



**PDE**  
Total Energy Solutions  
Electrical Contractors

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## Defining the Living Pilot

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PDE Total Energy Solutions is pleased to submit the following proposal in response to your call for **Defining the Living Pilot – Symposium of Ideas.**

PDE is a Southern California-based General and Electrical Contractor, established in 1990 with demonstrated success in managing complex critical power projects. PDE offers a unique combination of experience in design/build/maintenance of critical DC power systems with expertise in advanced power systems, energy controls, renewable integration, EV charging systems, energy storage, energy efficiency and smart microgrid design. PDE's solutions integrate diverse technologies to maximize energy savings, reliability and security options for its clients. Backed by 20+ years of construction project management, PDE understands the extensive pre-planning and execution necessary to complete a project on-time and within budget.

The following is a brief summary of PDE's approach and its benefits to SCE:

- PDE will provide turnkey products and services, including detailed financial modeling to justify the project
- PDE will provide a coordinated single-source of project management interface
- PDE's battery energy storage unit(s) will be fully integrated and tested at our supplier's state-of-the-art factory prior to shipment requiring minimal onsite installation time and commissioning
- Demonstrated commercial experience, proven technology
- PDE is a local contractor with a state-wide presence

PDE will supply a proposal that best represents the future of an integrated electric distribution system. Our proposal addresses the need to enhance renewable generation with energy storage and controls integration. PDE's solution is well suited to the environment comprising of a robust battery, utility grade power electronics in a fully integrated system. In addition, PDE's system will offer an unmatched variety of operating capabilities, more advanced than any technology currently available.

**The Challenge:**

Developing a balanced approach, including preferred resources to replace the capacity loss of 2,200 MW in the Orange County/San Diego County areas, resulting from SONGS closure.

**The Solution:**

A microgrid serving a campus, industrial park or community. The microgrid may generate power from fuel cells, wind and/or solar energy. The microgrid becomes "smart" by adding a battery, advanced power electronics, a smart inverter capable of multiple DC inputs and controls.

**Case Study: PDE's Smart Microgrid System**

In July 2012, PDE Total Energy Solutions designed, installed and commissioned a smart microgrid for the Los Angeles Electrical Training Institute (ETI) in the City of Commerce, CA. This smart microgrid has been operating for over 12 months – without interruption. The ETI microgrid has four components:

- Solar Shade Structure with EV Charging Stations.
- Advanced Energy Storage to store energy, provide supplemental power and smooth renewables.
- Custom Inverter – actively managing multiple DC power inputs while also managing bidirectional AC power connected to SCE utility grid.
- Microgrid Controller – Decides what to do with the power that is generated, based on the mode selected by user input from HMI. The controller may be managed locally or remotely.

This system has five modes that the user can choose:

- Default—system keeps batteries charge at 70% to 80%. Extra solar-generated energy may go back to the utility grid (or used to charge the battery if state of charge is below 70%).
- PV Smoothing—generates a user-determined “firm” electricity output from the microgrid by charging or discharging the battery in response to fluctuations in PV energy production due to weather and location of the sun.
- Peak Shaving—in this mode, the user sets maximum power that the microgrid will use from the macrogrid. If demand rises above the set level, the system will discharge battery power to lower the utility usage below the set point.
- Demand Response—the ETI smart microgrid, the microgrid controller lowers the air conditioning set point, enables battery charging, and/or discharges battery and solar power to the grid, depending on usage.
- Island—in response to user input or an actual power loss, the smart microgrid system enters island mode, where the battery and solar panels provide power to pre-determined critical power load(s). The microgrid controller lowers the building air conditioning set point and disables car charging to conserve power.

