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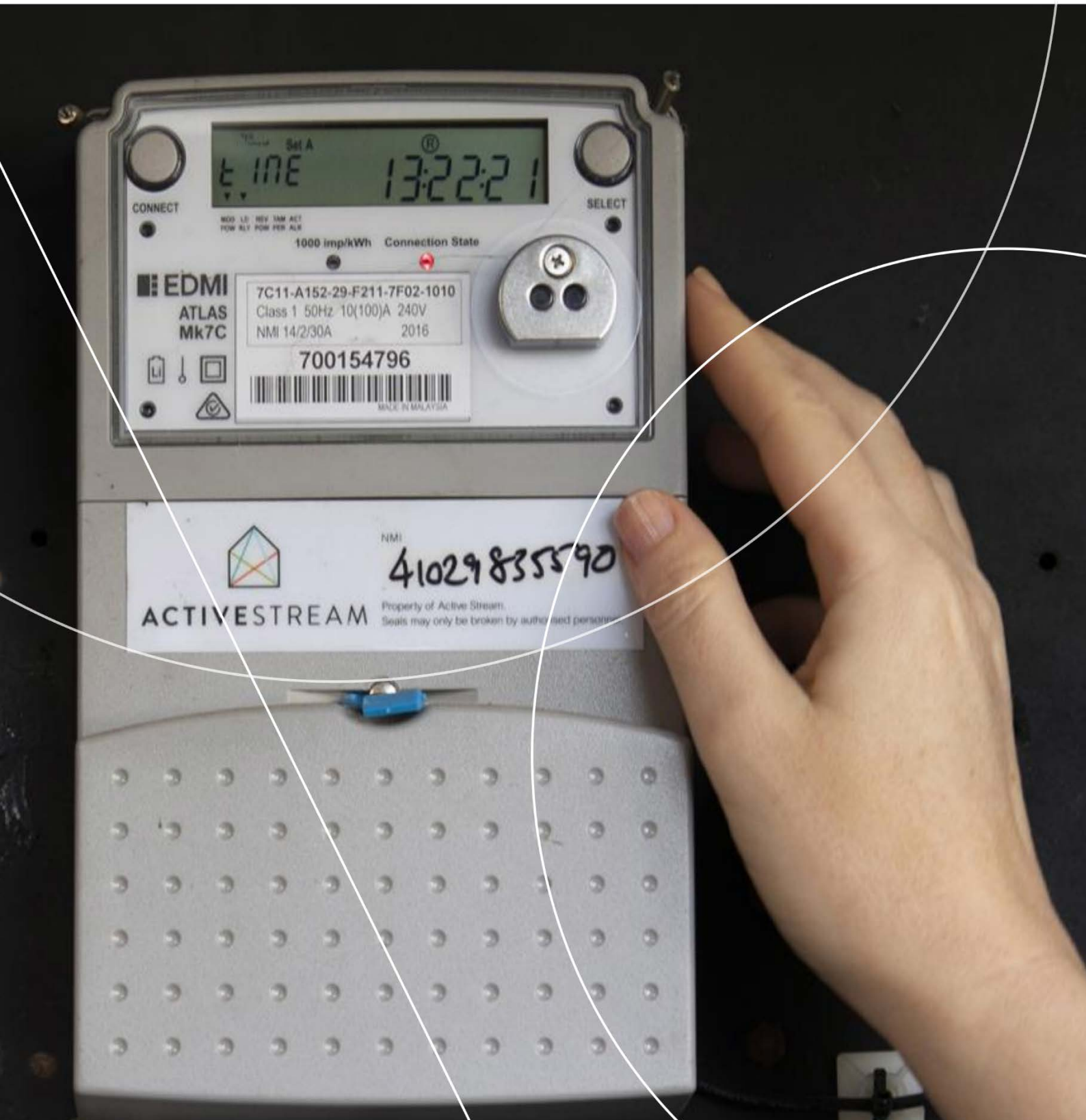
Costs and Benefits of Real Time Data from Smart Meters

Australian Energy Market Commission | 18 November 2025



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This report has been prepared for the AEMC as part of its consideration of the Real-time data for consumers rule change (ERC0399). It should be read in conjunction with the AEMC final decision.

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DOCUMENT INFORMATION

Project	Costs and Benefits of Real Time Date from Smart Meters-
Client	Australian Energy Market Commission
Status	Additional modelling results and final report
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1. Introduction

1.1. Project purpose

Oakley Greenwood (OGW) was engaged by the Australian Energy Market Commission (AEMC) to assess the costs and benefits (CBA) of making real-time data (RTD) available from residential smart meters (SMs).

1.2. Modelling for the Draft Determination

CBA modelling to inform the Commission's Draft Determination of the Real-time data for consumers rule change (ERC 0399)[1] addressed six different scenarios regarding how and when RTD could be made available, as shown in :

Table 1: Scenarios assessed for the Draft Determination

Scenario	Description
0	The base case: assumes that the current rollout of smart meters continues (no RTD)
1	Retailers must provide RTD to any customer that wants it, free* of charge[2], by the end of 2030
2	Retailers must provide RTD to any customer that wants it, free of charge, by the end of 2040
3	RTD must be available to any customer that wants it, free of charge, by the end of 2030; the SM would need to comply with a change (in 2026) in minimum functionality specification (MIN Spec)
4	RTD must be available to any customer that wants it, free of charge, by 2040, with the SM needing to comply with a change in the MIN Spec (to be implemented in 2029)
5	As above, except customers installing CER that can utilise RTD to avoid site monitoring costs are assumed to bring forward the replacement of their existing SM

Inputs for the CBA were developed by OGW with input from SMEs in the areas of smart meter functionality and CER systems and information from submissions to the Directions Paper and earlier work by the AEMC on the costs and timing of the accelerated rollout of SMs.

The CBA identified that the 5 most important drivers of the costs and benefits of the candidate market interventions are:

- The cost of adding RTD functionality to SMs
- The system needed to prevent unauthorised parties from accessing the RTD
- How quickly RTD will be required to be available from the SMs and how the costs of making it available will be recovered
- The magnitude of the benefits RTD can provide
- The number of customers that take up RTD.

1 ERC0399, Real-time data for consumers. See https://www.aemc.gov.au/rule-changes/real-time-data-consumers

2 The cost of any meters provided 'free of charge' to customers under any of the scenarios would be recovered by the retailers by a smeared charge to all customers

The results of the CBA showed that aligning the availability of RTD with existing meter replacement schedules makes it more likely that the policy would produce net benefits for customers, particularly if there is a risk customers who generate no or low economic value take up the offer because it is free. This is because that alignment avoids incurring the economic cost of replacing currently installed smart meters before the end of their useful life (referred to in the study as 'bring-forward' cost).

Consistent with this and more specifically, the CBA results showed that Scenarios 5 and 4 would be the preferred solutions because:

- They both assume the rollout of SMs with RTD functionality would align with business-as-usual (BAU) meter rollout and replacement schedules
- Scenario 5 assumes a strong alignment between the take up of SMs with RTD and benefit creation (as it assumes CER customers who benefit from RTD obtain a meter with RTD).
  - It is preferred to Scenario 4 because its benefits always exceed the associated bring-forward costs, which is not the case in Scenario 4.
- Mandating that RTD must be freely available to all customers in the near term (Scenarios 1 and 3) could impose significant costs that exceed the benefits likely to be accrued, if a large number of customers take-up that option thereby bringing forward the replacement of a large number of existing meters.
- Scenario 2 would be more cost-effective than Scenarios 1 or 3 because its later effective date results in lower bring-forward costs, but its net benefit would only be 8% to 15% of the the net benefit of Scenarios 5 and 4 respectively.

The full report of the original CBA modelling is provided in Appendix A.

The draft rule put forward in the Commission's Draft Determination differed in certain respects from each of the scenarios that had been modelled.

1.3. Additional modelling undertaken for the Final Determination

Based on information received in submissions to the Draft Determination, the AEMC requested additional modelling be undertaken and that it include:

- Alternative estimates provided, in confidence, by a stakeholder in response to the draft cost-benefit analysis[3] and Draft determination[4], outlining the estimated costs that could be incurred by meter manufacturers and metering coordinators to provide RTD from SMs. Given that the information was provided in confidence, the estimates have not been validated with other stakeholders.
- Alternative dates specified by the AEMC for the rule change to come into effect
- The expected take-up of RTD by CER OEMs and end consumers
- The physical means by which RTD would be required to be made available.

This document provides the results of the additional modelling.

3 Oakley Greenwood Pty Ltd, Costs and Benefits of Real Time Data from Smart Meters, Draft Report, 18 August 2025. (https://www.aemc.gov.au/sites/default/files/2025-09/Draft%20CBA%20-%20Real-time%20data%20for%20consumers.pdf)

4 AEMC, *Real-time data for consumers, Draft rule determination*, 11 September 2025. (https://www.aemc.gov.au/sites/default/files/2025-09/draft_determination_-_real-time_data_for_consumers.pdf)

Information on the specific inputs used in the additional modelling is presented in the following section.

It should be noted, however, that no changes have been made to either the nature of the costs and benefits associated with the implementation of RTD, or the methodology for assessing its net benefits. Details of the cost-benefit assessment methodology used in both the draft cost-benefit modelling and this additional modelling can be found in the draft cost-benefit report which is provided in Appendix A.

2. Inputs to the additional modelling

2.1. Cost assumptions

2.1.1. Cost of changes to the meter

AEMC requested that the additional modelling be undertaken based on two levels of costs for including WiFi and a data port in the SM:

- The costs used in the modelling undertaken for the draft cost-benefit assessment
- The alternative cost estimate provided, in confidence, by a stakeholder in response to the Draft Determination and draft cost-benefit assessment.

Table 2: Additional costs to make SMs RTD capable in the original and additional modelling

Item	Costs used in draft CBA	Alternative cost estimates used in additional modelling
WiFi	$5.00	$10.00 to $20.00
Data port	$5.00	$10.00 to $20.00
Both	$10.00	$20.00 to $40.00[5]

2.1.2. Implementation costs

The draft cost-benefit assessment assumed that the implementation of RTD:

- Would require some means by which the eligibility of the party seeking access to the meter data could be authenticated, and
- Providing the means for authentication would impose upfront, ongoing and or per meter costs on essentially each of the parties involved.
  - Upfront costs are those associated the developing the software and processes required to authenticate the CER device(s)
  - On-going costs are those associated with maintenance and operation of the software, including support
  - Per-meter costs are those associated with the initial installation work to establish access the SM and provide the RTD to the CER device(s).

The table below shows the upfront, ongoing and per-meter costs assumed in the modelling undertaken for the draft cost-benefit assessment.

Table 3: Cost assumed for delivery of RTD in the original modelling

Stakeholder	Once-off, upfront cost	On-going (annual cost)	Per-meter cost	No of stakeholders
CER OEMs	$100,000	$30,000	$0	50
Metering coordinators	$300,000	$150,000	$0	10

5 Costs were provided by stakeholders on a confidential basis. Inputs used in the modelling within the range did not materially change analysis results.

Stakeholder	Once-off, upfront cost	On-going (annual cost)	Per-meter cost	No of stakeholders
Metering manufacturers	$200,000	$50,000	$0	5
CER installed	$0	$0	$10	NA

The AEMC requested inclusion in the additional modelling the following other implementation costs identified by stakeholders in their responses to the Draft Determination and draft cost-benefit assessment. Some of these costs were provided on a commercial-in-confidence basis; the AEMC used them in developing the cost inputs they requested to be used in the additional modelling. They included:

- A once-off, upfront cost for the design and testing of a RTD meter
  - The additional modelling assumed that five meter manufacturers would be involved resulting in a once-off, total upfront cost of $10 million for this cost input
- Software costs required to support data delivery:
  - This results in an increasing annual cost as more RTD meters are installed
- Annual costs incurred in total by metering coordinators for ongoing support for RTD, including for communications fault support.

These costs were included as additions to the implementation costs assumed in the original modelling.

2.2. Timing and nature of RTD implementation and take-up levels

The AEMC requested that the additional modelling assume the following regarding the timing and nature of how RTD would be provided, and the extent to which it would be taken up (i.e. used to provide benefits):

- Two different dates were considered for the commencement of the rule change: 2028 and 2029[6]
- There will be no date after which a customer can request that their meter be changed free of charge to an RTD meter.

  This means that RTD will only be available to a customer free of charge when their existing meter is replaced in accordance with the current accelerated rollout of SMs or, in the case of an existing SM, at the end of its useful life.

  As a result, no bring-forward costs will be incurred under the implementation timing and arrangements included in the Commission's final rule

  This has been operationalised in the additional modelling by assuming that all existing smart meters are gradually replaced with smart meters with RTD functionality by 2045, in accordance with the same roll-out schedule as under the BaU.

6 Note that the AEMC requested modelling with the rule change commencing in November 2028. Because the model that had been developed calculates in calendar years, commencement was assumed to be January 2029. Net benefits will vary only very marginally in the earlier commencement date.

This differs to the draft CBA, which included a 'bring-forward' cost because the scenarios modelled in that report assumed that all customers were to be able to access RTD for free by a specified date (i.e., 2030 or 2040), both of which will occur prior to the replacement of all existing SMs under current meter replacement schedules. More specifically, because not all customers will have received RTD meters by either 2030 or 2040 under the BaU rollout, the modelling assumed that metering coordinators would replace existing meters in the final year prior to RTD having to be made available at no charge as it would be cheaper to do so than to replace those meters on a customer-by-customer, on-demand basis after that date. This results in a 'bringing forward' of the replacement of those meters relative to the BaU rollout, which constitutes an economic cost.

- Only WiFi will be required for the implementation of RTD functionality in SMs
- Increased use of real-time data via WiFi: The updated modelling assumes that as many sites and end-use applications use RTD (and that they accrue the same level of benefit) through RTD meters equipped with WiFi only as were assumed to do so in the original modelling through the use of RTD meters equipped with both WiFi and a data port.

2.3. Inputs that remain the same in the additional modelling

The following inputs used in the modelling for the Draft Determination remain unchanged in the additional modelling:

- The costs for adding WiFi and a data port in new SMs and for implementing and administering their use are used as the lower bound of costs in the additional modelling (see section 2.1 above and pages 33-42 and 45-46 in the draft CBA report which is provided in Appendix A.)
- The key benefits that arise from the use of RTD, which are assumed to be:
  - The avoidance of the costs of site monitoring equipment required to manage the operation of CER, including both PV and behind-the-meter batteries.

    Site monitoring is required to ensure that a home with CER can detect faults as soon as possible, optimise whole-house energy use and ensure the CER system(s) at the premises perform as expected, including in accordance with applicable requirements from the grid. Site monitoring requires the ability to measure power and voltage in real time.

    Where the CER is installed at the connection point, only a current transformer (to measure power) is needed as voltage can be monitored by the CER device itself. However, this approach must be supported by the CER manufacturer. Based on industry knowledge and input from some stakeholders it was estimated that these two conditions occur in about 25% of the CER installations.

    In the other 75% of the installations (where the CER is installed at some distance from the connection point and/or the CER manufacturer does not support the use of a CT) site monitoring requires the use of a power meter and a CT.

    The costs used in the original and additional modelling that can be avoided by the availability of RTD from the SM are as follows:

    - $400 for the power meter, which includes $350 for the cost of the meter and $50 for installation. This is an average developed from a wide range of sources and scenarios (e.g., high volume by CER manufacturer vs wholesale costs, single phase vs three phase, etc), as power meters costs vary from about $100 to $600.

- $50 for a CT. No additional costs were taken into account fo the installation of the CT as connecting the CER device to the smart meter will entail about the same labour costs (and therefore the use of RTD does not result in a net saving in labour cost).

- The ability to make more efficient use of household smart devices

  The original modelling assumes that homes with rooftop PV can use RTD to adjust the consumption of smart devices (particularly heat pump water heaters and EVs) based on what is happening at the site level. This benefit primarily occurs where the RTD can be used to shift consumption of these devices from the grid during cloudy periods to periods when they can self-consume electricity from the rooftop PV system. The economic benefit is the reduction in associated wholesale energy costs. The value of that saving is assumed to be $20/MWh, based on the Australian Energy Regulator's most recent Customer Export Curtailment Value (CECV) database.

  The annual net benefit assumed in the modelling for the use of RTD in these applications is as follows:

  - $3.36 per EV
  - $1.10 per heat pump water heater

  Details of the calculations of these benefits is provided on pages 43 and 44 of the draft cost-benefit assessment report which is attached as Appendix A.

- The ability to use RTD to inform behavioural changes that reduce the amount and/or timing of consumption from the grid

  For the customers responding visually to RTD available from the SM, the modelling assumes a bill reduction of $14.40 per year, based on the following assumptions:

  - Annual average household electricity consumption of 4,000kWh
  - An average 6% reduction in annual demand (which is supported by research conducted in 2019 for the Victorian Energy Efficiency Target)[7]
  - An average annual wholesale electricity cost of approximately $60/MWh
  - Note that the calculation does not include any benefit associated with reductions in network costs.

  In addition, a consumer using RTD from the SM for this purpose would also save the cost of additional equipment (such as a PowerPal) that can be attached to provide this information from the SM's optical port. This cost is assumed to be $100, based on current price lists.

- The expected take-up of RTD

  As noted above, the rate at which RTD is taken up is a key driver of the overall net benefits it will deliver. The assumptions and supporting data that was used in the original modelling and remain unchanged in the additional modelling presented in this report are provided below.

  - Take-up that avoids the costs of site monitoring equipment on rooftop PV systems

    The modelling assumes that, at present:

7 Energy Consult, *Analysis of EMS Options for the VEU Program*, (prepared for the Department of Environment, Land, Water and Planning), 15 October 2019, pp 17-22.

- 70% of new solar sites rely on a separate device for site monitoring under the BaU case
- The other 30% are sites that either do not require site monitoring or have in-built site monitoring equipment.

By contrast, by 2045, once all homes have SMs that provide RTD:

- Only 35% of new solar installations will rely on a separate device for site monitoring.

Therefore, the annual take-up of RTD to avoid site monitoring of newly installed rooftop PV systems is assumed to decline from 70% to 35% between the commencement of the rule change and 2045, with the annualtake-up rate in each year reflecting the cumulative proportion of customers with RTD.

The forecast number of solar installations used in the modelling is derived from AEMO's Step Change forecasts.

- Take-up that avoids the costs of site monitoring equipment on behind-the-meter batteries

The modelling assumes that, at present

- 35% of new battery sites will rely on a separate device for site monitoring
- The other 65% either do not require site monitoring or have in-built site monitoring equipment.

By contrast, by 2045 once all homes have SMs that provide RTD:

- Only 17.5% of the new battery installations will rely on a separate device for site monitoring.

Therefore, the annual take-up of RTD to avoid site monitoring of newly installed home battery systems is assumed to decline from 35% to 17.5% between the commencement of the rule change and 2045, with the annual take-up rate in each year reflecting the cumulative proportion of customers with RTD.

- Take-up that allows more efficient use of smart devices

The modelling assumes that the take up of RTD by Smart Devices (EVSE and heat pump water heaters) is related to the overall number of home that have those devices in any given year (noting that only EVSE that is assumed to be used for daytime charging is included). This is then adjusted for the penetration of RTD meters, and the probability of a customer with that type of smart device also having solar.

More specifically, the modelling assumes there is:

- A 60% chance that an owner of a heat pump water heater will also have a rooftop PV system
- A 75% chance that an owner of an EV that is charged at home during the day will have a rooftop PV system.

