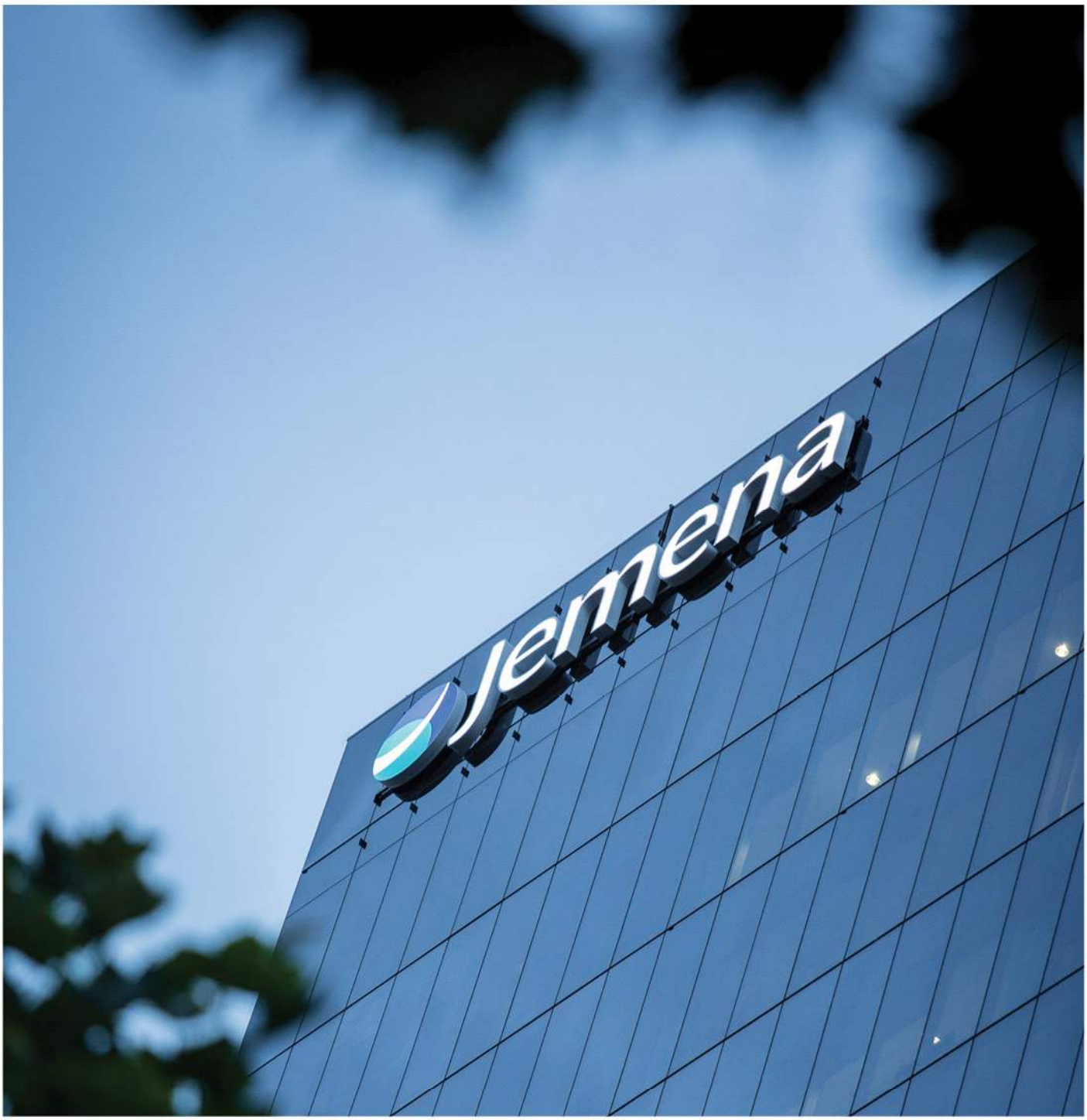

Jemena Gas Networks (NSW) Ltd

Digital Metering for Chronic No Access Meters

Jemena
bringing energy to life

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1. Summary

This business case outlines an investment[1] of $7.0M in capital expenditure and $0.5M per annum in operating expenditure (both in $2023) to install 8,000 digital meters within customers' premises that have consistently posed accessibility issues. The installation of these digital meters will be conducted as an adjunct to *end-of-life difficult access aged meter replacement program* to ensure that these customers can receive meter reading services as required under Jemena Gas Networks' (**JGN's**) Transportation Reference Service (**reference service**), as outlined in the box below.

