

IMPLEMENTING ADVANCED METERING IN A COMPETITIVE MARKET: THE VICTORIAN EXPERIENCE

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Biography: Stephen has been associated with the energy industry for the last twelve years; much of this time associated with managing major industry change programs.

After ten years as an Aeronautical Engineer in the RAAF and two years at Intergraph Public Safety, Stephen was engaged by Powercor Australia to develop and implement the whole of business strategy for procurement of metering services for electricity customers using 160 – 750 MWhr/yr. Stephen then worked as the National Business Development Manager in Powercor's Retail business before being appointed as Program Director for the Full Retail Contestability (FRC) Program. In this role, Stephen was also Chairman of the Victorian industry FRC project and represented incumbent retailers on the NEMMCO committee that oversaw national preparations for FRC.

In January 2003 Stephen was appointed Chief Executive Officer of REMCo. Having overseen the introduction of gas FRC in the South Australian and Western Australian gas markets and establishment of stable market operations, Stephen's position as CEO transitioned to part-time employment in mid 2007.

Stephen joined Marchment Hill Consulting as Principal Consultant in July 2007 and continues to work with utility and infrastructure clients throughout Australia, New Zealand and South East Asia. Marchment Hill Consulting were appointed to run the Program Office for the Victorian Advanced Metering Infrastructure (AMI) Program in August 2007. Stephen is the Program Director for this Program where he leads the day to day Program of work on the cross industry activities required to establish the business, regulatory and technical infrastructure to support successful deployment and operation of AMI in Victoria.

Abstract— In October 2007 the Victorian Government mandated the minimum functionality and service level specifications for advanced meters with an initial rollout proposed to be started by 31 December 2008. This policy decision initiated a complex industry transformation program requiring replacement of all cumulative electricity meters in Victoria with Advanced Metering

Infrastructure (AMI) meters, over a short time frame with the overlay of a competitive retail market.

The Victorian government handed stewardship of the program to an Industry Steering Committee which then appointed Marchment Hill Consulting to establish and run the Program Office overseeing the cross industry activities involved in this significant industry transformation. Key challenges faced during the early phases of the AMI Program have included:

- Facilitating agreement to the program plan,
- Redirecting the program focus from AMI technology to the intended Operating Model, and
- Negotiating agreements to scope and schedule outcomes in a multi stakeholder environment with vastly differing commercial, regulatory and political drivers.

This paper provides a unique insight into those challenges. Building on local industry presentations the paper details the approaches taken to overcoming implementation issues.

I. THE VICTORIAN GOVERNMENT AMI POLICY

In 2006 the Victorian Government acknowledged the benefits available to energy markets from having more detailed information regarding energy consumption available and adopted a policy requiring all new and replacement meters for customers using less than 160 Megawatt hours per year (MWhrs/yr) to be manually read interval meters. These meters register the energy consumption every half an hour and would be read on the same quarterly or monthly cycle as the previous accumulation meter. This became known as the Advanced Interval Meter Roll Out or AIMRO.

Shortly afterwards, the Victorian Government and electricity industry participants identified that global

advances in metering technology were making available meters which offered considerably greater features at costs equivalent to the AIMRO meters. These meters could be read remotely, potentially leading to savings in meter reading costs, and could provide two way communications to consumers and support in-home-displays, potentially leading to increased awareness of energy consumption and lowering of green house gas emissions.

The Victorian Government sponsored further studies into the new metering technology and worked closely with the industry to develop a better understanding of this technology and the potential costs and benefits. As this further study was progressed, work on the AIMRO was deferred. The study of this new technology identified that the additional potential benefits to Distribution Businesses arising from remote meter reading and remote operation of new metering features, such as remote energisation and de-energisation, could lead to considerable operating cost savings. Furthermore, the studies identified considerable benefits to consumers through cost savings arising from more efficient use of electricity based on increased consumer information. These studies also identified that operation of these meters would require two way communications between the meters and industry participants to fully utilise the capability.

