

Smart Meter Web Application

Presented to

The Bangor Hydro Electric Company

Proposed by

ASAP Media Services
University of Maine

April 2, 2012

I. Introduction

The Bangor Hydro Electric Company is an electricity transmission and delivery company serving 100,000 customers in central and eastern Maine. Bangor Hydro has shown commitment to its customers in numerous ways including enhancing infrastructure to improve energy delivery and exploring web-based tools to improve customer energy-awareness.

By 2005, Bangor Hydro launched smart meters to 97% of their customer base, allowing the compilation of daily energy usage data for each individual household. This data is currently available to customers on Bangor Hydro's website with usage data for the previous day updated every 24 hours. At the moment, data granularity is limited to cumulative daily usage, however, Bangor Hydro has planned to update their system to provide hourly data granularity. This opens the door for the implementation of far more advanced usage statistics benefiting both Bangor Hydro and its customers.

Bangor Hydro has approached ASAP Media Services to design and prototype a dynamic web system that encourages the consumer to make positive energy consumption changes and empowers them with the tools to understand and track these changes. This proposal outlines ASAP Media Services' response to this request.

II. Audience Analysis

Bangor Hydro Residential Customer

Currently, many customers receive their electricity bill at the end of the month and pay it without much knowledge of how the bill relates to their energy usage. Furthermore, without the ability to contextualize their bill, often they are unaware of how high or low their costs are compared to the rest of their community. Without context, the customer's bill is just a number.

Customers can benefit greatly from the ability to perform this contextualization and assessment. Such capabilities provide the customer with the tools to form a greater awareness of what their electricity bill indicates, and how they affect it. This increase in knowledge would give Bangor Hydro's customers the ability to make smarter decisions regarding their home energy usage within the context of their energy community, while creating a better relationship between the customer and provider by making Bangor Hydro's processes more transparent.

Bangor Hydro

Traditional energy distribution networks typically involve minimal consumer-provider interactions – the primary interaction being monthly electrical service and billing. An online system that promotes energy awareness would empower customers to become active participants in their own energy consumption, strengthening relationships between Bangor Hydro and its customers. This shift from passive consumer to active participant has the potential to expand the traditional consumer-provider model to include the entire energy community. Informed and empowered customers may see themselves as active partners in the community and with global energy issues, positioning Bangor Hydro as an influential instigator of positive change within the community.

III. Solution

To resolve the aforementioned issues, ASAP proposes the implementation of a web-based system for customers to interact with their own energy data. This system will provide customers with the tools necessary to better understand their energy usage through a variety of metrics including wattage, cost, and environmental impact with timescales from hourly to yearly. Critical to this understanding will be the tools available for customers to contextualize their usage according to community usage, temperature, home heating method, electrical appliances, and other comparisons. The system will also provide analytical tools for customers to simulate changes to their electrical usage to predict cost and energy savings as well as set and track goals.

The seven proposed features of the system (along with individual production times) are:

- A graphing tool to present energy cost/usage data on a variety of time scales (approx. 50 hours*).
- A graph annotating tool to understand how particular home electrical devices relate to fluctuating electrical usage in retrospect due to the 24-hour delay of information (approx. 70 hours*).
- A tool to explore context of energy usage by relating a variety of metrics to electrical usage such as environmental impact (carbon footprint), “units” of power production types (gallons of oil, hours of sun exposure for a typical solar panel, etc.), comparison to daily temperature, etc. (approx. 60 hours*).
- A tool to construct and manage a customer’s home profile of electrical devices to break down electrical usage into components of the customer’s home, applying approximations of each device’s impact (approx. 60 hours).
- A simulation and prediction tool to understand how changes in home electrical profile may affect energy cost, such as break-even periods for replacing an appliance or home heating, upgrading to CFL light bulbs, installing solar panels, etc. (approx. 70 hours*).
- A proactive notification system alerting consumer when electrical usage spikes via a variety of contact options such as text message, e-mail, etc. (approx. 40 hours*).
- A goal setting and tracking tool to assist the user in changing their energy consumption and following their progress (approx. 50 hours*).

* Does not include 50 hours time required to research and develop interface with existing databases; only required once in the event of multiple tools being implemented.

