

Docket: 12-EPIC-01
 EPIC TRIENNIAL INVESTMENT PLAN 2015-17
 February 13, 2014

Response of Bidgely, Inc to California Energy Commission's Questionnaire

Title of Proposed Initiative: Promote Real-time Information and Appliance Disaggregation for Residential Customers

Investment Areas – *For definitions, see First Triennial Investment Plan, page 12:*

- Applied Research and Development
- Technology Demonstration and Deployment
- Market Facilitation

Electricity System Value Chain (Check only one):

- Grid operations/market design
- Generation
- Transmission
- Distribution
- Demand-side management

Issues and Barriers:

Describe the issues and barriers that are impeding full market adoption of the proposed clean energy technology or strategy (such as cost, integration, or lack of information).

California has invested billions of dollars to deploy almost 13 million electric smart meters, which offer the promise of enabling huge energy savings in residential and commercial buildings, a sector that accounts for 40 percent of energy use and greenhouse gas emissions. Studies have shown that consumers – when given access to their energy usage data and tools to use that data to manage energy – can significantly reduce household energy use.¹

The state has been a national leader in enacting policies to enable the Home Area Network (HAN) to allow customers to access their own electricity usage data. To enable California consumers to realize the full benefits of our Advanced Metering Infrastructure – and support realization of the loading order and California's energy efficiency goals to the maximum extent feasible -- it is important to ensure that consumers have access to the hardware and software tools they can use to generate energy savings that up to now were not possible. In order for California to realize maximum benefits from

¹ Karen Ehrhardt-Martinez, Kat Donnelly, et.al. Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities, American Council for an Energy Efficient Economy (aceee.org), Report Number E105, June 2010, p. iii.

emerging home energy technologies, the next steps are to provide consumers with the most powerful easy-to-use tools to save energy.

Initiative Description and Purpose:

How will this technology or strategy help address the issue/issues? Describe knowledge to be advanced to overcome critical barriers. Include the recommended funding level (minimum and maximum) for each project under this initiative.

Bidgely proposes that EPIC’s research, development, technology demonstration and technology deployment programs provide to residential customers access to services and tools that make use of the real-time information from their smart meters and harness new technologies to maximize home energy savings.

For example, one of the especially promising technologies is disaggregation. Appliances have different patterns of energy consumption. With HAN devices and real time data from their smart meters, customers can gain an understanding of how much electricity particular appliances are consuming and receive personalized recommendations about how to save energy and reduce their electricity bills. In addition, real-time information can enable customers to respond to prices or event signals in real-time, enabling retail demand response. Preliminary studies have found increases in customer engagement and much larger energy reductions than other behavioral programs in place at scale².

Sections 2 and 12.1 of the 2012-14 Electric Program Investment Charge Investment Plan, respectively, provide support for “emerging technologies have yet to be proven (demonstrated) at commercial or industrial scales in “real world” conditions” and that need “an independent assessment of ...performance, overall economics, reliability, life cycle cost and energy savings and support for new technologies enabling “cost-beneficial customer-side-of-the-meter choices.” Customer education and increased adoption of the most powerful home energy management technologies could be accomplished by providing rebates for home area networking devices that allow consumers to realize tangible energy-saving benefits from the smart meters now deployed in California. The goal of the program should be to achieve greater adoption of home area network devices by making them as low-cost as possible, or even no-cost. Education would increase awareness among all California customers, maximizing impact.

Research is needed into how gains in home energy efficiency can be achieved across different income demographics and across different kinds of households (multi-family, single-family, owner-occupied, rentals, etc.). Because of their low cost, new technologies like disaggregation have the potential to provide discernable benefits to a wide variety of household types. Further research is needed to understand usage patterns and develop solutions that best address the needs of different communities.

² http://www.bidgely.com/resource-files/Case_Study-Savings_&_Engagement_v2.pdf

Research is also needed into how disaggregation technologies can create a new demand response resource. Many residential demand response programs have focused on air conditioning and pool pump use. Because disaggregation provides actionable intelligence across a much wider variety of appliances, it may be possible to obtain meaningful demand response reductions from residences that have not successfully participated in demand response programs up to now, or to involve more appliance categories in demand response programs, creating the possibility of a new source of additional value for customers.