In October 2007 the Victorian Government formally amended its policy to requiring the deployment of Advanced Metering Infrastructure (AMI) to all <160MWhr/yr customers. This policy superseded the AIMRO policy.

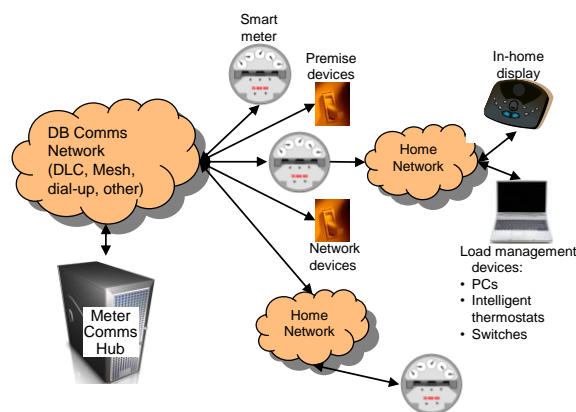


Figure 1 – AMI System

The Government and industry also acknowledged that there would need to be a control system to manage the communications network that controlled the messaging to and from the meters, the components were collectively identified as the AMI System. Figure 1 demonstrates the components of the AMI System at a high level.

The Victorian Government established the AMI Program as a multi-year industry wide program that would deliver the policy outcome of all <160 MWhr/yr customers having an AMI meter providing access to AMI Services via the AMI System, including related two-way communications.

The Government led the Establishment Phase of the AMI Program through to mid 2007; industry and consumer representatives were also heavily involved in this phase. The Establishment Phase of the Program defined the major milestones and objectives for the deployment and operation of AMI in Victoria and defined the minimum Functional Specification for AMI Meters and minimum Service Level Specification for AMI Services.

In mid 2007 the Government was satisfied that the AMI Program was sufficiently well defined and handed responsibility for governance of the delivery of the Program to an Industry Steering Committee. The Chairman of the AMI Industry Steering Committee (ISC) is The Hon. John Dawkins, AO. The remaining members of the AMI ISC include representatives from Victorian electricity retailers and distribution businesses and a consumer representative. Observers from the Victorian Department of Primary Industries, Victorian Essential Services Commission, Energy Safe Victoria, the National Electricity Market Management Company, the Commonwealth Department of Resources, Energy and Tourism and the Energy Networks Association also attend AMI ISC meetings.

The AMI ISC is responsible for governing the Development Phase of the AMI Program which has so far developed detailed a business requirements definition for operation of AMI, known as the AMI Operating Model, and developed a detailed Implementation Plan for deployment and operation of AMI. During the Development Phase will also involve project management of the initial deployment and commencement of operations and establishment of business as usual processes for completion of Program.

Marchment Hill Consulting was engaged in August 2007 to provide the Program Office to support delivery of the Deployment Phase.

The Development Phase will continue until the mid 2010 when the first milestone for AMI meter population of having AMI meters deployed to 5% of the <160 MWhr/yr customers is scheduled. Following this, the Deployment Phase will commence. The Deployment Phase will operate until the end of 2013, when all <160 MWhr/yr customers should have an AMI meter installed.

II. METERING IN THE NATIONAL ELECTRICITY MARKET

Metering in the National Electricity Market (NEM) is partly competitive and partly a monopoly and is also split between the activities associated with owning and operating the meters and the activities associated with collecting the data from the meters and then processing this data for delivery to the market for settlement and billing purposes.

The activities associated with owning and operating the meters are known as Meter Provision services. These are further split into the actual ownership and provision of the meter and the services associated with operating and maintaining the meter. This separation acknowledges that some businesses operate an asset owner/asset operator model down to this asset level, but in most cases these activities are integrated.