> *The Transportation Reference Service[2] is a service for:*
>
> *(i)* …
>
> *(ii)* *meter related services including:*
>
> *a.* …
>
> b. *meter reading and associated data activities as appropriate for the required capacity and meter reading frequency, but does not include Ancillary Reference Services.*

JGN currently has approximately 65,000 meters that are defined as 'chronic no access'. These are meters where JGN is not able to meet the obligation for meter reading due to the location of the meter and the meter having no remote reading capability. The locations are either within an inaccessible area of a customer's premise (and the customers have not provided any means of access) or the location is of a nature where the safety of the meter reader may be compromised, such as an aggressive pet or a restricted space.

This business case evaluates options that evaluate the extent to which JGN should roll out its meter reading obligations, especially for hard to access meters. Five options were considered, including:

- Option 1 – base case – maintain current approach (replace with standard meters)
- Option 2 – Replace hard-to-access meters that are part of the residential aged replacement program with digital meters (8,000 meters)
- Option 3 – Replace the subset of hard-to-access meters which are located inside a premise ("internal meters") with digital meters (32,000 meters)
- Option 4 – Replace all hard-to-access meters with digital meters (65,000 meters)
- Option 5 – Replace residential meters to be replaced in the RY27-RY30 period with digital meters (180,000[3] meters)

The selected 8,000 meters, as part of the recommended solution, represent a subset of hard-to-access meters that are also aged or defective. The strategy is to prioritise the deployment of the digital metering solution to customers who face both chronic access issues within the aged/defective meter programs. Crucially, the rollout of 8,000 digital meters allows JGN to assess the effectiveness of digital meters in removing the 'chronic no access' barrier to delivering its meter reading services.

An additional benefit of the selected option is that it enables JGN to assess the operational benefits of digital metering. These benefits include reducing manual readings, decreasing unnecessary service dispatches (e.g., wasted service visits), resolving billing disputes more efficiently, and enabling billing to be based on actual rather than estimated readings.

During the September 2023 customer forum, which tested the options for digital metering (Options 2, 3, 4, and 5), customers expressed the strongest support for a targeted approach. This approach involves replacing the

[1] Note. This investment is incremental to the cost of replacing the meters that would have occurred in the *end-of-life difficult access aged meter replacement program.* Further explanation is provided in Section **Error! Reference source not found.** of this document.

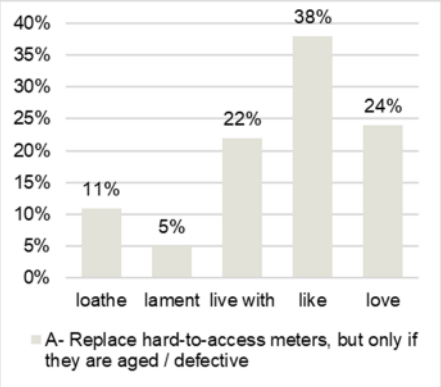
[2] Source: Page 15 of JGN's *Reference Service Proposal for the July 2025- June 2030 Regulatory Period*, accessible on the AER website.

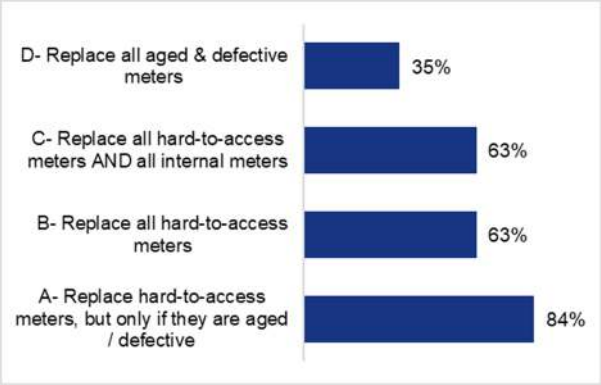
[3] This includes all residential aged meters, residential defective meters, residential meters for testing.

