Silver Spring Networks Pty Ltd
Level 25
360 Collins Street
Melbourne VIC 3000

14 September 2012

Sophie Dunstone
Committee Secretary
The Senate Committee on Electricity Prices

RE: Silver Spring Networks submission to The Senate Committee on Electricity Prices

To Sophie Dunstone,

Silver Spring Networks appreciates the opportunity to make a submission to the Select Committee on Electricity Prices established by The Senate on the 23 August 2012.

In Australia, Silver Spring Networks leads the industry with over 1.1M homes and businesses connected to Advanced Metering Infrastructure. Silver Spring is also the market leader globally connecting over 12M homes and businesses to date with contractual commitments for 10M more. Working with Silver Spring, our utility customers have been able to leverage their existing Advanced Metering Infrastructure to enable Demand Side Participation (DSP) technologies, empower consumers and more efficiently manage their distribution networks. As a result, consumers have been able to shrink their peak energy use and reduce their energy bills. Australia can achieve similar results.

We are pleased to make the attached submission and look forward to report on electricity prices in November 2012.

Regards,

John Garner
Regional Manager, Australia and New Zealand
Silver Spring Networks

The Senate Committee on Electricity Prices

How demand side participation, voltage optimization and consumer propositions and engagement on Advanced Metering Infrastructure can stop the rise of electricity prices

September 2012

Silver Spring Networks Pty Ltd
Level 25, 360 Collins Street, Melbourne Vic 3000 Australia
ABN: 65 132 628 258
O +61 3 9236 5222 I F +61 3 9236 5299
silverspringnet.com

Introduction

Electricity prices in Australia are increasing rapidly. The average electricity bill has grown by at least 48 per cent over the past four years, with New South Wales experiencing increases close to 70 per cent. Prime Minister Julia Gillard addressed the issue in her August speech to the Energy Policy Institute of Australia. She cited several reasons for the increases including the rapid growth in peak demand, higher reliability standards, catch up from years of infrastructure underinvestment and the complex patchwork design of the National Electricity Market (NEM). The Senate has established a Select Committee on Electricity Prices to examine the issue of electricity price increases across the nation.

The cost incurred to meet the growth peak demand is one of the greatest drivers of price increases. Prime Minister Gillard said that one quarter of all retail electricity prices, more than $500 per year for a typical family, is attributable to the costs of peak events that typically last for fewer than two days a year in total. She also stated that one sixth of the Australian national electricity network capacity has been built to meet peak demand events that last for barely four days a year.

However, this is not simply a case of the network service providers "gold plating" their networks as some have asserted. Rather, network service providers are acting rationally with regard to the standard control services and the performance incentives to meet the related service standards. Current regulations penalize network service providers for missing performance standards and consequently provide an incentive to network service providers to invest in infrastructure to provide sufficient installed network capacity to meet forecasted energy peak demands.

Conversely, network service providers are not comparatively compensated for spending on peak load reduction technology. To truly reduce peak demand and consequently consumer electricity prices, regulations need to encourage network service providers to meet peak demand through alternative solutions.

The good news is that Advanced Metering Infrastructure (AMI) solutions being used in Australia and around the world today are proven to reduce peak demand. Many network service providers around the world are confidently leveraging their existing smart meter systems to enable Demand Side Participation (DSP) technologies, empower consumers and more efficiently manage their distribution networks.

This white paper will examine three specific recommendations for reducing peak demand and consumer energy prices. All of these solutions leverage the existing Advanced Metering Infrastructure and would require relatively minimal incremental investment.

1. Demand Side Participation (DSP) – Shift peak load to off-peak by sending price signals or load control commands over the AMI network to Demand Response Enabling Devices (DREDs) or load control switches.
2. Consumer Propositions and Engagement – Reduce peak demand and encourage overall energy efficiency by educating consumers about their energy usage and provide value-based propositions that provide incentives for consumers to use energy more efficiently.
3. Voltage Optimization - Reduce energy consumption by measuring the voltage at the smart meter and then reducing the overall voltage and total energy sent over the network.