The forecast uptake of EVSE has been derived from AEMO's ISP, with additional inputs from the Bureau of Infrastructure and Transport Research Economics (bitre) and Ausgrid research.

The forecast uptake of heat pump water heaters was derived from a report undertaken by Jacobs for the Clean Energy Regulator (Jacobs, *Stage 1: Small-scale Technology Certificate Projections,* 14 August 2024).

- Take-up that results in economically efficient behavioural change

The modelling assumes that 5% of customers will actively use RTD in ways that change their consumption behaviour.

This assumption was informed by discussions with personnel from the Victorian Energy Efficiency Target program and an electricity retailer that sells an optical device that provides RTD via the SM optical port.

3. Results of the additional modelling

The Commission's final decision regarding the implementation of RTD via customer's SMs includes the following specifics:

- SMs will be required to provide local availability of RTD via WiFi commencing in 2029
- RTD functionality will be provided in SMs that are installed (a) as part of a retailer's current rollout of SMs or (b) as a replacement for an existing SM that has reached the end of its useful life
- The costs of the RTD meters will be borne by all consumers.
- A customer that wants to receive an RTD SM prior to its installation under condition (a) or (b) above will pay for the meter and its installation.

The table on the following page provides the results of the cost-benefit modelling of the option the Commission has decided upon for the implementation of RTD via customer's SMs, as well as several other options that were considered.

Table 4: Result of the additional modelling ($2025, net present value)

	Technology	Rule start date	Cost[a]/customer/year[b]	Total cost[a]	Benefit from lower cost CER installs	CER use of RTD required for breakeven	Other benefits[e]	Net benefit
Final decision	WiFi only	2029[d]	$0.83-$2.70	$86m-$280m	$250m[c]	14-39%	$161m	$132m-$326m
Other scenarios considered	WiFi only	2028	$0.80-$2.72	$88m-$297m	$277m[c]	12-38%	$176m	$156m-$365m
	WiFi and Wired	2028	$1.12-$3.67	$122m-$401m	$277m	15-49%	$176m	$51m-$330m
		2029[d]	$1.15-$3.66	$119m-$378m	$250m	19-53%	$161m	$33m-$293m

Notes:

a. The cost assumptions used adopt OGW's estimates from the draft CBA as the lower bound, and confidential, alternative estimates provided by in stakeholders' responses to the Draft Determination as the upper bound.

b. The cost per customer is the amount allocated to customers with real-time data when they get new meters. This results in different total customer numbers in individual years with different rule change commencement dates. This is why the cost per customer figures vary depending on the commencement date.

c. This uses the draft CBA's forecast uptake of WiFi and Wired (i.e., via the data port) for CER site monitoring requirements.

d. Due to limitations in the model, rule change commencement in November 2028 (as recommended in the Final Decision) could not be modelled. A commencement date of January 2029 provides a close approximation for that commencement date.

e. See section 2.3 above for a discussion of the nature of the benefits assumed to result from the take-up of RTD for different purposes.

Appendix A: Draft Cost-Benefit Assessment Report

Costs and Benefits of Real Time Data from Smart Meters

Draft Report

18 August 2025

Est. 2008

Oakley Greenwood

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Document information

Project	Costs and Benefits of Real Time Data from Smart Meters
Client	AEMC
Status	Draft report for consultation
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Date	18 August 2025

Disclaimer

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Caveats and a key assumption are shown on pages 13 and 14. The full list of assumptions is in Section 3.

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The project and this report

Oakley Greenwood was contracted to provide a cost benefit analysis of real time data provision from a customer smart meter.

The cost benefit analysis

A cost-benefit assessment (CBA) was undertaken of 5 different market interventions that would allow customers or their authorised agents to access real-time data (RTD) from their smart meters (SMs).

Inputs for the CBA were developed by OGW with input from SMEs in the areas of smart meter functionality and CER systems. The inputs included information from submissions to the Directions Paper and earlier work by the AEMC on the costs and timing of the accelerated rollout of SMs.

The CBA identified that the 5 most important drivers of the costs and benefits of the candidate market interventions are:

- The cost of adding RTD functionality to SMs
- The system needed to prevent unauthorised parties from accessing the RTD
- How quickly RTD will be required to be available from the SMs and how the costs of making it available will be recovered
- The magnitude of the benefits RTD can provide
- The number of customers that take-up RTD.

We did not consider that, under BaU conditions, RTD would be made available from SMs at the site for use by other parties in easily obtainable and usable formats.

The five scenarios

The scenarios examined were a base case (Scenario 0) and five potential changes that could be made under the rule change. Note that the five scenarios examine the key factors.

0. The base case assumes that the current rollout of smart meters continues
1. Retailers must provide RTD to any customer that wants it, free* of charge, by the end of 2030
2. Retailers must provide RTD to any customer that wants it, free of charge, by the end of 2040
3. RTD must be available to any customer that wants it, free of charge, by the end of 2030; the SM would need to comply with a change (in 2026) in minimum functionality specification (MIN Spec)
4. RTD must be available to any customer that wants it, free of charge, by 2040, with the SM needing to comply with a change in the MIN Spec (to be implemented in 2029)
5. As above, except customers installing CER that can utilise RTD to avoid site monitoring costs are assumed to bring forward the replacement of their existing SM

* The actual cost of any meters provided ‘free of charge’ to customers under any of the scenarios would actually be smeared across all customers

Overall conclusions

The overall conclusion of the scenario-based CBA was that:

- RTD provides material benefits to customers who are able to use it to avoid the cost of additional site monitoring of their CER systems (usually about $450), and more modest benefits for customers who can use it in conjunction with other smart appliances or to understand the impact of their electricity consumption and in some case change their behaviour to reduce their bill
- The take-up of RTD is likely to be greatest where access is provided from a hard-wired data port in the meter, using a common data transfer protocol as this will maximise the number of CER OEMs that are likely to use RTD from the SM instead of installing additional site monitoring equipment
- The cost of building RTD functionality into SMs is quite low (probably in the order of $10 per meter) and the cost of preventing unauthorised access less than $0.75 per year per customer
- Providing RTD as SMs are installed – either as part of the current rollout of SMs, or when SMs are replaced – would minimise overall costs, while ensuring that, over time, all customers will be able to access RTD from their SM
- Allowing customers to request and pay for an RTD meter prior to normal provision will preserve customer choice while avoiding any imposition of cost on other customers.

Other potential sources of benefits

There are two other potential sources of benefit that we considered but ultimately did not incorporate into the CBA modelling:

- **Network benefits** – DNSPs in jurisdictions with emergency backstop mechanisms (VIC, WA, and NSW by mid-2026) or dynamic operating envelopes or flexible export arrangements (SA and QLD) require CER devices to provide information via the cloud about their own and the site's operating state (i.e., whether they are exporting and if so how much). New CER systems that are installed in those states will continue to be required to provide that information.

  However, site information will not be directly available to the DNSPs from the RTD in the SM. That data will still need to be provided by the CER system via the cloud. As a result, the requirement for SMs to provide RTD locally will not increase the availability of site information for DNSPs and therefore does not constitute an incremental benefit.
- **Increased uptake of VPP** with consequent reductions in wholesale market and (possibly) local network costs.

  The decision to participate in a VPP is dependent on having a battery, and real-time information is required for all batteries whether they participate in a VPP or not. As a result, it is not apparent why access to RTD from the SM would make participation in a VPP any more attractive than it would be otherwise.

Contents

EXECUTIVE SUMMARY

Background

In October 2024 Energy Consumers Australia (ECA) submitted a Rule change proposal that would require all smart meters (SMs) to be able to provide all consumers with real-time data (RTD). ECA cited two primary use cases through which RTD could help consumers get better service and lower their bills:

- **The human eyes use case** – RTD, via an app or in-premise display, can give the customer a better understanding of how and when they use energy, allowing them to change their consumption pattern to lower their bill.
- **The machine use case** – RTD can be used by intelligent machines to alter generation and/or consumption at the premise in ways that respond to market price signals and network operating conditions and requirements

Consultation with stakeholders revealed that it was not universally agreed that the market benefits of real-time data would outweigh the costs, for example:

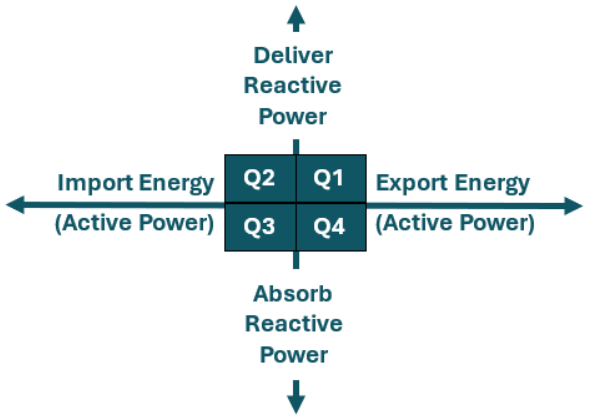
- A lower customer bill may be partly a wealth transfer and may only partly represent a reduction in network and generation costs
- Case studies from the UK and Victoria suggest many customers do not benefit from such granular data
- Industry stakeholders said they would incur additional costs to add RTD functionality to in-situ SMs and those already on order for deployment to meet the 2030 accelerated SM rollout

The AEMC proposed that:

- For a transition period of 15 years, any customer would be able to request their retailer to provide a meter that can provide RTD using a standardised format and protocol (to be specified by AEMO), and the retailer would be able to charge for this service
- After the 15-year transition period, retailers would be required to provide RTD to any customer that wants it from the SM for free

The AEMC has commissioned OGW to undertake a CBA of several different approaches for providing RTD via SMs

Note that RTD is defined as voltage and phase angle data recorded every second and delivered within a second. Phase angle data is active and reactive power, shown as:



Key policy question and the approach taken to address it

Question: Should a Rule be made that would require RTD to be available to consumers from their smart meters, and if so, what would be the most sensible approach for doing so, considering net benefits to consumers?

Approach: Five scenarios were conceptualised and subjected to cost-benefit analysis (CBA). Each was compared to a 'business-as -usual' (BaU) case which assumes no Rule is implemented. The scenarios tested different timeframes for making RTD available free of charge, and the impact a new meter functionality specification could have on costs and benefits due to different decisions that might be made by relevant stakeholders including CER OEMS and installers; electricity retailers, meter providers and metering coordinators; and consumers with different mixes of CER and non-CER devices.

No	Scenario	Further details
1	Retailers must provide RTD to any customer that wants it, free of charge, by the end of 2030	Prior to 2030 (in Scenario 1) or 2040 (in Scenario 2) any customer wanting RTD would be able to get it, but the retailer would be able to charge the customer for it. The retailer would also be able to decide how the SM would provide access to RTD, as these scenarios assume no change in the MIN SPEC. We have assumed that the market responds by inserting a Wi-Fi chip (but not a data port).
2	Retailers must provide RTD to any customer that wants it, free of charge, by the end of 2040	
3	RTD must be available to any customer that wants it, free of charge, by the end of 2030; the SM would need to comply with a change (in 2026) in minimum functionality specification (MIN Spec)	Same as Scenario 1 but assumes that a change would be made to the MIN Spec that would require the retailer to equip the SM with both a Wi-Fi chip and a data port as means for accessing the RTD, which would standardise the means for accessing RTD and providing a choice for doing so that could potentially be more useful to consumers and CER manufactures and installers.
4	RTD must be available to any customer that wants it, free of charge, by 2040, with the SM needing to comply with a change in the MIN Spec (to be implemented in 2029)	Similar to: • Scenario 3, the difference being that the change to SM MIN Spec would not be made until 2029, and • Scenario 2, in terms of the timeframes during which retailers could charge consumers for RTD and when it would have to be provided for free.
5	As above, except customers installing CER that can utilise RTD to avoid site monitoring costs are assumed to bring forward the replacement of their existing SM	We also assume that any customer that is putting in new CER and has a standard SM will pay to get an RTD-capable SM (in order to avoid the cost of additional site monitoring equipment).
6	Retailers must provide all consumers with a summary of their daily interval energy consumption data at least once per day	Note that this does not entail RTD and the information would be provided by the retailer, not accessed from the meter by the customer or an agent of the customer. The costs and benefits of this scenario were not assessed.

More information on how the scenarios have been modelled

No	Key implications for modelling	Additional modelling undertaken
1	We have assumed that: • Because the incremental meter manufacture cost is low, and there is a date after which it must be made freely available, Retailers will start rolling out SMs with Wi-Fi capability as part of their existing roll out schedule from 2027. • A small proportion of sites that have a SM with RTD functionality (via Wi-Fi) and who subsequently install a solar/battery installation will be willing to pay for access to RTD, along with a small proportion of other non-CER customers (e.g., customers that want to visually see the data to make changes to their consumption); and • Because it is free from 2031, a significant portion of the population will request access to the RTD, leading Retailers to bring forward the replacement of 100% of their in situ SMs with SMs with RTD functionality.	• Relax the assumption that 100% of all in situ meters will be replaced in 2031 with SMs that have RTD functionality, with only ~20% of customers requesting RTD (See Appendix A for results) • This leads to a more dispersed roll out, leading to diseconomies of scale, but across a lower volume.
2	As above, except that we have assumed that: • Because of the later deadline for free access (2040), Retailers commence their rollout of SMs with RTD functionality (via Wi-Fi) later (2029) • All SMs that do not have RTD functionality by 2040 are replaced *en masse* in 2040.	No specific sensitivity proposed

More information on how the scenarios have been modelled

No	Key implications for modelling	Additional modelling undertaken
3	We have assumed that: • The MIN SPEC specifies that access to RTD is to be made available via both Wi-Fi and a data port, and that this applies from 2027 • Because customers can access RTD via the data port, a much larger proportion of sites that have a SM with RTD functionality and who subsequently install a solar/battery installation beneficially use the RTD that is available, • A small proportion of non DER customers beneficially use the data that is available to them from the SM (e.g., customers use the RTD data that is available from the SM to make changes to their consumption); and • Because it is free from 2031, a significant portion of the population will request access to RTD from the SM, leading Retailers to bring forward the replacement of 100% of their in situ SMs with SMs with RTD functionality.	• Relax the assumption that 100% of all in situ meters will be replaced in 2031 with SMs that have RTD functionality, with only ~20% of customers requesting RTD (See Appendix A for results) • This leads to a more dispersed roll out, leading to diseconomies of scale, but across a lower volume.
4	As above, except that we have assumed that: • Because of the later deadline for free access (2040), the MIN SPEC applies from 2029 • All SMs that do not have RTD functionality by 2040 are replaced *en masse* in 2040.	• Lower take up of RTD by CER devices (See Appendix A for results)
5	As above, except that we have assumed that solar and battery installations that can benefit from access to RTD from the meter (via the data port) are willing to pay to bring forward the replacement of their existing in situ SM (that does not currently have RTD capability)	• Lower take up of RTD by CER devices (See Appendix A for results)
6	This scenario does not involve the provision of RTD. It would likely be much less costly than any of the other scenarios but is also likely to sacrifice a significant proportion of the benefits that RTD can provide. This scenario has only been assessed at a high level in this report.	No specific sensitivity proposed

Key drivers of results

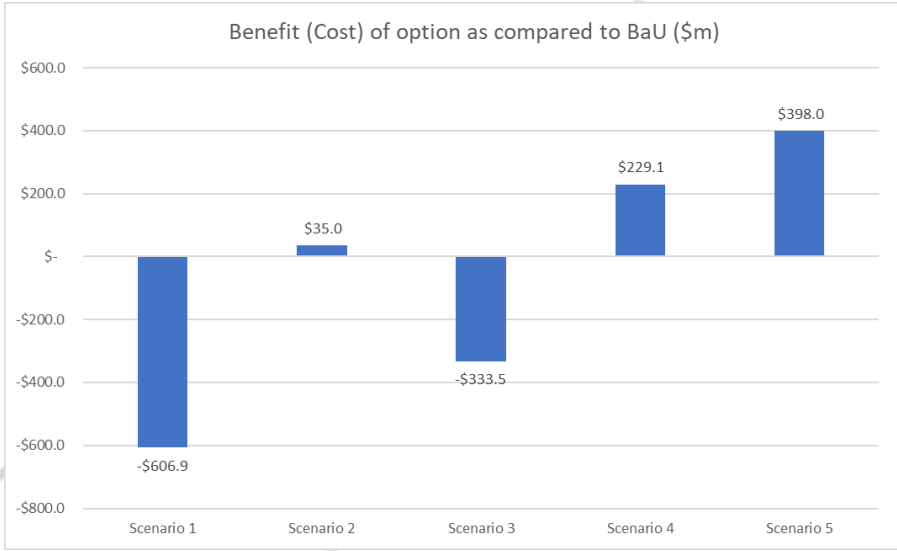
1. The number of CER installations for which the ability to access real-time data avoids the cost of another site monitoring device being installed (and the cost of those devices)
   - This has a significant impact on the costs that can be avoided by RTD being available from the SM
   - This depends on decisions by OEM manufacturers and installers; information obtained to date indicates that:
     - Some OEMs will use this data to avoid the cost of site monitoring, but others will continue to rely on dedicated site monitoring
     - Significant use of RTD instead of dedicated site monitoring will depend on how easy it is to set up for installers and how reliable the connection is (accessing RTD via Wi-Fi is seen by OEMs as unreliable and potentially insecure; a wired connection is generally preferred)
2. The dates set by the Rule change for when RTD must be made available for free, and how responsive customers' take up is to that "free" service. This has an impact on costs because it determines:
   - if a roll out of SMs with RTD is likely to occur en masse (and if so, how many years of remaining life a standard SM has on average and therefore, how far it is being 'brought-forward'); or
   - if a more fragmented rollout is likely to occur (with consequential diseconomies of scale)
3. The proportion of customers receiving RTD information that will use that highly granular consumption data to alter their consumption in ways that reduce economic costs in the electricity supply chain. This can include information from the meter being used:
   - Directly to control the consumption of non-CER devices (water heaters, pool pumps, V2G EVSE), or
   - To provide visual information that may inform the level and/or timing of the customer's electricity consumption behaviour
     - This is commonly done using optical devices (e.g., Powerpal, Emerald)
     - Note however that the addition of an optical device to a standard SM does not meet the definition of RTD as it does not provide full four quadrant information

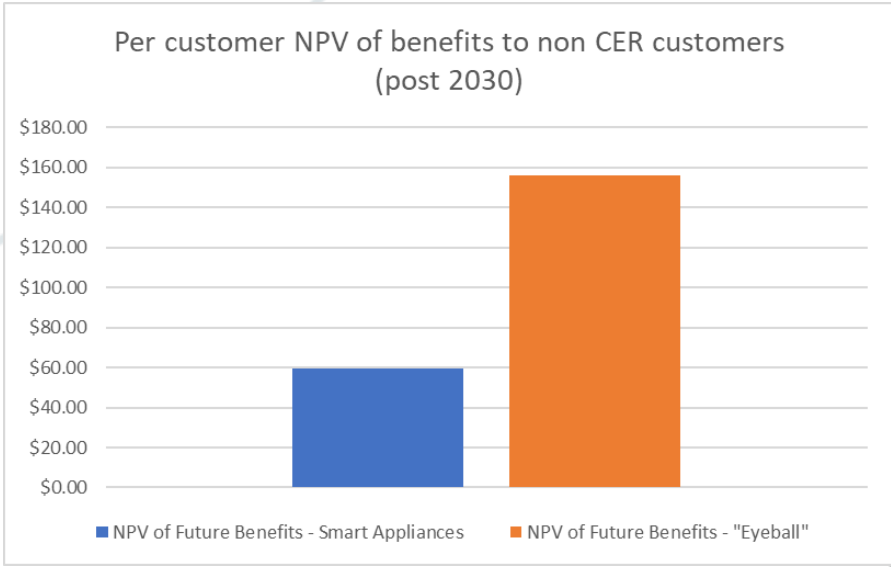
Interestingly, based on the Draft modelling results, the overall cost-benefit of RTD is ***not*** likely to be particularly sensitive to either:

- The incremental cost of making the SMs capable of providing RTD (which are estimated at $5/meter for a WiFi solution, and $10/meter for a WiFi and Data Port solution) or
- The cost of developing and implementing a scheme to ensure that only authorised parties can access SM's RTD
  - We have modelled the cost of a password approach based on a view from AEMC staff that this would be likely to provide an adequate level of data security and therefore would overcome security as a reason for CER manufacturer or installer to NOT use the SM for RTD
  - We have also modelled the cost of another approach (Public Key Infrastructure) that tests the effect of the cost of a much higher level of security on CBA results

Key findings

1. Preliminary results indicate that Scenarios 5 and 4 are the preferred solutions.
   - They assume the rollout of SMs with RTD functionality aligns to the BaU rollout schedule, hence they impose fewer economic costs because they do not disrupt the current roll out schedule
   - Scenario 5 assumes a strong alignment between the take up of SMs with RTD and benefit creation (as it assumes CER customers who benefit from RTD obtain a meter with RTD).
   - Mandating that RTD be freely available to all customers in the near term (Scenarios 1 and 3) could impose significant costs that exceed the benefits likely to be accrued, if a large number of customers take-up that option resulting in a large bring forward of meter replacement costs. This result occurs because:
     - Those CER customers' whose meters have been replaced early, materially contribute (positively) to the NPV
     - Non-CER customers who might beneficially use RTD earlier because their meter has been replaced (e.g., via "eyeball" or the better use of smart devices), only make a minor positive contribution in gross terms to the NPV (~$220/customer (graph to right) as against ~$180/customer bring forward cost)
     - Those customers who elect to take up RTD because it is free, but who do not beneficially use it, negatively impact NPV (by the amount of the bring forward costs).
2. Aligning the availability of RTD with existing meter replacement schedules is likely to make it more likely that the policy would produce net benefits for customers, particularly if there is a risk customers who generate no or low economic value take up the offer because it is free.
3. The status of Scenarios 5 and 4 as the preferred approaches is unlikely to change unless:
   - There is strong evidence to suggest that ONLY customers that materially benefit (in economic terms), take up what is an otherwise a free service; and/or
   - The cost of alternate metering would not be avoided for most customers installing new solar and battery, even if RTD from the meter was available.

