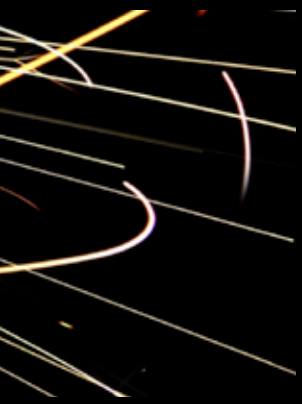
energy networks association

PILOTS AND TRIALS REPORT ON SMART METERING AND RELATED MATTERS

30 JUNE 2012



CONTNETS

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EXECUTIVE SUMMARY

In April 2007 the Council of Australian Governments (COAG) committed to a national mandated roll-out of electricity smart meters to areas where benefits outweigh costs. In 2008 the Ministerial Council on Energy (MCE) agreed to progress the smart meter roll-out by undertaking coordinated pilots and business-specific business case studies. MCE agreed these pilots and business cases should be coordinated though the National Smart Metering Program (NSMP), which presented reports on pilots and trials in 2009 and 2010.

In December 2010 the NSMP substantially had completed its charter and responsibility for some on-going tasks was transferred to other organisations. The responsibility for the Pilots and Trials workstream was transferred to the Energy Networks Association (ENA), with the proviso that it should enable appropriate active input from the Energy Retailers Association of Australia (ERAA) and National Consumer Roundtable (NCRT). From 1 July 2011, MCE was subsumed into a new Standing Council on Energy and Resources (SCER) and responsibility for oversight of the program transferred to SCER.

A lot of innovative activity relating to smart networks and metering advances is occurring outside the boundaries of the NSMP. Although this report does not provide full coverage of activity underway, it has been expanded to include experiences beyond the former reporting framework.

Status reports for 2012 have been provided by Ausgrid (NSW), CitiPower/Powercor (Victoria), Endeavour Energy (NSW), Essential Energy (NSW), ETSA Utilities (South Australia), Jemena (Victoria), SP-Ausnet (Victoria), United Energy (Victoria) and Western Power (Western Australia).

Some key messages that arise from the progress to date include:

» Many of the pilots and trials currently underway have not completed 'roll-out' of smart meters as at the end of June 2012. As a result, not all projects have sufficient data available for analysis and reporting – however they have been able to report on issues encountered to date.

» Effective and on-going customer engagement is critical to pilots and trials seeking to understand or change customer behaviour. Consumer representative groups need to be engaged in developing engagement programs and in disseminating benefits messages to customers.

» Some pricing trials, especially when accompanied by customer information and engagement, have proven to be effective in reduction of peak load on the network.

» Pilots and trials have not developed a good understanding of consumers' ability to trade off between reliability and energy cost. Further work in this area needs to be done.

» Roles and relationships of distributors, retailers and third parties and the services they provide are still developing. It will take some time before the emerging energy market structures and product applications are clear. Discussions are underway between the ENA, ERAA and consumer representatives to increase understanding on the respective requirements, perspectives and preferred options for these roles and relationships - and to optimise energy management services provided to customers.

» Meter vendors and smart device vendors are still developing products to meet the full requirements of the national minimum SMI FS. In addition, technology to support smart metering and smart networks is constantly evolving. The problems currently being experienced with the integration of devices and technologies is expected to improve as the sector matures and national minimum SMI FS is more widely adopted.

» Smart metering is a key enabler for improving the efficiency of energy networks and needs to fit within the broader business case for smart networks. Management of up-front costs and provision of early tangible benefits to consumers remains an on-going challenge that will require significant further efforts.

2. Background

In April 2007 the Council of Australian Governments (COAG) committed to a national mandated roll-out of electricity smart meters to areas where benefits outweigh costs, as indicated by the results of a cost-benefit analysis taking account of different market circumstances in each state and territory and the circumstances of different groups of consumers.

In 2008 the Ministerial Council on Energy (MCE) agreed to progress the smart meter roll-out by undertaking coordinated pilots and business-specific business case studies in most jurisdictions (not including South Australia and Tasmania). These pilots and business cases seek to confirm the findings of the cost-benefit analysis, reduce the range of uncertainty (particularly in jurisdictions with some risk of a net loss at the lower end of the range of benefits) to inform whether a roll-out should proceed, and also inform the development of roll-out implementation plans to maximise benefits.

MCE agreed these pilots and business cases should be coordinated through the National Smart Metering Program (NSMP) to share results, optimise learning and ensure all aspects of smart meters and associated systems, and their impact on network and market operation and customer responses are tested. Across the pilots a range of issues were to be considered, including: performance of technologies, interoperability of technologies, direct load control through smart meters, consumer response and impacts on different classes of consumers, and maximising business operational benefits.

The National Stakeholder Steering Committee of the NSMP presented reports to MCE on smart metering pilots and trials in 2009 and 2010. In December 2010 the NSMP substantially had completed its charter and responsibility for some on-going tasks was transferred to other organisations. The responsibility for the Pilots and Trials workstream was transferred to the Energy Networks Association (ENA), with the proviso that it should enable appropriate active input from the Energy Retailers Association of Australia (ERAA) and National Consumer Roundtable (NCRT). This responsibility includes annual reports for the years 2011 and 2012 on relevant pilots and trials underway. ENA presented the 2011 report on pilots and trials to the Australian Department of Energy, Resources and Tourism (DRET) on 30 June 2011.

From 1 July 2011, MCE was subsumed into a new Standing Council on Energy and Resources (SCER) and responsibility for oversight of the program transferred to SCER.

The ENA coordinates this task with representatives from the ERAA and consumer representative organisations as previously represented upon the NSMP Pilots and Trials Working Group. However, the ENA is addressing this task within the context of current challenges facing electricity businesses to supply increasing amounts of electricity while meeting community and government calls for more reliable, environmentally sustainable and affordable energy supplies. The demand for increasing supplies of electricity is primarily driven by a growing population, combined with lifestyle choices to live in larger houses with fewer residents and an increasing number of appliances. In particular, the level of peak demand (the maximum demanded at any given time) is growing significantly and, in some areas, already exceeds the capacity of the electricity network for a few short periods each year.

In response, electricity network businesses are changing the way they operate and gradually modernising their networks with smarter technologies — in essence integrating information and communications technologies (ICT) into existing electricity network infrastructure and business systems to create a smart electricity network (or smart grid). In addition, electricity network businesses have needed to replace ageing assets as they reach the end of their useful life. These network investments, along with responses to environmental drivers such as the Mandatory Renewable Energy Target and carbon tax impacts, have resulted in significant upward pressure on electricity prices. Network investments are currently undergoing significant review by the Australian Energy Market Authority in response to applications by the Australian Energy Regulator for increased discretion in managing network investments.

Electricity price pressures and significant technological innovations across energy services over the past few years have resulted in even greater scrutiny of smart metering and smart grid options. A strong business case for installation of new technology based on significant consumer and network benefits is required for implementation.

Other players including retailers and third parties also deliver energy management infrastructure and services to customers. Service providers are able to offer customers home energy management devices, such as in-home display units or web interfaces that provide detailed energy consumption information and allow customers to manage their electricity supplies either themselves or through their service provider. These tools provide a means through which customers can potentially alter their behaviour, such as reducing energy consumption or shifting the timing of their electricity use, in order to reduce their emissions and minimise electricity cost increases.

It is widely acknowledged that smart meters are an important element within this environment, but it is the combination of the smart meter with the other enabling technologies and the educated engagement of all parties including consumers that will enable the full benefits of a smart network to be realised.

Discussions are continuing between the ENA, ERAA and consumer representative organisations to assist development of common beneficial outcomes and facilitate exchanges of information and experiences between energy companies and consumer representatives relating to smart meters. The National Energy Industry and Consumer Forum (NEICF) has been constituted between the parties to provide a voluntary structure to facilitate the on-going discussions and cooperation.

3. Reports for 2012

The original purpose of this report was to provide the Standing Committee of Officials and Ministerial Council on Energy/Standing Council on Energy and Resources with status reports on the relevant pilots and trials planned by energy companies in each jurisdiction under the National Smart Metering Program (NSMP).

It is notable, however, that a lot of innovative activity relating to smart networks and metering advances is occurring outside the boundaries of the NSMP, as energy businesses identify options for improving network management and interfaces between parties in the national energy market. This report includes coverage of a range of activity underway both within and outside the NSMP.

Status reports for 2012 have been provided by Ausgrid (NSW), CitiPower/Powercor (Victoria), Endeavour Energy (NSW), Essential Energy (NSW), ETSA Utilities (South Australia), Jemena (Victoria), SP-Ausnet (Victoria), United Energy (Victoria) and Western Power (Western Australia) and are attached at Appendix A.

Ausgrid (the former Energy Australia) reports on its Smart Grid, Smart City (SGSC) project. This project is being undertaken under a tender from the Australian Government and in association with a wide range of other business entities. The project is still underway, with final reporting to Government due at end 2013. However, Ausgrid has provided information on the status of some activities relating to their smart metering trials within SGSC, including customer engagement to reduce peak demand, and initiatives to improve network reliability and support increased embedded generation opportunities. Rollout of smart meters to support these trials is underway and expected to be completed in September 2012. Ausgrid has also rolled out around 500,000 interval meters as new or replacement meters within its network since 2004 and have about 350,000 customers on time of use prices. This report does not cover Ausgrid's experiences with these meters and customers.

Endeavour Energy has performed several smart metering trials since 2006 to test communication mediums, metering technology, SMI FS functionality and customer responses. Endeavour Energy has reported on technology, functionality and communications issues experienced due to the relative immaturity of some products and systems and on their level of success in addressing these issues.

The **Essential Energy** pilot will consist of deploying Intelligent Network meters within representative communities on the Essential Energy network, predominately residential customers. The proposed size of the pilot is 2 communities of approximately 2500 meters. The pilot will endeavour to test all components of the current MCE functionality specification as well as gather more detailed cost and benefit information to assist in the justification of the business case for a further deployment.

The **ETSA Utilities** trial focuses on developing an understanding of the use of direct load control of domestic air conditioning and developing control strategies for maximum load reduction with minimal customer impact. This requires an understanding of customers' air conditioning equipment and its typical use. ETSA intend also to measure customer participation rates for different incentives and monitor customer response to varying load reduction control strategies. The trial involves the deployment of approximately 4500 smart meters within an inner Adelaide suburb together with other network monitoring, control and telecommunications equipment to manage peak demand on hot summer days (projected to be trialled in January 2013). Installation of communications systems and demand response enabling devices to control air conditioning units is currently underway and 3,500 smart meters have been installed to date. The project is expected to report results in June 2013.

In Australia, the Victorian Government mandated Advanced Metering Infrastructure (AMI) program has been the most comprehensive roll out of advanced metering to date. The AMI program is rolling out 2.6 million smart meters across Victoria over four years to 2013. The AMI Program operates outside the NSMP process with comprehensive oversight and reporting to the Victorian Department of Primary Industries. This report does not cover the status of the AMI Program. However, **CitiPower/Powercor**, **Jemena**, **SP-Ausnet and United Energy** have provided reports highlighting some relevant experiences to date. Jemena and United Energy report on establishment of web portals to advise and support customers in understanding and influencing their energy usage, while CitiPower/Powercor and SP-Ausnet provide reports on their experiences relating to the comprehensive business and system changes required for the large scale deployment of smart meters. Distributors, retailers and community groups are working with Government (through its Ministerial Advisory Council) to deliver benefits to customers as part of the AMI program.

The **Western Power** Smart Grid program commenced in July 2008 and has had several years of results in testing network functions and customer load management under its Solar City initiative. The program is designed to implement projects which support the business strategy of developing an enabling platform to meet future demands for sustainable energy solutions. The more than 10,000 smart meters deployed by Western Power in their trials met the Victorian, rather than national, functional specification due to timing of the rollout and meter availability and Western Power comprehensively report their experience with the functionality elements. Western Power report includes early analysis of results of the trial indicating a potential reduction of 20 per cent in peak demand from direct load control of air conditioning and significant experience in managing the impact of increased solar PV penetration on network operations.

As reported in last year's Pilots and Trials report, the smart meter pilots and trials programs proposed by **Energex and Ergon Energy** had not proceeded after consultation with the Queensland Government. However both companies have been active in testing innovative tools and techniques to manage increasing load (especially with growth in air conditioners in summer). These tools and techniques do not necessarily rely on customers' meters to manage load cycling. These programs are not covered in this report. The companies are still analysing of the results of their trials.

4. Key Messages

Before providing detail on the pilots and trials reporting this year, it is relevant to identify some key messages that have arisen from progress to date.

General Issues

- Many of the pilots and trials currently underway have not completed 'roll-out' of smart meters as at the end of June 2012. As a result, not all projects have sufficient data available for analysis and reporting – however they have been able to report on issues encountered to date.
- A key objective of the pilots and trials is to test and validate both customer and network outcomes of smart metering/smart networks, and to determine the real and sustainable costs and benefits.
- Many of the pilots and trials are exploring a variety of different aspects of smart metering and enabling technologies, such as network functionality; technology testing; or customer engagement. Varied objectives within the different pilots and trials can enhance the value of exchange of experiences between businesses within the working group.

Customer Engagement

- As outlined above, a key objective of the pilots and trials is to test and validate both customer and network outcomes. In an environment where the customer has formed a somewhat negative view of smart metering, the achievement of these outcomes is now much more difficult, particularly with customers' concerns regarding time of use pricing.
- Effective and on-going customer engagement is critical to pilots and trials seeking to understand or change customer behaviour. Consumer representative groups need to be engaged in developing engagement programs and in disseminating benefits messages to customers.
- An effective customer engagement process is critical to acceptance of technology rollouts and their effectiveness in improving energy efficiencies - and in customers accepting issues in their deployment, technology glitches, etc.
- Energy businesses need to understand and address different consumer segments as their drivers/needs can be significantly different (for example, vulnerable low income consumers versus energy literate consumers).
- Incentives may be required, at least initially, to support active customer participation in energy services and management of their energy usage.
- Some pricing trials, especially when accompanied by customer information and engagement, have proven to be effective in reduction of peak load on the network. Price incentives, technology and information are powerful tools to impact on customer energy usage
- Pilots and trials have not developed a good understanding of consumers' ability to trade off between reliability and energy cost. Further work in this area needs to be done.

Coordination between Retailers and Distributors

- Roles and relationships of distributors, retailers and third parties and the services they provide are still developing. It will take some time before the emerging energy market structures and product applications are clear.
- The current pilots and trials have demonstrated that in a disaggregated energy market, cooperation between distributors, retailers and third parties is advantageous, especially while working with customers.

- As at June 2012, discussions are underway between the ENA, ERAA and consumer representatives to increase understanding on the respective requirements, perspectives and preferred options for these roles and relationships - and to optimise energy management services provided to customers.

  [It is noteworthy that Government reviews have been underway investigating these issues for general application: eg. Australian Energy Market Commission *Power of Choice* review; Department of Resources, Energy and Tourism *National Smart Metering Consumer Pricing and Protection* consultation papers.]

Technology issues

- Meter vendors and smart device vendors are still developing products to meet the full requirements of the national minimum SMI FS. In addition, technology to support smart metering and smart networks is constantly evolving.

- Some pilots and trials report critical and practical difficulties with the supply, installation and integration of multiple new devices and technologies (including communication systems) from multiple vendors across the distribution network. These issues have proven to be complex, costly and challenging.

- The problems currently being experienced with the integration of devices and technologies is expected to improve as the sector matures and national minimum SMI FS is more widely adopted. Pilots have proven to be useful in identifying and managing these transitions, although lessons learned may vary depending on local conditions and technologies chosen.

- Increasingly, alternative technology developments such as the internet and home energy management systems can meet some of the required outcomes that were previously assumed to rely on smart meters alone.

Network issues

- It is widely acknowledged that smart meters are an important element within a smart network. However, it is the integration of the smart meter with the other supporting technologies that will enable the benefits of a smart network along the entire electricity supply chain (from generators to customers) to be fully realised.

- Smart metering is a key enabler for improving the efficiency of energy networks and needs to fit within the broader business case for smart networks. Management of up-front costs and provision of early tangible benefits to consumers remains an on-going challenge that will require significant further efforts.

5. The future

The objectives for the Pilots and Trial Working Group (P&TWG) confirmed in 2009, are to:

- assess the pilots and trials work already undertaken and identify key findings that should be taken into account in the development of the Smart Metering Infrastructure Functional Specification and NEM (National Electricity Market) Smart Metering Processes Maps (and proposed changes to NEM Procedures), and any gaps which may need to be addressed in future pilots or trials

- coordinate pilots and trials, share results, optimise learning and assess if all aspects of smart meters and associated systems, and their impact on network and market operation and customer responses are tested

As the SMI Functional Specification version 1.2 was only finalised in April 2011, most data and results from testing systems fully compliant with SMI Functional Specification version 1.2 will not be finalised until some time after 30 June 2012.