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Moreover, we will illustrate the efficacy of these approaches to reduce peak demand via three case studies

1. Perth Solar Cities - Demand Side Participation & Consumer Engagement
2. Oklahoma Gas and Electric (OGE) – Demand Side Participation & Consumer Engagement
3. Dominion Virginia Power – Voltage Optimization

Price Drivers

To undertake the challenge of mitigating the rise of electricity prices, it is important to understand the drivers of the increase. The price of electricity to consumers is comprised of the costs of the energy value chain, from generation to network service providers and retailers. The electricity grid must have sufficient installed capacity and reserve to meet peak demand, despite the fact that peak days occur only a few days per year. The result is an inefficient grid, with capacity far above the average demand (see Figure 1).

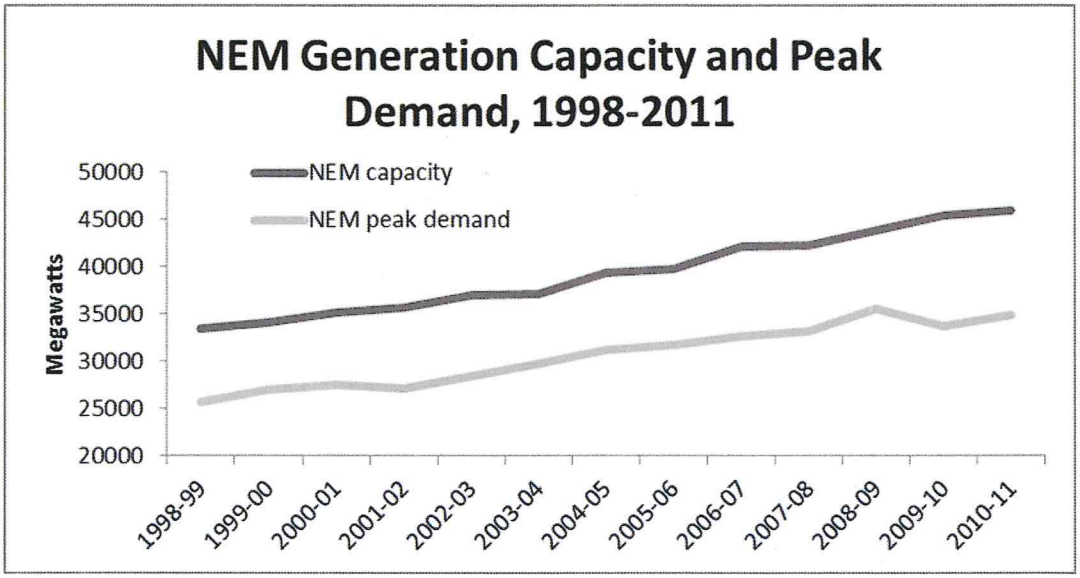

Figure 1: NEM Generation Capacity and Peak Demand, 1998-2011

Moreover, Australia's load profile is getting "peakier" (see Figure 2). Between 2005 and 2011, peak demand grew four times faster than average demand. Consequently, one sixth of network capacity is devoted entirely to peak days lasting less than four days annually. As Prime Minister Gillard stated, "It's like building a ten lane freeway – but with two lanes that are only used or needed for one long weekend".

