

Putting Smart Grids onto the Australian Agenda

Smart Grid Australia – May 2009

Introduction

Australia's economic health and the lifestyle of its citizens rely heavily on efficient and reliable energy supply. A program of upgrades is already underway with the deployment of improved customer metering technology – but even greater benefits lie in modernising the wider grid itself.

The Energy Supply Association of Australia estimates that Australia's energy supply industry will need to secure almost \$100 billion in refinancing and new capital expenditure over the next five years in an economic climate that has severely reduced the availability of both debt and equity.

Australia, like many other countries, is facing combined challenges. To be competitive, Australia will need to maximise the benefits of these vast investments. At the same time, Australia also has to meet the challenges of moving to a low carbon economy. Its energy networks will need to secure greater network reliability and efficiency as well as a step-change in network management. These significant challenges can only be delivered through smart grid technologies.

Early results from research by Access Economics, commissioned by IBM Australia, are showing that the adoption of smart grids throughout electricity markets would generate jobs by about 17,600 and grow Australia's gross domestic product by up to \$16 billion. These benefits are based on the Australian economy facing similar conditions to the current economic climate with underemployment of resources, including growing unemployment.

Investing in smart grid technologies is, therefore, an important part of securing Australia's economic and export future, with the benefits significant in the current climate.

Smart Grid Australia (SGA) seeks the Government to put forward a bold vision to lay the foundations for accelerated, nation-building agenda that is essential for supporting alternative clean, renewable, distributed energy generation.

Background

1. Australia has invested substantially (through efforts in Victoria and nationally through COAG) in looking at the merits of an Advanced Metering program – centred mainly on moderating peak electricity demand through time-of-day pricing. As a result of these efforts, utilities are under varying degrees of pressure to deploy "smart" meters. Smart Grid Australia acknowledges the Australian Government's leadership in advanced metering.
2. Upgrading meters is an important element of any smart grid deployment – typically representing the largest single cost. However, the features of new meters need to be determined with a smart grid roadmap in mind if they are to serve as a solid foundation for progress.
3. Over the same period, awareness of the critical pressures being placed on the environment by rising greenhouse gas (GHG) levels has skyrocketed, and this is leading to sweeping changes in the framework for energy supply and consumption – with carbon permits, a shift towards renewable energy sources, distributed micro-generation and storage and the growing adoption of plug-in electric vehicles. In addition, capacity to meet rising demand is under increasing pressure and the security of energy supply is becoming an ever more strategic consideration for vulnerable economies.
4. In conjunction with these pressures there has been the emergence of a global focus on smart grids. Smart grids are essentially, the fundamental modernisation of electricity distribution networks through the introduction of information, communications and sensing networked technologies. Smart grids support improved monitoring and control, which means:
 - losses can be reduced;
 - operational efficiency can be boosted;
 - quality and reliability of supply can be improved;
 - increased control can be given to end-users;
 - distributed micro-generation (solar panels etc) can be supported; and
 - GHG emissions can be alleviated.

5. In the US, the Energy Independence and Security Act (2007) gives explicit Federal support to smart grid deployments through:
 - the establishment of various monitoring and reporting bodies;
 - standardisation efforts;
 - grants (up to 50%) for pilot activities;
 - subsidies (20%) for Smart Grid capital investments; and
 - guidance to State authorities in relation to supporting Smart Grid deployments.
6. More recently, the US economic stimulus package provides USD4.5 billion for supporting the transition to a more reliable and efficient electricity grid. In Europe, EUR6 billion incentives have been created, and in the UK, the Conservatives have proposed a GBP 1 billion investment in Smart Grid modernisation. Germany is also offering funding worth about US 100m for smart grid technologies.

Market Failure

7. Smart grids encompass relatively new technologies with all the benefits not easy to quantify. In Australia smart grids have not yet been tested at scale in our network environment. Currently many energy distributors are examining the business cases of introducing smart grid technologies to their networks. There are benefits that these business cases are having difficult quantifying. Some examples include the interaction of smart grid technologies in the distribution network with demand side responses by customers to smart metering (which is at a very early stage of being rolled out). Another technology that has not been tested and the benefits quantified are smart grid systems for managing distributed energy resources on the network on a large scale.
8. In addition, there are benefits of smart grids investments that could spill over to generators and retailers as well as customers. Consequently, network distributors may not be able to capture all the value of the investment.
9. The existing regulatory regime in Australia provides a framework for capital investment by electricity distributors where investments must meet the test for being efficient, prudent and based on realistic demand forecasts. This framework provides for flexibility in how utilities invest, however, the framework is not suitable where the outcomes are uncertain or where the efficiencies have not been demonstrated. Distributors need an initial kick start to gain confidence in the ability of smart grids to meet the regulatory test and to compare favourably with more traditional regulator approved investments such as feeder or substation augmentation, asset replacement and aggressive vegetation management.
10. These difficulties capturing and quantifying all the benefits of smart grid investments mean that there are elements of market failure which is undermining normal market incentives to invest in the technology. This is a key reason why Smart Grid Australia seeks Government support through a smart grid fund.

