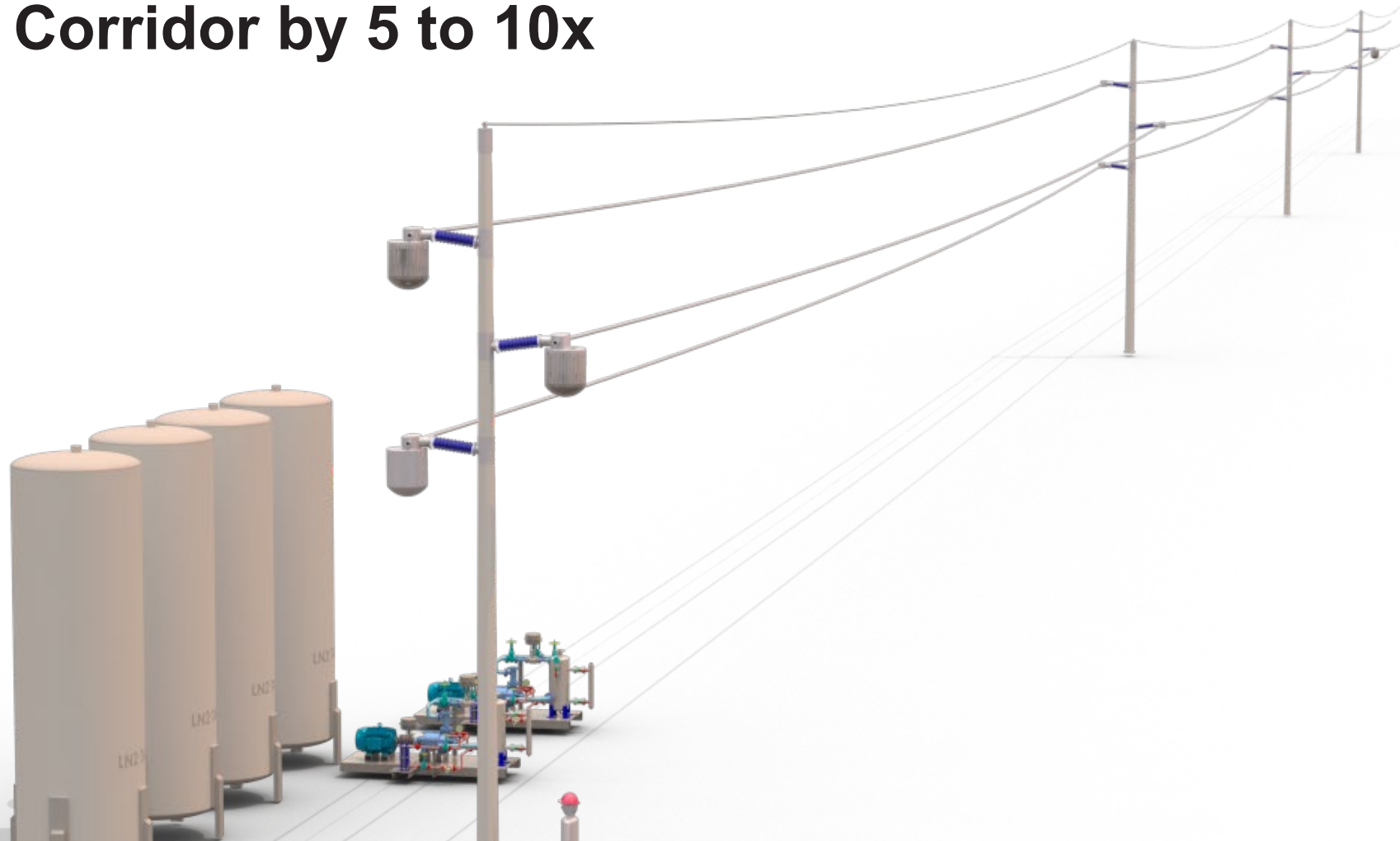
Global transmission investment today is \$200B/year and expected to double by 2035



**Building high-  
capacity  
transmission  
today is  
exceptionally  
difficult**



# VEIR Transmission Solution Increases Power Delivery within a Corridor by 5 to 10x



VEIR moves 5-10x the power of traditional conductors at a given voltage and can reduce transmission's footprint by nearly half

# Current Situation



# Conventional Upgrade



# VEIR Upgrade



# VEIR's technology has been demonstrated and Series B will focus on delivering a commercial pilot & first project

## Demonstration

- Outdoor, overhead conductor
- 100 ft span
- 34.5 kV wood poles
- VEIR's innovative cooling system



- VEIR is pre-commercial but has demonstrated its technology
- VEIR is looking for a host customer to deploy a 60 MW pilot in 2026
- VEIR has just kicked off a Series B fundraising which will close in 2024

## VEIR's Woburn, MA Demonstration Facility

Builds upon VEIR's indoor demonstration, which carried 4,000 Amps of current





Jessica Harrison  
VEIR, Executive Director of Strategy and Growth  
[jessica@veir.com](mailto:jessica@veir.com)

# Brian Fitzsimons

GridUnity



# Experienced Across Multiple Operating Environments

## Large IOU Experience



- ILCM first deployed in 2016
- Over 1M load and generation applications processed in California
- 1.2k applications/day avg.
- Over 8 enterprise system integrations
- Supporting over 32 programs in California across load, generation, and natural gas

## Multi-OpCo Experience



- ILCM platform deployed across 5 unique OpCo's at Entergy and 3 at Hawaiian Electric
- Ability to "roll-up" data to holding company view
- Multi-state/Multi-operating company IOU expertise
- Standardized the interconnection process across multiple states while supporting jurisdictional specific programs/requirements

## RTO Experience



- ILCM-T deployed in 2019
- Over 2k interconnection applications processed
- Manages large and small generation interconnection, replacement, retirement, and optional studies
- Facilitates communications between ISO's, TO's, and generation developers
- FERC Order 2023 compliant solution

# Robert Roseman

Schneider-Electric





# Digitalization for Grid to Prosumer



Life Is On

**Schneider**  
Electric

# Utilities are facing significant disruption

DER integration



Climate impacts



Data as the new energy



Changing regulation & policy



**Significant  
Disruption**

Cybersecurity risks



Aging infrastructure & people



New revenue models



The new energy prosumer



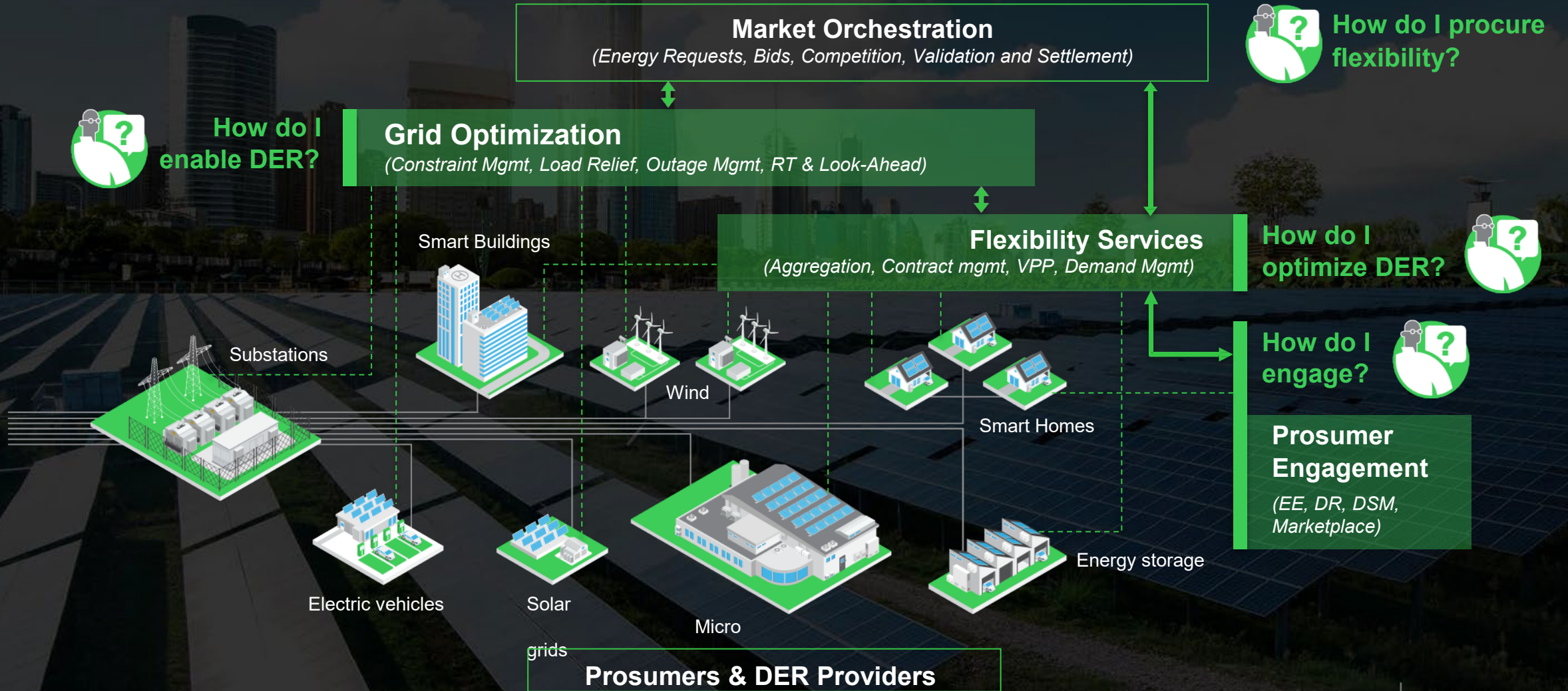
Life Is On



# Requiring new ways to optimize supply and demand



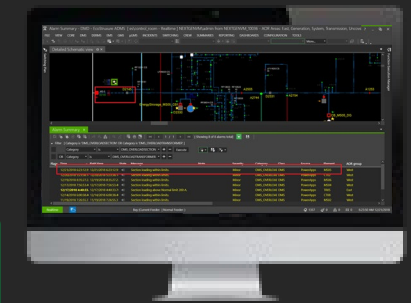
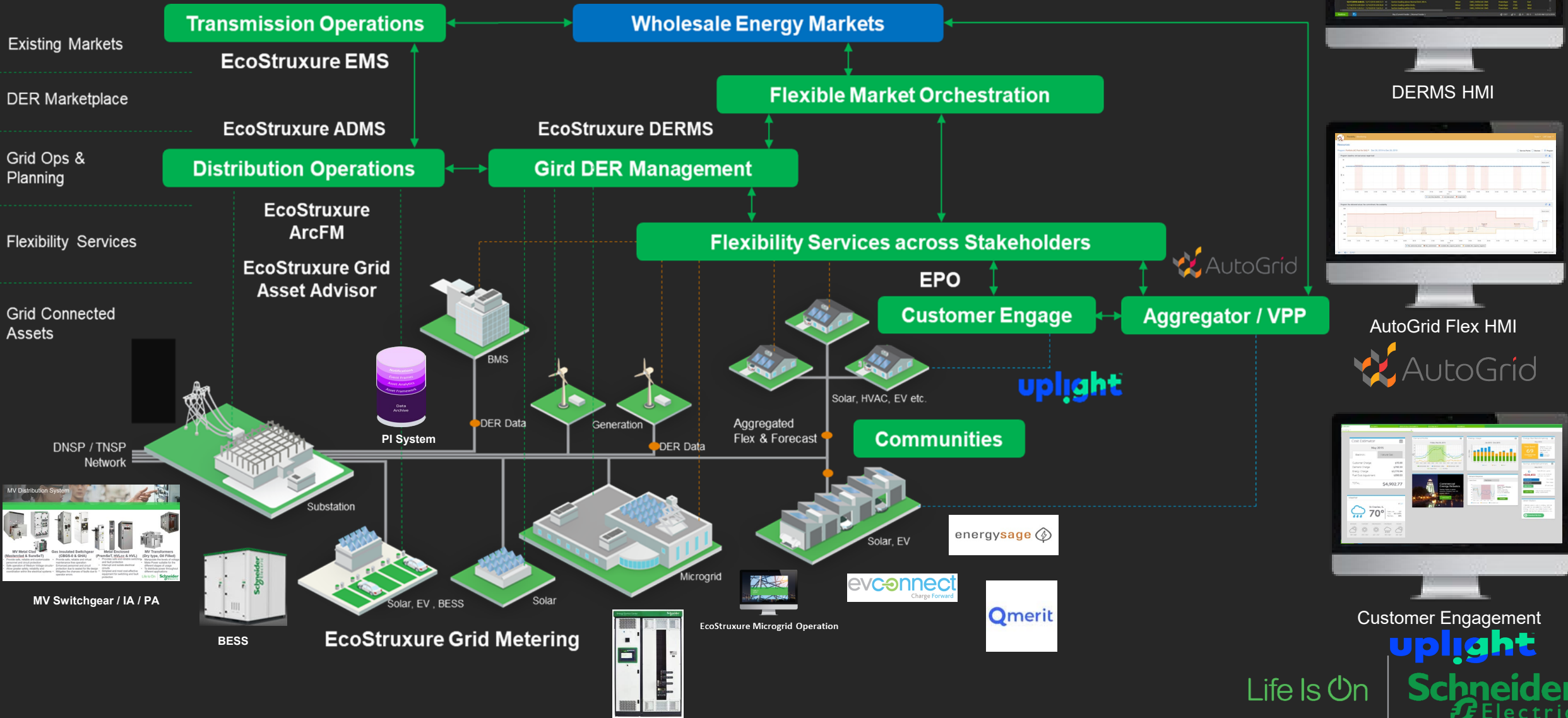
# Evolving complexity of the energy value chain