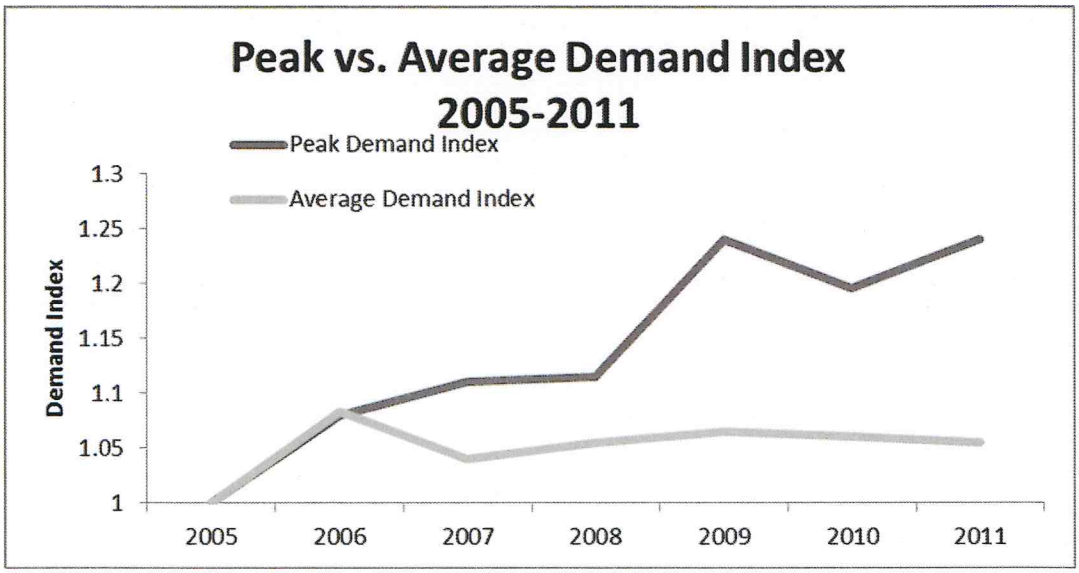

Figure 2: Peak vs. Average Demand Index, 2005-2011

Why is Australia constantly building network capacity to meet peak demand when solutions exist to control peak demand? A key reason is that electricity prices are not reflective of the costs of energy infrastructure at the time of consumption. Network service providers receive a return on their Regulated Asset Base (RAB) for capital investments in infrastructure necessary to increase the installed capacity (kW) to meet forecast peak demands, with sufficient reserve. Residential tariffs, or electricity prices, are based on the provision of electricity commodity to their premise (kWh). Consequently, the electricity prices paid by the customers are not a reflection of the cost of supplying electricity to them at the point in time of consumption.

Additionally, network service providers cannot earn a similar return on demand side participation programs or devices. For example, the Demand Management Incentive Scheme (DMIS) in place in Victoria offers only $10M in total compensation across five Distribution Network Service Providers (DNSPs) over five years. $10M is a tiny fraction of the total compensation earned for network infrastructure and not sufficient to fund demand side participation programs that can meet peak demand.

Reliability regulations also encourage greater investment in network infrastructure and discourage innovation with demand side management. Stringent reliability standards mean that networks are fined heavily for service interruptions. For example, in New South Wales, network service providers must provide power to their customers 99.98% of the time, a requirement that cost network service providers over $1.5 billion between 2005 and 2009. As a result, network service providers are spending more on the network to avoid costly penalties. Conversely, network service providers are loath to spend money on demand side participation programs that are not as well understood and predictable as network infrastructure investments.

Meeting the Challenge

Fortunately, Australia can meet the challenge of reducing electricity prices using tools that are available today. Electricity networks are being transformed by AMI technologies, which is unlocking new and more effective ways to reduce or shift peak demand through DSP programs. AMI also presents new opportunities for engaging with customers through these programs and empowering them to more effectively consume energy. AMI networks also enable network service providers to manage their voltage and energy more efficiently than before. This section will explore the ways that AMI-enabled demand side participation, customer engagement and voltage optimization can mitigate rises in peak demand and thus slow the increase in electricity prices.

Demand Side Participation

The Silver Spring Smart Energy Platform enables electricity network service providers to better manage peak load on their systems. The Silver Spring DSP solution consists of back-office software, the Silver Spring AMI network and third-party in-home devices that enable electricity providers to deploy broad-scale load control and pricing-based DSP programs. The solution enables electricity providers to define and manage DR programs, manage both customer devices and the network linking to customers' homes, define device groups at which to target DSP activities, and send DSP events and messages.

For areas that have not yet received smart meters, network service providers can utilise Direct-to-Grid™ communications solutions for DSP. Direct-to-Grid communications leverage the Silver Spring Communications Modules integrated into third-party devices such as load control switches and electric vehicle charging stations.

Electricity providers can initiate pricing events or load control message from within UtilityIQ Demand Response Manager, which manages communications over the AMI network to both grid- and ZigBee-connected devices. With this full two-way solution, electricity providers can view real-time and historical information about the success of various DSP programs.

Consumer Propositions and Engagement

Consumer engagement is critical to reducing peak demand and to lowering consumers' energy bills. AMI systems present retailers and distributor networks with the opportunity to arm consumers with increased knowledge about their energy usage. This knowledge is referred to as "energy literacy". Simply having energy literacy provides value: Evidence shows consumers are more likely to opt into the demand side participation and energy efficiency initiatives when they are knowledgeable about the value of these programs.

