



***BEopt-CA (Ex)* – A Tool for Optimal Integration of EE/DR/ES+PV in Existing California Homes**

**Cooperative Research and
Development Final Report**

CRADA Number: CRD-11-429

NREL Technical Contact: Craig Christensen

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In accordance with Requirements set forth in Article XI, A(3) of the CRADA document, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

Parties to the Agreement: Davis Energy Group

CRADA Number: CRD-11-429

CRADA Title: *BEopt-CA (Ex)* -- A Tool for Optimal Integration of EE/DR/ES+PV in Existing California Homes

Joint Work Statement Funding Table Showing DOE Commitment:

Estimated Costs	NREL Shared Resources
Phase II, Year 1	\$ 77,000.00
TOTALS	\$ 77,000.00

Abstract of CRADA Work:

Opportunities for combining energy efficiency, demand response, and energy storage with PV are often missed, because the required knowledge and expertise for these different technologies exist in separate organizations or individuals. Furthermore, there is a lack of quantitative tools to optimize energy efficiency, demand response and energy storage with PV, especially for existing buildings. Our goal is to develop a modeling tool, *BEopt-CA (Ex)*, with capabilities to facilitate identification and implementation of a balanced integration of energy efficiency (EE), demand response (DR), and energy storage (ES) with photovoltaics (PV) within the residential retrofit market. To achieve this goal, we will adapt and extend an existing tool—*BEopt*—that is designed to identify optimal combinations of efficiency and PV in new home designs.

In addition, we will develop multifamily residential modeling capabilities for use in California, to facilitate integration of distributed solar power into the grid in order to maximize its value to California ratepayers. The project is follow-on research that leverages previous California Solar Initiative RD&D investment in the *BEopt* software. *BEopt* facilitates finding the least cost combination of energy efficiency and renewables to support integrated DSM (iDSM) and Zero Net Energy (ZNE) in California residential buildings. However, *BEopt* is currently focused on modeling single-family houses and does not include satisfactory capabilities for modeling multifamily homes. The project brings *BEopt's* existing modeling and optimization capabilities to multifamily buildings, including duplexes, triplexes, townhouses, flats, and low-rise apartment buildings.

Summary of Research Results:

This project targeted the development of a software tool, *BEopt-CA (Ex)*, which aims to facilitate balanced integration of EE, DR, and PV in the residential retrofit market. The intent of the software tool is to provide utility program managers and contractors in the EE/DR/PV marketplace with a means of balancing the integration of EE, DR, and PV within the residential retrofit market.

NREL's existing *BEopt* software was enhanced by adding capabilities in the following areas: existing home retrofit analysis, retrofit measures and cost data, utility tariff capabilities, utility cost-effectiveness tests, incentives for PV and whole-house EE, and DR. The *BEopt-CA (Ex)* capabilities are available in the public version of *BEopt* (<https://beopt.nrel.gov>) and can be accessed by selecting the California-specific mode upon launching the program.

Phase II of the project made these enhanced capabilities available for analysis and optimization of multifamily buildings, including duplexes, triplexes, townhouses, flats, and low-rise apartment buildings (up to five stories).

Subject Inventions Listing:

None

Report Date:

29 January 2016

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