APPENDIX 5: METERING – COST BENEFIT ANALYSIS AND OTHER OPTIONS

Final Inquiry Report: Inquiry into Reform Options for SA Water's Drinking Water and Sewerage Prices

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GLOSSARY OF TERMS

AMR	Automated meter reading
ASM	Australasian Sub Meters
CBA	Cost benefit analysis
Commission	The Essential Services Commission of South Australia
Dwelling	An individual unit within a residential group
Flat (group site)	A group of high-density smaller individual units where the whole site appears as one valuation on the valuation roll
Group metered	Multiple dwellings or occupancies sharing a single water meter
HAN	Home Area Network
High case	20% less in costs and 50% more in benefits
Land assessment	A piece of land assessed for its value and recorded as a valuation on the valuation roll
Low case	20% more in costs and 50% less in benefits
Manifold	A pipe with multiple apertures to allow separate connections from a single supply pipe joining to a water main
Mid case	Assessed costs and benefits
NPV	Net present value
Occupancy	An individual unit within a non-residential group
Opex	Operating expenditure
Private flow meter	A 20mm meter installed inline on the existing supply pipework to measure flow to a particular dwelling/occupancy
SA Water	South Australian Water Corporation
SA Water mains connection	Pipework from a water main to a meter on the boundary of a property
Shop/office (group site)	A group of individual shops or offices where the whole site appears as one valuation on the valuation roll

Shop/office (separately valued)	A group of individual shops or offices where each individual shop or office unit appears separately on the valuation roll
Smart water meter (SWM)	Standard accumulation water meter with bolt-on device equipped to provide frequent consumption readings and send these to customer and/or utility. Other capabilities include: peak and minimum flow recording, leakage and backflow detection
SRE	Standard residential equivalent (400kL per annum). A measure of peak demand on the system.
SWIC	Statewide infrastructure charge
Townhouse (group site)	A group of medium to high-density small to medium individual units where the whole site appears as one valuation on the valuation roll
Townhouse (separately valued)	A group of medium to high-density small to medium individual units where each individual unit appears separately on the valuation roll
WBWC	Wide Bay Water Corporation

1. INTRODUCTION

The Inquiry has considered the scope for water metering reform, including:

- Individual metering – including the costs and benefits associated with extending individual metering to those customers that currently share a water meter; and
- Smart metering – including the costs and benefits associated with introducing electronic meters for water customers.

In doing so, it undertook cost benefit analyses for these reforms, under a number of reform scenarios. This report presents the details of those analyses (including the inputs, methodology and assumptions) and a summary of the options considered, but were deemed to be not favourable at this point in time. These options are based on those presented in the Issues Paper[1] which was released in August 2013.

This report is divided into two main sections. The first deals with individual metering reform, the second with smart metering reform.

[1] Essential Services Commission of South Australia (**ESCOSA**), *Water Reform Pricing Inquiry – Issues Paper No 5 – Metering*, 2013, available at http://www.escosa.sa.gov.au/library/130829-WaterPricingInquiry-IssuesPaper_5-Metering.pdf.

2. INDIVIDUAL METERING

2.1 Background and methodology

2.1.1 Scope

An analysis of SA Water's 2011/12 customer database revealed around 138,000 of 743,000 dwellings or occupancies (18.6 per cent) currently share a water meter. These dwellings were broken down into the following groups for the cost benefit analysis (**CBA**) of installing individual meters.

Table 1: Summary of group metered dwellings and occupancies

DWELLING OR OCCUPANCY TYPE	NO. LAND ASSESSMENTS	NO. METERS	NO. DWELLINGS	AVERAGE USE KL PA
Flat (group site)	6000	6000	22,000	125
Townhouse (group site)	6000	6000	14,000	205
Shop/office (group site)	3600	4000	20,000	260
Townhouse (separately valued)	77,000	17,000	77,000	120
Shop/office (separately valued)	5000	100	5000	225
Total	97,600	33,100	138,000	N/A

2.1.2 Current arrangements

Most properties in South Australia have accumulation meters that measure the amount of water supplied. A meter reading is typically taken every three months and customers are billed for water used during that period.

However, the approximately 138,000 dwellings or occupancies on group sites (residential and commercial) supplied by a shared SA Water meter, receive a bulk bill. Where each dwelling is individually owned, SA Water offers the following options:

- issuing a single bill to the manager of the site
- providing separate bills to each owner, reflecting equal division of water use
- providing separate bills to each owner, reflecting an agreed (and signed in writing) method of apportioning use.

Where a site manager receives a bulk bill there are various methods of charging occupants for water use. These include, but are not limited to:

- no charge (or an indirect charge)
- a fixed charge
- some form of proportionate charge.

Where no individual meters are fitted, charges do not reflect actual water use.

Customer awareness of water consumption – and attention to bills – has increased significantly in recent years and, in some cases, this has made the use of group meters, and the sharing of water bills, problematic.

SA Water's current policy stipulates that meters must be installed within 0.5m and 0.6m of the boundary of a property.[2] This means that many dwellings or occupancies on group sites are currently 'out of reach' of SA Water metering solutions.

For some sites, such as a row of townhouses, an SA Water manifold can be installed, allowing each dwelling to be metered separately. However, this would only work where the distance from the property boundary to the furthest dwelling was not too far, as water pressure is difficult to maintain over long distances in a typical 20mm pipe.

It is possible to privately install and operate sub-meters, to help allocate charges accurately, and some sites have opted to do this at their own expense. In other Australian jurisdictions, such as Tasmania and NSW, water companies maintain, read and bill where sub-meters have been installed on a group site, so long as they are installed in accordance with the utility's specifications. However, this is not current practice in South Australia.

2.1.3 Metering solutions

The following provides an overview of the main types of metering solutions based on a duplex dual occupancy situation. In practice, the metering solutions are more complex where a large number of dwellings exist on a property and are landlocked (not close to an SA Water main), and/or multiple storeys are involved. Some situations may require considerable on-site investigation to locate the supply pipe-work for a specific dwelling, to determine where a meter could be placed and whether all potential water lines to that individual dwelling could be metered from that location.