8,000 meters that are both difficult to access and either aged or defective, rather than replacing the entire group of 65,000 meters that are chronically inaccessible.

The box below details how 84% of customers voted to “live with”, “like” or “love” the option to roll out digital metering to 8,000 premises facing chronic access issues as part of the aged/defective meter programs. In comparison, the other options involving the rollout of digital meters to a larger number of customers received less support.

Customer support for the rollout of Digital Metering





During the September 2023 Customer Forum, customers were presented with four digital metering rollout options and asked to rate their preferences. The responses revealed varying levels of support for rolling out digital meters, with a notable difference between options targeting a wider base of chronic access meters and those focusing on a narrower base.

Option A[4], which suggested replacing hard-to-access meters only if they were also aged and defective, garnered the highest level of support. This option was seen as a more targeted approach that balances the need for accurate meter readings with the goal of minimising costs for customers.

Taking this feedback into account, we have decided to implement Option A as a pilot program. This approach will allow us to deliver our meter reading service to those who need it most and evaluate the benefits of digital metering before considering a more extensive rollout. A broader implementation will be possible after 2030, subject to the outcomes of the pilot and further consultation with our customers.

[4] Option A as presented to the customer forum is the equivalent of Option 2 in this Options Analysis.

2. Background

2.1 Regulatory Framework

The Jemena Gas Networks' (**JGN's**) measurement fleet includes various types of meters, volume correctors, data loggers, and modems. JGN maintains these metering assets throughout their lifecycle in accordance with:

- Australian Standards – In NSW, gas installations and appliances must comply with AS/NZS 5601:2022 and AS/NZS 1596:2014, as referenced and enforced by the Gas and Electricity (Consumer Safety) Regulation 2018.[5]
- National Measurement Act 1960 – Metering equipment must meet accuracy standards, be regularly calibrated, and maintain traceability to national or international standards to ensure reliable billing, safety, and operational efficiency.
- Retail Market Procedures – JGN is required to conduct meter readings according to schedule. In the event that scheduled readings cannot be performed, JGN must provide either estimated or validated readings, along with information regarding the rescheduling of the missed readings.

As a network operator, JGN also has a duty to deliver its reference service, which includes meter reading services around each scheduled read date, and provide the actual read. If an actual read cannot be completed, JGN provides an estimated read as a substitute.

Jemena Gas Networks' (**JGN's**) Transportation Reference Service (**reference service**). as outlined in the box below.

The Transportation Reference Service[6] is a service for:

(iii) …

(iv) *meter related services including:*

a. …

b. *meter reading and associated data activities as appropriate for the required capacity and meter reading frequency, but does not include Ancillary Reference Services.*

2.2 Meter Reading Performance

JGN has over 1.8 million meters which require meter reading on either a daily, monthly or quarterly basis, equating to approximately 8 million meter reads per annum. Meter reads are either conducted by:

- Manual reads – These readings require meter readers to walk by and manually read approximately 1.3 million meters per annum.
- Remote reads:
    - Meter Data Logger (MDL) – read around 440,000 customers' gas and hot water meters in medium-density and high-rise buildings, though a cabled solution
    - Radio Frequency (RF) – 5,000 meters installed in medium-density high-rise buildings where a cabled solution is not practical
    - Metretek – 500 Demand customers' meters

[5] See https://www.fairtrading.nsw.gov.au/trades-and-businesses/construction-and-trade-essentials/gasfitters/gas-standards-and-notes

[6] Source: Page 15 of JGN's *Reference Service Proposal for the July 2025- June 2030 Regulatory Period*, accessible on the AER website.

JGN's target for meter reading is to ensure that less than 5.79% meter reads are based upon an estimation. JGN on average over the past 4 years has achieved a meter reading performance of 6.24%.

