

SMART METER DECISION PAPER

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Cost-benefit analysis of an accelerated smart meter roll-out

In April 2007 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.

MCE has now considered the findings from a detailed cost-benefit analysis, including jurisdictional variations, undertaken by independent consultants and associated stakeholder views.

Estimates of the quantified net benefits nationally for the highest-value option, a distributor-led roll-out with the Home Area Network interface functionality, range between \$146 million and \$4.6 billion¹ (20 year net present value (NPV)).

Total quantified potential benefits ranged from \$4.8 billion to \$7.5 billion² (20 year NPV) nationally. Most of the benefits were driven by avoided meter costs and operational efficiency improvements in distribution and retail businesses, with these benefits alone largely covering the cost of the roll-out. However, importantly, the consultants agreed that these benefits were split between parties in such a way that individual parties were unlikely to independently establish a positive business case. Providing for a mandated roll-out by one party (rather than more complicated fundamental changes to the regulatory framework) is seen as the preferred approach to facilitating a roll-out of smart meters.

The quantified benefits also included potential benefits arising from changes in consumer energy use, through both response to price signals and direct load control services. Emissions abatement potential was estimated and ranged from 597,000 to 31 million tonnes over the 20 year period, depending on the different scenarios for direct load control and customer energy conservation response.

Total estimated costs ranged from \$2.8 billion to \$4.6 billion¹ (20 year NPV) nationally and were materially lower than benefits in most cases. However, MCE notes that given these are forward estimates in an area of new technology and significant change management, there remains some uncertainty around the level of costs, particularly business-specific costs which vary between individual businesses. This means that further business-specific reviews will be appropriate and should be a basis for any cost-recovery.

The cost-benefit analysis findings strongly support the benefits of an accelerated, or mass roll-out approach in comparison with a new and replacement smart meter program. By significantly increasing costs and delaying any benefits, the net present

¹ Based on Scenario 1 compared to the current metering policy counterfactual, including the HAN benefits and the summer peaking scenario in NSW.

value of a new and replacement approach is significantly reduced compared to an accelerated mandate.

The cost-benefit analysis demonstrates a range of areas where a new and replacement approach to smart meters would be more expensive, including in the areas of installation, communications and other back-end systems. In addition, a new and replacement approach would take many years to reach the majority of users. Without dense coverage of smart meters, most benefits will not be achieved. For example:

- Wide development of new retail products, such as time-of-use tariffs or direct-load control, is unlikely with few consumers to market them to, so demand response will be limited.
- Network management benefits, such as outage management and quality of supply monitoring, require broad coverage of the network to replace existing measures.
- Avoided metering costs, such as meter reading, will be reduced as meter readers still have to visit an area even if only half the meters are read.
- NEM market management issues, such as settlement of profiles, cannot be resolved with consumers on widely varying platforms.

MCE notes that the cost-benefit analysis estimated that a roll-out led by distributors would result in the greatest potential net benefits amongst the four scenarios examined. The other three scenarios examined are a retailer-led roll-out, a centralised communications roll-out and a direct load control roll-out without smart meters. The benefits from a distributor led smart meter roll-out are largely due to a wider range of communications options and synergies with network management. The cost-benefit analysis also estimated the largest proportion of smart meters benefits are achieved through operational efficiencies in the distributor.

Most stakeholders generally agreed that the alternative models examined introduce greater complexity and risk in capturing the benefits of an accelerated roll-out, enhancing retail competition and competition for in-home services. Some stakeholders advocate competition in metering and provide arguments supporting this as a long term position. However, further clarity is required in how a competitive model could maximise the benefits of an *accelerated or universal roll-out*, and management mechanisms for the risks identified.

In addition to the benefits identified, MCE notes a range of further potential opportunities and benefits that may arise from the roll-out of smart meters. These include the potential to increase retail competition through product differentiation, the potential for consumers to reduce and manage their bills through increased access to consumption and other information, a wide range of potential innovations in services, such as home energy management and links to water and gas metering, and synergies with other infrastructure developments such as smart grids. Costs and benefits from these opportunities have not been included in the cost benefit analysis.

