

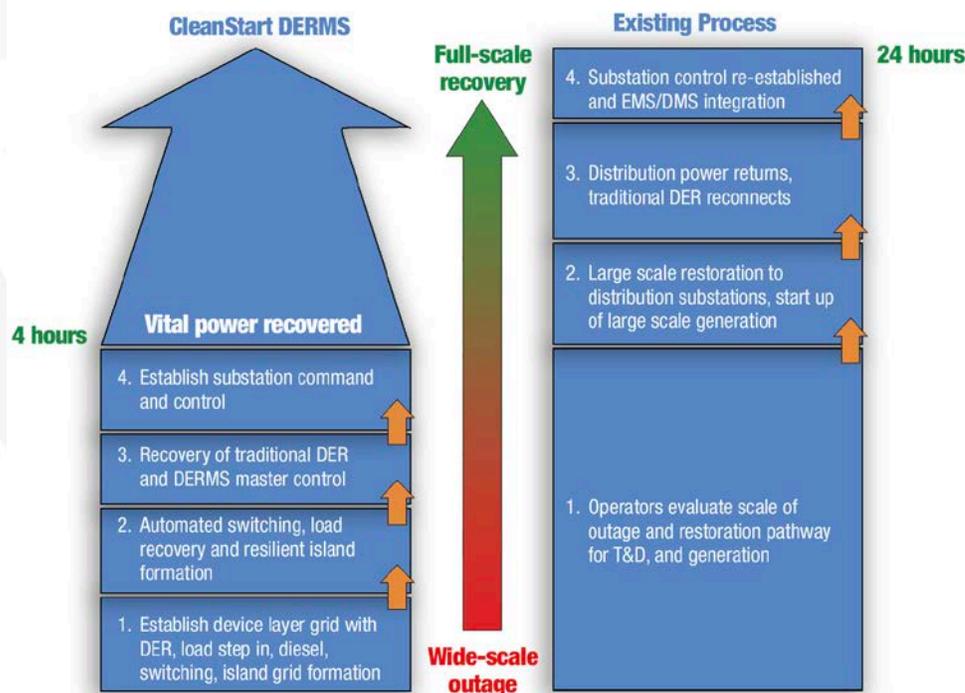
CleanStart Distributed Energy Resource Management System

CHALLENGE

After an unexpected wide-area grid shutdown, such as a blackout or brownout, utilities must be able to restore electric power to customers as quickly as possible. This typically occurs after restoring bulk system capabilities and stability. The ability for utilities to safely and reliably restart is imperative for long-term grid resilience and reliability.

Utilities typically have backup diesel generators for critical loads and specially designated generators that can supply enough support for a blackstart. However, this power source is costly to maintain and relies on a consistent fossil fuel supply. In addition, using generators can take up to 24 hours for the process to be completed.

Utilities need an alternative source of energy that can assist in maintaining grid stability after a shutdown, quickly achieving a blackstart, and enabling customers to receive power supply quicker while reducing the reliance on diesel generators.



When utilities restart after a grid shutdown, the CleanStart DERMS approach (left) creates a microgrid while the bulk system continues to be restored, thus accelerating connection time for customers.

At-A-Glance

PROJECT LEAD

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PARTNERS

- Smarter Grid Solutions
- SolarEdge
- PingThings
- City of Riverside Public Utility
- Pacific Gas & Electric
- University of California Riverside

BUDGET

DOE: \$5M
Industry: \$1.6M

DURATION

October 2017 – September 2020

TECHNICAL AREA

Operations, Power Flow, and Control
Lead: Jeff Dagle
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APPROACH

The CleanStart Distributed Energy Resource (DER) Management System will design, implement, and validate a novel blackstart and dynamic microgrid solution from DER feeders. This project will validate the capability to start a feeder from a complete outage, using DERs in the form of solar, energy storage, minimal diesel, and building control to resynchronize with the wider area network. The project will integrate distributed analytics, controls, and DER management system concepts, along with enhanced communication and control for agile islanding and microgrid controls.

The field validation, in collaboration with utility and city partners, takes place at two University of California at

Riverside buildings and DER structures that are connected to a City of Riverside utility substation. Both buildings are served by Riverside Public Utilities feeders, both have solar generation units, and one also has a lithium-ion battery storage unit.

For distribution, the project will use an existing high-fidelity sensing network that was integrated into the buildings during a previous project under DOE's Advanced Research Projects Agency-Energy (ARPA-E).

EXPECTED OUTCOMES

Developments from this project will reduce costs, increase availability and redundancy of blackstart generation, and improve customer reconnection time using real-time DER controls.

After successful implementation, customers benefitting from this technology could be reconnected after four hours, vs. up to 24 hours that is typical with existing processes.

LAB TEAM



As part of the U.S. Department of Energy's Grid Modernization Initiative, the GMLC is a strategic partnership between DOE Headquarters and the national laboratories, bringing together leading experts and resources to collaborate on national grid modernization goals. The GMLC's work is focused in **six technical areas** viewed as essential to modernization efforts:

Devices and Testing | Sensing and Measurements | Systems Operations and Control
Design and Planning | Security and Resilience | Institutional Support