Many current pilots and trials have been undertaken with smart meters that are not compliant with the final national SMI Functional Specification, as either the SMI FS had not been finalised when they were commencing their trials or meters were not available to comply with the SMI FS.

Consequently, in this report it is not possible to provide a definitive verification of the SMI FS as had been previously sought by government in the following terms:

- is it prudent/fit for purpose?

- is it technically feasible?

- what has been tested and what has not within the SMI FS? (gap analysis)

- what service levels have been achieved?

- what have been the customers' experiences within pilots and trials?

- Recommend whether the SMI FS version 1.2 should be revised/advise shortfalls

Within the detailed reports included in this report, companies have reported on their experience and ability to comply with the latest SMI FS, including gap analysis (see especially reports from Western Power and Endeavour Energy). However, it is considered that this issue requires further consideration when further results of applications with meters compliant to the SMI FS are available.

6. Summary Table: Smart Metering Pilots and Trials 2012

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
Ausgrid (NSW)	The Smart Grid Smart City (SGSC) project was won by tender from the Australian Government and has a substantial contracted reporting commitment to the Australian Government. Final project reporting is scheduled for late 2013. This report constitutes a very brief current SUMMARY of some relevant elements. The objective of the SGSC pilot is to demonstrate the benefits and costs of different smart grid technologies in an Australian setting. The project design, engagement and testing seeks to enable application of outcomes and experiences across distribution networks in Australia.	Grid Applications: Improve network reliability by testing automated Fault Detection, Isolation and Response and power quality feedback (via Active Volt-Var Control; Substation and Feeder Monitoring; and Wide Area Measurement) to improve reliability, improve switching activities, enhance fault detection, reduce the number and impact of network outages and reduce the cost of operations. This project is focussed in Nelson Bay, a network area requiring enhanced support. The Project will assist assessment of where tested devices and processes (for measurement, monitoring, switching, etc) are justified in future decisions across the network. High Level Design of the Trial has been completed, including a trial Distribution Management System. Installation of monitoring	Energy Resource Management: Testing the impact of increased penetration of distributed energy generation and storage on network performance and potential to produce a cost effective and reliable reduction in network peak demand. There are three trials underway. a. Newcastle trial will test distributed generation in an urban environment (25 gas fuel cells; 40 energy storage devices; 5 wind turbines). High Level Design, customer acquisition and device (BlueGen Fuel Cell and Redflow Energy Storage) installation and operation are complete. Data acquisition has not commenced. b. Newington trial will test high penetration of solar PV on the electricity network. Network will be reconfigured to	Measure ability to influence customer behaviour in both reduction of energy use and reducing peak load demand. Trial will install 30,000 smart meters and some related feedback technologies (In Home Displays; and/or webportal; and/or Demand Response Enabled Devices for air conditioning control; Home Energy Management System). Ausgrid is also investigating undertaking tariff trials in cooperation with retailers. Project seeks to engage customer blocs in terms of characteristics such as income, demographics, household size, gas usage and climate differences to obtain statistically significant coverage in areas across the Ausgrid network including Kurringai, Newington, Sydney CBD, Upper Hunter, Newcastle and the Central Coast of NSW. Pilot envisages rollout of 20,000 smart meters for network trial and 10,000 meters for retail trial. Rollout delayed 12 months due to

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
		and measurement devices on the network is underway and expected to be completed by August/September 2012. There will be sufficient number of devices installed to start the trial in July 2012 as planned. Supply, installation and integration of multiple new devices and technologies with associated communications system requirements across the distribution network have proven to be challenging. However this project is designed to provide improved reliability to the Nelson Bay area as successful system upgrades will remain in place after completion of the trial.	concentrate PV installations on one feeder. Newington was selected due to high penetration of solar PV (c. 1100 systems). Network reconfiguration to concentrate impact of solar PV systems was completed December 2011. c. Scone trial will test generation (5 wind turbines and a diesel generator) and high level distributed energy storage (20 energy storage devices) on a rural feeder. This trial is in early stages of High Level Design	equipment and communications issues. By 1 December 2012, meter rollout is expected to be completed; customers engaged for trials and trained with products; feedback technologies installed and operational. The creation of end to end solutions for customers has been challenging due to: - Maturity of products and the evolving focus of suppliers expending their respective offerings - Maturity and continued development of key standards (SEP and Zigbee) and the rate of supplier adoption of these. This has created the need for more complex and extensive system integration.
CitiPower/Powercor (Victoria)	The CitiPower and Powercor (CPAL) AMI Program has been running since 2006 and has been managed in a phased approach: The Business commenced the rollout of AMI meters in October 2009 and has in	Deliver requirements as defined in the Victorian Department of Primary Industry's (DPI) AMI Minimum State-Wide Functionality Specification	Ensuring optimum solutions are selected to meet regulatory requirements, while ensuring solutions provide an appropriate foundation to achieve	Successful delivery of the AMI Program requires the active engagement of a diverse stakeholders and customer groups. Along with the implementation of new

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
	excess of 650,000 smart meters installed as at June 2012. Activating and making use of functions that are embedded in the AMI. Initiation of HAN pilots. The goal of these pilots has been to better understand HAN support services and the role of CPAL in ensuring that customers' HAN solutions are effective.	(Victoria) Release 1.1 and the Minimum AMI Service Level Specification (Victoria) Release 1.1. Deliver against requirement as further detailed within relevant Victorian Government Orders in Council. Identifying, examining and implementing further AMI leverage opportunities for improvement and/or transformation of the business. Identifying, examining HAN performance.	medium to long-term business plans. Transformation of IT architecture with a specific focus in moving towards a near "*real-time*" "*non stop*" environment. IT systems integration effort has been significantly higher than originally planned. The introduction of new capability, processes and systems for the implementation of the AMI and associated new services requires considerable planning. A release strategy dealing with both internal and external dependencies with detailed testing, verification and a phased approach was adopted.	technology is the implementation of new services. The scale and complexity of the external environment requires a co-ordinated and comprehensive approach to stakeholder and customer management. The enablement of energy information to consumers and supporting this with a comprehensive education campaign is essential. The identification and associated repair of safety defects represents a significant safety benefit to consumers as a result of the AMI Program Through the HAN pilot it has become clear than along side the technical issues that must be managed to successfully provide HAN services to customers, it will be critical for a well defined customer protection framework to be in place. This framework should cover device functionality, market roles and responsibilities and HAN linkages to existing market functions.

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
				Binding devices to the AMI meter is most successful where the customer has been provided with suitable device training or information and is educated on device performance.
Endeavour Energy (NSW)	Endeavour Energy has performed several smart metering trials since 2006. The objectives of previous, and current trials are as follows: - To test and prove the use of different communication mediums for a smart metering solution to fit the Endeavour Energy business - 30 minute kWh interval data collection - Implementation of residential demand management programs - Peak demand reduction programs - Minimum functionality testing of metering/communications systems - Remote Firmware and Configuration updates - Customer engagement and education by utilising the Home Area Network capabilities to supply IHDs to customers	To test and prove the use of different communication mediums for a smart metering solution to fit the Endeavour Energy business. Utilising the Zigbee Home Area Network to launch Demand Response (DRED) and IHD programs in an effort to reduce peak demand Technical issues with technology (communications systems and devices) have been experienced and in some cases resolved successfully. Testing of conformity against SMI FS was undertaken and reported for selected functionality requirements.	To utilise smart metering to analyse customer behaviour and reduce peak demand. Analyse the use of a smart metering infrastructure to automate business processes such as disconnection / reconnection	To educate the customer about their electricity consumption. Customers on peak demand programs are given incentives to join and reduce peak demand. Limited availability of customers in the trial area with appropriate DRED enabled air conditioners limited impacts. Customers have been wary of smart meters due to media commentaries.

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
	- Network optimisation - Distribution substation monitoring - Customer Supply Monitoring - Control Off-Peak hot water from the meter - Remote Disconnection / Reconnection			
Essential Energy (NSW)	The pilot will consist of deploying Intelligent Network meters within representative communities on the Essential Energy network, predominately residential customers. The proposed size of the pilot is 2 communities of approximately 2500 meters.	The intent of the pilot is to install Intelligent Network meters and to remotely communicate with all metering installations emanating from a Zone Substation, providing end to end SMI capability through to a Meter Data Management System	The pilot will endeavour to test all components of the current MCE functionality specification as well as gather more detailed cost and benefit information to assist in the justification of the business case for a further deployment.	
ETSA (SA)	The objective of this pilot is to determine the applicability of direct load control when deployed in conjunction with smart metering infrastructure (SMI) within an Australian distribution network. Assess the opportunity to integrate advanced electricity network sensing to develop an automated demand response to changing electricity network conditions. Approximately 4,500 meters are to be deployed (3,500 to date) on residential sites. The trial will also be testing the SMI FS functionalities relating to remote	Source or develop demand response enabling devices for use with air conditioning equipment within Australia in association with SMI utilising the HAN functionality. The deployment of various sensors within the LV and MV electricity networks for both load and fault detection.	Develop understanding of the use of direct load control and develop control strategies for maximum load reduction with minimal customer impact. Determine the cost benefit analysis for the deployment of direct load control in conjunction with SMI and advanced network sensing.	Develop an understanding of customer's air conditioning equipment and its typical use. Measure customer participation rates for different incentives and monitor customer response to varying load reduction control strategies. All customer involvement on this trial will be voluntary.

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
	connection and disconnection; supply capacity control; quality of supply; meter loss of supply; remote meter configuration; and remote software upgrades.			
Jemena (Victoria)	In response to the introduction of Advanced Metering Infrastructure (AMI) and the Victorian government mandate to install smart meters for all small to medium customers; Jemena and United Energy have developed and commissioned an end to end AMI solution compliant with the Victorian Minimum functional and service specifications. This report concentrates on the Jemena Customer Portal trial,which is designed to explore the technical, regulatory, security, privacy and process aspects of a Distributor Led Consumer Energy Portal and business to business Facilitated Access of AMI/Smart Meters. Objectives: - Develop and trial a self service online application that can help customers manage their electricity usage with consumption monitoring and home energy assessment tools. - Facilitate access to AMI/Smart Meter enabled services for the Consumer and Industry - Address regulatory, legal and privacy issues associated with the delivery	- Online accessible content for Consumer Energy Portal for authorised parties - Security Architecture and protection for online threats including penetration testing - Application Programming Interface for Retailers and third party facilitated access to Smart Meter enabled services (HAN Binding and messaging) - Scaled solution suitable for a full scale deployment (Capacity and Performance Testing) Jemena has commenced facilitated access services for retailers and third parties for HAN related smart meter enabled services.	- Provide a capability for a customer to self manage their own connections of ZigBee Home Area Network Devices - Assess the potential for Demand Reduction Energy Savings possible through Energy Portals - Allow customers to understand interval data derived from Smart Meters and the impact of Time of Use Tariffs against their own energy profile - Ensure the Portal solution allows for consumer protection of their personal information (PI) (including energy data) and that only Authorised Parties can access the consumer's data and PI. - Allow Retailers and 3rd Parties facilitated access to Smart Meter enabled services (principally	- Provide electricity usage in an easy to understand format (energy, cost and CO_{2e}) - Allow customers access to historical energy data - Allow customers to compare their energy usage against suburb averages for the same period - Allow customers to set energy targets - Allow customers to enter Tariff structures and rates - Allow customers to manage HAN device connections - Allow customers to register for notifications of power outages Trial participants registered positive outcomes, but active engagement was short lived for many

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
	advanced Smart Meter services • Develop process and automation to ensure and efficient and timely Smart Meter consumer experience • Select and engage trial candidates (60). Jemena energy portal 'Electricity Outlook' launched on 15 June 2012 as a free of charge web portal to all electricity customers with a smart meter in the Jemena Electricity Network across NW Melbourne after 6 month trial. Website: electricityoutlook.jemena.com.au		managing HAN devices) • Assess the Regulatory Framework impacts and risks of distributor led Energy Portal • Review outcomes, lessons learnt and recommend next steps. Jemena's trial concluded that some participants will require assistance through binding/ activation process.	participants
SP-Ausnet (Victoria)	SP AusNet is one of the Victorian electricity distribution network businesses responsible for implementing the Victorian Department of Primary Industries (DPI) government mandated smart metering roll-out within its network area. Delivery of the AMI program is separately reported via the normal regulatory reporting channel processes and so comments within this document that relate to the mandated program activities take the form of high-level observations and learning experiences, rather than formal progress reporting.	• New technology application: New technology application within a large scale deployment requires sustained investment in configuration management and a highly structured process-based implementation approach • End to End Functionality: Achieving composite end-to-end functionality is far more onerous and resource intensive than achieving	• Commercial contracts: Establishing commercial contracts within an environment where there is not yet product maturity (based on functional specifications for which market products are not yet available) is challenging and leads to continued uncertainty over product development, testing, performance and overall project scope and cost • Integration: Investment in the "back-end" systems and in systems integration activities has proven to be	In-Home Display and Energy Management System Trial: SP AusNet initiated a 1000 customer trial in 2010 to better understand customer behaviours and responses when they have real-time access to their energy usage information, in particular also to explore their response to requests to reduce loads at times of network peak demand. This trial is well advanced but is not yet at a stage where formal feedback is possible around customer

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
		satisfactory system-by-system based operation	significantly more than what was anticipated - Data availability: As the AMI program is progressively deployed, it is possible to access and use a growing database of smart metering data for network purposes, including improving quality and reliability of supply, asset utilisation, solar PV integration and reducing safety risks.	responses. Customer engagement in the AMI Program: The socio-political environment surrounding the Victorian AMI roll-out has compounded effective delivery of the program and it is clear that effective customer engagement is vital for these types of mass technology deployments or transformation initiatives.
United Energy (Victoria)	In response to the introduction of Advanced Metering Infrastructure (AMI) and the Victorian government mandate to install smart meters for all small to medium customers; Jemena and United Energy have developed and commissioned an end to end AMI solution compliant with the Victorian Minimum functional and service specifications. This report concentrates on United Energy's Customer Portal trial which is designed to explore the technical, regulatory, security, privacy and process aspects of a Distributor Led Consumer Energy Portal and business to business Facilitated Access of AMI/Smart Meters. Objectives: - Develop and trial a self-service online	- Online accessible content for Consumer Energy Portal for authorised parties - Security Architecture and protection for online threats including penetration testing - Application Programming Interface for Retailers and third party facilitated access to Smart Meter enabled services (HAN Binding and messaging) - Scaled solution suitable for a full scale deployment (Capacity	- Provide a capability for a customer to self-manage their own connections of ZigBee Home Area Network Devices - Assess the potential for Demand Reduction Energy Savings possible through Energy Portals - Allow customers to understand interval data derived from Smart Meters and the impact of Time of Use Tariffs against their own energy profile - Ensure the Portal solution allows for consumer protection of their personal	- Provide electricity usage in an easy to understand format (energy, cost and CO_{2e}) - Allow customers access to historical energy data - Allow customers to compare their energy usage against suburb averages for the same period - Allow customers to set energy targets - Allow customers to enter Tariff structures and rates - Allow customers to

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
	application that can help customers manage their electricity usage with consumption monitoring and home energy assessment tools. - Facilitate access to AMI/Smart Meter enabled services for the Consumer and Industry - Address regulatory, legal and privacy issues associated with the delivery advanced Smart Meter services - Develop process and automation to ensure and efficient and timely Smart Meter consumer experience - Select and engage trial candidates (60). United Energy's 'Energy Easy' portal trial has been underway for some months and access to the trial is open to customers in the United Energy service area who have a smart meter installed.	and Performance Testing) United Energy has commenced facilitated access services for retailers and third parties for HAN related smart meter enabled services.	information (PI) (including energy data) and that only Authorised Parties can access the consumer's data and PI. - Allow Retailers and 3rd Parties facilitated access to Smart Meter enabled services (principally managing HAN devices) - Assess the Regulatory Framework impacts and risks of distributor led Energy Portal - Review outcomes, lessons learnt and recommend next steps. United Energy's trial is still underway. Difficulty in binding is being observed and some customers will require assistance.	manage HAN device connections - Allow customers to register for notifications of power outages Trial participants registered positive outcomes, but active engagement was short lived for many participants
Western Power (WA)	The Smart Grid Foundation Program proposes to implement a diverse Program of initiatives including: ▪ Smart Grid project ▪ 8,676 smart meters in Eastern region of Perth	▪ RF communications platform has proven to be successful in both metropolitan and rural pilot locations due to the scale of the meshing and coverage of the 900 MHz	▪ Direct Load Control trial seeks to better understand and quantify the opportunity to defer capital investment in network by investing in demand management of residential customer air conditioning systems. Early analysis of trials indicates a	▪ For calendar year 2011, users of IHDs within the Perth Solar City Smart Meter regional boundary showed an average energy reduction 6.82% or approximately $114.44 savings per household per year. In

