

EPIC Public Outreach Workshop

October 20, 2021

Agenda

1 Safety Moment & Workshop Introduction

Russ Ragsdale, Director of Asset and Engineering Strategy

2 Wildfire Prevention & Resilience Technologies

Kevin Sharp, Senior Manager, T&D Innovation & **Michael Balestrieri**, Engineer

3 Beyond Lithium-ion Energy Storage Demonstration

Josh Mauzey, Senior Manager, Grid Edge Innovation & **Gabriel Andaya**, Engineer

4 Q&A and Closing

Alex Mokover, Senior Advisor, Asset Strategy Integration

Presenters



Russ Ragsdale
Director, Asset and
Engineering Strategy



Kevin Sharp
Senior Manager, T&D
Innovation



Michael Balestrieri
Project Engineering
Lead



Josh Mauzey
Senior Manager, Grid Edge
Innovation



Gabriel Andaya
Project Engineering
Lead



Alex Mokover
Senior Advisor, Asset
Strategy Integration



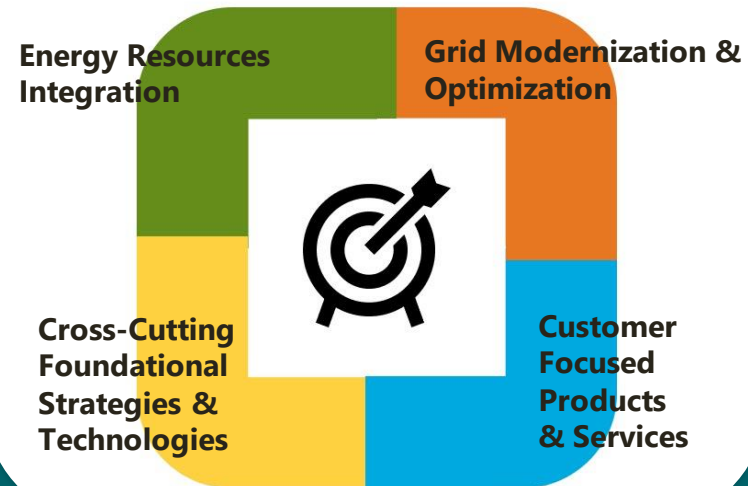
Safety Moment

Our project portfolio is screened to ensure alignment with EPIC's guiding principles and investment planning framework

CORE EPIC VALUES

- Providing benefits to ratepayer of the electric investor-owned utilities
- Advancing energy innovation
- Supporting California's energy policy goals

JOINT IOU FRAMEWORK CATEGORIES



SCE's strategic priorities are also aligned with the joint IOU framework categories and EPIC core values

We're focused on accelerating clean power and electrification, strengthening and modernizing the grid, achieving operational and service excellence and proactively mitigating climate change-related risks, including wildfires.

Our View

PATHWAY 2045

Achieves 100% carbon neutrality

WILDFIRE MITIGATION PLAN

Actionable, measurable and adaptive plan to reduce wildfire risk

TECHNOLOGY ROADMAP

Articulates SCE's technology development needs and priorities

REIMAGINING THE GRID

Enables Pathway 2045 vision and evolve SCE's grid

Our demonstration projects are designed to further the industry knowledge-base for the benefit of all stakeholders

As the need to strengthen the resiliency of the electric grid became a more urgent priority, the CPUC approved two new projects in the Feb. 2020 Research Administration Plan (RAP) Application.



Wildfire Prevention & Resiliency Technologies Demonstration

- Waveform Analytics
- Machine Learning at the Edge



Beyond Lithium-ion Energy Storage Demonstration



Wildfire Prevention & Resilience Technologies (WP&RT)

The WP&RT project demonstrates the latest advancements in hardware and software-based solutions in wildfire prevention, detection and mitigation

WP&RT utilizes **Machine Learning** (ML) in two different applications:



In a centralized application, waveform analytics aims to integrate grid data streams into ML algorithms that could **detect potential failures before they happen**



In a decentralized application, ML on edge devices could provide **faster decision making** for wildfire mitigation applications