Smart meters were found to largely support MCE's assessment objectives through their significant impact on: efficiency and innovation in electricity business

operations; promoting the long-term interests of electricity consumers; and enabling consumers to better manage energy use and greenhouse gas emissions. They were also expected to support: reducing peak demand; promoting retail competition; promoting energy efficiency and greenhouse benefits; and providing a platform for other demand side response measures.

Benefits vary significantly between jurisdictions because of differences in existing metering, network management and demand profiles. While all jurisdictions demonstrated potential net benefits in the best possible outcome (the consultants maximum net benefit assessment), variations and uncertainty in benefits and costs have resulted in some jurisdictions having the potential for the costs to outweigh benefits (the consultants minimum potential net benefit). This uncertainty in costs and benefits supports undertaking trials in some jurisdictions to confirm benefits and costs, with jurisdictions facing greater uncertainty learning from those jurisdictions who have commenced smart meter roll-outs.

National roll-out of electricity smart meters

On the basis of the results of the cost-benefit analysis, some jurisdictions seek to provide further commitments:

- **Victoria** already has a legislative commitment to roll-out smart meter and this program is well underway. MCE supports this Victorian initiative within the national roll-out and notes the benefits of a lead jurisdiction. Victoria agrees to work with other jurisdictions on the development of the national framework to support a consistent agreed business model for NEM arrangements and retailers. MCE notes that Victoria may proceed with meter procurement based upon existing specifications.
- **New South Wales** in December 2007 confirmed its commitment to a roll-out of smart meters. NSW expects that this roll-out should see most smart meters installed prior to 2017 and will work with NSW businesses through the next stage of pilots to confirm this timeline.
- **Western Australia** recognises the potential benefits of smart meters and will respond on the possibility and timing of a roll-out in the SWIS in conjunction with upcoming decisions on broader energy market policy in WA.
- **Queensland** recognises potential benefits and the possibility of a roll-out. However Queensland has some jurisdiction-specific cost concerns and will consider roll-out scope and timeline after further investigation via the pilots and further cost modelling. Queensland will also continue investigations into the benefits of direct load control.

More broadly, on the basis of the potential for significant net benefits at the upper end of the range but recognising remaining cost risks in some jurisdictions, MCE agrees to further 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 agrees these pilots and business cases should be initiated as quickly as possible and coordinated through the National Stakeholder Steering Committee 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. Jurisdictions will review pilot plans proposed by industry and may support additional cost-recovery, on the basis of demonstrated valuable findings to support analysis of the costs and benefits. Across the pilots a range of issues will be further 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.

MCE notes that a **National Stakeholder Steering Committee (NSSC)** is currently being formed and a scoping committee is in the process of developing detailed work plans. MCE's Standing Committee of Officials (SCO) will agree detailed working arrangements with the NSSC by the end of July 2008, to include the broader scope of work in this decision.

MCE will review the progress of the pilots and business cases annually, starting in June 2009. A review of findings, including any resulting revision in the cost and benefits for each jurisdiction or specific businesses, will occur by June 2012, at which point MCE will further review jurisdictional deployment plans and any requirement for further analysis.

In the interim, jurisdictions may choose to consider implications for a range of existing jurisdictional policies, such as new and replacement interval metering and existing direct load control arrangements, to optimise the transition to smart metering. Ministers note that new and replacement policies involving smart meters are unlikely to be cost-effective until roll-outs are further progressed, as it would be unlikely to capture the benefits of smart meters without the efficiencies of scale in installation and the supporting systems required.

National Minimum Functionality for smart meters

In December 2007 MCE agreed to support a National Minimum Functionality for smart meters to maximise the benefits of smart meters across all stakeholders. MCE referred functions to be included to further work by a technical stakeholder group, to develop and advise on technical definitions, performance and service level requirements and relevant Rules.

