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

1. Name of the case:

**Automated Critical Peak Pricing Field Tests: 2006 Pilot Program Description and Results**

2. What is integrated with DSM

| | |
|---|---|
| DG | X |
| Energy storage | X |
| Smart grid technologies | X |

3. What is the level of commercialization

| | |
|---|---|
| Research project | X |
| Demonstration | X |
| Field test | X |
| Existing practice | |

4. Where to find more information?
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   - Web-site: http://drrc.lbl.gov/pubs/62218.pdf

5. Objectives of the case

The program was designed to evaluate the feasibility of deploying automation systems that allow customers to participate in critical peak pricing (CPP) with a fully-automated response. The 2006 program was in operation during the entire six-month CPP period from May through October.

The objectives of this project were to:

- Demonstrate how an automated notification system for critical peak pricing can be used in large commercial facilities for demand response (DR). Evaluate the effectiveness of such a system. Determine how customers will respond to this form of automation for CPP.

- Evaluate what type of DR shifting and shedding strategies can be automated for CPP to provide effective DR.
- Evaluate CPP economics and the influence of various rate designs.
- Understand the costs and benefits of CPP from the building owners' perspective.
- Develop information systems for commercial customers, such as energy consumption feedback, audits, and economic analysis tools.
- Demonstrate integrated energy management using advanced controls for both energy efficiency and DR.
- Explore how automation of control strategies can increase participation rates and DR.
- Evaluate occupant and tenant response.

6. Business rationale/model

California investor-owned utilities (IOUs) have been exploring the use of critical peak pricing (CPP) to help reduce peaks in customer end-use loads. CPP is a form of price responsive Demand Response. Recent experience has shown that customers have limited knowledge of how to operate their facilities to reduce their electricity costs under CPP. While the lack of knowledge about how to develop and implement demand response (DR) control strategies is a barrier to participation in DR programs like CPP, another barrier is the lack of automation of DR systems. Most DR activities are manual and require building operations staff to first receive emails, phone calls, and pager signals, and second, to act on these signals to execute DR strategies.

7. Technologies used

In Auto-CPP a communications signal provides notification of price variations that reflect the CPP tariff. The signal is published on a single web services server and is available on the Internet using the meta-language XML (Extensible Markup Language). Each of the participating facilities monitors this common price signal using web services client applications and automatically sheds site-specific electric loads when the price increases based on the PG&E Critical Peak Pricing Program. The system is designed to operate without human intervention during the DR period.

LBNL provided the participants one of two automation equipment options:

- Web-service program source code, or
- Client and Logic with Integrated Relay (CLIR) Box

Once the Auto-CPP system setup was completed, a test of the system was conducted. LBNL published an XML electricity price signal via the Internet that contained information to represent electricity prices for the CPP event days. This signal initiated the implementation of the facility's automated DR strategies. However, the participant was able to override the test and "opt out" if necessary.

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The Demand Response Automation Server (DRAS) is at the heart of the controls and communications architecture for the Internet-based system used to enable Auto-DR in California. The DRAS was conceptualized and funded by California Energy Commission, Public Interest Energy Research (PIER), and Lawrence Berkeley National Laboratory (LBNL). The DRAS is managed by Akuacom[3] and provides a common signaling infrastructure for economic- and contingency-based demand response. The DRAS infrastructure allows each utility to communicate with energy service providers (ESCOs) and aggregators as well as customers in their territory. Since published open standards are used, ESCOs, aggregators and “trans-utility” statewide customers minimize their development effort through use of the common interface. Industry standards such as Extensive Mark-up Language (XML), Simple Object Access Protocol (SOAP) and web services are used.

8. Short description of the case

Fully-Automated Demand Response does not involve human intervention, but is initiated at a home, building, or facility through receipt of an external communications signal. The receipt of the external signal initiates pre-programmed demand response strategies. From the customer side, modifications to the site’s electric load shape can be achieved by modifying end-use loads. Examples of demand response strategies include reducing electric loads by dimming or turning off non-critical lights, changing comfort thermostat setpoints, or turning off non-critical equipment. These demand response activities are triggered by specific actions set by the electricity service provider. Many electricity customers have suggested that automation will help them institutionalize their demand response. The alternative is manual demand response, when building staff receives a signal and manually reduces demand. Research has found that many building energy management control systems (EMCS) and related lighting and other controls can be pre-programmed to initiate and manage electric demand response.

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

The overall average of the site-specific average coincident demand reductions was 10% for a variety of building types and facilities. Many electricity customers have suggested that automation will help them institutionalize their electric demand savings and improve their overall response and DR repeatability.

10. Lessons learned

DR programs will be more successful in the long run if they can be linked to energy efficiency programs. DR capabilities in buildings are dependant on controls. Ideally a candidate building would have good dynamic control capability, energy-efficient equipment, good commissioning, and good feedback linking operating conditions and strategies to energy costs. More of these attributes are needed in buildings to improve both DR capabilities and daily energy efficiency practices.

One key factor in the success of Auto-DR is to understand how acceptable it is to participants. Since Auto-DR is automated, it occurs as a transparent activity, and often when occupants are asked about their experiences they have limited opinions. LBNL collected anecdotal information from the Auto-CPP sites through a “request for quotes.” Since most of the sites had an EMCS, the responses showed that the operators in Auto-CPP sites do not differentiate between semi-automated and fully automated DR strategies. Post-event surveys showed that many of the second-year (2006) participants did not watch the events. Also, since the automation and communications technology performed without problems, the conclusion is that the automation was effective and acceptable, although there were some complaints.