

Electric Access System Enhancement (EASE)

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More Than Smart

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AGENDA

- ENERGEISE Program
- EASE Project
 - Objectives
 - Approach
 - Expected Outcomes
 - Innovation and Impact
 - Project Plan
 - Project Team
- Summary

ENERGISE

(ENabling Extreme Real-Time Grid Integration of Solar Energy)

Part of DoE's Grid Modernization Initiative that "represents a comprehensive effort to help shape the future of our nation's grid and solve the challenges of integrating conventional and renewable sources while improving the reliability, resilience, affordability, flexibility, and security of the electric power grid."

Develop "planning and real-time operation solutions that seamlessly interconnect high penetration (>50% of distribution peak load) solar generation."

The goal of ENERGISE is "to transition from static, manual, and cumbersome, experience-based, offline, non-scalable, and costly approaches to dynamic, automated, and streamlined, data-driven, online, highly-scalable, and cost-effective ones that are compatible with a broad set of grid modernization frameworks and solutions."



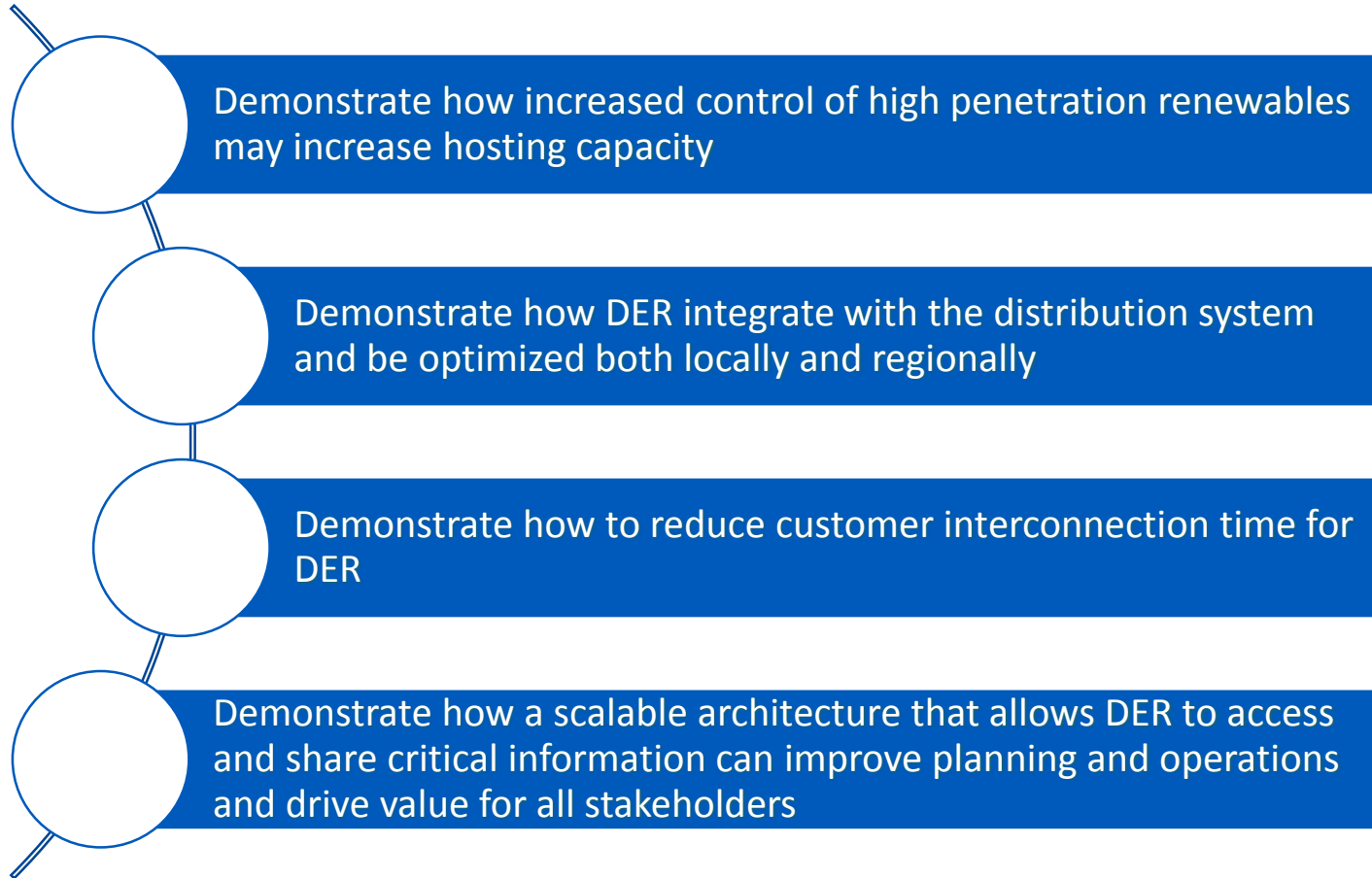
Electric Access System Enhancement - EASE

