THE ROAD TO SMART METERING IN AUSTRALIA

By Phil James

Like the rest of the world's industrialized economies, Australia has a centralized model of electricity production and distribution. In the past, the industry was centralized at regional and state level but micro-economic reforms over the past fifteen years have produced an integrated industry that serves the bulk of Australia's population through a single market, the National Electricity Market (NEM).

In the final article in this series, the focus shifts to the way in which Australia's electricity sector is dealing with the challenges of improved economic efficiency, energy security and reliability of supply, and climate change at a national level[1]. The particular focus is on the contribution that "smart" technologies are making in response to those challenges.

EXPANDING THE CHALLENGES

Productivity improvements are a key driver of economic growth. The micro-economic reforms, begun in the 1990s, were intended to stimulate productivity improvements and, thereby, enhance economic growth.

Improvements made to the energy sector, and electricity in particular, have far reaching economic effects because energy is a key cost input into most industrial and commercial activity. Industry and commerce account for around 70% of total electricity demand in Australia; a key factor driving economic prosperity and growth in Australia is the cost effective supply of electricity for businesses.

Significant progress has already been made in promoting more economically efficient energy markets in Australia and we are one of few countries in the world with similarly competitive energy markets.

Australia's electricity infrastructure is aging, particularly relative to the demands on modern production and distribution systems.

Since 2005, peak demand in the NEM has grown by about three times energy demand and, in the period to 2020, is forecast to continue to grow at double the rate of energy demand. In addition, there is now some evidence that household energy consumption may be falling in response to cost and environmental pressures.

This growing disparity between peak and energy demand has major implications for future investment requirements, particularly in peak generation and peak capacity network investment.

Finally, Australia's three levels of government, local, state and federal, are all taking action on climate change. The wide ranging initiatives now in place include manifold local conservation projects, mandatory and voluntary renewable energy schemes and, now, impending federal legislation to price carbon on an economy-wide basis.

NEM participants are already dealing with the challenges imposed by increasingly intermittent energy sources like wind and solar power, a rapidly increasing number of distributed micro-generators (like rooftop photovoltaics) and even electric vehicles, each with their various connection, metering and commercial complexities.

It goes without saying that initiatives that improve the overall efficiency and effectiveness of Australia's interconnected electricity production and distribution systems will be highly valued.

FIRST STEPS INTO THE "SMART" WORLD

"Smart meter" and "smart grid" are terms that are widely, but often loosely, used to describe varying degrees of automation and/or intelligence.

For this article, a smart meter is a meter that captures consumption data half-hourly and is equipped to send and receive information across distribution and local (home) networks. A smart grid is a distribution network able to predict and intelligently respond to the behaviours and actions of all electricity users connected to it. A smart grid should deliver reliable, economic, and environmentally sustainable electricity services more efficiently than current networks do.

To qualify as "smart", devices need to deploy technologies that operate in real time, are highly automated and broadly interactive, and systems need to allow interoperability across every point in the connected system.

Over the years there have been a vast number of technology deployments across Australia, aimed at improving the security, reliability and economy of electricity network operations. However, it is only quite recently that the demand for, and supply of, sophisticated technologies have resulted in large scale deployment of devices and systems that qualify as "smart".

With few exceptions, Australia's electricity distribution businesses are stand alone entities, free of any cross ownership of market facing generation and retail businesses. They are, for the most part, subject to incentive-based regulation, overseen by a single national regulator.

Given the capital-intensive nature of these businesses, prudent and timely investment in smart technologies will yield benefits for asset owners, network users and consumers.

A NUMBER OF PROJECTS ARE ALREADY UNDERWAY

It should be remembered that the Ministerial Council on Energy (MCE) has endorsed distributor-led smart metering rollouts where a jurisdiction has set an implementation date and where the benefits outweigh the costs.

The programme in Victoria is well established and, at the time of writing, about a third of Victoria's homes were equipped with operating smart meters.

New South Wales (NSW), Queensland and Western Australia (WA, which is outside the NEM) have committed to rollouts, subject to clarifying particular cost-benefit details by way of further trials and pilot projects.

[1] *For the first two parts see Metering International Issue 1 2011 p 44 and Issue 2 2011 p 36.*

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These projects are all state-based and, in NSW, Queensland and WA are being undertaken by publicly owned distribution businesses. While there are a number of smaller projects being undertaken by investor owned electricity businesses, less is generally known about them at trial stage due to commercial interests.

