Zincara

From strategy to action

AER Access Arrangement 2020
JGN Capital Expenditure Review
Stage 2 Report

Prepared for

AUSTRALIAN ENERGY REGULATOR

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Abbreviations

AA	Access Arrangement
AER	Australian Energy Regulator
AMP	Asset Management Plan
ALARP	As Low As Reasonably Practicable
AMS	Asset Management System
AEMC	Australian Energy Market Commission
Capex	Capital Expenditure
CPF	Contingent Payment Factor
Core	Core Energy & Resources
CP	Corrosion Protection
DRS	District Regulating Station
EGP	Eastern Gas Pipeline
FEED	Front End Engineering Design
I&C	Industrial and Commercial
ISO	International Organisation for Standardisation
JGN	Jemena Gas Network (NSW)
km	Kilometres
kpa	Kilopascal
kpi	Key Performance indicators
MSP	Moomba to Sydney
NGL	National Gas Law
NGR	National Gas Rules
PEM	Project Estimating Model
PJ	Petajoules
PIG	Pipeline Inspection Gauge
PMM	Project Management Methodology
SPM	Sydney Primary Main
SRS	Secondary Regulator Station
TRS	Trunk Receiving Station

1. EXECUTIVE SUMMARY

1.1 INTRODUCTION

In November 2019, the Australian Energy Regulator (AER) published its draft decision on JGN's revision to its Access Arrangement for the period 2021-2025. In January, 2020, JGN provided a response to the draft decision. The AER has engaged Zincara P/L (Zincara) to advise on the on the following matters:

- Connections
- Meter replacement
- Facilities and pipes
- Augmentation
- Mains replacement
- Relocation included in the "Others"

Zincara also provided comments on JGN's response to the CESS proposal.

Details of JGN's plan v AER's draft decision is provided in the table below.

Table 1-1: Summary of JGN's 2020 Plan with AER's draft decision ($2020, million)

	JGN's 2020 Plan	AER's Draft Decision	JGN's Revised 2020 Plan
Connections	387.5	363.9	392.2
Meter replacement	118.0	105.7	117.6
Facilities and pipes	72.2	63.2	71.5
IT	107.2	73.3	101.2
Augmentation	60.8	47.6	62.0
Mains replacement	44.8	36.2	44.6
Others[1]	34.3	301	31.2
Overheads	88.1	84.0	85.9
Gross totals	912.8	804.0	906.2
Contributions	13.4	12.9	13.1
Net total	899.5	791.1	893.1

(Source: JGN-RP-Attachment 4.2-Response to the draft decision-capex-20200109)

A summary of Zincara's findings is provided in the sections below.

[1] Others include property, fleet, SCADA and Relocations

1.2 CONNECTION CAPEX

Zincara had used the same methodology for reviewing the connection forecast to that used in its initial submission. We have examined the data to ensure that the averages are based on normal fluctuations and not include outliers. Where there are outliers, we have sought further information before making a decision to either include the data or discount the data.

Connection Forecast

The revised forecast connection numbers for new homes has increased by 3,529 to 94,316. There is no change to the I&C tariff or the Electricity to Gas connection numbers. We have accepted the forecast and is the basis for calculating the new homes capex.

New homes

The new homes capex is driven by the unit connection cost and the mains length per connection. The key difference between JGN's revised submission and Zincara's conclusion is the mains length per customer. JGN had experienced a building boom in the current AA period and JGN's four year average for mains length per customer of [redacted] m/connections reflect the building boom. JGN's forecast connection numbers for the 2021-25 AA period do not reflect the unprecedented environment and as such, using JGN's estimate would overstate the connection capex. We consider using the data for RY18 and RY19 would be more reflective of the forecast period environment and as such recommends using [redacted] m/customer.

Using the revised mains length per customer and the increased volume connection numbers, the new homes connection forecast is $211.3 million which is an increase of $11.1million from the AER's draft decision. This is also a reduction of $5.8 million from JGN's revised submission.

Commercial and Industrial tariff

This market segment has very wide range of customers and connections range from simple to quite complex. The location of a number of these connections also impacts costs. JGN's responses to questions clarified why there were wide fluctuations/anomalies in some of the rates. As a result of these clarifications along with the inclusion of RY19 actual data, Zincara has recommended JGN's revised unit rates. There is no change to the volume of connections.

Electricity to Gas

JGN's clarification of apparent anomalies in the yearly mains rates, in particular, relating to timing of council restoration invoices and backpay to contractors for significant materials price increases, along with the inclusion of RY19 actual data, has resulted in increased rates. As a result, Zincara has recommended JGN's revised unit rates. There is no change to the volume of connections.

Medium Density/High Rise

JGN will continue to provide its individual hot water metering product. The inclusion of RY19 actual data results in revised unit rates. Forecast volumes in the revised submission are reduced compared to the initial submission. Zincara recommends JGN's revised capex forecast.

I&C Demand Tariff

The inclusion of RY19 actual data results, we have accepted JGN's revised capex forecast.

1.2.1 Capex Summary

A summary of the connection capex is provided in the table below.

Table 1-20: 2020-25 Connections forecast ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Connections	367,053	353,989	372,623	366,823	+12,834

(Source: Connection capex forecast - model)

1.3 METER REPLACEMENT

As in section 1.2 on the connection capex, Zincara has used a similar methodology to that used for its initial report to review the meter replacement capex.

Residential gas meter replacement

JGN's revised planned residential gas meter replacement forecast increased by 12,555 meters to 294,272. The main reasons for the increased program are availability of the RY2019 test results which changed the meters to be removed. The other being the replacement of meters after 3-year field life extension.

As a result of the updated test outcomes and JGN's further information, Zincara's analysis recommends a replacement forecast of 257,410 meters which we consider provides the best estimate in the circumstances. In particular, the forecast includes a specific provision for failed 15 and 20 year meters and an estimate of 25 year meters pass/fail outcomes.

The capital expenditure of $47.2 million is an increase of $2.5 million from the AER's draft decision but $4.9 million less than JGN's revised expenditure.

Residential hot water meters

Zincara's recommended revised hot water meter replacement capex forecast totals $21.629 million which is an increase of $2.307 million compared with the AER draft decision. While the volume of meter replacements remains unchanged, the increase is largely as a result of the inclusion of RY2019 actual data increasing the unit rate for the hot water meter replacement program. There is also a decrease in the defective meter replacement forecast.

Meter data loggers

With the inclusion of actual RY2019 data, JGN's revised meter data logger program results in marginal decrease compared with its initial submission. Zincara has reviewed the data and recommends acceptance of JGN's revised capex forecast of $6.439 million, which is an increase capex of $0.226 million compared with the AER draft decision.

Industrial and commercial meters

With the inclusion of 2019 actual data, including I&C diaphragm meter statistical sampling test outcomes, the Zincara's recommended revised capex forecast is $27.127 million, an increase of $0.734 million compared with the AER draft decision. The recommended expenditure is $0.616 million less than JGN's revised expenditure due to difference between JGN's and Zincara's estimate of the unit cost for the "meter kit changeout".

Metretek

The revised capex forecast is $1.097 million, a reduction of $0.517 million compared with the AER draft decision. The reduction is the result of rectifying historical incorrectly capitalised opex costs.

Testing

As JGN's revised cost is only due to the updated field failure unit cost, we recommend acceptance of the revised capex. The revised Testing capex forecast is $1.629 million, an increase of $0.195 million compared with the AER draft decision.

Other meters

There is no change in the capex for this category with capex forecast of $0.14m.

1.3.1 Capex summary

A summary of the meter replacement capex is provided in the table below.

Table 1-10: JGN Revised Meter Replacement Capex ($2018, $000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommend	Recommend – AER DD
Meter Replacement	110,760	99,834	110,799	105,280	+5,446

(Source: Meter replacement capex forecast - model)

1.4 FACILITIES AND PIPES

Facilities and Pipes consist of multiple projects to maintain the integrity and safety of the projects. Zincara believes that there is sufficient information in JGN's response to recommend acceptance of the remaining projects not accepted in Zincara's first report. Zincara therefore recommends the remaining projects as prudent and efficient.

One project that is worth highlighting is the "Isolation of the secondary valves" which involves installing additional valves in the JGN's secondary mains in Sydney CBD.

Following the Martin Place incident, JGN did a review of the effectiveness of the valves to isolate sections of the secondary mains to minimise the loss of gas supply to customers should a similar event occur. We recommended the project due to the construction activity in the CBD and JGN's requirement to comply with its statutory and Australian standard obligations.

Note: The AER advised that it had moved the capex for the Lane Cove to Willoughby project from the Augmentation section to the Facilities and Pipes section. This project was reviewed and recommended in Zincara's first report as part of Augmentation. As the reallocation of the capex does not alter our recommendation of the project, we have retained the capex in the Augmentation section and have not made further comment about the project in this report.

1.4.1 Capex Summary

A comparison of the recommended costs versus the AER's draft decision is provided below.

Table 1-2: Comparison of Recommended Capex versus AER's draft decision ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommend	Recommend – AER DD
Facilities and Pipes Upgrade	68,101	59,848	67,646	67,646	+7,798

1.5 AUGMENTATION

The two main projects in Augmentation are the Aerotropolis and the Malabar Biomethane Sewage Treatment Project.

Aerotropolis

In its first report, Zincara concluded that it considered that the likelihood of Aerotropolis proceeding is high. However, with the lack of detailed scope and project estimates, Zincara recommended an initial funding of $2.0million to initiate the project.

In its revised submission, JGN had detailed where it had obtained its forecast and has provided NPV calculations to show that with the various levels of penetration, the project was still viable. JGN had also added the gas connection to the Water Factory[2] in its revised 2020 capex. It had based its construction timetable in time for the Water Factory to service the new Airport in 2024.

JGN had designed the gas supply using industry based software and had also signed a Memorandum of Understanding (MOU) with other relevant entities[3] to ensure that any synergies can be shared.

Given the above, Zincara is recommending the project to be prudent and efficient.

Malabar Biomethane Sewage Project

JGN advised that there is no renewable gas injected into the gas networks in Australia. JGN proposed connecting to the Sydney Water Malabar Sewage Treatment plant to supply its gas

[2] JGN-RP-Aerotropolis-Sydney Water-Letter of Support-20191219
[3] JGN-RP-Aerotropolis-MOU signed-20191211-confidential

network with renewable gas. It also said that it had consulted a number of customers including:

- Interface Carpets
- City of Sydney
- Dexus

These customers are in support of JGN's proposal.

Zincara considers the cost to be reasonable but is unable to recommend the prudency of the project for the following reasons:

1. The pipeline is to be constructed in 2021/22. There is no indication that Sydney Water will be ready to convert Biogas to Renewal Gas by then or that there will be commercial arrangements between the parties to take Renewal Gas at that time.
2. There is no assurance that this conversion of Biogas to Renewal Gas will meet the AS4645-11 Specification for General Purpose Gas so that it can be injected into the network.
3. The Renewal gas industry is still in its infancy and is still to develop a clear roadmap for its utilisation. This could change the viability and timing of the project.
4. Whilst the three companies have provided letters of support for being able to access biogas and as such, Renewal gas, there are no firm commitment that they will use the gas at any cost.
5. Other gas users could take up the spare capacity of Renewal gas, but this could change the results of the NPV.

1.5.1 Capex Summary

A comparison of the recommended costs versus the AER's draft decision is provided below.

Table 1-3: Comparison of Recommended Capex versus AER's draft decision ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommend	Recommend – AER DD
Augmentation Capex	57,531	45,169	58,874	56,153	+10,984

1.6 MAINS REPLACEMENT

The AER draft decision accepted all of the JGN's proposed mains replacement projects except for Newcastle which the AER deferred by one year. JGN's response[4] said "Delaying the project one year will cost customers over $1M as the financing cost savings from deferral are more than outweighed by the additional future opex costs.

[4] Attachment 4.2: Response to the AER draft decision: page 63

JGN's 2020 Plan shows that historically they have not spent their AER approved allowance for mains replacement:

Table 1-4: Mains Replacement Capex ($2020, Millions)

	2010-15		2015-20		2020-25
	Allowance	Actual/Est.	Allowance	Actual/Est.	Plan
Mains Replacement	24	21	75	34	55

(Source: JGN 2020 Plan: table 5.1)

The actual capex for the current period of 2015-20 translates to 85kms whilst the forecast capex is for 146kms including Newcastle. JGN's past performance does not give confidence that it is able to achieve such a program.

The leakage results of the Newcastle network since 2003 only shows a gradual increase and from 2009 to 2019 has been in the range of 60-80 leaks per year. It is noted that in 2017 there was a peak leakage rate possibly due to the weather affecting ground conditions.

Given the above, we believe that a reduced mains replacement of 65 kilometres during the forecast period, as proposed in the AER draft decision, would achieve noticeable improvements in the number of leaks required to be managed and an improved level of amenity for customers. It would mean that the Newcastle program would be completed early in the AA period 2026-2030.

In its initial report, Zincara recommended a capex of $13.353 million for the Newcastle rehabilitation project, resulting in a reduced rehabilitation of approximately 65 kilometres compared with the 104 kilometres proposed in JGN 2020 Plan. This means that JGN still has a replacement program of approximately 105kms out of a proposed 146kms. Zincara believes that is a more achievable target given JGN's historical performance.

Zincara therefore recommends no change to its initial recommendation for Newcastle.

1.6.1 Cost Summary

A comparison of the recommended costs versus the AER's draft decision is provided below.

Table 1-5: Comparison of Recommended Capex versus AER's draft decision ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommend	Recommend – AER DD
Mains Replacement Capex	42,340	34,386	42,340	34,386	-

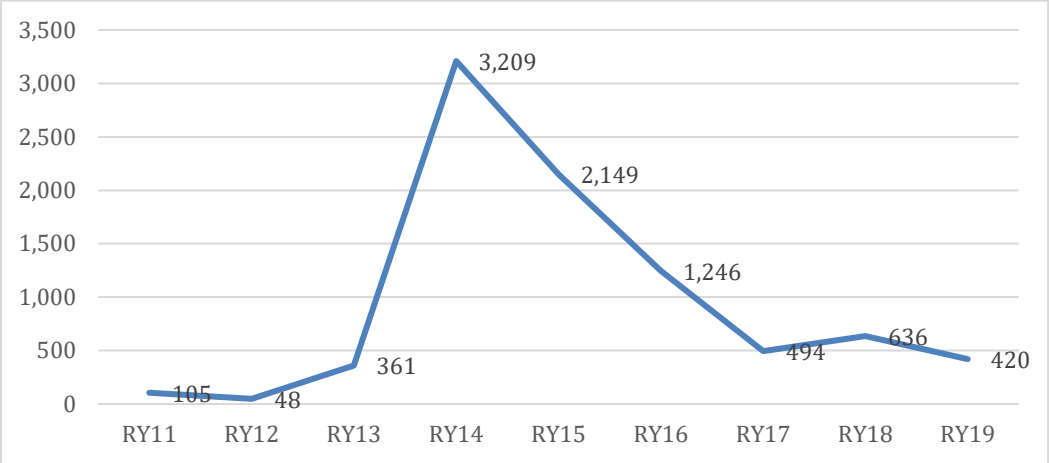
1.7 RELOCATIONS

JGN advised that from time to time, government authorities or private landowners require JGN to move its gas mains or facilities to enable the authority to perform works such as re-alignment or widening of road or for land owners to carry out their activities. JGN said that

its costs fluctuate year-to-year and believes that there is no declining trend in the costs given the ongoing major infrastructure projects in NSW.

Zincara does not dispute the need for some provision to enable these relocations. However, JGN's provision of $700k takes into account the annual cost of $1.2million in RY2016 as can be seen from the figure below.

Figure 1-1: Historical Relocation Capex (nominal $000)



Source: AER Summary from RIN data

Relocation projects are very specific to areas where JGN had installed gas pipes without any location rights. The high peak in the period RY14 to RY16 could be due to the high level of infrastructure activities in NSW in those specific areas. The capex in RY17 to RY19 supports our argument as the high level of infrastructure activities has not abetted but the annual cost are fairly constant. We therefore believe that a reasonable estimate should be the average cost of RY17 to RY19 which works out to be $517 ($2018, 000).

1.8 CAPITAL EXPENDITURE SHARING SCHEME

The AER has also requested that a number of modifications to be carried out on JGN's CESS proposal. The items include:

- Revise the proposed targets in Schedule 9 to remove outliers
- Review the proposed targets used internally
- Further justify using an 80-100% range for the contingent payment mechanism rather than 90-100%.

Proposed Targets

On the matter of proposed targets, JGN had provided information on the actual targets and its internal targets. JGN had also agreed to removing the outlier for SAIDI when setting the proposed targets for the next AA period. It proposed that that a definition for an outlier for SAIDI should be included so that JGN is not penalised in the future when the actual results are assessed.

We recommend using the actual results to set the performance targets as it is at a level consistent with normal operating conditions.

On the matter of including a definition of an outlier, we are of the view that since the CESS initiative is only commencing in the next AA period and there may be future circumstances that are unforeseen currently, it would be more prudent to not enshrine the definition of outliers in Schedule 9. The matter could be reviewed once the actual performance is known in five years time.

Contingent Payment Mechanism

JGN proposed that the contingent payment system should be 80%-100%. It said that the range is consistent with the Victorian arrangement approved by the AER. It also provided a calculation that showed that weighted average coefficient of variation is 23% which supports its 20% proposition.

In its first submission, JGN said that the contingent payment index should be fit-for purpose for NSW and not take into account the Victorian CESS which takes into account the Victorian GDB's operating environment. We support this argument and as such consider that it is not relevant JGN's current position that the limits should be consistent with the Victorian CESS.

In relation to the payment ceasing at 80%, we consider that it is too generous. At 80% of the performance target, the majority of the actual performance would be less than the performance target.

With capex programs such as the mains replacement program to reduce leaks, relocation of shallow mains to mitigate against third party damage and remote devices on meters to reduce estimated meter reads, we would expect that the performance levels to improve and not decrease. Our rationale of 90%-100% was based on our belief that JGN should not necessarily be penalised for a slight shift in the actual performance.

2. INTRODUCTION

2.1 BACKGROUND

In November 2019, the Australian Energy Regulator (AER) published its draft decision on JGN's revision to its Access Arrangement for the period 2021-2025. In January, 2020, JGN provided a response to the draft decision. The AER has engaged Zincara P/L (Zincara) to advise on the capex revisions in JGN's response to the draft decision.

In particular, Zincara provided advice on the following categories:

- Connections
- Meter replacement
- Facilities and pipes
- Augmentation
- Mains replacement
- Relocation included in the "Others"

Zincara also provided comments on JGN's response to the CESS proposal.

Details of the capex in JGN's response are provided in the table below.