PROJECT Objective

Enhancing interconnection to the grid, access to information, ability to provide services, and optimization of resources by implementing an interoperable distributed control architecture leading to higher penetration of DER.

- The EASE project should **accelerate DER opportunities** through information exchange and resource optimization
- Higher penetration of Solar PV will need storage and advanced monitoring and control – the project team includes **leading innovators** in these areas
- The project **leverages State initiatives and policy direction** to meet the ENERGEISE objectives
- This effort will reflect and inform the State initiatives while **accelerating the acceptance of these concepts nationally**

PROJECT GOALS



TECHNOLOGY SUMMARY

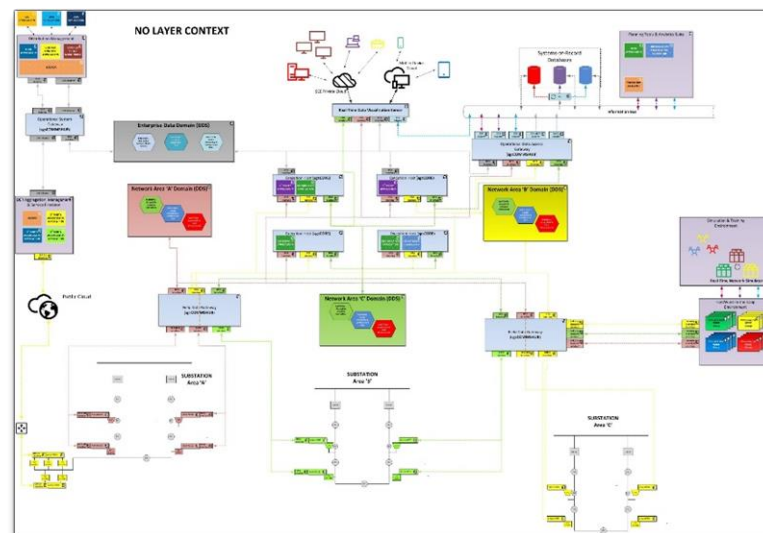
Implement a Distributed Control Architecture to demonstrate the following use cases:

- DER Registration Portal
- DER Self-Provisioning
- Real-time Constraint Management to Enhance Hosting Capacity
- Distribution Substation Net Load Management
- Distribution Voltage Management
- Provision of Services (e.g. ISO, IOU, 3rd party)
- Co-Optimization of DER Capabilities and Services

DISTRIBUTED CONTROL ARCHITECTURE

A primary objective of the project is to create and demonstrate a reference distributed controls systems architecture that provides a **scalable interoperable platform with transparency, innovation and interoperability (e.g. third party development of tools and applications)**.