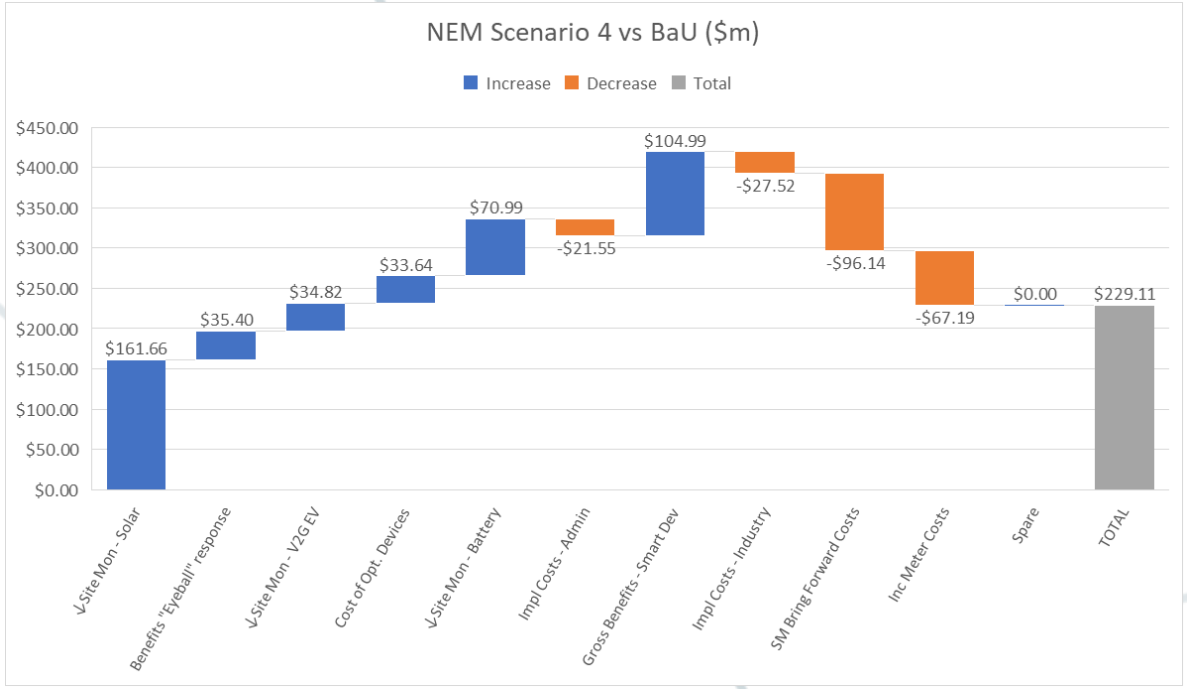


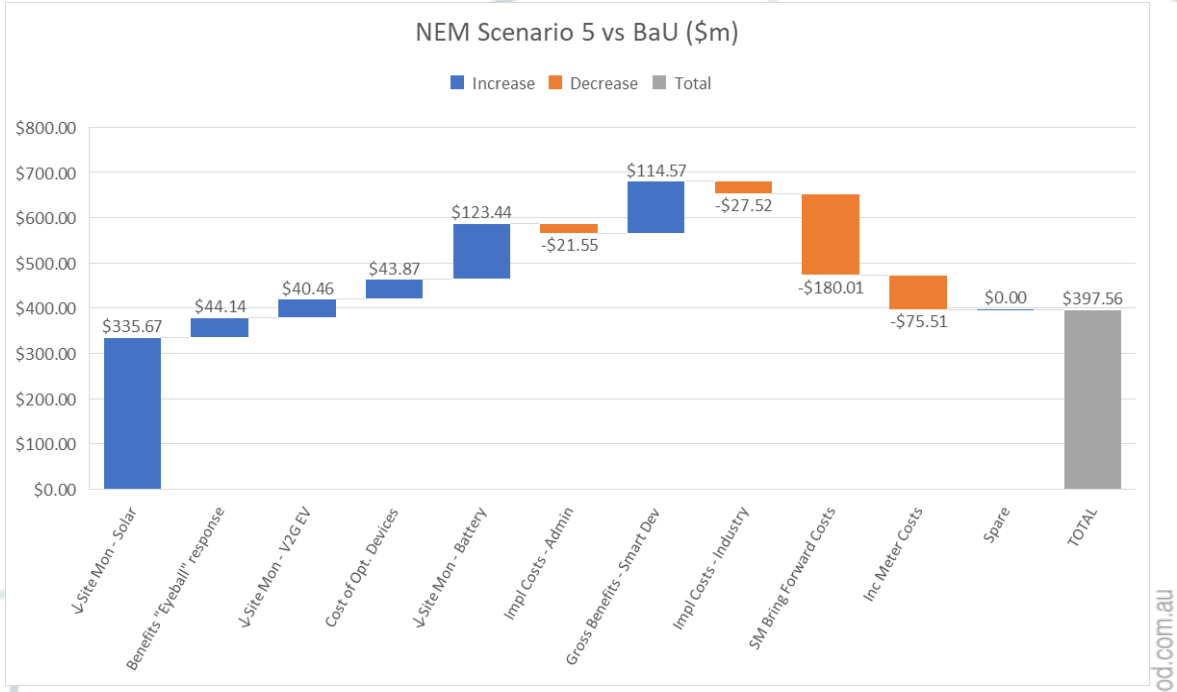


Key Drivers of Scenario 4 and 5

Other factors influencing the results in Scenario 4 and 5 include:

- Reduced site monitoring costs for new solar installations make the largest contribution (left hand bar of both waterfall graphs)
- Better use of smart appliances in response to fluctuations in CER output; and
- Reduced site monitoring costs for new battery installations





*Blue = increase = benefit

**Orange = decrease = cost

Overview of modelling approach and key assumptions

Modelling approach

The analysis was undertaken based on economic costs and benefits

- This perspective does not consider the financial costs and benefits, albeit these:
  - Implicitly drive some of the outcomes in the model, for example, we have assumed (based on available literature) that a small proportion of customers may adopt more efficient electricity usage behaviors to reduce their electricity bill, if presented (visually) with RTD (with the flow on impact on system costs incorporated into the model).
  - Explicitly drive some of the outcomes in the model, for example, we have assumed that where RTD is available at a price, that some customers will be willing to pay to access that information and some customers will not be willing to do so (with the difference dependent on how the customer is expected to use that information)
- This perspective does not consider the allocation of those costs and benefits between relevant parties.

We adopted:

- A real WACC of 5%
- A modelling time horizon that covers 20 years (2026 to 2045)

Assessed costs and benefits:

- By State
- By driver/component

Key assumptions

This document provides the CBA of those scenarios under the assumption that retailers decide to meet that requirement by:

- Beginning to deploy RTD-capable meters as part of their existing smart meter rollout programs:
  - Because our estimate of the incremental meter manufacture cost is low, and there is a date after which it must be made freely available, we have assumed that Retailers start rolling out SMs with some RTD capability as part of their existing roll out schedule, even when not required under the MIN SPEC (from 2027 for Scenario 1 and 2029 for Scenario 2).
- Ensuring all SMs are RTD capable by the time set in the Rule:
  - We have considered the possibility that the take up of RTD could feasibly be very large once it becomes free, which may make it more efficient to undertake a mass rollout of SM with RTD to avoid the diseconomies of scale associated with fragmented rollout (consistent with the Commission's decision to accelerate the rollout of smart meters),
  - The above is supported by the fact that consumers are expected to install a very large number of CER devices between now and 2050; continuing to roll out standard smart meters but having to replace or retrofit them whenever each of those customers installs a CER device and requests RTD is likely to significantly increase retailers' installation costs (which will ultimately be passed on to all customers)

Caveats to this report

1. This is a draft report, which relies on many inputs and assumptions
   - Some are forecasts about the behaviour of various parties including electricity customers, electricity retailers and other parts of the electricity supply chain and the manufacturers and installers of CER devices
   - We have used the knowledge of the project team – including 2 SMEs with in-depth experience in CER and metering – to develop reasonable inputs
   - The consultation process for the AEMC draft determination allows an opportunity for stakeholders to comment on and update our information. The updated information will allow us to:
     - Improve the analysis and refine the plausible inputs
     - Adjust our sensitivity testing and break-even analysis
   - The challenge of developing representative inputs from disparate views will remain

2. The CBA did not quantify several additional costs that may be incurred if retailers are required to install SMs with RTD functionality. These include:
   - The need to accredit and train CER installers (or other personnel) that would be involved in making physical connections to the data port of the SM.
   - AEMO's development of a new minimum SM functional and technical specifications
   - AEMO's development of processes and procedures for installers to use in making a physical connection to the SM, including arrangements for the connection of multiple devices to the SM
   - AEMO's development of accreditation requirements and processes and administration maintenance of the corresponding registry
   - The potential for the data protocol that is specified to impose some additional development costs on some OEMs
   - The potential (deemed to be very low) for damage to the meter and the development of procedures for assessing responsibility
   - The need to undertake cybersecurity testing of the physical configuration and security arrangements for the provision of RTD

1. THE BAU AND RTD DEPLOYMENT SCENARIOS ASSESSED

The BaU Case

Key features

1. No Rule change is promulgated
2. CER system providers and installers cannot access RTD directly from the meter; therefore, they need to continue to install site monitoring equipment to the extent that either:
   - They want to maximise the financial returns from their systems
   - They are required to comply with connection requirements (where CER nameplate capacity is higher than the static export limit) or emergency back-stop provisions implemented by state governments, or
   - Their customers choose to be able to respond to dynamic operating envelopes or participate in flexible export arrangements
3. Electricity users cannot access RTD from their meters (though optical devices and next day interval data information is available).

Assumptions:

1. The vast majority of current SMs cannot provide local access to the near-RTD the meters generate
2. There will continue to be a differential between import and export tariffs levels; hence there will continue to be a commercial case for customers with different forms of BTM generation to install site monitoring so that they can maximise their use of that generation, or network export limits that CER must adjust their output to comply with.
3. It is likely to be prohibitively expensive (and logistically untenable) to consider retrofitting this functionality to existing meters. Information provided via informal consultation with providers supports this.
4. Most simply, the potential benefits of providing customers (or their agents) access to RTD from the SM are:
   - The costs that would be avoided from not having to install additional site monitoring equipment
   - The impact of any reduction in electricity supply costs that would result from changes in customer import or export behaviour informed by the availability and use of the RTD

Customer segments of relevance to the design of the CBA

Segment	Potential benefits from RTD	Decision-making wrt RTD	Implications for CBA
Customers with CER	Reduced cost of the CER installation by avoiding additional site monitoring equipment	Generally none – this decision is almost always made by the CER OEM and installer It is also likely to be a very minor consideration in the end customer's selection of CER equipment	Future decisions of CER OEMs and installers will be a key variable affecting the level of benefit from different approaches for making RTD available from SMs
Customers with CER and smart appliances	Ability to control smart appliances to optimise their consumption in regard to the availability of on-site generation	Full decision-making regarding whether to access RTD and whether and how to respond to it (including manually or by automated control)	Assumptions had to be made about likely take-up and impact
Customers with neither CER nor smart appliances	Ability to 'see' consumption as it happens and adjust behaviour and use of appliances to reduce costs May involve spillover benefits from the decisions/behaviour of RTD use of other customers	Full decision-making regarding whether to access RTD and whether and how to respond to it	Assumptions had to be made about likely take-up and impact

Key Costs Modelled

Cost	Description
Incremental costs required to make the SM capable of providing local access to the RTD available in the meter	Although the SMs currently record four-quadrant data on a second-by-second basis, they cannot provide access to that data except through the meter's backhaul capabilities. Providing local access to the RTD would require inclusion of a Wi-Fi chip and/or data port to the meter. The inclusion of these bits of kit would incur cost.
Cost of bringing forward the replacement of currently-specified SMs with those that can provide local access to RTD	Providing local access to RTD via the SM by any particular date (or in response to a customer request) may require an existing SM to be replaced earlier that it otherwise would have been with an RTD meter. There is an economic cost to this bringing forward of the replacement of a meter.
Costs of developing and implementing and administering a means for restricting access to the RTD by authorised parties Administration	Ensuring that only an authorised party can access the RTD through the SM requires some means of checking the identity of the party and ensuring they have a right to access the data from that specific meter. There will be costs to CER OEMs and installers and MCs in developing the authorisation process and administering and resourcing its implementation.

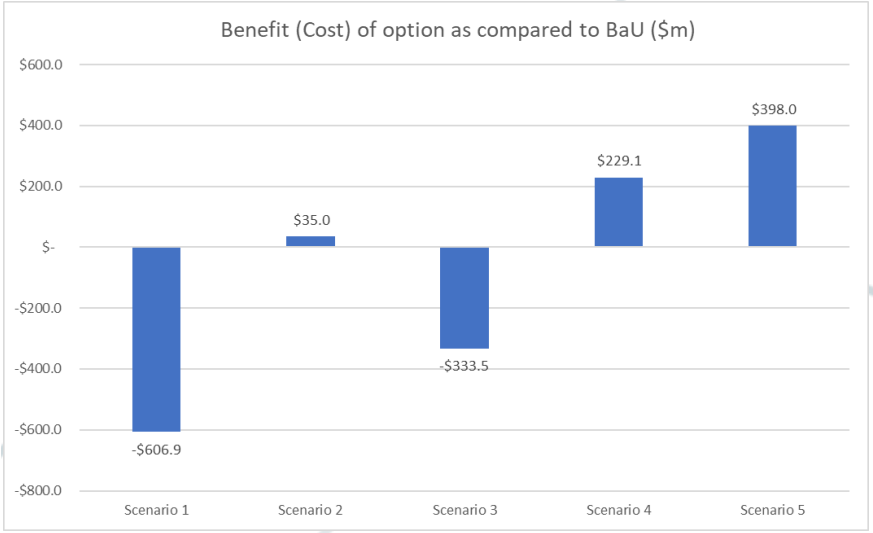
Key Benefits Modelled

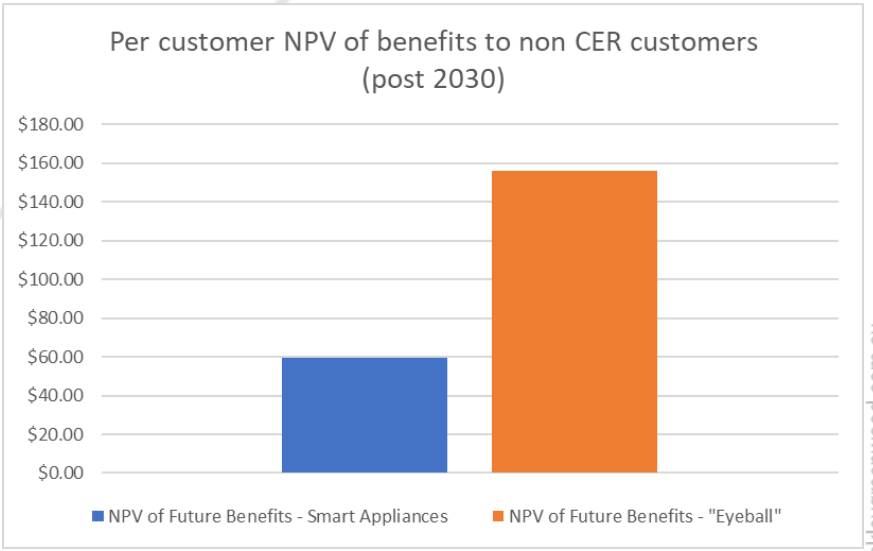
Benefit	Description
Avoided site monitoring costs at: • New PV installations that operate under a CSIP-AUS emergency backstop, are enrolled in DOEs, or have a nameplate capacity higher than the assigned export limit • New BTM battery installations • New V2G EVSE installations	To the extent that the ability to access RTD through the SM allows consumers to avoid installing alternative devices to provide site monitoring, there will be an economic benefit
Avoided installation costs – optical devices	To the extent that the ability to access RTD directly from the SM allows consumers to get that data in useful visible formats (i.e., without additional bits of kit), there will be an economic benefit
Economic benefits provided by customers that have Smart Appliances and Solar	To the extent that the ability to access RTD directly from the SM allows consumers to make better use of CER-generated electricity, there may be an economic benefit
Benefits provided by non-CER customers who use RTD to reduce their usage in ways that reduce economic costs in the electricity supply chain	To the extent that the ability to access RTD directly from the SM allows consumers to reduce their consumption in in ways that reduce economic costs in the electricity supply chain, there will be an economic benefit

2. RESULTS BY SCENARIO

Key findings

1. Draft results indicate that Scenarios 5 and 4 are the preferred solutions.
   - They assume the rollout of SMs with RTD functionality aligns to the BaU rollout schedule; hence they impose fewer economic costs because they do not disrupt the current rollout schedule
   - Scenario 5 assumes a strong alignment between the take up of SMs with RTD and benefit creation (as it assumes CER customers who benefit from RTD obtain a meter with RTD).
   - Mandating that RTD be freely available to all customers in the near term (Scenarios 1 and 3) could impose significant costs that exceed the benefits likely to be accrued, if a large number of customers take-up that option resulting in a large bring forward of meter replacement costs. This result occurs because:
     - Only CER customers whose meters have been replaced early, materially contribute (positively) to the NPV
     - Those non-CER customers who might beneficially use RTD earlier because their meter has been replaced (e.g., via “eyeball” or the better use of smart devices), only make a minor positive contribution in gross terms to the NPV (~$220/customer (graph to right) as against ~$180 meter bring forward cost)
     - Those customers who elect to take up RTD because it is free, but who do not beneficially use it, negatively impact NPV (by the amount of the bring forward costs).
2. Aligning the availability of RTD with existing meter replacement schedules will make it more likely that the policy would produce net benefits for customers, particularly if there is a risk customers who generate no or low economic value take up the offer simply because it is free
3. The status of Scenarios 5 and 4 as the preferred approaches is unlikely to change unless:
   - There is strong evidence to suggest that ONLY customers that materially benefit (in economic terms), take up what is an otherwise a free service; and/or
   - The cost of alternate metering would not be avoided for most customers installing new solar and battery, even if RTD from the meter was available.