For the purposes of the examples used in this chapter, it is assumed that an SA Water main runs alongside the road frontage. SA Water's current policy is to only place its meters within 0.5-0.6m of the boundary of the property abutting an SA Water main.[3]

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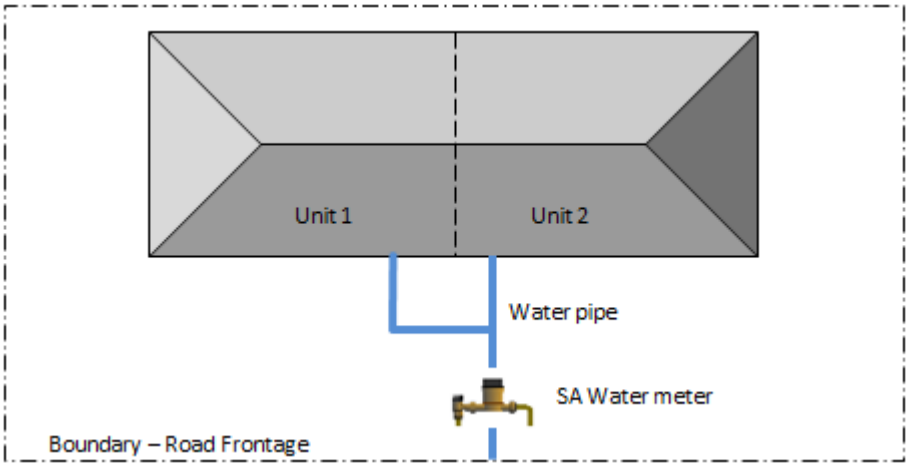
[2] SA Water, *Installation of a Water Meter – Fact Sheet*, available at http://www.sawater.com.au/nr/rdonlyres/15923f91-7a6d-4430-890f-587fc593c871/0/installwatermeter.pdf.

[3] SA Water, *Installation of a Water Meter – Fact Sheet*.

2.1.3.1 Typical Existing Shared Meter Supply Configuration

Figure 1 shows an example of an existing metering configuration, with one meter shared between two dwellings. In this situation, SA Water would bill based on the reading of the single meter. Units 1 and 2 would then have to divide the bill, usually based on an equal share of the water consumption.

Figure 1: Shared meter

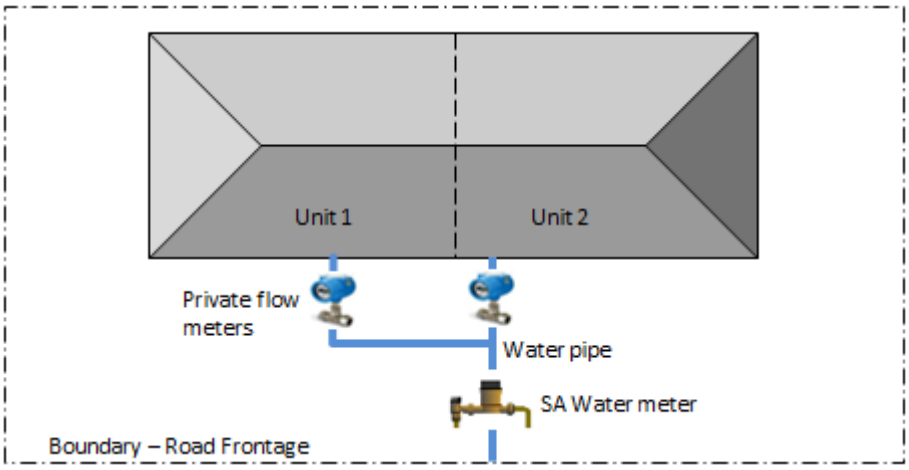


2.1.3.2 Private Flow Meter Solution

Figure 2 shows an example of how private flow or 'sub-meters' can be fitted into existing pipe-work. In this situation, SA Water would continue to bill for the reading at the boundary meter, but the two individual flow meters enable Units 1 and 2 to split their bill according to individual use. Any shortfall between the sum of the recordings of the private flow meters and the amount billed by SA Water would represent common or landlord use (e.g. the provision of taps between the SA Water meter and the private meters, for outdoor and common use).

This represents a relatively low capital cost option, if the supply to the individual units is easy to locate (if it is not easy to locate, any solution is likely to be expensive). Under current SA Water arrangements, the unit owners would be responsible for reading and maintaining the private flow meters. There is also potential to read the meters 'remotely' by installing automated meter read (**AMR**) devices. While this can reduce reading costs, it may be offset by higher maintenance costs associated with such devices.

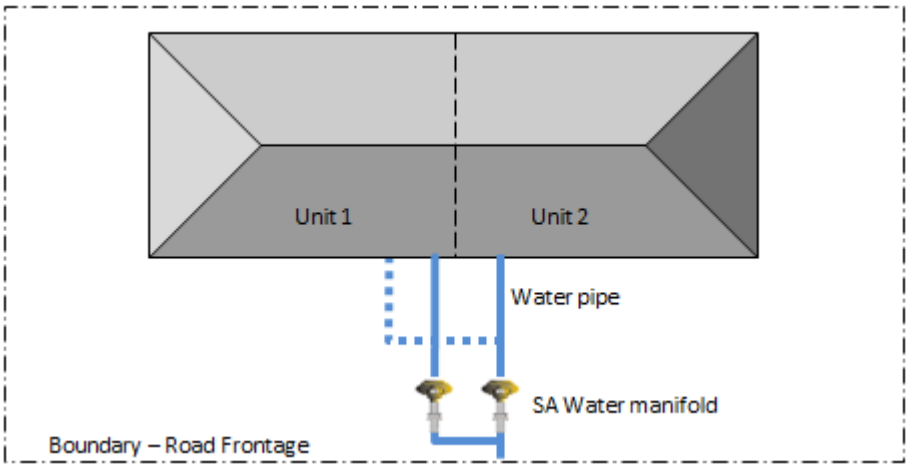
Figure 2: Private flow or sub-meters



2.1.3.3 SA Water Manifold on Existing Mains Connection Solution

Figure 3 shows an example of installing an additional SA Water meter, in the form of a 'manifold' (a pipe with multiple apertures to allow separate connections), to an existing SA Water mains connection. This would enable both units to have a separate SA Water meter once a section of new pipe was connected to Unit 1. In this situation, SA Water would bill each unit individually for actual water usage.

Figure 3: New manifold connection



There is a cost advantage with the manifold connection approach compared with a new mains connection (refer 2.1.3.4 below), as it does not involve works on footpaths and roads to make a new connection to the SA Water mains. However, if the existing supply pipe is not close enough to the boundary, additional pipe-work within the property may be required, compared with the new mains connection option. The blue dashed line in Figure 3 above shows the existing internal property pipework that would need to be disconnected in such an instance.

