



## Austin Energy Delivers First Smart Grid in the US

By: Andres Carvallo, Chief Information Officer, Austin Energy

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*Many utilities around the country have announced plans to deploy smart meters (or will at least add some level of intelligence to their wires over the next few years) with many of those projects scheduled for completion between 2012 and 2015. Xcel Energy's Smart Grid City project in Boulder, Colorado is well under way and will be completed next year. But in Austin – where things are routinely done in that uniquely Texas way – their initial smart grid project has already been completed – now, in 2009 – while a lot of other utilities are just getting started.*

*Moreover, a newer and even more aggressive phase of Austin Energy's smart grid plan (designated Smart Grid 2.0) was already getting started as early as December 2008. Now, as AE rolls out its pilots for its The Pecan Street Project – a unique and exceedingly innovative vision for what can legitimately be called the Smart Grid of the Future – the enabling technology for even more advanced stages of their Smart Grid blueprint is already in place. Here's the rest of the story from Austin Energy's dynamic, forward-thinking CIO, Andres Carvallo...*

### **Smart Grid 1.0**

By the end of this year, Austin Energy will have deployed 500,000 devices (86,000 smart thermostats; 410,000 smart meters from Elster, GE and AMI partner Landis + Gyr, covering all of our service footprint; 2,500 sensors; and 3,000 computers, servers and network gear), gathering 100 terabytes of data and servicing a million consumers and 43,000 businesses throughout the Austin metro area.

Our initial Smart Grid 1.0 deployment was completed in October 2009 - the first fully operational Smart Grid deployment in the U.S. This landmark project comprises the seamless integration of our electric grid; a communications network; and the hardware and software needed to monitor, control and manage the creation, delivery and consumption of energy by every one of our customers. Smart Grid 1.0 goes from the central power plant, through the transmission and distribution wires, to the meter and back. It took us five years to deploy the full solution set at a cost of approximately \$150 million. Smart Grid 2.0 will carry our Smart Grid plans even farther, providing the enabling technology for the advanced Smart Grid initiatives envisioned by our Pecan Street Project.

We began deploying our first 127,000 smart meters in January 2003. Today, five years later, the 410,000 smart meters we now have installed can deliver consumption data every 15 minutes. Austin Energy is testing the meters for the next phase of deployments now and plans to introduce some innovative new programs early next year that will allow customers to start seeing tangible benefits from those substantial investments in our future. The benefits will come primarily in the form of more efficient and less costly data acquisition and faster and more accurate information about how energy is being consumed.

The Pecan Street Project defines Austin Energy's smart grid initiative – a collaboration like no other. It all began in December 2008 when Austin Energy, the City of Austin, its Chamber of Commerce and the University of Texas teamed up to create Austin's next-generation smart grid implementation. But this ambitious project involves several other important organizations as well; these include: Applied Materials, Cisco, Dell, Freescale Semiconductor, GE, GridPoint, IBM, Intel, Microsoft, Oracle, the SEMATECH consortium and the Environmental Defense Fund, all of which have a role in our smart grid vision.

## **Why “The Pecan Street Project”?**

The city picked the historic name “Pecan Street Project<sup>1</sup>” to advertise its ideas and concepts around energy efficiency, conservation, renewables and smart grid initiatives to the public – and indeed, the world – to allow all interested parties follow, evaluate and better understand our intentions.

Sixth Street in Austin is our New Orleans Bourbon Street, and as such, it is a major artery of Austin’s famous live music culture. But you’re no doubt wondering, why Pecan Street instead of Sixth Street? Well first, the original name of Sixth Street was Pecan Street. But more importantly, the team that came up with the Pecan Street Project name chose it because we are aspiring to achieve in clean tech that same kind of leadership position that is associated with the live music Austin represents to people of all geographical regions and walks of life the world over.

## **Next: Smart Grid 2.0**

Austin Energy started working on this second phase of the project – Smart Grid 2.0 – in December of 2008. Since then, the team has been laser-focused on finding the answers to one vitally important question: What happens to the smart grid beyond the meter and into the premises, the homes, factories and businesses?

Smart Grid 2.0 is being driven by a growing vision of how homes and businesses will be different when they have access to some form of distributed generation – perhaps a solar rooftop, for example – connected to electric storage and smart appliances with an electric vehicle or two. And perhaps more important: How could those consumer assets be integrated into the grid in a way that you would preserve balance on the grid? That is, once distributed generation is feasible, not only will those consumers be using energy, but they will also be putting energy back into the grid.

Let’s imagine for a moment that in 2015, 80,000 automobiles come from all over the continent to enjoy

South by Southwest – our famous music and film festival – filled with people from the North, South, East and West. And let’s imagine that those 80,000 vehicles are either plug-in hybrid electric vehicles (PHEVs) or some other type of electric cars, trucks or SUVs.

As those drivers ease into their seats they will set their in-vehicle navigation systems for South by Southwest in Austin, Texas. The cars themselves will communicate with the Austin Energy smart grid, identify the characteristics of the vehicles (and also their batteries) and initiate a whole new kind of “charge accounts” for their drivers. With these new accounts – and their corresponding charging station networks – up and running, our smart grid will provide the vehicles with information about where drivers can charge their vehicles, including a choice of high-speed or regular charging mechanisms at restaurants, hotels homes or other convenient locations in and around the city.