Consumer Energy Portals, like the Silver Spring Networks CustomerIQ™ provides the ideal vehicle for electricity network service providers and retailers to inform and empower consumers. Today, most consumers receive a quarterly bill with little or no insight into how they consume energy. With AMI systems, electricity providers have a unique opportunity to improve their relationship with their customers by providing them with a deeper understanding of their energy usage and costs. The

CustomerIQ customer engagement platform makes it easy and cost effective for electricity providers to provide timely and actionable energy information (See Figure 3).

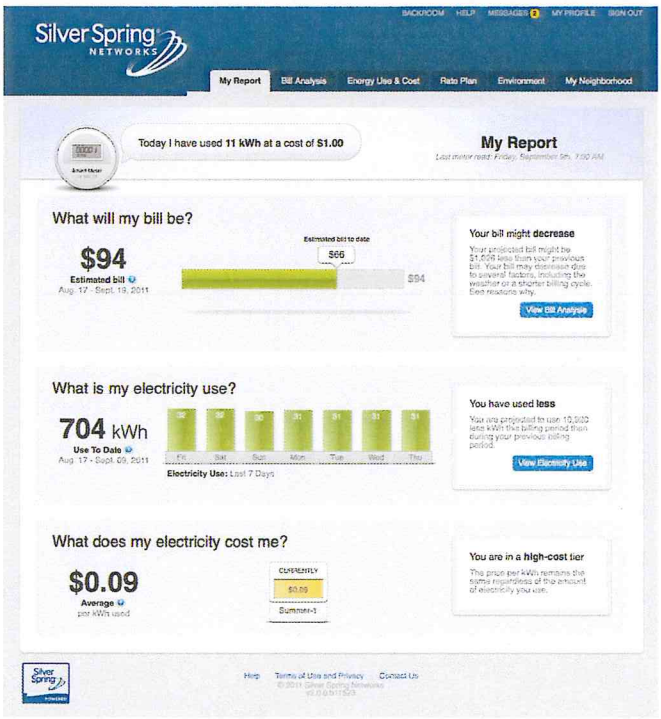

Figure 3: An example of a Silver Spring Networks CustomerIQ Portal

However, a more "energy literate" consumer requires value-based propositions, or incentives, to apply this new knowledge to reduce energy consumption, especially during peak demand periods. Where retail contestability exists in some jurisdiction, the appropriate market incentives exist to innovatively provide new products. However, there needs to be a closer alignment of the costs of supply throughout the whole energy value chain and the value-based propositions made available to consumers, such that electricity prices are a closer reflection of the cost of supply.

Voltage Optimization

Voltage Optimization enables network service providers to better manage the voltage and reduce the total energy being consumed by homes and businesses on their networks. With AMI, network service providers can more accurately measure the actual voltage being delivered to consumers. Today, without this level of accuracy most network service providers over-provision the voltage on their network to ensure they do not fall below minimum voltage requirements. Higher voltages lead to less efficient operation of electrical appliances, increased energy waste, higher energy bills and

unnecessary carbon dioxide emissions. In the US, estimates as high as $1B has been cited for the cost incurred per year by commercial buildings due to forced grid consumption.

AMI enables network service providers to ensure that the voltage provided to the end customer is in the lower part of the allowable voltage range, thus reducing energy consumption. A study by the Pacific Northwest National Laboratory for the US Department of Energy calculated an annual energy reduction of 3.04% if voltage optimization were to be deployed across the entire country. These results have been substantiated in the field, with a trial by Dominion Virginia Power in the US realising reduced consumption of 2.7%.

The Silver Spring Voltage Optimization solution provides benefits to both the end user and the utility: The end-user receives power savings and improved equipment efficiency and the utility ensures that the voltage at a customer premise is maintained within regulatory limits. Voltage Optimization also benefits the environment by reducing carbon dioxide emissions.

Case Studies

The AMI and smart grid technologies described in the prior section are proven solutions that have been tested at scale. In this section, we review three case studies of utilities that have deployed these technologies and the specific results.