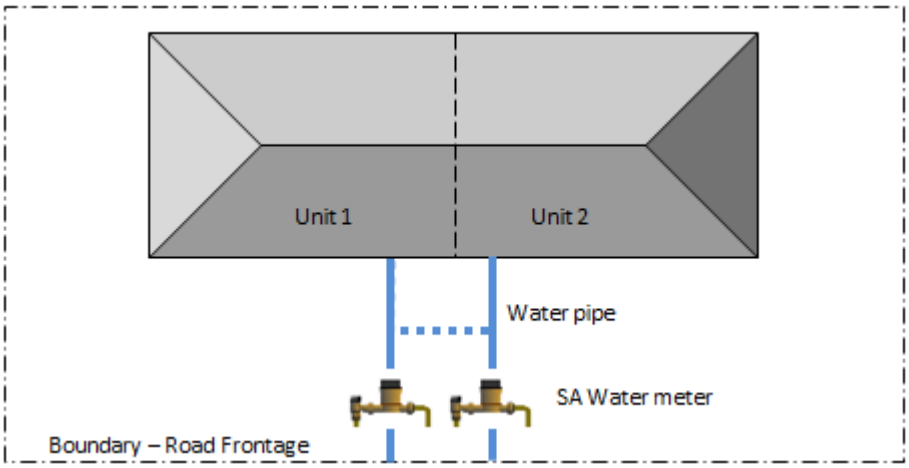
A limitation in the application of this solution is that the existing mains supply connection pipe must be between 25mm (where up to four 20mm meters can be attached on a

manifold) and 40mm in diameter (where up to twelve 20mm meters can be attached on a manifold).[4]

2.1.3.4 SA Water Mains Connection Solution

Figure 4 shows an example of a new mains connection for Unit 1, consisting of a new SA Water meter and a section of new pipe, with the second SA Water meter supplied directly from the SA Water mains. In this situation, SA Water would bill each unit individually for actual water usage. This option has the highest installation cost as it requires works on footpaths and roads to make a new connection to the existing SA Water mains.

Figure 4: New SA Water mains connection



2.1.4 Reform options assessed

The reform options assessed for requiring the installation of individual meters to unmetered properties are:

- Allowing the installation of individual meters to group-metered properties (retro and new) to be optional – **Status Quo** (further discussion on the recommended option can be found in Chapter 5 of the final Inquiry report)
- Requiring the installation of individual meters to all group-metered properties (retro and new) – **Mandate for all properties**
- Requiring the installation of individual meters to all newly constructed group properties – **Mandate for new build properties only**

In the Issues Paper the status quo and optional installation of individual meters were listed as two separate options for reform. [5] These have been combined for the purpose of the

[4] SA Water, *New Community Title Development – Water Fact Sheet*, available at http://www.sawater.com.au/NR/rdonlyres/83E8E7BA-EA05-4CBF-82CA-5BD51BC613D5/0/NewCommTitleDevWater.pdf.

[5] ESCOSA, *Water Reform Pricing Inquiry – Issues Paper No 5 – Metering,* pp2-3.

analysis used in this report, as the status quo is considered to be the optional installation of individual meters.

2.2 Cost Benefit Analysis inputs

2.2.1 Costs

The following table summarises the cost inputs considered in assessing the installation of individual metering (Table 2).

Table 2: Summary of costs of individual metering

COST	NATURE OF COST	OCCURRENCE OF COST	CALCULATION OF COST
Meter	Costs of procuring an approved 20mm water meter and any required AMR device	At installation/ replacement	Quote from market participants
Plumbing	Costs of labour and plumbing associated with installing the meter	At installation	As above
Meter administration	Costs of reading and servicing the installed water meter	Recurring	SA Water and private operator supply/service charges as a proxy for these costs
Site data set-up	Costs of setting up data collection for a new privately sub-metered site	At installation	Quote from market participant
Billing	Costs of customer billing requirements per meter	Recurring	SA Water actual variable costs of billing per customer and private operator billing charges per meter
Customer inquiries	Cost of answering increased customer inquiries (from increased customer base)	Recurring	SA Water actual variable costs of customer service per customer (only applied where SA Water meter fitted)

A 20 per cent overspend and underspend in the above estimated costs was tested during sensitivity analysis and forms the cost inputs of the low and high case NPVs.

2.2.2 Benefits

The following table summarises the benefit inputs considered in assessing the installation of individual metering (Table 3).

Table 3: Summary of the benefits of individual metering

BENEFIT	NATURE OF BENEFIT	OCCURRENCE OF BENEFIT	CALCULATION OF BENEFIT
Economies of scale on installation costs	Reduced costs incurred from large roll-out scheme	At installation	15% of upfront costs calculated above
Reduced/ economically efficient water consumption	Proper pricing signals would lead to economically efficient levels of consumption, which has been shown to reduce overall consumption	Recurring	9% reduction in average consumption converted to reduced bulk water requirement at the value of Greater Adelaide LRMC per kL
Reduced leakage	Better visibility of leaks on the customer side of the meter	Recurring	1% reduction in average consumption converted to reduced bulk water requirement at the value of Greater Adelaide LRMC per kL
Capital efficiency	Dispersed reduced demand load, resultant deferral of network upgrade works	At installation	10% reduced consumption converted to reduced bulk water requirement and then to Standard Residential Equivalents (**SRE**) and multiplied by the proposed Statewide Infrastructure Charge (**SWIC**)
User pays	Less perceived unfairness as customers pay for exactly what they are using	Qualitative only	-
Reduced disputes	Reduced neighbour disputes	Qualitative only	-

A 50 per cent over and under realisation of the above benefits was tested during sensitivity analysis and forms the benefit inputs of the high and low case NPVs.

2.2.3 Assumptions

All CBAs of options considers the marginal or incremental cost or benefit of that option when comparing it to the status quo.

Based on the characteristics of a sample of group-metered properties for each type, the requirements for each of the three metering solutions, and having preference for an SA Water solution, where available, the Inquiry assumes the following installation pattern, shown in Table 4, for each group.

Table 4: Summary of deployed metering solution assumptions

DWELLING OR OCCUPANCY TYPE	METERING SOLUTION		
	Private flow	**SAW Manifold**	**SAW Mains**
Flat (group site)	100%	0%	0%
Townhouse (group site)	10%	90%	0%
Shop/office (group site)	100%	0%	0%
Townhouse (separately valued)	50%	50%	0%
Shop/office (separately valued)	100%	0%	0%

SA Water's estimate of 0.9 per cent annual growth in its customer base has been applied to the current stock to establish annual new builds. The number of new builds this produced per year reconciled with new build trends in the State over the past 10 years.

It is assumed the costs and benefits would remain constant in real terms over the life of the initial roll-out of individual meters.

A statewide LRMC was used in calculating the value of reduced demand benefits.

The assumption has been made that all existing group sites installing individual SA Water meters would continue to use the existing meter on site to account for any group or common use water (i.e. the marginal cost of individual metering includes the installation of the same number of new meters as there are dwellings/occupancies). This is an issue which was noted by SA Water in its submission to the Issues Papers.[6]

Individual water meters are assumed to have a 20-year life, based on that experienced by SA Water over its meter fleet. AMR devices are assumed to have a 12-year life, based on discussions with private market providers.