Of this proportion of reads that are unable to be recorded, a large proportion are due to 'chronic no access'. JGN has approximately 70,000 meters that are defined in this category of 'chronic no access' and no remote reading capability provided.

2.3 Metrology Performance

To ensure the accuracy and reliability of its measurement fleet, JGN undertakes a number of programs related to its measurement assets.

As a JGN meter reaches end of life, it is included in the program to replace aging meters. JGN's meter replacement program aims to ensure the accuracy, safety, and reliability of gas meters by replacing these meters before they fail to accurately record consumption data or cause potential safety hazards.

Where one of these meters is located in a hard-to-reach areas within the customers' properties, it is included into a sub-program focussed upon 'difficult or no access meter replacements'. This program focuses on meters that have reached or exceeded their expected lifespan and are situated in challenging locations such as inside a locked residence, on rooftops, and in other hard to reach or confined spaces.

To implement this program, JGN has to employ a combination of tools, trained technicians, and customer communication strategies to overcome the unique access challenges posed by these meter locations. JGN is committed to maintaining a safe and efficient gas distribution system, even in the face of logistical and accessibility challenges.

The box below provides some examples of meters that are located in areas that are hard to reach, resulting in JGN having to provide estimated rather than actual meter reads.

Location and accessibility of meters have resulted in accessibility challenges, resulting in estimated instead of actual meter reads.

3. Options

3.1 Outline

In this business case, we explore the following options:

- Option 1 - Base case – maintain current approach (replace with standard meters)
- Option 2 – Replace hard-to-access meters that are part of the residential aged replacement program with digital meters (8,000 meters)
- Option 3 – Replace the subset of hard-to-access meters which are located inside a premise ("internal meters") with digital meters (32,000 meters)
- Option 4 – Replace all hard-to-access meters with digital meters (65,000 meters)
- Option 5 – Replace residential meters to be replaced in the RY27-RY30 period with digital meters (180,000[7] meters)

3.1.1 Quantified benefits

The tangible benefits of remote meter reading include:

- **Benefit 1: Reduced physical (manual) meter reads.** Remote reading reduces the need for physical visits to access difficult-to-access meters, streamlining the data collection process by digitally transmitting readings to a central system.
- **Benefit 2: Decrease in retailer-initiated meter reads.** Remote reading meter systems can reduce the necessity for retailer-initiated[8] meter readings, thereby diminishing the frequency of operational visits.
- **Benefit 3: Reduced operational visits.** Remote meter reading reduces unnecessary visits to customers' premises, some of which do not end up in an actual meter read.
- **Benefit 4: Reduced consecutive estimated meter reads**. Remote reading reduces the need to conduct consecutive estimated meter reads.
- **Benefit 5: Reduced billing disputes**. By ensuring bills are based on actual reads, it lowers the likelihood of disputes over estimated billing, operational visits, rebilling and back billing. This enhances efficiency and customer satisfaction.
- **Benefit 6: Avoided customer calls**. Remote meter reading systems can reduce the volume of customer inquiries regarding bill accuracy, especially those related to estimated readings, by providing actual billing information.
- **Benefit 7: Customer manageable energy saving**. Digital meter provides customer access real-time gas usage, allowing them to better understand and manage their consumption, potentially leading to cost saving.

The benefits outlined above have been quantified for each proposed option. There are also a range of qualitative benefits of remote reading systems that, while not quantified, are discussed further below in Section 3.1.2.

7 This includes all residential aged meters, residential defective meters, residential meters for testing.

8 A retail initiated read is when a retailer requests JGN to undertake a special read, requiring JGN to make an operational visit to read a customers meter outside the normal meter reading cycle.

3.1.2 Non-quantified benefits

There are a range of non-quantified benefits that arise out of remote meter reading options. These non-quantified benefits extend beyond immediate operational efficiencies and cost savings, contributing to broader strategic objectives and customer satisfaction.