Perth Solar Cities - Demand Side Participation & Consumer Engagement

The Perth Solar City program is the most comprehensive energy efficiency initiative in Western Australia and continues to deliver very positive results since its inception in 2009, including:

- 20% peak load reduction using direct load control
- 7% usage reduction when customers are given in home displays
- 11% "super" peak usage reduction using time-of-use tariffs.

Perth Solar City is a unique partnership involving industry, government and the community, all working together to change the way Australia produces, uses, and saves energy. The program launched after securing $13.9M seed funding from the Australian government Solar Cities program and a further $33.3M of cash and in-kind contributions from the Perth Solar City Consortium. Western Power, the lead consortium member, selected Silver Spring Networks to provide the AMI network management platform that is at the foundation of this deployment.

AMI technologies have been shown to reduce peak demand, facilitate increased network efficiencies, and provide customers with opportunities to reduce electricity consumption and save money. The Perth Solar City AMI trial has installed over 8,700 smart meters in four specific locations within Perth's Eastern Region.

Key findings to date include the following:

a) Air Conditioner Trial. This project explored the technical feasibility and cost-effectiveness of using Direct Load Control (DLC) as a demand side participation tool for reducing electricity

consumption at times of peak demand. The first trial of its kind in Australia to utilize AMI infrastructure, it showed that that energy consumption can be reduced by as much as 20% during peak demand times.

b) In Home Display Trial. This trial tests the impact of In Home Display (IHD) technology on residential energy use. During the trial, households were provided with an IHD showing their electricity consumption in real-time. The ability to see energy consumption in small time intervals was found to motivate consumers to reduce electricity use by 6.8% on average.

c) Time-of-Use Tariff Trial. "PowerShift" is a three-part time-of-use tariff developed especially for Perth Solar City. It is the first tariff in Western Australia that seeks to more closely align electricity consumption blocks with time based costs of generation. To date, 427 participants have been recruited to the Trial. Preliminary analysis shows a 10.9% reduction in electricity consumption during the "super peak" period.

d) Living Smart Households Program. This trial uses eco-coaching to help participants reduce their electricity, water and transport costs. Eco-coaches provide the right information at the right time and set simple and measureable targets for the household through the establishment of 'social contracts'. Preliminary analysis for 4,768 Living Smart participants shows an average 8.5% reduction in electricity use.

It is also worth stressing again that the successful implementation of any smart meter-based program requires consumer education. To support the Perth Solar City program, a broad-reach marketing strategy was developed, utilizing community-based social marketing concepts to create a shift in community energy perceptions and attitudes, and to assist in enabling behaviour change. The program created the 'Collective Impact' campaign to position Perth Solar City as the educator and enabler for households on their energy efficiency journey. The campaign has included cinema advertising, local art installations, local newspaper advertisements, billboards in high traffic areas, and attendance and sponsorship at local festivals. A community awareness rate of 51% was achieved in the first year of operation.

Oklahoma Gas & Electric (OGE) - Demand Side Participation & Consumer Engagement

OGE is the largest electric utility in the American state of Oklahoma. The company delivers all of its electricity across an interconnected transmission and distribution system spanning 50,000 square kilometres. OGE Electric Services serves approximately 754,840 customers in Oklahoma and western Arkansas, and a number of wholesale customers throughout the region. In 2011, OGE undertook a demand side participation study, detailed below, that demonstrated peak demand reductions of up to 33% (see Figure 4).