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
	▪ 2,200 smart meters at edge of grid location to test communications capabilities (Denmark and Walpole) ▪ Mesh communications system ▪ Test smart grid for the ability to enable dynamic management of loads, direct load control, automated meter reading (AMR), remote connect/disconnect, theft identification, and all MCE functionality ▪ Establishment of Home Area Network (HAN), time of use tariffs and in-home communications with customers regarding energy consumption ▪ Metering data management systems interfaced to current systems to enable full interval data management ▪ Changes to regulations, technical standards and policies to support new energy solutions; ▪ Communications and change management including business process changes, training and staff support for the transition to new business operations; ▪ Development of new business model to support the achievement of the objectives of the Smart Grid/AMI;	frequency. ▪ The communications, metering and Home Area Network (HAN) technologies have proven to operate beyond initial expectations and largely operating as designed. Some issues were found during testing of new HAN devices, mainly attributed to the SEP 1.0 standard that was open to interpretation from vendors hence interoperability was impacted. ▪ As the trial has progressed into the 2nd year with more functionality being explored, more complex technical defects have been found. To resolve this, Western Power and the vendors implemented an online issues management and reporting system. ▪ When meters with HAN devices such as IHDs or DREDs get exchanged, the secure	20% reduction in peak demand (of trial participants). ▪ PV Saturation Trial is a Perth Solar City (PSC) initiative that seeks to investigate the effects of high penetration of PV systems in Western Power's distribution network. Initial results show reverse power flow from PV systems can cause high voltage non-compliance at the customer level. On the other hand, voltage harmonics have remained well within compliance levels, so voltage distortion is not expected to limit the PV penetration levels on the network. ▪ Analysis of power quality (PQ) event data from smart meters showed that load unbalance can be observed without needing additional PQ meters installed (as is the current practice). Results show that capacity can sometimes be increased by reconfiguring the network rather than high cost upgrading LV feeders and transformers.	addition, 474 kg CO_2e per year were cut. ▪ Customers benefitted directly by receiving a financial incentive for taking part in the trial. Energy savings during events were largely achieved with no impact on comfort levels. ▪ On a larger scale, customers may also benefit from any deferment of network augmentation resulting from the reduction of peak consumption. Deferment of costly infrastructure installations and upgrades puts downward pressure on network and, in turn, retail tariffs. ▪ Interest in the smart meter trial remained low, with less than 250 enquiries from the beginning of the installation phase to date. ▪ A wider deployment would need to be both preceded and

Company	Summary	Technology Acceptance	Business Impact	Consumer Impact
	▪ Engagement with: ○ Retailers, generators and other utilities to explore the costs, benefits and risks for each stakeholder ○ National smart grid initiatives, working groups and steering committees to ensure alignment and sharing of "lessons learned" ○ CSIRO, universities and industry groups to bring skills, expertise and innovation into the team Substantial testing and reporting via gap analysis of performance experience against the SMI FS was provided. See full report.	pairing is lost and has to be manually established		accompanied by a comprehensive customer engagement process. ▪ Work has commenced to identify smart meter customers who would save, or be no worse off, on more cost-reflective time of use tariffs (TOU). ▪ Half-hourly smart meter consumption data has been examined for the feeder annual peak period(s) to determine which customers are contributing most to the annual feeder peak. This allows Western Power to effectively target peak consumption reduction towards demographics with the potential to make the most dramatic change to their behaviour.

7. APPENDIX A: COMPANY REPORTS

A. Ausgrid

PROGRESS REPORT FOR PILOT/TRIAL:	**Type of Test:** Smart Grid Smart City (SGSC) Trial The SGSC project was won by tender from the Australian Government and has a substantial contracted reporting commitment to the Australian Government. Final project reporting is scheduled for late 2013. This report constitutes a very brief current SUMMARY of some relevant elements for input to an industry wide report on industry status with smart meters and associated technologies. It does not encompass the full project. (see website http://www.smartgridsmartcity.com.au/)
Company Name: Ausgrid **Company Contact:** Jamal Cheema Smart Grid Engineering and Delivery Manager	jcheema@ausgrid.com.au **Phone:** 131525
Start Date: 2010	**End Date:** December 2013

Objectives of the Pilot/Trial:

The objective of the SGSC pilot is to demonstrate the benefits and costs of different smart grid technologies in an Australian setting. The project design, engagement and testing seeks to enable application of outcomes and experiences across distribution networks in Australia.

Consumer: Measure ability to influence customer behaviour in both reduction of energy use and reducing peak load demand. Trial will install 30,000 smart meters and some related feedback technologies (In Home Displays; and/or webportal; and/or Demand Response Enabled Devices for air conditioning control; Home Energy Management System). Ausgrid is also investigating undertaking tariff trials in cooperation with retailers. Project seeks to engage customer blocs in terms of characteristics such as income, demographics, household size, gas usage and climate differences to obtain statistically significant coverage in areas across the Ausgrid network including Kurringai, Newington, Sydney CBD, Upper Hunter, Newcastle and the Central Coast of NSW.

Technology:

Grid Applications: Improve network reliability by testing automated Fault Detection, Isolation and Response and power quality feedback (via Active Volt-Var Control; Substation and Feeder Monitoring; and Wide Area Measurement) to improve reliability, improve switching activities, enhance fault detection, reduce the number and impact of network outages and reduce the cost of operations. This project is focussed in Nelson Bay, a network area requiring enhanced support. The Project will assist assessment of where tested devices and processes (for measurement, monitoring, switching, etc) are justified in future decisions across the network.

Energy Resource Management: Testing the impact of increased penetration of distributed energy generation and storage on network performance and potential to produce a cost

effective and reliable reduction in network peak demand. There are three trials underway.

a. Newcastle trial will test distributed generation in an urban environment (25 gas fuel cells; 40 energy storage devices; 5 wind turbines).

b. Newington trial will test high penetration of solar PV on the electricity network. Network will be reconfigured to concentrate PV installations on one feeder.

c. Scone trial will test generation (5 wind turbines and a diesel generator) and high level distributed energy storage (20 energy storage devices) on a rural feeder.

Confirmation or variation in Scope:

Due to project complexity (including contractual engagement with substantial external parties and difficulties with equipment supply and system integration), the consumer trials will now operate for 12 months rather than 24 months as had been previously anticipated.

Project completion date remains 2013.

Record progress against each nominated problem/issue/service level:

List problem/issue/service level	Progress results
Consumer trial:	Pilot smart meter rollout also requires comprehensive meter management system, communications and back office support. Pilot envisages rollout of 20,000 smart meters for network trial and 10,000 meters for retail trial. Rollout delayed 12 months due to equipment and communications issues. Meter installation expected to be completed by end September 2012. Built Smart Grid, Smart City Centre at Honeysuckle: opened in September 2011. Prepared extensive customer communications packages. Extensive awareness campaigns in media, community meetings, SGSC centre tours, eNewsletter, seminars, media releases. Customer engagement for trial to commence after meter installations completed. Developing webportal and product offerings (Dynamic Peak Rebates; Lifestyle audits; In Home Displays; DRED; smart plugs). Ausgrid is in the final stage of product integration and testing. By 1 December 2012, expect meter rollout completed; customers engaged for trials and trained with products; feedback technologies installed and operational.
Grid Applications trial:	High Level Design of the Trial has been completed, including a trial Distribution Management System. Installation of monitoring and measurement devices on the network is underway and expected to be completed by August/September 2012. There will be sufficient number of devices installed to start the trial in July as planned.

	Ausgrid has also developed a 'model' of the Nelson Bay project to test enhanced, up-scaled system impacts on the basis of test results received from the trial. Substantial communications and IT upgrades and system integrations are required for this project. Some Nelson Bay installs have been delayed due to equipment supply and installation issues (eg smart meter rollout has already started, though later than planned, thus the complete rollout is now expected to be finished by September 2012).
Energy Resource Management Trial: Newcastle trial	High Level Design, customer acquisition and device (BlueGen Fuel Cell and Redflow Energy Storage) installation and operation are complete. Data acquisition has not commenced.
Energy Resource Management Trial: Newington	Newington was selected due to high penetration of solar PV (c. 1100 systems). Network reconfiguration to concentrate impact of solar PV systems was completed December 2011. Solar PV systems were tested from July 2010 to May 2011 to identify inactive systems. Approximately 1 in 4 systems (267) had not exported energy to the network during this period. Owners were contacted to offer free inspection and competitively priced repairs. Approximately 50% owners accepted free inspection but to date limited take-up (12) of repairs. No data collection and analysis as yet.
Energy Resource Management Trial: Scone	The intention of this trial is to test a rural feeder island (microgrid).
Major findings arising at this milestone (list):	
Itemise problems/issues	**Major finding to date**
Consumer trial:	Learnings to date have been in the areas of products, technologies and integrations. Smart meter rollout delayed 12 months due to equipment and communications complexities. The creation of end to end solutions for customers has been challenging due to the following considerations: - Maturity of products and the evolving focus of suppliers expending their respective offerings - Maturity and continued development of key standards (SEP and Zigbee) and the rate of supplier adoption of these. The effects of these have created the need for more complex and extensive integration work than originally anticipated. In considering Home Area Network (HAN) technologies, there has been an emerging consideration that web based product offerings may be more effective (cost/functional) than HAN based

	devices deployed in homes. In considering future HAN technologies, there remains a focus on determining who in the market (Distribution/Retailer) is best positioned to deliver both feedback technologies and peak demand initiatives.
Grid Applications trial:	Supply, installation and integration of multiple new devices and technologies with associated communications system requirements across the distribution network have proven to be challenging. However this project is designed to provide improved reliability to the Nelson Bay area as successful system upgrades will remain in place after completion of the trial.
Energy Resource Management Trial: 1. Newcastle	Customer Acquisition Findings: Process was costly and inefficient (letter; phone call follow up; door knocking; site suitability inspections for interested participants, which ruled out a number of keen volunteers). A more targeted process may have been more suitable. Additional customer feedback (including demographic indicators) will be further examined by Ausgrid. Device Implementation Findings: Installation of distributed energy and storage units (BlueGen and RedFlow) require site suitability checks (space, terrain and access) and takes several days, requiring plumbing, electrical and telecommunications work as well as device specific technical work. Effective management of installation process is critical to cost efficient outcomes and to minimise customer inconvenience. Wind turbines Location of wind turbines in urban areas creates significant challenges and installing all 5 wind turbines is unlikely to be possible.
Energy Resource Management Trial: 2. Newington	Ausgrid notes that it is too early to generate any significant findings from this trial, other than the relatively high incidence of inverter failure amongst PV installations and apparent reluctance of owners to repair those inverters.
Energy Resource Management Trial: 3. Scone	This trial is still in early stages of High Level Design. Safety concerns relating to the ability to detect faults during 'islanded' operation are under investigation. Communications options in a rural area without WiMax are also being investigated.
Date of submission of Progress Report:	8 June 2012
Report authorisation:	Jamal Cheema Smart Grid Engineering and Delivery Manager

B. CitiPower and Powercor

PROGRESS REPORT FOR PILOT/TRIAL	**Type of Test:** Victorian Government Advanced Metering Infrastructure (AMI) rollout
Company Name: **Company Contact:**	CitiPower Pty and Powercor Australia Ltd (CPAL) Peter Bryant, General Manager AMI Services
Start Date: 2006	**End Date:** On-going

Introduction and Background:

CitiPower is within the Central Melbourne area and CBD covering an area of 157 sq km and has a customer base of more than 306K. Powercor Australia covers an area of 150,000 sq km supplying electricity to regional and rural centres in central and western Victoria, and Melbourne's outer western suburbs. Powercor services approximately 700,000 distribution customers.

The scope of the Victorian AMI mandate is contained in the Department of Primary Industry's (DPI) AMI Minimum State-Wide Functionality Specification (Victoria) Release 1.1 and the Minimum AMI Service Level Specification (Victoria) Release 1.1. Further reference to the Victorian AMI Program scope is contained within relevant Victorian Government Orders in Council .

The CitiPower and Powercor (CPAL) AMI Program has been running since 2006 and has been managed in a phased approach:

- **Victorian Program Scoping (2006 – 2008)**

Industry & Government established the Industry AMI Program Scope. Government Policy & supporting Legislation was established along with the required Regulatory & Technical Frameworks and Industry governance model including the establishment of the Victorian AMI Industry Steering Committee. Initial Industry trials were undertaken by the Distribution Businesses. CitiPower and Powercor (CPAL) defined its own Advanced Metering Program along with foundation projects and initial mobilisation

- **Program Definition resulting in building capability (2007 onwards)**

Putting the right systems processes and people in place to handle this new technology and data environment.

This component developed the projects associated with the overall scope and the methodology for delivery including work breakdown structure, implementation management and change management. During this time of definition, Industry consultation and working groups were established to ensure appropriate carriage of cross industry risks and issues also focussing on customer and stakeholder management.

- **Deployment & Operations (2009 – 2013)**

Ensuring that the roll out of the required AMI technology meets the Victorian AMI Program scope and timeframes.

Ensuring that the AMI technology meets the required Minimum Functionality Specification and Minimum AMI Service Level Specification including the enablement of remote meter reading services and remote energisation services.

- **Leverage and Transition (2012 – 2015)**

Phasing and release management for the introduction of new capability and the transition lifecycle in the deployment and exchange of AMI meters and new services within National Electricity Market.

The meters are required to include the capacity to perform a prescribed set of minimum functions – refer Minimum Functionality Specification; however, not all these functions are initially utilised. The AMI services that are mandated comprise, in broad terms, the capacity to obtain better measurements of the quantity and quality of supply at a customer's premises, and the capacity to turn on or off supply at a particular customer's premises remotely.

Activating and making use of the other functions that are embedded in the AMI meters requires investment in information technology (IT) infrastructure. Such infrastructure includes the processes and systems necessary to store, manipulate, transfer and use the additional information that is collected or to use the capacity of the AMI. CPAL are progressing a number of initiatives to make use of some of the functions inherent in the AMI meters.

Enhanced Outage Management Systems trialling, Transformer Monitoring, Quality of Supply and controls and monitoring of Distribution Line Switches, Automatic Circuit Reclosers (ACR's) and Line Fault Indicators within the Electrical Network side of the business have either been initiated or are actively being considered.

Observations:

The scale of organisational change, breadth of program activity and the requirement for regulatory compliance demands tight alignment between the direction of the CPAL AMI Program and CPAL's broader strategic objectives.

The AMI program has required a major reorganisation within the Business including development of new business capabilities and support for existing operations to ensure continuity of current performance levels.

The introduction of new capability, processes and systems for the implementation of the AMI and associated new services requires considerable planning. A release strategy dealing with both internal and external dependencies with detailed testing, verification and a phased approach was adopted.

As the implementation of the AMI program proceeds, Business as Usual (BAU) metering activities will progressively transition to the AMI environment. As a result, the CPAL AMI Program will concurrently achieve regulatory compliance, leveraging and appropriate business transformation. Key elements of this approach include:

Ensuring optimum solutions are selected to meet regulatory requirements. Achieving such mandatory requirements may by default and/or at no increase in cost, leverage business improvement as well as transformation opportunities

Ensuring solutions provide an appropriate foundation to achieve medium to long-term business plans. This ensures that the Program demonstrates its support and potential direct contribution to Corporate strategy and associated Business Unit and Functional plans

Identifying, examining and implementing opportunities for further improvement and/or transformation of the business

By intentionally interweaving enablement and leveraging objectives the CPAL AMI Program delivers a quality enhanced compliance solution while establishing the building blocks for further transformation.

The roll out task for CPAL requires proactive planning and management to overcome the complication of significant diversity in customer density resulting from rural and decentralised geographies with relatively small economies of scale.

The Business commenced the rollout of AMI meters in October 2009 and has in excess of 650,000

smart meters installed as at June 2012.

Technology

CPAL selected an RF Mesh Technology solution supplied by Silver Springs Networks operating in 900 MHz ISM spectrum (i.e. in compliance with the Radiocommunications - Low Interference Potential Devices - Class Licence 2000).

Silver Springs Networks advanced meter management solution provides Network Management System (NMS) software, Network Interface Cards (NIC integrated into the meter), service and field tools, network communications devices (Access Points and Relays), multi communications network support including RF Mesh, Zigbee HAN and 3G Point-to-Point solution for out-of-mesh locations.