WP&RT intends to expand upon SCE's existing wildfire mitigation efforts

Alignment with SCE's Wildfire Mitigation Plan

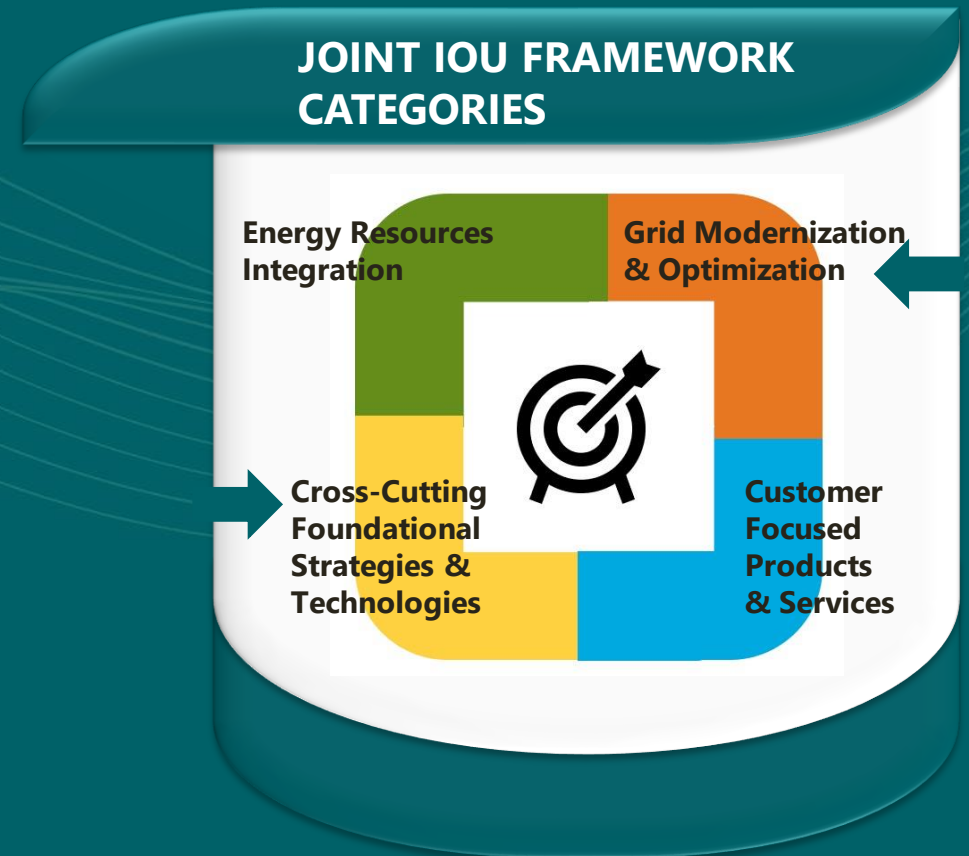
- Situational Awareness and Forecasting
- Asset Management and Inspections