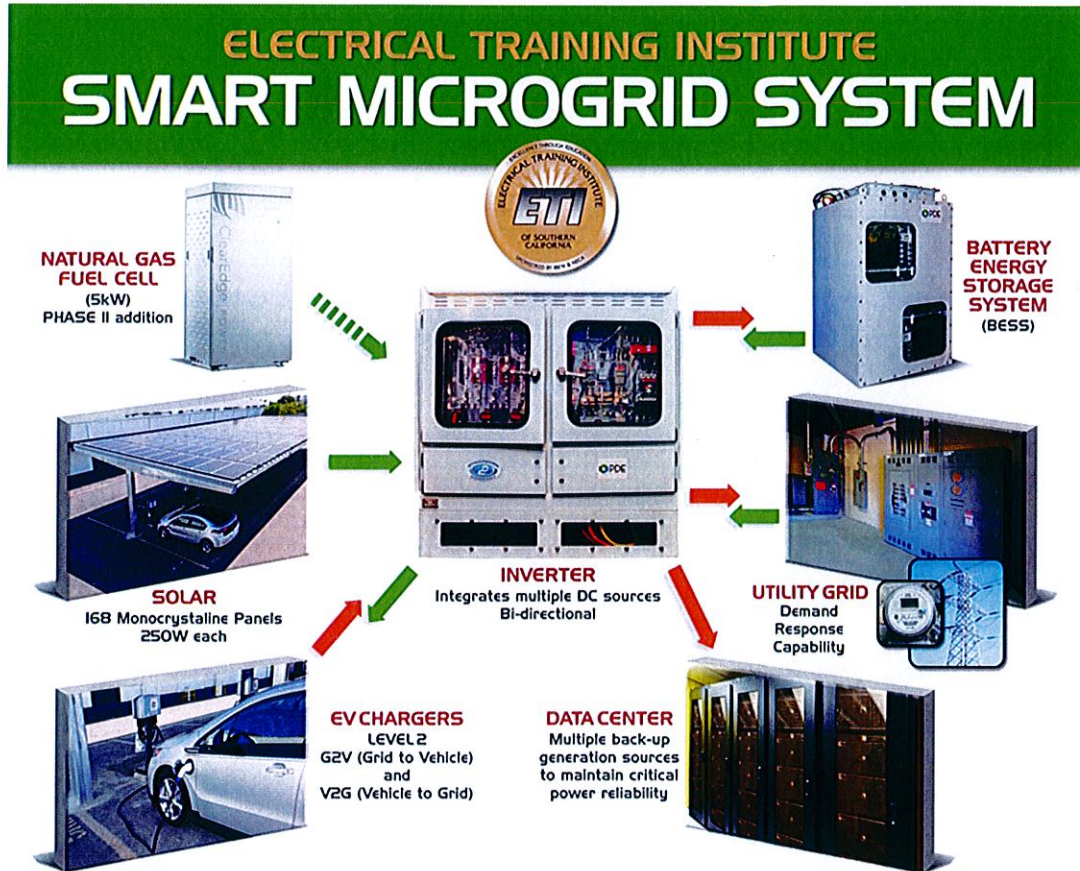
#### **Case Study: Department of Defense – 29 Palms, CA Battery Energy Storage System (BESS)**

In December 2011, PDE was selected as the prime contractor for a demonstration project at 29 Palms Marine Base to test a Battery Energy Storage System (BESS) that incorporates utility grade power electronics, a step-up cast coil transformer, AC and DC switchgear, and sodium-metal-halide battery energy storage and is designed to integrate seamlessly to an existing microgrid. The project will demonstrate how a robust BESS will alleviate renewable energy intermittency, improve island-mode operations, and reduce demand charges and peak load stress on the main transformers and other grid equipment. PDE’s deliverables are to demonstrate and assess the energy security, energy efficiency and reliability benefits realized from the integration of a 240 kW, 480kWhr, Battery Energy Storage System (BESS) with 1 MVA inverter. The project is underway and installation is scheduled for November 2013.

#### **Case Study: Penn State University**

PDE is providing design, engineering, equipment, construction management and contributing to curriculum development for Penn State University’s Energy Efficient Buildings Hub (EEBHUB). The system features a microgrid with renewable generation supported by a smart, multi DC port inverter, advanced controls to participate in ancillary services with the utility, DC distribution and multiple battery technologies. The project is underway and is scheduled for completion Q2 2014.

Below is graphical information regarding PDE's Smart Microgrid System at the Electrical Training Institute in the City of Commerce, California.



- Combines Energy Storage, Solar Generation, Electrical Vehicle Charging and building load management
- Can be operated both grid-connected and island-mode with full bumpless transfer
- Functionality includes renewable smoothing, peak shaving, VAR control and EV charge leveling

We look forward to participating the in the Symposium of Ideas on November 6, 2013. Please contact me or Dan Cohee with questions.

Best Regards,



Shelley Keltner, LEED AP™  
Chief Executive Officer



Dan Cohee  
Vice President, Operations