- Enhance network and public safety by potentially reducing incidents associated with traditional meter reading practices.
- Enhance network safety by the capability of leak detection. Digital meter can be configured to detect gas leaks and alerts the user or network operator, enhancing safety and allowing for prompt action to prevent accidents.
- Information and data gained from digital meters will offer valuable insights on customer usage patterns, enabling more informed decision-making for the future.
- In an energy market facing increasing competition and uncertainty, digital meters may help to retain the gas customer base by demonstrating a commitment to innovation and customer service.
- Digital meters support hydrogen blends of up to 20%, aligning with the growing demand for sustainable energy solutions, positioning the company as a leader in the transition towards low carbon energy sources.

3.1.3 Technological solutions

In addition to the digital metering technology, JGN considered other technological platforms to replace internal meters that are aged or defective:

- **Upgrade existing meters with local read radio frequency (RF) capability.** This involves retrofitting pulse data loggers with low-powered radio modules to gas meters. While this option builds upon the standard meter replacement program and can be deployed rapidly, it has several drawbacks. RF technology is not well-suited for stand-alone houses, and this option is financially the most costly, still requiring manual meter reading via PDA devices on a quarterly basis. It may lead to minimal improvements in the accuracy and frequency of estimated meter readings, perpetuating the current challenges in the meter reading process, and it is a high-cost solution for JGN to deliver its meter reading service.
- **Retrofit new mechanical meters with IoT-based dataloggers.** This approach involves retrofitting new mechanical gas and hot water meters with external IoT dataloggers, enabling remote meter reading and access to real-time data. It requires the deployment of a strategic IoT platform integrated with existing metering systems. One significant advantage is that it comprehensively solves the issue of inaccessible meters using remote reading capabilities. However, there are concerns regarding the reliability of this system, as with current similar systems, the alignment between the mechanical meter and datalogger frequently need adjustment. This issue could lead to increased maintenance costs, as field staff would need to be dispatched to the location of these dataloggers to re-align them.
- **Replace aged meters with integrated IoT-based digital meters and deploy a strategic IoT platform (option that was tested with customers)**. This option is designed to replace aging mechanical meters with IoT-based digital meters and requires the establishment of a comprehensive IoT platform and an integrated solution. The key feature of this technology is the centralised management of each digital meter via an IoT platform, intended to collate metering data, manage devices remotely, and synchronise with JGN's current meter data management systems.

The risk rating, and cost magnitude, for each technological option depends on weighing the advantages and disadvantages of each technology for implementing digital metering. This is summarised in Table 1.

Table 1: Comparison of Remote Reading Technology

Technology	Advantages	Disadvantages	Risk rating – Reliability	Magnitude of cost
Radio frequency Retrofit existing meters with local read radio frequency	An established solution that can be deployed rapidly, avoiding the need for additional staff training.	RF technology is not well-suited for stand-alone houses, and is more applicable to medium and high-density housing. This is the most costly of the options and still requires meter readers to manually access a site to collect meter readings.	**Low reliability**	**Significant**
Dataloggers Retrofit new mechanical meters with IoT dataloggers	Involves a medium level of capital expenditure and allows for the continued use of mechanical meters.	Reliability is uncertain, as the alignment between the mechanical meter and datalogger may frequently need adjustment. This could lead to increased maintenance costs.	**Low reliability**	**Moderate to Significant**
Digital meters Replace mechanical meters with digital meters connected to an IoT platform	Reliable and able to resolve chronic no access issue effectively	While it's a reliable solution with low maintenance demands, the key disadvantage is the high capital expenditure required.	**High reliability**	**Significant**

As illustrated in Table 1, RF technology has the highest risk rating among the three options due to its low reliability and comes at the highest cost compared to the alternatives. Although retrofitting meters with IoT dataloggers also has low reliability, it comes at a lower cost than RF technology. On the other hand, digital metering offers high reliability but comes at a higher cost.

After carefully considering both cost and reliability factors, digital meters emerge as the most suitable technology option for implementing the remote meter reading solution. It is important to emphasise that the primary driver for selecting this option is its superior reliability, rather than cost minimisation. While cost is undoubtedly an important consideration, ensuring the system's dependability and effectiveness takes precedence in this decision-making process.