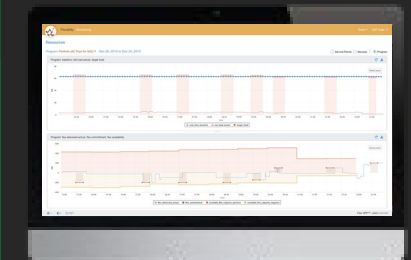


# Enterprise solutions for Grids of the Future

Digitalization, optimization & automation for flexibility, resiliency & risk mitigation



DERMS HMI



AutoGrid Flex HMI



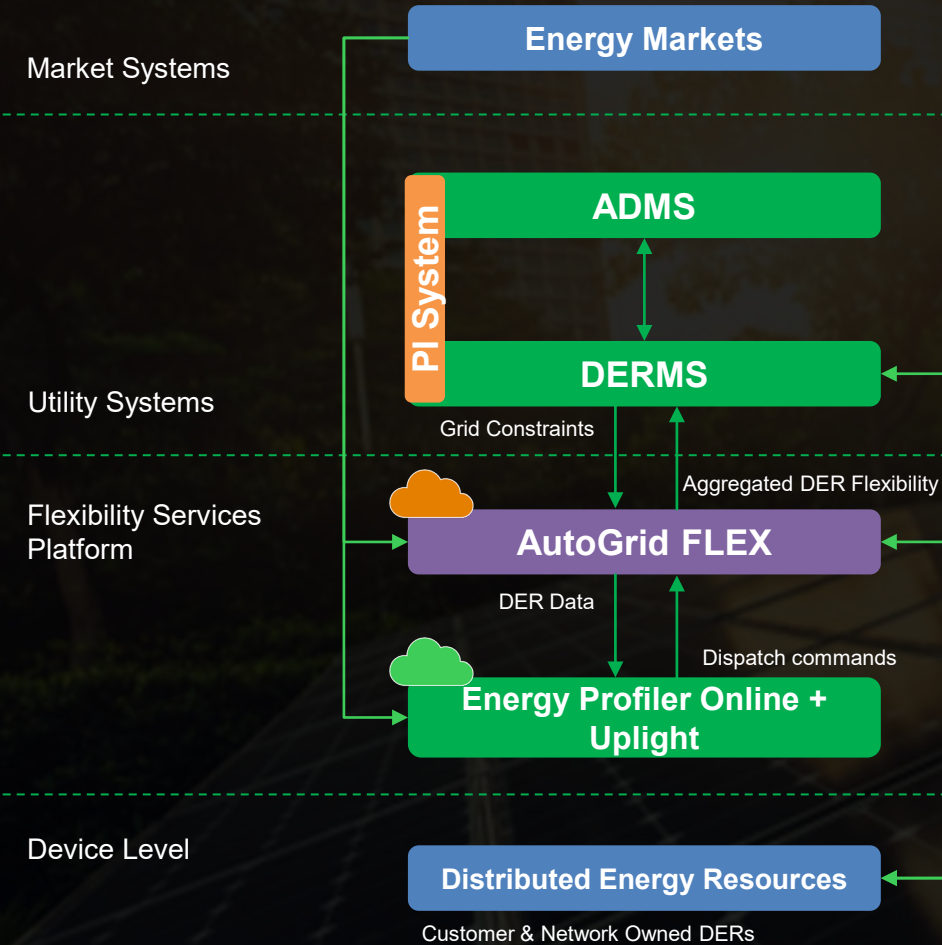
Customer Engagement



# Operational landscape – DER management

## Key Functions

- Weather Forecasting Services
  - Spot, FCAS & DR Markets etc.
  - External Data Feeds
- 
- Ensure network reliability and service supply
  - Optimize network operations by increasing workforce & asset efficiency
  - Increase energy efficiency and reduce technical losses
- 
- Identify, predict & manage grid constraints
  - Distribution Network simulation and planning (Hosting Capacity and Customer Connections)
  - DER Management with VVWO, Load Relief, Look-Ahead, etc.
- 
- DER Monitoring, Control & Forecasting
  - Individual, Aggregated & 'Pool of Pool' Optimization
  - Multi-market Optimisation & Bid Calculation
- 
- Customer Management
  - Customer Portals, Reporting & Dashboards
  - Demand Response Measurement & Validation
- 
- Generation: Solar PV, Generators
  - Flexible Loads: EVs, BMS, Batteries
  - Subsystems: Microgrids, Aggregators, Smart Precincts



Life Is On



# Nachum Sadan

GridEdge Networks



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# Grid Flexibility Solutions

**Nachum Sadan**

Founder/CEO

GridEdge Networks

40 Nagog Park, Unit 105

Acton, MA 01720

(978) 569-2030 / (978) 303 7515

[nachum@gridedgenetworks.com](mailto:nachum@gridedgenetworks.com) [www.gridedgenetworks.com](http://www.gridedgenetworks.com)

# GridEdge Overview

- MA grid technology company
- Facilitating grid integration of clean energy, energy storage and electric vehicles
- Reducing interconnection cost and accelerating deployment time using flexible technology innovations: **More DER, Faster, Lower Cost**
- Developed a grid flexibility platform named DERCOM for DER integration



NYSERDA

- Awarded two NYSERDA grants for Product Development and Field Testing of DERCOM in partnership with Avangrid
  - PON 4074 - High Performing Grid “DER Closed-loop Control System Using Distributed Communications” (2021)
  - PON 4393 – The Future Grid “Flexible Interconnections and Grid Services Platform for DER, ESS and EV Charging” (2023)



- Awarded two MassCEC grants (2022, 2023)
- Awarded CT PURA IES grant (2024)
  - Grid integration of EV Fleet with V2G



# The GridEdge Solution

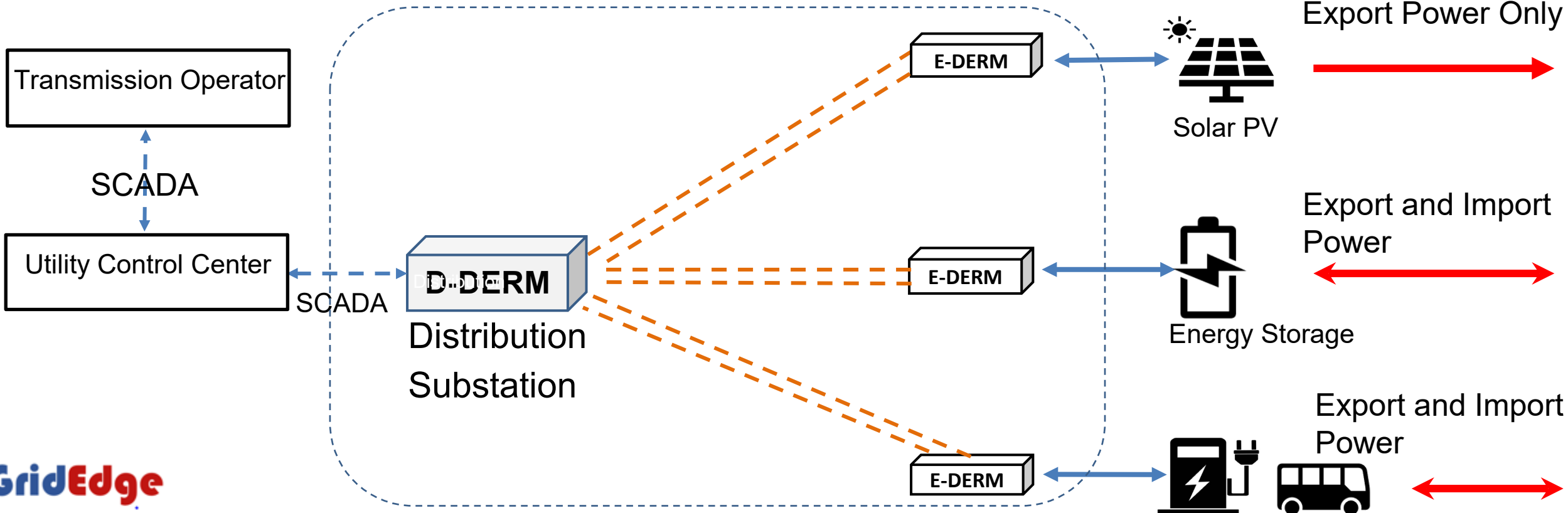
RTO & Utility

GridEdge DERCOM

DER

## Localized Grid Flexibility Platform

- Closed loop control algorithms
- Flexible interconnections
- Flexible load management
- Flexible charging/discharging



# GridEdge Pilot Projects



## Solar PV

Seaside Solar  
Bridgeport CT

Woodoak Solar  
Tusten NY

Flexible  
Interconnections

Utility partner: Avangrid



## EV Fleet integration with V2G

North Haven CT in LMI community area

Flexible Charging and Discharging

Model of cooperation between utility and EV Fleet  
operator serving the local community