The activities associated with collecting the metering data and then processing this data and delivering to the relevant market participants for settlement and billing purposes are also identified as separate services, particularly based on historical separation of the collection of accumulation data by meter readers and the processing of the collected data for settlement and billing purposes. Where a meter is manually read, Metering is a monopoly activity. The distribution business is responsible for the provision and operation of the meter and the collection and delivery of the metering data to the various market participants via MSATS. Furthermore, where a meter is remotely read, Metering is a competitive activity and the Financially Responsible Market Participant (contracted retailer) is responsible for appointing a suitably qualified for each of the metering services. This is demonstrated in the Figure 2 below.

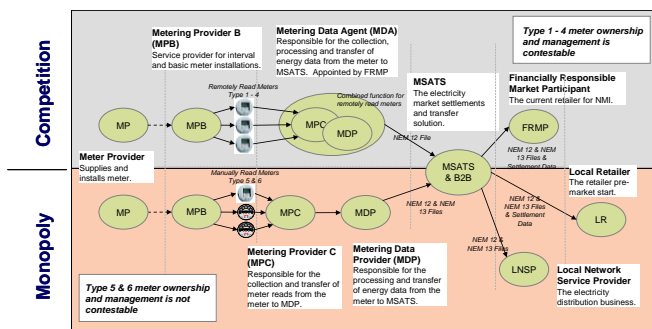


Figure 2 – Metering in the NEM today

A. Challenge for the AMI Program

The Victorian Government's AMI Policy requires a mass replacement of all accumulation meters, and manually read interval meters in Victoria with AMI meters that will be remotely read, over a four year period. This involves a

total of 2.6 million meters to be replaced in this period at a rate of up to 4,000 meter replacements per day at an estimated total cost of this policy is \$1,500,000,000.

Successful delivery of this policy, from a Government perspective, is dependent of two key drivers:

1. Certainty and speed of deployment; and
2. AMI works when deployed

Having handed over responsibility for delivery of the AMI Program to industry, the government then sought a structure that provided mechanisms to manage these two key drivers. In a competitive market where government has very few levers over retailers but can influence considerable leverage over the regulated distribution businesses, a distributor led deployment of AMI was the most desirable outcome. However, AMI meters are to be remotely read and the legislative and regulatory framework for metering in the NEM establishes that Metering for remotely read interval meters is a contestable activity, where the retailer chooses the service providers.

The Government therefore sought Derogation from the National Electricity Rules so that the meter services related to AMI meters would be monopoly functions of the distribution businesses in Victoria.

The government agreed to provide cost recovery for the distribution businesses' capital costs to establish AMI systems, including communications networks covering their entire network area, and the associated ongoing operating costs. The local economic regulatory authority, the Victorian Essential Services Commission, was authorised to assess the distribution businesses' costs and set regulated tariffs to allow recovery of these costs and an appropriate profit over the expected asset life of the assets through regulated revenue.

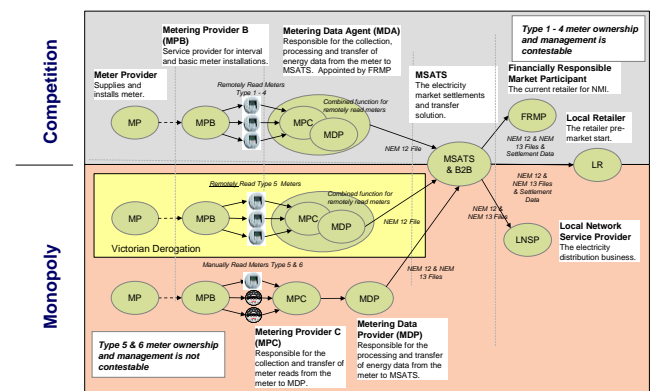


Figure 3 – The Victorian Metering Derogation

Figure 3 demonstrates how the Derogation for AMI meters in Victoria that are remotely read will fit into the national metering legislative and regulatory framework.

B. Impact of the AMI Program on Retailers and their response

Deployment of AMI to <160 MWhr/yr customers will dramatically increase the amount of metering data received and, during the meter rollout, will dramatically increase the number of meter exchanges processed on a daily basis.