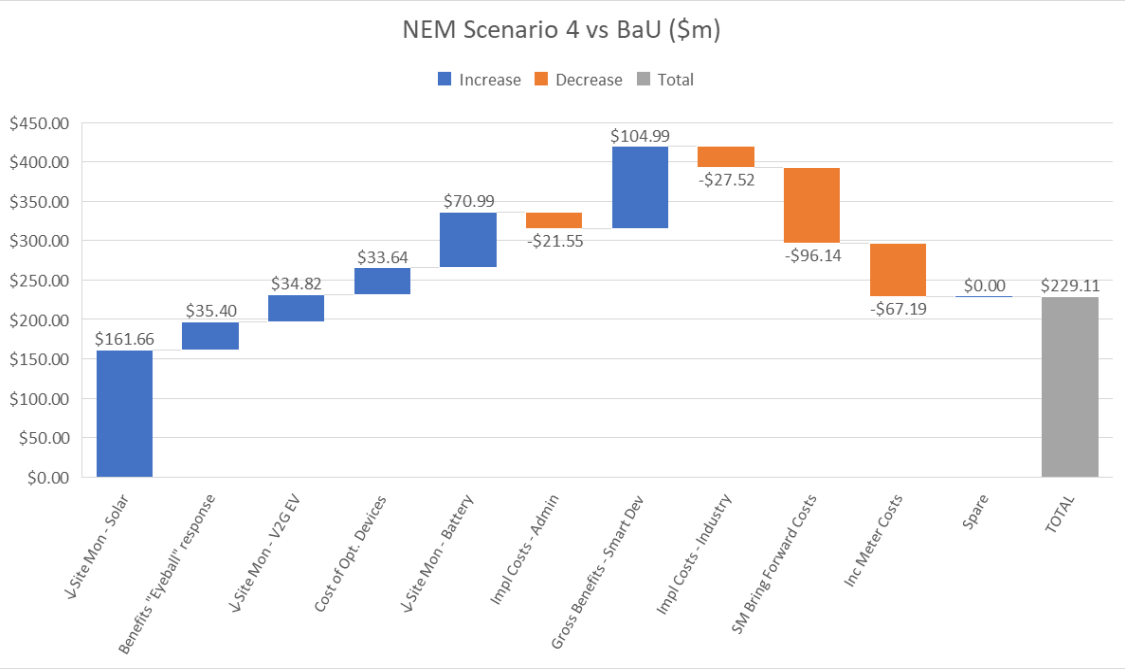


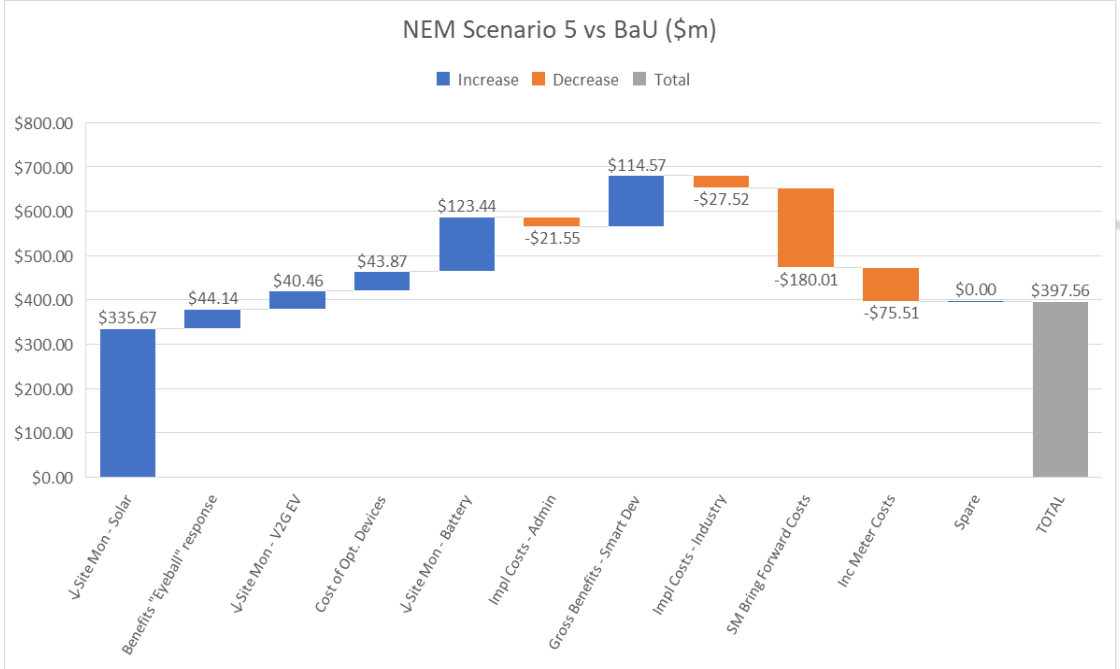
Costs and benefits of the Scenarios ($m compared to BaU)

Cost/Benefit parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
*↓ Site Monitoring - Solar	$49.23	$32.33	$246.13	$161.66	$335.67
Benefits "Eyeball" response	$63.50	$21.63	$68.33	$35.40	$44.14
↓ Site Monitoring - V2G EV	$8.09	$6.96	$40.46	$34.82	$40.46
Cost of Optical Devices	$62.47	$33.64	$62.47	$33.64	$43.87
↓ Site Monitoring – Battery	$20.44	$14.20	$102.19	$70.99	$123.44
Implementation Costs – Admin	-$21.55	-$21.55	-$21.55	-$21.55	-$21.55
Gross Benefits - Smart Devices	$127.30	$104.99	$127.30	$104.99	$114.57
Implementation Costs – Industry	-$27.52	-$27.52	-$27.52	-$27.52	-$27.52
SM Bring Forward Costs	-$846.50	-$96.14	-$846.50	-$96.14	-$180.01
Incremental Meter Costs	-$42.40	-$33.60	-$84.80	-$67.19	-$75.51
TOTAL	**-$606.95**	**$34.95**	**-$333.50**	**$229.11**	**$397.56**

*↓ = reduced costs

Scenarios with best net benefits





Blue = increase = benefit

Orange = decrease = cost

Factors influencing the results in Scenario 4 and 5 include:

- Reduced site monitoring costs for new solar installations make the largest contribution (left hand bar of both waterfall graphs)
- Better use of smart appliances in response to fluctuations in CER output; and
- Reduced site monitoring costs for new battery installations

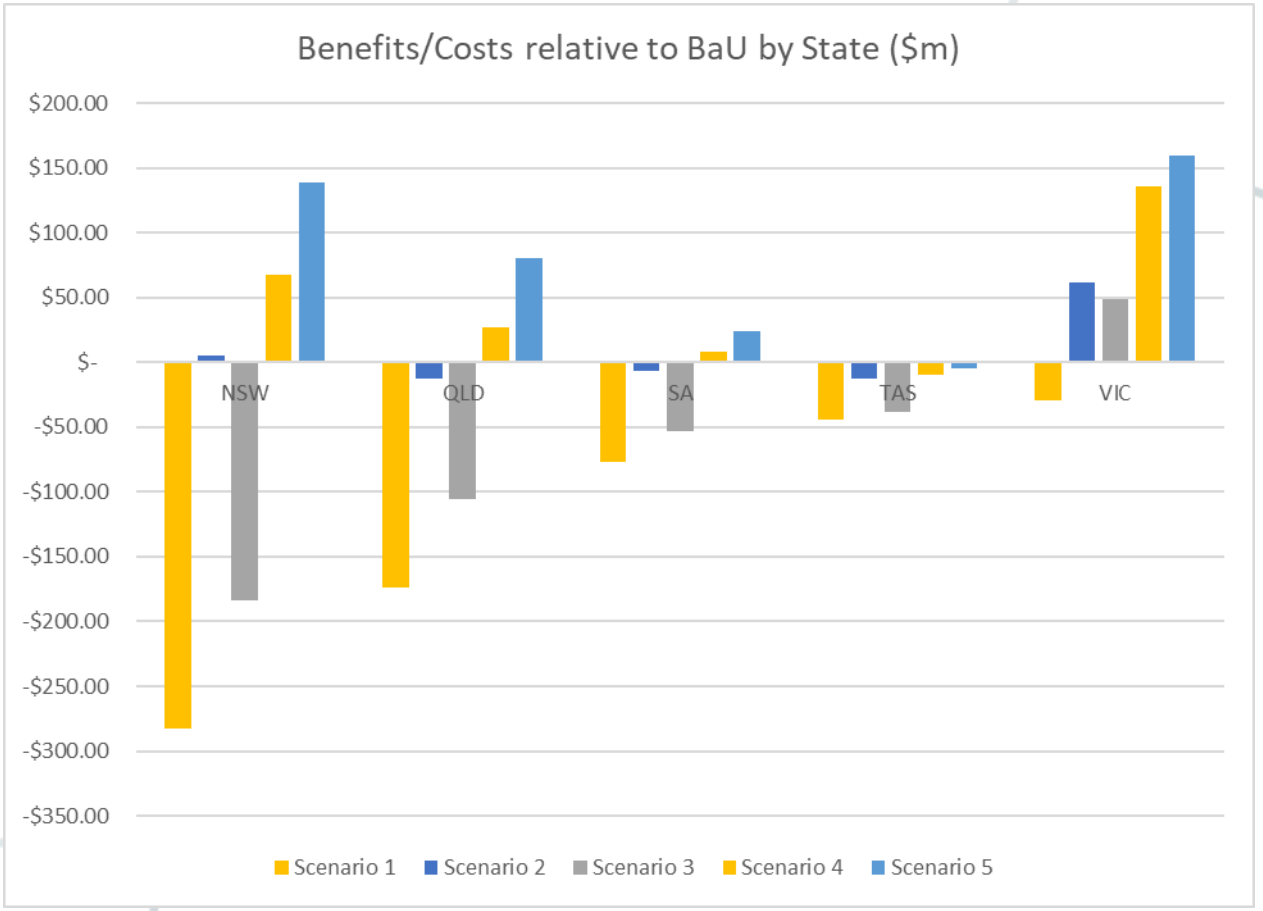
Results – All Scenarios, by State

The results are reasonably consistent across the States, except for Victoria

The difference is primarily due to the different meter age profile in Victoria

- Victoria's existing meter fleet is quickly approaching the end of its useful life. As a result, the 2030 timeframe does not bring forward as many costs as in other States (because the meters in VIC are up for replacement anyway, the bring forward period (and, in turn, cost) is lower).

While the overall scale of costs and benefits changes across the other jurisdictions, the relativity of the costs and benefits within each jurisdiction is very similar.



Net benefits by state, by year show the impacts of a later date and a MIN Spec

The impact of mandating a later date for RTD to be universally available (if requested) can be seen by comparing the graphs in the righthand column with those in the next column to the leftfirst

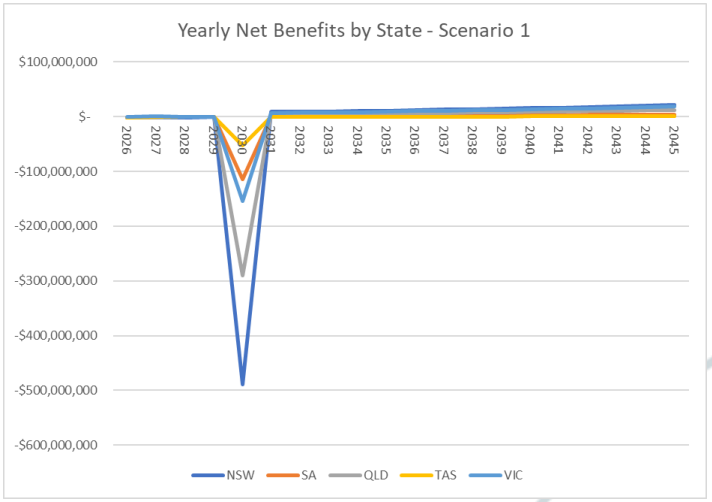
- This is due to the dramatically lower bring-forward costs associated with the later date

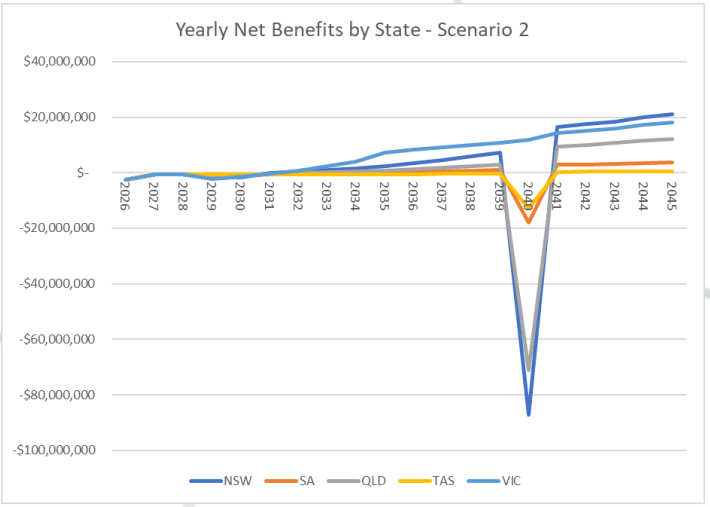
The impact of the MIN Spec can be seen by comparing the graphs in the bottom row with those above them

- This is due to the larger number of CER devices that would be expected to use RTD to avoid the cost of alternative site monitoring equipment

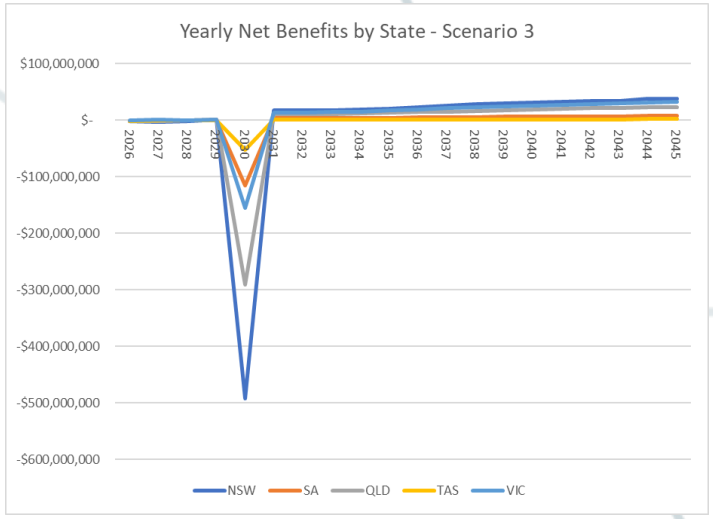
Scenario 5 shows the greatest net benefit

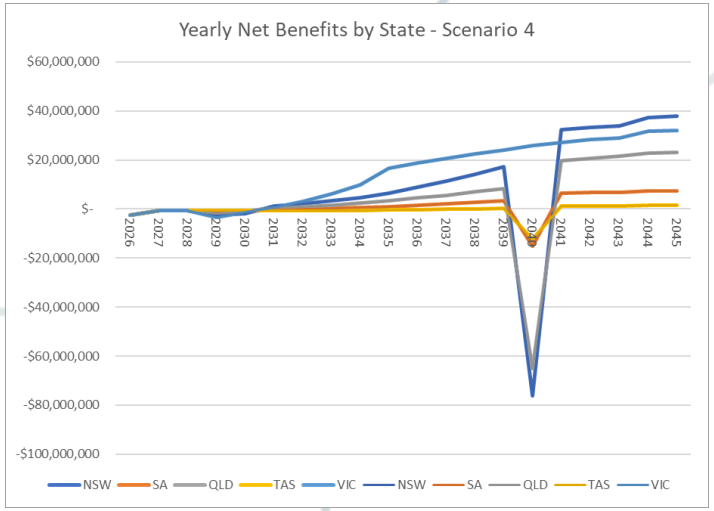
- This is because it is built on Scenario 4 and also assumes that CER customers who can benefit from RTD will pay for it rather than waiting for their cdurrrent meter to be replaced

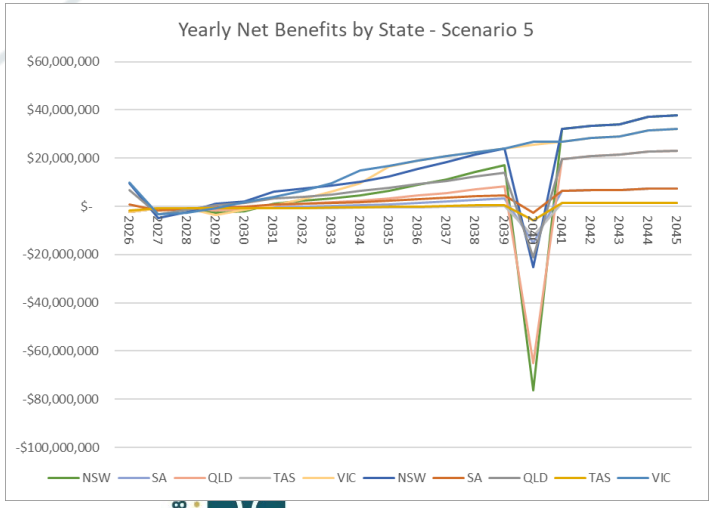




Note: The sharp decline in net benefits in year 2030 (for Scenarios 1 and 3) and 2040 (for Scenarios 2, 4 and 5) is an artifact of the modelling. We have assumed that retailers would comply with the requirement to make RTD via the SM by a specified date by installing them in the last possible year where the site that had not already received such a meter. In practice, this would not necessarily be the case, particularly if the number of those sites was expected to be large. Installing some of those meters earlier would be easier for the retailer and smooth the curves in the graph to some extent, but would not materially change the NPV of any of the scenarios.