## Energy Storage EV Charging

Scottsville Site  
Rochester NY

Flexible Load and  
Flexible Generation

# Distributed Control to a Distributed Grid

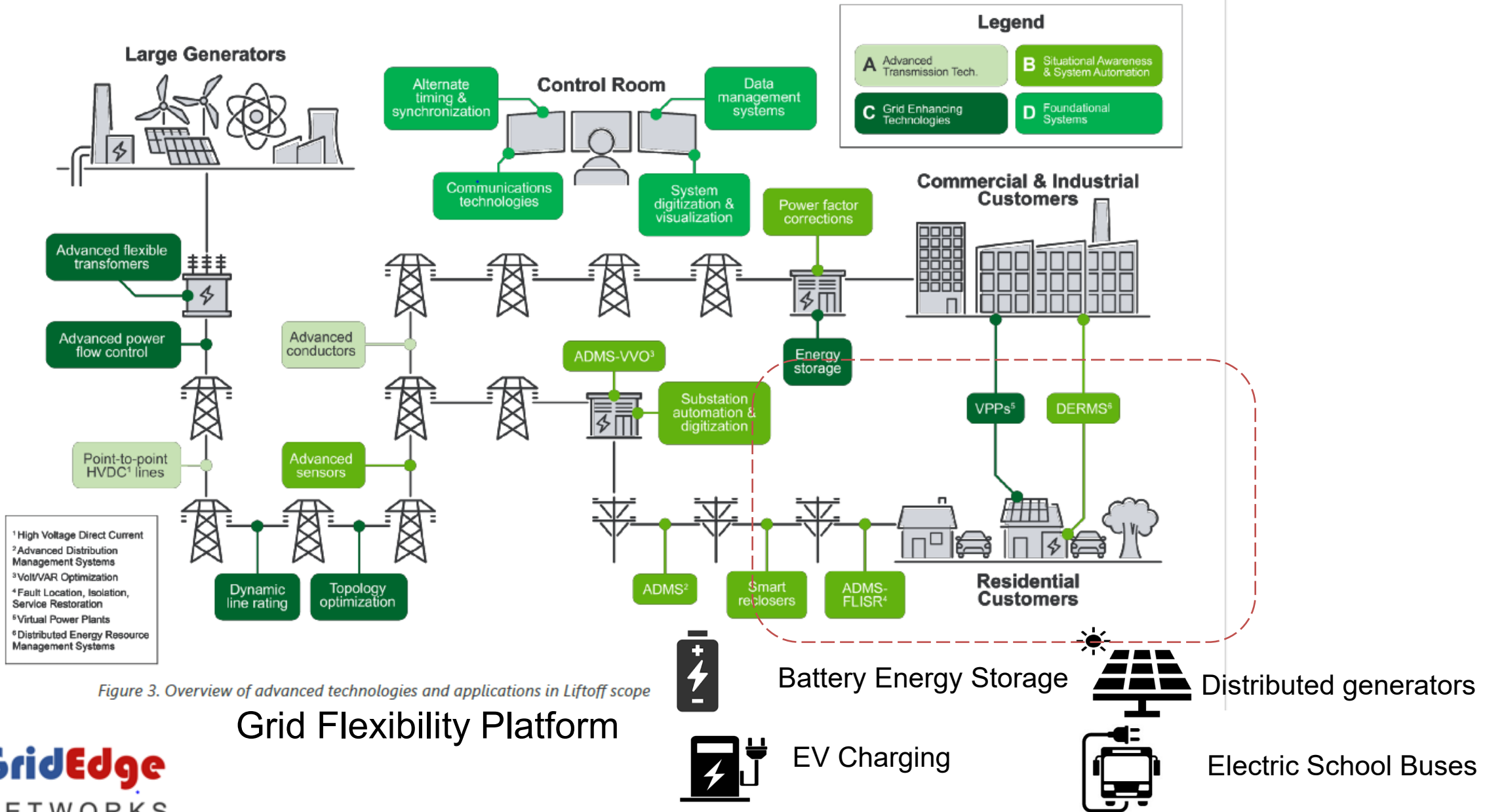


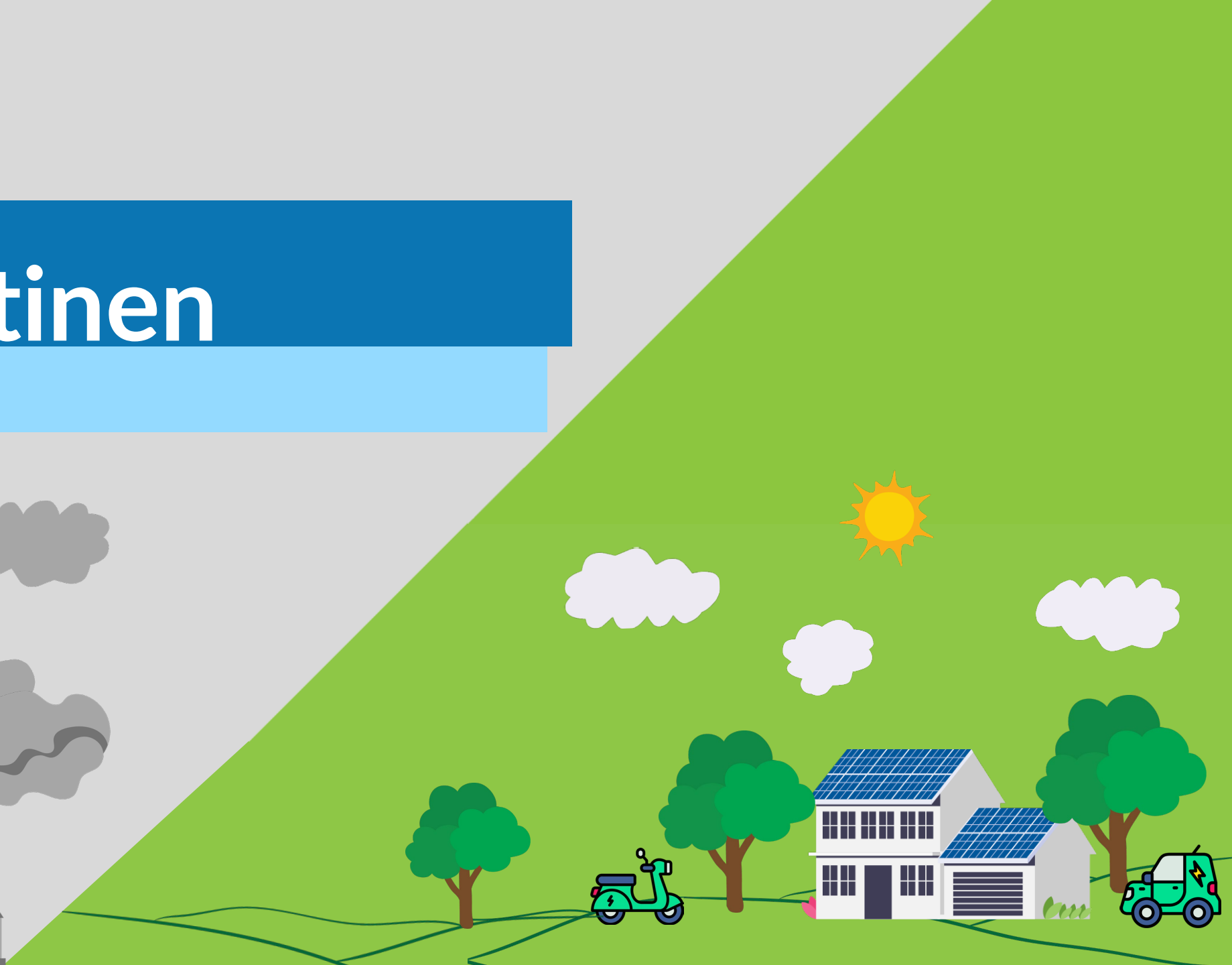
Figure 3. Overview of advanced technologies and applications in Lifford scope

## Grid Flexibility Platform



# Pasi Miettinen

Sagewell



# Scaling Electrification

**sagewell**<sup>SM</sup>

Future of the Grid  
May 23, 2024

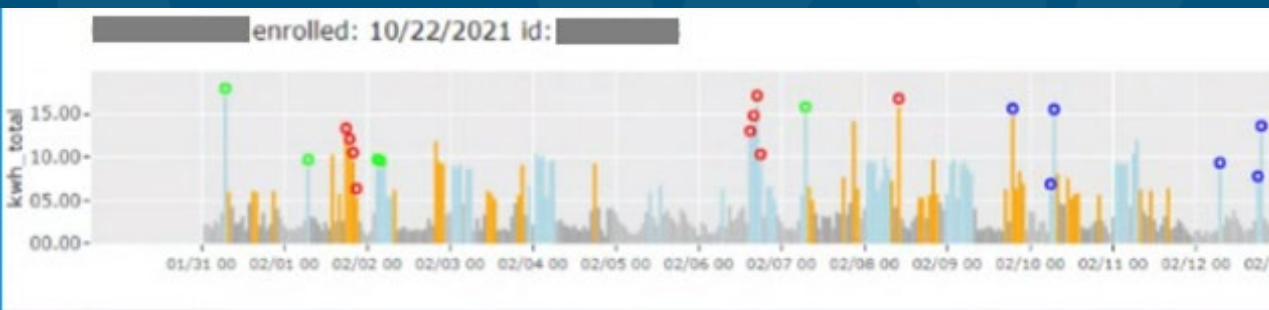
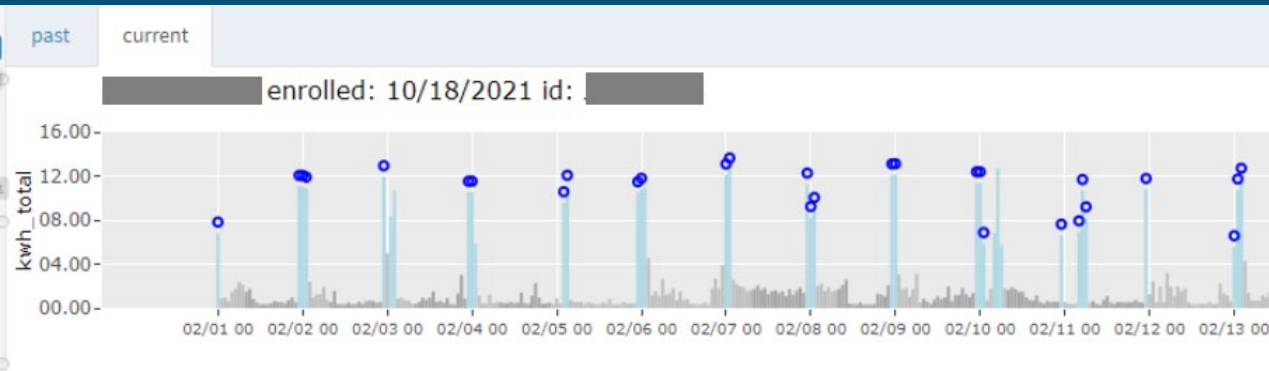
Pasi Miettinen  
CEO, Sagewell, Inc.  
[pasi@sagewell.com](mailto:pasi@sagewell.com)

## Which home do you electrify first?

- Who is already electrified?
- Who is easiest to electrify next?
- What barriers are there?
- Where do you deploy program resources?



# No need to guess: AMI analytics quickly analyzes millions of meters



Can create “digital twins” if AMI data is not available yet



50% of EVs

# Identify greatest emissions and peak reduction opportunities



✓		
		✓

			✓
✓			
✓			

# Customized decarbonization plan for every homeowner



sagewell<sup>SM</sup>



## Electrification Suitability Score

92<sub>/100</sub>

### Barriers:

- Insulation

### Candidate:

- Heat pump
- EV load management
- VPP
- Insulation



“Offer relevant energy solutions that make customers happy”

- Reduce electric rates for all
- Reduce energy costs
- Reduce emissions

# Sarah Herbert

Linevision





# Introduction to Linevision

May 23  
Transitioning to a  
Future Grid





# LineVision LUX Sensor



## Complete Visibility

- > Optical sensor monitors all phases
- > Data transmitted wirelessly to LineVision platform
- > Self-powered using solar PV

## Easily Deployed

- > Sensors strategically placed every 2-3 miles
- > Install completed using basic hand tools
- > **No outages and no live-line work**



### LineRate

Dynamic Line Ratings



### LineAware

Reduced Operational Risk



### LineHealth

Informed Asset Management

# Dynamic Line Ratings (DLR)

- What is DLR
  - A grid-enhancing technology that monitors ambient conditions that heat or cool the line and calculates the true line rating
- How its done
  - Combines data on ambient conditions that impact a conductor's carrying capacity (air temperature, solar radiation, wind speed and direction) with data on the conductor itself and sensor validation
- How is this different than current practice
  - Static Line Ratings
  - Ambient Adjusted Ratings

**Are there benefits to knowing a conductors true capacity? YES**

# Benefits of DLR

Quickly unlock additional capacity, support reliability, and increase operational flexibility



Safely unlocking 10-30% additional capacity to meet demands on transmission grid



Utilize real time ratings to respond to system events, including extreme weather



Provides benefits before, during and after construction of new facilities




DLR deployment can take place in a matter of months and at less than 5% the cost of rebuilding

# At a glance: AES Deployment

**Project:** 42 LineVision sensors deployed in IN & OH. Increasing grid capacity & providing grid flexibility for critical C&I load integration.



- LineVision & AES worked together to select lines based on utility & customer benefits
- **Increased Capacity:** 345 kV line for “step-load” customer - average increase of 61% over static; 23% over AAR
- **Reliability & Planning:** 69kV line to address overload for energy generation - initially saw decrease in ratings - this identified a line segment experiencing significant constraints to be addressed with strategic planning (vegetation management and/or reconductoring)
- **Ongoing work:**
  - Continue data collection for full year
  - Move from observation to operationalizing
  - Leverage synergies between 881 implementation and DLR



Lessons from first deployment of Dynamic Line Ratings

42 LineVision Sensors on 5 diverse AES lines

An AES | LineVision case study



[AES/LineVision Deployment Study](#)

# Additional Deployment Examples

**New York Transco**  
*Building a Clean Energy Future Together*

Installation **on critical sections of the new NYES 54-mile line**, ensuring the lines are operating at max efficiency and capacity.

*Reliability & Resilience*

 **SMUD**<sup>®</sup>

Project aims to **proactively alleviate bottlenecks** on congested transmission lines and more efficiently utilize renewable generation from the 700 MW of UARP hydropower.

*Reliability & Resilience*

**nationalgrid**

DLR has been integrated into operations to **reduce offshore wind curtailments** in UK.

*Reducing Congestion & Supporting OSW*

**nationalgrid**

DLR deployed on 4x circuits in **operationalized DLR project in NY** integrated into real-time ops w/NYISO.

