

CEC's EPIC GFO-15-311

The main objective of this solicitation is to identify, inform and develop strategies for overcoming technical, institutional and regulatory barriers to expanding DR participation in California. The main purpose of this research is to enable high renewable resource penetration and meet carbon emissions goals by facilitating the more effective use of DR and Distributed Resources by all sectors of California IOU customers. Projects fall within the following four project groups.

Group 1: Load Management Systems that Facilitate Participation as Supply-side Resources

The purpose of research in this group is to develop and pilot-test operational strategies for participation as supply-side resources utilizing onsite renewable generation, CHP, electricity and thermal storage, energy efficiency, electric vehicles and load management systems.

Group 1 Projects:

1. EPC-15-074 – CSE
2. EPC-15-083 – OhmConnect
3. EPC-15-084 – BMW

Group 2: Load Management Systems that Facilitate Participation as Demand-side Resources

The purpose of this project group is to develop and pilot-test behind-the-meter load management systems and operational strategies, program designs and retail tariff options that minimize the cost and complexity of customer participation, while maximizing the potential of large numbers of small loads

Group 2 Projects:

1. EPC-15-048 – AESC
2. EPC-15-054 – Universal Devices
3. EPC-15-057 – UC Berkeley
4. EPC-15-073 – UCLA
5. EPC-15-075 – EPRI

Group 3: Develop One or More Transactive Signals to Facilitate Demand Response

The purpose of the research in this group is to develop, test and operationalize one or more transactive signals that can be used by utility customers—and the other Recipients under this solicitation—as a basis for automating their load management strategies.

Group 3 Projects:

1. EPC-15-045 – EPRI

Group 4: Value Proposition for Nonresidential Building Lighting Retrofits and Demand Response

The purpose of this research project is to evaluate the costs and benefits of DR control system requirements in the California Energy Code across the existing non-residential building stock in California.

Group 4 Projects:

1. EPC-15-048 – LBNL

Group 1 Projects

EPC-15-074 – CSE: Meeting Customer & Supply-side Market Needs with Electrical & Thermal Storage, Solar, EE and Integrated Load Management Systems

1. *Did this project meet the objective of GFO-15-311?* Yes. This project contributed to developing a regulatory pathway for BTM resources to participate in CAISO's wholesale market.
2. *Did this project develop and pilot-test operational strategies for participation as supply-side resources?* Partially. Successful with energy storage. Unsuccessful with IoT system.
3. *Did this project test any transactive signals?* No. Due to delays with CAISO wholesale market participation eligibility, this project did not have enough time to test TLM signals.
4. *Did this project identify market barriers?* Yes. Policy/participation barriers with CAISO.
5. *Did this project lead to technological advancement or breakthroughs?* Yes. provided comprehensive recommendations on how to overcome technical, institutional and regulatory barriers to facilitating DER participation in the CAISO market.

EPC-15-083 – OhmConnect: Empowering Proactive Consumers to Participate in Demand Response Programs

1. *Did this project meet the objective of GFO-15-311?* Yes. Project provides critical evidence that residential customers are willing to manage their electric loads for the purpose of meeting grid needs.
2. *Did this project develop and pilot-test operational strategies for participation as supply-side resources?* Yes. Project applied a three-phase approach to test customer engagement strategies.
3. *Did this project test any transactive signals?* Yes. Participated in the supply-side markets to receive Day-ahead real-time wholesale market prices from the TIME system.
4. *Did this project identify market barriers?* No market barriers identified in presented reporting.
5. *Did this project lead to technological advancement or breakthroughs?* Yes. Results can be used to help shape utility tariff and program design and program parameters for third party aggregator participation in demand response.

EPC-15-084 – BMW: Total Charge Management: Advanced Charge Management for Renewable Integration

1. *Did this project meet the objective of GFO-15-311?* Yes. This project helps CA advance the flexibility of electric vehicle charging as a flexible grid resource and vehicle charging cost savings to the driver.
2. *Did this project develop and pilot-test operational strategies for participation as supply-side resources?* Yes. Project implemented and tested control software to assess grid and customer benefits when there was excess supply and DR events.
3. *Did this project test any transactive signals?* Yes. Participated in the supply-side markets to receive Day-ahead real-time wholesale market prices from the TIME system.
4. *Did this project identify market barriers?* Yes. Potential barrier related to vehicle driver consistently interacting with app for away-from-home charging.
5. *Did this project lead to technological advancement or breakthroughs?* Yes. Increased charging flexibility to better meet the needs of the grid, regardless of where the charging occurs.

Group 2 Projects

EPC-15-048 –AESC: Residential Intelligent Energy Management Solution: Advanced Intelligence to Enable Integration of Distributed Energy Resources

1. *Did this project meet the objective of GFO-15-311?* Yes. Identified and developed strategies for overcoming technical barriers to expanding DR participation.
2. *Did this project develop and pilot-test BTM load management systems and operational strategies, program designs and retail tariff options?* Yes. The project tested the RDERMS system.
3. *Did this project test any transactive signals?* Yes. Tested the signal with thermostats, batteries, and EV charging.
4. *Did this project identify market barriers?* Yes. technical barriers – Internet connection; data quality, programming; environmental sensors. Non-technical barriers – customer messaging; receiving utility price signals.
5. *Did this project lead to technological advancement or breakthroughs?* Yes. Project showed it is possible to promote electric consumption that reduces peak demand through automation, intelligent control, and price signals.

