Description of integrated pilots/demonstrations/field tests/existing practices

1. Name of the case:

RealEnergy Inc. Enterprise-Wide Distributed Energy Information System

2. What is integrated with DSM

DG	X
Energy storage	
Smart grid technologies	X

3. What is the level of commercialization

Research project	X
Demonstration	X
Field test	X
Existing practice	X

4. Where to find more information?
   - Contact person: Holly Thomas
   - Company: DOE
   - web-site: http://www.nrel.gov/docs/fy04osti/35049.pdf
   - Final technical report: http://www.nrel.gov/docs/fy03osti/33581.pdf

5. Objectives of the case

The goals of this project were to develop, demonstrate, and field-test an enterprise-wide DG energy management system that enables a business to monitor and control DG for optimal performance and operation. The work examines design and operational issues, communications standards, and experience with regulatory and market barriers while implementing a business solution. Effective tools for management and control are required to use distributed generation (DG) across an enterprise for reliable and economic power generation.

6. Business rationale/model

The market for distributed power is very new, and most of the products reviewed by RE were either still in the beta phase or no more than a year or two old and without substantial commercial operating histories. As the small generation market ripens, these products will improve. It is likely they have already improved a great deal. RE continues to re-evaluate its platform of choice and to test it against other reference systems. It is quite possible that products from companies whose services were previously declined could displace PML as the platform of choice should they prove that their products provide greater precision along with the other capabilities RE requires.

RE has strived to create a control system in which all of the integral parts are interchangeable and several vendors are available to supply each point. This encourages evolution and competition while creating a commercially available DG centralized command and control system. It is believed that such a system does not exist today.

In commercial buildings, one or more distributed generators are generally set up to operate in parallel with the utility grid. Challenges to achieving optimal performance and operation include:

- Entitlements (air, building, and interconnection)
- Utility barriers to entry (standby, departing load)
- Technology/manufacturer
- Building integration
- Profit/savings
- Scaling (systems, multiple locations)
- Optimizing thermal applications and system operations.

In addition, it is critical that regulatory requirements associated with interconnecting with the grid in California be met. These vary from utility to utility. Specific challenges included:

- No standardized application requirements
- Utility/inspectors need more experience and understanding of DG/CHP
- No formalized communications between utility personnel and applicants
- No standardized definition and protocol for a “complete” application
- Different requirements across utilities
- Different utilities require different types of protection devices.

7. Technologies used

RE designed a Distributed Energy Information System (DEIS) built with “off the shelf” technology to meter, manage, and monitor the DG. The technical design criteria included precision (quality and quantity of outputs), compatibility with existing building energy management systems, hardware/software integration in the platform device, durability, and remote operation. Business considerations included cost, data ownership, and versatility. Required functions were to:

- Communicate and operate the DG system on site
- Interface and manage the system with the host facility

Description of integrated pilots/demonstrations/field tests/existing practices

- Communicate with corporate servers, mobile operations, and maintenance staff.

8. Short description of the case

Real Energy was chosen to develop a set of tools to manage and control a distributed generation system. The system was built with commercially available, “off the shelf” technologies to meter, manage, and monitor the DG. The DEIS needs to gather information about each DG system and report to a central control station, which provides complete management capability as well as records to support billing for services. RE modeled the inputs and communication requirements needed to install a command-and- control module on each of its DG systems, which laid the foundation for optimized enterprise-wide dispatch. Using off-the-shelf hardware, RE and its vendor developed the software to complement the metering hardware. This enabled RE to meter, monitor, operate, and dispatch its fleet simply, safely, cost effectively, and within the parameters of Rule 21 (California’s interconnection governance).

9. Achieved/expected results (operational savings, CO_2, efficiency enhancement)

RE isolated system metrics that influence optimal dispatch and management of a DG network. Codes were installed, field-tested, and improved in real-time operations. Feedback allowed RE to improve the algorithms over time to make them more useful to operations, compliance, and billing departments. The dispatch of RE’s fleet of systems can now:

- Account for site demand and economic operating parameters and regulatory compliance issues
- Help individual systems independently avoid or minimize non-optimal dispatch scenarios
- Allow for the automated choice of dispatch options at potential hybrid projects
- Be remotely monitored and operated 24/7.

10. Lessons learned

Over the course of 2002, RE became the first DG Company to successfully interconnect with every major utility in California. Its learning process and collaborations helped influence the DG-friendly development of California’s Rule 21. Improvements to RE’s internal processes helped streamline interconnections and positively influence utilities’ expectations and handling of interconnection applications for the entire DG community. The RE DG Technology and Management Systems Web site is the first DG site of its kind. It dynamically details onsite operation information for public consumption. It serves as a public clearinghouse for information about interconnection, incentives, and RE’s interconnection experience in California.

Actual project installations and operations inform RE that, at this time, outputs are far more important than inputs to viable economic operation. The inputs needed for economic dispatch are few and simple while outputs are many and complex. The inputs and much of the design of the first system prototype have been found to be unnecessary under the current regulatory paradigm in California.

The market for distributed power is very new, and most of the products reviewed by RE were either still in the beta phase or no more than a year or two old and without substantial commercial operating histories. As the small generation market ripens, these products will improve. It is likely they have already improved a great deal. RE continues to re-evaluate its platform of choice and to test it against other reference systems. It is quite possible that products from companies whose services were previously declined could displace PML as the platform of choice should they prove that their products provide greater precision along with the other capabilities RE requires.

The market for DER in California must be founded on sound economics. Those technologies with the most positive economic return will emerge as technologies of preference. For DER to play a sustained role in power supply, it must be competitive with utility-provided power pricing and as convenient to obtain as utility-provided power. DER will be funded by private enterprise where utility power cost is highest. Basic economics dictate the highest costs occur where supply is limited; therefore, DER will play a smaller role in various irrigation districts, some municipalities, or WAPA because of low-cost power in these areas. One factor that contributes to the cost of implementing DER is that many technologies are in their first round of product production and per-unit cost is high. As manufacturers increase production, the cost for many of these technologies will decrease significantly.

For select applications, DER makes economic sense today. RE has shown that CHP in commercial operations with high capacity factor is economically viable during on- and mid peak tariff periods when gas prices are not too high.

Educating local regulators and permitting authorities is still an issue and a cost for many projects, as this report demonstrates. Many utility personnel also lack training. Some older field personnel may have a bias against DG from the days of PURPA. Utilities themselves are not aligned with allowing DG to be installed because it decreases utility distribution system revenue, which is based on kilowatts flowing through the lines. To this extent, investor-owned and many municipal utilities in California are not agnostic about DG and have been cooperative only in select instances. A mechanism decoupling rates from kilowatt-hour distribution — such as the Electric Rate Adjustment Mechanism of the days of demand-side management projects — might help, though it is likely to be opposed by the IOUs because it is a ratepayer subsidy for DG. The question remains how long utilities can resist DG as the technologies come within economic reach of an ever-increasing portion of the rate base.