*Integrating Renewables*

# Community Benefits

**LineVision's solutions can provide a range of benefits to communities, including:**

**Customer Savings:** grid congestion is often a cost customers must absorb, by reducing this congestion DLR can help customer rates

**Grid Resiliency:** our technology provides visibility into transmission lines, delivering real-time alerts that can reduce disruptions caused by factors such as extreme weather

**Carbon Reduction:** deploying DLR can enable clean energy integration. LineVision estimates our technology has helped utilities avoid ~2 million MT of CO<sub>2</sub>

**Economic Advancement:** our technology can also help enable connecting C&I customers including EV/solar manufacturers incentivized under IRA, facilities supported by the CHIPS act, and data centers



# Thank you.

Sarah Herbert

Regulatory & Policy Manager

[sherbert@linevisioninc.com](mailto:sherbert@linevisioninc.com)



# Richard Tabors

New Grid

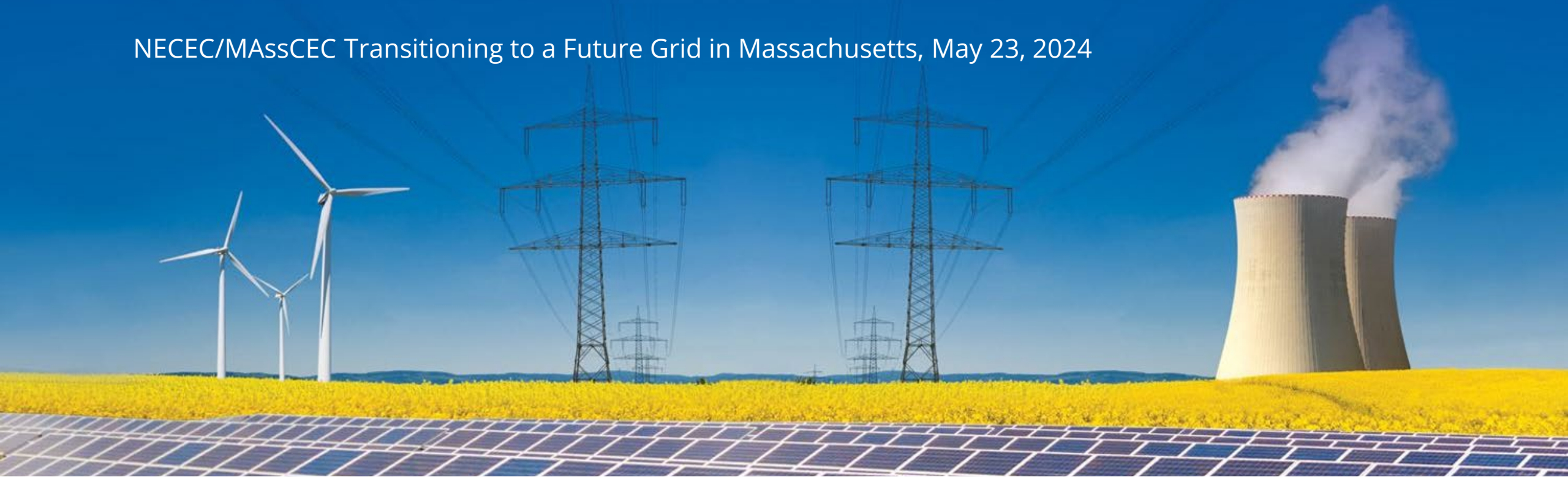






# CONGESTION MANAGEMENT / MITIGATION WITH TOPOLOGY OPTIMIZATION

NECEC/MAssCEC Transitioning to a Future Grid in Massachusetts, May 23, 2024



Presented by:

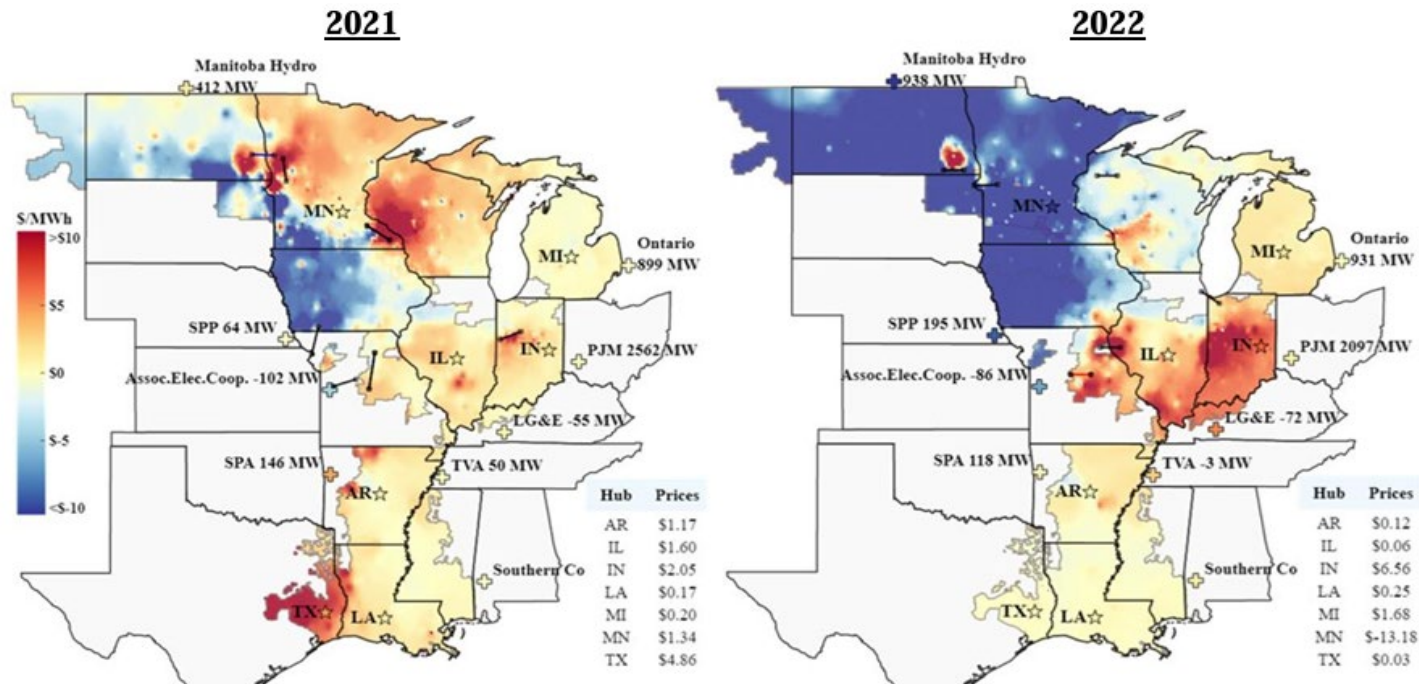
Richard Tabors, *NewGrid*

# THE PROBLEM: INSUFFICIENT TRANSMISSION WHERE IT IS NEEDED

CONGESTION OCCURS WHEN THERE IS INSUFFICIENT TRANSMISSION CAPACITY TO MOVE LOWER COST, (AND OFTEN RENEWABLE) ENERGY TO CONSUMERS

1. Transmission is seen as a FIXED ASSET... ***This is incorrect!!***
2. Today's congestion management approach is to redispatch high-cost generators close to consumers to meet demand ... ***This is expensive and inefficient!!***

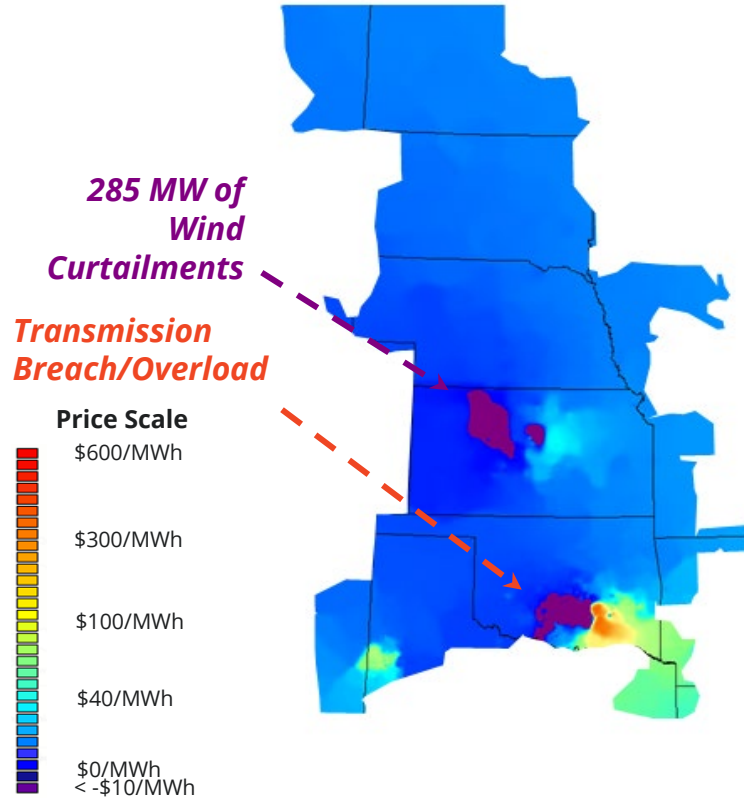
**Congestion Costs in MISO increased 30% from 2021 to 2022 (=\$3.7 Billion)**



# THE SOLUTION: NEWGRID **ROUTER**™ TOPOLOGY OPTIMIZATION

- In Real Time **Router** it can be used to Identify transmission lines and other elements that can be opened (“transmission switching”) to reroute energy flows around constraints as well as to respond to emergencies like those caused by extreme weather events.
- In the planning time-frame **Router** it can be used to identify strategies to schedule maintenance or modify future investments (Mass CEC Grid Modernization & Infrastructure Planning with ISO NE)

### SPP Historical Case

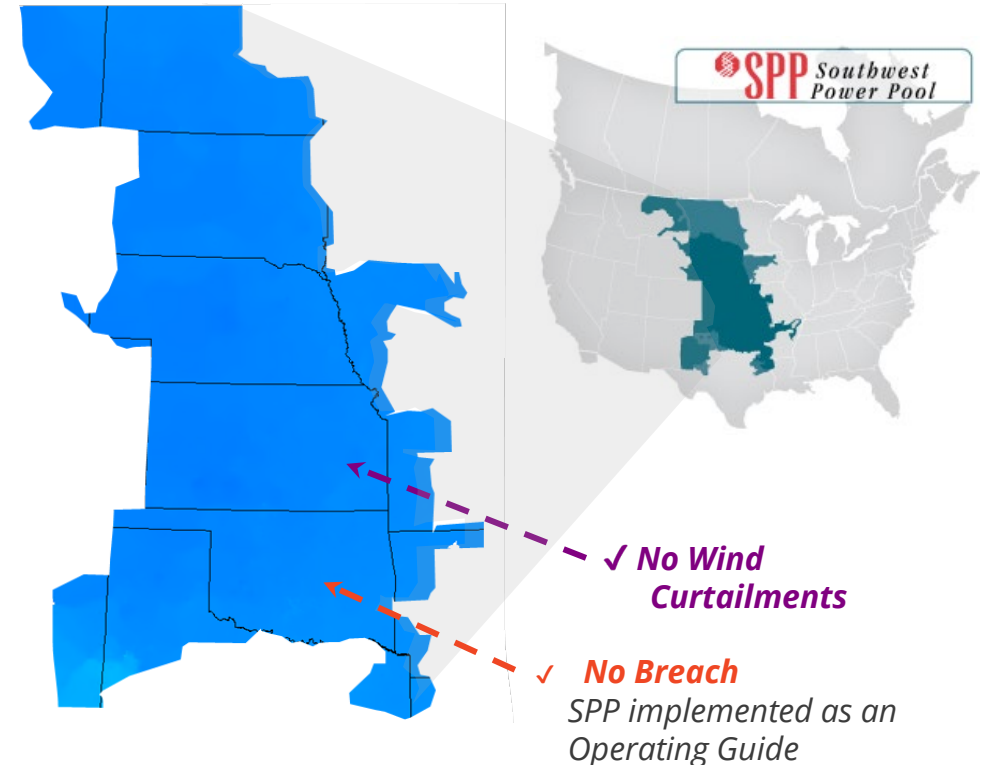


NewGrid Topology Optimization Software

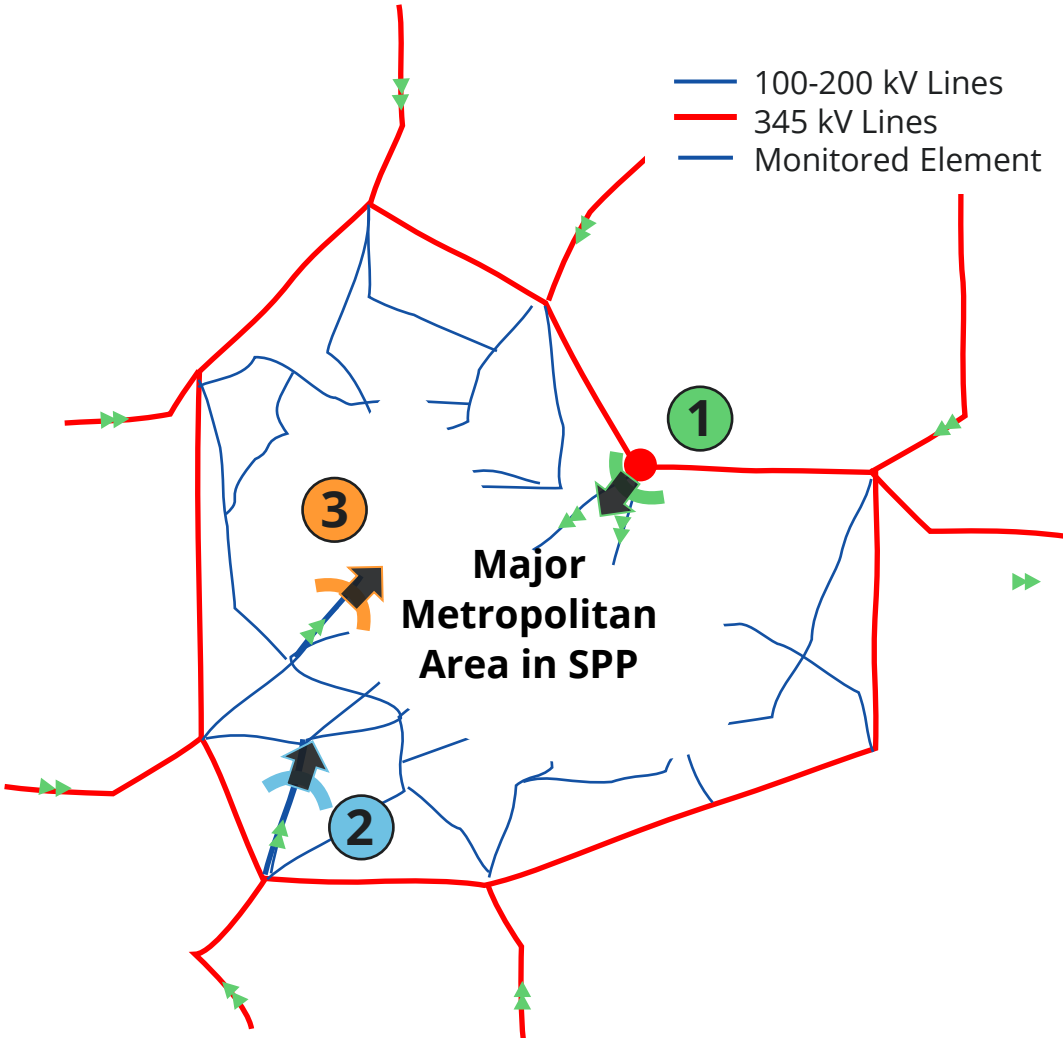


“Open/Close Circuit Breakers X, Y and Z”