2.3 Other options for individual metering reform

The other options considered are:

[6] SA Water, *Submission to ESCOSA Inquiry into the reform of SA Water's drinking water and sewerage prices,* 2013, p.19, available at http://www.escosa.sa.gov.au/library/131118-WaterPricingInquiry-IssuesPaperSubmission-SAWater.pdf.

- Requiring the installation of individual meters to all group-metered properties (retro and new) – **Mandate for all properties**
- Requiring the installation of individual meters to all newly constructed group properties (retro and new) – **Mandate for new build properties only**

2.3.1 Mandate individual metering for all properties

2.3.1.1 Summary

The option to mandate individual water metering for all properties involves requirements to retrofit to all existing group-metered properties and for all new builds to have individual water metering from construction. It is assumed (as outlined in 2.2.3 above) this option would require the deployment of some private flow water meters and some SA Water manifold solutions. The roll-out of meters to existing dwellings and occupancies has been costed evenly over five years (20 per cent per year).

2.3.1.2 Considerations

The expected net present value (**NPV**) of all costs and benefits of mandating individual water metering for all properties is −$74.4m (see Table 5).

Table 5: NPV of mandating for all properties ($m Dec-13)

DISCOUNT RATE	LOW CASE	MID CASE	HIGH CASE
4%	−134.5	−86.8	−39.1
6%	−115.5	**−74.4**	−33.2
8%	−100.8	−64.8	−28.8

The costs of initial installation are high, averaging $450 per meter for retrofit and $323 per meter (marginal) for new builds. However, efficiency gains of around 15 per cent can be made in a bulk roll-out program, reducing the upfront installation costs for retrofit to an average of $384 per meter. Additionally, there are continuing costs to maintain installed meters. These include meter reading, maintenance and administration. For private flow meters, AMR devices would need to be replaced after 12 years.

Mandating individual metering complies with user-pays principles and removes cross-subsidies. This would incentivise more efficient consumption as well as improve customer leak detection.

Australasian Sub Meters (**ASM**) was of the view that customers would be prepared to pay for the peace of mind, knowing that their water bills accurately reflected their usage.[7] ASM also

[7] ASM, *Individual Metering,* Submission, 2013, p. 1, available at http://www.escosa.sa.gov.au/library/131118-WaterPricingInquiry-IssuesPaperSubmission-AustraliasianSubMeters.pdf.

commented that the Commission should consider lobbying for appropriate standards for retrofitting sub meters across Australia.[8] ASM further quoted an example from Sydney's 'WaterFix' program where a large CBD residential building reduced consumption by 21 per cent following the installation of individual meters.[9]

Ceduna Council submitted that individual metering should be mandatory for all new properties, but that retrofitting should only be undertaken where the costs stacked up.[10]

Due to the high fixed cost nature of the water industry, reduced demand benefits are low (around 10 per cent of current consumption of these properties). On average, the retrofitting of individual meters would cost $542 per meter in net present terms (mid-case, 6 per cent).

An important input into the analysis is the variable cost attached to each kilolitre of bulk water supplied. If in the long run, marginal cost per kilolitre of water (as outlined in the assumptions above at 2.2.3 Assumptions) was to increase 530 per cent on current levels to around $3.46/kL, the individual metering of all group-metered properties would likely become viable at the mid-case (6 per cent discount rate).

2.3.1.3 Other qualitative considerations

The installation of individual meters at all group-metered dwellings would alleviate many neighbour and landlord/tenant disputes regarding water use and charges. It also would be likely to mean that fewer landlords and tenants might opt out of proposed default billing of tenants, and, hence, increase the probability the full benefits of that reform could be realised. The submission of ASM fully supported a mandated roll-out of individual meters to both retrofit and new build properties.[11]

2.3.2 Mandate for new build properties only

2.3.2.1 Summary

The option to mandate the individual water metering of all new build grouped properties would establish requirements that all new builds be individually metered, but would not force the individual metering of existing grouped dwellings and occupancies.

2.3.2.2 Considerations

The expected NPV of all costs and benefits of mandating individual water metering for all new build properties is −$7.6m (see Table 6).

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8 ASM, *Individual Metering,* p.1.

9 ASM, *Individual Metering,* para 3.10.

10 District Council of Ceduna (Ceduna Council), *Submission to Inquiry into the reform of SA Water's drinking water and sewerage prices,* 2013, p. 7, available at http://www.escosa.sa.gov.au/library/131118-WaterPricingInquiry-IssuesPaperSubmission-CedunaCouncil.pdf.

11 ASM, *Individual Metering,* p.1.

Table 6: NPV of mandating for all new build properties

DISCOUNT RATE	LOW CASE	MID CASE	HIGH CASE
4%	−14.8	−9.8	−4.9
6%	−11.4	**−7.6**	−3.8
8%	−9.0	−6.0	−3.0

While the costs of installing individual meters to new builds is, on average, $127 less per meter than for retrofitting, the number and spread of new builds per year does not create a large enough scale to achieve any efficiencies in costs.

The installation of individual meters at new build group sites would incentivise more efficient consumption and remove the cross-subsidies of a group-metered solution.

Costs of installing individual meters at new builds, while not as high as for retrofitting, are higher than the costs for fewer group meters. There are also ongoing costs in maintaining a greater number of meters. Reduced demand benefits are low (although around 10 per cent of consumption) as water supply is a high fixed cost industry and the benefits are outweighed each year by the ongoing costs.

An important input into the analysis is the variable cost attached to each kilolitre of water supplied. If the variable cost per kilolitre of water was to increase 535 per cent on current levels, mandating the individual metering of new builds on a statewide basis would become viable.

On average, the installation of individual water meters at new build properties would cost $500 per meter in net present terms (mid-case, 6 per cent). Mandating the installation of individual meters to new build group dwelling/occupancy properties gradually addresses the issues of group metering, reducing its prevalence over time, in a more cost-efficient manner than retrofitting.

2.3.2.3 Other qualitative considerations

Mandating the installation of individual meters at new build group-metered dwellings/occupancies would alleviate many neighbour and landlord/tenant disputes regarding water use and charges. It would also be likely to decrease the number of landlords and tenants who might opt out of proposed default billing of tenants, and, hence, increase the probability that the full benefits of that reform could be realised. The Ceduna Council expressed support for mandatory individual metering for new build group properties in response to the Commission's Issues Paper.[12]

[12] Ceduna Council, *Submission to Inquiry into the reform of SA Water's drinking water and sewerage prices*, p.7.