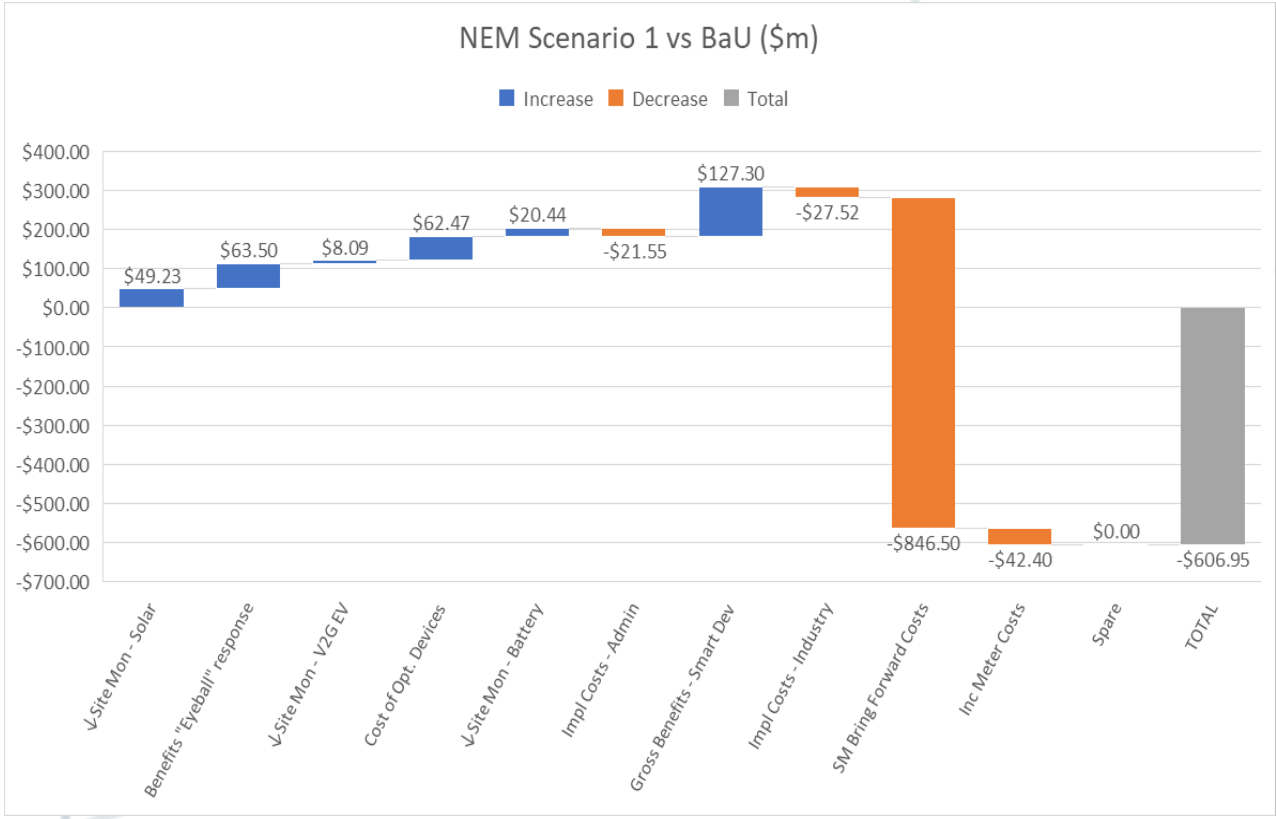




Results – Scenario 1 as compared to BaU

Scenario 1: Retailers must provide RTD to any customer that wants it, free of charge, by the end of 2030

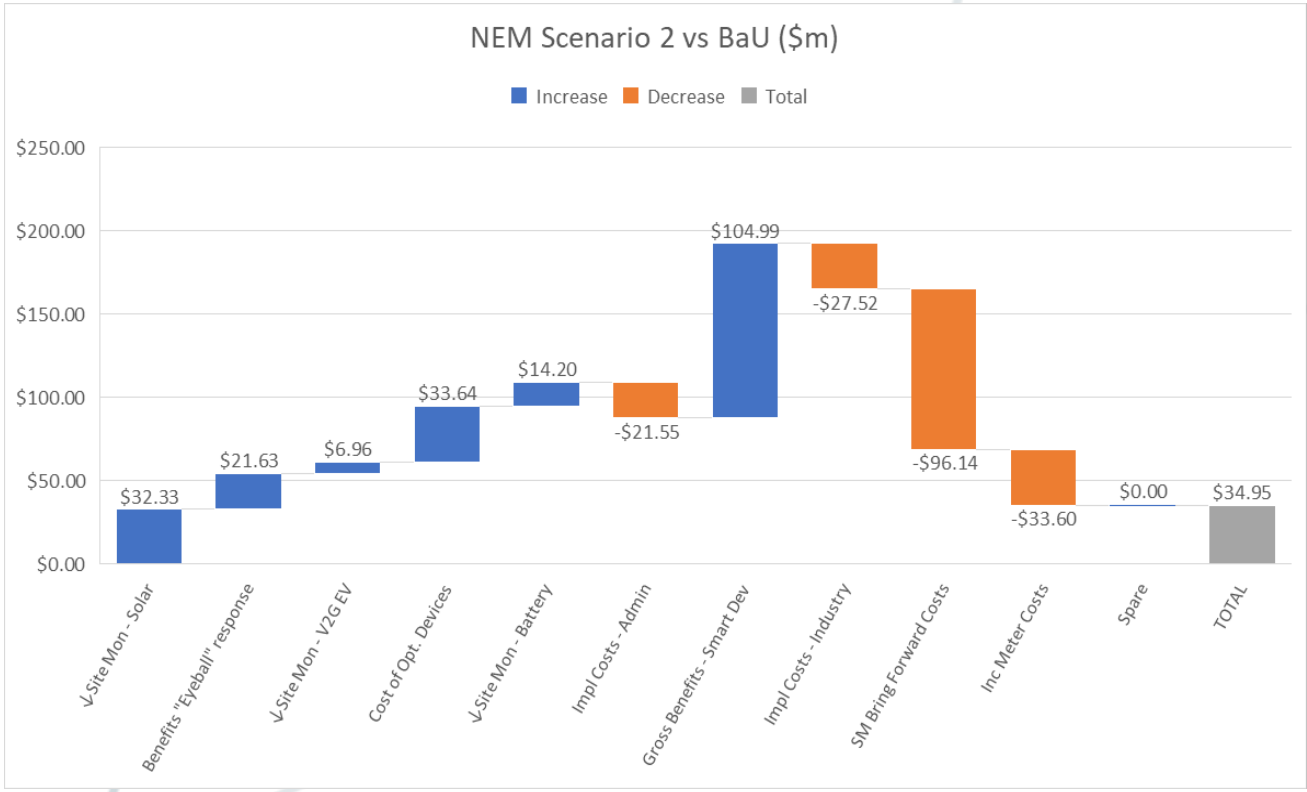
- The primary driver of benefits is the number of customers that use RTD to better manage their own consumption of their smart appliances. Because more customers get access to RTD earlier in Scenario 1 than in Scenario 2, the benefit is larger
- However, the modelling assumes a large number of customers will request access to RTD (because it is free) and therefore the most economically efficient way of delivering RTD from the meter is to bring forward the replacement of any meter that is not already RTD capable
- These bring-forward costs are the predominant driver of the overall results, and they far exceed the benefits that accrue from customers having access to RTD
  - Note, however, that in Scenario 1, we are assuming a Wi-Fi solution is relied upon by the market to meet the Rule change requirements. In this circumstance, our assumption (based on information gleaned to date from CER OEMs and SMEs) is that this means for accessing RTD will not be taken up by most CER OEMs or installers (i.e., they will continue to use alternative site monitoring equipment based on their views regarding the unreliability of Wi-Fi and the reputational damage and real costs that unreliability imposes on them)



Results – Scenario 2 as compared to BaU

Scenario 2: Retailers must provide RTD to any customer that wants it, free of charge, by the end of 2040

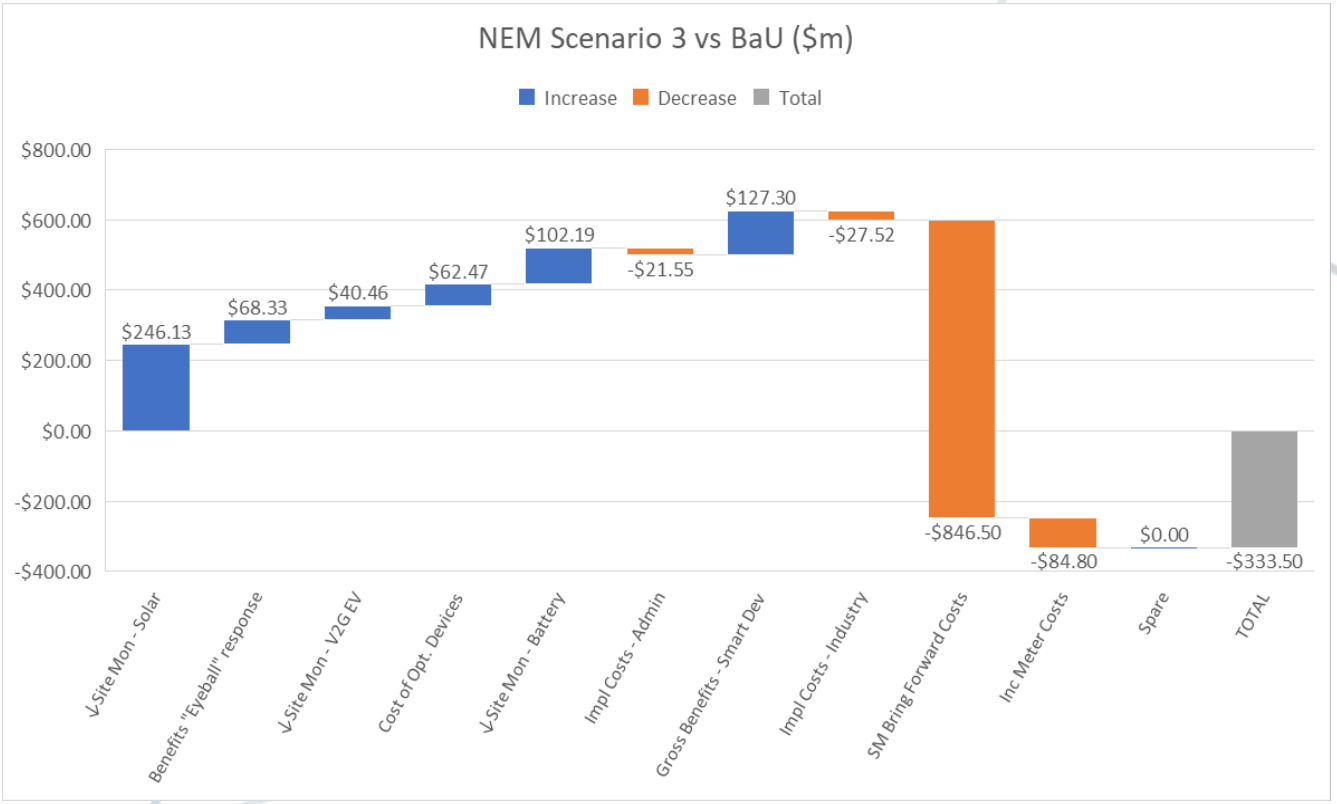
- In comparison to Scenario 1, SM bring-forward costs are much lower in Scenario 2, reflecting the fact that until 2039, the timing of the rollout of meters is not affected by the requirement to provide RTD
  - That is, RTD-capable SMs can be deployed as part of the retailer's normal SM rollout (through 2030) and as part of its on-going replacement of SMs at the end of their useful lives
- Bring-forward costs will still be incurred, however, because there will still be some meters that were originally scheduled for replacement post 2040 that will need to be brought forward (under the assumptions in our initial modelling) to meet the 2040 deadline
  - Note: We are implicitly assuming that the 2040 deadline will incentivise the market to rollout SMs with RTD capability in order to ensure their meters are not obsolete come 2040 (i.e., even though the MIN Spec does not 'force' this outcome)
- The largest amount of benefit is derived from customers with smart appliances using RTD to better manage the consumption of those appliances
  - As in Scenario 1, we are assuming that retailers will use a Wi-Fi solution to provide RTD functionality
  - And, as was also the case in Scenario 1, we are assuming that most CER OEMs and installers will not choose use Wi-Fi to access RTD but instead will continue to install alternative site monitoring equipment, thereby limiting the amount of costs by RTD
- As a result, Scenario 2 produces a small net benefit over the analysis timeframe



Results – Scenario 3 as compared to BaU

Scenario 3: RTD must be available to any customer that wants it by the end of 2030; the SM would need to comply with a change (from 2027) in the MIN Spec

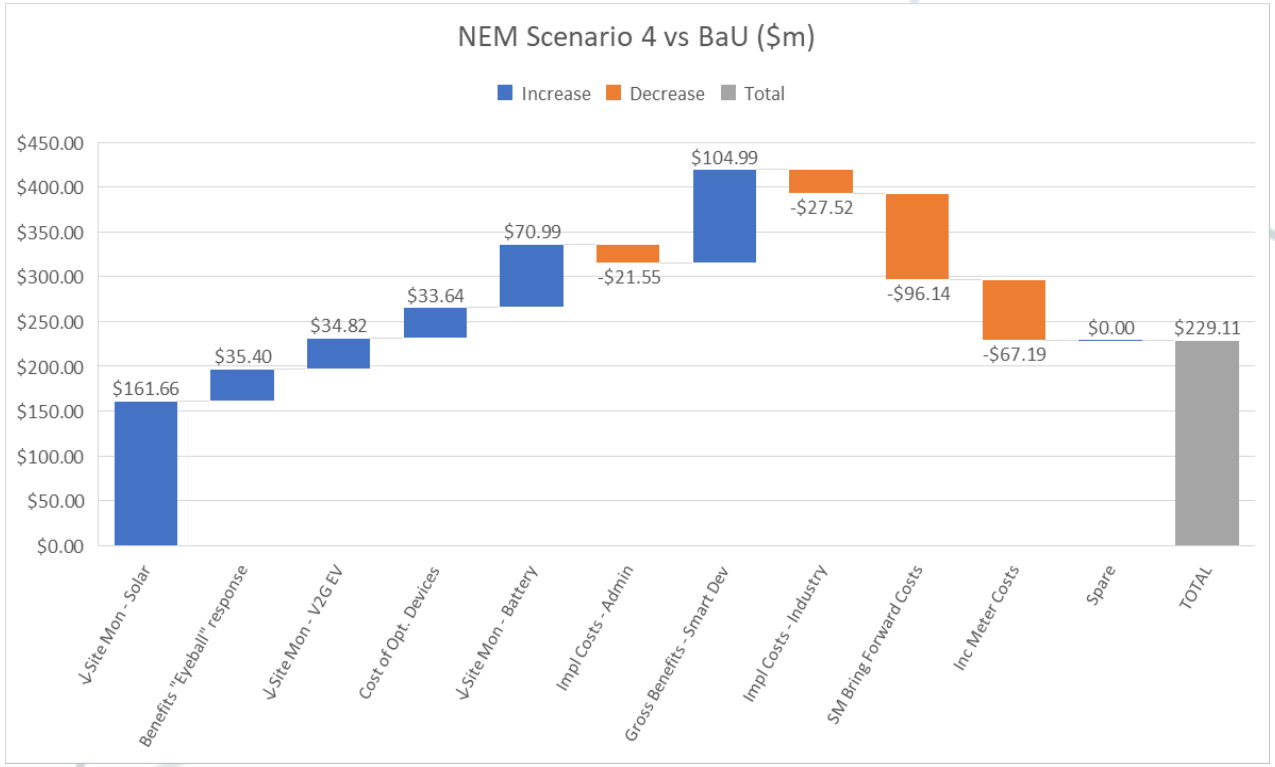
- Similar to Scenario 1, the SM bring-forward costs are the biggest contributor to the overall results in Scenario 3. This is due to the 2030 date at which all customers are able to access RTD for free upon request
  - As in Scenario 1, the modelling assumes that a large number of customers will take up this option and therefore the most efficient way of meeting the end 2030 deadline for free RTD is to bring forward the replacement of any meter that is not already RTD
- However, the benefits in Scenario 3 are higher than Scenario 1. This is due to the inclusion of a MIN Spec that requires SMs to be equipped with both Wi-Fi and a data port for accessing RTD
  - As a result, many more CER OEMs and installers use the data port to avoid the cost of alternative site monitoring devices at premises where there are new solar or battery installations (and to a lesser extent, V2G installations)
- Benefits to customers using RTD to manage their smart devices and other consumption are higher in Scenario 3 than in Scenario 2. This is due to the fact that more customers get access to RTD earlier in Scenario 3 than in Scenario 2
- These higher benefits are not enough, however, to overcome the significant bring-forward costs imposed by the 2030 date in Scenario 3. It, like Scenario 1 produces a net negative result



Results – Scenario 4 as compared to BaU

Scenario 4: RTD must be available to any customer that wants it by 2040, with the SM needing to comply with a change in the MIN Spec (to be implemented in 2029)

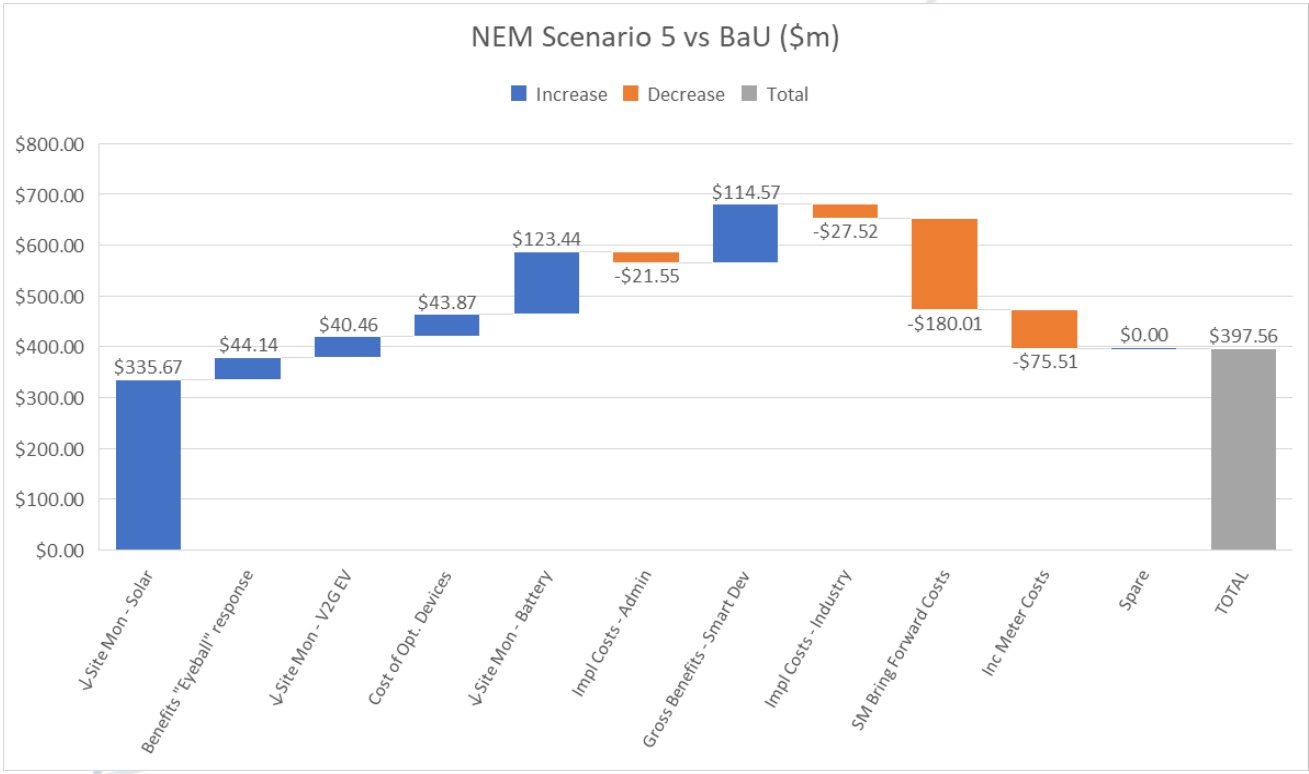
- Scenario 4 benefits from both the lower bring-forward costs of Scenario 2 and the greater avoided cost for site monitoring produced by the inclusion of the same MIN Spec introduced in Scenario 3
  - As in Scenario 2, the SM bring-forward costs are a much smaller contributor to the overall results because most meters are installed in accordance with the retailers' current SM rollout (through 2030) and as part of their on-going replacement of SMs at the end of their useful lives through 2039
  - And, as in Scenario 3, the inclusion of a MIN Spec that requires retailers to provide access to RTD through a data port as well as Wi-Fi results in many more CER OEMs and installers using the data port to avoid the cost of alternative site monitoring equipment at new solar and battery installations
- Scenario 4 also produces material benefits from customers using RTD to better manage their own consumption when they have smart appliances, though these benefits are lower than in Scenario 1 or 3
- The overall result is that Scenario 4 produces a significant net benefit



Results – Scenario 5 as compared to BaU

Scenario 5: Same as Scenario 4, except customers installing CER that can utilise RTD to avoid site monitoring costs are assumed to bring forward the replacement of their SM

- The SM bring-forward costs are larger than in Scenario 4 and 2 (which also have a 2040 deadline) because it is assumed some premises installing solar and battery will elect to bring forward the replacement of their existing (non-RTD) smart meter with one that has RTD functionality.
- However, the bring-forward costs are smaller than in Scenarios 1 and 3, as most meters are still installed in accordance with the original (BaU) rollout schedule.
- The predominate driver of benefits is:
  - Avoiding the cost of alternative site monitoring devices at premises where there are new solar or battery installations
  - This occurs because not only do we assume the meter has both a Wi-Fi and a data port solution (hence allowing a wired solution to be adopted by CER installers), a proportion of customers who install new solar and battery installations elect to take up that opportunity



Results – Scenario 6

Scenario 6 is not an RTD scenario. Rather, it would replace the requirement for retailers to provide RTD through the SM with a requirement to provide all consumers with a summary of their daily interval energy consumption at least once per day (which would most likely occur in the morning of the following day).