Table 2-1: Summary of JGN's 2020 Plan with AER's Draft Decision ($2020, $M)

	JGN's 2020 Plan	AER's Draft Decision	JGN's Revised 2020 Plan
Connections	387.5	363.9	392.2
Meter replacement	118.0	105.7	117.6
Facilities and pipes	72.2	63.2	71.5
IT	107.2	73.3	101.2
Augmentation	60.8	47.6	62.0
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Overheads	88.1	84.0	85.9
Gross totals	912.8	804.0	906.2
Contributions	13.4	12.9	13.1
Net total	899.5	791.1	893.1

(Source: JGN-RP-Attachment 4.2-Response to the draft decision-capex-20200109)

For information on Zincara's recommendation to the AER prior to the draft decision refer to Zincara's report titled: "JGN Capital Expenditure 17 November 2019".

2.2 APPROACH

In carrying out the review, Zincara has adopted a similar approach that it had used in assessing JGN's initial information provided in July 2019:

[5] Others include property, fleet, SCADA and Relocations

- Analyse the information provided in JGN's submission;
- Confirm the conclusions reached by the AER in its draft decision;
- As appropriate, sought clarifications on JGN's response; and
- Conclude on the prudence and efficiency of the revised capex submission.

2.3 COST REPORTING

Similar to our first report, all costs shown in this report are in real 2018 dollars unless otherwise stated. Any reference to direct cost means that the cost includes labour, material and contractors but does not include overheads.

This report is presented in regulatory years (e.g. July 2020-June 2021). The sections of the report which is presented in calendar years will have a notation CY.

It should also be noted that some totals in the tables may differ slightly with the addition of the numbers on the tables. This is due to rounding errors.

3. CONNECTIONS

3.1 INTRODUCTION

In response to the AER draft decision, JGN has proposed a revision of its Connection capex forecast, including:

- Connections forecast for new homes during the RY21-RY25 period has been updated resulting in an increase of 3,529 to 94,316 connections. There has not been any change to the forecast connections relating to industrial and commercial tariff or electricity to gas market segments;
- 2018-19 actual data has been incorporated into their revised 4-year average calculations, using RY16 – RY19, rather than RY15 – RY18;
- Price adjustment factor has been revised (downwards) to reflect inclusion of RY19, with fewer years that don't include contractor price reductions;
- Individual hot water metering product is continued, along with revised volume and unit rates forecast.

The revised capex forecast is compared with JGN's initial forecast and the AER draft decision in the following summary table. Note that all capex in this report is $2018:

Table 3-1: RY21-25 Connections forecast ($2018, 000)

	JGN Initial	AER - DD	JGN Revised
New homes	211,071	200,141	217,125
I&C (tariff)	28,535	25,868	28,308
Electricity to gas	78,673	73,675	80,016
Medium Density	35,007	*40,539	35,575
I&C Demand	13,766	13,766	11,599
Connections	**367,053**	**353,989**	**372,623**

(Source: Connection capex forecast - model)

Note:
* In the AER draft decision, for medium density / high rise (MDHR), the AER included an additional allowance of $5,532k due to rejecting JGN's VBM strategy. Excluding the allowance, then the AER draft decision for MDHR was $35,007k.

In JGN's revised capex forecast, the additional new homes connections results in increased capex of $8.124 million ($2018).

Additional information provided by JGN for consideration in this review includes:

- IR023 response: questions relating to connections (such as new homes mains length and some "outliers") were submitted by the AER on 30 August and responded by JGN on 26 September. The AER information request noted "JGN should assume responses received after 16 September 2019 will not be reviewed for the draft decision, but will be considered in deliberations for final decision";
- Revised 2020 Plan;
- Attachment 4.2: Response to the AER's draft decision – Capital expenditure;

- Connections capex forecast model-20200109; and
- Responses to further questions from the AER, during this review period.

3.2 FORECASTING METHODOLOGY

JGN did not agree with the AER draft decision, noting in particular:

- The draft decision departed from methodology worked through as part of the 2015-20 remittal process;
- JGN has applied same methodology but using 4-years, applied across all components;
- The draft decision relies on inconsistent forecasting assumptions;
- The draft decision resulted in a low forecast capex which does not reflect "best forecast in the circumstances" because it will significantly understate actual capex during the RY21-25 period;
- Unit rates fluctuate year-to-year due to timing differences such as often they incur part of a connection in the years preceding or after the works are undertaken, with timing delays arising from restoration costs, non-standard claims, bulk recognition of material costs and back-pay;
- Outliers were years where JGN undertook more costly or complex work or when costs were higher due to timing differences. As the work undertaken during these years was not atypical, excluding them results in an underestimate of capex requirements.

In preparing its connections forecast JGN said[6] that it:

- Applied top-down forecast, using revealed costs, consistent with the AER's preferred approach;
- Relied on audited data provided as part of the AA RIN;
- Adopted easy to use methods; and
- Adjusted the unit rates for material changes, including the changes to supplier prices (resulting in overall cost reductions).

Zincara considers that the AER draft decision was consistent with the above approach. Zincara also believes that it is prudent and reasonable to review and scrutinise the data provided, rather than simply verifying averages. Where there were normal fluctuations across the historical years, we used multi-year average to determine forecast rates/expenditures. However, where data showed an outlier in an individual year, we sought further information, noting that JGN did not provide such explanations in its initial submissions. Based on the data available, Zincara considered this approach best reflected the forecast period.

With respect to "outliers", Zincara found that in a few cases the data showed a significant variance compared with normal fluctuations, typically greater than 50%. These anomalies were not representative of other yearly results and without supporting explanation we could not be satisfied that they were likely to occur during the RY21 – RY25 forecast period. We therefore sought clarification via information requests. As an example, IR003: Q2 sought clarification with respect to MD/HR unit rates. Zincara reviewed and accepted JGN's response. Further questions raised in IR023 were not received from JGN until after the final cut-off of 16

[6] Attachment 4.2: Response to AER draft decision: page 2.

September. The AER said that late responses would therefore be considered as part of the final decision process.

3.3 NEW HOMES

3.3.1 Average unit rates

The AER draft decision accepted JGN's 4-year average for mains and services, as they were very similar to the 5-year average. RY19 actual unit rate data show higher unit rates for mains and services albeit within a normal range. With respect to meters we applied the 5-year average in the draft decision. The RY19 meter unit rate is relatively low and brings the JGN average close to the draft decision. Based on the revised analysis, we recommend the 4-year averages on the basis of normal annual fluctuations.

The following table shows the various unit rate averages:

Table 3-2: New Homes – unit rates ($2018)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended
Mains (per metre)	[redacted]	[redacted]	[redacted]	[redacted]
Services (per service)	[redacted]	[redacted]	[redacted]	[redacted]
Meters (per meter)	[redacted]	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

The above unit rates are then adjusted to reflect the price reductions in contractor prices:

Table 3-3: New Homes – price adjusted unit rates ($2018)

	Unit Rate	Adjustment Factor	Price Adjusted Rate
Mains (per metre)	[redacted]	[redacted]	[redacted]
Services (per service)	[redacted]	[redacted]	[redacted]
Meters (per meter)	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

3.3.2 Volume forecast

Mains (metres per connection). In the draft decision we noted that "*the data shows a reducing trend for the length of mains and we consider that this is likely to be consistent with smaller frontages for new estate allotments and also aligns with earlier historic data. We therefore propose that the most recent year is likely to be more representative of the forecast period and recommend using a connection length of* [redacted] *metres".* JGN disagreed with this view and provided comments[7] summarised below, including JGN's response to IR023:

- Although lot sizes have reduced by about 25% over the last 13 years there has been no reduction in the lengths of mains required per connection (refer IR023 response Figure 2

[7] Attachment 4.2 – Response to draft decision – capex: page1; IR050:Q1 response

below), with more mains to connect new estates on the edge of Sydney's fringe. Also, there isn't a similar trend of smaller block sizes outside of metropolitan Sydney.

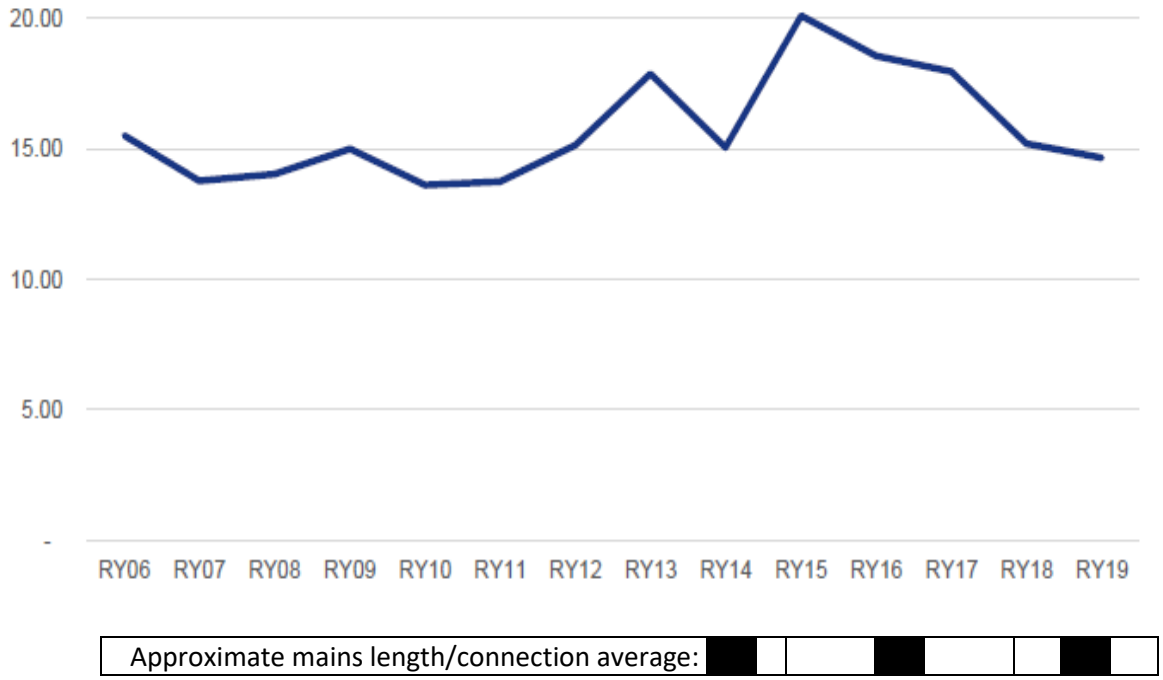
- Geographic Information System data confirms that there has been no reduction in the lengths of main required per lot. The recent decline in the number of connections per metre is driven by timing differences between when new estates are reticulated (when the area is first developed) and when homes are connected (in the subsequent years as homes are completed). JGN's response in IR050:Q1 provides worked example to clarify.

- The downward trend is likely due to the delay between when mains are laid and when customers connect and the building boom slowdown.

In its response to IR023:Q1, JGN said "*Given these factors, taking a four year average is the best approach as it captures how many metres of mains has been required (and will likely be required) to reticulate new estates, taking into account how new estates are currently being designed as well as the increasing trend towards smaller block sizes*."

The following figure shows the length of mains per connection since RY06, noting also that RY19 actual average length is [redacted] (updated in JGN's Attachment 4.2 response to the draft response provided after IR023 response).

Figure 3-1: Average length of mains per new home connection (IR023: Figure 2):



The above also shows approximate average mains length per connection across the various periods, aligning with the IR023: Figure 2.

The figure shows that the mains length per connection for RY18 and RY19 are similar to the earlier long term average, albeit marginally higher, following a period of years where new estate development increased as part of the building boom and with it increased mainlaying activity. As noted by JGN, the time lag between this development activity and actual

connections has created a "downward trend" effect, rather than the trend reflecting smaller block sizes.

JGN's initial Plan proposed [redacted] m/connection, while the revised Plan, with the inclusion of RY19 actual data in their 4-year average, proposes [redacted] m/connection. While the multi-year average is typically a useful tool for smoothing the data, in this case, Zincara considers that this average period is not likely to reflect the forecast period. In part we consider that this is because the building boom and subsequent lag between estate development and connection has distorted the mains length/connection compared to more normal new home connection activity, and associated timing differences, such as proposed in the connection volume forecast and as reflected in the longer term historic length/connections.

JGN's forecast connection activity for the RY21-25 period does not suggest a building boom, so Zincara considers that the elevated mains length/connection, as seen in the above figure, is not anticipated to reoccur during forecast period. As such JGN's revised 4-year average ([redacted] m/connection) is likely to overestimate mains length per connection in the forecast.

Therefore and as a result of our review of the available information Zincara recommends using the RY19 actual result data of [redacted] m/connection as the best estimate for the forecast period in the circumstances, a slight increase from the RY18 data.

Services and Meters data for RY19 is consistent with previous years, and Zincara recommends the 4-year average.

Table 3-4: **New Homes – volume mix**

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended
Mains (m/connection)	[redacted]	[redacted]	[redacted]	[redacted]
Services (per connection)	[redacted]	[redacted]	[redacted]	[redacted]
Meters (per connection)	[redacted]	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

The updated volume forecast prepared by CORE Energy is shown in the following table:

Table 3-5: **New Homes: 2020-25 Connections forecast**

	2021	2022	2023	2024	2025	Total
Initial submission	18,935	17,742	17,360	17,805	18,945	90,787
Revised submission	19,606	18,481	18,455	18,489	19,285	94,316

(Source: Connection capex forecast - model)

The above table shows that JGN's revised volume forecast has increased by 3,529.

3.3.3 Capex forecast

Applying the price adjusted unit rates and the volume forecast provides the following connections capital expenditure:

Table 3-6: New homes capex forecast ($2018,000)

	JGN initial	AER - DD	JGN revised	Zincara Recommended
Mains	64,737	54,830	66,314	60,514
Services	128,618	128,618	132,881	132,881
Meters	17,716	16,693	17,930	17,930
Total	**211,071**	**200,141**	**217,125**	**211,325**
Capex/connection	[redacted]	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

3.3.4 Conclusion

The volume of new homes connections in the revised forecast has increased by 3,529 to 94,316 following an update by CORE Energy. In JGN's revised forecast, this represents a capex increase of approximately $8.1 million.

Zincara's recommended new homes connection capex forecast is $211.3 million, giving an average new home connection of [redacted]. The recommended capex forecast is a reduction of $5.8 million compared with JGN's revised forecast.

Accounting for the increased connection volumes, this represents an increase of $3.2 million compared with the AER draft decision.

The following summarise outcomes of the review:

RY19 actuals have increased JGN's 4-year average unit rates for mains and services, while reducing the unit rate for meters. In the draft decision we had accepted JGN's 4-year averages for mains and services and applied the 5-year average for meters. The reduced RY19 meter unit rate aligns relatively closely with our initial unit rate. Zincara recommends the 4-year average unit rate for mains, services and meters.

Price Adjustment Factors have been revised slightly to provide for the impact of reduced contractor prices during the current period has reduced with the inclusion of RY19 data, with fewer years now excluding these price reductions.

Volume (mix) rates. RY19 actuals for services and meters are similar to earlier years so we recommend the 4-year average. For mains, RY19 actual is [redacted] m/connection which is similar to RY18 and the earlier years prior to the building boom. JGN, in its response to the draft decision and also its IR023 response says that while lot sizes have reduced over the years, the length of mains have not, due to increased mains required to connect to subdivisions. JGN also says that timing is impacting the data and hence the need for a 4-year average. Zincara agrees with JGN's comments regarding lag between mains construction and new homes connection. However, the connection volumes proposed by JGN do not suggest a similar

building boom during the forecast period, so we consider that JGN's 4-year average ([redacted] m/connection), which partly includes the impacts of the building boom will result in an over estimate of capex for the forecast period. We recommend using RY19 data ([redacted] m/connection), which is similar to RY18 and the earlier year rates, as providing a more reasonable estimate of the forecast period.

3.4 COMMERCIAL AND INDUSTRIAL TARIFF

3.4.1 Average unit rates

Mains: RY19 actual compares with the other years, showing normal fluctuations as described by JGN, particularly over the four year period. Having reviewed the data, we have revised our recommendation from a 5 year average, to the 4-year average as it is more reflective of the forecast period.

Services: RY19 actual is lower than the previous three years but similar to earlier years. Following review of JGN's response along with its response to IR023, we agree that there is the wide range of I&C tariff connections and with relatively lower volumes, it can be expected that there can be wide fluctuation in costs year to year. The trend in recent years suggests that there have been a number of more complex and potentially larger connections that have occurred and it is reasonable to assume that similar large connections will be required in the forecast period. As such we recommend the 4 year average rate.

Meters: RY19 actual is similar to RY18 and lower that the preceding two years. RY16 shows as an outlier being some 50% above other years. However, information provided by JGN in its response along with its response to IR023, shows that there are wide fluctuations in the size and complexity of meter installations over time. Therefore, we recommend the 4 year average rate as more reflective of the forecast period.

The following table shows the various unit rate averages:

Table 3-7: I&C tariff – unit rates ($2018)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended
Mains (per metre)	[redacted]	[redacted]	[redacted]	[redacted]
Services (per service)	[redacted]	[redacted]	[redacted]	[redacted]
Meters (per meter)	[redacted]	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

Price adjusted rates

Table 3-8: I&C tariff – price adjusted unit rates ($2018)

	Unit Rate	Adjustment Factor	Price Adjusted Rate
Mains (per metre)	[redacted]	[redacted]	[redacted]
Services (per service)	[redacted]	[redacted]	[redacted]
Meters (per meter)	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

3.4.2 Volume forecast

I&C tariff: mains length – In the draft decision we removed RY18 as an outlier, being approximately 40% above the next highest year. JGN said that the RY18 outlier in fact reflects higher mains volumes being the new normal and is similar to RY19 data and they have a number of larger projects in the forecast. With a relatively small volume of connections, the inclusion of a few larger more complex connections can result in wide fluctuations from year to year. As a result, Zincara recommends the 4-year average unit rate.

Services and meters: inclusion of RY19 actual data is similar to earlier years.

Based on the further information provided by JGN, Zincara recommends the 4-year average for I&C tariff connections.

Table 3-9: I&C tariff – volume mix

	Initial JGN	AER – DD	Revised JGN	Zincara Recommended
Mains (m/connection)	[redacted]	[redacted]	[redacted]	[redacted]
Services (per connection)	[redacted]	[redacted]	[redacted]	[redacted]
Meters (per connection)	[redacted]	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

The volume of I&C tariff connections has not changed in the revised Plan, remaining at 828 per year (4,140 for the period).

3.4.3 Capex forecast

Applying the price adjusted unit rates and the volume forecast provides the following connections capital expenditure:

Table 3-10: I&C tariff capex forecast ($2018, 000)

	JGN Initial	AER - DD	JGN revised	Zincara Recommended	Recommended – AER DD
Mains	8,940	7,722	9,558	9,558	
Services	10,351	9,722	9,865	9,865	
Meters	9,244	8,422	8,885	8,885	
Total	**28,535**	**25,868**	**28,308**	**28,308**	**+2,440**
Capex/connection	[redacted]	[redacted]	[redacted]	[redacted]	

(Source: Connection capex forecast - model)

3.4.4 Conclusion

I&C tariff connections cover a wide range of customers from relatively small local restaurants up to large manufacturers or food processors. This market segment therefore can see the new connection mix vary from year to year along with the size and complexity. As a result, capex can have wide fluctuations across the period.