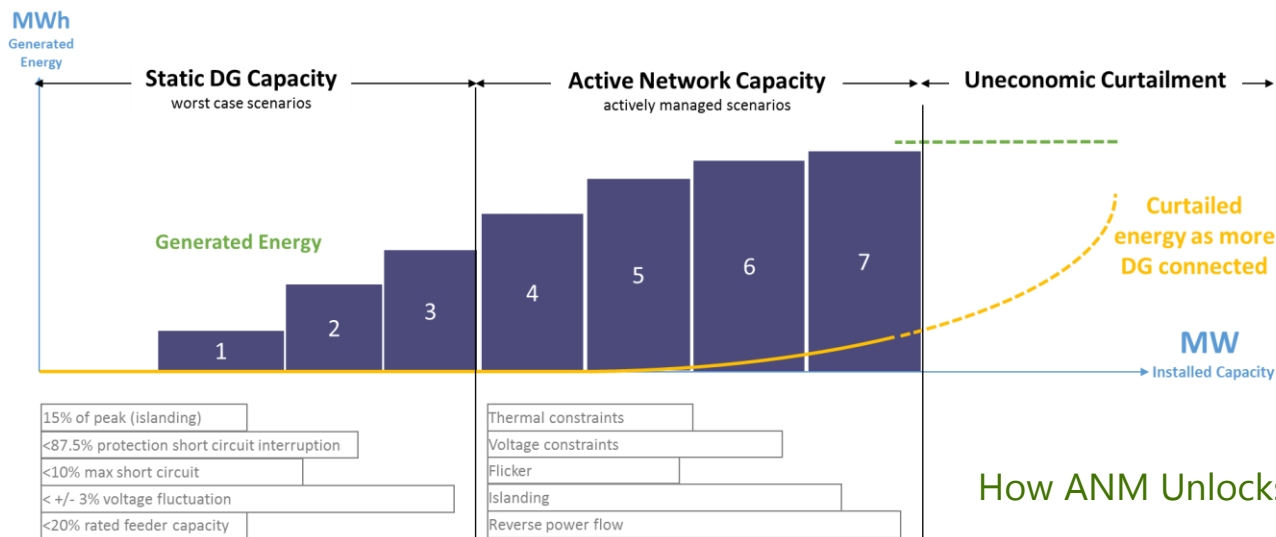
- Leveraging ongoing work in distributed control architecture and interoperable platform development, the project extends this work to specific circuits and resources
- The distributed control architecture is required for scalable resource management and enables energy service opportunities and consequently increases levels of penetration
- An open, interoperable environment creates a software innovation environment that may be tapped into by utilities, resource providers, sophisticated customers, and energy service companies



CONSTRAINT MANAGEMENT

Through Active Network Management, self-provisioned DERs are controlled to allow increased hosting capacity without physical grid upgrades from the existing static distribution planning approach.

- Accelerate the evolution to dynamic hosting capacity
- Maximize the use of the existing infrastructure
- Reduce the effort on distribution planners and engineers to integrate individual systems



How ANM Unlocks Grid Capacity

PROVISION OF SERVICES

- Investigate multiple resource optimization paths and business rules to maximize the value of DERs including customer bill benefits, local capacity requirements, distribution reliability services, and access to wholesale energy market.
- Establish a framework for exchange of services of DER assets with multiple market participants: the DSO; the CAISO; and DER Providers
 - Enable additional services not currently available, leading to additional potential revenue streams for DER assets
 - Enable new mechanisms for the utility to plan and manage its assets
 - Enable additional market participants to possibly lead to lower energy costs for all customers
- Provide demonstration test area for determining how multiple objectives may be optimized and how all parties can verify performance and ensure that a resource is fully utilized without double-counting or under-counting services provided by the resource

DESIRED OUTCOMES

Interconnection Times

- Streamline the interconnection process through automation and coordination amongst parties (resource providers/utility/customer/local jurisdiction)

Higher Penetration Levels

- Real-time management of resources to increase hosting capacity
- Resource optimization for intermittency control and peak demand management
- Accurately value and account for the energy services provided by the resources