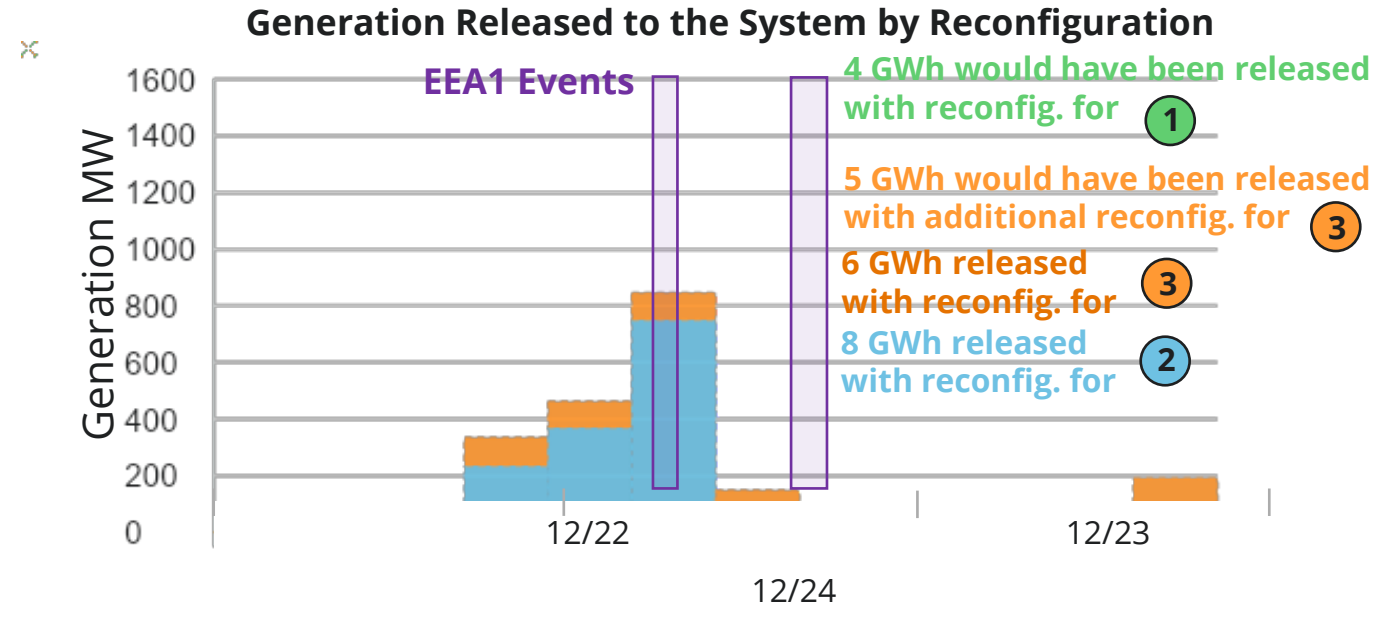
### With Reconfigurations



## UP TO 1445 MW GENERATION RELEASED DURING EMERGENCY



System Diagram Source: NewGrid.



- Two implemented reconfigurations allowed higher transfers, releasing up to **845 MW** from available plants upstream of the constraint.
- Two other reconfigurations would have released up to **600 MW of additional generation** to the system.

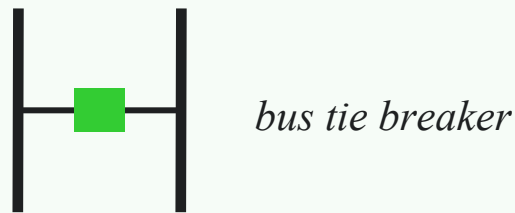
## THERE IS A VARIETY OF RECONFIGURATION TYPES

Optimization routines search reconfigurations to relieve **one or more simultaneous constraints**, and identify **preventive or corrective solutions**. Reconfiguration types vary depending on system topology, system conditions and congestion problem characteristics.

### Open/close branch

Branch types:

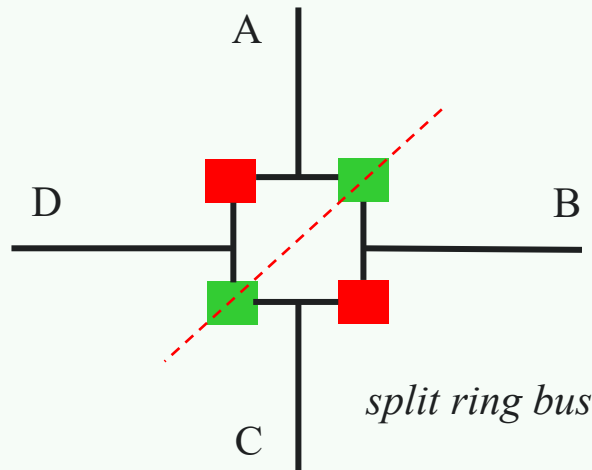
- Lines
- Transformers
- Bus tie breakers
- Reactor by-pass breakers



### Bus split/merge

Some substation arrangements allow bus splits:

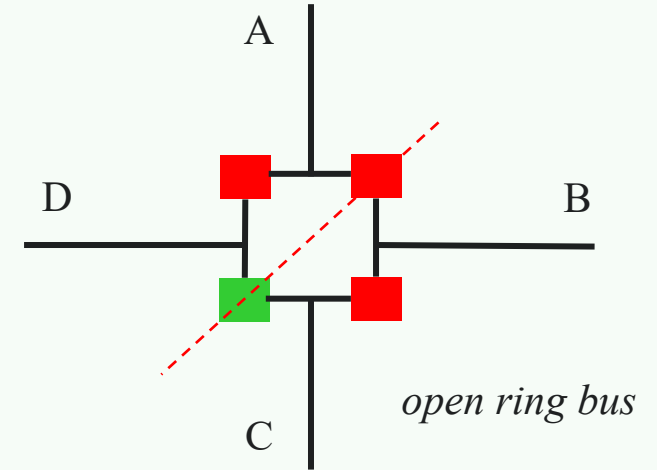
- Ring bus
- Double bus double breaker
- Breaker and a half



### Contingency-change

Substation reconfigurations

- Bus normally connected
- Split bus or disconnected element under specific contingency conditions



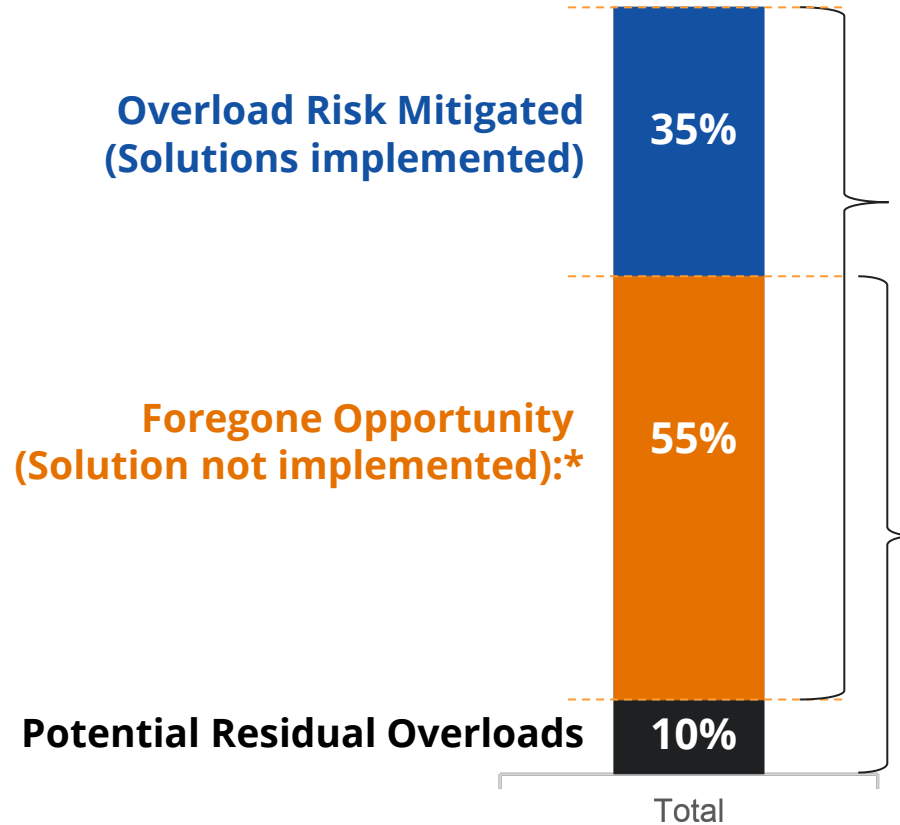
■ Closed Circuit Breaker

■ Open Circuit Breaker

## OVERLOAD EVENT RISK COULD BE REDUCED BY 90%



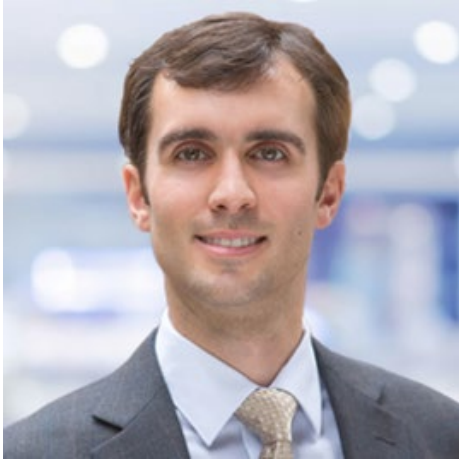
- Alliant Energy and NewGrid pilot:
  - Identify and analyze **regionally beneficial** reconfigurations
  - Request their implementation
  - Evaluate congestion cost mitigation for Alliant's customers.
- Looking for low-hanging fruit
  - Simple & robust solutions



**90% reduction in overload event risk – 614 constraint-hours** w/ reconfiguration request process in MISO based on reconfigurations identified in January - August 2023

**Realized overloads: 444 constraint-hours**

- Impacts calculated ex-post based on analyses of state estimator cases published by MISO and of historical market data.
- Solution not implemented includes the impacts of all solutions found, requested and that were not declined on a technical basis, as well as solutions not requested due to the lack of an established request process prior to July 2023.



