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CADCAMNet. P.O. Box 1647, Tonasket, WA, 98855 Telephone: 1-720-883-3317

Summary: One of the greatest engineering challenges of our day is the global implementation of Smart Grid technology. This next-generation network will link energy producers with consumers in a two-way link of both power and data. Who pays for it, who sets the standards behind it, and who rolls it out are all burning questions. New Cambashi Principal Consultant Christine Easterfield takes a close look. This is another article in our continuing series, The Expert's View, featuring the insights of Cambridge UK consulting firm Cambashi. (July 16, 2009)

The Expert's View: Who Pays and Who Plays in the Smart Grid Future?

By Christine Easterfield
Cambashi

July 16, 2009—Engineering and manufacturing industries did not escape when the global economy took a dive in 2008, but there is some good news on the horizon. Governments around the globe are committing large sums of public money to major infrastructure projects in order to kick start their economies. One of the infrastructure areas to receive special attention in this rush to spend money is the Smart Grid, the next-generation networks designed to distribute power and other utilities to individual consumers. Investment in Smart Grid initiatives also ticks other important check-list boxes for governments: making sure that energy is not wasted and working towards a more sustainable future.

Christine Easterfield

It will require both political will and deep pockets to support these projects. In a recent press release, Siemens AG claimed it would take more than €15 billion from various stimulus packages around the world, with nearly half of that dedicated to 'green' projects. 'Green' projects in the energy sector can be characterised as a move to renewable, 'clean' energy sources. The resulting need to ensure green power networks are running efficiently requires the development or deployment of Smart Grid technologies. One of the first major acts of President Obama's administration has been the US Rejuvenation and Reinvestment Act 2009, which ear-marks around $4.5 billion for Smart Grid projects. With that kind of support and backing, one might imagine the

success of these projects is guaranteed. Yet, initiatives that include direct government involvement in industry have a more mixed history.

Up to now, the energy grid has been very much a one-way channel but this is set to change. The focus has simply been to ensure the electricity was available when the consumer switched on their appliance or their production facility. As far as we, the consumers, are concerned this has been the limit of our involvement—to switch things on or off—apart of course from the inevitable arrival of the bill. A key technology shift for Smart Grid initiatives is enabling two-way communications that create the possibility of a dialogue between the user and the supplier. This results in a consumer who knows how much power they are using, and at what cost, and a utility that has better management and forecasting tools for its network. It also introduces the possibility of greater consumer choice.

New Network, New Technologies

What is abundantly clear, however, is that this new communications network creates demand for new technology. There will be new devices, software, and services to be designed, built, shipped, and installed throughout the utility network from the generator to the customer's meter. A next-generation intelligent meter will be the the first step in a Smart Grid implementation, and there are dozens of meter-related projects now in progress. They can be seen across the US from San Diego Gas and Electric to Florida Power and Light, though Europe by way of Italy's ENEL and France's ERDF, along with other projects in Russia, India, China, and Australia all dealing with the challenge of installing and connecting a new meter to every consumer. Once in place, these new meters can communicate with the supplier to enable variable tariffs for the consumer, monitor interruptions in supply (planned or otherwise), get an accurate picture of energy usage and ultimately deliver a more satisfying service. It also means exact usage and cost data become available to both the consumer and supplier, bringing an end to the estimated bill.

Between the network and the supplier is the transmission, distribution—and now communication—network itself, and of course the energy source. Upgrading the transmission and distribution infrastructure is a major part of improving efficiency in the network, but there is now a wider range of energy sources to be considered that lead to re-engineering of the network to manage that supply. From distributed generation, micro generation and embracing new, renewable generation sources to cleaning up existing generation plants—all have an impact through extensions to existing networks, additional control equipment, and new working practices. New investment in intrinsically clean generation technologies such as wind farms, hydroelectric, and nuclear will be needed, with Carbon Capture and Storage, though largely unproven, providing a technique for making the plentiful coal stocks meet strict carbon limits. All of this will require major capital projects.

Behind the implementation of all these projects and technologies are complex and lengthy rollout projects. While the economic stimulus packages may exist to support the funding of these, the tools and organizational know-how to get them completed is still the major challenge to overcome.

This all sounds rather grand but rather remote. However, the implications of a Smart Grid create the potential for new capabilities in every attached appliance. With a Smart Grid in place there is scope for new product development to take advantage of the dynamic nature of the communication with the grid. Inside the home, the smartest of meters could become mini control centers that communicate with so-called 'smart-appliances', and start and stop them depending on the current tariffs or energy demand. These smart appliances are already being developed, with household names such as GE and Whirlpool investing heavily. Whirlpool has set itself the target of having all its appliances capable of acting on 'Smart Grid' signals by 2015, while GE already has a pilot running, in partnership with Louisville Gas and Electric in Kentucky. In the pilot, participants have been given dishwashers, microwaves, refrigerators and laundry equipment that are programmed to avoid using energy when they receive the signal that peak demand—and therefore a higher tariff—is in force. (Luckily this can be overridden by the householder, anxious not to have a cold dinner or a house full of damp washing!) Such appliances will be key to reducing peak demand for the utility and saving money for the consumer.

The business challenges to be met in realising the many aspects of Smart Grid provide scope for us all to get involved. A word of warning though: in New Zealand the goal to replace all household meters with smart meters by 2012 has led to different companies choosing meters with different capabilities, resulting in the criticism that the meters are not smart enough. This type of issue and the outstanding questions around standard protocols needed for network interoperability and communication illustrate the fact there is still a long way to go. But with governments driving these projects on, answers will emerge. For the resulting complex rollout projects, planning and co-ordination tools and skills will be at a premium. There will be plenty of engineering work to go around.

Christine Easterfield recently joined Cambashi as a principal consultant. Previously her experience has been in geospatial asset management for the utility industry, assessing market needs and opportunities, managing customer requirements, liaising with development teams and running global product introduction programs. Cambashi Limited, 52 Mawson Road, Cambridge, CB1 2HY, United Kingdom, +44 (0) 1223 460439, or fax +44 (0)1223 461055. Web: http://www.cambashi.com.

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