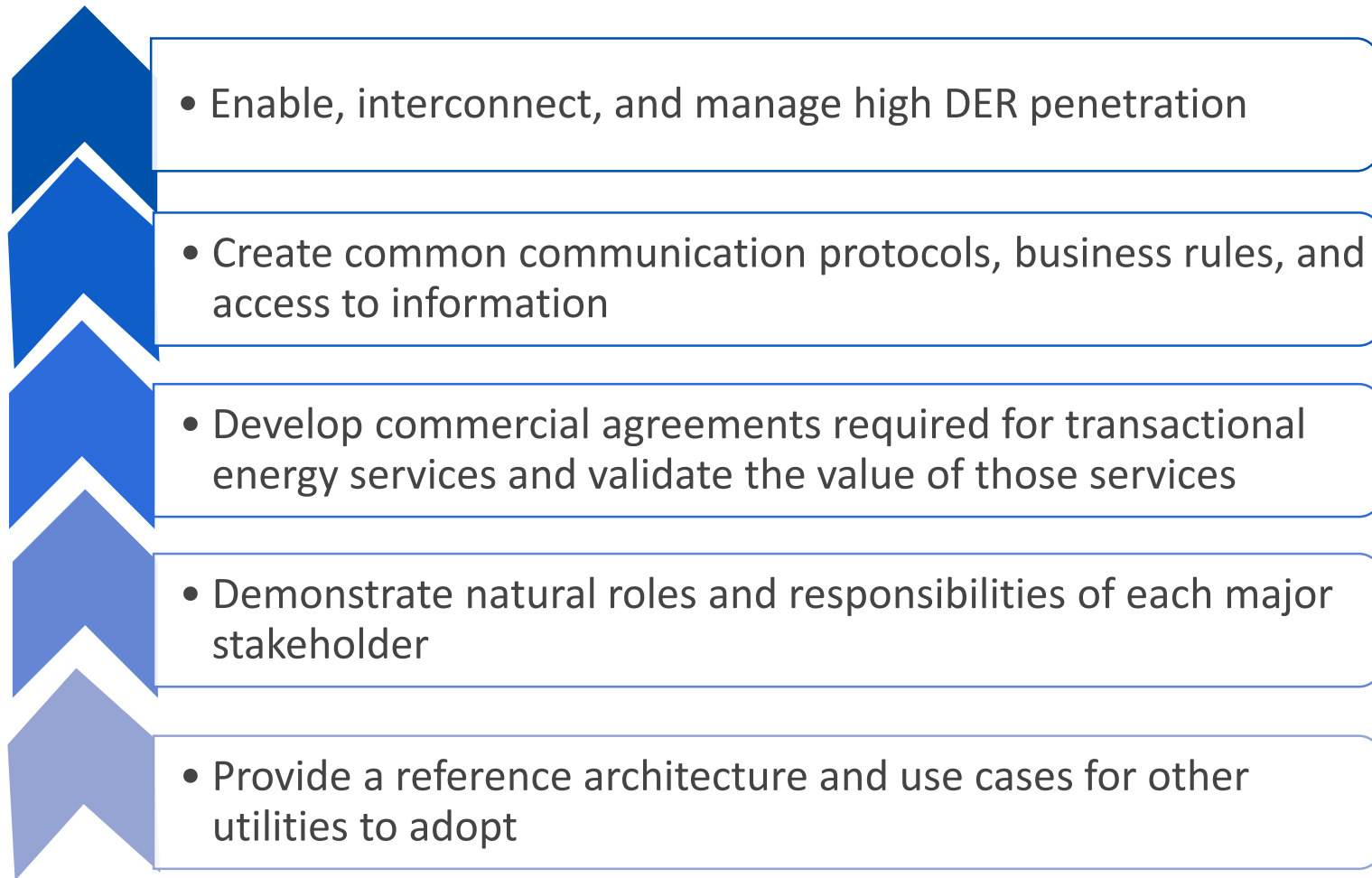
Reference Architecture

- Demonstrate distributed “system-of-systems” real-time control at grid-edge that maintains a safe and reliable power system

Industry Roles and Responsibilities

- Establish a workable framework and demonstrate interactions amongst all stakeholders