Many other water utilities across the country have guidelines for installing meters at properties, and in particular group dwellings, e.g. Victorian metro water businesses.[13] If SA Water were to do something similar, it could require new build group properties which could support such a solution to have individual SA Water meters.

While mandating individual metering for new build properties on a statewide basis is more costly than maintaining the status quo, it is comparatively less costly than for retrofitting. Given the mid-case sits at a cost of $7.6m (NPV), and, on average, each meter costs $500 (NPV) over its life, it is important that appropriate weight is given to the costs and benefits that could not be quantified in the Inquiry's analysis.

Consideration of these reveals the individual metering of some types of new build properties is more likely to yield a benefit than for other types.

In general terms, residential new build multi-dwelling properties, especially those with little common use, are considered to be the most likely to see an overall gain under individual metering in the medium term. Due to the shared nature of water-using facilities within non-residential shops and offices, the individual metering of these premises is less likely to yield an overall economic benefit. However, the results would depend heavily on the specific characteristics of a new group site.

For these reasons, developers of all group dwelling/occupancy sites are encouraged to consider the specific costs and benefits to their site, favouring an individual metering approach.

[13] For example, see City West Water, South East Water and Yarra Valley Water, *Water Metering & Servicing Guidelines, Version Three,* 2013, accessible at: https://www.yvw.com.au/yvw/groups/public/documents/document/yvw1003607.pdf.

3. SMART METERING

3.1 Background and methodology

3.1.1 Scope

Data provided from SA Water's meter asset information system was obtained to scope the analysis of a smart water meter roll-out and is summarised below in Table 7.

Table 7: Summary of deployed accumulation meters by sizes

METER SIZE CATEGORY	NUMBER
Up to 25m	653,000
32-80mm	23,000
Above 100mm	400
Total	676,400

3.1.2 Current arrangements

The majority of SA Water's customers are metered using standard accumulation water meters at the supply point to the property. Consumption is determined by the difference in accumulated value at two reading points, generally 90 days apart, to enable quarterly billing. However, as described above, some dwellings on group sites are not individually metered.

As a matter of course, given the extra cost of installing a smart meter over an accumulation meter, smart meters should be assessed for installation in new builds, or as replacements when old meters were no longer fit-for-service.

3.1.2.1 Experience in other jurisdictions

A number of smart metering trials have been conducted around Australia. For example, the Kalgoorlie-Boulder Smart Meter Trial involved the installation of 13,838 smart meters at residential, commercial and industrial properties and is expected to save about 896 million litres of water in its first full year.[14]

Another trial was conducted by Wide Bay Water Corporation (**WBWC**) at Hervey Bay, Queensland, in 2006. Approximately 20,000 domestic water meters were replaced with smart meters.

[14] Based on information provided by Water Corporation, Western Australia.

A third-party evaluation of the trial highlighted benefits in the following areas:[15]

- Billing – the ability to provide a higher level of customer service when customers inquire about their bills
- Operations – the ability to understand, at a detailed level, the effects of pressure reduction on various components of water demand
- Research – the discovery of the level of household water leakage
- Planning – the ability to determine and analyse daytime patterns for individual areas which could allow for improved major capital expenditure
- Management – the ability to cost and develop a business case for an AMR project.

The evaluation noted, however, that there are many additional – and significant – opportunities still to be explored. These included:

- real-time downloading of meter data to a water service provider to enable immediate analysis and response to leaks and water restrictions violations
- greater interaction between AMR data and water planning and demand forecasting tools
- the use of climate correction modelling to help provide better understanding of seasonal outdoor demand in various sectors and customer groups, as well as their responses to a variety of restrictions regimes
- automatic monitoring and evaluation of demand management initiatives (such as water restrictions or scarcity pricing) immediately following implementation, to quickly determine their effectiveness.

As part of its Optimal Water Mix for Metropolitan Adelaide project, the Goyder Institute has installed smart metering technology at 150 households across Adelaide. Their usage will be monitored over 15 months to provide detailed water use patterns which can be measured and applied to understand water demands at a city scale.[16]

However, smart water metering is not yet developed to the same extent as smart electricity metering.

3.1.2.2 Experience in other industries

In July 2007, the Ministerial Council on Energy's Smart Meter Working Group appointed a team of consultants to undertake a CBA – requested by the Council of Australian

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[15] Turner A., Retamal M., White S., Palfreeman L. and Panikkar A., *Third Party Evaluation of Wide Bay Water Smart Metering and Sustainable Water Pricing Initiative Project*, report prepared by the Snowy Mountains Engineering Corporation in association with the Institute for Sustainable Futures, UTS, for the Department of the Environment, Water, Heritage and the Arts, Canberra, 2010.

[16] Goyder Institute, *Achieving a sustainable water supply for Adelaide through innovative urban water planning,* Fact Sheet, 2012, available at: http://www.goyderinstitute.org/uploads/Fact%20Sheets/GOYDER_Fact%20Sheet_U.2.2_Metropolitan%20Adelaide.pdf.

Governments – of a mandated national smart electricity meter roll-out and a non-smart meter direct load control alternative. NERA Economic Consulting estimated that total costs of a mandated roll-out of smart electricity meters under this scenario in SA ranged from $188 million to $308 million.[17]

3.1.3 Metering technology

A key task is to determine what smart water meter functionality is required for the assessment, as each has a different benefit and cost stream. Types of functionality that could be considered are:

- Pulse or time interval-based consumption measurement and recording
- Measuring consumption daily or even more frequently during the day
- Remote reading of meter data and whether remote reading occurs at the end of a day, week or month
- Making meter consumption data available to consumers via a Home Area Network (**HAN**).

It is assumed that the following broad definition of a smart water meter be adopted for the purposes of this Inquiry.

A smart water meter is capable of measuring and recording water consumption in short intervals. It is also capable of two-way communication, which enables water providers to read and control features of the meter remotely.

This is consistent with adopted definitions of smart electricity meters.

3.1.4 Reform options assessed

The options assessed for requiring the installation of smart meters at all properties are:

- Allowing the installation of smart meters to accumulation metered properties (retro and new) to be optional – **Status Quo** (further discussion on this option can be found in Chapter 5 of the final Inquiry report)
- Requiring the installation of smart meters at all accumulation metered properties (retro and new) – **Mandate smart meters for all existing and new**
- Requiring the install of smart meters at all accumulation metered and unmetered properties (retro and new) – **Mandate smart meters for all; existing, new and where unmetered**

[17] NERA Economic Consulting, *Cost Benefit Analysis of Smart Metering and Direct Load Control – Overview Report for Consultation*, Report for the Ministerial Council on Energy Smart Meter Working Group, 2008, pp. 98-101.