Mains: with the inclusion of RY19 actuals which compares with other recent three years and showing normal variations we recommend the 4-year average.

Services: in the draft decision we considered that there was a significant step increase from RY16 and proposed a 5-year average to smooth this impact. RY19 actual is lower than the previous three years but similar to earlier years. Following review of JGN's response along with its response to IR023 we agree that there is the wide range of I&C tariff connections and with relatively lower volumes it can be expected that there can be wide fluctuation in costs year to year. The trend in recent years suggests that there have been a number of more complex and potentially larger connections that have occurred and it is reasonable to assume that similar large connections will be required in the forecast period. As such we recommend the 4 year average rate as reflective of the forecast period.

Meters: in the draft decision we considered that RY16, being approximately 50% above the next highest year, distorted the average and we calculated an average based on remaining years. RY19 actual is similar to RY18 and lower that the preceding two years. Further information provided by JGN in its response along with its response to IR023, shows that there are wide fluctuations in the size and complexity of meter installations over time. Therefore, we recommend the 4-year average rate.

Price Adjustment Factors have been revised slightly to provide for the impact of reduced contractor prices during the current period has reduced with the inclusion of RY19 data, with fewer years now excluding these price reductions.

Volume (mix) rates. For mains length, in the draft decision we removed RY18 as an outlier, being approximately 40% above the next highest year. JGN said that the RY18 outlier reflects higher mains volumes being the new normal as also noted by RY19 data and projects in the forecast. For services and meters, inclusion of RY19 actual data is similar to earlier years.

Volume of I&C tariff connections remains unchanged from the initial 2020 Plan.

Based on the further information provided by JGN, Zincara recommends a revised capex forecast for I&C tariff connections, of $28.3 million compared with the draft decision of $25.9 million an increase $2.4 million.

3.5 ELECTRICITY TO GAS

3.5.1 Average unit rates

Mains: in the draft decision we considered that RY17 was an outlier, being 45% above the next highest year. JGN has advised that this year included costs relating to work undertaken in previous years. JGN's IR023 response, said that there were higher than usual restoration costs associated with timing of invoices with (potentially) merging councils and also a backlog of restoration costs not processed in RY16 due to IT systems transition within JGN.

While we don't consider these specific issues "natural variations", the additional information helps to explain why RY17 presented as an outlier. While costs subsequently fell in RY18, they were again high in RY19, which JGN said was due to back paying contractors for work done in

RY18 arising from the increased cost of nylon pipe. With the further information clarifying why RY17 presented as an outlier, along with RY19 actuals, we recommend the 4-year average, with the trend of the recent years more reflective of the forecast period.

Services: in the draft decision we considered that the trend of yearly rates supported the use of a longer 5-year average. With RY19 actuals being similar to RY17 and RY18, the 4-year average appears to be more reflective of the forecast period. As such we recommend the 4-year average.

Meter: in the draft decision we considered that the trend of yearly rates tended to support the use of a longer 5-year average. RY19 is in line with recent years, and a 4-year average more appropriately reflects this trend. Zincara recommends the 4-year average.

The following table shows the various unit rate averages:

Table 3-11: Electricity to gas – unit rates ($2018)

	Initial JGN	AER - DD	Revised JGN	Zincara Recommended
Mains (per metre)	[redacted]	[redacted]	[redacted]	[redacted]
Services (per service)	[redacted]	[redacted]	[redacted]	[redacted]
Meters (per meter)	[redacted]	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

Price adjusted rates

Table 3-12: Electricity to gas – price adjusted unit rates ($2018)

	Unit Rate	Adjustment Factor	Price Adjusted Rate
Mains (per metre)	[redacted]	[redacted]	[redacted]
Services (per service)	[redacted]	[redacted]	[redacted]
Meters (per meter)	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

3.5.2 Volume forecast

Mains, services and meters: in the draft decision we found that the years were relatively consistent and accepted JGN's 4-year average. RY19 actuals: mains are low, while services and meters reflect natural fluctuations. We recommend the 4-year average as reasonable.

Table 3-13: Electricity to gas – volume mix

	Initial JGN	AER – DD	Revised JGN	Zincara Recommended
Mains (m/connection)	[redacted]	[redacted]	[redacted]	[redacted]
Services (per connection)	[redacted]	[redacted]	[redacted]	[redacted]
Meters (per connection)	[redacted]	[redacted]	[redacted]	[redacted]

(Source: Connection capex forecast - model)

The volume of electricity to gas connections has not changed in the revised Plan.

3.5.3 Capex forecast

Table 3-14: Electricity to gas capex forecast ($2018, 000)

	JGN initial	AER - DD	JGN revised	Zincara Recommended	Recommended – AER DD
Mains	18,394	14,562	17,644	17,644	
Services	54,813	53,759	57,680	57,680	
Meters	5,466	5,355	4,693	4,693	
Total	**78,673**	**73,675**	**80,016**	**80,016**	**+6,341**
Capex/connection	[redacted]	[redacted]	[redacted]	[redacted]	

(Source: Connection capex forecast - model)

3.5.4 Conclusion

Electricity to gas connections tend to be more complex than new homes connections due to the fact that they are in existing areas, often with difficult access, increased traffic management, more complex restorations, and typically one-off jobs.

Mains: in the draft decision we considered RY17 was an outlier, being 45% above the next highest year. JGN's response along with its response to IR023 clarified why costs were particularly high in that year. RY19 was also relatively high and again the further information clarified the reasons. As a result we recommend JGN's 4-year average.

Services: in the draft decision we considered that the trend of yearly rates supported the use of a longer 5-year average. With RY19 actuals being similar to RY17 and RY18, the 4-year average appears to more appropriately reflect the trend. We recommend the 4-year average.

Meter: in the draft decision we considered that the trend of yearly rates tended to support the use of a longer 5-year average. RY19 is in line with the recent years with a 4-year average reflecting the trend. We recommend 4-year average.

Price Adjustment Factors have been revised slightly to provide for the impact of reduced contractor prices during the current period has reduced with the inclusion of RY19 data, with fewer years now excluding these price reductions.

Volume mix: mains, services and meters: in the draft decision we found that the years were relatively consistent and accepted JGN's 4-year average. RY19 actuals: mains is low, while services and meters reflect natural fluctuations. We recommend retaining the 4-year average as appropriate.

Volume of electricity to gas connections remains unchanged from the initial 2020 Plan submission.

Based on the further information provided by JGN, Zincara recommends a revised capex forecast of $80.0 million compared with the draft decision of $73.7 million, an increase of $6.3M compared with the AER draft decision.

3.6 MEDIUM DENSITY / HIGH RISE

In its revised 2020 Plan, JGN said[8] that they accept the AER's decision regarding the volume boundary strategy and "high rise developers will be able to continue to choose individual metering provided by JGN. We have revised the 2020 Plan to remove assignment of a high rise building with centralised hot water connected after 1 July 2021 to a boundary metered tariff. The assignment will instead be dictated by the nature of the metering assets installed at the site".

JGN will continue to provide its individual hot water metering product. The update has been mainly applied via Core Energy's updated demand forecast and amended in the forecasting model, where the metering unit rate for individually metered high-rise connections reflects the continued installation of hot water meters and gas meters (rather than just gas meters).

3.6.1 Unit rates

Table 3-15: MDHR – average unit rates per site ($2018)

	RY15	RY16	RY17	RY18	RY19
Mains	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Services	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

(Source: Connections capex forecast model – 20200109: Calc|Adj rates _MDHR)

Mains: RY19 unit rate is approximately 47% higher than other years, while RY15 is approximately 33% below other years. JGN's proposed unit rate has increased from its initial submission with the inclusion of the RY19 rate. The AER sought further explanation of the anomaly unit rates. In its response to the AER's request for clarification (IR050:Q2), JGN provided further details of metres of main per site along with cost per metre of mains. They also provided examples of projects undertaken during RY19. With a majority of projects along transport corridors, inner city areas and so on, JGN advises that these more costly projects are expected to continue into the forecast period.

While we had considered the use of a 5-year average (RY15-RY19), with the additional explanation of projects and costs, we believe that RY15 unit cost is not likely to reflect the projects and costs in the forecast period. As a result Zincara recommends the 4-year average as reasonable for the forecast, albeit RY19 actual data has impacted the unit rate.

Services: RY19 reflects normal fluctuations. While the 4-year average is higher than initial submission, it does not appear to be unreasonable and also reflects JGN's response to IR003: Q2 during the draft review period. Zincara recommends the 4-year average as reasonable.

[8] Revised 2020 Plan: 14.2.3 volume boundary strategy. Page 65

Meters: with the inclusion of RY19 actuals the forecast capex model notes that only three years of data is available. Apportioning the three years of capex across the various meter configurations, the resultant unit rates are shown in the following table.

Price adjustment factors: taking into account the use of RY19 actuals, then the factors are slightly reduced from the initial JGN 2020 Plan. Note that there is no price adjustment relating to metering.

The price adjusted unit rates for mains and services (per site) and various meter configurations (per dwelling):

Table 3-16: **Medium density / high rise – price adjusted unit rates ($2018)**

	JGN Initial	AER – DD	JGN Revised	Zincara Recommended
Mains ($/site)				
Services ($/site)				
Meters ($/meter):				
MD				
HR-VI				
HR-VBM				
HR-VBH				

(Source: Connection forecasting model: Calc|Adj rates_ MDHR; and AER)

3.6.2 Volumes forecast

CORE connection forecasts provide the number of dwellings which will connect to JGN's network and also how many sites will be connected in the high-rise sub-segments.

Table 3-17: **Medium density / high-rise forecast dwellings**

	Initial JGN*	AER - DD	Revised JGN
Mains (number of sites)			
Services (number of sites)			
Meters (number)			
MD			
HR-VI			
HR-VBM			
HR-VBH			

(Source: Connection capex forecast model and AER)

Note: * Initial JGN source: Connections capex forecast model – 20190630 .

3.6.3 Capex forecast

To forecast medium density / high-rise capex, the forecast volumes are combined with the price-adjusted unit rates. Meter costs are determined by multiplying the unit rate per connection (dwelling) by the number of connections at a sub-segment level. Mains and services costs are determined by multiplying the respective costs per service by the number of sites. The resulting medium density / high-rise capex forecast is shown as follows.

Table 3-18: Medium density / high-rise capex forecast ($2018, 000)

	Initial JGN	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Mains	11,111	11,111	12,537	12,537	+1,426
Services	10,335	10,335	9,201	9,201	-1,133
Meters	13,561	19,093	13,837	13,837	-5,257
MD	*2,610*	*2,610*	*3,376*	*3,376*	
HR-VI	*3,938*	*3,938*	*4,653*	*4,653*	
HR-VBM	*7,012*	*5,914*	*5,316*	*5,316*	
HR-VBH	-	*6,631*	*492*	*492*	
Total	**35,007**	**40,539**	**35,575**	**35,575**	**-4,964**

(Source: Connection capex forecasting model and AER)

3.6.4 Conclusion

As a result of the AER draft decision, JGN will continue to provide its individual hot water metering product. The revised submission has applied Core Energy's updated demand forecast which is reduced compared with the initial submission and changes in the average unit rates as a result of the inclusion of RY19 actual data.

The AER draft decision rejected JGN's proposal to no longer offer individual metering in new high-rise buildings with centralised hot water services and as a result provided an additional allowance of $5.532 million for the additional metering.

JGN's revised submission shows a reduced number of sites, with higher unit rates for mains and services. The revised overall forecast number of meters is lower than approved in the AER draft decision and as a result the forecast meter capex is lower.

Zincara recommends JGN's revised connections capex forecast for medium density / high rise market segment of $35.575 million, which is a reduction of $4.964 million compared with the AER draft decision.

3.7 I&C DEMAND

The AER draft decision accepted the 4-year average as reasonable given the small volume of I&C Demand connections and the significant variability that can occur from year to year. With the inclusion of the RY19 actuals, the revised 4-year average is lower than the initial 2020 Plan, reflecting the variability of this market segment. As with the initial draft decision, we recommend the 4-year average.

Table 3-19: I&C demand – capex forecast ($2018, 000)

	Initial JGN	AER – DD	Revised JGN	Zincara Recommended	Recommended – AER DD
I&C Demand	13,766	13,766	11,599	11,599	-2,167

(Source: Connection capex forecast - model)

Zincara's recommended capex forecast of $11.5 million represents a reduction of $2.2 million compared with the AER draft decision.

3.8 SUMMARY

The following table summarises and compares the capex forecast:

Table 3-20: 2020-25 Connections forecast ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
New homes	211,071	200,141	217,125	211,325	+11,184
I&C (tariff)	28,535	25,868	28,308	28,308	+2,440
Electricity to gas	78,673	73,675	80,016	80,016	+6,341
Medium Density	35,007	40,539	35,575	35,575	-4,964
I&C Demand	13,766	13,766	11,599	11,599	-2,167
Connections	**367,053**	**353,989**	**372,623**	**366,823**	**+12,834**

(Source: Connection capex forecast - model)

Zincara's recommended revised capex forecast reflects the increased new homes connection volume, continued provision of JGN's individual hot water metering product, and impacts of the RY19 actual data on unit rates averages. The recommended capex forecast is $366.8 million. Accounting for the increased new homes connection volumes (increase of 3,529) this represents an increase of $4.9 million compared with the AER draft decision. Based on the additional data, Zincara has recommended a revised capex forecast which it considers is prudent and represents the best estimate of the forecast in the circumstances.

Zincara's recommended capex forecast is $5.8 million below JGN's revised forecast.

Zincara's review of JGN's revised connections forecast has been undertaken in a similar manner to that used with the initial submission. We consider it entirely prudent to review and scrutinise the data provided, rather than simply verifying averages. Where there were normal fluctuations across the historical years, we used multi-year averages to determine forecast rates/expenditures. However, where data showed an outlier in an individual year we again sought further information. With this review we were able to consider the additional information provided by JGN, such as IR023 response and its response to the draft decision, as well as responses from additional information requests.

Zincara's proposed adjustments, determined during a review of the various market segments, are summarised as follows:

- **New homes**: Zincara's recommended new homes connection capex forecast is $211.3 million, giving an average new home connection of $[redacted]. Accounting for the increased connection volumes (increase of 3,529), this represents an increase of $3.3 million compared with the AER draft decision. The recommended capex forecast is a reduction of $5.8 million compared with JGN's revised forecast. With respect to mains, Zincara has recommended [redacted] m/connection, compared with JGN's proposed [redacted] m/connection

(and JGN's initial submission of [redacted] m/connection). JGN's forecast connection activity for the RY21-25 period does not suggest a building boom, and Zincara considers that the elevated mains length/connection, largely associated with the unprecedented building boom, is not anticipated to reoccur during forecast period. As such JGN's revised 4-year average ([redacted] m/connection), in this case, is likely to overestimate mains length per connection in the forecast. We consider that the recent years (RY18 and RY19) which also approximately reflect similar lengths/connections over the longer term are more reasonable estimates of the forecast period in the circumstances.

- **New homes connections forecast revised**. The revised forecast increases the connections by 3,529 for the RY21-RY25 period, a capex impact of approximately $7.9 million. I&C tariff and Electricity to Gas forecast connection volumes have not been revised.

- **Commercial & Industrial tariff**: This market segment has very wide range of customers and connections range from simple to quite complex. The location of a number of these connections also impacts costs. JGN's responses to questions clarified why there were wide fluctuations/anomalies in some of the rates. As a result of these clarifications along with the inclusion of RY19 actual data, Zincara has recommended JGN's revised unit rates. There is no change to the volume of connections.

- **Electricity to Gas**: JGN's clarification of apparent anomalies in the yearly mains rates, in particular, relating to timing of council restoration invoices and backpay to contractors for significant materials price increases, along with the inclusion of RY19 actual data, has resulted in increased rates. As a result Zincara has recommended JGN's revised unit rates. There is no change to the volume of connections.

- **Medium Density/High rise**: JGN will continue to provide its individual hot water metering product. The inclusion of RY19 actual data results in revised unit rates. Forecast volumes in the revised submission are reduced compared to the initial submission. Zincara recommends JGN's revised capex forecast.

- **I&C Demand**: with the inclusion of RY19 actual data results, Zincara recommends JGN's revised capex forecast.

4. METER REPLACEMENT

4.1 INTRODUCTION

JGN's response to the draft decision includes the following updates in its revised forecast:

- Revised four-year averaging period for unit rates and average annual costs to reflect RY19 actual data (use RY2015-19 period rather than RY2014-18 period).
- Residential meter replacement: include outcomes of 2019 statistical meter testing.
- Industrial and commercial: corrected a referencing error in metering volumes.

JGN revised meter replacement capex forecast is summarised in the following table.

Table 4-1: JGN Revised Meter Replacement Capex ($2018, 000)

	JGN Initial	AER - DD	JGN Revised
Residential gas meters	52,268	44,719	52,123
Hot water meters	21,709	19,321	21,629
Meter data loggers	6,528	6,212	6,439
I&C meters	26,969	26,393	27,743
Metreteks	1,614	1,614	1,096
Testing	1,532	1,435	1,629
Other	139	139	139
Total	**110,760**	**99,834**	**110,799**

(Source: Meter replacement capex forecast model)

4.2 RESIDENTIAL GAS METERS

JGN provided 2019 residential gas meter test outcomes and as a result increased their meter replacement program.

The test outcomes for meters showed:

- 15 year meters: all three families passed (54,847 meters) and have been extended to 20 years.
- 20 year meters: Two families failed ([redacted]: [redacted]; [redacted]: [redacted]) and will be replaced at 20 years in CY2021. One family passed ([redacted]: [redacted]) and will be extended by three years to 23 years.
- 25 year meters: One family passed ([redacted]: [redacted]) and has been extended to 30 years. One family passed ([redacted]: [redacted]) and has been extended by three years to 28 years.

With respect to these test results, JGN's methodology had assumed all 15 and 20 years meters would pass, and all 25 year meters would fail. JGN said[9] "while this approach appears simple, we consider that it is appropriate given that it is not possible to determine with any certainty whether each batch of meters will fail their tests." JGN do not intend to further test those meters that achieved three year field life extension, on the basis that they consider "high likelihood they will be inaccurate". Note: meters accurate to ±2.5% are field life extended by three years. As a result of these test outcomes, JGN has increased its meter replacement program by 12,555 meters to 294,272 meters.

In addition, JGN's methodology does not account for the proportion of meters which will fail the 15 and 20 year tests, noting[10] "this approach reflects the performance we have seen over the last few years where *most* meters have passed their 15 and 20 year life extensions."

In response to the AER draft decision, JGN said[11] "we consider that a reasonable forecast, no matter how it is calculated would assume that at least 28,225 (13%) of the 220,758 meters scheduled for testing at the 15 and 20 year marks will fail."

With the high volume of meter replacements proposed by JGN, Zincara considers that it would be prudent to undertake some further analysis of meter families to develop the best estimate of the forecast in the circumstances. We agree with JGN that it is not possible to determine future test outcomes with any certainty, however, we propose that meter test outcomes of similar meter types can provide some level of confidence, sufficient to develop an overall estimate, particularly at the portfolio level.