3.2 Option 1 - Base case – Maintain current approach

As part of its ongoing maintenance and asset management operations, JGN has obligations to replace aged meters. In the base case scenario, these aged meters would be replaced with standard meters, preserving the existing mechanical meters and meter reading processes. However, this approach fails to address the persistent no-access issue, and JGN will not be able to deliver accurate meter readings for these customers.

3.3 Option 2 – Replace hard-to-access meters in the residential aged meter program

Option 2 proposes the deployment of 8,000 digital meters. In RY26 the digital meter data platform and its integration to Jemena's meter billing system SAP will be established, with the meters being installed, at an average of 2,000 per annum, in the following years (RY27-RY30). The targeted meters are those meters in the residential aged metering program that are hard to access internally located meters, e.g. within customers' homes, e.g. below the sink, on the roof, or behind locked gates.

3.4 Option 3 – Replace all hard-to-access internal meters

Option 3 proposes the deployment of 32,000 digital meters. In RY26 the digital meter data platform and its integration to Jemena's meter billing system SAP will be established, with the meters being installed, at an average of 8,000 per annum, in the following years (RY27-RY30). The targeted meters are all internally located hard-to-access meters, e.g. within customers' homes - below the sink, on the roof, or behind locked gates.

3.5 Option 4 – Replace all hard-to-access meters

Option 4 proposes the deployment of 65,000 digital meters. In RY26 the digital meter data platform and its integration to Jemena's meter billing system SAP will be established, with the meters being installed, at an average of 16,250 per annum, in the following years (RY27-RY30). The targeted meters are all internally located and externally located (e.g. due to aggressive pets, overgrown vegetation, storage items obstructing the meter) hard-to-access meters, e.g. within customers' homes - below the sink, on the roof, or behind locked gates.

3.6 Option 5 – Replace all aged meters with digital meters

Option 5 proposes the deployment of 180,000 digital meters. In RY26 the digital meter data platform and its integration to Jemena's meter billing system SAP will be established with the meters being replace in RY26 in accordance to the current approach. During RY27-RY30 all residential meters required to be replaced as part of the aged program, testing program or defective program will be replaced using digital meters.

3.7 Costs of each option

The main categories of costs for the roll out of digital meters are:

- Incremental Costs for Digital Meters: The cost of a digital meter is $245, compared to $70 for a standard meter. This results in an incremental cost of $175 for each digital meter.
- Installation Costs: Installation of standard (mechanical) meters carries an estimated cost of $556 per meter. To estimate an incremental cost of installing a new digital meter in a chronic no-access premise, the business case assumes an uplift of 10% on top of the $556 installation cost due to the challenges of replacing meters in hard-to-reach areas. Therefore, the adjusted installation cost for new digital meters is $611 per meter. The incremental cost of installing a meter is hence $55 per meter.
- Other network capex cost: The cost of each SIM card per digital meter is $5.
- Digital Platform Costs: To centralise the meter reading data and ensure seamless integration with existing meter reading systems, a one-time investment in an IoT platform is required, amounting to $5.1 million.
- IoT costs:
    - The data plan necessary for each meter costs $6 per meter.
    - Subscription to the IoT platform is priced at $16 per meter, with an overarching IoT platform subscription fee of $30,000 annually.
- Network and Digital Infrastructure Uplift: To support and manage these systems effectively, a cost for network and digital infrastructure FTE uplift is estimated at $260,000 annually.

Table 2 summarises the costs of each option. All options are costed up based on the assumption to roll out within a single regulatory period.

Table 2: Incremental Costs of Options

		Number of meters	Incremental CAPEX Costs $M	Incremental OPEX Costs $M p.a.
Option 1	Do Nothing (replace 8,000 with standard meters)	8,000	n/a	n/a
Option 2	Replace 8,000 hard to access and aged meters with digital meters	8,000	7.0	0.4
Option 3	Replace 32,000 hard to access and internally located meters with digital meters	32,000	27.7	0.9
Option 4	Replace all 65,000 hard to access meters with digital meters (include both internal and external)	65,000	56.1	1.6
Option 5	Replace all 180,000 aged meters with digital meters	180,000	47.5	2.2

(1) Note for Option 3 the incremental costs are higher as 24,000 of the meters were not due for replacement and therefore these 24,000 meters have been allocated the full cost.