In order to minimise divergence with the Victorian roll-out, MCE requires timely **national agreement** through the NSSC on these detailed arrangements. This will support the Victorian roll-out and ensure a consistent national framework within the NEM, while still allowing businesses in other jurisdictions to be fully engaged with the national arrangements. MCE notes that the level of advanced work already undertaken in Victoria will provide major input. While further useful findings will be achieved through pilots, any National Minimum Functionality and related service levels will necessarily change over time as technology and experience develops and these amendments can be supported via usual Rule change mechanisms.

MCE now agrees to an addition to the National Minimum Functionality of *an interface to a Home Area Network (HAN)* which allows communication with in-home devices. The HAN should use an internationally-supported, nationally-consistent open standard which can be integrated easily into many types of devices. This function creates the opportunity for consumers to be offered a wide range of innovative new services, like in-home displays to monitor their energy use and direct load control programs to reduce energy costs on large appliances like air conditioning and electric hot water systems. The consultants quantified potential additional net benefits from the HAN from direct load control services alone of potentially greater than \$392 million, and noted that these services are one driver of the projected greenhouse benefits. In the longer term the potential exists for further innovative services to be offered which may deliver further customer benefits and could include the ability to link in-home displays with related water and gas meters. MCE requests advice from the NSSC by the end of 2008 on the specific standard to be adopted. MCE notes that Victoria has prescribed the use of the ZigBee open standard for wireless messaging between a smart meter and in-premises devices and that consideration of national consistency for the HAN is a priority issue to be considered by the NSSC.

MCE notes that uptake rates of direct load control of appliances can drive significant benefits identified in the study. To support voluntary uptake of direct load control services further, MCE agrees that consideration should be given to adjusting some appliance standards, such as air-conditioning, to include the HAN standard. MCE requests advice from the NSSC on recommendations to integrate this capability into priority appliances. This analysis should be undertaken in conjunction with the existing appliance energy standards work currently being conducted by both the Equipment Energy Efficiency (E3) Committee of the National Framework for Energy Efficiency and Standards Australia. In addition MCE considers that direct load control should be further tested and explored through the smart meter pilots to identify mechanisms to maximise the benefits and to consider the level of network demand management that can be achieved. MCE seeks advice from the NSSC in this regard.

MCE also notes positive cost-benefit findings for a non-smart meter direct load control roll-out in some jurisdictions, with net benefits nationally estimated to lie between \$34 million and \$618 million. MCE therefore supports continuation of non-smart meter direct load control trials.

MCE notes that one of the key functions of the HAN is to allow the introduction of *in-home displays*, which MCE recognises as major tools in empowering consumers and maximising demand management benefits. In-home displays range widely in functionality from simple traffic lights, to interactive colour screens, to virtual services delivered to mobile phones. MCE has not included the in-home display as part of the National Minimum Functionality as maximising the benefits of this technology requires consumers to be able to choose the display which suits them from a wide range of offers. MCE expects retailers to innovate and compete in this space, and supports inclusion of in-home displays in the pilots. MCE requests advice from the NSSC on whether there is a need to provide guidelines to support this development. MCE will continue to review the development of the in-home display market.

MCE notes that the benefits of the HAN through both in-home displays and direct load control depend on access for retailers, and other service providers, to this interface. Defined service standards for access to the HAN should be proposed by the NSSC to optimise innovation and uptake of these in-home services.

MCE also considered the issue of *interoperability and communications standards*. MCE recognises insufficient interoperability between different meters, communications infrastructures and metering management systems may introduce further market power risks or reduce competition in metering. MCE requests advice from the NSSC on: the materiality of this risk; international progress on communications standards and practices to support interoperability; and the most appropriate framework to manage this risk in the Australian market. This work will also inform further testing of interoperability options through the pilots. (MCE notes that Victoria has not pre-empted any national decisions in this area and has consequently not prescribed open communications standards – but has prescribed ZigBee as an open standard for local HAN communications.)