IV. Cost Analysis and Prototype Development

It is estimated that this project, if all seven key feature prototypes are designed and implemented with visual styling, will take approximately 650 hours to complete. ASAP Media Services' hourly rate is \$35, yielding a total price of \$22,750. Any additional development required beyond the 650 hours will be billed at an hourly rate of \$35.

Cost Analysis

Research and Development	100 hours	$100 \times \$35 = \$3,500$
Thematic and Site Design	100 hours	$100 \times \$35 = \$3,500$
Interfacing with existing databases	50 hours	$50 \times \$35 = \$1,750$
Development of 7 systems	400 hours	$400 \times \$35 = \$14,000$
Total	650 hours	$650 \times \\$35 = \\$22,750$

Payment Schedule

Initial	April 25, 2012	Projected start	\$7,583
Mid	July 25, 2012	4 Systems implemented	\$7,583
End	November 25, 2012	5 Additional implementations	\$7,584

In the proposed strategy, ASAP will continue to research current and alternative system features to fully conceptualize the designated key features, evaluating these designs according to identified customer needs. Upon completion of research and design, ASAP will style and prototype the seven identified features of the system, interfacing with the existing resources provided by Bangor Hydro. At the completion of each stage of prototyping a feature, its status will be sent to Bangor Hydro for review and alteration. Additionally, ASAP and Bangor Hydro will meet bi-weekly for status updates to discuss progress.

V. Conclusion

ASAP Media Services will assist Bangor Hydro in effectively conveying electrical usage data to Bangor Hydro's customers through the development of this web application. As a web-based project, customers will be able to easily access and interact with their electrical usage data from any location. This capacity will increase customer energy awareness and improve customer-relations.

By working to empower consumers with the tools necessary to understand and explore energy consumption, Bangor Hydro has demonstrated its commitment to its customer base in numerous ways including, but not limited to, anticipating the future of energy consumption. ASAP Media Services shares Bangor Hydro's forward-looking perspective regarding technology and is excited to partner with Bangor Hydro to assist with its goal of exploring and building the future of technology to both design and realize the world of tomorrow.

Sincerely,

ASAP Media Services

VI. Agreement

Original graphical elements created by ASAP specifically for the application become property of Bangor Hydro once payment has been delivered. ASAP shall retain ownership rights of interactivity designs, and reserves the right to reference and reuse source components (void of Bangor Hydro's styling, data, or information otherwise) in future projects.

We hereby agree to these terms, conditions and scope of work between ASAP and Bangor Hydro concerning research and development of the Smart Meter web application prototype.

Bangor Hydro

Date

Mike Scott
ASAP Media Services

Date

Appendix A: About ASAP Media Services

ASAP Media Services is a student-operated New Media research and production house at the University of Maine. Since 1987, ASAP has built a reputation for innovation and creativity at local, national and global levels. Its clients range from on-campus and multinational organizations to federal agencies such as the United States Department of Defense. A student-centered experiential learning environment and research center dedicated to exploring and promoting innovative uses of new and emerging technologies, ASAP is an ongoing experiment in education where students are provided an environment and the incentive to complete projects that will stretch their creativity and explore their full range of abilities.

Related work

The Gulf of Maine Ocean Observing System maintains a set of buoys in the Gulf of Maine that collect a wide variety of data from temperature, to currents, to salinity. The amount of data collected is on the order of a gigabyte a day. A research project with the Spatial Information Department at the University of Maine has conceptualized a system for browsing through datasets at a high level to identify areas of interest and compare different locations, time periods, etc. ASAP Media Services was contracted to develop a web-enabled interface for viewing this event data. Following up the success of the web-based data visualization tool, a port to the Apple iPad was conceptualized and prototyped. The port aims to improve on the usability of the web-based interface through the employment of multi-touch to simplify interaction with complex data visualizations, along with providing a portable platform for researchers to utilize in the field and elsewhere outside of the lab.

On-going research by the University of Maine involving the Sebago Lake region investigates environmental watershed modeling to determine short-term and long-term effects of human development. Disseminating awareness of the environmental issues and context to the residents within and outside of the region is critical to the pragmatic success of this research. In collaboration with the research group, ASAP is designing and developing a web application using HTML5 technologies for residents to visualize a wide variety of watershed processes based on research data and models.