Apart from the Victorian project, most other state-based initiatives are relatively small in scale and appear to be somewhat tentative, limiting their approach to testing particular technologies. None has the scale of, or is as technologically comprehensive as, Victoria's AMI programme.

In many ways, Australia's national regulatory framework is new and is still finding its way in an uncertain and challenging political climate.

In the recent past, the federal government has announced two major initiatives in the broad "smart" space: The Solar Cities Programme and, most recently, Smart Grid, Smart City.

SOLAR CITIES

The Solar Cities programme is designed to trial new sustainable models for electricity supply and use, and is being implemented in seven separate areas around Australia. It is administered by the federal government, in partnership with local and state. The seven projects announced between 2006 and 2008 included Solar Cities in Adelaide, South Australia; Blacktown, New South Wales; Townsville, Queensland; Alice Springs, Northern Territory; Central Victoria; Moreland, Victoria and Perth, Western Australia.

The individual Solar City projects all combine a mix of solar power, smart metering, energy efficiency initiatives and cost reflective pricing to trial a range of innovative energy solutions. They have been most successful in getting active community participation and will generate a significant amount of valuable consumption information.

The federal government has identified that the benefits expected to flow from the Solar Cities programme will include:

- Consumers will better understand their energy use
- Electricity businesses will understand the extent of cost savings in servicing peak electricity demand periods
- Industry will be able to test new sustainable energy options in a low-risk environment, and
- Government will have access to better environmental and economic information.

SMART GRID, SMART CITY

In 2009, the federal government announced that it would invest up to Au$100 million (US$106 million) in partnership with the energy sector for the development of a project "to assist Australia's transition to a low carbon economy by encouraging a smarter and more efficient energy network."

In mid-2010 a group led by Ausgrid (the distributor, then known as Energy Australia,) won the tender for the Smart Grid, Smart City project. The group included IBM, GE Energy Australia, AGL Energy (a retailer), Newcastle City Council and, Sydney Water and Hunter Water.

Smart Grid, Smart City is Australia's first commercial-scale smart grid and one of the world's largest and most integrated smart grid projects. The three-year project will run across five locations in Sydney and the Hunter Valley with the city of Newcastle being the largest site.

The key elements of the project include:

- The installation of a two-way radio communications network and 12,000 smart sensors across the Ausgrid electricity network to facilitate a machine-to-machine communications network capable of transmitting information between field devices, back-end systems and households;
- Installing up to 50,000 smart meters and in-home displays and products at 20,000 homes, including at 2,000 "smart homes", where households will be able to turn appliances on and off remotely using websites and smartphones;
- Battery storage trials in households in support of solar installations and virtual power station (ceramic fuel cell) trials; and
- Electric vehicle trials using 20 vehicles, including building 50 standard charging points and eight fast charging points to test charging from multiple locations on the grid.

The electricity industry alliance, Smart Grid Australia, claims that "The (Smart Grid, Smart City) technology will allow residents to see real time analysis of electricity usage for their households and even for individual appliances, to help them make better decisions about energy efficiency in their homes and minimize their environmental impact.

Since the announcement of this project, the federal government has also started work on Australia's National Broadband Network (NBN) through its management vehicle NBNCo. During the Smart Grid, Smart City bidding process, bidders were asked to consider the potential synergies between this project and the NBN as it rolls out. While not spelt out in any detail yet, it can be assumed that there is significant potential for the future interconnection of intelligent electricity and high speed broadband networks.

THE REGULATORY CHALLENGES AHEAD

In its 2011 discussion paper "Strategic Priorities for Energy Market Development", the Australian Energy Markets Commission (AEMC) poses a range of questions with respect to the development of smart technologies, including:

- Who owns the "property right" to control loads?
- What are the appropriate customers privacy and data security protections?
- What should regulated networks be obliged to do in respect of investment in, and providing access to, smart grid technology?
- How should economic regulation be designed to provide the right incentives and what is the boundary between regulated and competitive activities in this space?
- How should access and pricing be regulated across this boundary to promote competition and enable innovation and flexibility whilst providing appropriate customer protection?
- What are the challenges in moving from mandated to contestable services?

While the answers to those questions are not yet clear, it is apparent that Australia has taken a substantial step in evaluating the sort of technologies that will make future electricity supply more reliable, relatively more economic than it would otherwise have been and, finally, more sustainable.

It is also clear that we would have been unable to embrace these sorts of developments on a national scale without the very significant micro-economic reforms begun in the 1990s and continuing to this day. MI

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