CPAL has adopted the following communications strategy :

Primary (>99.5% of meter fleet) – *mesh network* - has focused on RF mesh radio meter communication networks.

Secondary (<0.5% of meter fleet) – "*Point-to-Point*" – 3G modem integrated into meters – limited to where the mesh can not economically reach.

Tertiary (<0.1% of meter fleet) - a mixture of solutions including wireline or satellite connection where the Primary or Secondary solution cannot economically reach.

Backhaul – Wireless 3G Network (Telstra Carrier – selected on coverage, reliability and cost)

Meter Supply

Two Meter vendors were chosen and both suppliers integrated the SSN Network Interface Card into their meters. The meter vendor's are responsible for the supply of meters (including integrated NIC) and functional and performance compliance with specifications. The two meter suppliers are:

Landis+Gyr Pty Ltd - Australian based company with meter manufacturing in Australia and China

Secure Meters Australasia Pty Ltd – Australian based company with meter manufacturing in India

Information Technology

The AMI program represents a major change to existing IT architecture with upgraded and new applications as well as significantly increased data processing volumes and service level obligations. The increased functionality and services under AMI will require a complete transformation of IT architecture with a specific focus in moving towards a near "*real-time*" "*non stop*" environment.

The IT component of the AMI program required the adoption of relatively immature technologies with attendant risk. Vendor software systems are still maturing, particularly for Australian market rules, requiring more technical upgrades than originally planned. IT systems integration effort has been significantly higher than originally planned stretching the availability of certain IT skills.

Customer Management

Successful delivery of the AMI Program requires the active engagement of a diverse stakeholders and customer groups. Along with the implementation of new technology is the implementation of new services. The scale and complexity of the external environment requires a co-ordinated and comprehensive approach to stakeholder and customer management. The enablement of energy information to consumers and supporting this with a comprehensive education campaign is essential.

Deployment

Throughout the deployment of smart meters there has been a strong non-compromising focus on safety including a comprehensive installer training, authorisation and mentoring program and the implementation of a quality system to ensure on-going compliance with installation policies and procedures. Program to date there have been zero Lost Time Injuries (LTIs).

The Victorian industry has undertaken and number of specific independent reviews into the safety of Smart Meters. These reviews have been undertaken by the Victorian Department of Primary

Industries (DPI) and Energy Safe Victoria. These reviews may be found on the Victorian DPI website and Energy Safe Victorian website.

To date there have been 17,000 consumer installation safety defects identified. The identification and associated repair of safety defects represents a significant safety benefit to consumers as a result of the AMI Program.

The introduction of field mobile computing to support the meter rollout and ongoing AMI customer response work is regarded as essential to ensure day to day control of the programme through automating the dispatch of service orders and tracking the progress of field crews associated with exchanging and commissioning of meters and communication network equipment. The AMI rollout has also involved the use of a supply chain mobile scanning technology solution for track and trace of all new meters from supplier, via the warehouse to multiple resource providers responsible for installations.

Major findings arising at this milestone (list):

Meter Data Delivery:	In general, AMI Meters installed as part of the mass exchange process are installed as remote read with no lag time. AMI meters installed outside of the established AMI communications network for new connections will be logically converted using established market B2B transactions at such time as AMI communications network is established. The performance of the AMI communications network has been above expectation as the network communications is built out. Currently there are 600,000 AMI-capable meters remotely communicating. 450,000 AMI meters are delivering data daily to the market and retailers in line with Victorian AMI specifications for 6am (95%) and 24hr(99%) data delivery. 10 day data delivery performance may be expected to be marginally lower than 99.9% while the AMI network communication is established As the number of AMI Type 5 meters delivering daily data to the market increases, we can expect the following outcomes: Accuracy of Meter Reading Data will improve, data will be real time and remote energisation will be in 'near' real time'. Field visits associated with Remote energisation services are expected to reduce significantly. Further potential to enhance response and efficiency related to the remote resolution of customer metering issues, specifically those activities currently performed by field staff .
Remote Service checking	CPAL have devised a "meter ping" tool that the Customer Contact Centre use to interrogate the electricity supply at the customers premises whilst the customer is on the phone. Remote assessment of reported electricity outages at a customer premises has resulted in being able to confirm customer side reported outages. This has reduced wasted visits of fault crews to investigate problems at customer premises and potentially will result in avoided truck visits

Remote Meter configuration	Since the deployment of AMI meters commenced, over 12,000 meters have been remotely configured for solar customers. Solar configuration is different to normal meter set up and would normally require a site visit to change the meter. The AMI network has enabled remote configurations of meters. This has reduced the time taken for customers to have solar installations, increased customer service and reducing operational costs from avoided truck visits.
Smart Metering communications monitoring	The SSN Advanced Meter Management system provides certain tools to monitor and manage the performance of the AMI Mesh network. More specifically it enables the performance monitoring of the AMI communication network backbone elements (Access Points and Relays) and moreover provides good oversight of the Telstra network availability for backhaul. It also includes the ability to conduct trace route and meter pings, evaluate hop counts by Access Point and packets of data transmitted /received to assist in managing the AMI Network performance. These tools are rudimentary and are continuously being improved with each release.
Remote connection & disconnection	CPAL has participated within the Victorian Industry to undertake Risk Assessment reviews of the Remote Connection & Disconnection functionality. CPAL has recently commenced utilisation of this function with a number of Retailers now utilising the service which is proving a real benefit for customers. Full Retailer take up is anticipated over the following six months. Remote disconnection or reconnection are prevented from taking place in the following circumstances: Load on Meter. Known Site Defect. Special conditions such as Life support. System outages/failures. Currently there have been more than 350 remote re-energisations performed with an end of 2012 estimate of 24,000. There have been more than 500 remote de-energisations performed with an end of 2012 estimate of 36,000 and there have been more than 350 remote special reads with an end of 2012 estimate of 25,000 There has been a ‘step’ improvement in service delivery performance from the manual process. Current average duration for provision of same day remote services is 52 minutes. Currently there are in excess of 300,000 service requests performed annually. Remote re-energisation and de-energisation, when fully operational, will negate the need for field trip visits. This will deliver significant benefits to consumers with timeliness and significantly reduced service costs.
Service outage and restoration	CPAL Enhanced Outage Detection project has two main objectives; (1) Detect outages below SCADA controlled ACR’s and significantly reduce the reliance on customer feedback as the means of outage detection, and (2) Detect the presence of unrestored imbedded faults associated with large scale outages usually associated

	with wild storms. CPAL project is in evaluation mode to select the appropriate integration solution to take the “meter last gasp” signals from the AMI system as escalated input into the Outage Management System. CPAL has already developed “meter ping” capability to verify that the meter is communicating which will be deployed to detect the presence or not of imbedded outages. The data evaluation process has indicated that this project will provide significant customer service benefits as well as operational benefits. CPAL planned to have completed its evaluation phase and commence deployment in Q4 2012.
Transformer Monitoring	CPAL has commenced a pilot to monitor distribution transformer loading with two objectives in mind; (1) Better manage the asset reliability by use of actual loading on transformers rather than estimations based on energy billing information (load profile and consumption data) or having technicians installing temporary measuring instruments, and (2) Detect the presence and quantum of non-technical losses that maybe occurring on the transformer.
Powerflow analysis	CPAL have invested in an ambitious data warehouse project in order to better utilise the vast amounts of data available from the AMI system. Of specific interest is the timely extraction and availability of interval energy consumption data to assist the Sub-transmission and Distribution system planning and analysis functions. This project is well into its design phase with early pilots of data scheduled to available in Q4 2012. The expectation is that this “new” data will yield better decisions with respect to assets planning and management.
Quality of Supply event recording;	The smart meters have the ability to measure supply quality in terms of when voltage levels dip or swell out of defined regulatory limits. A current trial using the meter events data to assess low voltage information has resulted in a reduction in installation of temporary logging equipment (and subsequent truck visits) for customers who have reported voltage problems. CPAL have commenced to utilise this information to evaluate potential solutions including augmentation of the electrical network. With 60% of the meters deployed, this function is further enhanced by the availability of real time “meter ping” tool which provides the voltage level at the time of the “meter ping”.
Remote Firmware upgrade)	As discussed CPAL have deployed Silver Spring Networks (SSN) Advanced Meter Management solution which includes the Network Management System, Network Interface Cards, Access Points, Relays and two meter suppliers. The characteristic is that the NIC’s have firmware as do the meters which have meter firmware and also meter “metrology programs”. The Access Points and Relays also have firmware. CPAL have implemented E2E quality assurance, testing and defined release strategies to meet the challenges with many multiple versions, of NMS, NIC, meter, metrology and Access Point/Relay firmware. As the AMI solution has been evolving through delivery of capability and bug fixing, this has necessitated an almost constant level of firmware management across the network. The SSN

	system has been thoroughly tested for firmware management and has proven itself with several upgrades involving c 600,000 meters able to be completed over a few days.

Home Area Networks

CPAL have initiated and partnered with other market participants to provide HAN pilots since 2011. To date almost 750 devices have been deployed in residential homes and this number is set to expand as some pilots are expanded.

The goal of these pilots has been to better understand HAN support services and the role of CPAL in ensuring that customers' HAN solutions are effective. Through the pilot it has become clear than along side the technical issues that must be managed to successfully provide HAN services to customers, it will be critical for a well defined customer protection framework to be in place. This framework should cover device functionality, market roles and responsibilities, HAN linkages to existing market functions and inclusive of customer support processes.

The pilots have included customers in a variety of rural, suburban and high density sites and the ZigBee technology has been able to operate effectively in a variety of environments.

Through the pilots, CP/PAL has tested devices from ten different ZigBee device vendors. This testing has identified the numerous differences in how devices operate and communicate with AMI meters. This information will be critical to helping establish a robust system to ensure customer satisfaction with their ZigBee device.

Additional observations include;

Different devices types vary in performance within the environment of customer homes. Network range can be limited by layout, material and other electronics with the customer premise.

Binding devices to the AMI meter is most successful where the customer has been provided with suitable device training or information and is educated on device performance

Devices where customers can enter their relevant pricing information should be further explored and developed as an alternative to devices that require over the air pricing updates through the AMI.

Date of submission of Progress Report:	4th July, 2012
Report authorisation:	Peter Bryant General Manager AMI Services CitiPower Pty and Powercor Australia Ltd

C. Endeavour Energy

Progress report for Pilot/Trial	**Type of Test:** Trial
Company Name: Endeavour Energy **Company Contact:** Paul Butylewicz	**Phone Number:** 02 9853 6740 **Email:** paul.butylewicz@endeavourenergy.com.au
Start Date: 2006 **Initial trial**: 2006 **New trial:** 2012	**End Date:** **Initial trial:** **New Trial:**

Objective of the pilot/trial:

Endeavour Energy has performed several smart metering trials since 2006. The objectives of previous, and current trials are as follows:

- To test and prove the use of different communication mediums for a smart metering solution to fit the Endeavour Energy business
- 30 minute kWh interval data collection
- Implementation of residential demand management programs
- Peak demand reduction programs
- Minimum functionality testing of metering/communications systems
- Remote Firmware and Configuration updates
- Customer engagement and education by utilising the Home Area Network capabilities to supply IHDs to customers
- Network optimisation
- Distribution substation monitoring
- Customer Supply Monitoring
- Control Off-Peak hot water from the meter
- Remote Disconnection/Reconnection

Business:

To utilise smart metering to analyse customer behaviour and reduce peak demand. Analyse the use of a smart metering infrastructure to automate business processes such as disconnection/reconnection.

Consumer:

To educate the customer about their electricity consumption. Customers on peak demand programs are given incentives to join and reduce peak demand.

Technology:

To test and prove the use of different communication mediums for a smart metering solution to fit the Endeavour Energy business. Utilising the Zigbee Home Area Network to launch Demand Response (DRED) and IHD programs in an effort to reduce peak demand.

Confirmation or variation in scope:

Since 2006 Endeavour Energy has launched a number of trials that utilise different communication mediums for the backhaul of metering data. These include power-line-carrier, GPRS, RF Mesh and Ethernet.

In 2006/07, 5,000 smart meters were installed over a number of urban residential areas in Western Sydney. These meters were utilised for load profile data collection in line with the Blacktown Solar Cities Project. Two residential demand management programs came out of this project, price signalling (dynamic peak pricing) and AC cycling.

50 distribution substation monitors were installed in this area with three phase CT meters to capture the kWh and power quality from the low voltage side of the sub.

In August 2010, Endeavour Energy commenced two customer engagement programs aimed at reducing peak demand in 3 years. *CoolSaver* was aimed at customers with DRED enabled air-conditioning units which has a target of a reduction of 500kVA at 2.5kVA per customer, and *PeakSaver* was a Peak Time Rebate program which has a target for a reduction of 500kVA at 1.0kVA per customer.

In September 2010 Endeavour Energy installed a further 3,900 meters in two different urban areas in Western Sydney as part of two (2) separate RF mesh technology trials. Thorough testing of the metering and communications system compliance with the NSMP specification v1.2 was performed over a number of months.

Remote configuration and firmware upgrades have been successfully performed for upgrading meters for net metering capabilities.

Meters on edge of the trial RF mesh network had high hop counts, at times up to 14 hops. Installation of external antennas installed on the meter box has improved and optimised network statistics.

Endeavour Energy has been utilising the meter events received from the backend system to determine network related issues. To date there have been five (5) network issues detected and rectified.

IHD's and DRED device have been deployed as part of a voluntary technology trial for Endeavour Energy employees living in the RF mesh trial area.

In 2012, Endeavour Energy rolled out meters to a new fibre estate to utilise the Ethernet network in the area to backhaul data.

Endeavour Energy will soon begin trialling the use of the internal load control switch within the meters to control the off-peak hot water on both off-peak 1 and off-peak 2. The randomised delay time on/ time off function as proposed by Endeavour Energy to the metering vendor will be utilised to ensure that off-peak load are incrementally switched on and off to avoid load spikes on the system, but to also ensure that all customers have the same heating time.

Remote disconnection and reconnection of move in/move out customers is set to start soon as a trial to test the viability of remote disco/reco as a business process.

Record progress against each nominated problem/issue:	
Itemised problems/issues	**Major Findings to date**
Customer refusing installation of smart meters.	Due to the negative media backlash in the media, Endeavour Energy customers have been refusing the installation of smart metering.
Recruitment issues with *CoolSaver* Project.	The size of the potential target market of customers with dred ready air conditioners was overestimated lowering the number of participants. For this project the recruitment channels were limited primarily to two AC dealers.
Recruiting for voluntary technology trial for IHD and DRED trial utilising Zigbee SEP 1.0	Very limited recruiting possibilities, required customers that wished to be part of the trial to live within the trial area of RF Mesh (1), and have a DRED enabled air conditioning unit. Only 1 Endeavour Energy employee in the trial area has a DRED enabled air conditioning unit which has been installed with a Zigbee DRED.
Zigbee SEP 1.0 devices dropping off the HAN network	There have been a number of cases when IHDs have dropped from the HAN Network. Dual Band antennas have been installed on sites to fix reception. Also during testing, Zigbee nodes that should act as repeaters (IHDs, DRED devices) to extend the HAN network radius have failed to do so. Further testing is required with HAN device manufacturers, and the meter vendors.
Randomisation on/off for load control did not work as expected.	Endeavour Energy originally expected the random **on** time to be equal to the random **off** time, to ensure that for the use of OP hot water control, all customers would have the same heating time, and that “random” would mean that all meters would have a different “random” switching time. Two issues came out of this: 1. The Victorian DPI spec (Random load control switch delay - 3.6.4) permit dedicated load control circuits from the meter (i.e. hot water) to have the randomisation time “on” only, with fixed time off. This does not align with Endeavour Energy requirements. 2. One vendor meter used only one input to calculate the randomised switching time. Testing showed that all meters with randomised switching enabled would all switch at the same time (roughly 2 minutes). Issue resolved with a new firmware upgrade that was developed by the vendor with the assistance of Endeavour Energy which increased the number of variables taken in the randomisation algorithm.
Limitation in profile data (only consumption data is currently available)	The Victorian DPI has dictated the load profile data configurations for the Victorian roll-out, which has limited what information we can capture using some vendor meters. Under the limitations of the DPI which have been placed on some meter vendors, it’s not possible to log power quality values using the meters.