- Requiring the installation of smart meters at all accumulation metered properties on a new and replacement basis only – **Mandate on a new and replacement basis only**

SA Water mentioned in its submission to the Issues Paper that the optional installation of smart meters should be assessed. [18] It has since been concluded that the status quo is the optional installation of smart meters, albeit with communication only to the customer and not the utility.

3.2 Cost Benefit Analysis inputs

3.2.1 Costs

Table 8 below summarises the cost inputs considered in assessing the installation of smart meters.

Table 8: Summary of costs of smart metering

COST	NATURE OF COST	OCCURRENCE OF COST	CALCULATION OF COST
Meter	Costs of procuring an approved 20mm smart water meter/smart meter bolt-on	At installation	Quote from market participants checked against SA Water estimates and Kalgoorlie trial costs
Plumbing	Costs of labour and plumbing associated with installing the meter and/or bolt-on	At installation	As above
Meter communications	The costs of setting up and maintaining a meter communications network	At installation and recurring	Information from market participants and the actual costs incurred in the Kalgoorlie trial
System upgrades	Any back office system and hardware upgrades required to support smart meters	At (or just prior to) installation, with refresh every 7 years	SA Water estimates and comparison to costs incurred in other smart meter roll-outs
Meter maintenance	Any costs above and beyond those for accumulation meters associated with maintaining a smart meter	Recurring	SA Water actual expenditure on unplanned meter replacements adjusted for smart meter scenario

[18] SA Water, *Submission to ESCOSA Inquiry into the reform of SA Water's drinking water and sewerage prices*, p.21.

Customer web portal	Maintaining customer web portal to consumption information	Recurring	SA Water estimates
Leakage/abnormal consumption notices	The costs of sending notices to customers where a leakage or abnormal consumption flag is detected in smart meter reading	Recurring	SA Water actual costs of printing and sending notices
Sunk cost of stranded assets	The costs of early replacement of in-life assets	At installation	Not costed as bolt-on smart metering technology costed

A 20 per cent overspend and underspend in the above estimated costs was tested during sensitivity analysis and forms the cost inputs of the low and high case NPVs.

3.2.2 Benefits

Table 9 below summarises the benefit inputs considered in assessing the installation of smart meters.

Table 9: Summary of benefits of smart metering

BENEFIT	NATURE OF BENEFIT	OCCURRENCE OF BENEFIT	CALCULATION OF BENEFIT
Economies of scale	Reduced costs incurred from large roll-out scheme	At installation	15% of upfront costs calculated above
Reduced consumption	More instantaneous pricing signals would lead to economically efficient levels of consumption, which has been shown to reduce overall consumption	Recurring	2% reduction in average consumption converted to reduced bulk water requirement at the value of Greater Adelaide LRMC per kL
Reduced leakage	Leak detection technology to inform the customer and/or utility of leaks on the customer side of the meter	Recurring	2% reduction in average consumption converted to reduced bulk water requirement at the value of Greater Adelaide LRMC per kL

Capital efficiency	Dispersed reduced demand load; resultant deferral of network upgrade works	At installation	4% reduced consumption converted to reduced bulk water requirement and then to SREs and multiplied by the proposed SWIC
Meter reading savings	Manual meter reading no longer required	Recurring	SA Water actual average costs per meter reading
Special meter read savings	Ceased expenditure on manual special meter reads as hourly electronic read data would be available and human error in manual reading eliminated	Recurring	SA Water actual costs of conducting special meter reads per annum
Enhanced customer service	Lower costs of customer service due to the collection of more detailed customer consumption information	Recurring	2% efficiency in variable costs of customer inquiries
OHS	Lower OHS costs for the manual reading of meters in risk of harm circumstances	Qualitative	-

A 50 per cent over and under realisation of the above benefits was tested during sensitivity analysis and forms the benefit inputs of the high and low case NPVs.

3.2.3 Assumptions

All CBAs of options considers the marginal or incremental cost or benefit of that option when comparing it to the status quo.

The smart water meter specification on which the CBA is based is:

- Bolt-on Itron everblu cyble[19] capturing hourly reads
- Remote read once every 24 hours (incorporating 24 reads)
- Data collectors obtain data from meters (via Zigbee or like communications) and then communicate back to an externally hosted data warehouse which links back into the SA Water IT systems (via 3G, broadband or similar technologies)

Other assumptions made:

- Individual water meters are assumed to have a 20-year life. This is based on the actual meter life experienced by SA Water over its meter fleet.

[19] Or similar radio module for mobile AMR that can be fitted to a standard accumulation water meter.

- AMR devices and smart meter bolt-ons are assumed to have a 12-year life. This is based on discussions with private market providers.
- It is assumed all 676,400 meters currently deployed are capable of having a smart meter bolt-on installed.
- It is assumed leakage/abnormal consumption letters would be sent to 7.5 per cent of customers per annum. These would be automatically generated when the data warehouse, analysing the incoming reads, recognised a meter leakage alarm had been flagged or consumption for a meter was out of step with previous reads.
- The CBA intends to provide an NPV for a single life cycle of installed smart meters. For this reason, planned smart meter replacement costs (e.g. normal end of life) are not included in the marginal ongoing opex.
- It is assumed the value of the costs and benefits would remain constant in real terms over the life of the initial roll-out of smart meters.

In the new and replacement roll-out, the following further assumptions have been made:

- End-of-life accumulation meters would be replaced with smart meters at a rate of 5 per cent per year.
- Communications infrastructure would begin being installed once 25 per cent of meters were smart and would continue in line with the timing of smart meter installation.
- The costs of meter maintenance would accrue from bolt-on installation.
- The costs of ongoing meter communication would accrue from installation of communications infrastructure.
- The costs of system upgrades would be incurred upfront and as refreshes were required.
- Prior to the installation of communications infrastructure, data from smart meters would be collected once every 90 days.

3.3 Other options for smart metering reform

The other options considered are:

- Mandate smart meters for all existing and new properties
- Mandate smart meters for all existing, new and unmetered properties
- Mandate on a new and replacement basis only

These are explained in more detail below.

3.3.1 Mandate smart meters for all existing and new properties

3.3.1.1 Summary

The option of mandating smart meters for all existing and new properties includes the retrofitting of smart meters at all existing properties and a mandating of smart metering for all new builds and replacements. As discussed above, it has been assumed for costing purposes that smart meter bolt-ons would be deployed.[20] Similar to the installation of smart electricity meters in Victoria, the Inquiry has assumed a roll-out period of five years, with 20 per cent of meters installed each year.

