

Even Couch Potatoes Can Save Energy with Dreamy Advanced Meters

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ABSTRACT

Panel Objective: While most of today's talk is about offering customers smart rates using smart meters, it appears that most customers are pretty happy being dumb. Sure, some of the population gets it and participates. But the masses are unmoved. Might they get it if you offered easy, energy cost savings and control options on their TV? Would they, being offered specific savings on one extremely hot or cold day, be prone to permanently program their thermostats to get even more savings? Would they change behavior if an environmental signal was offered to them showing when the pounds of carbon per kWh are highest? Xcel Energy's pilot project is hoping to help reveal the answers.

Concepts/Results to be presented: Price and environmental signals have been developed to reflect both supply side needs while making it easy for customers to "set and forget" their preferences. Translating the supply side need into an easily understood customer opportunity is central to the success of the project. This effort also takes a close look at whether non-price drivers (e.g. the desire to reduce carbon footprint) are more influential than price drivers in engaging customer participation. This project is a part of Xcel Energy's SmartGridCity™ project. Target participation for the Control 4 and Apogee solution is 400 households in Boulder, Colorado

With Apogee's energy efficiency expertise, Control4's success in home entertainment and home automation systems and Xcel Energy's customer base, all conditions are ripe for a very telling initiative. The concept here is to move well beyond real-time pricing or critical peak pricing ideas by adding the environmental aspects and moving beyond the traditional technical equipment to the homeowners' true love – their TV, with extensions to other in home displays.

Why this Panel is Unique & Valuable: Smart meters and smart thermostats have been kicking around for more than three decades. But they're still the exception. Will placing energy management information and controls squarely on the TV screen and inside the TV remote give humans the power to really make behavioral changes? If \$5 gas won't do it, what will? See how this project may just prove how the life of Wall-E does not necessarily have to be our destiny.

Project Overview – Xcel Energy's Utility Innovations and SmartGridCity™

Do customers care enough about energy conservation, saving money, the environment or renewable energy to make changes in their daily habits? Xcel Energy's Utility Innovations department, in partnership with Control4 and Apogee Interactive, developed the Customer Web Portal project to test the extent to which customers will change behavior if provided education and analysis tools and the ability to automatically respond to variable energy prices and renewable energy levels.

Utility Innovations was created to find leading edge and emerging technologies that help utilities better serve their customers. It brings together experts in various fields to develop new solutions and creative approaches to deliver energy. The organization's shared purpose is to build a more intelligent "smart grid" for future generations.

Utility Innovations looks for partners who:

- Are attempting to bring something new into the marketplace;
- Are able to work quickly and produce results using rapid application development techniques;
- Will share findings and lessons learned with others as a means of moving the entire industry forward;
- Are willing to co-invest (by providing financial support, physical resources, and/or technical expertise); and
- Will work with others in an open, candid environment.

Xcel Energy has several programs focused on educating customers, and provides tools to help increase energy efficiency and conservation, such as their online Home Energy Analyzer and on-site Home Energy Audits. Opportunities exist to make these tools more effective with a system that presents personalized energy use data and provides more sophisticated energy analysis.

Because customers are accustomed to paying a fixed price per kWh, few understand that the cost of producing electricity varies widely throughout the day and year. Real-time pricing programs help manage demand by raising the retail price when energy cost is high and lowering the retail price when costs are low. However, these programs may prove unpopular with customers without a convenient way to respond to changing prices.

Xcel Energy strongly supports renewable energy and environmental sustainability and is the number one wind power provider in the nation. The utility offers Windsource®, an easy way to support clean and renewable energy generated from Minnesota wind farms. Recent Renewable Energy Standards have been enacted requiring Xcel Energy to provide 30% of its electricity from renewable energy in Minnesota and 20% in Colorado by 2020. The variability of renewable energy sources has caused concern with system planners and operators that high renewable energy levels may increase operating costs and affect grid reliability. Integration of renewable energy at high levels is a challenge that requires innovative solutions from all sectors of the energy pathway, including increased customer involvement. The ability to educate and empower customers to automatically manage their energy use will create more options as Xcel Energy's renewable energy portfolio continues to grow.

This effort will provide Control 4 and Apogee solutions to 400 customers in Boulder, CO - the nation's first SmartGridCity™ – giving them the ability to easily respond to variable electric prices and renewable energy levels. Customers using Control4 energy management technology will be able to decide for themselves whether they want to respond to price or renewable energy signals using a priority setting within the system.

The system has four stages of control that allow for maximum flexibility and accommodation of varying customer preferences. Each stage corresponds with a price level and renewable energy level and contains temperature and appliance settings. As pricing or renewable energy events occur, the customer-selected preferences for thermostat settings and appliance operation will be automatically enacted. This

allows for reducing energy when either the price is high or renewable energy is low and encourages customers to leverage low emissions generation from renewable sources.