- We have not modelled Scenario 6 explicitly, but it would probably provide benefits similar in nature to the benefits modelled in Scenarios 1 through 5 that result from customers using RTD to reduce their consumption in ways that reduce economic costs in the electricity supply chain (the 'eyeball' benefit).
- However, it is likely that, due to the delay in receiving the interval consumption data (i.e., next day as compared to real time), fewer customers will actively engage with the information, and the level of demand response will likely to be lower, relative to the 'eyeball' response to RTD.
  - On the other hand, this approach could almost certainly be rolled out more quickly (and at lower cost) than any of the RTD scenarios.
- To estimate the benefit, we have assumed:
  - Only 2.5% of customers actively use the information to make permanent reductions in their usage (c.f. with 5% when the data is delivered in real time)
  - The 1-day lag means that only half of the economic benefit per customer (as compared to RTD) is achieved, so $7.2 per customer per annum, based on 4000kWh * 3% (demand response) * $60/MWh (average wholesale cost)
  - When ascribed to our estimate of the number of customers in the NEM (~10M), the NPV of this benefit is in ~$21m
- It is also worth noting that several retailers and DNSPs (including all DNSPs in Victoria) already provide interval data on a next-day basis, meaning that a material proportion of the benefit available from this approach is likely to have been realised already.

3. DETAIL ON THE KEY BENEFITS & COSTS MODELLED

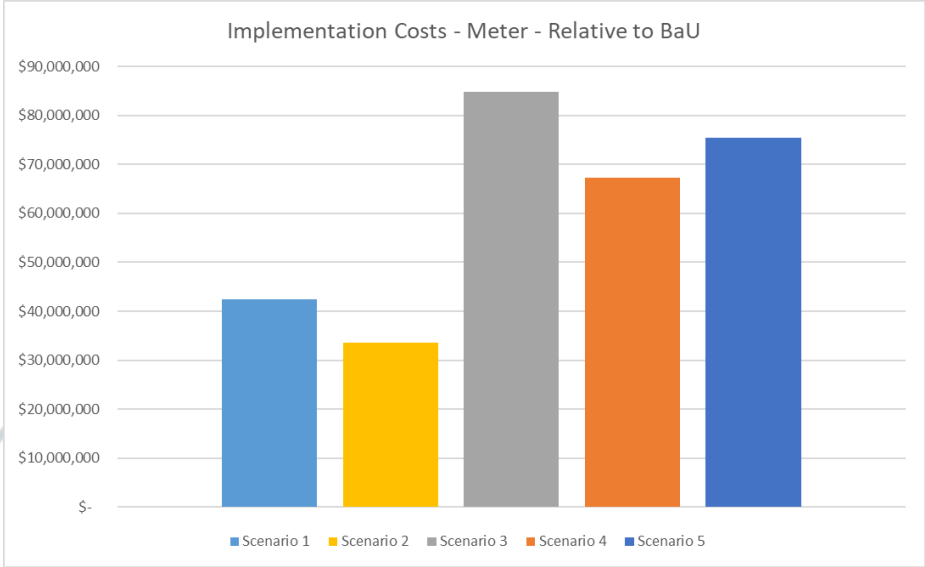
Key benefits and costs modelled

1. Incremental meter costs
2. Bring-forward costs
3. Site monitoring costs for solar and battery
4. Benefits:
   a. Where a customer has a Smart Appliance/Device ***and*** solar
   b. Where a customer responds to the visual presentation of RTD ('eyeball' response)
5. Implementation costs for meter manufacturers, metering coordinators, CER manufacturers and CER installers:
   a. Once-off, upfront
   b. Fixed annual
   c. Variable (per CER installation)

Incremental Meter Costs

- SMs that have RTD functionality are higher in cost, and therefore, under each scenario, the costs are higher relative to the BaU case
- We assume that the cost of manufacturing the meter will be higher in Scenarios 3, 4 and 5, because the meters installed (as a result of the MIN Spec change) have both Wi-Fi and a data port (to allow it to be hard-wired to the CER)
- Scenario 3 imposes the highest costs in the CBA, as it:
  - Assumes the MIN Spec meter, and
  - Has a front-ended roll out schedule (by 2030), which imposes higher costs in NPV terms (even though the undiscounted costs are exactly the same under Scenarios 3, 4 and 5).
- The incremental costs per meter used in the modelling are:
  - $5 for the addition of a Wi-Fi chip
  - $5 for the addition of a data port

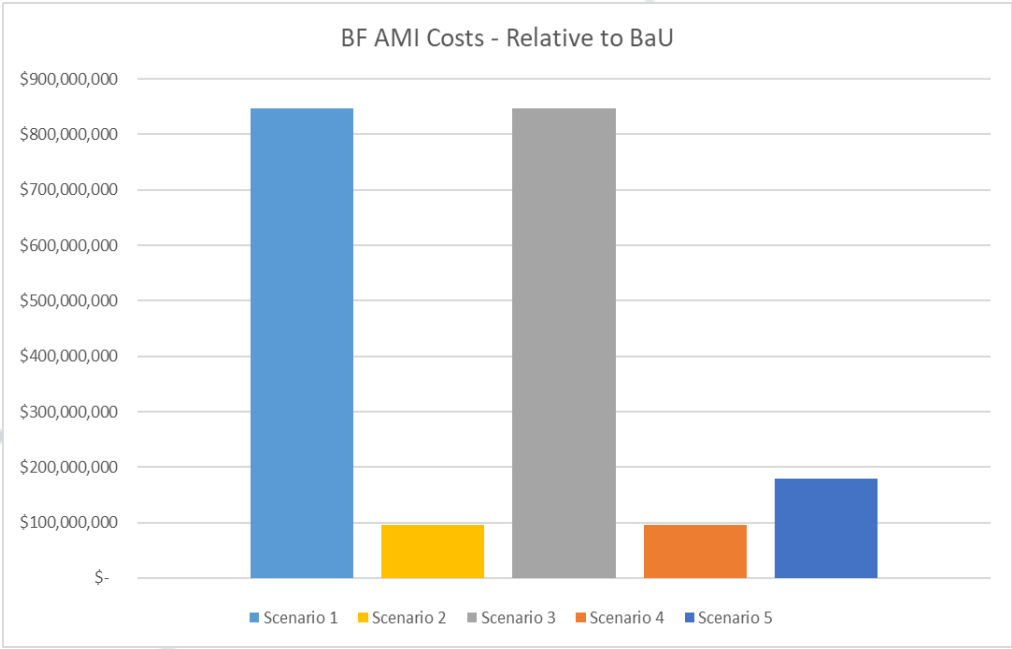
  Therefore $5 in Scenarios 1 & 2 and $10 in Scenarios 3, 4 and 5
- These amounts are based on:
  - OGW project team SME knowledge from building hardware with Wi-Fi and serial data ports
  - Known wholesale hardware costs of additional components with an allowance for integration costs into the meter



Scenario	Incremental Meter Manufacture Costs
BaU	$0.00
Scenario 1	$5.00
Scenario 2	$5.00
Scenario 3	$10.00
Scenario 4	$10.00
Scenario 5	$10.00

Bring Forward Costs

- Any requirement to make available free of charge, RTD by 2030 (Scenarios 1 and 3) is assumed to induce a large number of requests (because it is free) causing significant bring-forward costs.
  - See page 37 for state-by-state rollout / replacement schedules
  - NOTE: The 2040 date in Scenarios 2 and 4 is assumed to bring forward the replacement of significantly fewer meters, hence the incremental costs of those two scenarios (as compared to the BaU) are much lower than those of Scenarios 1 and 3
- Scenario 5:
  - Includes an additional cost of $120/meter due to the diseconomies of scale of installing meters on request by customers installing CER (this is based on information derived from the Victorian AMI rollout, and was used as an input into the Accelerated Rollout CBA OGW undertook for the AEMC several years ago)
  - Assumes a specific bring-forward period depending on the year the CER installation occurs which aligns with when the meter is assumed to be deployed (e.g., 12 years if the CER installation occurs in 2026, 11 years if 2027, etc.; that is, on average, the later the date at which a meter is replaced, the shorter the bring-forward period)
  - Takes account of the probability that a solar/battery customer may have already been provided with an RTD meter under the normal rollout (so as more RTD meters are rolled out, the probability that a solar/battery customer will need to request a meter with RTD reduces)



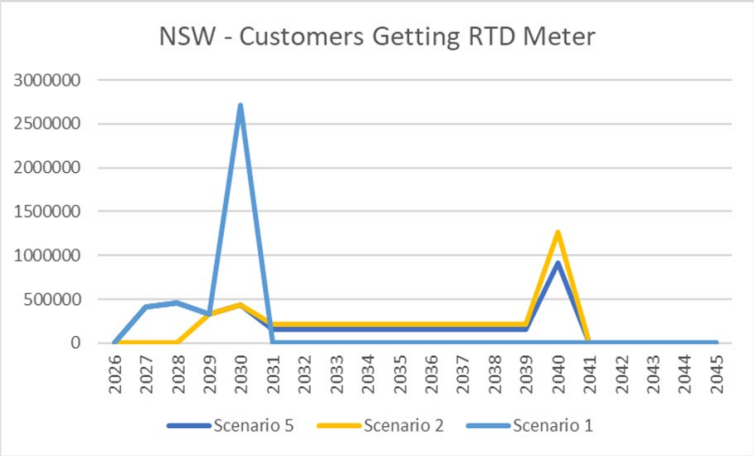
Bring Forward Costs – assumptions

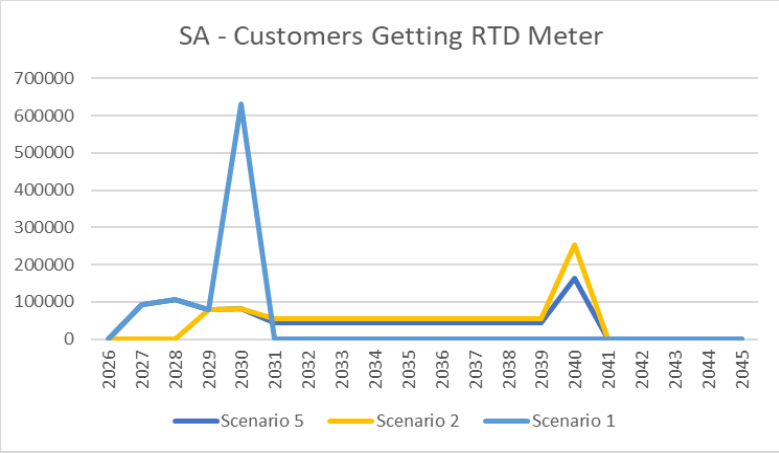
- We assumed a 5% WACC
- Average remaining life estimated for 2030 and 2040
  - Reflects current rollout profile
  - Split between NEM (ex Tas and VIC), Tas and VIC
  - The latter two were separated due to their very different rollout schedules (Vic ~2010-2015 and Tas 2020 - 2025)
- We assume the replacement of meters under Scenario 1 and 3 will be brought forward 8 years on average (NEM) and 3 years on average (VIC):
  - This leads to a cost of ~$177/meter, based on a 5% WACC for NEM and a $550 overall meter cost (capital and installation for a single-phase meter, based on VIC DNSP data) and ~$74/meter for VIC
- For the purposes of this modelling, we have assumed that the addition of an Optical Device to a current-spec SM is not an option as:
  - It does not meet the requirements of RTD:
    - It does not provide full four-quadrant data
    - It is better considered as a use case of the provision of RTD
  - The bring-forward cost is lower than the weighted average cost of a power meter and CT (75%/25% split), hence, even if installing a power meter / CT was technically compliant with the AEMC's definition of RTD (which they aren't because the RTD is not provided from the meter), they are unlikely to be the cheapest way of providing RTD to customers if large numbers request access once it is made freely available
  - Based on information provided informally, the retrofitting of a HAN to an existing meter is unlikely to be a viable option

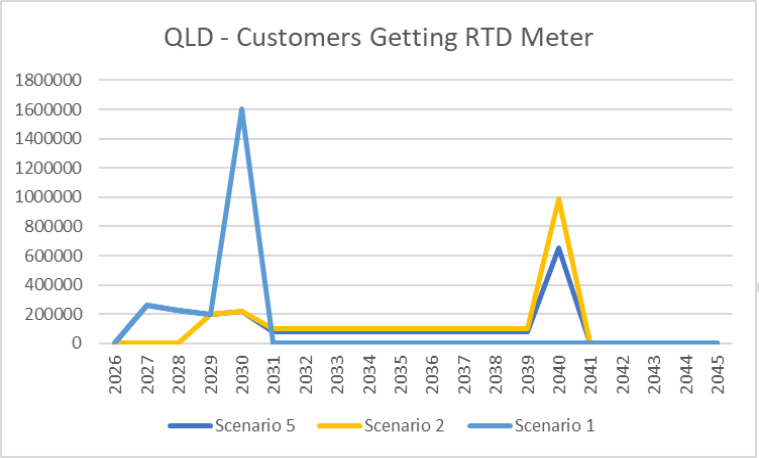
Meter Fleet Info	
Input	**Value**
Average Remaining Life of Non RTD Meter Fleet at 2030	8.00
Average Remaining Life of Non RTD Meter Fleet at 2040	3.00
Average Replacement Cost - RTD Meter (includes installation) - as per JT info	$550.00
Average Bring Fwd Cost per meter - 2030	$177.74
Average Bring Fed Cost per meter - 2040	$74.89
Average Remaining Life of Non RTD Meter Fleet at 2030 - Tas	9.00
Average Remaining Life of Non RTD Meter Fleet at 2040 -Tas	5.00
Average Bring Fwd Cost per meter - 2030	$195.47
Average Bring Fwd Cost per meter - 2040	$119.06
Average Remaining Life of Non RTD Meter Fleet at 2030 - VIC	3.00
Average Remaining Life of Non RTD Meter Fleet at 2040 -VIC	3.00
Average Bring Fwd Cost per meter - 2030	$74.89
Average Bring Fwd Cost per meter - 2040	$74.89
Scenario 5 (piecemeal rollout, therefore diseconomies of scale per meter)	$120.00

Average Bring Fwd Period - Scenario 5 - NEM (ex VIC)	12.00	11.00	10.00	9.00
Average Bring Fwd Cost - Scenario 5 - NEM (ex VIC)	$363.74	$348.43	$332.35	$315.47
Average Bring Fwd Period - Scenario 5 - VIC	7.00	6.00	5.00	4.00
Average Bring Fwd Cost - Scenario 5 - VIC	$279.13	$259.58	$239.06	$217.51

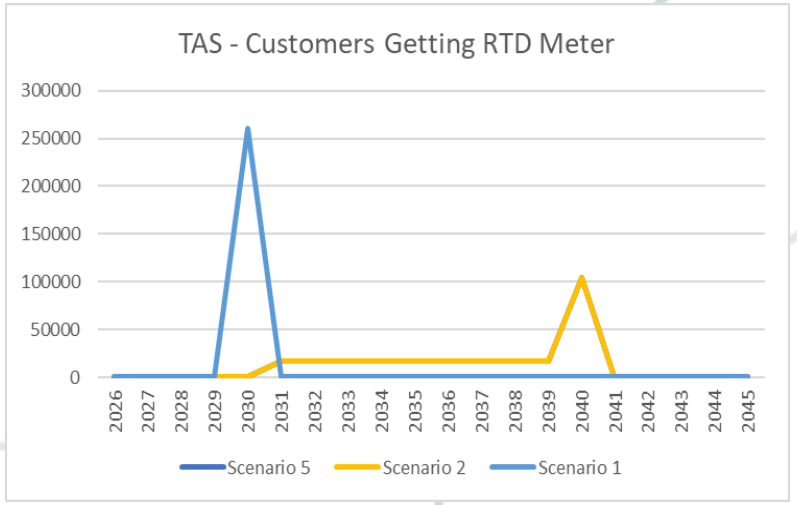
Bring Forward Costs – Meter Rollout

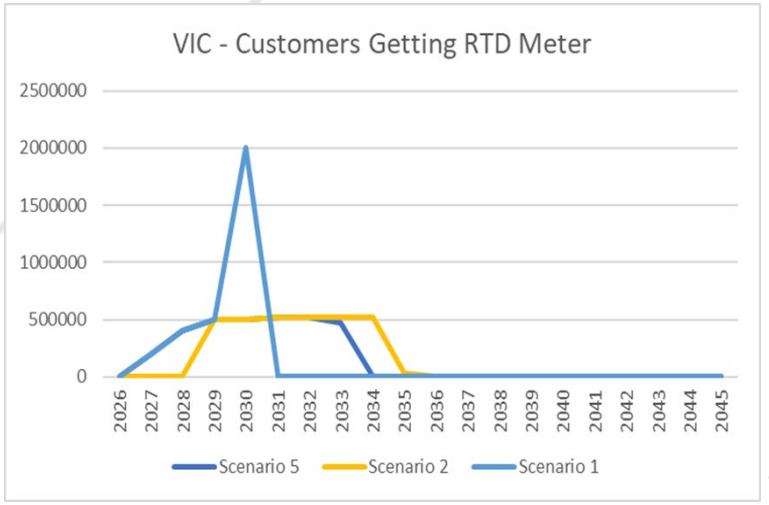






- For NSW, SA, and QLD, we adopted the rollout schedule that underpinned the Accelerated Rollout CBA
- For VIC and Tas, we have developed a coarse replacement profile, based on our understanding of their meter age profiles
- The same number of meters is rolled out under every scenario – only the timing changes
- No allowance has been made for growth in customer sites – any allowance for growth would not change the NPV outcomes materially (as growth, once the RTD rollout schedule is in place, does not affect timing of meter deployment, and incremental manufacturing costs are minor)