Currently retailers receive one or two items of data from the vast majority of <160 MWhr/yr meters each quarter, or, where there is a manually read interval meter, the retailer will receive 48 data items for that meter for each day in the read cycle once every month or quarter, depending on how frequently the meter is read.

In Victorian today there are less than 50,000 manually read interval meters from a total meter population of approximately 1,500,000. Therefore, assuming that all meters are read on a 90 day cycle, approximately 1 million data items are collected each day by distribution businesses and processed then delivered to the market participants. Once the AMI Program has been completed, every meter will collect 48 data items per day and these will be delivered to the market participants every day. This will result in approximately 72 million data elements being collected each day by distribution businesses and processed then delivered to the market participants. Retailers are not being compensated for the additional data processing and management costs, or any other consequential impacts on their operations from the AMI Program.

Retailers, therefore, are seeking to leverage their investment driven by the AMI Program and consider that innovation based on the new capability, or capability of the metering service providers desirable. However, Retailers believe that once a distribution business is granted a monopoly over a specific activity and given cost recovery for the capital cost of establishing the capability to perform the activity and associated ongoing operating costs, there is no incentive for the regulated business to innovate.

Retailers therefore argued that there would be greater benefits over the long term if Retailers remained able to choose the service provider for these services because there is no incentive for regulated businesses to innovate service capability.

C. A National Approach

Despite the retailers' arguments, in June 2008 the Australian governments agreed that deployment of AMI would be a DNSP monopoly activity for the for a period equivalent to the asset life of the first assets deployed,

following which the services will become contestable again, and retailers will appoint the service providers.

III. ADVANCED METERING INFRASTRUCTURE CAPABILITY

A. AMI System Capability

The AMI system capability is split between capability built into the AMI Meters and capability inherent in the communications network [1]. The particular features of the AMI meters include:

- Record export and, where applicable, import energy consumption at 30 minute intervals;
- Allow both local and remote collection of energy consumption data and various setting, event logs and status flags at least once in every 24 hour period;
- Support both local and remote operation of a connect and disconnect contactor;
- Respond to 'group' commands related to a controlled load contactor in the meter for primary, secondary and tertiary groups; and
- Interface to a ZigBee® Home Area Network.

B. AMI Services Requirement

AMI is capable of supporting a range of services [2]. However, enabling many of these services would require changes to the NEM and impact on participants outside of Victoria who are not (yet) required to interface with AMI. Therefore the Victorian Program AMI Service requirement was revised to focus on a subset of core services that can be implemented in Victoria ahead of the other jurisdictions and deliver a material benefits [3]. The core services include:

- Remote collection of 30 minute interval consumption data;
- Remote energisation; and
- Remote de-energisation.

The AMI Program also allows the period up to 1 January 2012 before provision of interval metering data on a daily basis is required. This arrangement provides a transition period for the distribution businesses to bed in new systems and processes before the more stringent service levels apply.

IV. THE VICTORIAN AMI PROGRAM

The timing elements of the AMI Program scope are defined in legislative instruments known as Orders-In-Council. These stipulate the population targets for AMI meters over the duration of the AMI Program and the Service Level Requirements at various times throughout the Program. The functional scope of the Program, detailed in [1] and [2] were in draft form when the AMI ISC assumed

responsibility for the AMI Program and were first published in October 2007.

In August 2007, the AMI ISC appointed Marchmont Hill Consulting (MHC) as the Program Office for the Development Phase of the AMI Program and tasked MHC with establishing appropriate governance arrangements for the successful delivery of the AMI Program, including a Program Plan and risk and issue registers.

On appointment MHC identified that [1] and [2] were not an end-to-end mapping of the operation of the deployment or operation of AMI and reported the major risk of failure of the Program if detailed analysis of the end-to-end processes was not completed and communicated across the industry.