Bigdely recommends that the Commission consider funding such a program at a level that would allow at least Californians for whom the HAN has been activated -- in a variety of demographic groups and housing types -- to obtain low- or no-cost home area networking devices. By the end of 2014, California's major utilities will have in place infrastructure to activate at least 600,000 home area networks. An incentive of \$25 per device over a period of two years, for example, would require an annual investment of \$7.5 million.

Background and the State-of-the-Art:

- *What research development and demonstration has been done or is currently being done to advance this technology or strategy (cite past research as applicable)?*
- *Describe any public and/or private successes and failures the technology or strategy has encountered in its path through the energy innovation pipeline: lab-scale testing, pilot-scale testing, pre-commercial demonstration, commercial scale deployment, market research, workforce development.*
- *Identify other related programs and initiatives that deal with the proposed technology or strategy, such as state and federal programs or funding initiatives (DOE, ARPA-E, etc.).*

Energy disaggregation has been called the Holy Grail for of energy efficiency and there has been on-going research for years³. Bigdely has released two studies based on its results to date. The first, a study in California, used a standard experimental methodology to show significant energy reductions averaged across all users exposed to Bigdely's Energy Disaggregation-based solution. The second, conducted in an international market, showed exceptionally high levels of customer engagement, favorable consumer reaction and an 86% approval from users on making this solution available to all⁴. Bigdely is engaged in additional research and will provide additional information to the Commission as it becomes available. Bigdely believes that the Energy Commission's independent validation of energy savings is important to further development and scaling of this technology.

Justification:

³ <http://stanford.io/1fnUfIC>

⁴ http://www.bigdely.com/resource-files/Case_Study-Savings_&_Engagement_v2.pdf

Describe how this technology or strategy will provide California IOU electric ratepayer benefits and provide any estimates of quantified annual savings/benefits in California, including:

- *Name of sector and estimated size and energy use.*
- *Quantifiable performance improvements for the proposed technology/strategy.*
- *Maximum market potential, if successful.*
- *Number of direct jobs created in California.*
- *Why this research is appropriate for public funding.*

According to studies reviewed by Bidgely, the operational savings made available by smart meters (per million households) are likely \$77-208 million and consumer driven-savings are likely \$100-\$150 million.⁵ These suggest that California consumers could realize significant benefits through the investment contained in this proposal.

In addition, Bidgely and many other young technology companies are based in California. The maturation of this market and adoption of this program could create hundreds of technology jobs and energy efficiency implementation jobs.

Ratepayer Benefits (Check one or more):

- Promote greater reliability
- Potential energy and cost savings
- Increased safety
- Societal benefits
- Environmental benefits - specify
- GHG emissions mitigation/adaptation in the electricity sector at the lowest possible cost
- Low emission vehicles/transportation
- Waste reduction
- Economic development

Describe specific benefits (qualitative and quantitative) of the proposed initiative

Public Utilities Code Sections 740.1 and 8360:

Please describe how this technology or strategy addresses the principles articulated in California Public Utilities Code Sections 740.1 and 8360. The California Public Utilities Code is available online at www.leginfo.ca.gov/cgi-bin/calawquery?codesection=puc.

PUC Code Section 740.1

⁵ Ahmad Faruqui et. al., The Costs and Benefits of Smart Meters for Residential Customers, Institute for Electric Efficiency, July 2011.

This project promotes California's loading order by finding novel way to contribute to the cost-effective deployment of energy efficiency.

PUC Code Section 8360

This proposal would contribute to sections a,d,e,f,g,h, i, and j of PUC code section 8360. Utilities could use information generated by disaggregation to aid demand response and energy efficiency program design, targeting customers, and measurement of savings. This program would promote HAN to allow real-time information to consumers about their consumption and, if they choose, personalized recommendations about ways to participate in and benefit from demand response or dynamic pricing programs. Promotion of HAN technologies could increase the adoption of smart appliances and consumer devices. The increased adoption and use of HAN would also provide incentives for the industry to further develop communication standards for appliances and integration with grid operators. The program would incent adoption and education efforts, which in turn lower barriers to adoption of these real time device and appliance disaggregation technologies.

EPIC

As previously noted, this proposal is consistent with the objectives set forth in the current 2013-14 EPIC Investment Plan.