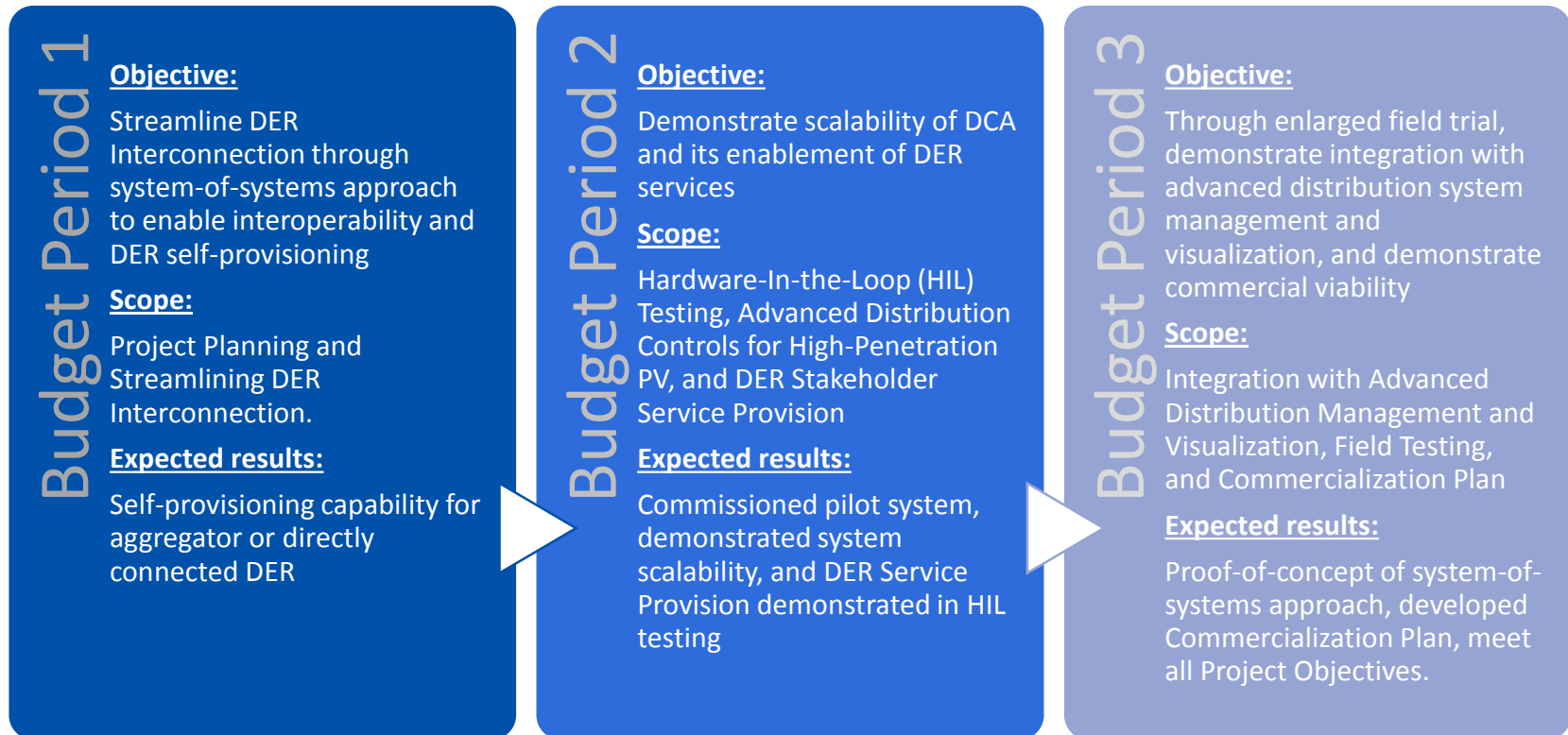
INNOVATION & IMPACT



INNOVATION & IMPACT

- The project is to move from conceptual design to a demonstration of a distributed control architecture
 - A fundamental and disruptive shift from centralized command and control to an open standard-based, distributed control environment necessary to scale to higher penetration of resources
- Key advancements to the State-of-the-Art include:
 - Portfolio optimization across fleets of DERs
 - Firm capacity dispatch using load flexibility and battery availability
 - Co-optimization of host-customer resources and grid assets
- While some demonstrations have had some of these components, there are no known examples of all three working in concert
- This DoE funding is bringing together a diverse set of stakeholders working together to create efficiency and optimize solutions

PROJECT PLAN



PROJECT TEAM



Southern California Edison (SCE): One of the largest utilities in the country with significant solar and storage installed and ongoing future potential



Smarter Grid Solutions (SGS): Unique and differentiated advanced technology for high DER penetration



Advanced Microgrid Solutions (AMS): Built to co-optimize between utility-side needs and host customer benefits on a portfolio-wide basis.



National Renewable Energy Laboratory (NREL): State of the Art facilities available for large-scale HIL testing

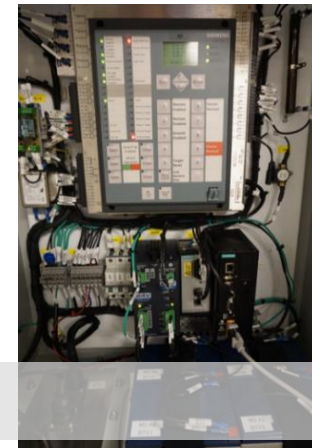
Additional Team Members:

- City of Santa Ana
- Customers (*Irvine Ranch Water District, Santa Ana School District, Target, Mater Dei High School*)
- Premier local research university students (*UCLA, Cal Tech, UCR, UCI, UCSD*)

FACILITIES



NREL Energy Systems Integration Facility (ESIF)



SCE Advanced Technology Labs

SUMMARY

- EASE project will create a grid environment that enables and increases renewable adoption through ease of access and optimization of resource value
- EASE project will demonstrate the technology and business rules required for accelerating DER opportunities
- EASE project will create and demonstrate a reference distributed controls systems architecture that provides a scalable interoperable platform that incorporates centralized guidance while optimizing to regional considerations
- EASE project will leverages State initiatives and policy direction to meet the ENERGEISE objectives and inform the State initiatives, while accelerating the acceptance of these concepts nationally