Meanwhile, the grid will negotiate directly with the vehicles – wirelessly – and communicate price options for variable charging locations, which feature charging points that could take up to 10 hours to charge – or as little as two hours – depending on cost, urgency and other factors.

The “back-end” of the system Austin Energy creates will be able to handle that scenario and more. Yet what’s really missing is the car having the ability to interact with us as human drivers. To address and solve that challenge, we’re already working with Mercedes, Ford, GM, Chrysler and Toyota to create as seamless and transparent an experience as possible for driver and vehicle alike.

## **More Than Just Another Smart Grid Project**

The main goal of the Pecan Street Project is to transform Austin Energy into the urban power system of

the future while making the City of Austin and its local partners a model clean energy laboratory and hub for the world's emerging clean tech sector. In doing so, we seek to prove that it is possible to transform the way we traditionally produce, use, store and trade energy into a new behavior that is simultaneously consistent with our economical, environmental, social and security objectives and responsibilities.

Implementing this vision will likely include the following types of innovations:

- Connected homes that incorporate smart end points such as meters, appliances, and local generation, integrated with smart markets and distributed smart grids to enable two-way electricity flow
- Smart home energy control systems/portals that provide consumers with more information, alternatives, and decision support
- Smart appliances and devices that can turn off during times of peak demand or high energy prices, driven either by the energy services provider's policies or by consumer preferences
- Smart markets that feature pricing built on supply and demand models and that vary according to the time of day, day of year, etc. when the energy is actually consumed
- Smart policies and government stimulus approaches that foster the innovation and implementation of these technologies and markets
- A "green economy" workforce that can build, design, test, install, maintain, operate and continually improve and invent sustainable energy resources and innovative demand response capabilities
- Smart business plans that enable Austin Energy to continue to lead in this reinvention of the energy system without compromising its sound financial foundation
- Smart political leadership and popular will that shares the vision to make this project – and future projects – a reality
- Innovative laboratory environments supported by public, educational, private and NGO (Non-governmental Organization) partnerships
- Energy communities and networked information platforms that enable social network community development, community energy markets and sustainable economic improvements
- Smart transportation systems that incorporate two-way distributed approaches to information flows, energy flows, and unified information and energy storage
- Smart working alternatives that provide more green options to citizens, from smart working centers with virtual life size video alternatives, to alternative mass transportation, alternative routes, and stay-at-home options
- Connected and sustainable buildings for management of commercial and personal real estate; whether by tenants, owners, or energy services providers
- At least, 300MW of alternative, distributed generation through distributed wind and solar

The Pecan Street Project comprises three distinct phases along with several parallel efforts. Although only the first two phases are described here in any detail, the third phase involves a potentially new research consortium and is even more creative and ambitious than the prior phases.

As previously mentioned, Smart Grid 1.0 was completed in October (2009) and focused on developing an action plan for Austin Energy and identifying key barriers that had to be overcome for long-term success. At the outset of Smart Grid 2.0, these barriers were organized into the following categories: Technology, Workforce, Markets & Business Models, and Policies.

The Technology section will then be divided into three sub-categories; namely: 1) Projects ready for implementation (for example, motion sensors for hallway lights); 2) projects that need to be tested and

verified when integrated into the grid; and 3) projects that need to be developed. Some projects will be further categorized as generation, storage, efficiency, and low-tech options.

As technologies are verified over the first few years, they will be moved into implementation phase. And, as technologies emerge from the initial research process, they will be re-categorized as ready for testing and verification.

Policies will also be organized into several additional categories that accelerate adoption with incentives for consumers, energy services providers, the City, and also the private sector. Various economic stimulus approaches will also be examined and deployed, ranging from investments, bonds and tax incentives to R&D partnerships – just a few of the methods we will carefully explore, evaluate and select to build out the desired impact of green economy and Clean Tech Economy jobs.

Some policies can be readily identified for implementation. For example, removing the ability of homeowner's associations or others to prohibit the installation of solar panels, while others will be identified, developed and worked through the appropriate regulatory, policy, and consumer acceptance models.

### **Conclusion**

It is recognized that in order to change behaviors toward these positive opportunities, the Pecan Street project must strive for an unprecedented level of collaboration among city, state, and federal authorities will be required to ensure higher levels of consumer acceptance, satisfaction and a commitment to contribute to a sustainable economy in Austin.

Just as it took a century to invent today's energy system, the Pecan Street Project will require many years to reinvent it. Consequently, the cycle of technological innovation and implementation is expected to take place continuously. The inflection point of these two aspects will cause a disruption and accelerate the transformation cycles from what would ordinarily have been decades, to a decade or less.

### ***About the Author***

*Andres Carvallo is the Chief Information Officer for Austin Energy, where he is responsible for the technology vision, planning, development and operations across the enterprise. An expert in hardware, software and communications, Carvallo joined AE in 2003 with the specific goal of freeing up capital and operating dollars to build a new business for the company, the major outgrowths of which are AE's Smart Grid initiatives and the subsequent Pecan Street Project.*