Alignment with SCE's Reimagining the Grid

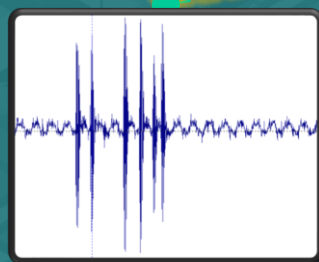
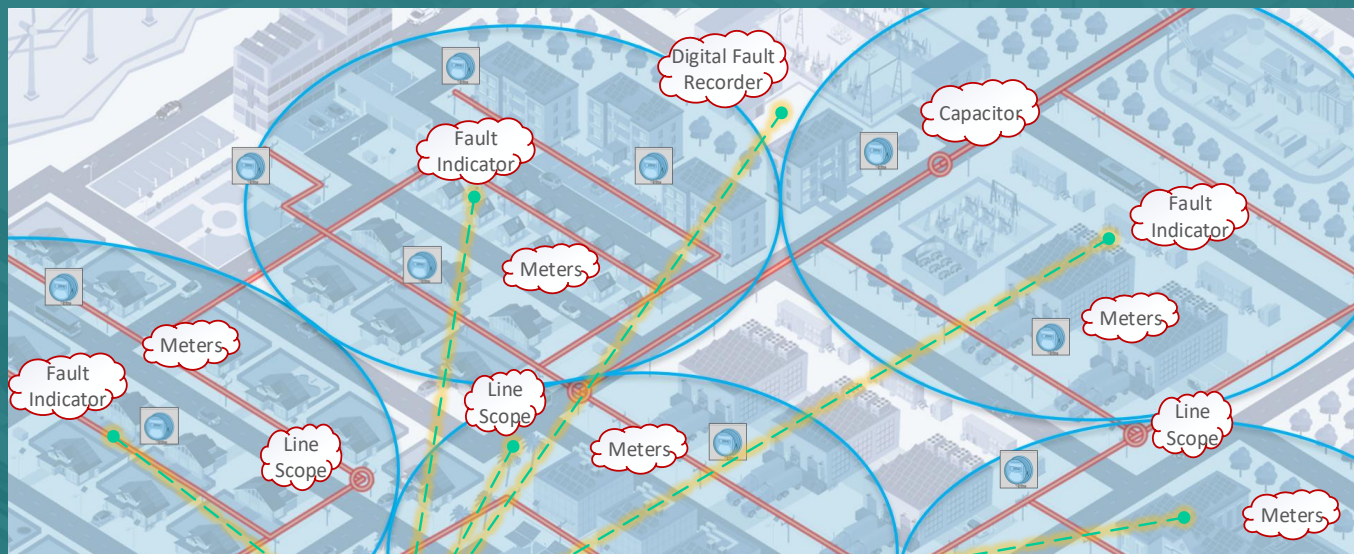
- Foundational (Grid-Wide)
- Grid Control and Data Analytical Systems
- Sensors and Edge Computing

Alignment with SCE's Technology Roadmap

- **Technology Challenge:** Addressing Wildfire Risk
- **Technology Objective and Capability:** Advanced data analytics solutions (e.g., automated image processing, machine learning, artificial intelligence, etc.) and decision-support tools in service of wildfire modeling, prevention, asset management, and response activities