PABLO RUIZ  
Co-Founder and  
CEO & CTO



RICHARD TABORS  
Co-Founder and  
Executive VP



XIAOGUANG LI  
Co-Founder and  
Director of Product

## CONTACT

Pablo A. Ruiz  
CEO and CTO, NewGrid  
[Pablo.Ruiz@newgridinc.com](mailto:Pablo.Ruiz@newgridinc.com)

Richard Tabors  
Executive VP, NewGrid  
[Richard.Tabors@newgridinc.com](mailto:Richard.Tabors@newgridinc.com)





# Sarah Jackson

Form Energy



# BREAKTHROUGH LOW-COST, MULTI-DAY ENERGY STORAGE

Sarah Jackson, Policy Manager

Transitioning to the Future Grid in MA

May 23, 2024



Energy Storage  
For A Better World



# The Challenge

*New England needs clean, firm sources of energy to support a reliable transition to a zero-carbon grid*



Extreme weather events have become more frequent and disruptive



Power supply is becoming tighter



Intermittent resources need firming up



Transmission congestion and interconnection queues are increasing

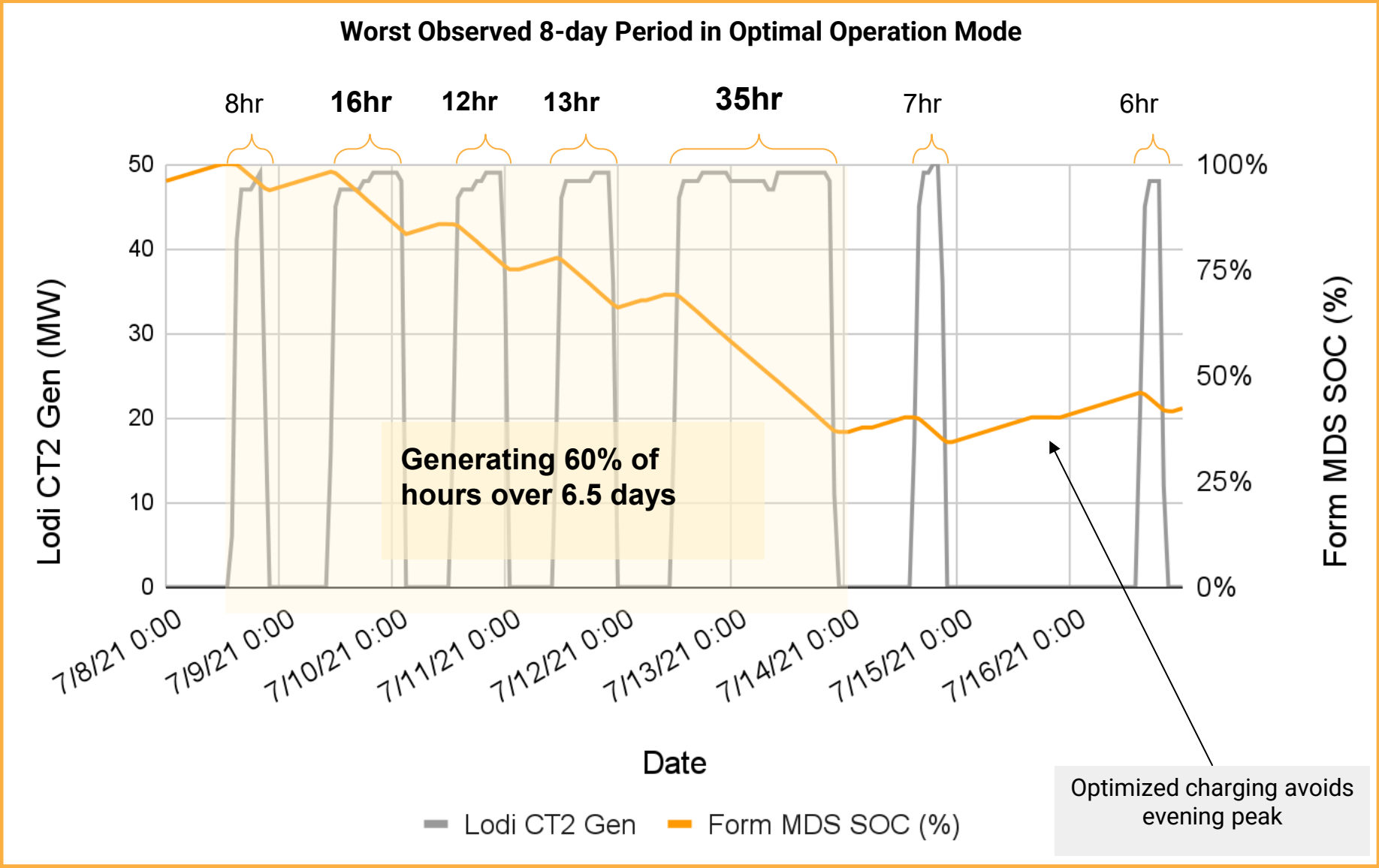
# Multi-Day Storage: Clean, Firm Power for a Reliable Grid

- Dispatchable power to protect against supply shortfalls during multi-day extreme weather
- Can match the operating profiles of costly fossil peakers and help avoid costly Reliability Must Run contracts
- Lowers total system cost and land impacts by reducing total resources needed
- Safe, affordable, and sustainable inputs avoid an overreliance on lithium ion supply chain



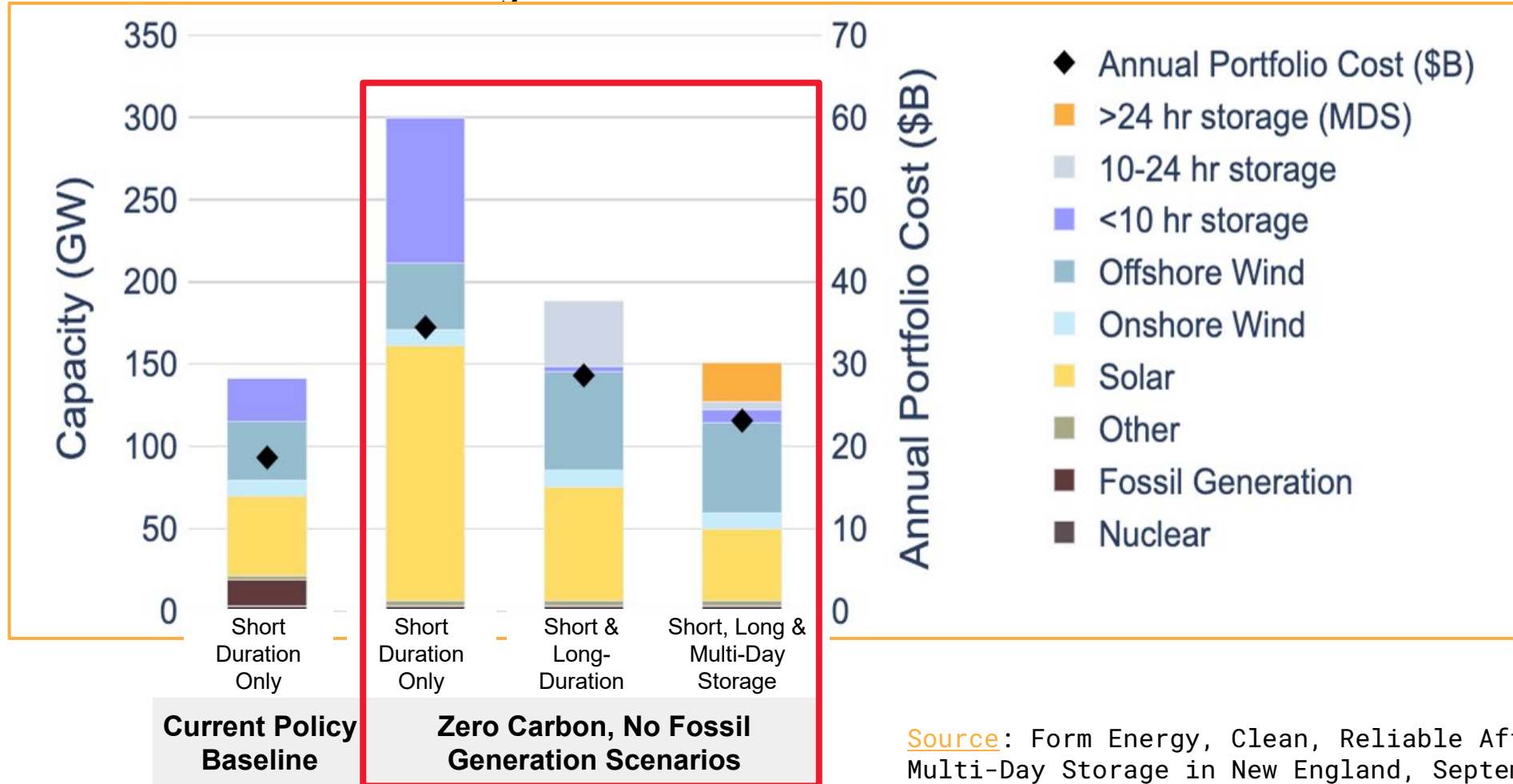
Photo Credit: RTO Insider

# Multi-day storage supports reliability during extended grid stress events



# Multi-Day Storage Unlocks a Reliable Zero Carbon Future

Least Cost 2050 New England Resource Portfolios



Source: Form Energy, Clean, Reliable Affordable: The Value of Multi-Day Storage in New England, September 2023

# Over 5 GWh of Commercial Engagements



First-of-its-kind **1.5 MW / 150 MWh** MDS project in Cambridge, Minnesota to come online in 2024



**Two 10 MW / 1,000 MWh** MDS systems; one in Becker, MN and one in Pueblo, CO. Both expected to come online as early as 2025



**5 MW / 500 MWh** MDS system in collaboration with the California Energy Commission in Mendocino County; online by 2025



**10 MW / 1000 MWh** MDS system in New York to come online as early as 2025



**15 MW / 1500 MWh** MDS system in Georgia to come online as early as 2026



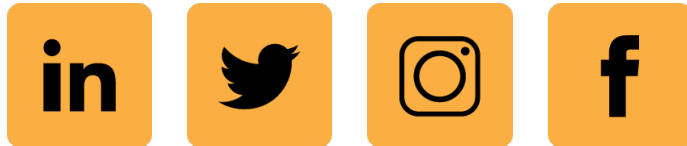
**5 MW / 500 MWh** MDS system in Virginia to come online as early as 2026

# Thank you!

## Sarah Jackson

*Policy Manager, Eastern Region*

[sjackson@formenergy.com](mailto:sjackson@formenergy.com)



30 Dane St.

Somerville, MA 02143

1 (844) 367-6462

info@formenergy.com

www.formenergy.com





# Chris Rauscher

Sunrun



**SUNRUN**

# Virtual Power Plants 2024




# Commitment to Our Future, Together

We believe in a customer-led clean energy future

- 2007** Changed solar industry with solar-as-a-service model for home solar
- 2016** Batteries added as option to provide resiliency for homes & the grid
- 2019** Won bid for first residential virtual power plant in wholesale market
- 2021** Partnership to introduce V2H/V2G Ford Home Integration System
- 2023** Running VPPs across the country with tens of thousands of customers
- 2024** For 2nd year in a row, running country's largest VPP in history

## OUR IMPACT

- **6.7 GW** installed solar capacity
- Over **960,000** customers; **100,000+** solar+storage systems
- **22 states** plus DC and Puerto Rico
- Over **12,000** Sunrunners - local workforce
- **Over 50%** racially and ethnically diverse workforce with national recognition on diversity and inclusion efforts



# VPPs unlock clean electrification – keeping costs down and reliability up

- Electrifying everything will cause national kWh consumption to double, according to Rewiring America
- If kW peaks continue to rise, grid costs will grow exponentially
- VPPs / flexible demand are necessary to smooth, shift, and chase these peaks on a daily, monthly, and yearly basis

## MORE EFFICIENT GRID. FAST & SCALABLE.

- Residential solar deployment was 6.8 GW in 2023
- DERs can save U.S. ratepayers \$473B by 2050
- **80-160 GW of VPPs by 2030 to help address national capacity needs could save ~\$15-35B in annual grid costs and will direct grid spending back to electricity consumers. ([Brattle](#))**

# VPP Case Study #1: PG&E

## Counterparty

- PG&E

## VPP product

- Daily discharge 7-9 PM, August-October 2023

## Enrollment

- 8,500 PG&E/Sunrun solar customers with batteries

## Payment

- Enrolled customers: \$750 gift card + free nest thermostat
- Sunrun: capacity performance-based payment

## Performance

- 27 MW average capacity delivered
- 32 MW maximum capacity delivered

## Lessons Learned

- Auto enrollment significantly increases participation
- Customer enrollment incentives should consider incremental impact on the customer behavior and ease of customer authorization, and projected performance
- Complex system integration will hinder the speed of implementation and is not required for many VPPs

## Software Integration/Metering

- None
- Metered at the battery



First of its kind program in partnership with PG&E

Sunrun, jointly with PG&E, is launching Peak Power Rewards—an exciting new summer program to reward qualifying solar + battery customers for helping reduce grid strain! Eligible customers are auto-enrolled in this 3-month program. In direct response to California Governor Newsom's July 30, 2021 Proclamation of a State of Emergency stating "it is necessary to take immediate action to reduce the strain on the energy infrastructure, increase energy capacity, and make energy supply more resilient this year to protect the health and safety of Californians."

## Program Highlights



### Rewards + enrollment

Customers received \$750 and a free Nest Thermostat.

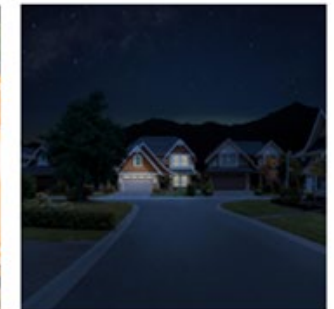
Enrollment is automatic for eligible customers and is limited to 8,500.



### Performance

Fleet of 8500 customers to provide up to 34 MW of peak power.

August-October 2023, batteries will discharge daily between 7-9 p.m.