Further market benefits

11. In addition, smart grid is an enabler for many allied industries which create jobs, thousands of jobs; some of the more obvious being:
 - a whole new generation of "grid aware" white goods;
 - distributed energy sources (eg. microgeneration);
 - a new generation of cars and associated service industries;
 - new smart, intelligent efficient lighting, cooling and heating appliances and "grid-aware" control systems,
 - "grid-aware" sensors and actuators for legacy appliances.
12. The business case for smart grid is not simply about the direct benefits to utilities and society (as in Attachment A) but also the flow on effects on allied industries and society in general which (if Australia takes some leadership) can magnify the impacts of a smart grid dramatically and drive significant growth in jobs, the economy and innovation leadership in Australia.

Recommendations

13. We believe that Australia is uniquely placed in the region as an advanced economy with relatively more developed energy networks. Australia risks falling behind unless it urgently extends its policy and investments beyond advanced metering. This will facilitate the wider energy network leveraging information and communications technology to upgrade our energy networks to become smart grids.
14. Accordingly Smart Grid Australia recommends that the Government announces a policy position that says:

“The Australian Government supports the smart grid modernisation of Australia’s electricity distribution infrastructure to achieve increased efficiency, reliability and to facilitate the integration of clean, renewable energy sources into the electricity grid.”
15. We also recommend that the Government develops a funding support program for smart grid demonstration projects as part of an economic development program. This program would be designed to test smart grid technologies and quantify the benefits to the energy sector and consumers - in much the same way as was done over the past two years to progress the assessment of AMI opportunities.
16. Smart Grid Australia suggests that a provision of \$50m be established for this purpose, with Commonwealth funds to be matched by those of energy utilities on a 50:50 basis. To leverage the investments, Smart Grid Australia recommends that projects demonstrate industry collaboration through the involvement of complementary industry players and expertise. This approach is consistent with the Government’s wider approach to industry support schemes.
17. Smart grid demonstration projects eligible for funding could include those that examine and quantify the following benefits:
 - improvements to network and system reliability, including the security of energy supply
 - positive environmental impacts
 - increased efficiency of power delivery
 - the economic development of smart grids, including standards and protocols, product innovation and business opportunities
 - consumer choice and demand responses
 - greater capability to manage the interaction of the grid and much higher levels of distributed energy on the network
 - the interoperability of smart grid technologies with broadband network technologies
 - prediction and avoidance of network and device failures
 - new management technologies for extending asset life.
18. We have included an expanded list of the potential benefits that can be demonstrated through smart grid technologies at Attachment A. This list is designed to provide further information about where the benefits of this technology lie. Because the technology has not been fully tested in the Australian environment, this list is not exhaustive.
19. We believe the funding of demonstration projects will encourage the energy sector to develop projects of sufficient scale to test the technology in the Australian network environment.

Summary

20. Smart Grids are fundamental to the modernisation of Australia’s electricity distribution networks and the adoption of alternative/distributed energy sources in a carbon-constrained future. Smart grids need smart meters, but meters are only one of the elements in a smart grid.
21. Smart Grid Australia feels that now is the time to focus on the bigger picture and determine what infrastructure will be needed to assure Australians of clean, reliable energy well into the future. Smart grids will support a Smart Australia and create jobs at a time when the country needs new economic activity to protect its standard of living.

Benefits of Building Smart Grid Technologies

Network and system reliability, including the security of energy supply

- faster diagnosis of distribution outages and automated restoration, reducing outage times
- support for distributed generation by dynamically managing energy sources in the grid
- automated diagnostic and self-healing capability that prolongs the life of the network infrastructure
- price sensitive shaving of peak demand defers the need for grid expansion and retrofit and the need for peak generation capacity investments
- the opportunity to enable better utilisation of transmission paths, improving long distance energy transfers

Positive environmental impacts

- reduces distribution losses, and power generation demand
- enables grid integration of high levels of renewable resources that require smart grid to manage extensive distributed generation and storage
- manages grid support of vehicle charging and the high penetration of PHEV
- enables intelligent appliances to provide feedback through the network, sense grid stress and reduce peak power use
- measures electricity use and carbon emissions through advanced metering

Increased efficiency of power delivery

- reduces direct operating costs through the use of advanced metering technology, including connections, disconnections, vehicle fleet operations, maintenance, meter reading, employee insurance
- reduces transmission congestion

Economic development of smart grids

- promotes product innovation and business opportunities through smart grid technology standards and protocols that support interoperability

Consumer choice and demand responses

- provides customers with information about their usage, so they can make energy efficient choices
- offers customers the choice of cost and convenience trade-offs through real-time pricing that is superior to more traditional demand management programs
- provides the opportunity for building automation systems to offer more 'intelligent' energy efficiency opportunities

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