Customers will get timely feedback and analysis to let them know how their preferences and priorities affect their energy use, which they can use to further modify their consumption patterns. For example, during a high price period, a customer's preference calls for their thermostat to respond by moving up to 80 degrees. The following day they use Apogee's powerful online tools to see how that change reduced their energy consumption and cost. Using that knowledge, they may decide to save even more energy and increase their preferences to 82 degrees; or they may decide that their home was uncomfortable and decrease their preference to 78 degrees. The analysis and control provided by the system is designed to optimize and align energy use to personal priorities, comfort and convenience.

Engaging Customers and Providing Control – the Control 4 Home Area Network

The penetration of the Home Area Network (HAN) is climbing with the increasing complexity of homes, the desire for simplicity of operations of home systems, and the increasing functionality available with a HAN while installed costs are falling. Industry analysts Parks Associates forecasts the market for home controls will increase nearly 6 fold in five years, growing from \$600M in 2007 to \$3.5B by 2012¹.

Control 4 was founded in 2003 to address this market opportunity. Based in Salt Lake City, we currently have 225 employees. We are a leading provider of HANs, having shipped over 60,000 Home Controllers which address over 700,000 of our ZigBee devices. Control 4 has a network of 1,200 dealers across the US, and we are currently rolling out the retail channel through Best Buy. We have expanded to a dozen countries worldwide. We look to expand international market products next year as we have local language support.

“The proliferation of new home gadgets and entertainment options has made connecting all these systems more important than ever – and also more confusing,” according to the Wall Street Journal². The success of Control 4 is based the power of our HAN and its ability to make it simple. In effect, the Control 4 HAN becomes the foundation, or the operating system, of the home – “Everything works better when it works togetherSM.” Home entertainment, security, lighting, comfort, communications, major appliances, and other devices (including smart meters) and loads can all be interrogated and controlled over a simple remote control through the TV, over the web in the home or remotely, and also with low cost yet powerful in home displays and controllers.

For the purposes of the Xcel Energy project, and in a number of other utility pilots now underway the Control 4 HAN links to: utility pricing, load management, and/or environment signals; the home's ZigBee-enabled smart meter; utility billing data; and the energy use analytics of Apogee Interactive. The Control 4 HAN then provides the homeowner with new insights into their energy use, its cost and environmental consequences, and the ability to take action to mitigate those consequences as desired. Actions can be pre-determined or in real time in the home, or remotely. All this information is delivered from the home owner's existing television or through the Xcel Energy customer web portal.

¹ Parks Associates, 2007

² Wall Street Journal, January 8, 2008

Providing Information and Actionable Insights – Apogee Interactive’s Energy Use Analytics

Apogee Interactive has been in the business of providing online energy analysis tools and related services to the utility industry since 1994.

Apogee’s core energy use model, the AuditMation™ Energy Analysis System, is the analysis platform for online and onsite energy use analyses for applications on over 300 utility websites. The AuditMation Energy Analysis System (AMES), in its more sophisticated applications, incorporates home and building characteristics and operations, local weather, rates, generation mix, and billing or meter data to provide insights into energy use and options for savings. AMES is not a statistical comparison of typical homes – it is a sophisticated energy use model which calculates disaggregated energy use at the time of each query. As a result, it is a powerful tool which can answer any number of questions a homeowner may have about historical, current, or even predicted energy use.

When AMES technology is linked to the data available via the Control 4 HAN, including interval meter data direct from the meter, actual thermostat settings, and other relevant data streams as desired, homeowners can view energy use in a whole new light;

- How am I using energy now, and what has been my energy use trend, by end use?
- Have I been saving as much as I had hoped when I completed a recent home improvement?
- What would I save if I changed my energy use decisions in a normal price time, in a high price time, or in a critical peak price time?
- What would be the cost of bypassing a load management event, or changing my comfort settings?
- How would my carbon footprint be reduced if I shifted my usage to times of high renewable power availability?
- How much money have I saved and how have I reduced my carbon footprint from recent actions?
- How does my energy use and environmental impact compare to my peers?
- How am I doing in my energy and environmental savings “fantasy league”?

In Summary

The utility industry faces the challenge of meeting increased energy needs while minimizing environmental impact. Educating and empowering customers to use energy wisely to help them save money and make choices that reflect their own environmental priorities and commitments, will also help the industry meet growing demand in a responsible way. The consumer aspects of the SmartGridCity initiative are expected to help drive Xcel Energy and the industry to a better understanding of the customer’s role in renewable energy integration and energy conservation.