DER Siting and Optimization Tool for California

CHALLENGE

The State of California is pursuing aggressive goals for integrating 15 gigawatts of distributed energy resources (DERs), including 12 gigawatts of renewable energy distribution systems. In addition, through the Public Utilities Code Section 769 instituted by Assembly Bill 327, electric utilities in California are required to file Distribution Resources Plans (DRPs) to "identify optimal locations for the deployment of distributed resources." However, the current resource plans do not necessarily take into account optimal DER dispatch strategies from both an economic or environmental standpoint.

In previous studies conducted in California focusing specifically on the commercial building sector, the economic impact of statewide DER penetration has been estimated to produce potential annual energy savings ranging from $700M to $900M by 2020. Carbon dioxide emission reductions are in the range of 0.5 to 4.1 megatons, using purely economic objectives. While promising, these results were obtained using a simplified approach that did not consider DER impacts on the grid. Some of the key challenges currently associated with renewable penetration derive from the grid's ability—or lack thereof—to cope with natural resource variability and how that is amplified by rapid customer adoption and state mandates and goals.

Further, these studies did not consider the potential for DER markets and ancillary service provision, and included only roughly 37% of the commercial building sector. This suggests the potential for a significantly larger impact when addressing the entire statewide building sector.

APPROACH

To identify and mitigate the impacts of high levels of DER penetration in the bulk electric grid system, this project addresses some of the limitations found in the current DRP methods, including:

- introducing optimal investment decisions of privately owned DER assets to develop adoption patterns, and
- introducing power flow co-simulation of transmission and distribution networks.

The project leverages an upgraded and customized version of Lawrence Berkeley National Laboratory's Distributed Energy Resources – Customer Adoption Model (DER-CAM) optimization engine to obtain meaningful DER adoption patterns. Also, Lawrence Livermore National Laboratory's

At-A-Glance

PROJECT LEADS

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PARTNERS

- California PUC
- Pacific Gas and Electric
- Southern California Edison
- Metropolitan Council of Governments
- New York State Energy Research and Development Authority

BUDGET

$1.3 million

DURATION

June 2016 – September 2017

TECHNICAL AREA

Design and Planning Tools

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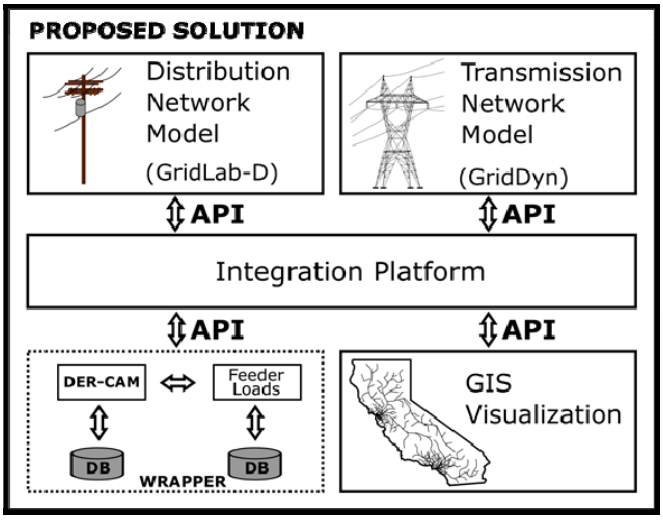
GridDyn power system simulator will enable the coupling of transmission and distribution system simulations.

Significant project efforts are focused on developing the necessary software components to enable the integration and automation of these capabilities, as well as on developing a mapping and visualization platform to enable the spatial representation and analysis of results.



Methods and tools developed by the project could be used nationwide.

EXPECTED OUTCOMES

This project aims to support California in achieving its 33% renewable portfolio standards (RPSs) by 2020 by helping guide customers, DER investors, and utilities in developing the most effective DER locations to support local and system-wide grid services needed for increased renewables. The methods and tools developed on the project can also be used nationwide in future projects to help other states achieve RPS targets or otherwise boost renewables, thereby contributing to achieve long-term penetration goals.

LAB TEAM

BERKELEY LAB

Lawrence Livermore National Laboratory

SLAC NATIONAL ACCELERATOR LABORATORY

Launched in November 2014 under 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