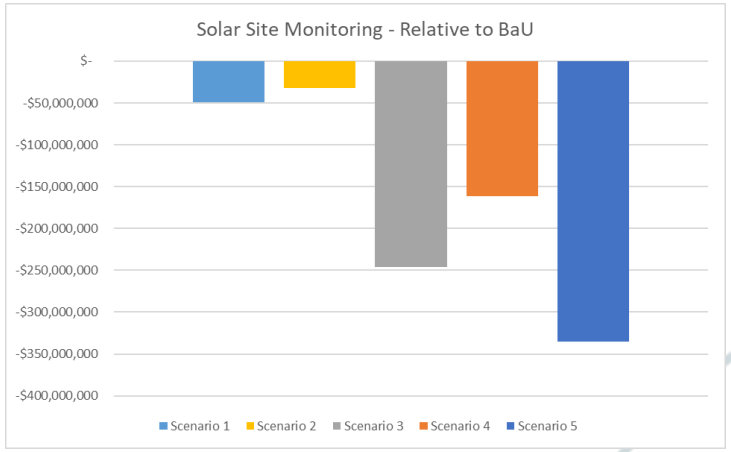


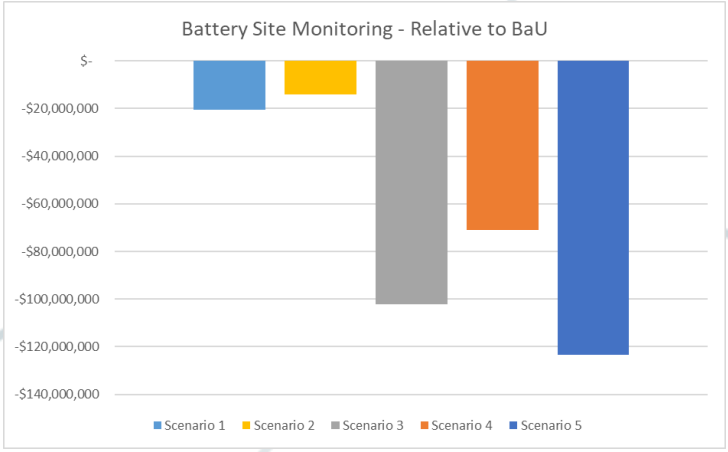
Notes: As noted on page 25, the spikes in bring-forward costs in 2030 and 2040 are artifacts of the modelling
The scales on the Y axis vary between graphs.

Solar and battery site monitoring – numbers used in the modelling

The avoidance of costs to provide site monitoring at solar and battery sites is:

- Lowest in Scenarios 1 and 2, as the market is assumed to provide a Wi-Fi solution under those scenarios (which, in the main, is not taken up by CER installers so site monitoring costs are not avoided (see next slide)
- Higher in Scenarios 3 and 4, because the MIN Spec is assumed to require the inclusion of both Wi-Fi and a data port as means for accessing RTD, the latter of which is utilised by a larger proportion of CER installations
- Highest in Scenario 5, as it assumes customers installing new solar and battery can (and will) elect to have a new meter installed at the same time that includes RTD functionality that will allow them to avoid spending money on alternative site monitoring solutions





Option	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Scenario 5	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%
Scenario 4	70.00%	70.00%	70.00%	67.03%	63.16%	61.28%	59.41%	57.53%	55.65%	53.77%	51.90%	50.02%	48.14%	46.26%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%
Scenario 3	70.00%	66.29%	62.15%	59.18%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%
Scenario 2	70.00%	70.00%	70.00%	69.41%	68.63%	68.26%	67.88%	67.51%	67.13%	66.75%	66.38%	66.00%	65.63%	65.25%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%
Scenario 1	70.00%	69.26%	68.43%	67.84%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%	63.00%
BaU	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%

Option	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Scenario 5	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%
Scenario 4	35.00%	35.00%	35.00%	33.51%	31.58%	30.64%	29.70%	28.76%	27.83%	26.89%	25.95%	25.01%	24.07%	23.13%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%
Scenario 3	35.00%	33.14%	31.08%	29.59%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%	17.50%
Scenario 2	35.00%	35.00%	35.00%	34.70%	34.32%	34.13%	33.94%	33.75%	33.57%	33.38%	33.19%	33.00%	32.81%	32.63%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%
Scenario 1	35.00%	34.63%	34.22%	33.92%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%	31.50%
BaU	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%

The tables show the proportion of new solar (top) and battery (bottom) installs that incur the cost of an alternative site monitoring device under each scenario

For example, 70% of new solar sites will rely on a separate device for site monitoring under the BaU case (the other 30% are sites that are assumed to either not require site monitoring, or whose CER system(s) has in-built site monitoring equipment), whereas only 35% of the new solar will rely on a separate device for site monitoring under by 2045 under scenarios 3, 4 and 5 (due to the MIN Spec change, and the ability to access RTD via the port)

Site monitoring

Will CER manufacturers use site-monitoring via Wi-Fi?

We have assumed that most CER manufacturers would not use site-monitoring from the smart meter if it was only available via Wi-Fi as:

- The connection between the CER and site-monitoring must be very reliable, as if the connection is lost the CER must stop operating in many cases
- Site monitoring in almost all cases is connected to the CER via a wire (even though it is more expensive). There are some specific wireless exceptions that manufacturers can use in extraordinary circumstances where wiring is not possible. These wireless solutions often uses a specialised reliable wireless protocol and hardware; they do not rely on household Wi-Fi
- Some stakeholders have told us during consultation they would not use a Wi-Fi site-monitoring solution due to its lack of reliability

Meter providers prefer Wi-Fi access

Meter providers and MCs have said that access to RTD via Wi-Fi is preferable to a direct connection through a data port because:

- There is no need for physical access to the meter, which could pose safety issues to installers and the potential for damage to the meter itself
- It provides no means for data in the meter to be tampered with, thereby keeping the data which is used for market settlement secure.

Will CER manufacturers support receiving real-time data from the smart meter (if available) to forego costs of installing their own site monitoring meter?

Some manufacturers of CER have told us that they may not adapt their product to support receiving real-time data from the smart meter because:

- They install a standardised global product and are not willing to adapt it for an Australian-only metering solution
- The cost of their site metering would not be avoided even if there was access to RTD from the SM (because their alternative site monitoring device is built into the CER product, and they would not remove it as that would entail additional cost)
- There would be a risk of increased support costs and reputational damage from a 3rd party meter that they don't control

Other manufacturers of CER have stated they would use the smart meter for site monitoring if it was available, particularly those that build an Australian-specific product and/or don't manufacturer their own site monitoring devices

Modelling Assumption

We are confident that *some* manufacturers would use RTD from the smart meter, thereby avoiding the cost of installing their site-monitoring meter, but not *all* manufacturers

- Additionally, the proportion of manufacturers choosing to use RTD from the SM will likely depend on the how easy it is to access the data at the time of CER installation, and the reliability of the access provided over time

Based on the above, the modelling for this draft CBA assumes that around half of new CER installations that would have relied on alternative metering for site monitoring would use the SM for site monitoring where RTD is available

To the extent that relevant comments to the Draft Determination provide better information, they will be used to revise the modelling

Which CER currently requires site-monitoring?

How do the introduction of emergency backstop programs, DOEs, larger system sizes and reduced static export limits affect the need for site monitoring?

- Each of them increases the need for site monitoring, thereby making RTD more beneficial

1. A behind-the-meter battery requires site-monitoring in all cases, as it often operates relative to the site; e.g., it charges from excess solar, discharges to offset house load
2. A V2G EVSE requires site-monitoring if its nameplate capacity is larger than the export limit at the site, or if it needs to operate relative to the site such as charging from excess solar or discharging to offset house load. Note: most export limits are 5kW, and V2G chargers are 7kW or higher (most above 10kW).
3. Solar requires site-monitoring under the following circumstances:
   - Has a nameplate capacity larger than the export limit at the site
   - Is enrolled in a flexible export program, or
   - In an emergency backstop program operated through CSIP-AUS (VIC, NSW in 2026, expected in QLD)*
4. Site-monitoring can also be voluntarily installed to see enhanced information about CER usage (e.g., how much solar generation was consumed by the household)
5. With the growing average size of solar systems, shrinking static export limits and establishment of CSIP-AUS backstop programs in VIC/NSW, we estimate a high level of solar systems currently require site-monitoring, with that number increasing over time. Notably, much of the requirement for site-monitoring is already locked in, therefore flexible export rollouts or when QLD gets a CSIP-AUS backstop does not materially change the amount of CER that require site monitoring

* Specific smaller-scale rollouts on non CSIP-AUS backstops such as QLD requiring systems >10kW to have a DRED control which does not require site-monitoring, noting that it's likely the QLD scheme <10kW will likely require site-monitoring

Power meter/ CT meter avoided costs

Avoided Cost of Power Meter	$400.00
Avoided Cost of Current Transformer	$50.00
Cost of Optical Device (e.g., Powerpal)	$100.00

CER such as solar and batteries achieve site monitoring by capturing voltage and current at the connection point

One way of achieving this is installing a dedicated power meter that records voltage through a voltage transformer (VT) and current through a current transformer (CT). The dedicated meter then sends that site-monitoring information to the CER through a wired connection

Where the CER is installed at the connection point, and the manufacturer supports this configuration, there is the option for just a current transformer to be installed for site-monitoring, as the CER itself can monitor the voltage. In this situation the hardware and labour costs for site-monitoring are lower. Most manufacturers do not support this option, however, and many CER systems aren't installed directly next to the switchboard. We have estimated that 25% of CER installations are able to use this solution for site-monitoring (and therefore 75% from a power meter)

The $400 avoided cost of the power meter includes an assumed average cost of $350 for the power meter, and $50 less labour cost to connect the CER to the SM as compared to the cost for installing an alternative site monitoring device

- The power meter costs are an average cost from a wide range of sources and scenarios (e.g., high volume by CER manufacturer vs wholesale costs, single phase vs three phase, etc). Power meter costs can vary from $100 to over $600
- Power meters require additional labour to install and connect to the CER compared to connecting the CER to the SM

$50 is the assumed average costs of a CT that can be avoided. Labour costs for installing a CT and connecting the CER to a smart meter are equivalent ($50)

Benefit Assumptions

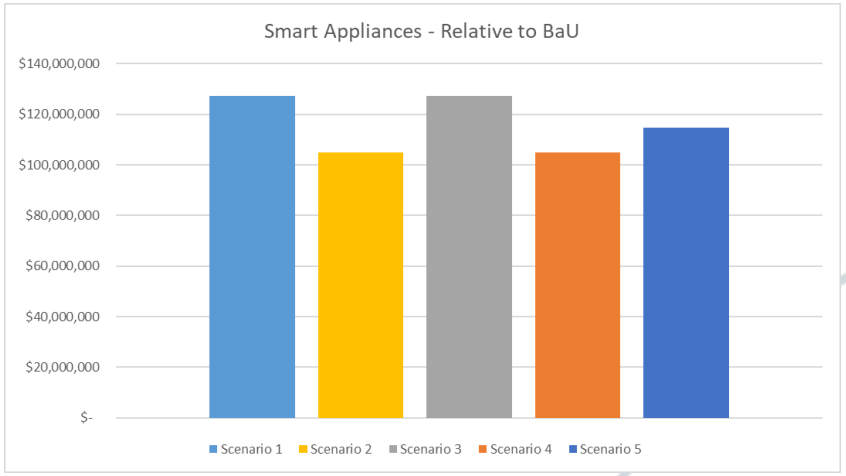
We assumed relatively small per-customer/pa benefits related to:

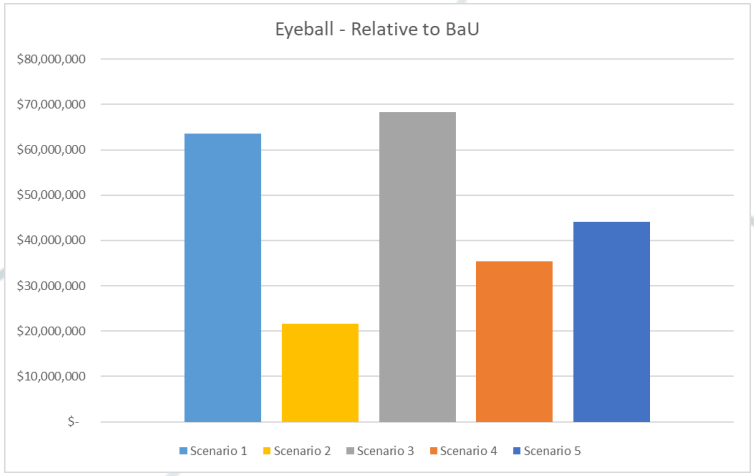
- Operating smart appliances/devices more efficiently as a result of having access to RTD at the site level
- Customers responding to visually seeing RTD (potentially accompanied by hints/tips)

We have conceptualised the former as RTD allowing customers who have solar to dial down/up the use of their smart devices based on what is happening at the site level (e.g., is the PV system exporting or importing).

- Current tariff arrangements (and for the foreseeable future, for most customers) incentivise self-consumption.

We have assumed that RTD would have limited benefit, except where it allows customers to avoid consuming during periods of fluctuating cloud cover:





Scenario	Hot Water (per customer/pa)	EV Charger (per customer/pa)	Eyeball Data (per customer/pa)
BaU	$0.00	$0.00	$0.00
Scenario 1	$2.00	$3.50	$14.40
Scenario 2	$2.00	$3.50	$14.40
Scenario 3	$2.00	$3.50	$14.40
Scenario 4	$2.00	$3.50	$14.40
Scenario 5	$2.00	$3.50	$14.40

- The customer's self interest is to avoid consuming during cloudy periods if that means they will have to import electricity. RTD allows them to do this by shifting their consumption to when cloud cover reduces/ends (and generation increases)
- We have assumed those weather patterns also affect the wholesale market (e.g., cloud cover causes prices to increase in the market, due to lower production from central solar); therefore, any shift of load by the customer (for financial reasons) is also likely to produce market benefits

Assumptions in estimating smart appliance benefits

Heat pumps and EVs

We have assumed 10 days per month in winter (according to the BOM, Victoria has 15 days), and 10 other days of the year where there is some level of variable cloud cover (which would cause the customer to move from exporting to importing, absent a reduction in the usage of their EV Charger and/or Heat Pump Water Heater)

- 40 days by 2 hours per day = 80 hours
- Average usage of device over that period
  - Heat pump water heater = 1,500kWhpa/365/6hours per day= ~0.7kWh/hr
  - EV = 2,300kWhpa/180days (assume it only charges every second day) / 6 hours = 2.1kWh/hr
- Average difference in wholesale price in winter in medium versus low PV days = $20/MWh [Informed by CECV information]

= Heat pump = 80 hours * 0.7kWh * $20MWh/1000 = $1.10 per customer per annum (rounded up)

= EV = 80 hours * 2.1kWh * $20MWh/1000 = $3.36 per customer per annum (rounded up)

Sources for forecasts:

- Heat pump water heaters: CER project to 2030 and flat thereafter
- EVSE: AEMO ISP with additional inputs from bitre and Ausgrid research

"Eyeball" case

For the customers responding to visually seeing RTD (potentially accompanied by hints/tips), we assumed:

- 4,000kWh (average consumption) * 6% (reduction in overall demand) * ~$60/MWH (average wholesale cost) = $14.40 per customer per annum
  - We have not explicitly reflected any network benefits into the analysis at this stage.
- The quantum of energy saved is based on a meta-study conducted in 2019 for the VEU
  - The average savings cited in the 5 international studies in that report was 10% but has been discounted to reflect the fact that no information was available about persistence of effects and all jurisdictions have higher average residential consumption including higher heating loads
- We have assumed that a maximum of 5% of customers will actively use the RTD when it is free over the longer term in ways that change their consumption behavior. We assumed that a maximum of 1.5% of customers would be prepared to pay for it, when it was not free
  - No studies of actual impacts of these devices has been identified to date

Costs to implement and administer password authorisation to access RTD

Implementation costs have been estimated for CER manufacturers and installers, meter manufacturers, metering coordinators

In total, these come to about $48m (NPV)

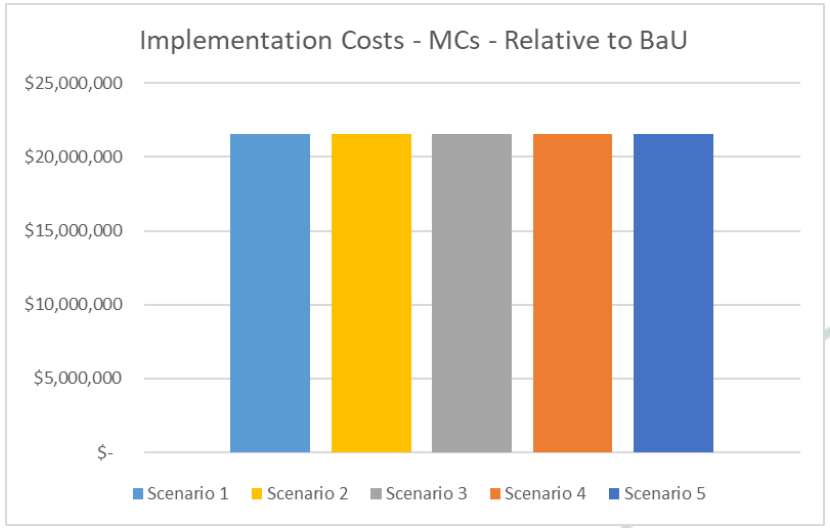
We have assumed costs are split into:

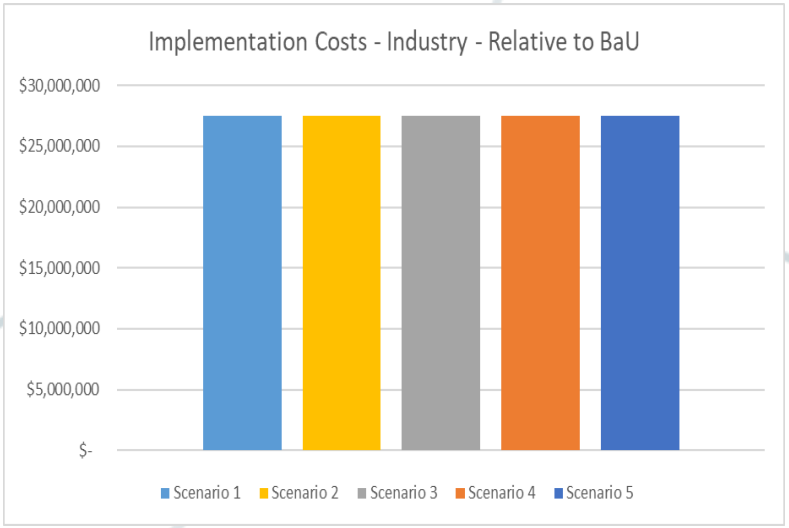
- Fixed upfront
- Fixed, annual
- Variable (per installation)