Appendix A provides the analysis and revised forecast for meter replacement taking into consideration the information provided by JGN in its various submissions and responses.

In particular Zincara revised forecast includes a specific provision for meters failing at 15 and 20 years, based on 2019 test results and comment from JGN regarding further failures. In the initial review we had taken a conservative view of meters at 25 years that may pass and be extended to 30 years, in order to provide for some 15 and 20 year failures. As our revised forecast makes a specific provision we have also revised our assessment for 25 year meters.

With respect to the family of meters now extended to 23 years, we believe that it would be prudent to undertake further testing when it is due in 2022. Diaphragm meters are mechanical devices and their performance will slowly degrade over time. In addition, the Standard recognises the replacement cost of meters far outweighs the slight degradation in the performance of meters. The cost of testing this family of Email 610 meters is approximately $ 35k while replacement would cost approximately $ 2.3 million. Given the fact that over 100,000 Email 610 meters have passed testing to achieve 25 years, it is reasonable to expect that this family could pass testing for a further three year field life extension. Note that in our revised estimate we do not anticipate that the family of Email 610 meters extended to 28 years will pass further testing.

We again note that we do not propose that the scenario of pass/fail meters is certain, however, we do consider that at the overall, portfolio level, it provides the best estimate of the forecast in the circumstances. Zincara's revised residential gas meter replacement is shown below and compared with the initial forecasts and JGN's revised forecast.

[9] Attachment 4.2: response to AER draft decision: page 22.
[10] JGN response to IR026:Q2.
[11] Attachment 4.2: response to AER draft decision: page 22.

Table 4-2: Residential gas meter replacement volume - revised

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Planned	281,717	226,250	294,272	257,410	+31,160

The proposed revised replacement program of 257,410 meters, is a reduction of 36,862 meters compared with JGN's revised program.

4.2.1 Capex forecast

JGN's revised meter replacement capex model includes RY2019 actual data, which they use to update 4-year averages throughout.

Planned replacement: with the inclusion of RY2019 actual data, the revised average has reduced slightly to $ [redacted] /meter, compared with the initial plan of $ [redacted].

Planned statistical sampling: the revised rate is $ [redacted] /meter, compared with initial plan of $ [redacted] /meter. While the 5-year average is slightly lower than the four year average, the historical trend shows increases each year, so it is reasonable to use the 4-year average. The revised volume of meters is higher at 7,280 meters, compared with 6,011 meters in the initial plan.

Defective meters: the revised rate is $ [redacted] /year compared with the initial plan of $[redacted]/year. The 5-year rate is very similar to the 4-year rate, so reasonable to use the 4-year average and a total $ [redacted].

Defective regulators: the revised rate is $ [redacted] /year. The 5-year average is higher and the historical expenditures show a slight downward trend in the last three years, so it is reasonable to use the 4-year average.

4.2.1 Conclusion

The residential gas meter replacement capex is summarised in the following table:

Table 4-3: Recommended Residential gas meter replacement capex ($2018, 000) - revised

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Planned	38,340	30,792	39,138	34,235	+3,443
Statistical	1,198	1,198	1,312	1,312	+114
Defective meter	4,200	4,200	4,156	4,156	-44
Defective regulator	8,530	8,530	7,517	7,517	-1,013
Total	**52,268**	**44,719**	**52,123**	**47,220**	**+2,501**

(Source: Meter replacement capex forecast model-20200109)

Zincara's proposed revised residential gas meter replacement capex represents a $4.903 million reduction compared with JGN's revised capex, and an increase of $2.501 million compared with the AER draft decision.

JGN's revised planned residential gas meter replacement forecast increased by 12,555 meters to 294,272. The 2019 test result outcomes along with some 3-year field life extensions are the main reason for their increased program.

As a result of the updated test outcomes and JGN's further information, Zincara's analysis recommends a replacement forecast of 257,410 meters which we consider provides the best estimate in the circumstances. In particular, the forecast includes a specific provision for failed 15 and 20 year meters and an estimate of 25 year meters pass/fail outcomes. We do not propose that the estimate gives a precise outcome for each meter family, but rather at the portfolio level the best estimate of meter replacement for the forecast period.

The inclusion of 2019 actual data results in some revision of the other residential meter categories, which Zincara considers to be reasonable.

4.3 RESIDENTIAL HOT WATER METERS

JGN's response to the AER draft decision includes RY2019 actual data which has been reflected in the revised meter forecast model.

Planned replacement of residential hot water meters: with the inclusion of RY2019 actual data the average unit rate increases to $ [redacted] /meter (from $ [redacted] /meter). 2019 data shows a significantly increased program of meter replacements. The earlier historic years of data do not provide any useful average and while the revised unit rate is increased from the initial submission, it is based on a much larger volume of meter replacements and therefore Zincara considers that it represents the best forecast in the circumstances. There is no change in the volume of hot water meter replacements.

Defective meters: JGN's initial forecast proposed expenditure of $ [redacted] million per year and $ [redacted] million for the period. The AER draft decision considered that 2015 expenditure, being more than 50% above other years distorted the calculation and as a result applied an average of the remaining three years giving an expenditure forecast of $ [redacted] million per year and $ [redacted] million for the period. JGN's response to the draft decision rejected this approach saying that with natural variations and timing differences occurring then the average should reflect each of the four years. With the inclusion of RY2019 data, JGN's four year average uses RY2016 - RY2019 and therefore excludes RY2015. While Zincara doesn't accept JGN's explanation of "outliers" we agree that the latest four years do reflect a repeating fluctuation across the years and therefore represents a reasonable forecast, resulting in an average of $ [redacted] million per year and $ [redacted] million for the period.

4.3.1 Conclusion

The residential hot water meter replacement capex forecasts are shown in the following table:

Table 4-4: JGN Residential hot water meter replacement capex ($2018,000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Planned	11,418	11,418	14,664	14,664	+3,246
Defective	10,291	7,903	6,964	6,964	-939
Total	**21,709**	**19,321**	**21,629**	**21,629**	**+2,307**

(Source: Meter replacement capex forecast - model)

Zincara's recommended revised hot water meter replacement capex forecast totals $21.629 million which is an increase of $2.307 million compared with the AER draft decision. While the volume of meter replacements remains unchanged, the increase is largely as a result of the inclusion of RY2019 actual data increasing the unit rate for the hot water meter replacement program. There is also a decrease in the defective meter replacement forecast.

4.4 METER DATA LOGGERS

JGN's response to the AER draft decision includes RY2019 actual data which has been reflected in the revised meter forecast model. The meter data logger capex includes:

- **Planned replacement of MDL batteries**: revised forecast remains unchanged and proposes [redacted] replacements per year, with a unit rate of $ [redacted].
- **NBN rollout**: revised volume forecast remains unchanged with [redacted] upgrades over two years ([redacted]: [redacted]; [redacted]: [redacted]), with a revised unit rate of $ [redacted] compared with $ [redacted] in the initial plan. The RY2019 actual data shows an increase in expenditure and lower volume of installations resulting in a higher unit rate than RY2018 data. Reviewing the available data Zincara considers that the revised average unit rate is reasonable. The resulting capex forecast is $424,738.
- **Wireless RF**: revised volume and capex forecast remains unchanged with [redacted] installations, and a unit rate of $ [redacted].
- **Defective replacement**: with the inclusion of RY2019 actual data, JGN's revised average yearly spend decreases to $ [redacted], giving a total capex of $ [redacted]. The AER DD had noted a high outlier year (RY2015) and averaged the remaining three years. With the inclusion of RY2019 data, the outlier does not fall into JGN's 4-year average and so aligns with our revised average.

4.4.1 Conclusion

With the inclusion of actual RY2019 data, JGN's revised meter data logger program results in marginal increase compared with its initial submission. Zincara has reviewed the data and recommends acceptance of JGN's revised capex forecast of $6.439 million, which is an increase capex of $0.226 million compared with the AER draft decision.

JGN's meter data logger capex forecast is summarised in the following table:

Table 4-5: Meter data loggers capex ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Planned	2,755	2,755	2,755	2,755	-
NBN rollout	357	357	425	425	+68
Wireless RF	2,177	2,177	2,177	2,177	-
Defective	1,239	924	1,082	1,082	+158
Total	**6,528**	**6,212**	**6,439**	**6,439**	**+226**

(Source: Meter replacement capex forecast - model)

4.5 INDUSTRIAL AND COMMERCIAL METERS

Diaphragm meters - planned replacement: as a result of 2019, test outcomes JGN has increased its planned meter replacement program by [redacted] meters to [redacted] meters. Three families of [redacted] meters achieved 3-year field life extension, rather than 5-year extension. Given the volumes of meters subject to statistical testing over the forecast period and the potential for pass or fail, we consider that the revised replacement volume and capex is reasonable in the circumstances.

Rotary meters – planned replacement: the revised JGN program shows a volume forecast of [redacted] meters, an increase of [redacted] meters. With the increase in meters being replaced the revised capex is reasonable.

Turbine meters – planned replacement: there is no change to the forecast volume or capex.

Statistical sampling: there is no change to the forecast volume, but the inclusion of RY2019 actual data results in an increased unit rate of $ [redacted], compared with $ [redacted] and resulting increase in capex to $2,710,610, an increase of $359,495. Zincara considers the revised unit rate and capex to be reasonable.

Defective I&C meters: this category includes diaphragm meters, rotary meters and turbine meters. With the inclusion of RY2019 actual data there is a decrease in the average annual expenditure and capex forecast.

Meter capacity upgrades: with the inclusion of RY2019 actual data there is a decrease in the average historical expenditure and capex forecast.

Meter kit change out: there is no change to the forecast volume ([redacted]). However, JGN's revised unit rate is $ [redacted], compared with $ [redacted] in the initial plan. The historic expenditure and volumes show significant variance across the years and in this case we consider that the 5-year average ($[redacted]) will be more representative of the forecast period, and similar to that proposed in JGN initial plan. Using this revised unit rate the forecast capex for the period is $1,138,183, a reduction of $615,866 compared with JGN's revised forecast and an increase of $44,493 compared with the AER draft decision.

4.5.1 Conclusion

The revised industrial and commercial meter capex is shown in the following table:

Table 4-6: Industrial and commercial meter capex ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Planned-diaphragm	9,002	9,002	9,702	9,702	+700
Planned - rotary	4,275	4,275	4,342	4,342	+67
Planned – turbine	747	747	747	747	-
Statistical sampling	2,927	2,351	2,711	2,711	+359
Defective	1,916	1,916	1,745	1,745	-172
Capacity upgrades	7,009	7,009	6,743	6,743	-266
Meter kit change	1,094	1,094	1,754	1,138	+44
Revised I&C Total	**26,969**	**26,393**	**27,743**	**27,127**	**+734**

(Source: Meter replacement capex forecast - model)

With the inclusion of 2019 actual data, including I&C diaphragm meter statistical sampling test outcomes, the revised JGN capex forecast has increased compared to the AER draft decision.

In general, Zincara considers the revised capex to be reasonable, except for "meter kit changeout". We consider that because the historic expenditure and volumes show significant variance across the years, in this case we consider that the 5-year average rather than JGN's use of a 4-year average provides a more reasonable unit rate for the forecast period. It is also similar to JGN's initial 2020 Plan.

Zincara's recommended revised capex forecast for the Industrial and Commercial meter replacement program is $27.127 million, an increase of $0.734 million compared with the AER draft decision.

4.6 METRETEKS

Defective replacement of Mercury/Metretek equipment: the RY2019 actual data shows a [redacted], giving 4-year average expenditure of $ [redacted] /year and capex forecast for the period of $391,260. In response to IR055, JGN confirmed the revised capex without any explanation. Following further questions JGN advised that it results from rectifying incorrectly capitalised opex costs. As a result Zincara recommends the capex forecast as proposed by JGN.

Planned replacement of Metreteks - NBN rollout: there is no change to this category with the JGN's revised plan.

Table 4-7: Metreteks capex ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Defective	909	909	391	391	-517
NBN rollout	705	705	705	705	-
Total	**1,614**	**1,614**	**1,096**	**1,096**	**-517**

(Source: Meter replacement capex forecast - model)

The revised Metreteks capex forecast is $1.097 million, a reduction of $0.517 million compared with the AER draft decision.

4.7 TESTING

This category consists of three sections: field failure, warranty and quality assurance.

Field failure: with the inclusion of RY2019 expenditure data there are only four years of data available. Averaging those years gives $69,456/year and a total capex forecast of $347,279.

Warranty: the capex forecast has been developed using a weighted average of unit costs from the residential testing, I&C diaphragm testing and hot water meter replacement programs. The "corrected" capex model provided by JGN, shows revised forecast capex for this program.

Quality assurance: there is no change to capex in JGN's revised Plan.

Table 4-8: Testing capex ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Field failure	268	268	347	347	+80
Warranty test	654	654	769	769	+115
Quality assurance	513	513	513	513	-
Total	**1,532**	**1,435**	**1,629**	**1,629**	**+195**

(Source: Meter replacement capex forecast - model)

As JGN's revised cost is due only due to the updated field failure unit cost, we recommend acceptance of the revised capex. The revised Testing capex forecast is $1.629 million, an increase of $0.195 million compared with the AER draft decision.

4.8 OTHER METERING

JGN's revised capex does not make any changes to the forecast.

Table 4-9: Other metering capex ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended	Recommended – AER DD
Dew Point analysers	139	139	139	139	-

(Source: Meter replacement capex forecast - model)

4.1 SUMMARY

Table 4-10: JGN Revised Meter Replacement Capex ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommend	Recommend – AER DD
Residential gas meters	52,268	44,719	52,123	47,220	+2,501
Hot water meters	21,709	19,321	21,629	21,629	+2,307
Meter data loggers	6,528	6,212	6,439	6,439	+226
I&C meters	26,969	26,393	27,743	27,127	+734
Metreteks	1,614	1,614	1,096	1,096	-517
Testing	1,532	1,435	1,629	1,629	+195
Other	139	139	139	139	-
Total	**110,760**	**99,834**	**110,799**	**105,280**	**+5,446**

(Source: Meter replacement capex forecast - model)

Zincara's recommended revised meter replacement capex forecast is $105.280 million, an increase of $5.446 million compared with the AER draft decision. It is also $5.518 million below JGN's revised forecast.

Residential gas meter replacement: Zincara's proposed revised residential gas meter replacement capex represents a $4.903 million reduction compared with JGN's revised capex, and an increase of $2.501 million compared with the AER draft decision.

JGN's revised planned residential gas meter replacement forecast increased by 12,555 meters to 294,272. The 2019 test result outcomes along with some 3-year field life extensions are the main reason for their increased program.

As a result of the updated test outcomes for 2019 and JGN's further information, Zincara's analysis recommends a replacement forecast of 257,410 meters. In particular, the revised

forecast includes a specific provision for failed 15 and 20 year meters and, as with the AER draft decision, Zincara has applied information relating to meter types to develop an estimate of 25 year meters pass/fail outcomes. We consider that this is a prudent approach given the large volume of meters associated with the planned replacement program. While we do not propose that the estimate gives a precise outcome for each meter family, we consider that at the portfolio level it provides the best estimate of meter replacement for the forecast period.

We also consider it prudent for meter families to be statistically sample tested to ensure that maximum field life can be achieved.

The inclusion of 2019 actual data results in some revision of the other residential meter categories, which Zincara considers to be reasonable.

Hot water meters: Zincara's recommended revised hot water meter replacement capex forecast totals $21.629 million which is an increase of $2.307 million compared with the AER draft decision. While the volume of meter replacements remains unchanged, the increase is largely as a result of the inclusion of RY2019 actual data increasing the unit rate for the hot water meter replacement program. There is also a decrease in the defective meter replacement forecast.

Meter data loggers: With the inclusion of actual RY2019 data, JGN's revised meter data logger program results in marginal decrease compared with its initial submission. Zincara has reviewed the data and recommends acceptance of JGN's revised capex forecast of $6.439 million, which is an increase capex of $0.226 million compared with the AER draft decision.

Industrial and commercial meters: With the inclusion of 2019 actual data, including I&C diaphragm meter statistical sampling test outcomes, the Zincara's recommended revised capex forecast is $27.127 million, an increase of $0.734 million compared with the AER draft decision. In general Zincara considers JGN's the revised capex forecast to be reasonable, except for "meter kit changeout". We consider that because the historic expenditure and volumes show significant variance across the years, in this case we consider that the 5-year average rather than JGN's use of a 4-year average provides a more reasonable unit rate for the forecast period. It is also similar to JGN's initial 2020 Plan. This component results in a reduction of $0.616 million compared with JGN's revised forecast.

Metreteks: The revised capex forecast is $1.096 million, a reduction of $0.517 million compared with the AER draft decision. The reduction is the result of rectifying historical incorrectly capitalised opex costs.

Testing: As JGN's revised cost is only due to the updated field failure unit cost, we recommend acceptance of the revised capex. The revised Testing capex forecast is $1.629 million, an increase of $0.195 million compared with the AER draft decision.

Other metering: There is no change to the capex forecast for this category.

5. FACILITIES AND PIPES

5.1 INTRODUCTION

The AER in its draft decision accepted $63.2million ($2019-20, direct cost) of JGN's proposed capex for facilities and pipes of $72.2million. The projects that the AER has listed for further information are shown in the table below.

Table 5-1: Facilities and pipes capex not included in the AER's alternative capex estimate ($2019–20, $million)

Facilities and Pipes Categories	Project Name	Total Capex
Facilities and Safety Upgrade	Minor capital TRS	1.1
	Minor capital SRS	2.1
	Appin POTS upgrade Stage 2	0.5
	Installation of secondary isolation valve	1.1
Secondary district regulator replacement	Minor capital: PRS	0.6
Other minor works	Minor capital washaway works	1.6
	Path valves – low pressure and secondary pressure	0.4
Escalation differences	Labour and inflation	0.3
	Total	**9.0**

(Source: AER Draft Decision Table 5-20)

In response to the Draft Decision, JGN has provided further information[12] on each of the projects. JGN had grouped the projects into the following categories:

- Minor Capital works;
- Appin Package Off-Take Stations (POTS) upgrade Stage 2;
- Installation of secondary isolating valves; and
- Path valves low and medium pressure

The annual capex for each of the projects not included in the AER's draft decision are provided in the table below.

[12] JGN-RP-Attachment 4.2- Response to the draft decision-capex-20200109 public

Table 5-2: Remaining Facilities and Pipes Capex ($2018 000)

Categories	2021	2022	2023	2024	2025	Total
Minor capital works - TRS	200	200	200	200	200	**1,000**
Minor capital works - PRS	120	120	120	120	120	**600**
Minor Capital works – SRS	400	400	400	400	400	**2,000**
Minor Capital works – pipework	250	250	250	250	250	**1,250**
Washaways	300	300	300	300	300	**1,500**
Total Minor Capital Works	**1,270**	**1,270**	**1,270**	**1,270**	**1,270**	**6,350**
Isolation of Secondary valves*	375	450	225			1,050
Path Valves - Low, Medium and Secondary Pressure	180	180	180	180	180	900
Total	**1,825**	**1,900**	**1,675**	**1,450**	**1,450**	**8,300**

Note: Appin Pot Upgrade was not included as JGN is not proceeding with the project.
*Total Cost of project is $1,125K. $75k is proposed for 2020.
(Source: JGN-RP-Attachment 4.1-Capex Model-20200109)

Zincara's analysis and conclusion for each project is detailed below.