Record progress against each nominated service level:		
Service Level	**Assessment Criteria**	**Progress results**
Remote meter interval data collection	SMI FS Version1.2 Section 7.2	Power Line Carrier – Partially Conforms. GPRS - Conforms RF Mesh (1) – Conforms RF Mesh (2) – Does Not Conform Ethernet – To be trialled
Local Acquisition	SMI FS Version1.2 Section 7.3	Conforms for all systems
Load Control Contactor or Relay to control Off-Peak hot water.	SMI FS Version1.2 Section 7.6	Significant work has gone into fixing the switch time randomisation function. New production firmware created with meter vendor to allow random time **on** equal random time **off**, and to include more variables in the randomisation function to achieve diversity of randomisation values. Trial set to start in May.
Supply Contactor operation	SMI FS Version1.2 Section 7.7	All testing has performed for RF Mesh (1) trial system has conformed. Trial set to begin in May for Remote Disconnection/Reconnection of supply to move in/move out customers.
Home Area Network	SMI FS Version1.2 Section 7.9	Some minor issues in binding IHD's, and some reception issue. Trials currently in progress.
Event Recording – Quality of Supply	SMI FS Version1.2 Section 7.10	RF Mesh (1) – Conforms
Loss Of supply detection	SMI FS Version1.2 Section 7.11	Simulated Last Gasp Tests performed on RF Mesh (1) trial. Results of last gasp alarms received: DSUB outage - ~38% Feeder Outage -12% Trial Network Outage – 7.4%

Remote Meter Service Checking	SMI FS Version1.2 Section 7.12	All testing has performed for RF Mesh (1) trial system has conformed. Trial set to begin in May for Remote Disconnection/Reconnection of supply to move in/move out customers.
Over the air configuration upgrades	SMI FS Version1.2 Section 7.13	PLC – Conforms GPRS – Conforms RF Mesh – Conforms
SMI functionality specification	SMI FS Version1.2	Testing completed for RF Mesh (1) and RF Mesh (2) with >90% compliance for two metering vendors.
Zigbee HAN Requirements	HAN interface standard request for information Version 1.1	Testing done on a number of IHD's and DRED device.

Major findings arising at this milestone (list):	
Milestones	Major Findings to date
Test and prove different communication mediums for a smart metering solution	PLC – This technology is robust and self healing, however requires a data concentrator installed at every distribution substation. Technology has limited communication redundancy. GPRS - This technology is great for customers in remote location, however a third party carrier needs to be involved, and they can sometimes cause issues with communication reliability. RF Mesh (1) – The most robust and scalable technology trialled thus far. RF Mesh (2) – This system does not comply with the SMI Functionality spec. Ethernet – To be trialled
Data Collection – Read Success Rates	Daily load profile read success rate PLC – 95% GPRS - ~97% RF Mesh (1) - 99.9% RF Mesh (2) - 20% Ethernet – to be trialled

Implementation of residential demand management programs	Dynamic Peak Pricing - This program required customers to sign to a retail contract, and specially designed meters that utilised a separate register to monitor energy consumption during the dynamic peak period were required. These two conditions made this product difficult to use in an expanded program. The official results from this trial are still being analysed. AC Cycling – AC units were hard wired into control switches in the meter box which cycled the AC by physically cycling supply to the compressor. This trial was done before the development of the AS4755.3.1 DRED for Air conditioners. The official results from this trial are still being finalised.
Peak demand reduction programs	Trials are still on going. These findings are after year 1 *PeakSaver* - Average peak demand reduction = 1.7kVA per household *CoolSaver* – Average peak demand reduction = 1.3 kVA per house hold.
OTA configuration upgrades	Successful over the air (OTA) upgrades for 3 phase net metering and for OP hot water heating. Large scale firmware upgrades on entire RF Mesh (1) trial meter population to take place in the near future.
Customer engagement and education by supply IHDs to customers	Case studies with Endeavour's Energy employees indicated some behavioural change, particularly with appliance monitoring.
RF Mesh Network Optimisation	External Antenna's were installed on selected meter locations based on geographical locations that would achieve optimum RSSI values. Monitoring network statistics during and after installing 7 antennas verified that the addition of the external antennas decreased both the maximum hop count and the average read times for all meters surrounding the meter with the new external antenna.
Distribution substation PQ monitoring	There have been no business processes created to utilise this data for business purposes, however this data has been looked over internally by different branches for various reasons, i.e. seasonal network behaviour, QoS capturing e.t.c.
Customer Supply Monitoring	There have been four (4) specific types of neutral integrity issues found to date, two (2) within the LV pillar and the other two (2) within the customer meter box. Findings have been a major success as the first investigation was conducted on a customer premise where the customer had explained that she had noticed flickering lights and tingles from the taps, but had failed to contact Endeavour Energy to investigate. One high resistive joint was found which was caused by a bad contact within the service fuse housing. Sufficient damage was done to the service fuse which had failed to trip the circuit. All incidents were resolved before customers lost supply.
Demand Response Utilising Zigbee SEP 1.0	Technology has been successfully tested with a number of AS4755.3.1 compliant AC units in the Endeavour Energy smart metering laboratory with the assistance of the air conditioner manufacturers. Testing on both ducted and split systems were

	consistent with the Demand Response Mode (DRM) operational requirements for the three (3) DRM configurations as specified in AS4755.3.1. Still to be Trialled.
Controlling off-peak hot water from the meter	Analysis was performed to determine the optimised time for switching to take place ensuring sufficient heating times and avoiding the daily peak loads. The Victorian DPI spec permit dedicated load control circuits from the meter (i.e. hot water) to have the randomisation time **on** only, with fixed time **off**. This does not align with Endeavour Energy requirements. Development of the randomisation algorithm to ensure a normalised bell randomisation for load control switching. Using this technology with the randomisation function, all switching times (roughly 20 in the trial area) are rationalised down to 2 switching schedules, off-peak 1 and off-peak 2. Trial set to start in May.
Remote Disconnect/Reconnection	Trial set to start in May

D. Essential Energy

PROPOSAL FOR PILOT/TRIAL	**Type of Test:** Pilot
Company Name: Essential Energy **Company Contact:** Tony Woolfe Commercial Manager Metering Services	**Phone number/Mobile number:** 0417 535 229 **Email address:** tony.woolfe@essentialenergy.com.au
Start Date: Q1 2009	**End Date:** Dec 2012
Milestone progress report dates:	30 June 2009 – Pilot location, scope, and technology approved 30 January 2012 – Pilot Community 1 Live. 30 June 2012 – Community 1 Optimisation complete 31 August 2012 – Preliminary costs available for business case 30 September 2012 – Assessment of Technology, Cost & Benefits
Objective of the pilot/trial: Collection, recording and analysis of associated costs and benefits for an SMI deployment for Essential Energy. Assess the application and performance of selected technologies on Essential Energy's network in accordance with the minimum national functionality and service level requirements. Better understand the implementation challenges and risks associated with an SMI deployment and the interaction within a broader Intelligent Network program.	
Does the objective align with the NSSC list of required pilots/test: Yes	
Scope: The pilot will consist of deploying Intelligent Network meters within representative communities on the Essential Energy network, predominately residential customers. The proposed size of the pilot is 2 communities of approximately 2500 meters. The intent of the pilot is to install Intelligent Network meters and to remotely communicate with all metering installations emanating from a Zone Substation, providing end to end SMI capability through to a Meter Data Management System. Communication technologies proposed include Mesh Radio, Point to Point (3G). The pilot will endeavour to test all components of the current MCE functionality specification as well as gather more detailed cost and benefit information to assist in the justification of the business case for a further deployment.	

Estimated cost: Commercial in Confidence	
List of problems/issues to be tested:	
Itemise problems/issues	**Assessment Criterion/Criteria**
Meters tested not fully compliant to SMI functionality specification	SMI_FS_Version1.2_110516.doc Gap analysis to be performed
List of service levels to be tested:	
Itemise service level	**Assessment Criterion/Criteria**
As per SMI functionality specification	SMI_FS_Version1.2_110516.doc (As published on NSMP website) Technology Acceptance Framework V2.0 (As published on NSMP website)
Date of submission of Update:	25th May 2012
Proposal authorisation:	Col Ussher Executive General Manager Infrastructure Strategy

E. ETSA Utilities

PROGRESS REPORT FOR PILOT/TRIAL	**Type of Test:** PILOT
Company Name: ETSA Utilities **Company Contact:** Stephen Webb, Project Manager	08 8404 9411/0403 582 090 webb.stephen@etsa.com.au
Start Date: December 2010	**End Date:** TBD
Milestone Date: July 2010 – Pilot location and scope approved December 2010 – Proof of concept live October 2011 – SMI established sans communications June 2012 – SMI communications plus DRED installations to begin January 2013 – trialling DRED during extreme summer events June 2013 – Assessment of technology, costs and benefits.	

Objective of the Pilot/Trial:

The objective of this pilot is to determine the applicability of direct load control when deployed in conjunction with smart metering infrastructure (SMI) within an Australian distribution network. Assess the opportunity to integrate advanced electricity network sensing to develop an automated demand response to changing electricity network conditions.

Business: Develop understanding of the use of direct load control and develop control strategies for maximum load reduction with minimal customer impact. Determine the cost benefit analysis for the deployment of direct load control in conjunction with SMI and advanced network sensing.

Consumer: Develop an understanding of customer's air conditioning equipment and its typical use. Measure customer participation rates for different incentives and monitor customer response to varying load reduction control strategies.

Technology: Source or develop demand response enabling devices for use with air conditioning equipment within Australia in association with SMI utilising the HAN functionality. The deployment of various sensors within the LV and MV electricity networks for both load and fault detection.

Confirmation or variation in Scope:

Initial trials 2005 to 2007 utilised simplex communications. Cost benefit analysis undertaken in 2007 showed that a positive societal benefit could be achieved if additional supply management functions included in any deployment. Prior to availability of SMI some early trials were undertaken to prove the concepts for the following functions.

Functions in SMI FS	Description
7.7	Remote connect and disconnect
7.8	Supply Capacity Control
7.10	Quality of Supply recording
7.11	Meter loss of supply and detection
7.13	Remote configuration
7.14	Remote software upgrades
7.9	Home Area Network

With the advent of SMI further development efforts to develop demand response enabling devices to use the Home Area Network functionality were undertaken.

Approximately 4500 meters to be deployed to all whole current metering installations supplied from one Zone substation. To date approximately 3,500 meters are installed on residential sites.

The communications technology to be utilised will be a 4G WIMAX communications network. Early signal strength mapping is nearly completed and limited numbers of communications modules are deployed to selected field sites.

Demand Response Enabling Devices will be deployed as part of a voluntary demand response program amongst those residents with SMI installations. Testing the DRED with SMI has been undertaken in laboratory environments and final software refinements are underway.

Record progress against each nominated problem/issue/service level:

List problem/issue/service level	**Assessment Criterion/Criteria**	**Progress results**
Service Level: Assess demand response	% achieved	Range of response 18% to 35% - firm response equivalent to selected cycling rate achieved over multiple events.
ISSUE: Control of advanced air conditioner systems – compressor curtailed only. Fans continue to operate normally.	Control all types	Control methods identified and implemented
ISSUE: Modification to customer metering enclosure to accommodate antennas for wireless communications	% of selected customers with completed installs	Customer response to be tested.

Major findings arising at this milestone (list):

Itemise problems/issues	**Major finding to date**
Customer participation rates	The customer participation varies dramatically between suburbs and regions. Range of response from 5% to >30% - substantial efforts may be required to recruit customers to trials.

Demand response over extended heatwave events	Response achieved over extended 14 day heatwave event 2008 and 10 day heatwave event in 2009.
Customer comfort levels	No reported effect on customer comfort levels for switching levels of 25% ie 7.5 minutes off in each 30 minute period – trialled in ambient temps up to 44C. Some customers able to sustain up to 50% switching ie 15 minutes off in each 30 minute period. (older homes generally) – trialled in ambient temps up to 41C.
Remote Connect/Disconnect	To be trialled..
Supply capacity control	To be trialled
Quality of supply	To be trialled
Meter loss of supply and detection	Business Rules need consideration for response to outage notifications. Outages not related to network failure also reported which can result in unnecessary attendance. (Electrician working on customer site – meter isolator also main switch.) Further consideration required..
Remote configuration	To be trialled
Remote software upgrades	The update of software has been undertaken on a limited basis with considerable success. The number of firmware updates are more than expected but as the required functionality is reached the pace of updates will slow. This will become more manageable with time.
Interoperability between devices	This is challenging with different interpretations of the same standards between vendors. Purchasing equipment which meet the same standards does not guarantee interoperability. With customer's bringing their own devices to this area it will require significant work to ensure their connectivity is seamless – a list of approved devices will need to be developed.
Date of submission of Progress Report:	30th May 2012
Report authorisation:	Doug Schmidt General Manager Network Management ETSA Utilities

F. Jemena Energy Portal Trial

PROGRESS REPORT FOR PILOT/TRIAL	**Type of Test: Trial**
Company Name: **Company Contact:**	Jemena Electricity Networks (Vic) Ltd Michael Macfarlane SmartNet and Customer Service Strategy &Technology Manager 0402 297 275 Michael.Macfarlane@jemena.com.au
Start Date: December 2011	**End Date:** June 2012
Milestone Date: **Date:** action/activity/achievement	NA

Objective of the Pilot/Trial:

In response to the introduction of Advanced Metering Infrastructure and the Victorian government mandate to install smart meters for all small to medium customers; Jemena have developed and commissioned an end to end AMI solution compliant with the Victorian Minimum functional and service specifications. While the Jemena AMI project deliverables meets the obligations of the mandate it does not deliver direct Smart Meter consumer benefits that could be enabled by a Smart Meter.

The Jemena Customer Portal trial is designed to explore the technical, regulatory, security, privacy and process aspects of a Distributor Led Consumer Energy Portal and business to business Facilitated Access of AMI/Smart Meters.

Objectives:

- Develop and trial a self service online application that can help customers manage their electricity usage with consumption monitoring and home energy assessment tools.
- Facilitate access to AMI/Smart Meter enabled services for the Consumer and Industry
- Address regulatory, legal and privacy issues associated with the delivery advanced Smart Meter services
- Develop process and automation to ensure and efficient and timely Smart Meter consumer experience
- Select and engage trial candidates from Employees, their families and some VIPs.

Business:

- Provide a capability for a customer to self manage their own connections of ZigBee Home Area Network Devices
- Assess the potential for Demand Reduction Energy Savings possible through Energy Portals
- Allow customers to understand interval data derived from Smart Meters and the impact of Time of Use Tariffs against their own energy profile
- Ensure the Portal solution allows for consumer protection of their personal information (PI) (including

energy data) and that only Authorised Parties can access the consumer's data and PI.

- Allow Retailers and 3rd Parties facilitated access to Smart Meter enabled services (principally managing HAN devices)
- Assess the Regulatory Framework impacts and risks of distributor Led Energy Portal
- Review Outcomes, lessons learnt and recommend next steps.

Consumer:

- Provide electricity usage in an easy to understand format (energy, cost and CO_{2e})
- Allow customers access to historical energy data
- Allow customers to compare their energy usage against suburb averages for the same period
- Allow customers to set energy targets
- Allow customers to enter Tariff structures and rates
- Allow customers to manage HAN device connections
- Allow customers to register for notifications of power outages

Technology:

- Online accessible content for Consumer Energy Portal for authorised parties
- Security Architecture and protection for online threats including penetration testing
- Application Programming Interface for Retailers and third party facilitated access to Smart Meter enabled services (HAN Binding and messaging)
- Scaled solution suitable for a full scale deployment (Capacity and Performance Testing)

Confirmation or variation in Scope:

As Above

Record progress against each nominated problem/issue/service level:

List problem/issue/service level	**Assessment Criterion/Criteria**	**Progress results**
Customer Engagement	Customer sentiment to Smart Meters has been very low with a perception that benefits of Smart Meters only flow to the Distributor. The portal trial is designed to empower the consumer with tools that will allow them to save energy, potentially save money and prove the	From the limited number of trial participants (60) it is clear that all active users of the portal discover benefits from understanding their energy profile and associated analytics. Jemena Customer Engagement has improved in offering the Energy Portal as a practical benefit. Some previously antagonistic Smart Meter customers have turned to positive outcomes following being given access to the Portal and direct

	societal benefits of Smart Meters.	access to their energy data. It is also evident that many participants active engagement in the portal trial is short lived.
Automation / Self Service	Customer self service HAN device binding is seen as a principal outcome to achieve high level of automation and low or zero touch from the distributor	Binding can now be established through the Web Portal GUI or via the Portal API. Self service has been achieved however some customers require support through the process. (Manual entry of HAN device MAC address and Install code is still required for a secure bind to be established).
Privacy	Framework, Policy and Process established that protects the consumer in line with the National Privacy Principles and Jemena Privacy Policy.	A framework is in place which allows for customer registration verification. The framework requires participation from the customers retailer where the Distributor does not have adequate records on hand to verify the customer.
Regulatory	Assess laws, rules, regulations and market procedures to ensure ongoing compliance without inhibiting customer direct access to energy consumption data	Established a working framework and understanding of the compliance requirements for a distributor led portal. Ongoing participation and industry work is required to bring the rules inline with the advent and growth of Smart Meters in Victoria and Australia.
Facilities Access	Commence facilitated access for Retailers and or third parties energy service providers	Developed and documented an API that allows authorised retailers and third parties access to HAN related Smart Meter enabled services. - Bind HAN Device - Unbind HAN Device - Send HAN Message - Execute HAN Diagnostics
Date of submission of Progress Report:	30th June 2012	
Report authorisation:	Richard Twisk General Manager Electricity Networks	

G. SP-Ausnet

PROGRESS REPORT FOR PILOT/TRIAL	**Type of Test:** Victorian Government Advanced Metering Infrastructure (AMI) rollout
Company Name: **Company Contact:**	SP Ausnet John Theunissen, Director Smart Networks Networks Strategy and Development Division
Start Date: 2009	**End Date:** On-going

Introduction and Background:

SP AusNet is one of the Victorian electricity distribution network businesses responsible for implementing the Victorian Department of Primary industries (DPI) government mandated smart metering roll-out within its network area.

