

## Internet of Things is Already a Reality in Texas

In the last IOT essentials magazine, Mr. Furness' article called out the impact that the Internet of Things (IoT) may have on global energy. Meanwhile, there is clear public policy momentum in the U.S. and around the world for diversifying and improving the efficiency of energy sources. The consumers' empowerment promoted by the Internet and the concerns around energy demand and scarcity of resources prompted many to consider an Internet-enabled grid that will provide accurate and timely information around offer, demand, distribution and consumption of energy, to its providers (utilities) and consumers. This vision has some calling for the upgrade of the entire U.S. energy infrastructure, constructed during the Eisenhower Administration, and is generally referred to as creating the "Smart Grid."

The IoT can play a major role in making such policies reality and a small electric cooperative outside Austin, TX - USA has embarked in implementing its visionary smart grid technology since 2009. Currently, more than 60,000 Bluebonnet members are already part of this new infrastructure, which is in production and not simply a proof of concept or pilot program. Bluebonnet's project is one of the most advanced examples on how Americans are changing their approach to managing electricity and IoT being implemented by some of the biggest IT providers in the utilities industry.

### **The Smart Grid**

The Smart Grid is built upon three elements:

- New metering technology that provides timely, accurate and bi-directional data to the consumer and the utility;
- New sensor devices throughout the transmission and distribution infrastructure that enables real time network monitoring of energy consumption, system break-downs and service connections; and
- The integration of these systems to allow the business model to change and the consumers to have transparency and more influence on the process and its net effect.

Smart grids allow for a better integration of alternative energy sources and remote generation alternatives, such as Plug-in Electric Vehicles (PEVs), wind, geothermal or solar facilities into the distribution network and efficiently route that energy for consumption. Some estimate that the smart grid could reduce total U.S. carbon emissions by 25 percent (the equivalent of planting a forest of trees the size of the State of Texas) and nitrous oxide emissions equivalent to taking 130 million cars off the road.

The U.S. Department of Energy (DOE) has made available some US\$3.4 billion under the American Recovery and Reinvestment Act of 2009 (ARRA) to fund up to one-half of the investments made by utility companies in smart grid projects, up to a maximum of US\$200 million. There is another \$615 million available for smart grid demonstration programs, up to a maximum of US\$100 million.

With accurate Time of Use (TOU) billing, variable consumption rates, timely demand response, outage management and alternative energy options, consumers become active participants and contributors in the

deployment of IoT smart grids, with more knowledge, incentives and control over their impact in the environment and energy consumption.

### **IoT at Texas Bluebonnet**

Founded in 1939, the Bluebonnet Electric Cooperative (<https://www.bluebonnetelectric.coop>) is one of the largest electric cooperatives in Texas. It services some 80,000 meters and owns and maintains roughly 11,000 miles of power lines, located across more than 3,800 square miles in the suburbs of Austin, Texas. About 85 percent of its members are residential, with a small amount of agricultural users and a mix of rural, suburban and exurban characteristics.

The company trademarked its Sustainable Grid™. According to Bluebonnet, “A Sustainable Grid™ differs from both the traditional, current grid system and other Smart Grids in that it goes beyond the implementation of technology to encompass three main ideas: Net Energy Market™, Economic Development and Education Empowerment.” It is noteworthy how Bluebonnet’s vision aligns with principles articulated by the IoT Initiative (IoT-i), extending the concepts of smart grids beyond technology and including social and economic aspects.

Bluebonnet used Siemens IT Solutions and Services (SIS) to integrate its back-office management software from SAP with eMeter’s Energy IP software and has already completed the modernization of its business information and outage management systems by installing two-way metering systems to all of its 80,000 meters. These meters are core in the creation of a Sustainable Grid™. They enable messages to and from the meter and can send a “last gasp communication”, letting a utility know specific end points that have lost power. In the future, they will also enable a home area network that can remotely adjust energy usage, from appliance usage timing to air conditioning settings in the home.

In the current phase, one key component of the solution is the Advanced Meter Infrastructure (AMI), which is a set of devices, networks, computer systems, protocols and organizational processes dedicated to collecting accurate information about customer energy usage and delivering it to the utility and end users. Event and meter data are integrated and synced with utility systems via a Meter Data Management (MDM) system to enable the dramatic improvement of business processes within the utility. AMI provides for asset and power-delivery efficiency, more responsive customer service, and operational savings.

The Meter Data Management (MDM) consists of computer hardware and software that receives and manages meter data, including data validation, storage and archiving, and interfacing to utility business systems. MDM also powers business process functions and integrates with utility business systems, providing data when it is needed to enable intelligent decision-making and business process efficiencies.