5.2 MINOR CAPITAL WORKS

JGN said that its minor capital works are typically undertaken in a short timeframe due to equipment failure or external parties' requirements.

Its annual capex for each program is shown in the table below.

Table 5-3: Annual Capex for Minor Capital Works ($2020, $M)

Program	Annual Forecast Requirement	4 year average annual capex
Minor capital works - TRS	0.21	0.16
Minor capital works - PRS	0.13	0.90
Minor Capital works – SRS	0.42	1.01
Minor Capital works – pipework	0.26	0.29
Washaways	0.32	0.20
Total	1.33	2.56

(Source: JGN-RP-Attachment 4.2- Response to the draft decision-capex-20200109 public)

Minor Capital Trunk Receiving Stations (TRS)

JGN said that this capex allocation is to replace failure of equipment in the TRS or POTS (package off-take stations). Examples of works in the last four years include:

- Upgrade of country water bath heaters;
- Upgrade of earth and communication equipment;
- Installation of TRS air conditioning units;
- Replacement of power poles and overhead power line; and

- Installation of silence trim to control high pitch noise.

JGN also indicated that for the next AA period, it is already aware of a number of issues such as:

- Upgrade of poor performance regulators;
- Installation of "drop-out" vessel at the Wallerawang POTS; and
- Installation of a flow meter for the Appin POTS Stage 2 upgrade.

JGN does not expect the capex allocation to decrease due to the increasing size and age of the network.

Minor Capital Secondary Regulator Stations (SRS)

This category is to replace SRS and secondary meter sets with an inlet pressure <1050kpa. JGN indicated that this work has been triggered by field investigations. It adopts a reactive approach based on its condition monitoring program. JGN believes that planned SRS replacement program will lead to a higher capex forecast.

Future capital works for replacing SRS include:

- SRS that has degraded over its lifetime;
- Difficulty accessing SRS due to development in the surrounding area;
- Reclassification of surrounding area as a high consequence area; and
- Safety issues when performing maintenance.

Minor Capital Primary Regulating Stations (PRS)

The capital allocation for this category is for the replacement of equipment in JGN's PRS. JGN said that the works are usually triggered from field investigations and are generally undertaken to correct safety and operability issues.

The future cost allocation is for the replacement of components such as valves, pressure regulators, over pressure protection equipment etc.

JGN also advised that over the last four years it had incurred an average of $0.9million per annum but its proposed capex is only $0.13million per annum. This reduction is due to its proposal to replace electrical and instrumentation at several of its PRS which should result in the lesser replacement of components.

Minor Capital Pipe works

The capex for this category is for reactive projects such as replacement of cathodic protection system and installation of bushfire valves. The bushfire valves are installed based on advice from Emergency Services in porches of residential dwellings.

In response to Zincara's comment on whether the cost should be capitalised, JGN advised that the cost covers the cost of replacing network components and does not include repair costs and have been capitalised in accordance with Australian Accounting Standards.

Minor Capital Washaway Works

This category is for projects that are required due to pipelines being exposed due to erosion and other associated activities. The works involves civil construction works to stabilise the ground supporting the pipework and, in some cases, to divert the water course to minimise further erosion. JGN said that it had identified 29 sites on its Southern and Northern truck mains that may require additional remediation works.

Notwithstanding the 29 sites, JGN said that it had only made provision to remediate one site per annum at a cost of $0.32million. It has based this on the average cost of two recent projects: $150,000 (Canoelands) and $400,000 (Hexham 350mm secondary mains washaway).

5.2.1 Conclusion

From the information above, Zincara acknowledges that such projects are of an ad hoc nature and can surface during the five year AA period. It is therefore reasonable to have an annual capex provision for such works. Using the four year average historical expenditure as the proxy for the forecast is not unreasonable given that all of the projects are not identified currently.

Zincara also notes that in Table 5-3, the forecast cost for the "Minor Capital Washaway Works" is not within the range of the four year average. JGN's explanation that it based the forecast cost on the average of two actual projects. Given that JGN has already identified 29 similar projects that may need remediation, Zincara accepts the forecast cost.

Zincara therefore recommends acceptance of the capex as prudent and efficient.

5.3 APPIN POTS UPGRADE STAGE 2

Since its 2020 Plan, JGN has changed its strategy for the Appin POTS from its proposed upgrade to installing a flow meter. The flow meter will allow JGN to determine the optimal time for the upgrade. The cost of the flow meter will be covered in the minor capital works TRS.

As the upgrade is no longer proceeding, Zincara will not be commenting further on the project.

5.4 INSTALLATION OF SECONDARY ISOLATION VALVE

In July 2018, an incident on the corner of Castlereagh St and Martin Place, Sydney CBD caused a gas escape which resulted in the evacuation of a large area of the CBD. Due to the specific location of the hit, any attempt to isolate the affected section of main using existing isolation valves would have resulted in the loss of supply to approximately 4,000 customers. As a result, gas was vented for almost 24 hours until the repair of the damaged main was completed. The investigation of the incident highlighted an issue regarding the effectiveness of the existing isolating valves in minimising interruption to gas customers.

Under the Gas Supply (Safety and Network Management) Regulations 2013, JGN is required to ensure that the Secondary Mains Network integrity complies with AS/NZS4645.1 and AS/NZS4645.2. As such, the Martin Place incident prompted JGN to carry out an investigation of the effectiveness of the number of secondary line valves in High Density Community Use (HDCU) areas with a potential for a loss of supply to over 1,000 customers. The key drivers to the investigations are:

- Minimise the hazards arising from uncontrolled gas escapes resulting from third party damage to an underground gas main by isolating the damaged section of mains.

- Limit the supply disruption to the community arising from isolation of the damaged mains.

JGN considered three options for this project and carried out a risk analysis using Jemena Group Risk Management Manual. A summary of the options, costs and risk outcomes are summarised in the table below.

Table 5-4; Options Summary ($2018)

Option	Options Name	Description	Cost -Capex	Risk Outcome
1	Maintain Status Quo	Risk to public safety and nearby properties will remain significant	Nil	Significant
2	Secondary line valves - Sydney CBD	The option reduces the risk of a gas escape and loss of supply within the Sydney CBD	$1.125M	Moderate

3	Secondary line valves - secondary network	This option aims to reduce the risk of a gas escape and loss of supply for the whole secondary network.	$3.825M	Low

(Source: JGN-RP-R-RAKS- Secondary Isolation Valves-Options Analysis-20200107-public)

JGN decided that option 1 was not acceptable and Option 3 the risk was already low. As such, JGN's preferred proposal is option 2: to install secondary line valves in the Sydney CBD.

5.4.1 Conclusion

Following the Martin Place incident which resulted in a shallow secondary main being damaged by a third party, JGN had reviewed the risk of the secondary mains and has proposed the removal of shallow secondary mains. Zincara has recommended acceptance of the shallow mains project which was accepted by the AER. Given that the risk of damage to the secondary mains has been lowered to "as low as reasonably practicable (ALARP)", is there a need for another project to provide further isolation just in case there is a third party damage to the secondary mains in the CBD.

JGN also believes that should a third party damage to the secondary mains in the CBD occur, there is every likelihood that that more than 1,000 customers would experience the loss of gas supply. This assumption has been used to justify the secondary valves project.

Zincara acknowledges that there has been one accident in Sydney CBD and although the issues related to the accident has been address, there is always a risk, be it small, that a third party damage can occur which could result in gas outages.

In addition, we are also aware that JGN has to comply AS/NZS 4645. AS/NZS4645.1 Appendix B which sets out the process for conducting a risk assessment requires that any identified failure event requires a severity class assigned to the event. The risk of loss of supply to over 1,000 customers is considered severe under the Table B1 Severity Table. JGN has used this criterion to determine whether it needs further isolation and as such we recommend accepting the project as prudent and efficient.

5.5 PATH VALVES, LOW, MEDIUM AND SECONDARY PRESSURE

In its first report, Zincara recommended acceptance of the replacement of the path valves as they are no longer functional. JGN highlighted that this replacement project has two parts:

- Low and medium pressure path valves - 10 valves at a cost of $0.1M ($2018) per annum.
- Secondary pressure path valves – 2 valves at a cost of cost of $0.08M ($2018) per annum.

5.5.1 Conclusion

Given that Zincara, in its first report, has accepted the replacement of the low and medium pressure path valves, we consider that the same rationale applies to the replacement of the secondary valves. As such, we recommend the replacement of the project as prudent and efficient.

5.6 SUMMARY

Facilities and Pipes consist of multiple projects to maintain the integrity and safety of the projects. Zincara believes that there is sufficient information in JGN's response to recommend acceptance of the remaining projects not accepted in Zincara's first report. Zincara therefore recommends the remaining projects as prudent and efficient. The table below is Zincara's recommended expenditure for the remainder of the projects.

Table 5-5:Recommended remaining facilities and pipes capex ($2018, 000)

Categories	2021	2022	2023	2024	2025	Total
Minor capital works - TRS	200	200	200	200	200	**1,000**
Minor capital works - PRS	120	120	120	120	120	**600**
Minor Capital works – SRS	400	400	400	400	400	**2,000**
Minor Capital works – pipework	250	250	250	250	250	**1,250**
Washaways	300	300	300	300	300	**1,500**
Total Minor Capital Works	**1,270**	**1,270**	**1,270**	**1,270**	**1,270**	**6,350**
Isolation of Secondary valves*	375	450	225			1,050
Path Valves - Low, Medium and Secondary Pressure	180	180	180	180	180	900
Total	**1,825**	**1,900**	**1,675**	**1,450**	**1,450**	**8,300**

To show the difference between the AER's draft decision and the total capex that Zincara is now recommending, we have prepared the table below.

However, Zincara has had trouble reconciling the revised cost for Facilities and Pipes category in the JGN-RP-Attachment 4.1-Capex Model-202001109 as Facilities and Pipes have been categorised as Other Capex which includes other costs not related to this category. As such, to provide a summary table of the Initial 2020 submission versus JGN revised submission to Zincara's recommendation, we have used the capex provided in Zincara's first report. The calculation of the costs shown in the table below are:

- JGN Initial is as Zincara's first report Table 7-22.
- AER-DD is assumed to be as per Zincara's recommended capex in Table7-22.
- JGN Revised is JGN's Initial minus Appin POTS cost of $455k as JGN advised it is not proceeding with this project.

A comparison of the recommended costs versus the AER's draft decision is provided below.

Table 5-6: Comparison of Recommended Capex versus AER's draft decision ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommend	Recommend – AER DD
Facilities and Pipes Upgrade	68,101	59,848	67,646	67,646	+7,798

Note: The AER advised that it had moved the capex for the Lane Cove to Willoughby project from the Augmentation section to the Facilities and Pipes section. This project was reviewed and recommended in Zincara's first report as part of Augmentation. As the reallocation of the capex does not alter our recommendation of the project, we have retained the capex in the Augmentation section and have not made further comment about the project in this report.

6. AUGMENTATION

6.1 INTRODUCTION

In its Draft Decision, the AER decided to accept $47.6million ($2019-20, direct cost) out of JGN's proposed capex of $60.8million. The AER had rejected JGN's capex for the Aerotropolis project of $15.2million on the basis of planning and asset scope uncertainty. The AER had proposed an initial capex of $2.1million as the initial funding for JGN to develop its detailed design and approval processes.

JGN had provided a response to the Draft Decision on the Aerotropolis and has also added an additional augmentation project: the Malabar biomethane project. JGN said that this new augmentation is to build a secondary main to the Malabar Sewage Treatment plant which will allow renewable gas to be injected into the network.

In its first report, Zincara also recommended that JGN provided updated cost estimates for three projects:

- Cecil Park;
- Lidcombe CBD and
- Menangle Park including an update of the capital contribution.

In its response to the draft decision, JGN advised that there are no updated information on Cecil Park and Lidcombe CBD.

In relation to Menangle Park, JGN said[13] that the cost has increased from $ [redacted] to $ [redacted] ($2018). The project is to commence in 2020 and as such the cost is divided into $ [redacted] (RY2020) and [redacted] (RY2021). The capital contribution has also changed from $ [redacted] to $ [redacted]. JGN had provided a PEM[14] for Menangle Park detailing the cost.

Given that there is only a marginal change in the cost for Menangle Park, Zincara recommends accepting the capex of $7.46M. Zincara's first report had recommended a capex of $6,886 ($2018, 000)[15] for RY2021. The revised capex of $7,084($2018, 000) means that there is an increase of $198 ($2018, 000).

JGN also advised that its Bankstown augmentation in 2012-22 is no longer required as it is able to increase the capacity of the network.

Zincara analysis and conclusion for the Aerotropolis and the Malabar Sewage Treatment plant are discussed below.

[13] JGN-RP-Attachement 4.2 – Response to the draft decision – capex-20200109-Confidential
[14] Note: In JGN-RP-13003925-Menangle Park-PEM-20191211-confidential, the cost of the project is shown as $ [redacted]. All other spreadsheets have shown the capex as $ [redacted].
[15] Table 8-5 of Zincara's first report.

6.2 AEROTROPOLIS

In its response on the Aerotropolis, JGN said that since it lodged its 2020 plan, it has been working with other utilities (eg. Sydney Water, Endeavour Energy and Transgrid) to underpin the infrastructure. Its response has been divided into following:

1. Reasons why it is not able to seek additional allowance after the final determination;
2. Basis for its demand forecast;
3. Options being considered;
4. Update of its cost estimates; and
5. Inconsistency in the AER's draft decision

This report will only discuss items 2-4 only as items 1 and 5 are outside the scope of the technical review.

6.2.1 Demand Forecast

JGN said that its demand forecasts for the Aerotropolis are based on a number of reports including:

- NSW Government, Western Sydney Aerotropolis, Land Use and Infrastructure Implementation Plan, Stage 1: Initial Precincts, August 2018
- NSW Government, Western Sydney Aerotropolis Plan, December 2019 and
- Western City & Aerotropolis Authority, *Delivering The Western Parkland City*, 2019.

Details of the next step are provided in the draft Sydney Aerotropolis Plan. The initial precincts (including the Aerotropolis Core and the Northern Gateway) will be rezoned in mid-2020 with precinct plans finalised by late 2020. Development applications will then follow. Only after the development applications are approved will JGN expect to see requests to connect from developers.

JGN has also had discussion with the developer for the approved Sydney Science Park which has been rezoned. It is expected[16] that there will be [redacted] homes, [redacted] m^2 of retail and [redacted] m^2 of employment. [redacted].

In addition, Sydney Water has also an interest in connecting its Water Factory[17] to the gas network. JGN indicated that based on the projected load, it estimates that a capital contribution is required for the gas connection. Both the capex and the capital contribution are included in its Revised 2020 Plan.

[16] JGN-RP-Attachment 4.2-Response to the draft Decision-capex-20200109-Confidential
JGN-RP-Aerotropolis-Sydney Science Park-Letter of Support-20291212
[17] Water Factory is a wastewater treatment plant which will service the new Western Sydney Airport and the Western Sydney growth demand.

JGN had also provided NPV calculations of various residential penetration rates showing that that in all cases, the revenue exceeded the capex, as such a capital contribution is not required.

Table 6-1: NPV Aerotropolis across various penetration rate scenarios ($2018, $M)

Penetration	80%	90%	94.3%	100%
Aerotropolis Core	2.4	3.1	3.5	3.9
WS Airport and Sydney Science Park	4.4	5.8	6.5	7.3
Water Factory	NA	NA	NA	NA

(Source: JGN-RP-Attachment 4.2-Response to the draft decision -capex -20200109-Public)

6.2.2 Options Considered

JGN had considered four options for this project as detailed in the table below. JGN also said that to develop the options, it had taken into account the route, timing and pipe sizes. It had only been able to identify options and utilities synergies for the Airport and the Science Park only. The Aerotropolis Core and the Water Factory can only be supplied with gas mains on the most direct routes.

JGN also highlighted that it is not always possible to align with other utilities due to timing issue. In the case of the Science Park where customers are connecting in December 2021, JGN will need to lay mains to supply gas ahead of other utilities.

The options summary is provided below.

Table 6-2: Aerotropolis Option Summary

Option	Option Name	Gas Delivered Date	NPV ($m 2018)	Augmentation Capex $M 2018)
1	Defer Investment until 2026	RY26	-4.46	18.7
2	Gas available for first dwellings and businesses	AP: RY25 SP: RY 23	9.92	13.7
3	Same as option 2 except delay gas to Sydney Science Park	AP: RY25 SP: RY 23	7.28	14.4
4	Supply timeframe as Option 2 but alternative supply route for Science Park from the north	AP: RY25 SP: RY 23	4.23	17.5

(Source: JGN-RP-Aerotropolis-Options Analysis-20191220)

JGN decided on Option 2 which provides the highest return with the least cost option.

6.2.3 Updated Cost Estimate

JGN indicated that its cost estimate was based on similar projects. It had used its Project Estimation Methodology to develop the cost estimates[18] for the following:

[18] JGN-RP-13033942-Western Sydney Airport and Sydney Science Park-PEM-20191211-public
JGN-RP-13033933-Aerotropolis Core-PEM-20191211-public

- Western Sydney Airport and Sydney Science Park
- Aerotropolis Core
- Water Factory

JGN has also indicated that its costs have taken into account synergies such as common trenching and shared restoration. However, the tight time frames may result in some loss of synergies. It had also identified that laying the mains to the airport and the Sydney Science Park together will reduce the costs and as such have combined the construction of the two mains into one project.

The table below shows its original 2020 Plan and the revised plan.

Table 6-3: Aerotropolis Cost Estimate ($2018, $M)

	2020 Plan	Revised 2020 Plan
Aerotropolis Core	5.4	3.8
Sydney Science Park	5.7	7.8
Airport	3.3	
Water Factory	NA	2
Total	**14.4**	**13.7**

(Source: JGN-RP-Attachment 4.2-Response to the draft decision – capex -20200109-Public)

Details of the project capex timetable is provided in the table below.

Table 6-4: Aerotropolis capex timetable

	RY2021	RY2022	RY2023	RY2024	RY2025	Total
Aerotropolis Core	270	3,570				**3,840**
Sydney Science Park and airport	480	7,346				**7,826**
Water Factory			188	1,893		**2,081**

(Source: JGN-RP-Attachment 4.1-Capex Model-20200109-Public)

6.2.4 Conclusion

In its first report, Zincara concluded that it considered that the likelihood of Aerotropolis proceeding is high. It also agreed that it is prudent to have the gas supply infrastructure for the various precinct in place during the early stages of the development of the Aerotropolis. However, with the lack of detailed scope and project estimates, Zincara recommended an initial funding of $2.0million to initiate the project.