Waveform analysis is a useful tool for troubleshooting incipient events within an electrical system



Grid Telemetry Data



Predictive Analytics

Distribution Waveform Analytics Diagram

Concept: Integrate disparate grid data sources from existing equipment into a single analytics platform capable of running advanced predictive models

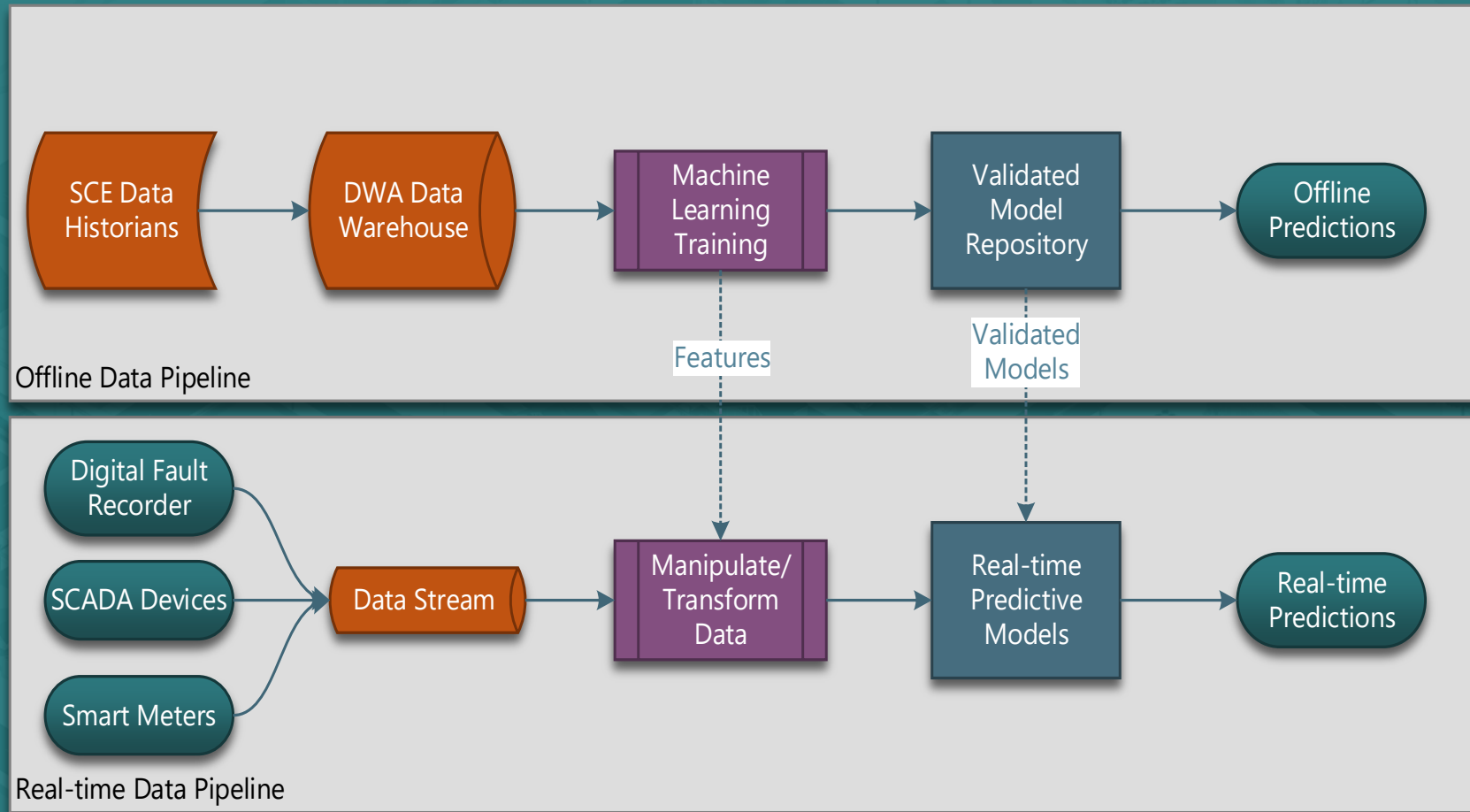
Outcome: Provide situational awareness of when and where a failure may be developing that could potentially spark a wildfire