(2) Note for Option 4 the incremental costs are higher as 57,000 of the meters were not due for replacement and therefore these 57,000 meters have been allocated the full cost.

(3) Note the incremental OPEX cost uses as the current cost $11/meter pa

4. Options Comparison

4.1 Customer Engagement

At the Customer Forum in July 2023, participants were presented with several options regarding the rollout of digital metering. Initially, opinions were divided among customers. The extent of the rollout was the main point of contention, with some customers in favour of replacing all meters and others advocating for a more selective approach, focusing on meters that were either aged, defective, or hard to access.

During the initial discussions, a minority of attendees expressed a preference to maintain the status quo, either due to scepticism about the benefits of the project or the preference that digital metering should not be a priority for JGN. However, when it came to voting using the L-scale, a majority of 84% showed support for Option 2 as outlined in Figure 1 and Table 3. This option was for replacing only 8,000 aged[9] meters that were difficult to access.

Figure 1: Customer support for various digital metering rollout options

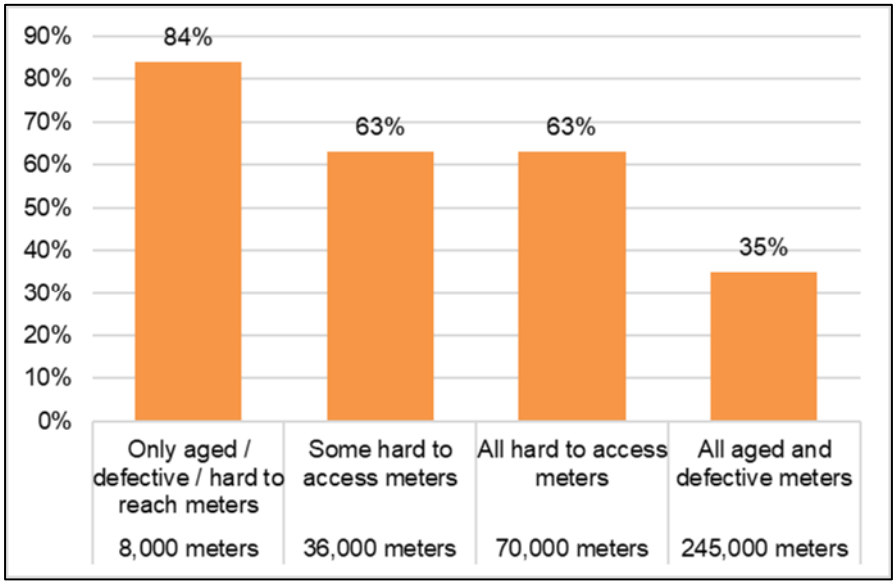


Table 3: Customer voting outcomes for various digital metering options

Number of meters	Description	loathe	lament	live with	like	love	Total (live with, like, love)
8,000 meters	Only aged / defective / hard to reach meters	11%	5%	22%	38%	24%	**84%**
36,000 meters	Some hard to access meters	21%	16%	34%	18%	11%	**63%**
70,000 meters	All hard to access meters	21%	16%	18%	29%	16%	**63%**

[9] The options presented at the time included some hard to access meters that were identified as defective. This is anticipated to be an insignificant number (<10) and thus is immaterial to the outcome.

Number of meters	Description	loathe	lament	live with	like	love	Total (live with, like, love)
245,000 meters	All aged and defective meters	39%	26%	11%	11%	13%	**35%**

(4) At the time of the forum, the numbers of meters for replacement were estimates only, since the forum the numbers have been reset as per this business case. The change in numbers is not considered material to the customer responses.

Following the clear preference for Option 2 (8,000 meters) in the voting, the decision was made to move forward with this option as a pilot project. This measured approach allows the company to evaluate the benefits of the upgrade against the costs, with the potential to expand the program based on the pilot's success and customer feedback.