In its revised submission, JGN had detailed where it had obtained its forecast and has provided NPV calculations to show that with the various levels of penetration, the project was still viable (refer Table 6-1). In addition, it had also considered four options and had decided on the option that has provided the highest return and the least cost (refer Table 6-2).

JGN-RP-10049740-Water Factory-PEM-20191216-public

JGN had added the gas connection to the Water Factory[19] in its revised 2020 capex. It had based its construction timetable in time for the Water Factory to service the new Airport in 2024.

In relation to the design of the gas infrastructure, JGN had described how it had modelled[20] the gas supply to the respective sites (through the use of its Synergi modelling) to ensure it had the optimal configuration and has based its project scope on the modelling.

It had also signed a Memorandum of Understanding (MOU) with other relevant entities[21] to ensure that any synergies can be shared. JGN has also indicated that it had factored these synergies into its cost estimates and highlighted that JGN's tight timetable may reduce some synergies. It has also indicated that the cost estimates have been based on similar projects.

Given the above, Zincara has concluded that the costs is the best estimates available and recommends the project be accepted as prudent and efficient.

6.3 MALABAR BIOMETHANE SEWAGE TREATMENT PROJECT

6.3.1 Introduction

JGN is proposing a project to deliver Renewable gas to customers. The key drivers for this project is JGN's concern about the threat of losing customers that are exploring decarbonisation options.

Australia currently does not have Renewable gas injected into its gas networks. This project will be the first of its kind in Australia to supply gas customers with Renewable gas from the Malabar Biomethane Sewage Treatment facilities.

The Sydney Water Malabar Sewage Treatment plant currently produces approximately 1,500Nm3/hr of biogas for electricity generation. Sydney Water proposes to upgrade the facility to convert the Biogas into Renewable gas and would have the capacity to inject up to 268 TJ/yr of methane into JGN's network.

JGN proposes[22] to construct [redacted] secondary main to the Malabar Sewage Treatment plant to allow renewable gas to be injected into the secondary mains network. The cost of the project is $2.771 million ($2018, direct).

[19] JGN-RP-Aerotropolis-Sydney Water-Letter of Support-20191219
[20] JGN-RP-Aerotropolis-Options Analysis-20191220-Public
[21] JGN-RP-Aerotropolis-MOU signed-20191211-confidential
[22] JGN-RP-13046264-Malabar Biomethane Project-Appendix C-PEM-20191211-Confidential

6.3.2 Customer Consultation

JGN advised it had been in consultation with its customers and a number of them have sought decarbonisation of their existing energy supply to meet their sustainability targets. The interested customers are detailed[23] below:

Interface Carpets
It proposes a decarbonisation target by 2020. At the time that Interface Carpets contacted JGN, it was investigating the potential of electric boilers for their manufacturing. Interface Carpet provided a letter[24] of support for this project.

City of Sydney
It has a decarbonisation target for their own energy by 2030 and the City of Sydney itself by 2050. JGN said that this would result in the early reduction on natural gas for Sydney of Sydney's buildings and further reduction of the use of natural gas across the region following this. It has also provided a letter of support[25] for the project.

Dexus
Dexus has a net zero emissions target by 2030 and proposes to steadily phase out onsite natural gas and diesel and replace gas appliances with electric equivalents (Dexus 2018). It has also provided a letter of support[26] for the project.

JGN also referred to the Green Star Certification Scheme managed by the Green Building Council. As part of the Scheme, the Council issues a tool to determine the star rating of buildings. Its new tool (to be issued in 2020) disincentivises the installation of gas appliances and actively encourages the removal of gas appliances. JGN said that whilst the roadmap applies to new registrations, if a new fit occurs in the existing building, it will need to comply with the roadmap.

6.3.3 Renewable Gas Pathway

JGN advised that there is no Renewable Gas injected into the gas networks in Australia as such there needs to a process to enable Renewable Gas to be made widely available to customers. They include the following:

- Establish certification system for Renewal Gas
- Encourage investment in Renewable Gas Projects
- Establish incentives
- Develop technical standards and processes

JGN believes that this project will assist in the development of steps that needs to be taken which will ultimately reduce the cost to supply Renewable gas to customers. Further details

[23] JGN-RP-130-46264-Malabar Biomethane Project-OptionsAnalsysis-200191220-public
[24] JGN-RP-13046264-Malabar Biomethane Project -Appendix D – Interface Carpet-Letter-20191022-Confidential
[25] JGN-RP-13046264-Malabar Biomethane Project -Appendix E – City of Sydney-Letter-20191213
[26] JGN-RP-13046264-Malabar Biomethane Project -Appendix F – Dexus-Letter-20191219

of JGN's comments are available in the Options Analysis titled "JGN-RP-13046264-Malabar Biomethane Project-Options Analysis-20191220-public".

6.3.4 Project Outline

As mentioned above, the Sydney Water Malabar Sewage Treatment plant proposes to upgrade all of this Biogas to Renewable Gas which could produce up to 268TJ/yr of methane into the network.

Sydney Water has also further plans to upgrade the plant to process other organic material that could expand the capacity of the network

As its key driver is to avoid losing customers who are considering decarbonising JGN considered three options:

1. Maintain status quo -loose customer revenue to electrification
2. Connect the Sewage Treatment plant to the secondary network
3. Connect the Sewage Treatment plant to the local distribution network.

Option 1 Maintain Status Quo

JGN has based its NPV on the cost of loss of customer demand until 2050. The assumption that JGN used are:

- Interface Carpets – have a decarbonisation target by 2020 but they are modelled to eliminate gas demand by 2028.
- City of Sydney – has a decarbonisation target by 2050 and so such JGN has based its decreased demand to occur by 2050.
- Dexus – has a decarbonisation target by 2030. JGN has projected that it will not be taking gas by occur in 2035.
- GreenStar – is modelled based only on no gas consumption from currently certified buildings.

Option 2 Connect the Sewage Treatment plant to the secondary network

This option involves the connection of the Sewage Treatment plant to the secondary network. It is assumed that there the customers will continue to use gas. JGN said that the cost of the project has been subject to a FEED cost estimate.

Option 3 Connect the Sewage Treatment plant to the local distribution network

Option 3 is similar to Option 2 except that the pipeline will be connected to the local gas network and as such can be constructed using PE pipes. This will reduce the cost to 80% of

Option 2 but the pipeline can only supply 47TJ/a due to its lower pressure. JGN has assumed[27] that there will be no loss of demand from Interface Carpet and only partial loss from the City of Sydney. It expects to lose the gas demand from Dexus.

Results of NPV

The results of the NPV are shown in the table below.

Table 6-5 NPV Options Biomethane Project

Option	Final Annual Revenue Loss	Capex	NPV	Incremental NPV
1	$2.1 M	$0.0 M	-$22.7 M	$0.0 M
2	$0.0 M	$2.5 M	-$2.5 M	$20.2 M
3	$1.9 M	$2.0 M	-$21.3 M	$1.4 M

(Source: JGN-RP-13046264-Malabar Biothmethane Project-Options Analysis-20191220-public)

JGN has decided on option 2 which gives the lowest NPV.

The project capex timetable is shown in the table below.

Malabar Biomethane project capex timetable

	RY2021	RY2022	RY2023	RY2024	RY2025	Total
Malabar Biomethane	272	2,449	0	0	0	**2,721**

(Source: JGN-RP-Attachment 4.1-Capex Model-20200109-Public)

6.3.5 Conclusion

Zincara has reviewed the Project Estimation Model (PEM) for this project. A summary of the cost is shown in the table below.

Table 6-6: Project Cost Summary ($2018)

Description	Costs 000
Internal labour and plant	[redacted]
Materials	[redacted]
Subcontractors	[redacted]
Risk Allocation	[redacted]
Total	[redacted]

(Source: JGN-RP-13046264-Malalbar Biomethane Project Project – Appendix C-PEM-20191211-Confidential)

Zincara notes that the estimate is based on a high level desktop review plus site visits. The subcontractor's cost is based on Zinfra's estimate and the material cost is based on historical cost. Zincara therefore considers the cost to be reasonable.

Notwithstanding that we considers the cost to be reasonable, we would like to highlight a number of issues:

[27] JGN-RP-13046264-Malabar Biomethane Project-Options Analysis-20191220-public

6. The pipeline is to be constructed in 2021/22. There is no indication that Sydney Water will be ready to convert Biogas to Renewal Gas by then or that there will be commercial arrangements between the parties to take Renewal Gas at that time.
7. There is no assurance that this conversion of Biogas to Renewal Gas will meet the AS4645-11 Specification for General Purpose Gas so that it can be injected into the network.
8. The Renewal gas industry is still in its infancy and is still to develop a clear roadmap for its utilisation. This could change the viability and timing of the project.
9. Whilst the three companies have provided letters of support for being able to access biogas and as such, Renewal gas, there are no firm commitment that they will use the gas at any cost.
10. Other gas users could take up the spare capacity of Renewal gas, but this could change the results of the NPV.

Zincara has concluded the cost to be efficient but given the issues above, we are not convinced that a prudent service provider will sought funding for this project through the AA process.

6.4 SUMMARY

In its response to the draft decision, JGN advised that there are no updated information on Cecil Park and Lidcombe CBD except for Menangle Park. Based on the response for Menangle Park, Zincara recommends accepting the capex of $7.46M for the project with a capex of $7.084M ($2018) for RY2021.

Aerotropolis

In its first report, Zincara concluded that it considered that the likelihood of Aerotropolis proceeding is high. However, with the lack of detailed scope and project estimates, Zincara recommended an initial funding of $2.0million to initiate the project.

In its revised submission, JGN had detailed where it had obtained its forecast and has provided NPV calculations to show that with the various levels of penetration, the project was still viable (refer Table 6-1). JGN had also added the gas connection to the Water Factory[28] in its revised 2020 capex. It had based its construction timetable in time for the Water Factory to service the new Airport in 2024.

JGN had designed the gas supply using industry based software and had also signed a Memorandum of Understanding (MOU) with other relevant entities[29] to ensure that any synergies can be shared.

Given the above, Zincara is recommending the project to be prudent and efficient.

[28] JGN-RP-Aerotropolis-Sydney Water-Letter of Support-20191219
[29] JGN-RP-Aerotropolis-MOU signed-20191211-confidential

In relation to the Malabar Biomethane Water Treatment project, we consider the project cost to be reasonable but is unable to recommend the project as prudent based on the issues identified.

A comparison of the recommended costs versus the AER's draft decision is provided below.

Table 6-7: Comparison of Recommended Capex versus AER's draft decision ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommend	Recommend – AER DD
Augmentation Capex	57,531	45,169	58,874	56,153	+10,984

7. MAINS REPLACEMENT

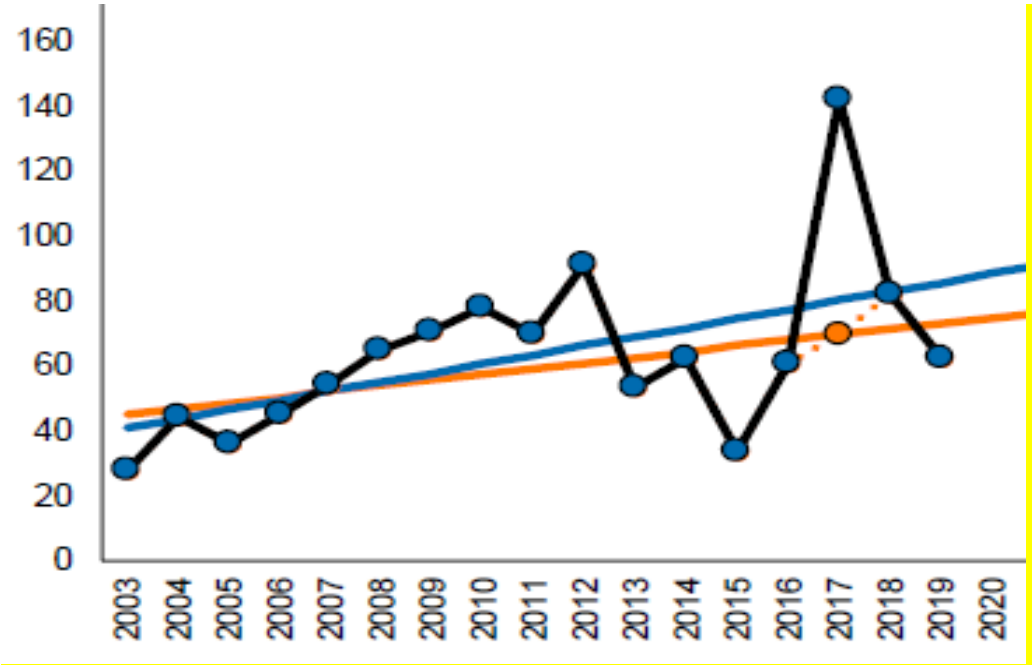
7.1 INTRODUCTION

The AER draft decision accepted all of the JGN's proposed mains replacement projects except for Newcastle which the AER deferred by one year. JGN's response[30] said "Delaying the project one year will cost customers over $1M as the financing cost savings from deferral are more than outweighed by the additional future opex costs. Further delaying the project also increases safety risks, as given the state of the network we cannot continue to effectively manage the leaks, and will leave our customers in the Newcastle area continuing to deal with lower levels of amenity as a result of gas smells and the disruption of reoccurring leaks and repairs in their local streets."

7.2 ASSET CONDITION

JGN's response to the AER draft decision includes the following figure which includes actual leaks during 2018 and 2019.

Figure 7-1: Leaks in the Newcastle area



(Source: JGN-RP-Attachment 4.2: Response to the draft decision-capex-20200109-public: figure 6-1)

The leaks data shows that there has not been any appreciable change in annual leaks since around 2009, apart from a surge in 2017. This would suggest that prioritisation for a mains replacement of the Newcastle network hasn't appreciably changed during that time. JGN's

[30] Attachment 4.2: Response to the AER draft decision: page 63

comments relating to difficulty of leak repair, smell of gas and customer dissatisfaction are therefore likely to have been evident for a number of years. JGN propose to initiate detailed planning in RY2022 with field rehabilitation activity commencing from RY2023. Zincara considers that the AER draft decision of rehabilitating approximately 65 kilometres during the forecast period would achieve noticeable improvements in the number of leaks required to be managed and an improved level of amenity for customers.

7.3 MAINS REPLACEMENT PORTFOLIO

JGN's 2020 Plan shows that historically they have not spent their AER approved allowance for mains replacement:

Table 7-1: Mains Replacement Capex ($2020, Millions)

	2010-15		2015-20		2020-25
	Allowance	**Actual/Est.**	**Allowance**	**Actual/Est.**	**Plan**
Mains Replacement	24	21	75	34	55

(Source: JGN 2020 Plan: table 5.1)

JGN have said that they expect to complete approximately 85 kilometres during the current RY15-20 period, with the prior period completing a much lower level of replacement. The 2020 Plan proposes a program to rehabilitate 146 kilometres during the forecast period, while the AER draft decision proposed approximately 105 kilometres, of which Newcastle would be approximately 65 kilometres. Compared to the 2015-2020 period, the draft decision proposes a 23% increase in kilometres rehabilitated. Zincara considers that the draft decision provides a significant yet manageable increase in mains replacement, while ensuring that the impact on the overall program of cast iron and unprotected steel replacement is negligible.

At the same time, the draft decision provides the Newcastle MP1 mains replacement with a substantial 65 kilometres during the forecast period. As has been demonstrated in the past, JGN will prioritise its projects and in this regards the forecast period is no different. When considered at a portfolio level, JGN can elect to initiate the Newcastle project at a time that suits its works program ensuring benefits to customers and managing the risks. Also achieving a larger mains replacement program outcome than has been the case for a long period of time.

7.4 NPV analysis

JGN have updated leak forecasts for RY18 and RY19 in their NPV analysis and compared the rehabilitation project starting in RY2022 or RY2023. The results of the analysis show a lower cost outcome by starting the project at the earlier date. Leakage due to unaccounted for gas (UAG), which JGN has estimated at [redacted] %, has the most significant impact with an estimated expenditure of approximately $1.8 [31] million per year. The UAG cost impact in any comparative NPV analysis is therefore expected to show that the earlier project commencement will yield improved NPV result than a later period.

JGN's priorities have not seen it necessary to initiate this project at an earlier time, although the NPV analysis is likely to have shown the benefit of doing so. As noted above JGN has not

[31] JGN-RP-10022511-Newcastle with updated leakage data-NPV Model-20191211-public

spent its mains replacement allowance over the last two access arrangement periods, seeking to reduce its program rather than bring forward large projects such as Newcastle.

The AER draft decision approved a capex of $34.386 million ($2018), and approximately 105 kilometres, both larger than actual outcomes over the last two access arrangement periods. When considered as a portfolio of projects, there is an opportunity for JGN to initiate the Newcastle project at a time determined by them that can largely negate the NPV differences shown in its NPV analysis.

7.5 CONCLUSION

Zincara recommends no change to the capex forecast provided in the AER draft decision, as shown in the following table:

Table 7-2: Mains Replacement capex forecast ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommended
Kurri Kurri	3,470	3,470	3,470	3,470
Matraville	9,408	9,408	9,408	9,408
Mittagong	1,237	1,237	1,237	1,237
Newcastle	21,307	13,353	21,307	13,353
Bankstown	326	326	326	326
Haberfield	341	341	341	341
Minor mains renewal	1,500	1,500	1,500	1,500
Minor connection renewal	4,750	4,750	4,750	4,750
Total	**42,340**	**34,386**	**42,340**	**34,386**

(Source: Capex model: Forecast)

In its initial report, Zincara recommended a capex of $13.353 million for the Newcastle rehabilitation project, resulting in a reduced rehabilitation of approximately 65 kilometres compared with the 104 kilometres proposed in JGN 2020 Plan.

When considering the overall program of rehabilitation projects, Zincara's recommended works would result in approximately 105 kilometres being completed, compared with 85 kilometres anticipated to be completed in the current period, a 23% increase in kilometres.

The updated leaks data shows that the number of leaks in the Newcastle MP1 networks has been around 60 – 80 per year since about 2009, apart from a significant increase in 2017. During that time JGN has managed priorities, and customer frustrations, within the Newcastle network and across its entire networks in such a way that it has not deemed it necessary to initiate the rehabilitation project at an earlier time. JGN proposes to commence detailed planning in 2022, with field activities commencing in 2023, still some years away.

Zincara considers that its recommended mains replacement capex and kilometres for the forecast period can deliver benefits for customers and reduce leakage rates in the Newcastle MP1 network, with a capex allowance of $13.353 million and 65 kilometres approved in the AER draft decision. Within the approved portfolio of rehabilitation projects, the Newcastle

field works can be initiated at a time determined by JGN, which can largely negate the NPV differences outlined by JGN, as well as deliver customer benefits and manage risks.

With an overall mains replacement portfolio of $34.4 million and approximately 105 kilometres, the program is in excess of that achieved during the current and previous regulatory periods.

For consistency with the other sections, we have provided a comparison of the recommended costs versus the AER's draft decision is provided below.