The AMI ISC acknowledged this risk and assigned resources to working groups tasked with the development across the industry of the end-to-end processes. MHC subject matter experts facilitated the development of an AMI Operating Model over the next 8 months.

During this period MHC also developed a detailed Program Plan for the delivery of the AMI Program over the period through to the end of 2013. The AMI Program comprises eight work streams:

- Victorian Business Requirements;
- AMI Technology Functional & Service Level Specifications;
- Accreditation (including Metrology Procedures and Service Level Requirements);
- Market Systems (including NEM Procedures);
- Participant Systems;
- Industry Testing;
- Victorian AMI Rollout;
- Consumer Education & Communications.

Figure 4 shows the high level program schedule and critical path.

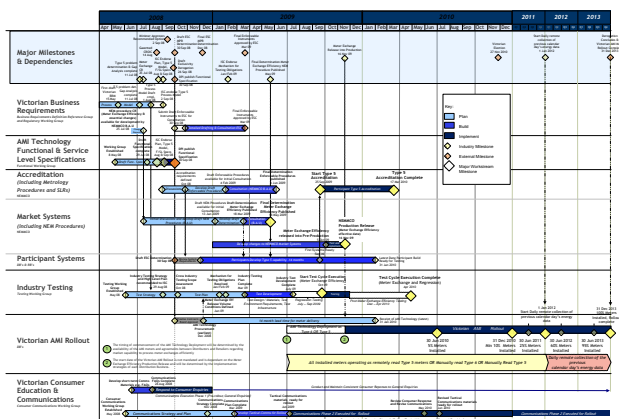


Figure 4 – High Level AMI Program and Critical Path

As noted earlier, the Victorian AMI Program is proceeding before other Australian states and territories have fully considered how AMI may be implemented in those jurisdictions and enabling AMI in Victoria will require some change in the NEM. A National Stakeholder Steering Committee has been convened to consider the legislative and regulatory framework that will apply to the deployment and operation of AMI nationally.

Furthermore, changes that impact the operation of the NEM can only be implemented through a governance structure that involves stakeholders from all participating NEM jurisdictions. This change process involves consultation through NEM Reference Groups that report to joint committees responsible for the NEM processes and related business to business processes.

The governance arrangements therefore must address both the Victorian Government's authority and the authority of various national governing bodies. Figure 6 shows the endorsed AMI Program Authority Relationship diagram. Figure 7 further explains the relationship that the AMI Program has with the national reference groups that operate in the NEM and a new governing body that is being established to oversee how AMI may be deployed nationally, the National Stakeholder Steering Committee (NSSC).

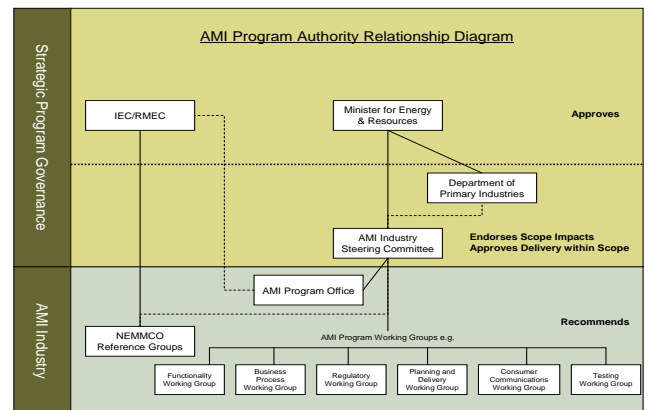


Figure 6 – AMI Program Authority Relationship Diagram.