A consistent national framework for smart meters

MCE notes stakeholder views that there are strong benefits in a consistent national framework for smart meters. These benefits include: minimising costs through the promotion of competition between technology providers; maximising efficiencies in NEM management and cross-jurisdictional businesses such as retailers; and maximising development of retail competition and products.

MCE agrees that while deployment in different jurisdictions will be on varied timescales, as relevant to net benefits in individual jurisdictions, *the underlying regulatory arrangements for National Energy Market jurisdictions will remain within a consistent national framework*. Consistency between the NEM and non-NEM jurisdictions will also be a sought where beneficial, given different market arrangements.

Technical and operational aspects of this framework will be developed through a co-regulatory model by the NSSC and agreed with the MCE's Standing Committee of Officials (SCO). The detailed timeline for completion of this framework will be agreed between the NSSC and MCE by the end 2008. This timeline will consider the need for consistency between the first two jurisdictions to roll-out, Victoria and NSW. Legislative and cost-recovery aspects of the framework for NEM jurisdictions will be necessarily implemented by MCE in the same time frame.

MCE notes that separate existing arrangements in the Western Australian energy market and Northern Territory system will require separate regulation and potential variations specific to those systems. These arrangements will be implemented to meet jurisdictional deployment timelines but will also be considered by the NSSC to maximise consistency where beneficial. MCE also notes that the policy decisions on the obligation and related economic regulatory arrangements detailed below will apply in the NEM but given that WA and NT maintain separate economic regulation these decisions may vary outside of the NEM and will be considered as part of any jurisdictional roll-out.

Transitional arrangements will be put in place to consider smart meters deployed prior to the conclusion of national arrangements, such as the Solar Cities trials or advanced pilots.

As a critical part of the national framework, MCE agrees that distributors are the most appropriate party to manage any obligation for an accelerated roll-out. To support this MCE agrees that **residential and small customer metering and related data management services should remain the responsibility of distributors** in NEM jurisdictions for at least the roll-out period. This decision is consistent with the current approach in Victoria. To provide clarity on this policy position, and to allow the AEMC to consider any related Rule changes efficiently, MCE will release a Statement of Policy Principles on this matter.

MCE supports this distributor led roll-out largely to manage the market failure risks specific to achieving an *accelerated* roll-out, given the scale of change required, the complexity in market change and the need to maximise network operational benefits in the transition. MCE recognises that many of the benefits identified depend on a managed large scale changeover and will be reduced or not captured through a slower incremental or selective deployment, as is likely in a market-driven scenario, or on a new and replacement basis. Examples include: avoided meter reading costs; installation efficiencies; network management improvements; time-of-use settlement; and market scale for new retail products. MCE also recognises that a distributor roll-out will assist in the timeliness of the roll-out, given skills and resources are already in place, and provide consistency with current metering arrangements for small customers. This will minimise the delay of benefits to consumers and maximise the overall benefits.

MCE notes that a distributor led roll-out also reduces risks to maturing retail competition by: providing a common platform for all retailers; reducing lack-of-scale disadvantages to smaller retailers; reducing complexity and technology costs to support customer transfers; and reducing potential advantages to incumbent retailers. Maximising retail competition and competition in new in-home energy services is critical in maximising smart meters benefits, and this is best achieved through an open access regime.

MCE however does recognise the potential benefits of contestability in the provision of metering services and does not intend for this decision on a distributor roll-out for small, mass-market meters to negatively impact existing contestable metering services in the larger customer and special metering market. MCE will consider supporting changes to regulatory arrangements to ensure incentives in this sector are maximised and not negatively impacted. MCE notes that the benefits of exclusivity to distributors are specific to the mass scale and major change requirements of a universal roll-out of small homogeneous meters. MCE remains open to further expansion of contestable metering beyond the roll-out period and as technology and retail competition matures to support this. Regulatory and operational arrangements in the national framework should be designed with future flexibility on this matter in mind.