Devices in Scope:

- Digital Fault Recorder (DFR): Records high-resolution data at the feeder head that can pick up minute transient events
- SCADA¹ Devices: Switches, capacitors, and fault indicators that record data such as status, events, and system conditions (V & I)
- Smart Meters: Customer energy meters provide granular view of energy and voltage across the grid

¹ SCADA is the acronym for Supervisory Control and Data Acquisition

The Distribution Waveform Analytics platform enables data integration and machine learning modeling

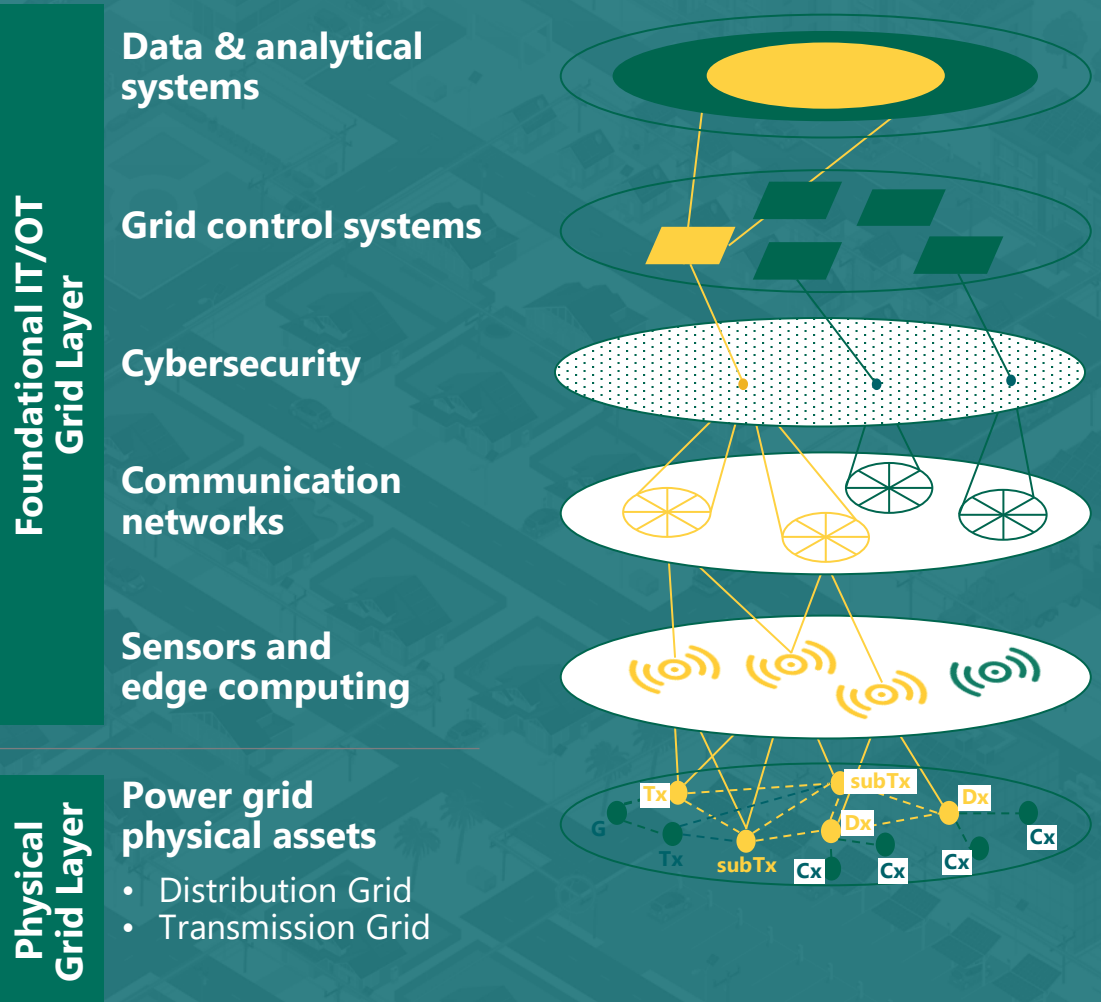


Platform Components

- Data management and integration
- Data accessibility
- Data viewer and exploratory analysis
- Machine Learning toolkits
- Offline model development
- Model deployment to real-time data stream
- Real-time incipient event predictions

Machine Learning at the Edge streamlines processes and provides predictive insights for proactive damage assessment

Machine Learning At The Edge Conceptual



Project Objective

- Target processes related to high fire risk area asset inspections and PSPS circuit patrols
- Investigate moving algorithms from the back-office to edge devices like UAVs¹ and imagery equipment
- On-demand identification of damaged/defective field equipment to mitigate ignition
- Localized decision making to reduce delays in business processes

¹ UAV is the acronym for Unmanned Aerial Vehicle

WP&RT Project Benefits

Prevent Ignition

- The analytics platform senses incipient issues and allows SCE to target its infrastructure replacement on equipment in imminent danger of failing and igniting a wildfire
- Distribution Waveform Analytics (DWA) may be able to alert operators to a **potential failure before it happens in 5 of the currently projected High Fire Threat District (HFTD) ignition instances** in 2022
- ML at the Edge will help expedite the remediation of high priority issues

Detect Ignition

- The analytics platform detects the signature of an ignition event for early warning
- DWA may be able to alert operators to **30 currently projected potential ignition events HFTD** in 2022, allowing for more immediate fire response and suppression efforts to occur before fires expand

PSPS Outage Reduction

- Through reduction of manual patrols, ML at the Edge could reduce the impact of PSPS events to our customers



Beyond Lithium-ion

SCE's portfolio includes a project that looks beyond the fundamental limits of lithium-ion technology to the development and commercialization of new battery chemistries

The project demonstrates one or multiple examples of **next-generation, pre-commercial, "beyond lithium-ion" energy storage technologies** that require real-world field experience to reduce technology and adoption barriers on the path to commercialization. Project objectives:



Identify and prioritize non-lithium-ion energy storage system (NoLESS) technologies



- Procure, install, and demonstrate a NoLESS
- Evaluate NoLESS **safety, performance, and reliability** in use cases appropriate for the storage technology (e.g., long duration, renewable integration, microgrid, etc.)