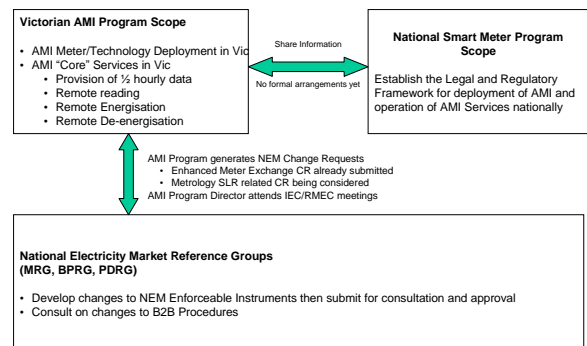


Figure 7 – AMI Program Relationship with NEM Reference Groups and the NSSC.

V. KEY LESSONS

A. An independent Program Office facilitates transparent and unbiased reporting of program status, risks and issues but is only able to perform to the standard of cooperation the stakeholders demonstrate.

Like any system, the quality of the outputs is heavily dependent on the quality of the inputs. If stakeholders withhold or are guarded with information, the Program Office's effectiveness is compromised. To avoid risk of this, the AMI Program Office agreed at the outset a set of principles regarding how participants would report and how bad news would be dealt with.

The agreed principles have thus far allowed transparent sharing of information and discussion of the potential consequences of various scenarios which has allowed a comprehensive approach and plan to be developed which is tracking well against the baseline.

B. Senior Executive participation in the Executive governance of the Program facilitates effective decision making on contentious issues.

DNSPs are required to meet minimum deployment targets periodically throughout the AMI Program (annual population targets), but there is also an incentive for businesses to exceed these targets.

Problems with the current meter exchange process generate a high proportion of exceptions that require manual intervention to resolve and often result in negative impacts on customers.

Retailers therefore want to minimise the number of AMI meters deployed before this process is improved, yet DNSPs want to maximise their chance of exceeding the minimum targets.

By having senior executives at the AMI ISC, a voluntary industry compromise was agreed.

C. The approach to deployment of AMI will need to balance the competing priorities of speed of deployment and realisation of the benefits from the investment and the ability of the AMI and related market processes to adapt to technology innovation over time.

Deployment by regulated businesses with incentives to deliver a standard infrastructure and operate to defined service levels ensures efficient and cost effective access to AMI benefits, but does not create incentives for innovation which may allow competitors to differentiate, particularly where the new technology does not provide benefit for the regulated business.

This can only be resolved by government policy – separation of regulated minimum service and innovation services.

D. Deployment of AMI in a competitive environment requires detailed analysis of the end to end market processes, failure to do so could result in serious failure of market processes leading to major disruption to electricity consumers or a failure to satisfy stakeholder expectations.

Move Out/Move In Example:

- Retailer for a premise requests remote de-energisation of meter when customer moves out. Communications – Retailer to NEMMCO to Distribution Business to meter - is not real time.
- New Customer moves in before meter is de-energised and contacts a new Retailer to set up contract: confirms to retailer that electricity supply is energised.
- Instruction to de-energise meter arrives at meter and performed after 3.00pm.
- CUSTOMER IS OFF SUPPLY UNTIL NEXT DAY.

The Victorian AMI Program spent 9 months developing a detailed understanding of the operation of the processes associated with AMI across the energy delivery value chain to ensure that outcomes like this could be avoided.

E. A detailed understanding of the operation of AMI should be developed before specifications for the functionality or service levels are worked on.

The Victorian AMI Program focussed on the development of the Functionality and Service Level Specifications before performing a detailed analysis of the operation of AMI.

Versions of these were published which created the perception that the program was ready to move into deployment before the operating model for the new or changed services had been developed. Had deployment commenced at that time, the anticipated services would not have worked and significant rework would have been required.

Fortunately, based on recommendations from the Program Office, there was a significant investment in an AMI Operating Model which established a comprehensive understanding across all stakeholders of the operation of AMI Services.

REFERENCES

- [1] *Minimum AMI Functionality Specification, Version 1.1, October 2007, Victorian Government.*
- [2] *Minimum AMI Service Level Specification, Version 1.1, October 2007, Victorian Government.*
- [3] *Minimum AMI Service Level Specification, Version 1.2, September 2008, Victorian Government.*