EXECUTIVE SUMMARY
LAS POSITAS COLLEGE MICROGRID AUTOMATION PROJECT

The Chabot-Las Positas Community College District proposes to use the Las Positas College campus grid as a real world example to evaluate how to most effectively manage energy flows using advanced microgrid energy management applications and multiple energy storage mediums on a grid with high penetration renewable energy generation and a variable energy load.

The Las Positas College campus grid provides a unique opportunity to study and evaluate means and methods to manage over-generation from variable renewable energy generation sources. The 2.35Kw on-site solar PV arrays have been supplying 55% of the college's electrical energy for the past 2 years. We propose to install a 1 MWH flow battery coupled with the college's central plant cooling loop containing a 3200 ton/hour ice storage system to capture excess energy generation during daylight hours and release that energy during the early evening hours using a Growing Energy Laboratories, Inc (Geli) Energy Operating System and Energy Management Applications. In addition, we propose to collaborate with PG&E and Olivine, Inc to develop Demand Response scenarios that optimize the value of energy to the College and the utility while improving the reliability of the grid.

The primary goals of the Las Positas College Microgrid Automation Project (LPC-MAP) are

- Demonstrate and document the management and coordination of energy storage using both electrochemical battery and thermal/mechanical energy storage systems combining real time and forward forecasting algorithms to manage and smooth energy produced from solar PV arrays.
- Develop Energy Management Applications that automate an interface with Demand Response programs that provide local energy providers and suppliers and the California Independent System Operator (CALISO) the ability to coordinate demand response services "behind the meter"
- Prepare and disseminate models that allow educational institutions the ability to evaluate the addition of energy storage and microgrids to their existing renewable energy assets and include open source software to facilitate standardized public domain communication protocols.
- Collaborate with PG&E and CALISO to model benefits to the customer and the local and regional grid thorough the broad installation of customer side microgrid/energy storage systems along with greater demand response and grid services.

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The LPC-MAP project plan is to integrate and automate Imergy Power Systems vanadium redox flow battery energy storage assets, campus-cooling loop and thermal storage systems, renewable energy generation, electrical metering and switching, with local and network controls systems. The systems will be integrated using Growing Energy Labs, Inc. (Geli) algorithms, optimizations, and automations in the form of Energy Applications to (1) maximize the on-site use of renewable energy, (2) to balance and decrease campus demand charges, (3) be a community non-polluting full time emergency energy resource, and (4) provide energy services to the utility when requested and/or programmed by dynamically providing local grid stabilization services and Demand Response.

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An initial analysis indicated the College could reduce their annual energy cost by $100,000 with the implementation of energy storage and energy management system through reduction of peak demand charges and optimizing the value of energy generated. We will develop scenarios that demonstrate the potential benefits of and barriers to participation in demand response programs. With over three years of detailed power and energy data from the solar arrays along with utility metering, the team will be able to identify trends as the system begins operation.

The project approach will be to develop a clear basis of design defining the key energy flow metrics along with a verification plan. As Geli is developing their energy management applications for the LPC network, we will work closely with CEC, the Technical Advisory Panel and PG&E to coordinate the installation with the anticipated power flows on the local utility grid. We will also develop feasibility analysis of levels of Demand Response participation. As the flow battery is being fabricated, we will develop detailed construction design documents. The modifications to the existing solar PV electrical system and the chiller/thermal storage system can proceed as soon as the design is complete, prior to the installation of the battery. After the testing and commissioning of the battery and the energy management system, we will start collecting detailed energy flow data and performance data from the battery and ice storage systems and test the Demand Response scenarios.

The technical advances of this project are the development of expanded energy management applications by Geli, a performance documentation of a commercial/institution scale up of Imergy's vanadium redox flow battery system, and evaluation of wide spread participation models of Demand Response participation. The firms are currently developing a demonstration of the technology using a 30KW flow battery network at the Port Hueneme Naval Base.

The project team will actively share the project findings. We will prepare a microgrid energy storage implementation report that will enable other educational and commercial entities to evaluation implementation. The report will provide access to a public domain energy management operating system and application program interfaces to connect and communicate with energy assets as well as local utilities/energy providers and CALISO. The project team will present our project findings and models at statewide Community College and K-12 facility manager conferences and a website providing real time energy management system dashboard.

The project will be managed in conjunction with Las Positas College's on-going $240M Bond funded capital improvement program. The District's Bond Program team will handle all contracting, accounting and business items, minimizing grant funded administrative expenses. Parsons Brinckerhoff, as the District's Las Positas College program and construction management team, will manage the overall project. Parsons Brinckerhoff's project manager, Bruce Rich, brings over 35 years' experience managing projects from development to operations. As a California licensed electrical engineer, he brings specific technical background to effectively manage the work, provide the documentation of the project and speak about the results of the project to educational facilities managers who have installed solar PV arrays throughout the state.