Gain experience of deploying and operating NoLESS technology

To achieve California's long-term energy policy goals and SCE's Pathway vision, the marketplace will require a diversity of cost-competitive energy storage products

Alignment with California Policy

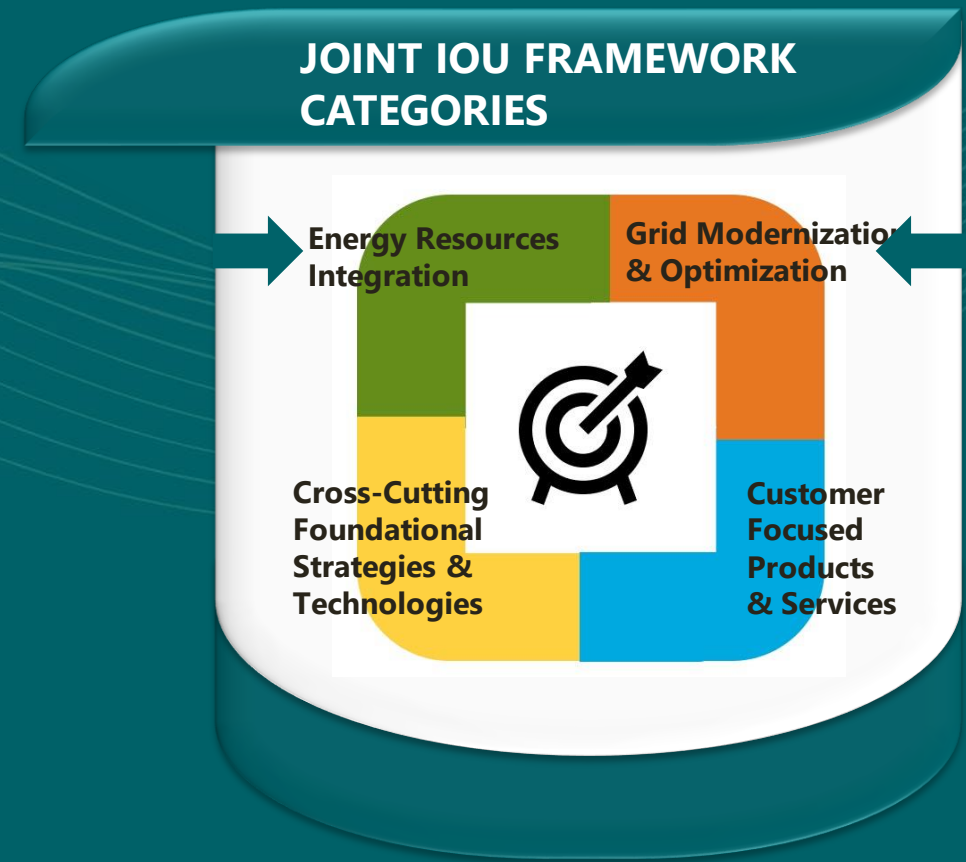
- Supports California's decarbonization goals
- Will allow SCE to meet state mandates such as Senate Bill SB 100

Alignment with SCE's Reimagining the Grid

- Power Grid Physical Assets
- Situational (Location-Specific)