3.3.1.2 Considerations

The mandating of smart metering for all SA Water customers, existing and new, has an NPV of -$80.6m (Table 10).

Table 10: NPV of mandating for all existing and new properties

DISCOUNT RATE	LOW CASE	MID CASE	HIGH CASE
4%	−175.1	−85.4	4.2
6%	−160.7	**−80.6**	−0.6
8%	−148.4	−76.4	−4.3

Costs of installation for meter and communications infrastructure, and costs of back office systems, are high. While the costs of the meters themselves are not prohibitive at an average NPV of $94.85 per bolt-on (mid case, 6 per cent), building the communications network infrastructure and updating IT systems adds an estimated $64.27 per meter (NPV, mid case, 6 per cent) to the costs.

The costs to SA Water of the communications infrastructure per smart metered customer would be lowest per customer if all customers were smart metered on a geographical basis.

Itron submitted that current bolt-on AMR devices had the required functionality of a smart water meter. It further stated that web portals were available for customers to access usage information and the accuracy of smart meter readings would eliminate bill disputes, credits and time spent revisiting properties to confirm readings.[21]

One of the most significant benefits is reduced demand. This results from lower consumption and customer leakage. More frequent price signals are estimated to reduce current consumption by 2 per cent. SA Water estimates 5 per cent of current customer consumption can be attributed to concealed leaks in customer pipework. As smart meters detected and alerted for continuous low flow, leaks would be found and rectified earlier.

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[20] 'Bolt-on' refers to a device that can be fitted to a standard accumulation water meter to allow AMR.

[21] Itron, *Submission to ESCOSA Water Pricing Reform – Metering*, 2013, p.2, available at http://www.escosa.sa.gov.au/library/131118-WaterPricingInquiry-IssuesPaperSubmission-Itron.pdf.

Reduced leakage is estimated to reduce current consumption by a further 2 per cent. The Kalgoorlie smart water meter trial showed smart metering had a positive impact on reducing customer leakage. Leakage detection was also noted in the ASM[22] and Itron[23] submissions. With the long-run marginal cost of water (based on a weighted average of the regional LRMCs) around $0.65/kL, the total value of the 4 per cent of water saved over the roll-out period is comparatively small in net present terms at $35.8m.

Capital deferral is expected as suppressed demand (consisting of 2 per cent customer consumption and 2 per cent leakage) would increase leftover capacity across SA Water's network. This deferral is worth $22.3m in net present terms. Submissions to the Issues Paper acknowledged the costs of a wide-scale roll-out of smart meters was likely to outweigh the benefits at this time (SA Water[24], Landlords' Association of SA[25] and Business SA[26]).

The technology would also avoid manual meter reading costs of around $18.3m (assuming an NPV, mid case, of 6 per cent) once all customers had smart meters. The collection of more detailed customer information would also allow for improved, and more efficient, customer management, resulting in around a 2 per cent reduction in the variable costs of addressing customer inquiries (assuming an NPV, mid case, 6 per cent).

3.3.1.3 Other qualitative considerations

Some customers are strongly opposed to a smart water meter roll-out, due to health concerns.[27] ASM supported a roll-out of AMR technology to support smart water metering in the future, along with continuing to locate the meter at the boundary of the property to alleviate these concerns.[28] ASM also suggested weekly drive-by collection of meter data as the most cost-effective communications system which would still allow utilities to optimise operations and planning.[29] ASM commented that AMR units could be installed in under 30 minutes by a licensed plumber.[30] ASM suggested that customers could pay a fee to receive SMS alerts if consumption recorded was 'abnormal'.[31]

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22 ASM, *Individual Metering,* pp. 1-2.

23 Itron, *Submission to ESCOSA Water Pricing Reform – Metering*, p.2.

24 SA Water, *Submission to ESCOSA Inquiry into the reform of SA Water's drinking water and sewerage prices*, p. 20.

25 Landlords' Association of SA (LASA), *Water Pricing Reform Inquiry*, submission, 2013, p. 2, available at http://www.escosa.sa.gov.au/library/131118-WaterPricingInquiry-IssuesPaperSubmission-LandlordsAssocSA.pdf.

26 Business SA, *Submission to Water Pricing Reform – Inquiry into the reform of SA Water's drinking water and sewerage prices*, 2013, p.3, available at http://www.escosa.sa.gov.au/library/131118-WaterPricingInquiry-IssuesPaperSubmission-BusinessSA.pdf.

27 ASM, *Individual Metering*, p.1.

28 ASM, *Individual Metering*, p.1.

29 ASM, *Individual Metering*, pp.1-2.

30 ASM, *Individual Metering*, para 2.6.

31 ASM, *Individual Metering*, pp.1-2.

There are also some concerns about the reliability of smart meter technology, especially in the area of communications, according to Strata Water.[32] If significant, this would have the potential to increase ongoing costs.

It is also likely SA Water would benefit from a reduced OHS risk if its contractors were no longer manually reading meters. The remote reading enabled by smart metering has seen a reduced occupational health and safety risk for the WA Water Corporation in the Kalgoorlie smart meter trial. It is expected SA Water would also see reduced occupational health and safety risks from smart metering. This is a benefit that cannot be accurately quantified at this time, but which is not expected to materially impact the results of this CBA.

Once smart meters were rolled out, SA Water would have access to further potential reform options which would create benefits for both SA Water and its customers. For example, a move to monthly billing could improve SA Water's cash flows as well as minimise 'bill shock'[33]. Smart metering could also provide the ability for pre-payment accounts, giving households and business further control over expenses and reducing SA Water's debt risk. Smart metering data would allow improved monitoring if water restrictions were introduced (e.g. from the tracking of demand responses, and customer compliance behaviour such as responses to penalties). SA Water could also discontinue its customer leakage rebate program, saving it around $1.3m per year.

Strata Water submitted that it did not support mandatory smart metering as the current technologies were still too uncertain.[34] LASA stated that it would support a roll-out of smart metering only at end of life, where the benefits clearly outweighed the costs and would be fully passed on to consumers.[35] Similarly, Uniting Communities stated it would support mandatory smart metering only if it was shown to produce an unequivocal saving to consumers in the medium term (i.e. a payback period of five years).[36]

3.3.2 Mandate smart meters for all existing, new and unmetered properties

3.3.2.1 Summary

Mandating smart meters for all existing, new and unmetered SA Water customers involves retrofitting to all existing properties, retrofitting individual smart meters to properties that are currently unmetered and mandating smart meters for all new builds (including those which have been typically group-metered in the past).

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[32] Strata Water Solutions (**Strata Water**), *Re: Metering Issues Paper No 5 – the installation of individual water meters and smart water meters*, 2013, p.4.