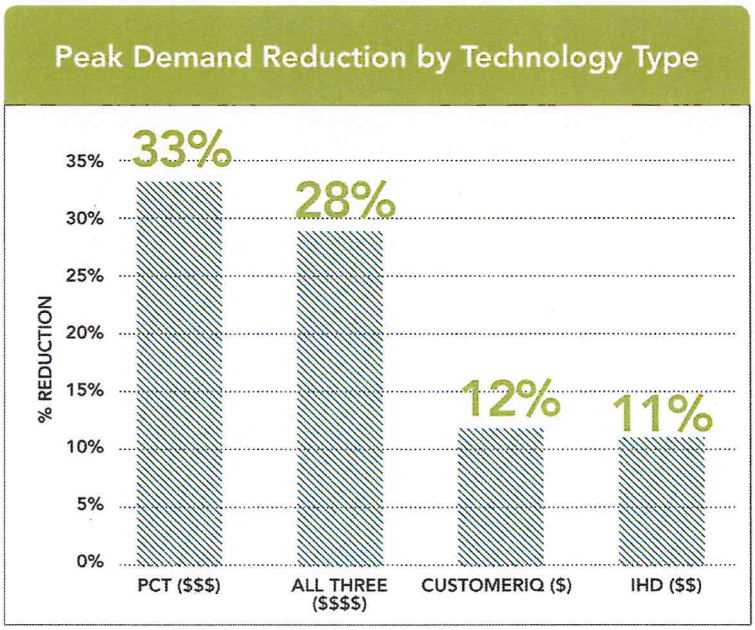

Figure 4: The relative benefits of different consumer engagement methodologies were measured during OGE's demand response program.

OGE is now implementing a three-year program to reduce energy usage during summer months when consumption is at its peak. The utility expects the program to save 70 MW in the first year of its rollout and as much as 176 MW by the third year. As a result of the program, OGE has delayed building two peaker generation plants until at least 2020. Since the estimated cost of building a peaker generation plant is $165M, the company is deferring a capital outlay of approximately $330M. The utility plans to achieve savings by providing its customers the tools necessary to manage their energy usage and incentivizing them to do so during peak periods. The utility's demand response program, SmartHours™, is intended to assess the impact of various types of enabling technology combined with different dynamic pricing rates on a customer's energy consumption.

After a successful 2010 pilot study consisting of 3,400 demand side participation customers in Norman, Oklahoma, the program was expanded to include surrounding areas of Oklahoma City, Oklahoma. Approximately 3,200 additional customers were enrolled for the broader 2011 study, for a total of 6,600 customers in years 2010-2011. Residential customers were assigned one of two rate options for this study. Based on their random assignment, participants received either a Variable Peak Pricing rate with a Critical Price (VPP-CP) option or a Time-of-Use rate with a Critical Price (TOU-CP) option. Customers randomly assigned to a control group were left on their existing standard rates. OGE tested four technology options, including a web portal, an in-home display (IHD), a programmable communicating thermostat (PCT), and a combination of all three. In the study, 98% of participating customers saved money and reduced peak energy usage by 11% to 33%.

One of the key findings from this program is that customer and employee education is critical to broad acceptance. OGE branded its customer partnership program, Positive Energy Together®, and educated its customers and employees through an extensive multi-channel marketing campaign that included an extensive TV and radio media campaign, mailer, and community outreach.

The utility also found that a web portal is critical and is the most cost-effective customer tool. OGE relies on the Silver Spring CustomerIQ web portal to communicate energy consumption data and price alerts to its customers. OGE chose the web portal for its ability to explain time-of-use pricing and to suggest ways to cut energy consumption, eliminate waste, and ultimately reduce customer bills.

The success of the pilot study program encouraged OGE to broaden the program and make it accessible to all customers in their service territory – an industry first to make AMI-based DR available to everyone. The utility is signing up approximately 1,000 customers per week and is on target to enrol approximately 34,000 customers in the program by September 2012. OGE intends to continue the program through 2013 and beyond with a target enrolment of 40,000 per year and hopes to enrol as much as 20% of the 750,000 households in its service territory by the end of the program.

Dominion Virginia Power – Voltage Optimization

Dominion Virginia Power, which provides electricity to 2.4 million customers in the American state of Virginia, recently conducted a one year voltage optimization pilot with impressive results. Dominion leveraged the visibility provide by their Silver Spring Networks AMI system to narrow the voltage band along distributions lines to 114-120 volts. The 6,600 customers in the pilot's test area reduced their total energy consumption by 2.7%. This equated to $260,000 in total savings, or $40 per pilot customer. Combining voltage optimization and AMI will allow Dominion to save customers $1B over 15 years, even after spending $600M on their AMI deployment.

Demand Side Participation and Vulnerable Households

Demand side participation initiatives need to consider the needs of vulnerable and low income households. The elderly, families with young children and the unemployed tend to have flatter than average load profiles and less discretion to alter them. Traditional thinking has therefore been that demand side participations programs might negatively impact these customers. However, data from eight time varying pricing programs in the US showed an average of 12% peak reduction among low income households and peak savings of 80% relative to average households. In fact, since the energy budgets of low income households are often greater than that of average households, the savings impact (as share of wallet) to this group was twice as great in the low-income populations.