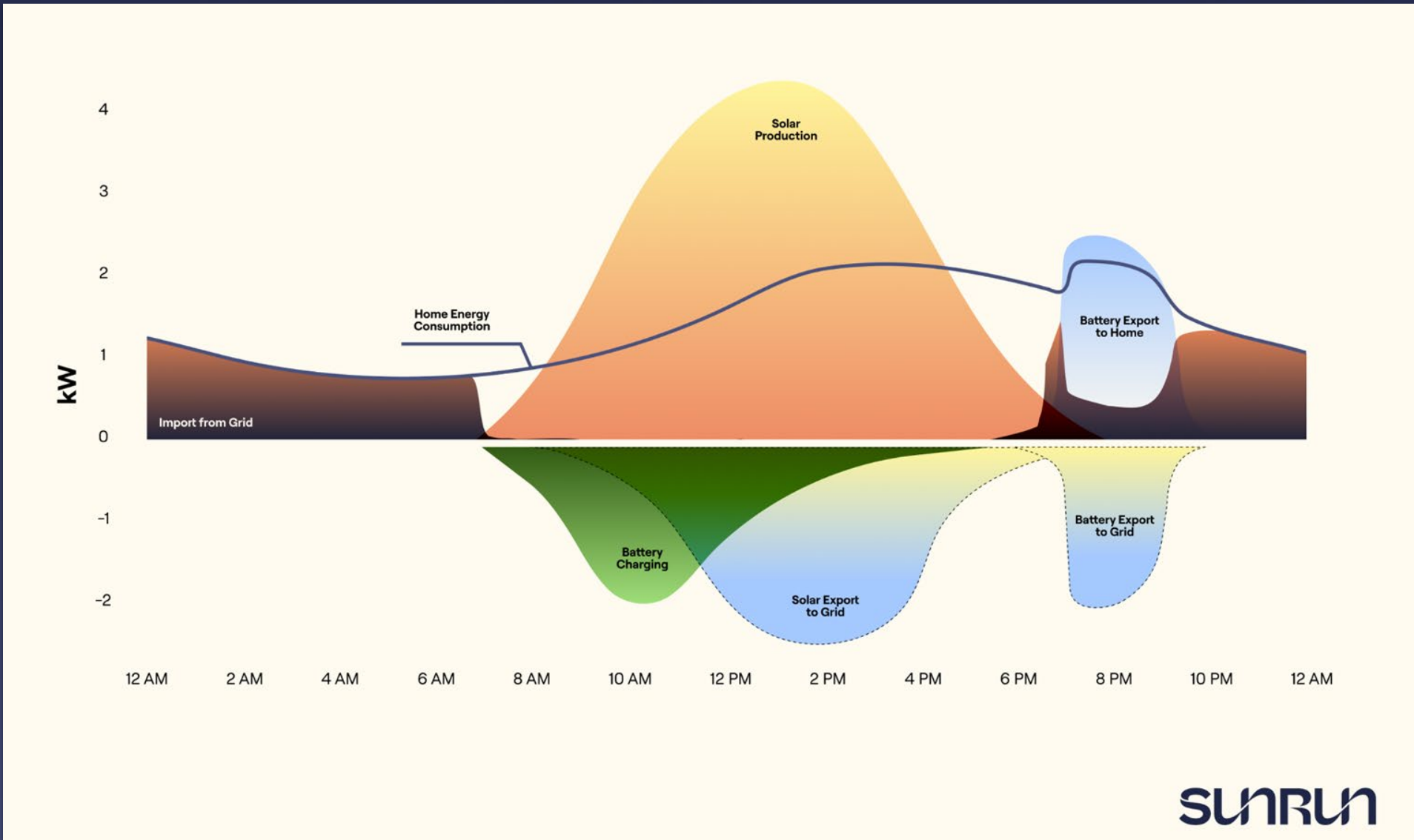


### Keeping power for backup

Our battery systems will reserve 20% for backup energy needs.

In the event of an outage, all energy from customers' battery systems will be available.

# Sunrun PG&E VPP Aggregate Operational Profile



# VPP Case Study #2: CEC DSGS - Statewide in CA

## Largest VPP in the US!

### Counterparty

- California CEC - funded through the budget, run by state agency
- Dispatching summer 2024

### VPP product

- Emergency dispatch between 4-9pm
- Day-ahead dispatch trigger
  - When DA-LMP  $\geq$  \$200/MWh
- 2, 3, or 4-hour product to be selected for storage

### Enrollment

- Auto-enrolled
- Nearly 17,000 customers / 60 MW for 2-hour product - largest VPP in US history

### Software Integration/Metering

- None
- Metered at the battery



The image displays a promotional email template for Sunrun's CalReady program. The top section features the Sunrun logo and a photograph of a palm tree against a blue sky. Below this, the text reads "Hi Vanessa," followed by an introduction to the CalReady program, which offers rewards for using battery systems to relieve grid strain during peak demand times. A "What you'll get" section lists benefits such as a \$100 Visa Gift card per year and NEM credit. The "How it works" section includes a numbered list: "1. Use & export stored power when demand is highest (up to 36 days per year)".

**SUNRUN**

CalReady

Hi Vanessa,

There's a new opportunity for you to earn rewards with your battery system, and we wanted to make sure you get the invitation.

Join fellow California Sunrun customers in a new statewide battery program called CalReady. Since we launched the program last year, CalReady rewards customers for using their battery system to relieve grid strain during peak demand times (up to 36 days per year). CalReady, however, there are only up to 36 days per year when your battery will support.

**You're enrolled in a new rewards program!**

Hi [First Name],

There's a new opportunity for you to earn rewards with your battery system, and we're happy to inform you that you're auto-enrolled and ready to go! You'll join fellow California Sunrun customers in a new statewide battery program called CalReady, which rewards you for using your battery system to relieve grid strain during peak demand times (up to 36 days per year).

**What you'll get**

- \$100 Visa Gift card per year enrolled
- Standard Net Energy Metering (NEM) credit toward your utility bill for any energy you export

**How it works**

1. Use & export stored power when demand is highest (up to 36 days per year)

# VPP Case Study #3: LUMA Puerto Rico

## *Keeping Lights on For All Puerto Ricans*

### Counterparty

- LUMA

### Program

- Battery Energy Demand Response Program

### VPP product

- Emergency dispatch to prevent rolling blackouts on the island
- Email dispatch notification

### Enrollment

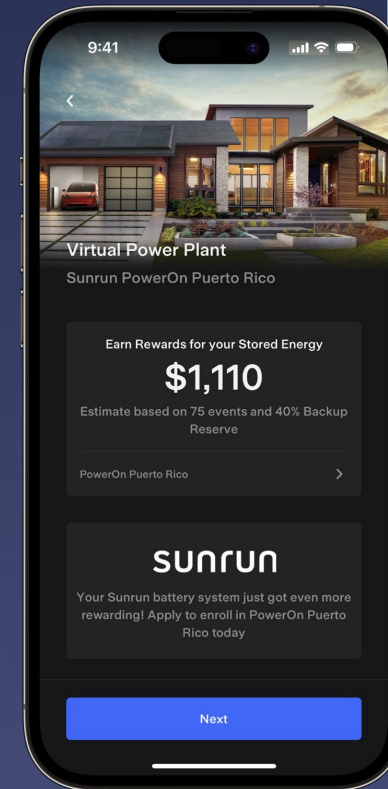
- Nearly 2,000 customers, largest aggregator on the island

### Payment

- Pay-for-performance energy payments

### Software Integration / Metering

- None
- Metered at the battery





# VPP Case Study #4: ConnectedSolutions - the OG VPP

## *Longest Running, Best-in-Class in US*

### First Open-Access Program in Nation

- NGrid piloted with Sunrun in 2018
- California and Puerto Rico programs modeled after ConnectedSolutions

### Counterparty

- Utilities / Program Administrators, funded through the efficiency budgets

### VPP product

- Chases system-wide peaks to lower costs for all ratepayers

### Software Integration/Metering

- Integration with DERMs EnergyHub
- Metered at the battery

### National Grid Announces Home Batteries Are Now Eligible for ConnectedSolutions Program across Massachusetts and Rhode Island

Jun 13, 2018

National Grid is announcing a significant expansion of its **ConnectedSolutions** program, which rewards customers for helping the company better manage the electric grid.

The program expansion makes more thermostats eligible for the program, and also adds eligibility for customers with rooftop solar and storage to the program for the first time. **ConnectedSolutions** customers can now enroll using home batteries from Sunrun, as well as thermostats from Nest, Honeywell, ecobee, Alarm.com, Building 36,

# Sunrun Recommendations

## Lower customer upfront costs to deploy more batteries

- Increase adders for deployment in LMI and high-outage communities

## Leverage existing grid service program frameworks

- Existing grid services program - ConnectedSolutions - offers excellent program design

## Limited Software / Tech. Integration / No Smart Meters

- Leverage 3rd party technology for lowest cost service

## Remove Permitting Barriers

- Clarify state fire code rules for consistent AHJ application
- Streamline city permitting, utility interconnection

**Thank You!**

# David Stuebe

Camus





**CAMUS**  
Zero Carbon Grid Orchestration

# Orchestrating Virtual Power Plants

NECEC Technology Showcase 2024 | David Stuebe

# Utilities need to alleviate billions in local grid upgrades via Virtual Power Plants, but **utilities don't trust VPPs to deliver (yet).**

3 reasons why:

- 1 Utility operators **can't monitor VPP & DER behavior** in their ADMS
- 2 Third-party VPP managers have **no means (or reason) to coordinate** with utilities
- 3 Utility planners **lack the data** to incorporate VPP flexibility into distribution planning



We are enabling utilities to **reliably orchestrate Virtual Power Plants** to defer or avoid expensive network upgrades.



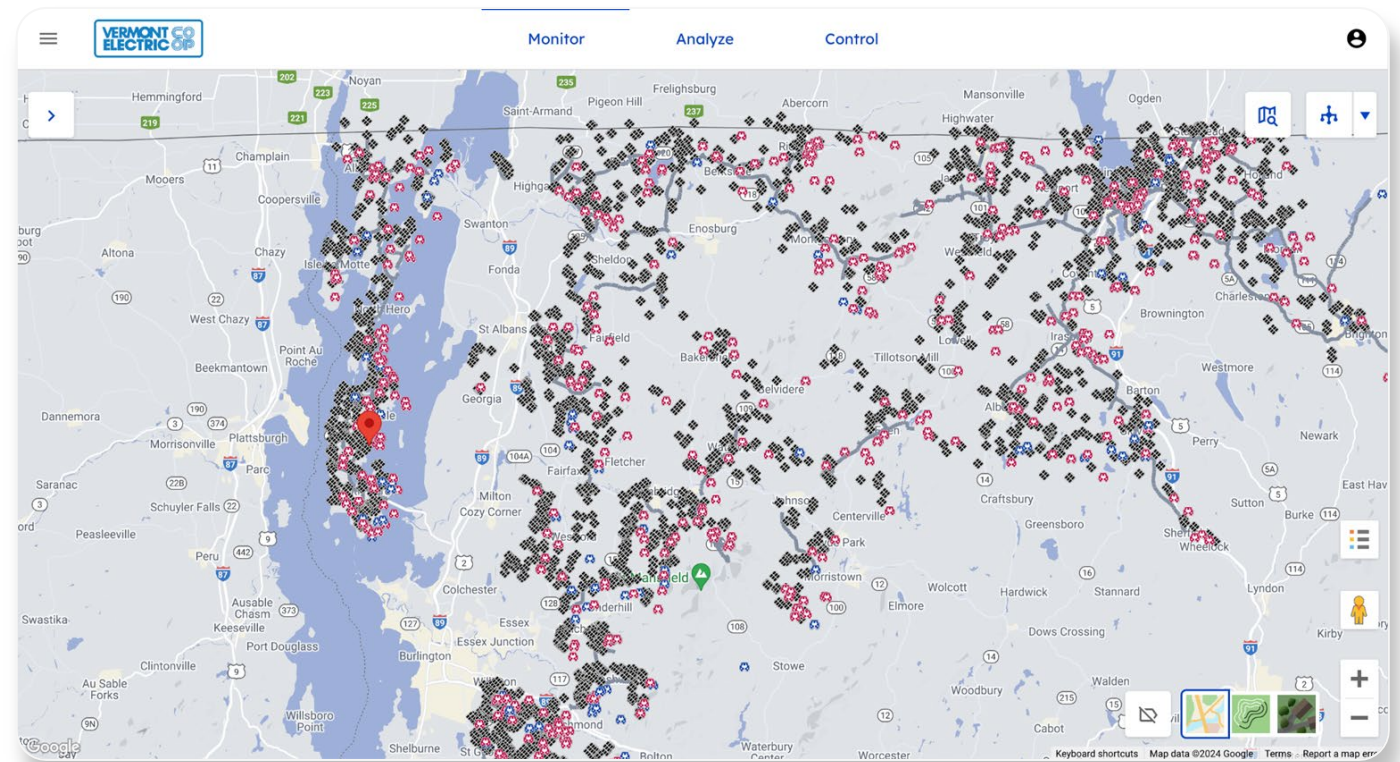
Bring DER and VPP data **into the ADMS with foresight**