The next stage of the IoT solution is to integrate provider and consumer. SIS will improve the existing web site that went live in June 2010 and develop a self-service Web portal for the utility, from where customers will be able, for example, to precisely request when services can be cut-off from an old location and start-up at a new address. Instead of the current multiple, asynchronous steps and calls among customers, customer service representatives, field and billing personnel to “schedule” such switching services, the system will automatically execute the task as defined by the customer with the appropriate accuracy, timeliness monitoring and billing systems in place, avoiding all unnecessary human interventions and source of mistakes, losses and energy waste.

The next phase will also include advanced meters capable of self reporting outages, and in-home wireless devices, which will allow household members to read their meter, understand their load and know the real-time cost of their consumption. This will allow the utility to start an energy conservation and demand response program that will encourage members to set up energy networks to manage their electric load.

At the conclusion of the third phase of the project, the MDM and SAP will be fully integrated using the Lighthouse Council integration standards. "... We hope to help creating sustainable communities that are empowered to manage and conserve energy, eventually having a net zero impact on the state's energy grid," states Matt Bentke, Bluebonnet Electric Cooperative COO.

### Conclusions

From smarter use of appliances to selling self-generated energy back to the utility, consumers who embrace these IoT Sustainable Grid™ innovations will be able to lower their energy bills and reduce their carbon footprint, moving from passive consumers of a disconnected resource to active managers of their own energy consumption and generation.

The question, however, is whether consumers used to electricity whenever and wherever they need it and paying a flat rate for its usage, will have any real interest in taking on the responsibility and effort to engage and participate in the management of energy. In addition, terms like smart metering, sustainable grids, and dynamic pricing are new concepts, which confuse and even raise suspicion in some people.

As described in the first issue of IoT Essentials magazine, the EU Framework 7 – Internet of Things Initiative (IoT-i) aims at "contributing to the creation of an economical sustainable and socially acceptable environment for IoT technologies." The case in this article illustrates how critical is the fulfilment of this objective, if the IoT is to become the next transforming wave in human progress.

Technology challenges represent problems that can be somewhat easily resolved and standards will emerge either by consensus or driven by de-facto economic drivers. However, non-technical challenges, mostly involving people's responses to innovation and government interference, are likely to pose a much more significant threat to the materialization of the benefits of the IoT.

Bluebonnet is well on its way to pave the technology foundation for a true IoT application in the energy industry. Its success thus far relies on the visionary aspirations of its CEO, which includes socio-economic elements, and on its relatively small number of users, who are members of a cooperative and thus inherited the vested interested in making the utility efficient. In large scale, however, the challenge becomes one of changing people's perceptions, awareness, and to educate them in a different way to approach a century-old industry.

This is not an easy task and the marketing machine of companies with a vested economic interest in the success of such investments will play a major role in the success of IoT. Companies can learn from the intimate knowledge that Apple, Inc. has of its consumers and how it was able to innovate not by creating something substantially new with its "i"-series of products, but with the ability to bring together or update multiple, dispersed technologies in an extremely simple, easy-to-use device that meets a very specific need and then evolve (or, should we say i-volve?) from there. Even the "i" term did not happen by accident. It puts the

consumer in the centre of the action and subtly empowers and transfer ownership to people. This type of simplicity, empowerment, and behavioural change, normally studied and scrutinized by marketing professionals, allowed for premium pricing strategies and will be crucial to the true success of the IoT.

In commoditized industries, such as utilities, the financial incentives (a price-driven marketing strategy) may be the best route to increase adoption and promote change. Bluebonnet's approach to allow users managing and potentially selling back to the company energy generated by their households through alternative means in order to potentially achieve a net-zero effect on energy consumption, uses a financial motivation to consumers.

In parallel, governments are likely to play a major role, either as enablers or hindrance to progress. In this case, the U.S. DOE is trying to have an active role, but some in the industry have voiced concerns about the complex and sometimes confusing grant application process and a sizeable portion of the smart grid grants have yet to be spent. On the other hand, the moment that someone starts making some significant money as a result of innovations or efficiencies, governments at all levels tend to solicit their "fair share" in the forms of new taxes, levies, regulations, inspections, ordinances, approvals, permits and any other creative collection mechanisms.

Hence, for initial IoT deployments like Bluebonnet's to scale to the levels of large impact that the IoT can produce in society, it is critical to consider a pragmatic, commercial approach, centred in marketing strategies to motivate and engage consumers changing and adopting new business models, while keeping the regulators in check. Without such business approach, most of the IoT efforts will be limited to theories and proof of concepts.

#### References and Acknowledgements

Several parts of this article are extracted or paraphrased from the white papers below, which can be retrieved at <http://www.siemens.com/it-solutions/smartgrid>:

**O'Neill J., Rauch P, Wunderlich, R.** - "There's Something Happening Here - *How a Small Texas Utility is Leading the National Movement to Smart Grid Innovation*" - September 2009

**Munson, D., Terrell T.** - "SIEMENS-Bluebonnet Sustainable Grid™ Solution"- September 2010

<http://www.usa.siemens.com/it-solutions>

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