Delivery of the AMI program is separately reported via the normal regulatory reporting channel processes and so comments within this document that relate to the mandated program activities take the form of high-level observations and learning experiences, rather than formal progress reporting.

SP AusNet took a decision early on to work towards realising the various network benefits that could be achieved from the smart metering data, as soon as the data became available and so various initiatives are being progressed, albeit not yet within a "production" environment. This report provides an overview of these as well as preliminary observations or findings.

Separately, SP AusNet initiated a 1000 customer "In-Home Display and Energy Management System" trial in 2010 to better understand customer behaviours and responses when they have real-time access to their energy usage information, in particular also to explore their response to requests to reduce loads at times of network peak demand. This trial is well advanced but is not yet at a stage where formal feedback is possible around the learning, so the comments in this report relate mainly to the trial preparation, applied technologies and initial deployment of the equipment to customers.

Observations relating to Victorian Government mandated AMI Program:

At this stage the Victorian AMI deployments are well advanced and are providing valuable Australian case study insights. The following observations represent a collection of SP AusNet experiences as the program has been outworked:

2.1. Commercial contracts: Establishing commercial contracts within an environment where there is not yet product maturity (based on functional specifications for which market products are not yet available) is challenging and leads to continued uncertainty over product development, testing, performance and overall project scope and cost;

2.2. New technology application: New technology application within a large scale deployment requires sustained investment in configuration management and a highly structured process-based implementation approach;

2.3. Scale: The scale of the Victorian AMI program has been such that it could not be handled like any other large network infrastructure replacement/augmentation traditionally implemented by the utility. This resulted in a relatively large degree of separation from utility Business as Usual (BAU) undertakings which meant that there were increased challenges and complexities in aligning strategy, architecture, product/system choice and operating models across the enterprise;

2.4. End to End Functionality: Achieving composite end-to-end functionality is far more onerous and resource intensive than achieving satisfactory system-by-system based operation;

2.5. Integration: Investment in the "back-end" systems and in systems integration activities has proven to be significantly more than what was anticipated;

2.6. Customer engagement: The socio-political environment surrounding the Victorian AMI roll-out has compounded effective delivery of the program and it is clear that effective customer engagement is vital for these types of mass technology deployments or transformation initiatives;

2.7. Remediation: The cost of remedial activities increases by orders of magnitude from design through to the installation/operations stage, even though moderated by centralised configuration management;

2.8. Data availability: Visibility of the smart metering data has proven to be highly illuminating so far, and there is little doubt that substantial network benefits (both within and additional to the government business case) may be enabled by the AMI deployment and that many of these outcomes should also ultimately benefit connected customers.

Major findings arising at this milestone (list):

As the AMI program is progressively deployed, it is possible to access and use a growing database of smart metering data for network purposes. The pilot and trial activities in this regard have focussed on improving quality and reliability of supply, asset utilisation, solar PV integration and reducing safety risks. Some of the more prominent activities are briefly outlined below:

Supply voltage profiles:	Following initial indications from asynchronous smart meter events (eg fault messages and alerts) it became clear that 240V customer connection voltage profiles in certain areas of the electricity distribution network were higher than the normal supply envelope. To properly evaluate this, special meter read "policies" were deployed whereby the voltage at each selected meter within those areas was read every two minutes over a period exceeding one week. From this, accurate voltage profiles were able to be obtained. When one compared the individual voltage profiles within a geospatial environment one could conclude that there were improvement opportunities. Following further analysis of the data in conjunction with network planning staff (which included a radial plot of the voltage ranges for meters connected to end customers supplied off a particular Zone Substation), adjustment of transformer tap positions was actioned and the respective customer voltage profiles have been improved. This process has been outworked at several Zone Substation supply areas already and this quality of supply improvement process will continue into the future as more data becomes available and in conjunction with other operational and network planning activities;
Loss of neutral connection	On inspection of the five minute interval based smart metering voltage data, it became evident that one could reliably determine from the waveform the condition where a discontinuity existed in the neutral screen of the 240V service connection. This means that one can effectively reduce the risk of "tingles" and possible electrocution from a person touching plumbing ware in the premise. A proof-of-concept application has been successfully developed and the formal development of the functionality is underway. Once completed, this will be implemented across the population of smart metering installations (via remote deployment of a new policy);

Detection and analysis of solar PV installations within the network	Interrogation of the smart metering data enables one to reliably determine the presence of embedded generation (eg. solar PV) at specific metering points. This has proved useful in validating the SP AusNet solar PV connection database, detecting any "unauthorised" generation connections, as well as in calculating the collective contribution of locally "exported" power within specific Low Voltage (LV) cell networks in relation to the utilisation of the distribution transformer substation feeding that LV cell network
Smart Metering communications monitoring	Using the meter management system and the data from the smart meters, several applications have been developed to provide effective monitoring of the smart metering communications network. These include displaying the signal strength of the WiMAX communications to each meter as well as various metrics associated with the communications to a specific meter that relate to the reliability of the communications link and the exchange of data between the meter and the meter management system
Brown-out" detection	A proof-of-concept application has been developed and successfully proven that detects a single phasing condition on a three phase LV supply or an abnormal connection service condition that could result in potential appliance damage within the premise if not actioned immediately. Once fully developed and implemented, this application will enable the automatic de-energisation of the premise until the supply problem is resolved, thus reducing the risks of plant and equipment damage
Service outage and restoration visualisation	When network outages occur and multiple customers are off supply, it can take a significant amount of time for the network control centre to discover the full extent of the network service interruption. An application is being designed using smart metering data and communications response information from the meter management system that will ultimately, once fully developed and implemented, enable a more efficient method of reliably determining outage information and shorter service interruption times
Phase identification	One of the major issues for electricity network service providers is not having a reliable LV customer connectivity model (most utilities internationally have never had an effective means of documenting, maintaining and validating which LV customers are connected to which distribution substation). SP AusNet is currently engaged in proof-of-concept analytical work that uses the smart metering data (analogue measurement quantities) to determine to which phase a specific customer is connected. Once fully developed and implemented, this will ultimately enable greatly improved planning and operational management of the LV network;

Plant utilisation factor	One of the key components in managing the utilisation of electricity distribution assets and the quality of service experienced by the connected LV customers is to be able to know and understand the loading profiles of each distribution transformer. If this is known then significant network planning and life cycle efficiencies can be realised, the benefits of which ultimately flow to the customer base. Proof-of-concept work is presently being undertaken, in conjunction with the previous point, to reliably determine the per-phase loading on each distribution transformer using smart metering analogue and metering data;

Customer In Home Display and Energy Management System Trial

SP Ausnet initiated a 1000 customer trial in 2010. Although well advanced, the trial is not yet at a point where formal reporting can occur. At this stage about 180 customers have the equipment installed in their homes, the majority of which are actively engaging in the trial program.

The intent of the trial was to establish and measure customer behaviour and response to having real-time access to their energy usage information, per selected appliance and for the home in total. In addition, the technology enables trial participants to configure “smart controls” for their home and to remotely control and monitor appliances via various media (iPhone, iPad, iTouch, Internet web access).

SP AusNet has partnered with smart metering provider Landis & Gyr in the trial and the IHD/EMS technology is being provided by GreenWave Reality.

As the trial has progressed through the incubational stages through to practical implementation in the field the following high-level observations have been made:

4.1. When the trial was first initiated, the product/service offerings in the market place were reasonably immature. In this regard, choice of vendor becomes key, together with an acknowledgement that there will need to be a continuing journey with the vendor as the product/system becomes more mature or is adapted to the Australian market. For SP AusNet this has been a favourable experience however it could well have been otherwise;

4.2. It is beneficial to have a friendly or trusted group of trial participants (preferably internal to the company) with whom one can carry out any potential experimentation or “proving” of the technology before rolling it out to external customers;

4.3. Interdependency with the smart metering environment is something that needs to be well managed. Security and interoperability testing requirements are high and can be resource intensive;

4.4. Once the equipment is installed in customer homes, it is important to maintain an effective monitoring and operations regime in order to be able to appropriately respond to customers when they have a query. In this regard there is an ongoing resourcing commitment;

4.5. The trial consisted of both DIY “self-install” and professional installation. Both methods have worked. The professional installation appears to be less problematic and there are less operational performance issues;

4.6. Initial informal customer feedback has been quite positive.

Date of submission of Progress Report:	19 June 2012
Report authorisation:	John Theunissen, Director Smart Networks Networks Strategy and Development Division

H. United Energy

PROGRESS REPORT FOR PILOT/TRIAL	**Type of Test:** Trial
Company Name: **Company Contact**:	United Electricity Distribution (Vic) Ltd Darryn McDonald General Manager Customer and Market Service 03 8846 9707 0407 744 872 darryn.mcdonald@ue.com.au
Start Date: December 2011	**End Date:** Dec 2012
Milestone Date: Date: action/activity/achievement	NA

Objective of the Pilot/Trial:

In response to the introduction of Advanced Metering Infrastructure and the Victorian government mandate to install smart meters for all small to medium customers; United Energy have developed and commissioned an end to end AMI solution compliant with the Victorian Minimum functional and service specifications. While the United Energy AMI project deliverables meets the obligations of the mandate it does not deliver direct Smart Meter consumer benefits that could be enabled by a Smart Meter.

The United Energy Customer Portal (called Energy Easy) trial is designed to explore the technical, regulatory, security, privacy and process aspects of a Distributor Led Consumer Energy Portal and business to business Facilitated Access of AMI/Smart Meters.

Objectives:

- Develop and trial a self-service online application that can help customers manage their electricity usage with consumption monitoring and home energy assessment tools.
- Facilitate access to AMI/Smart Meter enabled services for the Consumer and Industry
- Address regulatory, legal and privacy issues associated with the delivery advanced Smart Meter services
- Develop process and automation to ensure and efficient and timely Smart Meter consumer experience
- Select and engage trial candidates from Employees, their families and network customers through a limited promotional campaign.
- Support the Government's initiative of providing In home Displays (IHDs) to consumers under the Victorian Energy Efficiency Target (VEET) scheme by providing binding capabilities via the Energy Easy portal,
- The trial is capped at 5,000 customers.

Business:

- Provide a capability for a customer to self-manage their own connections of ZigBee Home Area

Network Devices

- Assess the potential for Demand Reduction Energy Savings possible through Energy Portals
- Allow customers to understand interval data derived from Smart Meters and the impact of Time of Use Tariffs against their own energy profile
- Ensure the Portal solution allows for consumer protection of their personal information (PI) (including energy data) and that only Authorised Parties can access the consumer's data and PI.
- Allow Retailers and 3rd Parties facilitated access to Smart Meter enabled services (principally managing HAN devices)
- Assess the Regulatory Framework impacts and risks of distributor Led Energy Portal
- Through the VEET scheme, it gives accredited businesses the ability to offer residents discounts and special offers on selected energy saving products (eg In- home Displays)..
- Review Outcomes, lessons learnt and recommend next steps.

Consumer:

- Provide electricity usage in an easy to understand format (energy, cost and CO_{2e})
- Allow customers access to historical energy data (up to a four hour delay
- Allow customers to compare their energy usage against suburb averages for the same period
- Allow customers to set energy targets
- Allow customers to enter Tariff structures and rates
- Allow customers to manage HAN device connections (eg In Home Displays)
- Allow customers to register for notifications of power outages

Technology:

- Online accessible content for Consumer Energy Portal for authorised parties
- Security Architecture and protection for online threats including penetration testing
- Application Programming Interface for Retailers and third party facilitated access to Smart Meter enabled services (HAN Binding and messaging)
- Scaled solution suitable for a full scale deployment (Capacity and Performance Testing)

Confirmation or variation in Scope:

As Above

List problem/issue/service level	**Assessment Criterion/Criteria**	**Progress results**
Customer Engagement	Customer sentiment to Smart Meters has been very low with a perception that benefits of Smart Meters only flow to the	From the limited number of trial participants to date (450) it is clear that all active users of the portal experience benefits from understanding their energy

	Distributor. The portal trial is designed to empower the consumer with tools that will allow them to save energy, potentially save money and prove the societal benefits of Smart Meters.	consumption and associated analytics. United Energy customer engagement has improved in offering the Energy Portal as a practical benefit. Some previously negative / antagonistic Smart Meter customers have turned positive as a result of being given access to the Portal and direct access to their energy data. It is also evident that many participants active engagement in the portal trial is short lived.
Automation / Self Service	Customer self-service HAN device binding is seen as a principal outcome to achieve high level of automation and low or zero touch from the distributor	Binding can now be established through the Web Portal GUI or via the Portal API. Self-service has been achieved however some customers require support through the process. (Manual entry of HAN device MAC address and Install code is still required for a secure bind to be established).
Privacy	Framework, Policy and Process established that protects the consumer in line with the National Privacy Principles and United Energy's Privacy Policy.	A framework is in place which allows for customer registration verification. The framework requires participation from the customer's retailer where United Energy does not have adequate records on hand to verify the customer.
Regulatory	Assess laws, rules, regulations and market procedures to ensure ongoing compliance without inhibiting customer direct access to energy consumption data	Established a working framework and understanding of the compliance requirements for a distributor led portal. Ongoing participation and industry work is required to bring the rules in line with the advent and growth of Smart Meters in Victoria and Australia.
Facilities Access	Commence facilitated access for Retailers and or third parties energy service providers	Developed and documented an API that allows authorised retailers and third parties access to HAN related Smart Meter enabled services. - Bind HAN Device - Unbind HAN Device - Send HAN Message - Execute HAN Diagnostics
Date of submission of Progress Report:	30th June 2012	
Report authorisation:	Darryn McDonald General Manager Customer and Market Services	

I. Western Power

Company Name: Western Power

Company Contact: Mike Davidson, Branch Manager, Smart Grid Development

Contact details: mike.davidson@westernpower.com.au

Milestone Dates

Milestone	Implementation Date
Start date	July 2008
End date	December 2011
Commence project	July 2008
Business requirements	December 2008
Vendor assessment & Contract Negotiation	December 2009
Contract and Order placement	January 2010
Commenced rollout of 2,200 In Home Displays (IHDs) with remote configuration of tariff pricing.	January 2010
Communication Network Deployed	April 2010
Network Management Systems (test & production) in service	May 2010
Commencment smart meter deployment	May 2010
Implementation of AMI - Half-hourly consumption - Four hourly remote reading - Daily half hour Interval data provision to WA market - Four hourly collection of events - Enablement of real time outage, tamper and power quality alarms - Remote software and meter program configuration - Import/Export metering - Remote time clock synchronisation - Power factor measurment	June 2010

Remote connect/disconnection	October 2010
Home Area Network using Zigbee wireless open standard	October 2010
Commenced air conditioning (AC) demand management load control trial using smart meter infrastructure, Zigbee wireless and specially developed SEP01 demand response enabling device (DRED).	December 2010
Completed testing on Import/export capable IHD	January 2011
Completed ten AC load control events over 2010/11 summer (year one of two).	March 2011
Deployed Import/Export capable IHD	July 2011
Tested integration with data historian	July 2011
Completed Testing and Deployment of Gross metering on 2nd element of single phase smart meter	September 2011 September 2011
Tested new Smart Grid communication antenna type	October 2011
Upgrade of Network Management system to v4.2.18	October 2011
Tested and deployed Zigbee repeater technology	November 2011
Completed testing of Point to Point 3G communication solution	February 2012
Completed testing of Landis + Gyr CT smart meter	February 2012
Commenced data analytics	February 2012
Developed designs for installation of SG communication infrastructure in underground network areas	March 2012
Completed nine air conditioner demand management events over 2011/2012 summer (year two of two)	March 2012

Developed Event and Alarm management framework	March 2012
AA3 ERA draft decision	March 2012
Tested automated Meter tamper alarm service order creation	April 2012
Developed and tested tariff comparator	April 2012
Tested automated Location data synchronisation between NMS and MDM	April 2012

Objective of the pilot:

The Program is to implement projects which support the business strategy of developing an enabling platform to meet future demands for sustainable energy solutions. As the projects become embedded in the business we expect acceleration in the adoption of new technologies, a lowering of power delivery costs whilst improving energy efficiency, reduced carbon pollution and increasing growth in renewable energy forms. In addition, the Program is designed to better connect Western Power with its customers and community through the provision of creative energy alternatives.