[33] Bill shock refers to an infrequent, but large, bill required to be paid in a short timeframe from receiving it.

[34] Strata Water, *Re: Metering Issues Paper No 5 – the installation of individual water meters and smart water meters*, p.4.

[35] LASA, *Water Pricing Reform Inquiry*, submission, p.2.

[36] Uniting Communities, *Submission to Water Pricing Reform – Inquiry into the Reform of South Australia's Drinking Water and Sewerage Prices,* p.9, available at http://www.escosa.sa.gov.au/library/140107-WaterPricingInquiry-IssuesPaperSubmission-UnitingCommunities.pdf.

This reform option includes installing individual meters and installing smart meters for all customers.

3.3.2.2 Considerations

The mandating of smart meters for all existing, new and unmetered properties has an NPV of $170.5m (assuming a mid case at 6 per cent).

Table 11: NPV of Mandating for all existing, new and unmetered properties

DISCOUNT RATE	LOW CASE	MID CASE	HIGH CASE
4%	−342.7	−188.8	−34.9
6%	−306.4	**−170.5**	−34.6
8%	−277.1	−155.8	−34.5

The installation of smart meters for all customers, including the retrofitting of individual smart meters at group-metered dwellings and occupancies, and the mandating of smart individual meters for all new build properties, has significant upfront costs. These include the costs of installation of meters and associated plumbing, as well as the system and technology infrastructure upgrades required to support smart metering. In mandating a bulk roll-out, efficiency gains of around 15 per cent can be made, reducing these upfront costs. There are also ongoing costs to maintain installed individual smart meters which are in addition to the current costs incurred to support current deployed accumulation meters. These ongoing costs would be increased due to a larger customer base resulting from increased individual metering.

The costs of smart meters themselves is not prohibitive. However, the retrofit plumbing work, building the communications network infrastructure and updating IT systems significantly increases costs.

The smart metering of all SA Water customers (and availability of a customer web portal) removes the current lag in pricing signals, incentivising more efficient consumption decisions. This is estimated to reduce overall annual consumption by 2 per cent for those with an existing individual meter and 11 per cent for those currently sharing an accumulation meter. The technology would also avoid manual meter reading costs. The collection of more detailed customer information would also allow for improved, and more efficient, customer management, resulting in around a 2 per cent reduction in the costs of addressing customer inquiries. This option also includes the benefits that arise from the detection of leakage, as discussed above. This means leaks would be found and rectified earlier, reducing overall annual consumption by a further 2 per cent for existing metered customers and 3 per cent for unmetered customers. Capital deferral is expected as a result of the suppressed demand across SA Water's network.

For unmetered customers, compliance with user-pays principles, the unwinding of cross-subsidies and the more immediate sending of pricing signals are all benefits that would result from mandating individual smart metering.

3.3.2.3 Other qualitative considerations

The installation of individual smart meters at all group-metered dwellings would alleviate many neighbour and landlord/tenant disputes regarding water use and charges. It also would be likely to reduce the number of landlords and tenants who might opt out of proposed default billing of tenants, thus maximising the benefits associated with that reform scenario. ASM's submission supported a mandated roll-out of individual meters to both retrofit and new build properties.

As discussed in section 3.3.1.3 above, some customers are strongly opposed to a smart water meter roll-out on the grounds of health, and there are some concerns regarding the reliability of smart meter technology. These issues could significantly increase costs. The Inquiry has costed an approximate number of communications receivers for the number and spread/density of meters, however, there is a possibility that any implementation may require a different number of receivers due to geographical characteristics (e.g. topography creating black spots or signal obstructions).

Once smart meters were rolled out, SA Water would have access to further potential reform options which would create benefits for both SA Water and its customers, as discussed in section 3.3.1.3 above (e.g. minimising 'bill shock' and monitoring water restrictions).

3.3.3 Mandate on a new and replacement basis only

3.3.3.1 Summary

Mandate the smart metering of all new build and replacement meters.

3.3.3.2 Considerations

The mandating of smart metering on a new and replacement basis only has an expected NPV of −$48.0m.

Table 12: NPV of Mandating on a new and replacement basis only

DISCOUNT RATE	LOW CASE	MID CASE	HIGH CASE
4%	−116.4	−57.5	1.5
6%	−93.7	**−48.0**	−2.4
8%	−76.7	−40.6	−4.5

The costs of system upgrades to support smart metering would be incurred upfront. In addition, 'refreshes'[37] would be required at a net present cost of $11.7m. Given the 20-year life of SA Water's meters, the replacement roll-out has been costed as 5 per cent of meters replaced per year and has an NPV of −$59.0m.

It has been assumed the communications infrastructure would not be installed until 25 per cent of meters were smart. The install of this infrastructure would then continue as meters were replaced. The net present cost of the communications infrastructure is $21.4m.

The ongoing costs of meter maintenance accrue, in full, once the smart bolt-on is installed. However, the ongoing costs of meter communications would only accrue once communications infrastructure was installed.

For the first five years (prior to the installation of communications infrastructure) reduced demand and leakage, and enhanced customer service benefits are halved. The costs of manual meter readings would not decrease. Once communications infrastructure was installed, full benefits would be realised each year for all in-life smart meters.

Due to the discounting of future costs, the installation of smart meters only on a new and replacement basis has a smaller net present cost than a quicker roll-out. However, some benefits would be forgone for those smart meters installed in the first years, where communications infrastructure was not yet in place. Under a slower roll-out, there would also be little opportunity to achieve efficiencies in costs as there are no economies of scale.

The new and replacement option would eventually achieve the same outcomes as the mandating for all existing and new option, but at a higher total cost.

3.3.3.3 Other qualitative considerations

Some subsets of customers are strongly opposed to smart water meter roll-out, due to perceived concerns such as health and privacy as discussed earlier. Under a slower roll-out, SA Water has more time in which to address its customers' concerns.

A longer roll-out period could allow SA Water the opportunity to investigate technology communications reliability further by testing the reliability of the communications infrastructure in the earlier years. If any issues were to materialise, the costs of switching communications technologies would be lower, as only a limited number would have been deployed. In the later years of the roll-out, SA Water may see a benefit from a reduced OHS risk if its contractors were no longer manually reading meters.

Once smart meters were rolled out across the customer base, SA Water would have access to further potential reform options which would create benefits for both SA Water and its customers. Under a new and replacement roll-out, these could not be captured before 20 years. For example, it would be unfair for only some customers to have access to monthly billing or to face penalties for non-compliance with restrictions by virtue of their meter requiring replacement earlier than others.

[37] Refreshes refers to updates to the smart metering IT environment to maintain efficient running and smooth integration with other areas of SA Water's IT environment.

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