These costs are based on remote provision of the password (see next slide) and have been equally proportioned across each of the States in the draft modelling

For the draft modelling, we have assumed there are no additional design costs to the meter manufacturer to accommodate provision of RTD

- We note that many meter manufacturers produce meters with RTD functionality (often via data port access) for Australia or in other jurisdictions

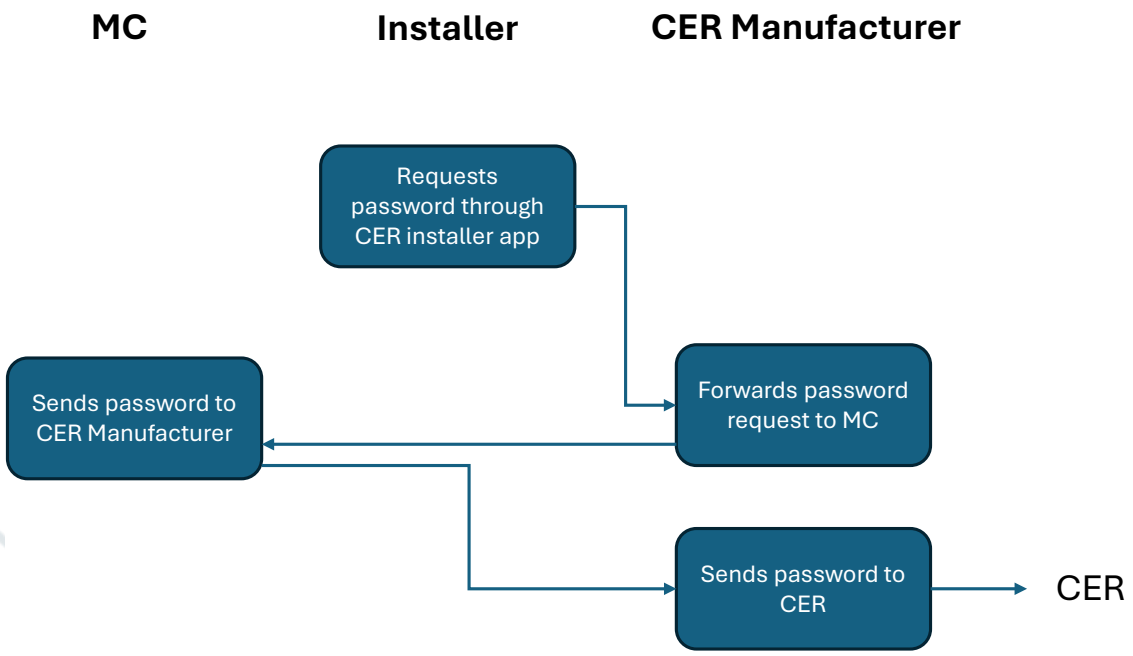




Password (remote provision)

Party	Upfront	Fixed annual	Per installation	# Entities
CER manufacturers	$100,000	$30,000	0	50
Metering coordinators	$300,000	$150,000	0	10
Meter manufacturers	$200,000	$50,000	0	5
CER installers	$0	$0	$10	N/A

Remote password approach for authorising RTD access



Note: The process from initiation by the installer to receipt of the password by the CER device is almost instantaneous because it will be done through digital communications channels. It is also the case that the connection between the SM and the CER device must be in place for further steps in the installation process to be completed (e.g., the backstop commissioning test that DNSPs require)

- There are variations to the specific steps shown in the diagram for providing a unique password remotely to each CER device, but the requirements and processes of the three parties would be similar in all cases
- In addition, the costs for providing the password on the meter would be much the same; the remote password provision is preferred due to its greater security
- As shown on the previous page, CER manufacturers, meter manufacturers and metering coordinators would incur costs to set up digital systems and firmware to support a remote password capability
- Parties would also incur costs to maintain and support these digital systems over time
- We have assumed from knowledge and industry information that there are no material economies of scale to these systems, therefore we have treated all ongoing system costs as fixed and not per installation
- The $10 per installation for the installer is for operating a CER installer app as part of the password process

4. CONCLUSIONS AND NEXT STEPS

Conclusions and next steps

The draft results indicate that Scenarios 5 and 4 are the preferred solutions. Their status as the preferred approaches is unlikely to change unless:

- There is strong evidence to suggest that ONLY customers that benefit take up what is otherwise a free service; and/or
- The cost of alternate metering would not be avoided for most customers installing new solar and battery, even if RTD from the meter was available (which may mean no scenario produces a positive NPV, and the BaU would be the preferred outcome)

The features of Scenarios 5 and 4 are that.

- They assume the rollout of SM with RTD functionality aligns to the BaU rollout schedule, hence they impose fewer economic costs associated with disrupting (in our modelling, bringing forward) that rollout schedule
- They assume the MIN Spec is changed to incorporate both WiFi and data port
- Scenario 5 also assumes a strong alignment between the take up of SMs with RTD and benefit creation (as it assumes CER customers who benefit from RTD obtain a meter with RTD, even if it involves bringing forward the replacement of that meter)

Feedback from the consultation on the draft report will be assessed and incorporated as appropriate

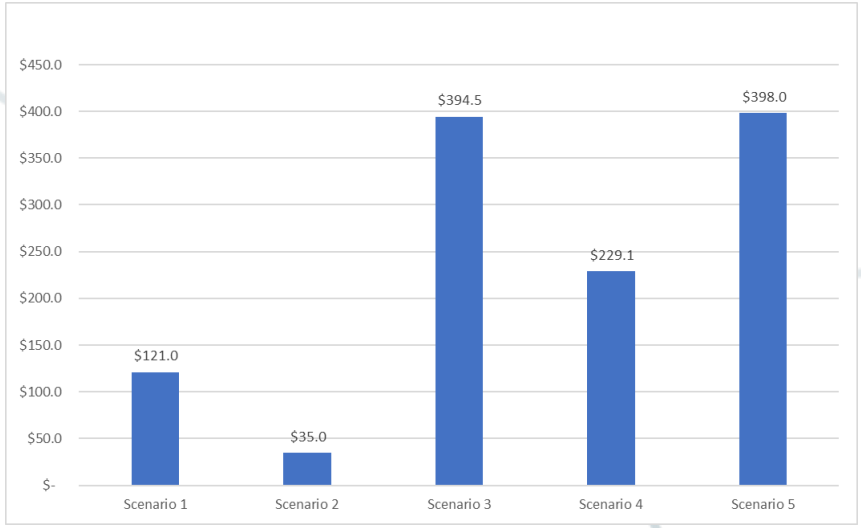
APPENDIX A: DRAFT SENSITIVITIES

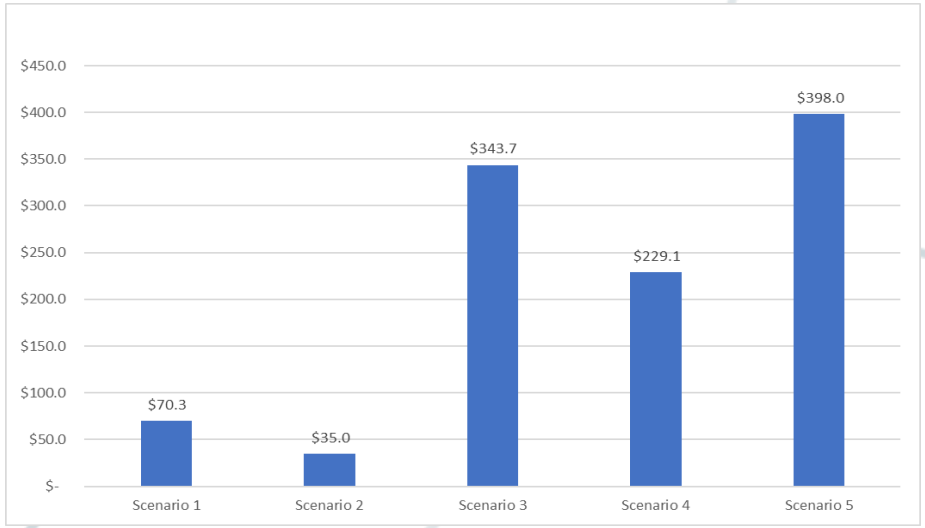
Sensitivity 1: What if only 20% of customers instead of 100% took up free RTD?

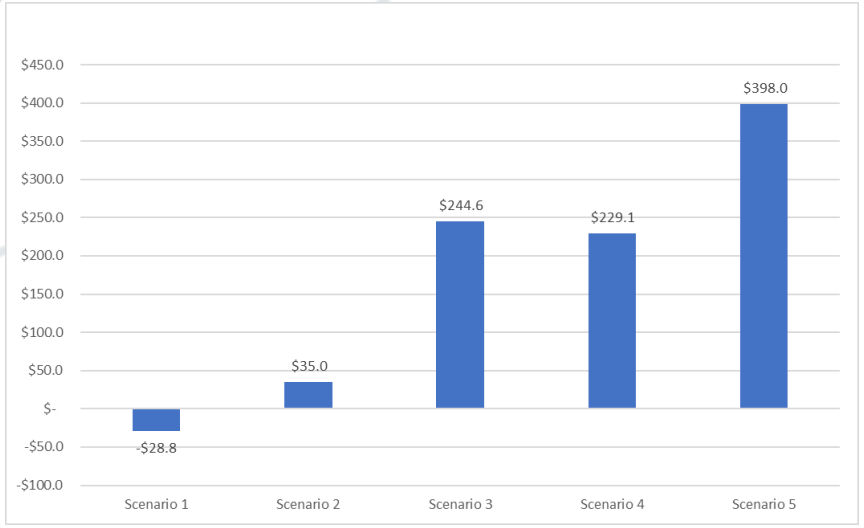
Our draft results indicate that:

- If only 20% of customers took up SM with RTD (instead of the 100% assumed in the main modelling), both Scenario 1 and 3 results would improve
- The right top graph assumes the same cost per meter as assumed in the base modelling (e.g., bring forward cost of $177 NEM) whereas the bottom right graph assumes a $300 cost per meter (reflecting a more likely estimate, given the diseconomies of scale associated with a smaller, more fragmented rollout)
- All other assumptions have remained constant (including an implicit assumption that customers that benefit from RTD are “amongst” the 20% of customers that take it up, and that it occurs in 2031)

Scenario 3 would produce about the same net benefit as Scenario 5 (see figure below) at a 14% take up (for reference, the Aurora + app has > double this take up, within 2 years), assuming base case meter costs assumptions (e.g., bring forward cost of $177 NEM)







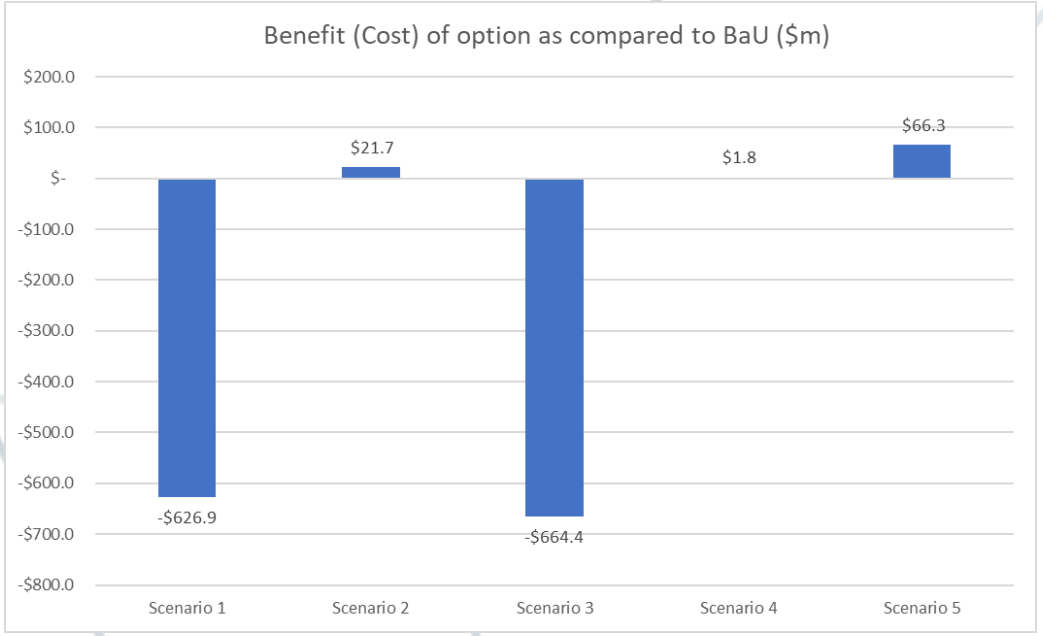
Sensitivity 2: What if fewer CER customers take up RTD from the meter?

In this sensitivity:

- We assumed a much smaller reduction in the proportion of new solar (top) and battery (bottom) installs that incur the cost of an alternative site monitoring device (relative to the base modelling).
- The results indicate that only scenario 5 has a positive NPV.

Option	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Scenario 5	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%
Scenario 4	50.00%	50.00%	50.00%	49.58%	49.02%	48.75%	48.49%	48.22%	47.95%	47.68%	47.41%	47.15%	46.88%	46.61%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%
Scenario 3	50.00%	49.47%	48.88%	48.45%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%
Scenario 2	50.00%	50.00%	50.00%	49.58%	49.02%	48.75%	48.49%	48.22%	47.95%	47.68%	47.41%	47.15%	46.88%	46.61%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%
Scenario 1	50.00%	49.47%	48.88%	48.45%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%	45.00%
BaU	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%

Option	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Scenario 5	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%
Scenario 4	25.00%	25.00%	25.00%	24.79%	24.51%	24.38%	24.24%	24.11%	23.98%	23.84%	23.71%	23.57%	23.44%	23.30%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%
Scenario 3	25.00%	24.73%	24.44%	24.23%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%
Scenario 2	25.00%	25.00%	25.00%	24.79%	24.51%	24.38%	24.24%	24.11%	23.98%	23.84%	23.71%	23.57%	23.44%	23.30%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%
Scenario 1	25.00%	24.73%	24.44%	24.23%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%	22.50%
BaU	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%



APPENDIX B: THE ECONOMIC BENEFITS & COSTS THAT RESULT FROM DIFFERENT TYPES OF CUSTOMERS USING RTD

The economic benefits & costs that result from different types of customers using RTD

Customer A wants to install CER and access real-time data. Customer A already has a meter with in-built real-time data functionality

Customer A, a solar / battery customer who accesses real-time data from their in-situ SM to avoid alternate site monitoring devices:

- Direct Economic Benefit: Reduced site monitoring costs for new installations:
  - If a power meter is used, $450 avoided cost, if a CT is used, $50 avoided cost – we have weighted this 75%/25%, based on our SME
  - We have assumed that the majority, but not all, new solar customers would utilise RTD from the meter (i.e., not all BaU site monitoring costs will be avoided)
  - A proportion of batteries (~50%) are assumed to require additional site monitoring, even if site monitoring is in place for in situ solar
- Direct Economic Cost: Higher meter costs ($10/meter, assuming data port solution under Scenarios 3,4 and 5)

Customer B wants to install CER and access real-time data, prior to it being freely available. Customer B does not have a meter with in-built real-time data functionality:

Customer B, a future solar / battery customer who elects to bring forward the replacement of their current SM with one that has RTD functionality to avoid alternate site monitoring devices* (Scenario 5):

- Direct Economic Benefit: Reduced site monitoring costs for new installations (as per above)
- Direct Economic Cost: Higher meter costs ($10/meter, assuming data port solution under Scenario 5)
- Direct economic cost of bringing forward replacement of their meter:
  - The modelling assumes a specific bring-forward period depending on the year the CER installation occurs which aligns with when the meter is assumed to be deployed (e.g., 12 years if the CER installation occurs in 2026, 11 years if 2027, etc.; that is, on average, the later the date at which a meter is replaced, the shorter the bring-forward period)
  - The modelling assumes a capital and installation cost of ~$550, based on a single-phase meter (as per information from Victoria). The modelling also assumes a $120/meter diseconomies of scale cost.

** Scenario 5 assumes that where beneficial, solar/battery customers bring forward the installation of a new SM with RTD functionality. Other scenarios do not assume customers bring forward the replacement of their smart meter, when it is not free*

Customer C is an existing solar customer who wants to access real-time data. Customer C already has a meter with in-built real-time data functionality

Customer C, an existing solar customer who accesses real-time data from their in-situ SM can better utilise any smart appliances they have:

- Direct Economic Benefit: Use RTD from in situ SM to better utilise smart appliances in response to fluctuations in CER output
  - Modelled based on take up of EVs and heat pumps * probability that a customer has solar^ * economic benefit (per annum) resulting form that better utilisation
  - We have assumed benefits come predominately on cloudy days (causing fluctuations in both CER output and the cost of electricity in the wholesale market) – the economic benefit is small per device, at $2 (hot water) and $4 (EVSE) per annum
- Direct Economic Cost: Higher meter costs ($5/meter if Wi-Fi OR $10/meter if both Wi-Fi and data port)

Customer D is a non-DER customer who wants to access real-time data. Customer D already has a meter with in-built real-time data functionality

Customer D, a non-DER customer who actively uses data to reduce their consumption:

- Direct Economic Benefit: From more efficient consumption
  - We assumed a maximum of 5% of ALL customers will actively use the RTD when it is free over the longer term (and that a maximum of 1.5% of ALL customers would be prepared to pay for it), and
  - We have assumed 4,000kWh (average consumption) * 6% (reduction in overall demand) * ~$60/MWH (average wholesale cost) = $14.40 per participating customer per annum
- Direct Economic Cost: Higher meter costs ($5/meter if Wi-Fi OR $10/meter if both Wi-Fi and data port)

^ *For the avoidance of doubt, even if there is site monitoring under the BaU, in most cases, smart loads/appliances cannot access it (whereas they can if the RTD is available locally from the SM).*

Customer E is a customer who does not want to access real-time data. Customer E already has a meter with in-built real-time data functionality

Any customer that does not use RTD functionality (e.g., non-DER customers who do not actively use RTD data, solar customers that do not have any smart appliances or any DER customer that chooses to not use RTD to avoid alternate site monitoring devices)

- Direct Economic Cost: Higher meter costs ($5/meter, Scenario 1 and 3) or $10/meter Scenario 3, 4 and 5)

Customer F is a customer who does not have a meter with in-built RTD functionality, but once it becomes freely available, chooses to obtain access to RTD, but despite obtaining access to RTD does not beneficially use that RTD

- Direct Economic Cost:
  - Bring forward costs driven by any customer that chooses to access, free of charge, RTD post 2030 (Scenario 1 and 3) and post 2040 (Scenario 2, 4 and 5) earlier than they otherwise would have been able to access based on the BaU SM replacement profile
  - We have assumed ~$180 bring forward cost for most meters in the NEM, based on current rollout schedule and a meter cost of $550 per meter. This assumes a mass rollout, therefore no diseconomies of scale

General note

All customers will also incur a share of the general costs associated with implementing and administering the scheme

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