Table 7-3: Comparison of Recommended Capex versus AER's draft decision ($2018, 000)

	JGN Initial	AER - DD	JGN Revised	Zincara Recommend	Recommend – AER DD
Mains Replacement Capex	42,340	34,386	42,340	34,386	-

8. RELOCATIONS

8.1 INTRODUCTION

JGN advised that from time to time, government authorities or private landowners require JGN to move its gas mains or facilities to enable the authority to perform works such as re-alignment or widening of road or for landowners to carry out their activities. JGN said in cases when the original pipe construction was carried out without a right guaranteeing the location of JGN's assets, JGN is required to relocate the mains at its own expenses.

In its draft decision, the AER decided that the cost of $0.5 million (2019-20, direct cost) for 2019-20 should be used to estimate the annual cost for the forecast period, resulting in a total cost of $2.6 million (2019-20, direct cost) for the five year forecast period. The AER also sought clarification that any past expenditure did not overlap with any shallow mains requirements.

JGN said that its costs fluctuate year-to-year and believes that there is no declining trend in the costs given the ongoing major infrastructure projects in NSW. It provided a table showing its capex for the past three regulatory periods. JGN also said that it has based its annual forecast expenditure on its RY2015-20 actual expenditure.

Table 8-1: Average Annual Relocation Spend ($2020, $M, direct)

	2005-10	2010-15	2015-19	2020 Plan Forecast	AER Draft Decision
Relocations	**0.53**	**1.35**	**0.77**	**0.74**	**0.53**

(Source: JGN-RP-Attachment 4.2-Response to the draft decision-capex-20200109-Public)

JGN also confirmed that where it has rights around the location of the assets, it recovers the cost of the relocation from the authority or landowner. It has not included any capex for recoverable works in its 2020 forecast. It also clarified that there is no overlap between past expenditure and its shallow mains requirements.

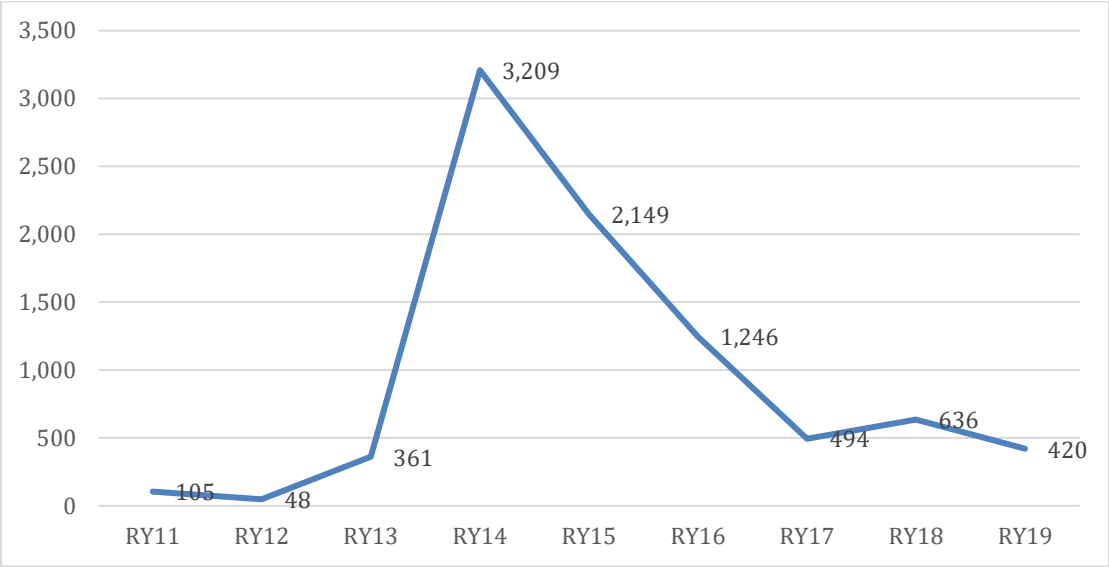
8.2 CONCLUSION

Zincara understands that under the Conveyancing (General) Regulations 2018 Schedule 3, JGN is listed as a prescribed authority for the purpose of creating easements thus giving JGN certain rights to location of the assets. It is therefore expected that where possible, JGN would ensure that its assets are installed in easements that give JGN location rights. However, Zincara also accepts JGN's advice that under certain circumstances, JGN has constructed its networks in positions that do not guarantee its location rights. In those circumstances, JGN is expected to relocate its gas network when instructed by the authority or the land owner.

It is unclear whether JGN is still continuing with its practice of locating its infrastructure in locations where it does not have location rights but we believe that the infrastructure that needs to be relocated would mainly be those that have been installed in the past. As such, during redevelopment of the related areas, these legacy mains need to be relocated or abandoned.

The historical relocation cost for the period RY11 to FY19 is shown in Figure 8-1.

Figure 8-1: Historical Relocation Capex (nominal, $000)



(Source: AER Summary from RIN data)

Figure 8-1 shows that there was a significant spike for the period RY14 -RY16. Prior to that period, there had been some nominal costs and the period RY17 to RY19 shows a more consistent annual expenditure. This spike could be due to the increase in infrastructure development in NSW.

JGN said[32] that it has forecasted the 2020-25 costs consistent with the 2015-20 actuals. This means that RY16 cost of $1.2million (nominal) would be included in JGN's calculations. It also said[33] that given the forecast increase in major infrastructure projects in NSW, it does not expect that the relocation costs will fall. However, JGN has not highlighted any specific project that will result in JGN having to relocate some of these mains which could result in the spike experienced in the period RY14-16. Given that the relocation of the gas infrastructure is specific to areas where JGN does not have location rights, ongoing infrastructure projects may cause some relocations but not necessarily in the same order of magnitude as for the period RY14-16.

As RY16 cost of $1.2million (nominal) is more than 50% of the cost for the ensuring years, we consider this cost to be an outlier of the current AA period and should not be included as part of the calculations for the annual cost for the forecast period. A reasonable estimate should be an average of the costs for the period RY17-19.

[32] JGN-Attachment 5.1-Capital Expenditure-20190630-Public

[33] JGN-RP-Attachment 4.2-Response to the draft decision-capex-20200109-Public

Table 8-2 Calculation of Forecast Annual Capex ($2018, 000)

	RY17	RY18	RY19	Total	Average annual Capex
Factors Nominal to Real 2020 End Year*	1.0169	1.0000	0.9819		
Nominal Capex (000)	494	636	420		
Real Capex ($2018 000)	502	636	412	1,550	517

Note* The factors have been sourced from JGN-RP-Attachment 4.1-Capex Model-20200109

Zincara therefore considers that a reasonable annual expenditure is $517 ($2018, 000).

9. CAPITAL EXPENDITURE SHARING SCHEME

9.1 INTRODUCTION

In its Draft Decision, the AER has generally accepted JGN's proposal to introduce a Capital Expenditure Sharing Scheme (CESS). The AER has also requested that a number of modifications to be carried out on JGN's CESS proposal. The items include:

- Revise the proposed targets in Schedule 9 to remove outliers
- Review the proposed targets used internally
- Further justify using an 80-100% range for the contingent payment mechanism rather than 90-100%.

Zincara's response to the modifications are detailed below.

9.2 PROPOSED TARGETS

In the Draft Decision, the AER sought that JGN review its proposed targets against its own internal targets for each measure and remove any outliers. In its response[34], JGN said it has carried out the following:

- Removed the outlier for its unplanned SAIDI
- Proposed a new paragraph that removes observations from the asset performance index that are materially affected by events outside of JGN's control.
- Compared its estimated targets against JGN's internal target where relevant.

9.2.1 Removing outliers

JGN said that whilst it understands the need to remove outliers, it believes that there needs to be some consistency between how performance targets are set and how actual performance is measured. It advised that the outlier in the unplanned SAIDI highlighted in Zincara's initial report was as a result of a Blue Mountain bushfire which affected over 760 customers with over 160,000 customer hours off supply. JGN therefore proposed the following:

- Outliers are removed when setting performance targets;
- Material events outside of JGN's control are adjusted for when measuring actual performance.

[34] JGN-Attachment 11.1-Response to draft decision-CESS-January 2020

JGN provided a table showing the performance targets before and after removing the outlier.

Table 9-1:Performance target adjusted for outlier

Measure	2020-25 AA Proposal	Outlier-Adjusted Target
Unplanned SAIFI	3.33	3.33
Unplanned SAIDI	40.95	13.07
Mains and services leaks	0.16	0.16
Meter leaks	8.15	8.15
Poor quality supply	0.92	0.92
Estimated meter reads	5.93%	5.93%

(Source: JGN-Attachment 11.1-Response to draft decision-CESS-January 2020)

To ensure consistency, JGN proposed adding the paragraph (J) to Schedule 9 of the AA:

The arithmetic average calculated in paragraph (b) will be adjusted to remove the impact of material events that are outside of JGN's control such as natural disasters (e.g. the October 2013 Blue Mountains bushfires, or major flooding) or third party damage to the pipeline (e.g. those that lead to 10,000 or more hours off supply). For instance, if an annual observation is so affected, then it will be adjusted to remove the reasonably estimated impact of such an event (i.e. specified in hours).

9.2.2 Conclusion

Zincara believes that the performance targets should be set at a level consistent with normal operating conditions and not include outliers in the targets. For the next AA period, JGN has adjusted the SAIDI target so that the 2013 incident is not included in the SAIDI target. JGN also proposed that the only outlier to be excluded is that for SAIDI.

However, we are of the view that since the CESS initiative is only commencing in the next AA period and there may be future circumstances that are unforeseen currently, it would be more prudent to not enshrine the definition of outliers in Schedule 9. The matter could be reviewed once the actual performance is known in five years time.

9.3 COMPARING TO INTERNAL TARGETS

In the draft decision, the AER recommended that JGN reviewed the performance targets against its internal targets to ensure that the future targets do not inadvertently lower performance. This recommendation was based on Zincara's advice.

JGN expressed some concern about Zincara's advice and the use of internal targets but said that for completeness, it had compared the CESS performance targets against its internal targets. The comparison is shown in the table below.

Table 9-2:Performance Targets compared to internal targets

Measure	Actual Performance*	Internal target	Commentary
Unplanned SAIFI	3.33	N/A	JGN does not have a comparable internal target.
Unplanned SAIDI	13.07	11.3	JGN said that the internal target reflected its ambition at one point in time.
Mains and services leaks	0.16	N/A	JGN does not have a comparable internal target.
Meter leaks	8.15	N/A	JGN does not have a comparable internal target.
Poor quality supply	0.92	1.40	JGN's internal target is higher than the historical data.
Estimated meter reads	5.93%	5.00%	JGN said that recent experience raises doubts about its attainability.

(Source: JGN-Attachment 11.1-Response to draft decision-CESS-January 2020)
Note: * Actual Performance column is notated as Outlier-adjusted target in JGN's document.

9.3.1 Conclusion

JGN has provided a comparison in the performance targets in Table 9-2 which shows that some of the proposed targets are not measured internally and for those that have internal targets (Unplanned SAIDI, poor quality supply and estimated meter reads), the difference is not significant to the extent that you would change the performance targets.

Given that the next AA period is the commencement of the CESS, Zincara recommends accepting the actual results as the performance targets.

9.4 CONTINGENT PAYMENT MECHANISM

The AER recommended that JGN consider why its proposed contingent payment factor (CPF) of 80%-100% should not be 90%-100%. The sliding scale of 80%-100% means that the sharing scheme decreases as the measured performance declines and ceases at 80%.

JGN said that the sliding scale of the CPF was to recognise that there are factors outside its control such as weather, third party damage and a raft of issues such as leaks, poor quality of supply and estimated meter readings.

JGN said that its proposed range was developed to be consistent with:

- CESS approved for the Victorian gas distribution businesses; and
- Historical performance

9.4.1 Victorian CESS

The AER accepted the 80%-100% for the Victorian gas distribution businesses. JGN said that the 80% was accepted after the Victorian gas distribution businesses revised their range from 60% to 80%.

9.4.2 Historical volatility

To demonstrate the historical volatility, JGN carried out the following for each measure:

- Calculated the five year historical average which will form the basis of the forecast performance target.
- Calculated the standard deviation (σ) of the sample data to show the variation in the data.
- Calculated the coefficient of variation which shows how the sample data varies from the average in percentage.
- Estimated the weight for each measure so that the highly valued measures are given more influence.
- Multiplied the weight for each measure with coefficient of variation.
- Calculated the weighted coefficient of variation.

Details of the calculations are provided in the table below.

Table 9-3:Measures Historical Volatility

Measure	Five Year Average	Standard Deviation (σ)	Coefficient of Variation (CV)*	Weights	Weighted CV
Unplanned SAIFI	3.33	0.36	10.83%	10%	1.08%
Unplanned SAIDI (bracketed value is if outlier removed)	40.95(13.07)	62.56 (61.4)	152.77% (46.99%)	10%	15.27% (4.70%)
Mains and Services leaks	0.16	0.01	9.06%	30%	2.72%
Meter leaks	8.15	1.55	19.17%	10%	1.92%
Poor quality supply	O.92	1.25	27.24%	30%	8.17%
Estimated meter reads	5.93%	2.66%	44.83%	10%	4.48%
Weighted average					**33.65% (23.07%)**

*Calculated by the Standard Deviation (σ) divided by the five year average
(Source: JGN-Attachment 11.1-Response to draft decision -CESS-January 2020)

9.4.3 Conclusion

In relation to consistency with the AER's decision for the Victorian CESS, Zincara would like to highlight JGN's comments in its initial submission[35]:

"Index measures, targets and weights in the contingent payment index that are fit-for-purpose for our pipeline services in NSW. …….the Victorian CESS took account of the Victorian GDB's operating environment. Our CESS should similarly take account of our operating environment in NSW.

Scaling thresholds in the contingent payment factor that consider our historical performance on the chosen measures."

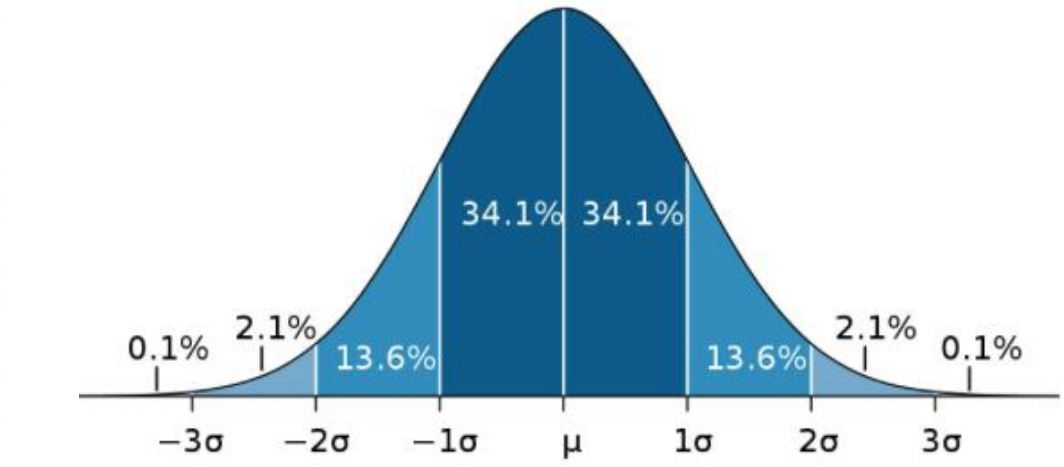
We concur with this proposition that the measures and factors should be specific to NSW. As such, we do not believe that JGN comments in Section 9.4.1 regarding consistency with Victoria should be a factor in deciding the appropriateness of the sliding scale.

On the matter of historical variation, JGN has calculated the historical average which will be used to set the performance measure. JGN also calculated the standard deviation (σ) and used this data to finally determine the weighted average coefficient of variation (discussed in Section 9.4.2) of 23%.

Our view on the matter is discussed below.

For illustrative purposes, we have provided Figure 9-1 to show that for sample points that are not biased, we can expect that the data will form a normal distribution curve. We have assumed that the average is also the median (μ) which is the centre point of the curve. Therefore, from the normal distribution curve, 68.2% of the data will be within one standard deviation of the average. This means that 34.1% of the data will be better than the average and 34.1% of the data will be worse.

Figure 9-1: Normal Distribution Curve

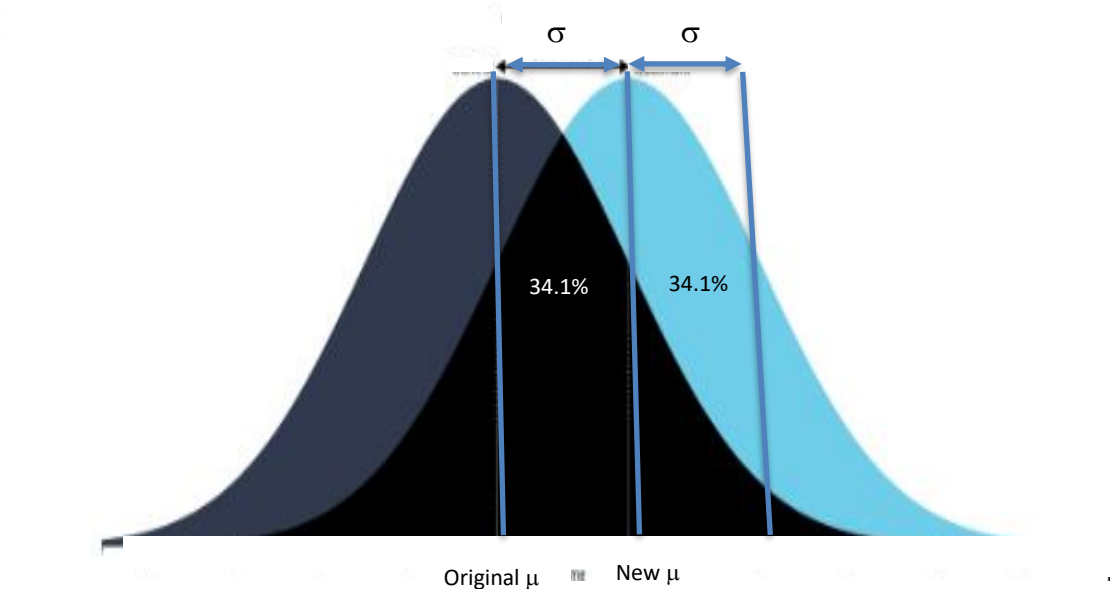


[35] JGN-Attachment 7.11-Incentive schemes-20190630-Public pg12

Referring to Table 9-3, the weighted average of 23% is calculated using one standard deviation (σ). This has been used to justify the sliding scale of 80%-100%. At 80%, the new average (μ) has now been shifted by one standard deviation (34.1%) from the original performance target. This means that 68% of the actual data is now less than the performance target. Figure 9-2 shows the impact of the shift of the average by one standard deviation (σ).

This implies that the service performance has significantly decrease.