EPC-15-054 –Universal Devices: Complete and low-cost retail automated transactive energy system (RATES)

1. *Did this project meet the objective of GFO-15-311?* Yes. The team demonstrated the feasibility of using a transactive system.
2. *Did this project develop and pilot-test BTM load management systems and operational strategies, program designs and retail tariff options?* Yes. The RATES design was tested with about 100 retail customers on the SCE distribution grid.
3. *Did this project test any transactive signals?* Yes. The team demonstrated the feasibility of integration of wholesale and retail operations using a transactive system.
4. *Did this project identify market barriers?* Yes. Access to real-time and forecast data on circuit load and SCE net load. Need for more flexible devices, need for a fully operational subscription transactive tariff.
5. *Did this project lead to technological advancement or breakthroughs?* Yes. The technology will reduce barriers to low cost, anytime responsiveness for millions of customers and their devices by solving the cost and complexity of current DR participation options.

EPC-15-057 – UC Berkeley: XBOS-DR: Customer- Controlled, Price Mediated, Automated Demand Response for Commercial Buildings

1. *Did this project meet the objective of GFO-15-311?* Yes. Using networked thermostats to reduce energy consumption, demonstrated the prototype XBOS-DR platform reduced peak loads on event days in SMB, and demonstrated price messaging/ information exchange module functionality.
2. *Did this project develop and pilot-test BTM load management systems and operational strategies, program designs and retail tariff options?* Yes. Tested the XBOS-DR platform.
3. *Did this project test any transactive signals?* Unclear from available reporting if the project was able to test any transactive signals.
4. *Did this project identify market barriers?* Yes. difficulties in commissioning and managing multiple buildings; data quality issues.
5. *Did this project lead to technological advancement or breakthroughs?* Project revealed incorporating real-time building energy data with thermostat data can achieve building system identification, conduct diagnostics, and improve control.

Group 2 Projects

EPC-15-073 – UCLA: Identifying Effective Demand Response Program Designs for Residential Customers

1. *Did this project meet the objective of GFO-15-311?* Yes. Study identified, and developed strategies for overcoming customer and policy barriers to expanding DR participation in California.
2. *Did this project develop and pilot-test BTM load management systems and operational strategies, program designs and retail tariff options?* Yes. This study tested the effectiveness of innovative design strategies for residential demand response programs using behind-the-meter customer engagement platforms.
3. *Did this project test any transactive signals?* No. This project did not utilize the TLM signals.
4. *Did this project identify market barriers?* Yes. Customer engagement; Customer demographics; Current DR program design.
5. *Did this project lead to technological advancement or breakthroughs?* Yes. This research will help DR providers to design cost efficient and long-lasting DR programs. This research also provides policy recs., which could be used by a wide variety of stakeholders.

EPC-15-075 – EPRI: Customer-centric demand management using load aggregation and data analytics (DSRIP)

1. *Did this project meet the objective of GFO-15-311?* Yes. Project designed a flexible Platform (OpenDSRIP) and provides insights into technical and market barriers to scaling such a platform and approach.
2. *Did this project develop and pilot-test BTM load management systems and operational strategies, program designs and retail tariff options?* Yes. Tested the OpenDSRIP.
3. *Did this project test any transactive signals?* Yes. Tested the EPRI TLM signal.
4. *Did this project identify market barriers?* Yes. Customer appetite; data security; solutions for DACs; solution scalability; energy standards.
5. *Did this project lead to technological advancement or breakthroughs?* Yes. By developing frameworks and open-source tools for evaluating flexibility, the project provides a more realistic understanding of the potential for flexibility as a pathway to decarbonization.

Group 3 Projects

EPC-15-045 – EPRI: Transactive Incentive Signals to Manage Electricity Consumption for Demand Response

1. *Did this project meet the objective of GFO-15-311?* Yes. Project successfully developed a day-ahead hourly proxy price signal that incorporates system conditions as reflected by wholesale energy markets.
2. *Did this project to develop, test and operationalize one or more transactive signals?* Yes. project developed TLM signals, expressed in the form of proxy prices reflective of current and future grid conditions, and develops and implements software to calculate such signals.
3. *Did this project test any transactive signals?* Yes. Project developed the signal for projects under this GFO to test.
4. *Did this project identify market barriers?* N/A
5. *Did this project lead to technological advancement or breakthroughs?* Yes. This project has resulted in extended and new research projects to test the transactive signal across additional scenarios and how this technology might influence CA policy.

Group 4 Projects

EPC-15-048 – LBNL: Residential Intelligent Energy Management Solution: Advanced Intelligence to Enable Integration of Distributed Energy Resources

1. *Did this project meet the objective of GFO-15-311?* Yes. research sets the stage for IOUs to offer new pay-for-performance programs to support lighting technologies.
2. *Did this project evaluate the costs and benefits of DR control system requirements in the California Energy Code?* Yes.
3. *Did this project test any transactive signals?* No. study focused on shape, shed, and shimmy regimes when evaluating networked lighting controls demand response value for offices and retail buildings.
4. *Did this project identify market barriers?* Yes. Unclear value proposition to customers; perceived impact to trade allies; lack of standardization; lack of best practices in commissioning; lack of integrated program support.
5. *Did this project lead to technological advancement or breakthroughs?* Yes. Project developed a framework that can be used to better quantify in real terms, the value associated with networked lighting controls for different building types.