4.2 Benefit analysis of options

Table 4 summarises the costs versus the benefits for each of the options. Note for option 1 there is no change to current costs and does not provide any of the benefits as identified.

Table 4: Benefit analysis, from RY26 to RY35

	No. of meters	Cost	Customer Support	Reduced physical (manual) meter reads	Decrease in retailer-initiated meter reads	Reduced operational visits	Reduced consecutive estimated meter reads	Reduced billing disputes	Avoided customer calls	Customer manageable energy saving
Option 1	8,000									
Option 2	8,000									
Option 3	32,000									
Option 4	65,000						X	X	X	
Option 5	180,000						X	X	X	

(1) Note the benefits marked ‘X” for Option 4 and Option 5 are only really applicable to those customers with difficult access.

5. Recommendation

Option 2 is the preferred option because it offers a balanced and financially prudent approach to:

1. Deliver JGN's reference service more effectively to the subset of customers that have aged meters in hard-to-access locations; and
2. Evaluate the operational efficiencies anticipated from digital metering — notably, the reductions in manual readings, unnecessary service dispatches, billing disputes, and enhanced transparency in meter readings.
3. Implement the approach to digital metering that received the most customer support.

Option 2 will also allow for the assessment and validation of the benefits of digital metering without the commitment to extensive capital outlay. Option 2 is essentially a pilot that is strategically focused on replacing 8,000 aged meters, which enables JGN to gather critical data on operational efficiencies and inform long-term investment decisions with a substantially lower risk profile.

Option 2 will:

- Collect and analyse daily remote meter readings throughout the pilot.
- Examine the practicality and integration of metering and communication technologies.
- Provide preliminary outcomes from the pilot.

5.1 Risk analysis

The Project Risk register considers risk associated with project and delivery of Option 2 as per the table below:

Project Risk Register	Rating	Mitigation
There is a risk the digital meter battery life will expire prior to the end of useful life resulting in meter family failure and unrealised program benefits	Medium	Meter battery lifecycle replacement included after 10 Years of service
If there's no available digital hot meter, then we cannot address issue of hot-water meters at chronic no-access site	High	Project includes early supply chain and compliance testing of digital hot water meters.
No access environment prohibits successful installation of Digital Gas and Hot Water meters	Medium	No Access team and customer booking portal allowed for in project delivery
There is a risk that a program decision will preclude a subsequent technology that is more effective resulting in vendor lock in with uncontrollable vendor costs or opportunity cost limitations of an obsolete but committed technology	Medium	Strategic platform sourcing in project year one
There is a risk that unauthorised parties are able to access or alter granular customer consumption data (personal information) at the meter, in transit, in the Backoffice or through customer facing portals resulting in a breach of compliance, fines and reputation damage	Medium	Meter data is regarded as PI, project cyber security controls. Security requirements in non-functional requirements.
There is a risk that the increased complexity and demands of the end to end digital solution will lead to an unforeseen step changes in (e.g. Digital FTE) operating costs resulting in erosion of projected benefits	Low	JGN capacity and Jemena skills support complex technical and operational solutions
There is a risk that customers hold a negative view of the overall program leading to misinformation campaigns, perceived unacceptable price increases, resulting in customer angst, high levels of opting out and damage to our corporate reputation.	Low	Jemena AMI experience of customer engagement and customer first
There is a risk of immature digital meter technology failure as digital meters are relatively new technology compared to legacy meters resulting in early family failure of digital meters	Low	Testing programs and Gas Digital Meter Pilot in flight, lessons learnt and Go-No-Go decision / change procedures
There is a risk that in an uncertain future, hydrogen blends greater than 23% will result in non-compliant metering meter fleet for existing and new digital meters and shortening of the Digital Meter lifecycle	Medium	Engage with the meters supply market for supply of >50% Green hydrogen compatible digital meters (upgrade path for digital meters)
Remote disconnect and reconnect may not be permitted by market procedures or FIRB controls resulting in unrealised project benefits	High	Project has excluded remote disconnection in analysis.