



Highlights:

- Boulder's SmartGridCity project provides significant value to the city.
- The City has a great opportunity to build on the SCG infrastructure with high-value citizen-facing initiatives.
- New initiatives will require technical, behavioral and

The City of Boulder is one of 24 cities chosen to receive a grant from IBM in 2011 as part of IBM's citizenship efforts to build a Smarter Planet™. IBM's Smarter Cities™ Challenge aims to contribute to the improvement of high-potential cities around the world.

During a three-week period in May 2011, a team of six IBM executives worked in the City of Boulder to develop and deliver their recommendations on smart grid to City Manager Jane S. Brautigam and a wide range of stakeholders.

The opportunity

The City of Boulder has established itself as a leader in environmentally responsible growth. In 2007 Xcel Energy, in partnership with the City, launched the SmartGridCity (SGC) project in Boulder. SGC involved "enhancements of the Xcel Energy's distribution system to employ various 'smart grid' technologies". The program was widely supported and publicized, with the citizenship of Boulder expecting significant end-user benefits. As a trail-blazing project, the effort encountered various challenges that resulted in revised reduced scope and end-results.

The City asked IBM to apply its expertise with smart grid technologies and energy efficiency to the SGC project. It intends to leverage SGC capabilities to achieve aggressive energy objectives and continue its leadership in environmental and energy arenas.

The Scope

The team was tasked to answer three questions for the City of Boulder:

- What are SCG technical capabilities and their value to Boulder?
- What are the gaps in those capabilities that inhibit SGC from supporting the city's energy goals?
- What are IBM's recommendations on the capabilities to grow and expand SGC in line with the City's focus on energy and its Climate Action Plan (CAP)?

Understanding

The team's first priority was to develop a thorough understanding of the requirements and priorities of the City and its constituents. Boulder's CAP documents four key goals: providing stable and competitive rates, ensuring reliability, increasing renewable contribution and improving energy efficiency.

The team held interviews with a broad cross-section of local constituents, including city and council representatives, businesses, community and environmental groups, and state, federal and academic representatives. The team found differences in each group's priorities in relation to the CAP. Reconciling the differing views of businesses and consumers is of particular importance, as the majority of Boulder's energy consumption originates from large corporate consumers.

In addition, the team conducted interviews and accessed extensive technical and business documentation regarding the SGC project, reviewed other smart grid implementations and engaged experts from the private and public sector to evaluate the latest trends in functionality and benefits for smart grid infrastructure.

The team's assessment

Current SGC infrastructure provides significant value to Boulder. The deployment of a high-bandwidth communication medium, thousands of sensors, smart transformers and smarter meters has transformed Boulder's electrical grid. SGC allows for effective two-way communications, sensing and monitoring performance, remote control and automation and near real-time reporting. To consume and utilize the exponential increase in data that SGC produces, Xcel Energy has also had to transform its grid operations, back-office infrastructure and applications.

However, while these developments have improved transmission stability and reduced operating costs (among other benefits), the SGC project does not provide direct, visible customer value. SGC was advertised as providing customers with significant benefits including in-home real-time information access. This is not present in system functionality today. This mismatch in expectations has been a source of friction between the utility, the city and its citizens.

Based upon Boulder's CAP objectives and an evaluation of other smart grid implementations, the team identified ten key gaps in SGC functionality that are inhibiting valuable customer-facing initiatives. These include providing customers with near real-time usage information, demand forecasting at aggregation point to enable local renewable sourcing, and interoperability between the grid and home devices.

Given the technical, social and regulatory complexity of these gaps, it would be unwise to attempt to address them all simultaneously. To identify where to prioritize investments, we assessed both the impact of these gaps on the city's energy goals and the degree of difficulty and length of time to implement and deliver value.

Recommendations

The team recommends that the City pursues a small number of funded pilot projects that are aligned to its CAP. Other standards-focused institutions in the area, including the National Renewable Energy Laboratory (NREL) and the National Institute for Standards in Technology (NIST) provide invaluable expertise and resources to accelerate any projects the City chooses to focus on. Some examples are below:

- Local renewable sourcing initiatives and incentives
- Solar and plug-in hybrid electric vehicle (SPHEV) – extending SGC analytic and forecasting capabilities to enable and increase penetration of PHEVs
- Green infrastructure management – improving energy efficiency in large building stock
- Energy efficiency for small and medium businesses (SMBs) – a targeted effort, leveraging SGC capabilities and analog efficiency improvements may provide significant value.

Conclusions

- The team believes that SGC provides significant value to Boulder. While the utility is experiencing the greatest proportion of benefits today, the measurable value to Boulder constituents should increase over time.
- SGC provides an infrastructure upon which valuable customer-facing initiatives can be built.
- These initiatives will require technical, behavioral and policy changes as well as the participation of multiple organizations to implement.
- The City, in partnership with Xcel Energy, policy organizations, and local energy innovators should select targeted pilots that extend SGC functionality and support their energy objectives.

For more information

To learn more, send an email to ccca@us.ibm.com or visit smartercitieschallenge.org

© Copyright IBM Corporation 2011
IBM Corporate Citizenship, New Orchard Road, Armonk, NY 10504
Produced in the US – July 2011

The information in this document is provided "As Is" without any warranty, express or implied, including any warranties of merchantability, fitness for a particular purpose and any warranty or condition of non-infringement.

IBM, the IBM logo, ibm.com and Smarter Planet are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at: ibm.com/legal/copytrade.shtml

SmartGridCity is a trademark of Xcel Energy Inc.