Enable the utility to serve as an **“aggregator of aggregators”**



Simulate **loading & voltage impacts** of VPPs






CAMUS

CASE STUDY

# VERMONT ELECTRIC



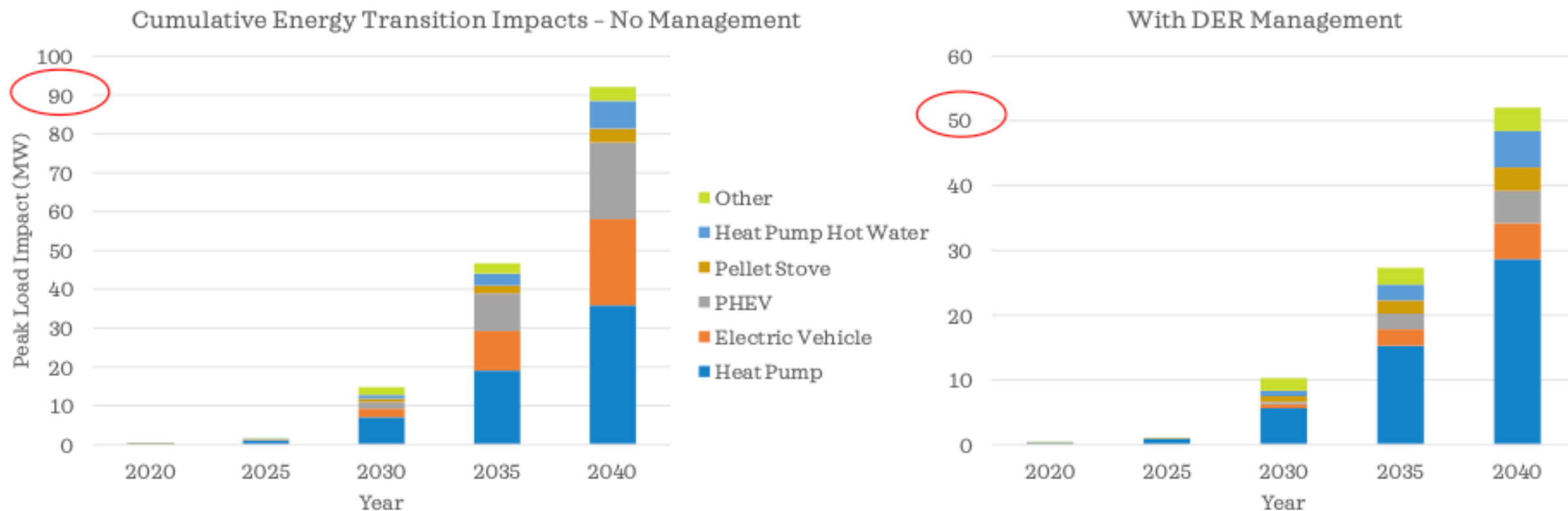
CO  
OP  
INC



Grid orchestration for a 34,000 member  
electric co-op in Northern Vermont



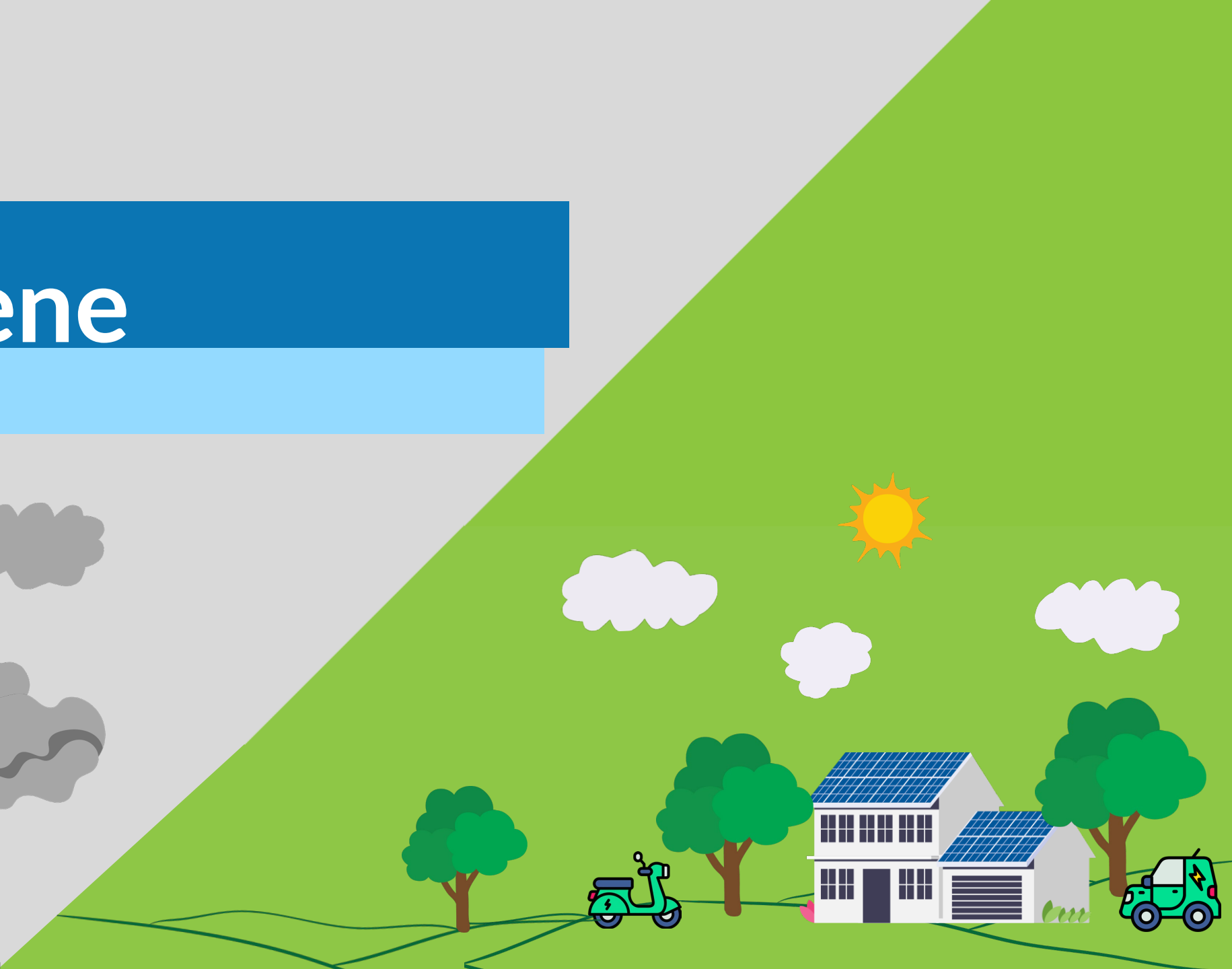
## We can save ~\$50 million in Grid Investment with DER Management



- Significant load growth expected by 2040
- 30-40% of distribution transformers, lines and substations would be overloaded by 2040 without load management
- ~\$100 million in grid upgrades, even more at the transmission level

# John Greene

Piclo Energy





**The leading independent marketplace  
for DER-enabled grid flexibility**



## We have markets live in six countries worldwide

220+

Active DER providers

22 GW

DER capacity registered

300K+

Assets registered

11

Grid operators active

\$95m

Transacted to date

9,000 tons

Carbon savings to date

### Select clients

**nationalgrid**



e-distribuzione



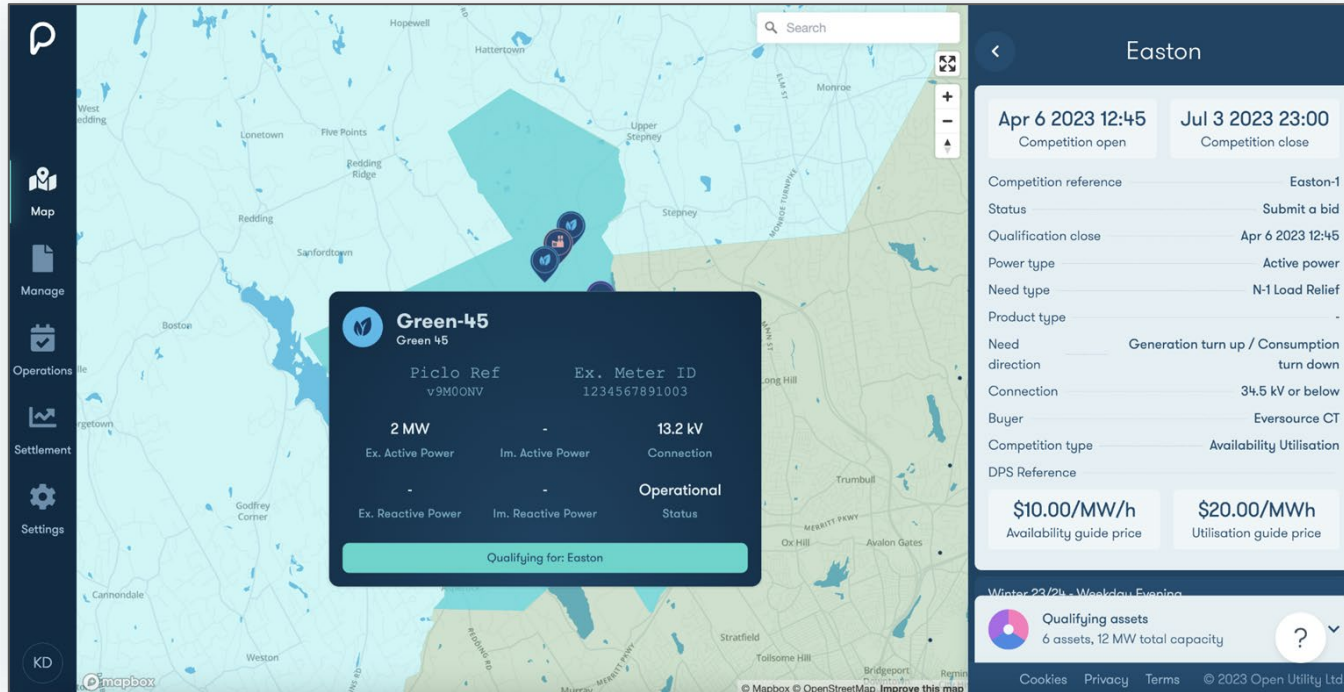
**nationalgrid**  
DistributionSystemOperator



**nationalgridESO**



## A better way: digitized, democratized marketplaces for local flexibility



- **Competition-based approach** to connecting utilities and Flex Service Providers (FSPs) to source local flex at lowest \$ / MW
- **End-to-end process:** Advertisement, auction, dispatch, settlement & payment
- **Engaged ecosystem** of FSPs of all types, shapes, and asset sizes
- **Independent third-party platform** that can be configured and launched in three months
- **Streamlined digital processes** that reduces procurement costs for utilities & FSPs

Market-driven approach

Local & inclusive

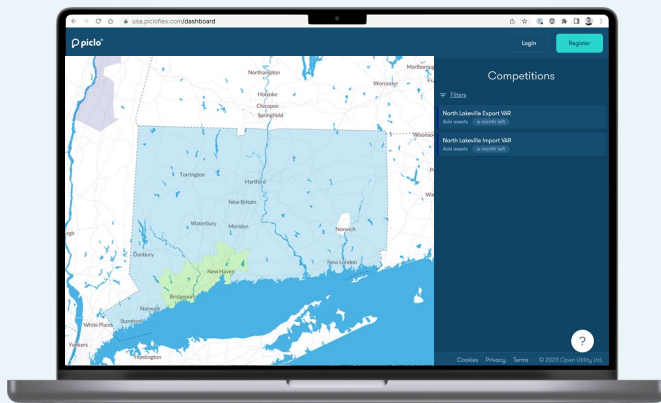
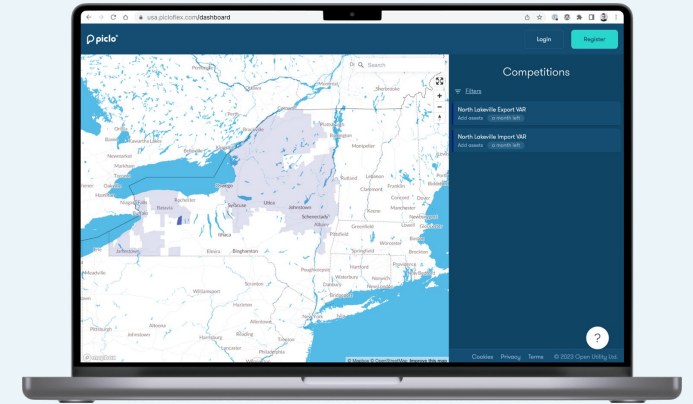
Low cost to operate



## Ongoing Projects in the US

### nationalgrid

- Testing how a centralized platform can improve existing programs - Non-Wires Alternatives (NWAs) and demand response and storage (Dynamic Load Management, DLM)
- Streamlining processes and submission requirements to improve user experience and FSPs' ability to participate



- Launching statewide DER grid flexibility marketplace as part of inaugural cohort of regulator's (PURA) Innovative Energy Solutions (IES) program
- Running end-to-end capabilities, recruiting and centralizing DER participation, and improving electrification and reliability