Alignment with SCE's Technology Roadmap

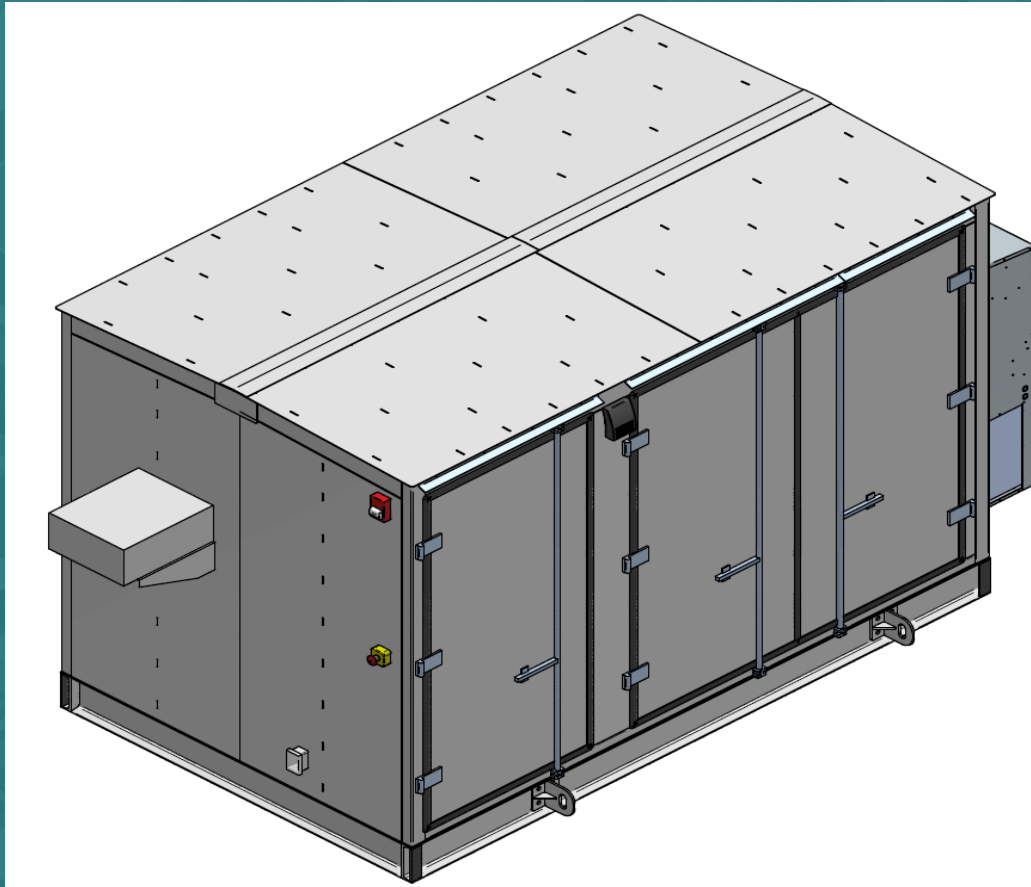
- **Technology Challenge:** Cleaning the power system
- **Technology Objective:** Develop additional operational flexibility through new resources
- **Technology Capability:** Deep understanding of energy storage technologies to inform selection of best performance and cost to power and energy needs



Pathways to Engagement

- We are seeking opportunities to:
 - **Engage industry and receive feedback** on potential technologies to demonstrate
 - **Create partnerships** with vendors to demonstrate their products and help them reach commercialization
- We do not want to procure or own a NoLESS
 - SCE would pay for shipping, interconnection, facility upgrades, etc. and would be responsible for testing and providing results

Gap the Technology Addresses



Grid planners must understand the characteristics and capabilities of different energy storage technologies

Lithium-ion batteries are well-suited to low-duration, high power use cases due to their energy density

Intermittent power sources on the grid may create a need for longer duration batteries

This project advances the industry's understanding of lithium-ion alternatives to ensure new storage technologies can "cross the chasm" and compete with lithium-ion

Beyond Lithium-ion Project Benefits

Safety

- Some new battery technologies are less prone to thermal runaway than lithium-ion, and some may use safer or more plentiful raw materials

Reliability

- **30 GW of utility-scale energy storage** will be needed to support the state's policy goal in the next 25 years
- Some non-lithium-ion batteries could be used for longer durations than lithium-ion, which gives applications for both mitigation of long-term PSPS and base load capabilities to the point that a non-lithium battery could provide base load rather than the ramping capabilities that lithium-ion provides.
- Improved storage technologies may make microgrids more attractive and allow for longer lasting backup generation, power quality improvement, and fast ramping

Emissions

- Natural gas plants currently provide 46% of in-state generation
- A cost-competitive long-duration storage technology could reduce the **60 million tonnes of CO₂e released in 2019** by the California electric sector

Costs

- NoLess batteries can be potentially cost competitive at mid- or long-duration storage levels
- NoLess technologies may offer better capacity and power degradation characteristics, reducing upgrade and maintenance costs

The background of the slide is a teal-colored isometric map of a city. The map shows a grid of streets, various buildings of different sizes, trees, and utility poles. The perspective is from an elevated angle, looking down at the city layout.

Q & A

Share your feedback and ideas



Provide written feedback on the WP&RT and Beyond Lithium-ion projects:

Email **ideas@sce.com** with the name of the project in the subject line



Submit your product or service idea for SCE to review:

Complete the form at **sceideas.com**



Request a letter of support or commitment for your CEC EPIC, DOE or other funding source proposal:

Visit **sceideas.com/Idea/LetterofSupport**



Attend the Joint Utilities Fall EPIC Workshop

Wednesday, **Nov. 17, 2021**
9 a.m. – 12 p.m.