In summary, the pilot is designed to:

examine how to organise the network to leverage range of benefits of digital technologies

test costs and understand benefits

explore integration requirements, both technical and organisational

understand full range of business' change requirements

test our deployment capabilities

test the new technology and our ability to utilise infrastructure and data

identify changes to technical and planning standards and associated risks

build better relationships with other beneficiaries of improved grid capabilities: retailers, generators, other utilities, Regulator

bring innovation closer to home by building links with universities, CSIRO and research institutions so as to inject their expertise into our business

enable new business models and partnering opportunities to be explored

provide opportunities to leverage smart meter multi-utility capabilities (work with water and gas utilities)

recruit new skills and develop exciting opportunities for our current staff

reassure the community, State Government, the Western Power Board, Executive, Regulator and staff that future investments would be prudent

Confirmation of Scope:

The Smart Grid Foundation Program proposes to implement a diverse Program of initiatives including:

- Smart Grid project
- 8,676 smart meters in Eastern region of Perth
- 2,200 smart meters at edge of grid location to test communications capabilities (Denmark and Walpole)
- Mesh communications system
- Test smart grid for the ability to enable dynamic management of loads, direct load control, automated meter reading (AMR), remote connect/disconnect, theft identification, and all MCE functionality
- Also includes establishment of Home Area Network (HAN), time of use tariffs and in-home communications with customers regarding energy consumption
- Metering data management systems interfaced to current systems to enable full interval data management
- Changes to regulations, technical standards and policies to support new energy solutions;
- Communications and change management including business process changes, training and staff support for the transition to new business operations;
- Development of new business model to support the achievement of the objectives of the Smart Grid/AMI;
- Engagement with:
    - Retailers, generators and other utilities to explore the costs, benefits and risks for each stakeholder
    - National smart grid initiatives, working groups and steering committees to ensure alignment and sharing of “lessons learned”
    - CSIRO, universities and industry groups to bring skills, expertise and innovation into the team

The metropolitan segment of Western Power’s Smart Grid project is carried out as part of its Perth Solar City commitments.

Perth Solar City is part of the Federal Government’s $94 million Solar Cities initiative, which brings together industry, business, government and community to come together and change the way they produce, use and save energy.

Perth Solar City is the platform for Western Power’s metropolitan smart metering infrastructure network, the air conditioning Direct Load Control trial and the PV Saturation Trial.

Under Perth Solar City Western Power has also supported Synergy in the delivery of In Home Displays (IHDs) to assist metropolitan smart meter recipients to track their energy consumption.

In Denmark and Walpole, Western Power’s smart grid activities are underpinned by the Green Town program. This internally funded program combines education and behaviour change programs, rebates and technology to assist the community to reduce peak consumption.

Experiences so far:

Is the SMI FS prudent/fit for purpose?	The national smart metering infrastructure minimum functionality specification has been developed in accordance with the objectives from the Ministerial Council on Energy Policy Objectives. Western Power deployed meters prior to the National Smart Metering Program (NSMP) finalising the minimum specification. Testing of the meter functionality deployed by Western Power has confirmed the functions common to the NSMP specification as fit for purpose. Western Power is not able to comment on the functions not tested as part of its trial deployment (refer to gap analysis).
Is the SMI FS technically feasible?	The smart meter infrastructure deployed by Western Power has proven it is technically feasible to deliver the functionality capable of meeting the objectives of the Ministerial Council on Energy. Western Power's experience is that the functions that can be delivered by upgrades to firmware/software are possible even with the infrastructure deployed in Western Power's trial locations. However, some functions require a hardware change to support functionality not supported in the current deployed smart meters.
Recommend whether the SMI FS v1.2 should be reviewed/advise of shortfalls	The Home Area Network space has been significantly developed in the SMI. However, whilst most of the requirements listed are warranted, there are cases of misalignment with the Smart Energy Profile v2.0. Overall, the SMI is both robust and achievable in its current state.

SMI Functional Specification Gap Analysis

The smart meters and network management infrastructure procured were based on the Victorian DPI specification. The gap analysis against the SMI functional specification is provided below. Note that only deviations are noted in the gap analysis.

Minimum Functionality	Tested	Used in Production
1. Measurement and Recording	YES	YES Planned to deploy CT Meters by 1st half of 2012
2. Remote Acquisition	YES Planned to test remote acquisition of multi-utility (water) metering during 2nd half of 2012 using the HAN	YES Planned to deploy remote acquisition of multi-utility (water) metering during 2nd half of 2012 using the HAN
3. Local Acquisition	YES	YES
4. Visible Display and Indicators on Meter	YES	YES
5. Meter Clock Synchronisation	YES (AWST) The time synchronisation event does not indicate the size of time adjustment	YES (AWST)
6. Load Management through a Control Load Contactor or Relay	LIMITED	LIMITED Limited number of hot water systems are connected to the Load Controlled element which is scheduled to switch ON between 9 pm and 7 am.

Minimum Functionality	Tested	Used in Production
7. Supply Contactor Operation	YES	YES Monitor Supply is not used
8. Supply Capacity Control	PARTIALLY	NO
9. Home Area Network using an Open Standard	YES Planned to test SEP 2.0 support in 2nd half of 2012 SMI shall support the setting of a commencement date is not currently supported SMI currently does not support setting local time offset in the ESI and making the offset available to the HAN device SMI does not support communication of supply capacity control limits to HAN devices SMI does not support ability for customers to override load control schedules associated with HAN devices Remote Service checking is not supported by the ESI Time of Use (TOU) rate structures are not correctly supported by the SMI – the calculation of accumulated cost is incorrect when a TOU structure is used Future tariffs are not currently supported Planned to test remote acquisition of multi-utility (water) metering during 2nd half of 2012 using the HAN	YES for all supported aspects Planned to deploy remote acquisition of multi-utility (water) metering during 2nd half of 2012 using the HAN
10. Quality of Supply & Other Event Recording	YES Planned to test Customer supply monitoring in 2nd half of	YES

Minimum Functionality	Tested	Used in Production
	2012	
11. Meter Loss of Supply Detection	YES	LIMITED Currently manually monitored. Integration with back office system not turned ON due to false power traps from older meter firmware
12. Remote Meter Service Checking	YES	YES
13. Meter Settings Reconfiguration	YES SMI shall support an effective data and time for all meter settings reconfiguration is not currently supported	YES
14. Software Upgrades	YES	YES
15. Plug and Play Device Commissioning	YES	YES
16. Communications and Data Security	YES	YES
17. Tamper Detection	YES	YES
18. Interoperability for Meters/Devices at Application Layer	N/A	N/A
19. Hardware Component Interoperability	3G modem connectivity to meter via Ethernet port successfully tested	Pilot Test completed in 2nd half of 2011 with wider rollout planned in 1st half of 2012
20. Meter Communications: Issuing Messages and Commands	YES	YES Priority override and Emergency Supply

Minimum Functionality	Tested	Used in Production
		capacity limit command has yet to be planned
21. Customer Supply (Safety) Monitoring	NO Functionality is not currently available to Western Power. Planned to test functionality in 2nd half of 2012	NO

Progress against each nominated service level:

Minimum Functionality	Performance Level (Assessment Criteria)	Performance Result
1. Measurement and Recording	N/A	N/A
2. Remote Acquisition	Daily meter readings - All data from: - 99% of the meters within 4 hours after midnight - 99.9% of the meters within 24 hours after midnight Individual meter reads - Action performed at: - 95% of meters within 5 minutes - 99% of the meters within 10 minutes	Half hourly interval data read from day one of implementation Daily meter readings – 11,000 smart meters - Conforms - 99.8% of meters within 24 hours after midnight (lag in processing of removed meters which affect this number. The existing meter removal business process is not designed for real-time data processing) Individual meter read performance is yet to be tested based on criteria defined in 7.2.2.1.2 b) of the SMI Functional Specification

Minimum Functionality	Performance Level (Assessment Criteria)	Performance Result
3. Local Acquisition	The local communications port shall support the acquisition of 35 days of a single interval energy channel of 30 minute trading intervals and all energy data within 14 seconds The stated SMI performance level shall be maintained under all test conditions outlined in relevant Australian Standards for meters.	Non compliant: Acquisition of data takes longer than 14s due to conflict of priority between RF and optical ports.
4. Visible Display and Indicators on Meter	N/A	N/A
5. Meter Clock Synchronisation	Meter clock shall be maintained within 20 seconds of WST	Conforms
6. Load Management through a Control Load Contactor or Relay	**Group of meters -** Action performed at: - 90% of meters within 5 minutes **Individual meters -** Action Performed at: - 95% of meters within 5 minutes - 99% of the meters within 10 minutes	Group meter performance is yet to be tested based on criteria defined in 7.6.2.1.1 d) of the SMI Functional Specification Individual meter performance is yet to be tested based on criteria defined in 7.6.2.1.2 b) of the SMI Functional Specification
7. Supply Contactor Operation	**Individual meters -** Action performed at: - 95% of meters within 5 minutes - 99% of the meters within 10 minutes	With Western Power's Smart Grid architecture, it is prohibitive to test Individual meter performance based on criteria defined in 7.7.2.1.1 b) of the SMI Functional Specification. However, of the reduced sample size, 99% of meters performed within 5 minutes

Minimum Functionality	Performance Level (Assessment Criteria)	Performance Result
8. Supply Capacity Control	**Group of meters -** Action performed at: • 90% of meters in 10 minutes • 99.9% of meters in 1 hour **Individual meters -** Action performed at: • 95% of meters within 30 minutes • 99% of the meters within 1 hour	Group of meters – Functionality available but not yet tested. Possibly 2nd half of 2012. Individual meters – Functionality available but not yet tested. Possibly 2nd half of 2012.
9. Home Area Network using an Open Standard	**Group of meters -** Action performed at: • 90% of meters in 5 minutes Individual meters (Load Control) - Action performed at: • 95% of meters within 5 minutes • 99% of the meters within 10 minutes Individual meters (Acknowledgement) - Action performed at: • 95% of meters within 30 minutes • 99% of the meters within 1 hour	Group of meters • Limited messaging trials carried out to date with 250 customers. Further tests planned in 2nd half of 2012 • For load control events over the HAN, performance level conforms Individual Meters (Load Control) • Conforms • Conforms Individual meters (Acknowledgement) • Conforms

Minimum Functionality	Performance Level (Assessment Criteria)	Performance Result
		Conforms
10. Quality of Supply & Other Event Recording	Reporting of Events 95% of meters within 10 minutes	Over 95% of Asynchronous events are delivered within 10 minutes. 99.8% of event logs retrieved every 4 hours with Silver Spring Networks (SSN) technology.
11. Meter Loss of Supply Detection	Power Loss (Performance level from 10) 95% of meters within 10 minutes Power Restoration 90% of meters within 1 hour	Power Loss Conforms - 20% of affected meters report loss of supply within 2 mins Power Restoration Conforms – upon Power restoration, 100% of affected Smart meters report restoration within 5 mins.
12. Remote Meter Service Checking	**Individual meters -** Action performed at: 95% of meters within 5 minutes 99% of the meters within 10 minutes	With Western Power's Smart Grid architecture, it is prohibitive to test Individual meter performance based on criteria defined in 7.12.2.1.1 b) of the SMI Functional Specification. However, of the reduced sample size, 99% of meters performed within 5 minutes
13. Meter Settings Reconfiguration	**Individual meters -** Action performed at:	Individual meter performance is yet to be tested based on criteria defined in 7.13.2.1.1 b) of the

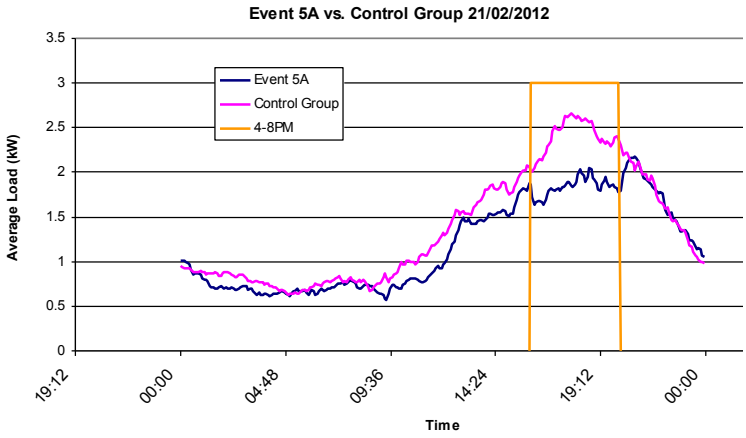
Minimum Functionality	Performance Level (Assessment Criteria)	Performance Result
	95% of meters within 30 minutes 99% of the meters within 1 hour	SMI Functional Specification However, with a reduced sample size, performance 99% of meters performed in under 5 minutes
14. Software Upgrades	**Group of meters -** Action performed at: 99.9% of meters in 7 days **Individual meters -** Action performed at: 99.9% of meters within 2 days	Group of meters Conforms Individual meters Conforms
15. Plug and Play Device Commissioning	N/A	N/A
16. Communications and Data Security	N/A	N/A
17. Tamper Detection	Reporting of Events 95% of meters within 10 minutes	Reporting of Events Over 95% of Asynchronous events are delivered within 10 minutes.
18. Interoperability for Meters/Devices at Application Layer	N/A	N/A
19. Hardware Component Interoperability	N/A	N/A
20. Meter Communications: Issuing	**Group of meters -** Action performed at:	Group of meters

Minimum Functionality	Performance Level (Assessment Criteria)	Performance Result
Messages and Commands	90% of meters within 5 minutes	Conforms
21. Customer Supply (Safety) Monitoring	Reporting of Events 95% of meters within 10 minutes	Reporting of Events Functionality not yet available to Western Power. Planned to undertake trial in 2nd half of 2012

Major findings arising at this milestone:

Communications and Smart Grid Network Management System - Silver Spring Networks' Utility IQ (UIQ) Platform	**Technical findings:** The RF communications platform has proven to be successful in both metropolitan and rural pilot locations due to the scale of the meshing and coverage of the 900 MHz frequency. Currently, the communication coverage in metropolitan is 99.93% and regional area is 99.29%. The actual communication metric would be higher but current business processes leads to a delayed data entry into the Network Management System (NMS) for removed meters which falsely indicates meters as unreachable. To achieve full functionality the UIQ software has been upgraded four times since the original deployment. The latest release offers various bug fixes and security enhancements. An independent security audit of communications and meter technology was completed. Recommendations have been considered and changes implemented. No high risk security concerns were unearthed. **Customer benefits:** This high success rate has allowed Western Power to collect interval data remotely from over 11,000 customers. This has resulted in direct benefits to the community in the following ways: - Remote and rural customers are no longer required to submit self-read cards on a bi-monthly basis - There is no need for meter readers to enter private property on a bi-monthly basis, improving privacy and security **Network benefits:** Operational cost savings result from the reduced need to have meter readers physically attend properties to read meters. Remote delivery of interval data also allows Western Power to quickly respond to requests for consumption data in relation to billing queries.
Metering technology	**Technical findings:** To date, Western Power has installed over 11,000 Landis + Gyr single phase and three phase meters which have proven to be reliable and operating successfully with the communications platform. Western Power has successfully completed testing of the Landis + Gyr CT meter but is yet to be deployed in the field. Western Power has also successfully tested and deployed a limited number of Secure Australasia three phase meters.
Technology interoperability	**Technical findings:** The communications, metering and Home Area Network (HAN) technologies have proven to operate beyond initial expectations of the technology and largely operating as designed. A number of issues have been found during testing of new HAN devices. This has mainly been

	attributed to the SEP 1.0 standard that was open to interpretation from vendors hence interoperability was impacted.
Systems integration	**Technical findings:** Western Power has completed development and user acceptance testing of location data synchronisation with the Hansen Meter Business System (MBS). Also, user acceptance testing of automated generation of investigation service orders upon receiving of tamper events has been completed. Integration with Western Power's trouble call system (TCS) has been developed and is currently being tested. **Customer benefits:** Once enabled, TCS integration will allow Western Power to reduce the impact of power outages on the community by allowing faster detection and restoration of network faults. **Network benefits:** Meter tamper alarms remotely alert Western Power to the possibility of meter tampering, preventing losses resulting from bypassing of the meter. In addition these alarms alert Western Power to proactively detect and rectify the incorrect installation of meter covers.
Solution deployment	**Technical findings:** Mesh communication coverage has been improved through use of external antennas in especially regional towns of Denmark and Walpole where 6.03% of meters required external antennas compared to 1.28% in the metropolitan area. However, of the antennas required in the metropolitan area, 44.73% were needed to improve HAN coverage. **Customer benefits:** This has resulted in improved service for customers with HAN devices such as In Home Displays (IHDs) and Demand Response Enabling Devices (DREDs), as well as allowing more customers to take part in the trials. **Network benefits:** Increased coverage has allowed maximum cost reductions by enabling remote reading of the maximum number of smart meters.
Home Area Network	**Technical findings:** Zigbee wireless standard with SEP 1.0 has been used in conjunction with Silver Springs and Landis + Gyr meters to successfully operate a Home Area Network. The HAN has been used to support an In Home Display trial and purpose built Demand Response Enabling Devices (DRED) for air conditioners. For the quarter ending March 2012, a total of 2265 households had HAN devices deployed. **Customer benefits:** For the calendar year ending 2011 (Year 1), users of In Home Displays (IHDs) within the Perth Solar City Smart Meter regional boundary have shown an average energy reduction 6.82% which is approximately $114.44 savings per household per year. In addition to this, 474 kg CO_2e per year were cut. (Perth Solar City 2011 Annual Report,

	http://www.perthsolarcity.com.au/annual-report/) **Network benefits:** By giving customers a real-time view of energy consumption, IHDs can be used as a tool to encourage the take-up of time of use tariffs or improve response to them. This shifts energy consumption away from peak periods.
Demand Management	**Technical findings:** The Air Conditioner Trial (Direct Load Control) seeks to better understand and quantify the opportunity that exists to defer capital investment in network by alternatively investing in demand management of residential customer air conditioning systems. During the summer period nine demand response events, of four hours duration (between 4:00 pm and 8:00 pm.) were performed and electrical consumption data for analysis. A total of 169 successful Demand Response Enabling Devices (DREDs) were installed, bringing the total number of installations to 384. Nine demand response events were performed, two of which were subdivided resulting in eleven occasions on which events were performed. A database of customer specific air conditioner data has been established. A database of electrical consumption data has been established. Early analysis indicates a 20% reduction in peak demand (of trial participants) can be achieved (see graph below). Further analysis is currently being undertaken, including the results of the 2011/12 events.  **Customer benefits:** Customers benefitted directly by receiving a financial incentive for taking part in the trial as well as an IHD. In addition, energy savings during events were largely achieved with no impact on comfort levels. On a larger scale, customers also stand to benefit from any deferment of network augmentation resulting from the reduction of peak consumption. Deferment of costly infrastructure installations and upgrades puts downward pressure on network and, in turn, retail tariffs. **Network benefits:** The Direct Load Control trial allowed Western Power to quickly and effectively reduce consumption

	among participants during peak periods. On a larger scale this could help to defer costly network augmentation required to meet peak demand.
Community Response	Interest in the smart meter trial remained low, with less than 250 enquiries escalated to Smart Grid staff from the beginning of the installation phase to date. Positively, this has seen very little negative attention from the Perth community, government or media, and has created limited additional work for call centre and customer service staff. However it is important to note that it has also resulted in very limited understanding of the benefits of smart meters. In the case of a ring-fenced trial this assists in limiting appetite for the meters in areas where they cannot be deployed. In the case of a wider SMI deployment, however, awareness and understanding of the benefits smart meters can offer the community is highly desirable. For this reason, a wider deployment would be both preceded and accompanied by a comprehensive engagement process.
PV Saturation Trial	**Technical findings:** The PV Saturation Trial is a Perth Solar City (PSC) initiative that seeks to investigate the effects of high penetration of PV systems in Western Power's distribution network. To this end, high PV penetration was promoted on a distribution transformer in the Perth Solar City catchment area where smart metering infrastructure had been deployed. 43% PV penetration (by customer numbers) and 28% PV penetration by transformer capacity have been achieved so far. Smart meter and transformer data has been collected. PV systems and network performance has been analysed. Initial results show that reverse power flow from PV systems can cause high voltage non-compliance at the customer level. On the other hand, voltage harmonics have remained well within compliance levels, so voltage distortion is not expected to limit the PV penetration levels on the network. **Customer benefits:** Enabling the network to reliably handle more distributed generation will give more customers the option to connect distributed resources to the network in order to their decrease electricity bills and carbon footprint. **Network benefits:** Currently, a range of initiatives to manage voltage regulation under a high PV penetration scenario are being investigated. This will enable Western Power to improve the PV hosting capacity of the existing networks and ensure future network expansions/upgrades better cater for distributed energy resources,

Meter Phase identification modeling	**Technical findings:** Using the voltage recording capability on the smart meters it is possible to identify which phase single phase customers are connected to. This has been completed on two LV networks and work is nearing completion on development of a tool that will automate the process of phase identification for each smart meter. These results will enable effective identification of phases each customer is on and a faster correction of phase imbalance on LV networks. **Customer benefits:** This will improve power quality. **Network benefits:** It will also allow for better utilisation of existing assets, extending their life and resulting in the deferral of network upgrades.
Power Quality Analysis	**Technical findings:** This analysis is based around utilising the smart meters functionality to record power quality (PQ) related data and using these to enable WP to proactively address potential PQ issues prior to customer complaints. PQ events from smart meters on a number of LV Networks have been grouped and instantaneous samples of smart meter voltages analysed. The key finding of this analysis has been that load unbalance can be observed using smart meters, without the need for additional PQ meters being installed (as is the current practice). This has helped identify at risk transformers and weak parts of the LV network within the ring fenced Perth Solar City and Green Town program areas. **Customer benefits:** Plans are in place to proactively improve the network before they cause disruption and damage to customers' appliances. **Network benefits:** Results have shown that in some cases capacity can be increased by simply reconfiguring the network rather than high capital cost of upgrading LV feeders and transformers. In addition, there is the capacity to determine which phase PV systems are connected to and to estimate the size of these PV systems (rather than the inverter size as recorded by Western Power)
Residential tariff comparison using half-hourly consumption smart meter data	**Technical findings:** Work has commenced to identify smart meter customers who would save, or be no worse off, on more cost-reflective time of use tariffs (TOU). A recent 12 months of half-hourly data has been analysed for ~11,000 customers and the cost calculated for each customer on the flat tariff and a TOU tariff. Results indicate that a significant number of customer would save on the TOU tariff (which is of course dependent on the relative levels and cost-reflectivity of the tariffs), and the savings are not necessarily correlated to average consumption per day,

	but rather on the consumption profile as is expected. **Customer benefits:** Many customers stand to benefit from TOU tariffs, even with little to no change to their current energy consumption patterns. Smart meter data indicates these customers already use a large proportion of their energy during off-peak periods. **Network benefits:** Access to the interval data provided by smart meters allows the targeted promotion of time of use tariffs to customers who stand to benefit. This encourages customer who can shift load away from the peak to do so
Determination of peak contributors using half-hourly smart meter interval data - Greentown	**Technical findings:** For all (~2000) smart meter customers in Denmark and Walpole (Greentown) on the south coast of WA, their half-hourly smart meter consumption data has been examined for the feeder annual peak period(s) to determine which customers are contributing most to the annual feeder peak. This allows Western Power to effectively target peak consumption reduction programs and tools towards demographics with the potential to make the most dramatic change to their behaviour. **Customer benefits:** These customers represent those who have the opportunity to save the most money and energy by shifting or reducing their consumption when on a time of use tariff. There are further community-wide benefits due to the potential to defer network augmentation – a new line through native forest. **Network benefits:** Encouraging these customers to shift consumption away from the peak allows Western Power to defer the need for major feeder augmentation.

Program issues:

Solution Deployment: non-smart meters replace smart meters when a new connection is made due to subdivision.	Due to the dynamic nature of the LV network brought about by land subdivisions, smart meters have been replaced by non-smart meters during the current pilot program. This is primarily due to current business processes by which any new connections are dealt as business-as-usual which is to use non-smart meters. However, on a wider rollout, the business structure and process will ensure that any new meter installation is a smart meter if in a smart meter area.
Technology interoperability: Not all Home Area Network (HAN) devices work seamlessly with Western Power's Energy Services Interface (ESI) despite both having ZigBee accreditation.	During testing, Western Power has found that not all HAN devices operated as expected with the ESI despite having ZigBee accreditation. This has mainly been attributed to the SEP 1.0 standard that was open to interpretation from vendors hence interoperability was impacted. Also, despite being an open standard, vendors tend not to disclose their implementation of the standard making product development difficult. SEP 2.0 promises to improve the interoperability as the standard is more robust. However, the impact of the standard will only be determined once testing is completed on devices running SEP 2.0
Systems integration: Western Power has opted to delay full integration of the remote service connection and disconnection functionality with the backend Meter Business System (MBS)	It had been planned to integrate the remote connection and disconnection functionality between the Network Management System (NMS) User Interface (UI). However, this function has been deferred pending further analysis of potential risks. At present, Western Power continues a parallel process by which a remote operator manually initiates a remote disconnect or reconnect operation on a meter through the Network Management System User Interface while a technician physically verifies the successful operation on site. Western Power intends to develop a position paper on the automated remote connection/disconnection to be reviewed by the Office of Energy and Energy Safety before proceeding with any further integration work for this function.
Smart meter installation: Not all smart meters could be immediately read remotely	The firmware on the batch of meters delivered first was not compatible with the current version of the network management system. This prevented the reading of any newly installed meters until the firmware was upgraded. Western Power has since developed an automated process to detect incompatible firmware on any newly installed meters and undertake upgrade within a day of

	installation.
Home Area Network: In Home Displays – low take up rate	82% of IHDs were deployed to households who had not opted into the trial (ie. Had not requested to participate). The pairing rate for IHDs in households who had not opted in was lower (52% - 64%) than for opt-in households (75%). (Perth Solar City 2011 Annual Report, http://www.perthsolarcity.com.au/annual-report/) To improve utilisation, IHDs should be deployed to participants who have opted in, and should be supplied as part of a more general education program.
Issues and Defect Management: A robust management and reporting system should be implemented to manage vendor issues.	As the trial has progressed into the 2nd year with more functionality being explored, more complex technical defects have been found. This quickly became unmanageable via traditional communication methods such as email correspondence and eventually led to long lead times for issues to get resolved. To resolve this, Western Power and the vendors implemented an online issues management and reporting system which could be utilised by all parties. It is critical that all vendors chosen should have an online issues management and reporting system in place before commencement of any larger rollout.
Demand Management: Customer recruitment to the DLC trial could be improved.	Recruitment rates for mail-out only engagement did not meet target participant rates and an outbound calling program was implemented. This resulted in targets being met and exceeded. However, DLC installation required some work on the customer's air conditioning unit by the installation contractor, and this resulted in some customer withdrawals at installation. Western Power resolved these late withdrawals by making specialist staff available by phone to address any questions and concerns which could not be addressed by the installation contractor.

Technology issues resolved:

Intermittent communication on point to point 3G meter. The 4 V DC aux voltage supplied from the meter to the 3G modem is at the extremities of its operating standard of 4-24 volts.	Landis+Gyr (L+G) have an updated meter design which has a 12 V aux supply on the Ethernet port.
Field pairing of NIC is not available for current deployed solution.	Issue remains unresolved, field pairing currently under review and negotiation between Silver Springs Networks and L+G.
Loss of join between Demand Response Enabling Device (DRED) and Meter Network Intercommunication Card (NIC). Vendors identified root cause as different interpretations of SEP 1.0 that led to DRED devices being dropped by NICs.	New NIC firmware v 2.12 prevented forced drops and deployed.
Loss of communication on point to point 3G meter due to invalid failover configuration	Failover configuration avoided and deployed by vendor
Continual rebooting of IHDs and Data Synchronisation failure error message due to bad batch of rechargeable batteries causing brown outs	New batteries fixed issue and deployed to affected households
Approximately 80 meters found configured for AEST	Manual reconfiguration to AWST performed on affected meters before deployment
Meter data export failure due to insufficient memory allocation within service of Network Management System	Increased memory allocation and upgrade of Network Management System resolved the problem for the limited rollout of meters. Longer term solution is performing daily exports of billing data into the Meter Business System (MBS). This is currently being tested.
DREDs have to be manually paired by pushing a button. This exercise is costly especially when a re-commissioning is required.	It is preferred to have a periodic auto-join mechanism. The solution is not available as yet.
Difficulty in extending range for HAN devices (IHDs and DREDs) beyond 50m	The range was extended beyond 50m and up to 100m using Zigbee repeaters as well as installation of external antennas on the meters.
On a number of three phase meters, it was found that the disconnect relay would operate unreliably and false report relay status.	Relays were being periodically moved to ensure they do not jam. However, this operation resulted in an invalid state during relay operation which resulted in a false positive to both the meter's LCD display as well as the backend network management system. New firmware, which is currently under development, ensures that the original relay position is reverted to

	before any disconnect/reconnect operation takes place.
When meters with HAN devices such as IHDs or DREDs get exchanged, the secure pairing is lost and has to be manually established.	When a meter which has downstream HAN devices is exchanged, secure pairing information is not transferrable from the old meter to the new meter. This requires IHDs and DRED devices to be manually paired to the new meter at the same premise. This is both costly to Western Power as well as inconvenient especially for the customer who has to call up Western Power to re-establish IHD connectivity and accommodate an electrician to re-pair the DRED device. It would be desirable to be able to transfer secure pairing information between meters and for HAN devices to instantiate an auto-join process on detection of a new HAN network and loss of the old one.

Relevant developments in industry:

AS/NZS 4777 series: Grid connection of energy systems via inverters

The above standard is currently being revised. The revised series will be merged into 2 parts:

Part 1 - Installation requirements

Part 2 - Inverter requirements

The key changes from the 2005 revision include an increase of the inverter capacity from 30 to 100 kVA, the inclusion of requirements for installations with multiple inverters, additional central protection requirements, demand response and power quality modes of operation.

The design and installation requirements have been improved to coordinate correctly with AS/NZS3000 (Wiring Rules) as well as requiring more attention to the existing installation and connection capacity when installing a system, which will result in improved compliance of the system to performance requirements of networks.

The revised 4777 series is expected to be published early 2013.

Smart Energy Profile (SEP) 2.0

The move to IP connectivity promises global scalability, improves device management, increased security and more importantly, it will attract more vendors in the HAN market space.

The challenge for Western Power will be management of the existing batch of approximately 2300 SEP 1.0 devices with customers which may be left stranded when the ESIs in the field deployed batch of meters get upgraded to SEP 2.0.

8. APPENDIX B List of Acronyms

AC	Air conditioning
AEST	Australian Eastern Standard Time
AMI	Advanced Meter Infrastructure
AMR	Automated meter reading
API	Application Programming Interface
AWST	Australian Western Standard Time
COAG	Council of Australian Governments
CT	Current Transformer (eg CT meter)
DLC	Direct Load Control
DPI	Department of Primary Industries (Victoria)
DRED	Demand Response Enabling Device
DRET	Department of Energy, Resources and Tourism (Commonwealth)
DRM	Demand Response Mode
ENA	Energy Networks Association
ERAA	Energy Retailers Association of Australia
GPRS	General Packet Radio Service
GUI	Graphical User Interface
HAN	Home Area Networks
ICT	Information and Communications Technologies
IHD	In-Home Display
IP	Intellectual Property
LV	Low Voltage
MAC	Media Access Control (as in MAC address)
MCE	Ministerial Council on Energy (now replaced by SCER)
MV	Medium Voltage
NBN	National Broadband Network
NCRT	National Consumer Round Table
NEICF	National Energy Industry and Consumer Forum
NIC	Network Intercommunication Card

NSMP	National Smart Metering Program
OP	Off Peak
OTA	Over the Air
PI	Personal Information
PLC	Power Line Carrier
PQ	Power Quality
QoS	Quality of Supply
RF	Radio frequency
RSSI	Received Signal Strength Indication
RTU	Remote Terminal Unit
SCER	Standing Council on Energy and Resources (replaces MCE)
SEP	Smart Energy Profile (eg Zigbee SEP)
SGSC	Smart Grid Smart City
SMI	Smart Metering Infrastructure
SMI FS	Smart Metering Infrastructure Functional Specification

Energy Networks Association Ltd
P +61 2 6272 1555 **F** +61 2 6272 1566 **E** info@ena.asn.au
Level 3, 40 Blackall Street, Barton ACT 2600

www.ena.asn.au