MCE agrees that in complying with any jurisdictional obligation to roll-out smart meters distributors should receive regulatory cost recovery for direct costs consistent with the revenue and pricing principles in the National Electricity Law. However, MCE agrees that this cost-recovery should be clearly limited. Cost recovery should be

net of reasonably achievable network operational benefits to ensure that these benefits are passed directly to consumers and the regulator should also consider mechanisms to smooth any related impacts on tariffs over time. Cost recovery should include meters and communications infrastructure which meet the National Minimum Functionality and systems directly required to meet agreed service requirements to other parties, such as billing and settlement. MCE will also review regulatory incentives to maximise the competitive purchase of meters and metering services, which is already common practice, and maximise cost-transparency.

MCE also requests that a framework to support prudent costs of pilots be considered by SCO.

The costs and benefits of broader activities to capture the additional benefits of smart meters within the distribution businesses, such as outage management, broader systems integration or development synergies with other projects (such as smart grids), will vary widely between businesses. These activities are strongly encouraged but should be negotiated separately with the regulator on the basis of a business case relevant to the business within the existing regulatory framework, rather than as part of the obligation to provide smart meters.

MCE also notes that, consistent with the existing National Electricity Rules, distributors should not be penalised for stranding of related existing assets. The estimation of cost and benefits is consistent with this, having assumed no benefits of a reduced asset base.

MCE agrees that access to and protection of smart meter data must be closely reviewed by both the NSSC and the MCE's consumer protection review. MCE notes that this should include consideration of mechanisms to ensure transparency of time-of-use data to consumers, to support effective retail competition. MCE also notes that market operators should have access to all relevant smart meter data to maximise the benefits from improved settlement and demand forecasting and support the development of wider demand management opportunities. Access to this data on an appropriate basis could also provide greater transparency for regulators on matters like outages and quality of supply. Distributors, retailers and related metering service providers should have data management obligations to ensure that the market operator's data set remains up to date and is the legally agreed set of data against which disputes can be settled.

Based on the above commitments, MCE notes that a consistent national legislative framework within the NEM would include:

- Legislative support for the roll-out in the National Electricity Law, including the obligation to roll-out smart meters on the distribution businesses *where a jurisdictional implementation date has been set*². This will include any legislative support necessary to ensure appropriate cost recovery, as well as proposed supporting Rules as necessary.

² Implementation dates may be referred to as listed in a regulatory instrument to allow these to be updated as relevant to jurisdictional deployment commitments.

- Supporting changes in the National Electricity Rules, NEM procedures to support: the National Minimum Functionality; service and performance standards; metrology arrangements; NEM management processes; data management; and business interfaces. This work will be undertaken by NSSC and reviewed by officials.
- Equivalent arrangements as relevant in WA and NT, in a timeline relevant to their jurisdictional deployment.

The timeline to finalise these arrangements will be finalised in consultation with the NSSC by the end of 2008.

Maximising consumer benefits

As committed to in December 2007, a review of related impacts on and from *consumer protection and safety regulation*, will be undertaken by MCE and completed by May 2009. This review may consider consumer pricing, billing arrangements, information protection, treatment of vulnerable consumers, in-home display content and processes for connection and disconnection. Given the Victorian roll-out, any necessary changes to the obligations which are part of the National Energy Customer Framework will be prioritised and progressed in the implementation of that package. MCE notes that while consistency is preferred where possible, some of these arrangements remain specific to different jurisdictions as agreed in the Australian Energy Market Agreement. The NSSC will be consulted on this work but it will be led by policy officials, given the relevance to jurisdictional policies.

MCE also recognises that *consumer education programs* will be critical to maximising demand response and greenhouse benefits. MCE will develop a significant consumer education program to maximise consumer benefits, greenhouse reductions and demand response. This program will be informed by the review of consumer protection impacts and ongoing industry pilots. It will be implemented as supportive to jurisdictional roll-out timelines.