Figure 9-2:Normal distribution curve with one curve shifted by one standard deviation (σ)



With capex programs such as the mains replacement program to reduce leaks, relocation of shallow mains to mitigate against third party damage and remote devices on meters to reduce estimated meter reads, we would expect that the performance levels to improve and not decrease. Our rationale of 90%-100% was based on our belief that JGN should not necessarily be penalised for a slight shift in the actual performance.

We therefore maintain our recommendation of 90% to 100%.

Appendix A

Residential Gas Meter: Planned Replacement: 2021-2025: Revised Plan Analysis

Note: All meter volumes are as at January 2019
Source: Meter Replacement Volume Forecast Model-20200109: "Meter Information".
Convert to RY by halving each of the respective CY, then adding accordingly.
Volumes will decrease over time due to meters removed for sample testing, defective meters, difficult access etc, to achieve the final forecast volumes

Table C-1: CY2019 test results

Meter type		Start (CY)	Replace (CY)	Volume (CY)	Comment
15 years:	*Tested at 13 years*				
[redacted]					Pass5. Current age 13 years. JGN assumes these families will also pass at 20 years and be replaced at 25 years in CY2031. Note: if failed would have been replaced in CY2021.
[redacted]					
[redacted]					
20 years:	*Tested at 18 years*				
[redacted]					Fail. To be replaced in CY2021. JGN methodology had assumed extend to 25 yrs.
[redacted]					Fail. To be replaced in CY2021. JGN methodology had assumed extend to 25 yrs.
[redacted]					Pass3. Extended by 3 years, to 23 years. JGN propose to replace in CY2024
25 years:	*Tested at 23 years*				
[redacted]					Pass5. Extend to 30 years. JGN methodology assumed fail and replace in CY2021.
[redacted]					Pass3. Extend to 28 years. JGN methodology assumed fail and replace in CY2021..

The CY2019 test results are incorporated into the following table to show JGN's revised meter replacement forecast:

JGN: meter families planned for replacement during the 2021-2025 period

Age replaced / meter type		Start (CY)	Replace (CY)	Volume (CY)	Volume (RY)	Comment
15 years:	*(all to be removed)*					
[redacted]	[redacted]	2005	2020	[redacted]	[redacted]	Failed 13 year test, remove at 15 years. 50/50 split to get 2021
Miscellaneous			2020-25	[redacted]	[redacted]	Remove at 15 years. includes 50/50 split of CY20 and CY25
				[redacted]	[redacted]	
20 years:	*(all to be removed)*					
[redacted]		2001	2021	[redacted]	[redacted]	In 2019 Failed 18 year test, remove at 20 years
[redacted]		2001	2021	[redacted]	[redacted]	In 2019 Failed 18 year test, remove at 20 years
				[redacted]	[redacted]	
23 years:	*(due for test at 21 years)*					
[redacted]	[redacted]	2001	2024	[redacted]	[redacted]	In 2019 Passed 18 year test and given 3-year life extension, rather than 5-years. JGN propose not to retest in CY2022 and plan to replace in CY2024.
28 years:						
[redacted]	[redacted]	1996	2024	[redacted]	[redacted]	In 2019 Passed 23 year test and given 3-year life extension
30 years:	*(due for test at 28 years)*					
[redacted]	[redacted]	1993	2023	[redacted]	[redacted]	Note: One family (22,399 meters) of [redacted] tested in CY2019 at 23 years, passed test and field life extended by five years to 30 years (scheduled for replacement in CY2026). Total 30 year meters = [redacted] (CY2023 – CY2026).
		1993	2023			
		1993	2023			
		1994	2024			
		1994	2024			
		1995	2025			
		1995	2025			
				[redacted]	[redacted]	

25 years:	*(due for test at 23 years)*					
[redacted]	[redacted]	1997	2022	[redacted]	[redacted]	Passed tests CY2010 and CY 2015
[redacted]	[redacted]	1997	2022	[redacted]	[redacted]	JGN has assumed to fail next test due CY2020
[redacted]	[redacted]	1997	2022	[redacted]	[redacted]	Assume don't test below 1,000 meters
[redacted]	[redacted]	1997	2022	[redacted]	[redacted]	
[redacted]	[redacted]	1997	2022	[redacted]	[redacted]	
				[redacted]	[redacted]	
[redacted]	[redacted]	1998	2023	[redacted]	[redacted]	Passed tests in CY2011 and CY2016.
[redacted]	[redacted]	1998	2023	[redacted]	[redacted]	JGN has assumed to fail next test due CY2021
[redacted]	[redacted]	1998	2023	[redacted]	[redacted]	
[redacted]	[redacted]	1998	2023	[redacted]	[redacted]	
				[redacted]	[redacted]	
[redacted]	[redacted]	1999	2024	[redacted]	[redacted]	Assume don't test below 1,000 meters
[redacted]	[redacted]	1999	2024	[redacted]	[redacted]	Passed tests in CY2012 and CY2017.
[redacted]	[redacted]	1999	2024	[redacted]	[redacted]	JGN has assumed to fail next test due 2022.
[redacted]	[redacted]	1999	2024	[redacted]	[redacted]	
				[redacted]	[redacted]	
				[redacted]	[redacted]	
[redacted]	[redacted]	2000	2025	[redacted]	[redacted]	CY2025 to be split 50/50 for RY25/RY26
[redacted]	[redacted]	2000	2025	[redacted]	[redacted]	Passed tests in CY2013 and CY2018
[redacted]	[redacted]	2000	2025	[redacted]	[redacted]	JGN has assumed to fail next test due CY2023
[redacted]	[redacted]	2000	2025	[redacted]	[redacted]	Assume don't test below 1,000 meters
				[redacted]	[redacted]	
	Total 25 year meters (RY21-25)				[redacted]	
	*** JGN: total replacement meters (RY21-25)**				[redacted]	* Source: Meter replacement volume forecast model – meter information

From the above table, the total residential gas meters (15, 20, 23, 25, 28 and 30 years) listed for replacement (per "meter information") during 2021-2025 = [redacted], compared with [redacted] in the initial plan. As this volume is at January 2019, there will be some reduction due to replacement of defective meters, meters removed for statistical sample testing and so on. These adjustments are reflected in the volumes shown in the revised Meter Replacement Capex Forecast Model which shows [redacted] meters planned for replacement, compared with 281,717 meters in the initial Plan.

Analysis: Residential gas meter planned replacement

With reference to the information in the above table, we make the following comments:

15 year meters: The [redacted] meters have failed their sample testing (at 13 years) and therefore need to be replaced when they reach 15 years. Miscellaneous meters are typically small meter families that are not cost effective to test and therefore are to be replaced at 15 years.

20 year meters: CY2019 statistical sampling meter testing resulted in one family of [redacted] meters and one family of [redacted] meters failed their 18 year testing and are therefore required to be replaced when they reach age of 20 years during CY2021.

23 year meters: CY2019 statistical sampling meter testing resulted in one family of [redacted] meters passing but with field life extension of 3 years. JGN say that they do not propose to test this family again in CY2022, "given the high-likelihood they will be inaccurate" and will replace the meters at 23 years of age in CY2024. While a 3-year extension, rather than 5-year extension, indicates that accuracy has deteriorated from within ±2.0% to within ±2.5%, given the volume of meters in the family and in order to ensure that these meters remain in the field as long as they meet performance criteria , we consider that it would be reasonable and prudent to statistically retest at CY2022 with the potential of a further 3 year extension. The cost of statistical testing would be approximately [redacted], compared with approximately [redacted] to replace the family in CY2024. Given the nature of these meters, it can be expected that there will be gradual deterioration in performance over time. Typically this would be a slow process, so we consider that there is a high likelihood of this family passing subsequent testing and be field life extended for a further three years to 26 years.

25 year meters: The table shows that there are [redacted] meters that will reach 25 years of age during 2021-2025 and not yet tested. Note: excludes those meters tested during CY2019. JGN methodology assumes that all of these meters are not expected to pass test at 23 years of age and are therefore planned for replacement at 25 years. We consider that a number of meter families, will pass this test and be field life extended to 30 years. Based of available information from JGN, our analysis and recommendations are detailed below.

28 year meters: 2019 statistical sampling meter testing resulted in one family of [redacted] meters passing but with field life extension of 3 years. JGN say that they do not propose to test this family again in CY2022 and will replace the meters at 28 years of age in CY2024. Given their age at replacement, we consider JGN's approach is reasonable.

30 year meters: The table shows around [redacted] meters will reach 30 years of age during 2021-2025 and JGN has planned that they are not expected to pass further testing and therefore will be replaced. While there is no quantified data provided to support this view, for the purposes of our analysis, we have not proposed any of these meter families will be further field life extended.

15 and 20 year meters not yet tested at that age or failed testing CY2019:

We note JGN's methodology whereby meter families that have not yet been tested, are assumed to pass their 15 and 20 year life extensions. JGN says[36] "This approach reflects the performance we have seen over the last few years where *most* (but not all) meters have passed their 15 and 20 year life extensions". We also note that JGN's forecast estimate does not specifically account for the proportion of meters which will fail these tests. However, in its response to the AER draft decision (page 22), JGN says "We consider that a reasonable forecast, no matter how it is calculated, would assume that at least [redacted] scheduled for testing at the 15 and 20 year marks will fail……while [redacted] meters may pass their 25-year test a similar amount of meters are likely to fail either their 15 or 20 year tests." The CY2019 test results show that two families of 20 year meters totaling [redacted] meters failed ([redacted]) and will be replaced in CY2021. Given the CY2019 test results and the further responses by JGN we have revised our meter replacement model to specifically show this category. Replacing meters as a result of failed tests or not yet tested at 15 and 20 years is approximately **48,000** meters, approximately [redacted] of JGN's total mains replacement forecast.

Analysis and forecast of 25 year meters

The following analysis relates to the 25 year meters, and our recommendations are based on information provided by JGN in its initial submissions, including Options Analysis, the Meter Replacement Volume Forecast Model, responses to our information requests and further information provided in the response to the AER draft decision. The volume forecast model includes "meter information" which provides details for planned replacement for CY2019 onwards and therefore does not include any information relating to test outcomes prior to that year.

[36] IR026 response.

The above table shows that the following meter types will reach 25 year life during 2021-2025 and are yet to be tested, or tested in CY2019:

- Email 602 JF JG: [redacted] meters
- Email 610 EA EB EM ER EX: [redacted] meters
- Email 602 JX: [redacted] meters
- Email 602 JZ: [redacted] 10,270 meters
- ABB DS5: [redacted] meters
- Toyo MT5: [redacted] 2 meters

[redacted]**:** CY2019 test results show one family ([redacted] meters) passed the test at 25 years and has been field life extended by five years to 30 years, then due for replacement in CY2026. The AER draft decision proposed that this family would pass this test.

[redacted]**:** CY2019 test results show that one family of 20 year meters ([redacted] meters) passed test and life extended by three years to CY2024, at which time JGN propose to replace the then 23 year old meters as they say there is a "high likelihood they will be inaccurate". Also one family of 25 year meters ([redacted] meters) passed test and life extended by three years to CY2024, at which time JGN propose to replace the then 28 year old meters. In addition, JGN response to draft decision indicates that there was one lot ([redacted] meters) which passed. Meters were purchased between CY1996 and CY2005, meaning that the first family to be tested at 23-years was in CY2019 (which as noted above passed but only with a 3-yr field life extension). JGN's response (IR026) says that they have seen poor performance of this meter family, noting that there have been failures at 15 year test and a batch failed at the 20 year test. However, over [redacted] meters have passed the earlier (15 and 20 year) tests and are now coming due for the 25 year testing. We have not seen any quantified information to show that all of the meter families will fail this test. Based on our review of the available information, we consider that it would be reasonable to assume that the family of meters that will achieve 28 years may not pass subsequent testing and is therefore forecast to be replaced in CY2024. We also believe that it would be prudent to consider that at least some meter families will successfully pass the test and be field life extended by three or five years.

[redacted]**:** JGN's response to draft decision along with IR026 response says that the performance of this family of meters has not been strong and has noted that [redacted] tested at 25 years have failed. JGN also said that [redacted] % of lots and meters tested at 20 years have failed. The available information indicates these meters were purchased between CY1993 and CY2000, so the first family due for testing at 25 years was in CY2016. The information shows that the one family tested in CY2016 passed ([redacted] meters) and was extended to 30 years, while the family tested in CY2017 failed ([redacted] meters) and was scheduled for replacement in CY2019. The next families due for testing will be in CY2020 and CY2021. It is also noted that families due for testing in CY2022 and CY2023 are small and hence are not expected to be tested and are planned for replacement. Based on the information available we consider that at

least one of the two families to be tested, will pass the test and be field life extended to 30 years. JGN's responses, above, indicate [redacted] % of these meters have passed testing at 25 years.

[redacted]: CY2019 test results show one family of 20 year meters ([redacted] meters) failed and will be replaced in CY2021. JGN methodology had assumed this age of meter would pass this test and be extended by 5 years. One family of 15 year meters ([redacted] meters) passed and has been extended by 5 years. JGN's IR026 response says that no families have been tested at 25 years and they have no data which supports extending the life further. JGN indicate that [redacted] % of meters failed their 20-year tests indicating poor performance of this meter family. They also say that this family is similar to [redacted] where [redacted] % of the lots tested and [redacted] % of the meters failed their 25-year tests. This meter type were purchased from CY1997 to CY2007, so the first family for 25 year test is due in CY2021 but this is a small family with [redacted] meters, so is not expected to be tested. There are three families that can be tested from CY2021. Based on the information available we consider that some of the families will pass the test and be field life extended by three or five years.

[redacted]: CY2019 test at 18 years failed one family of [redacted] meters and these will be removed in CY2021. These meters were purchased between CY1997 and CY2002, so the first family due for testing at 23 years will be in CY2020. JGN's IR026 response says that while all of the meters tested at 15 and 20 years were found to be accurate, they have seen significant number of these meters fail in the field (failing indexes). Given the extent of the failures JGN is not proposing to extend the life of these meters any further. The response does not quantify the volume of defective meters replaced and with four families totalling [redacted] meters, we consider it prudent to undertake the testing. With no other information to indicate the failure of the meters, we consider that at least one family can be expected to pass and be field life extended.

Forecast estimate for 25 year meters

In the AER draft decision we considered that some 15 and 20 year meters would fail their testing and, in line with JGN's approach of not specifically showing these meter replacement separately in the forecast estimate, we instead took a more conservative approach in assigning pass/fail to the 25 year meter families. Given the further information and comments in JGN's response to the AER draft decision, we have revised the forecast estimate model to include a separate category for the 15 and 20 year meters that have not yet been tested, or were tested in CY2019. As a result we have also revised the 25 year forecast estimates. We consider that this provides a more transparent forecast.

We also maintain that it is prudent to continue to test meter families to ensure their field life is extended as long as they maintain performance in accordance with the Australian Standards. In this regard, we do not accept JGN's view that a number of meter families will be replaced without being subject to statistical sample testing.

In the following model we have assigned each meter family with a pass or fail in order to develop an overall program for meter replacement that we consider reasonably reflects the best estimate of a forecast estimate. Within the bounds of selecting meter families we have aimed to achieve overall percentage pass/fail for each meter type, based on our analysis of the available information provided by JGN. We do not consider that this specific selection is expected to reflect the actual program which is based on test results. However, we do consider that, at the portfolio level, the overall total volumes achieve the best forecast estimate in the circumstances.

Forecast estimate of 25-year meters: proposed Pass / Fail volumes (revised)

	Year (CY/RY)	[redacted]	**Comments**
Meter families	CY2021	[redacted]	Tested in CY2019
	CY2022	[redacted]	
	CY2023	[redacted]	
	CY2024	[redacted]	
	RY2025	[redacted]	
	Total:	[redacted]	
Pass	CY2021	[redacted]	[redacted]: pass CY19 test, extend to CY26
	CY2022	[redacted]	
	CY2023	[redacted]	
	CY2024	[redacted]	
	RY2025	[redacted]	
	Pass Total:	[redacted]	
	% Pass:	[redacted]	
Fail	CY2021	[redacted]	
	CY2022	[redacted]	
	CY2023	[redacted]	
	CY2024	[redacted]	[redacted] test in CY2019: Pass3. JGN will replace in CY24
	RY2025	[redacted]	Note: CY2025 = 27,842
	Fail Total:	[redacted]	

In the above table we have converted CY2025 (Calendar Year) meters to reflect 2025 by halving the volumes. For the other years they are shown in the table as Calendar Years. We have done this to show volumes for the 2021-2025 period. The following summarises proposed outcomes:

- [redacted]: the model proposes one family ([redacted]) ([redacted]) will pass with either a three year or five year extension.
- [redacted]: the model proposes one family ([redacted]) ([redacted]) will pass with a five year extension.
- [redacted]: the model proposes two families ([redacted]) ([redacted]) will pass with a three or five year extension. Note: JGN said that the [redacted] meter types are similar and noted a [redacted] % pass at 25 years. Combining these families gives a [redacted] % pass which is reasonable given the [redacted] is proposed to pass with a three or five year extension.
- [redacted]: the model proposes one family ([redacted]) ([redacted]) will pass with either a three or five year extension.

Reflecting the above results, the following table shows a proposed planned meter replacement program:

Residential gas meter: Planned Meter Replacement (Recommended)

	CY2020	CY2021	CY2022	CY2023	CY2024	CY2025	Total Replace
15 year meters	22,315	4,081	17,448	477	16	9	
30 year meters				32,474	26,379	42,306	
25 year meters			38,064	36,127	19,510	****27,842	
15 & 20 year meters fail tests in period		19,947	8,000	8,000	8,000	****8,106	
Total Replace (CY2020 – CY2025):	22,315	24,028	63,512	77,078	53,905	78,263	
		RY2021	**RY2022**	**RY2023**	**RY2024**	**RY2025**	
Convert to RY totals:		23,172	43,770	70,295	65,492	66,084	
Factored RY Totals*		23,812	41,276	66,545	62,322	63,461	
Proposed Program Volumes (rounded)		**23,810**	**41,270**	**66,550**	**62,320**	**63,460**	**257,410**
JGN 2020 Plan (revised) volume**		**23,812**	**38,147**	**59,617**	**81,428**	**91,269**	**294,272**
Volume Difference:							**-36,862**
Capex revised unit rate: [redacted] ***							
Proposed Capex		**$3,166,701**	**$5,488,860**	**$8,851,069**	**$8,288,484**	**$8,440,102**	**$34,235,216**
(revised) JGN 2020 Plan Capex		$3,166,967	$5,073,438	$7,928,988	$10,829,825	$12,138,599	**$39,137,817**
Capex Difference:							-$4,902,601

Notes relating to the above table:
* To allow for reduced volumes arising from meters removed as defective, statistical testing etc, we have applied a factor calculated by comparing “Meter Information” volumes (per Meter Volume Model) and planned meter replacement volume forecast in the Capex Forecast Model.
** revised planned meter replacement volumes in JGN meter capex model 20200109
***revised Unit Rate: per meter Capex model.
****CY2025 = 27,842 and RY2025 = 13,921. Similarly, CY2025 = 8,106 and RY2025 = 4,053.