Recommendations

In August 2012, the Productivity Commission stated that energy market reform is the highest priority for improving the economy of Australia. The Australian Energy Regulator (AER), under the auspices of the Australian Competition and Consumer Commission (ACCC), has determined that there is a clear regulatory incentive for electricity network service providers and governments to overinvest in infrastructure and pass the costs along to consumers. Moreover, The Australian Energy Market Commission (AEMC) recently published the "Power of Choice" draft report, a review of demand side initiative topics that set the stage for the October 2012 open forum on the same topic. The forum will be an important opportunity to set the right energy rules to promote demand side initiatives.

In order to reduce energy prices, Silver Spring Networks recommends the following:

1. Network service providers have an obligation and are incentivised to invest in infrastructure that provides sufficient capacity to meet forecast peak demand, with reserve. These costs are not reflected in electricity prices in a manner that empowers and incentivises consumers to use energy more efficiently.

   We recommend that the energy market, including network service providers and retailers, have the capacity to make available to consumers value-based propositions (such as tariffs), with necessary engagement and support, which empower and provide incentive to consumers to alter energy consumption behaviours.

2. The value of reliability and power quality to the community, balanced against increased electricity prices, must be appropriately considered in setting performance standards. Electricity infrastructure assets have a long engineering asset life and consequently, network service providers seek predictability in standard control services and performance standards to confidently make long-term and informed investment decisions.

   We recommend that network performance standards be reviewed, with community input, which results in the setting of performance standards that are balanced against the costs of providing reliable electricity sufficient to meet peak demand against the community's willingness to pay increased electricity prices. Such performance standards must encourage and provide confidence for network service providers to investment in technologies over the long term.

3. Network service providers should be provided incentives to invest in demand side participation programs. A precedent already exists. The Demand Management Incentive Scheme (DMIS), introduced by the State of Victoria in January 2011, provides compensation up to $10M to any of five DNSPs for program costs stemming from adoption of energy efficient technologies. This and other similar schemes are a good start but don't go far enough.

   We recommend that network service providers be compensated for their investment in demand side participation capacity at a rate equal to or greater than their investment in distribution network infrastructure.

4. Network service providers should be empowered to use demand side participation to protect their networks and maintain reliability. Today, the effectiveness of network-initiated DSP programs is

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silverspringnet.com

inhibited as network service providers do not have a relationship with consumers in that regard and their network pricing is subsumed into the retailers' price.

We recommend that network service providers be enabled to offer programs directly to consumers or be given greater influence in the structure of programs offered through their retailer partners.

Conclusions

The long term trend of price increases is, as Prime Minister Gillard put it, "unsustainable". The Productivity Commission has cited electricity network inefficiencies and excessively regulated prices as serious impediments to economic growth. This white paper has discussed several technologies and regulatory changes that can accomplish the former goal. The Silver Spring Networks Smart Energy Platform provides the demand side participation, consumer engagement and voltage optimization technologies that can accomplish significant peak control. The Western Power-led Perth Solar City program has already demonstrated 20% peak reduction using the Silver Spring Networks network management platform. OGE has used these same technologies to achieve peak reduction levels up to 33%. The time is now for Australia to act.

Silver Spring Networks Pty Ltd
Level 25, 360 Collins Street, Melbourne Vic 3000 Australia
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O +61 3 9236 5222 I F +61 3 9236 5299
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About Silver Spring Networks

Silver Spring Networks is a leading networking platform and solutions provider for smart energy networks. With its pioneering IPv6 platform, Silver Spring has networked over 12 million homes and businesses throughout the world with the goal of achieving greater energy efficiency for the planet. Silver Spring's innovative products enable utilities to gain efficiencies, integrate renewable energy sources and empower customers to monitor and manage energy consumption. Silver Spring Networks is used by major utilities around the globe including Baltimore Gas & Electric, CitiPower & Powercor, Commonwealth Edison, Florida Power & Light, Jemena Electricity Networks Limited, Pacific Gas & Electric and Pepco Holdings, Inc. among others. For more information please visit www.silverspringnet.com.

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