



**AGN Access Arrangement 2021
Capital Expenditure
Stage 2
Public**

Prepared for



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TABLE of CONTENTS

1. Executive Summary	5
2. Introduction	9
2.1 Background	9
2.2 Scope of the Consultancy	10
2.3 Approach	10
2.4 Cost Reporting	10
3. Mains Replacement	11
3.1 Introduction	11
3.2 CI/UPS - Block replacement.....	12
3.2.1 Updated leak data.....	12
3.2.2 Summary.....	14
3.3 HDPE 575 DN40 HP	15
3.3.1 Failure data.....	16
3.3.2 Zincara assessment and conclusion.....	17
3.4 Non-AMRP services.....	18
3.5 Ongoing role of replaced HDPE mains and services	19
3.5.1 Summary:.....	19
3.6 Conclusion.....	20
3.6.1 CI & UPS – Block.....	21
3.6.2 HDPE 575 – DN40 HP	22
3.6.3 Non-AMRP service	22
3.6.4 Ongoing role of replaced HDPE mains and services	23
4. Other Distribution System	24
4.1 Introduction	24
4.2 SA103 Replacement of Valves Revised Proposal	24
4.2.1 Risk Assessment of previously leaked valves.....	25
4.2.2 Conclusion	25

TABLE of TABLES

Table 1-1: Summary of AGN's 2020 Plan with AER's Draft Decision (\$ million 2020/21)	5
Table 1-2: Mains Replacement Recommended Capex (\$19/20 million).....	7
Table 1-3: Valve Replacement Recommended Capex.....	8
Table 2-1: Summary of AGN's 2020 Plan with AER's Draft Decision (\$2020/21 million)	9
Table 3-1: AGN revised mains replacement program (\$2019/20, million)	11
Table 3-2: Zincara recommendations: mains replacement capex (\$2019/20 million)	20
Table 4-1: AGN Valve Replacement Revised Capex (\$ 2019/20 million).....	24
Table 4-2: Recommended Valve Replacement Capex (\$2019/20 000).....	25

TABLE of FIGURES

Figure 3-1: Cast iron failure history over time	13
Figure 3-2: Historic breaks and cracks on cast iron mains remaining in the network	13
Figure 3-3: Cast iron mains leaks per km	14
Figure 3-4: HDPE 575 mains – squeeze off failure history by year laid and diameter	16

1. EXECUTIVE SUMMARY

In January 2021, AGN submitted its final capex plan in response to the AER's Draft Decision. The three areas that AGN's final capex plan differed from the amendments in the AER's Draft Decision are:

- Its plan to complete the replace the CI/UPS gas mains and also to replace its 198km of its HDPE 575 DN40 mains.
- The most recent actual material/other costs are more reflective of the future service replacement unit cost instead of the three-year weighted average.
- Its proactive replacement plan on previously leaked valves revised from 16 to 9.

AGN also advised that it is not proceeding with the Mt Barker extension and also that its IT have been revised due to timing of the projects been updated.

The AER engaged Zincara to advise on the differences between the final capex plan and AER's amendments.

Details of the capex submissions and AER's draft decision are provided in the table below.

Table 1-1: Summary of AGN's 2020 Plan with AER's Draft Decision (\$ million 2020/21)

	AGN's 2020 Plan	AER's Draft Decision	AGN's Revised 2020 Plan
Mains Replacement	294.0	209.4	259.2
Meter replacement	20.7	20.6	20.9
Augmentation	11.5	11.6	11.6
Telemetry	107.2	73.3	101.2
IT System	36.5	26.3	51.3
Growth	147.4	146.8	128.9
Others distribution system assets	61.5	51.6	50.1
Other non-distribution system assets	5.1	5.1	5.2
Gross totals	578.8	481.4	529.2

(Source: AGN SA rev FP_Attachment 8.11_Response to Draft Decision on Capex_20210113_Public)

Mains Replacement

AGN's revised program differs from the AER Draft Decision for the following:

- **CI/UPS block:** AGN proposes completion of 520km, with recent leakage rates suggesting increasing level of mains deterioration (██████ v AER Draft Decision);
- **HDPE 575 DN40 HP:** AGN proposes prioritised replacement of 198km of mains laid prior to implementation of improved squeeze-off techniques (ie. pre-1993) (██████);
- **Non-AMRP service replacement:** AGN clarifies unit rate proposal (██████).

We also noted that the Minister of Energy and Mining in its letter to the AER said that given the additional information from AGN and the engagement with the OTR, it supported the mains replacement program for all low pressure cast iron and unprotected steel and also the replacement of the HDPE 575 High Pressure mains laid up to 1993.

CI/UPS

AGN provided updated leaks data which showed that the remaining CI/UPS mains are experiencing ongoing and elevated rates of leaks, indicating that the condition of these mains are deteriorating. The data also indicates that the rate of mains replacement during the current AA period and proposed by the AER to be continued during the next AA period may not be sufficient to effectively reduce the current rate of leaks and to maintain these assets in the medium term.

Zincara therefore recommends that it would be prudent to increase the rate of CI/UPS mains replacement to the level proposed by AGN during the next AA period, being 520 kilometres with a capital expenditure of [REDACTED] million, an increase of 115 kilometres and [REDACTED] million (2019/20 direct). This will enable the CI/UPS mains replacement program to be completed during the next AA period.

HDPE 575 -DN40 HP

In its response to the AER's Draft Decision, AGN provided an internal memo, dated August 1991, relating to squeeze-off practices in place at that time and the slow crack growth (SCG) failures being experienced as a result of these practices. The information concluded that early squeeze-off practices were likely not to be fully improved until around 1993 and as a result there remained the potential for mains laid prior to 1993 to have structural damage which could result in SCG failures, warranting prioritised replacement by insertion.

While Zincara considered that the data showed that squeeze off failures for mains laid from 1991 were at or below rates of failure for post-1993 DN50 mains, the data did show that there had been failures on DN40 HP mains in 1991 and 1992. Considering the information provided, the likely timeframes for replacing these mains and the risk consequences, we consider that it would be prudent to increase the length of prioritised mains replacement for HDPE DN40 HP to include 1991 and 1992 during the next AA period. As a result, we recommend acceptance of AGN's prioritised program of 198 kilometres with a capital expenditure of [REDACTED] million, an increase of 48 kilometres and [REDACTED] million (2019/20).

Non-AMRP services

AGN has clarified why the direct unit rate for non-AMRP service replacement appeared to be disproportionately high compared to earlier years. This increase is due to a recent change in the accounting treatment of motor vehicle leasing costs that allocates these costs to the capital projects and programs in which they are incurred.

On the condition that the AER accepts the transfer of costs from capitalised overhead to direct costs, then Zincara recommends acceptance of AGN's proposed unit rate direct cost of [REDACTED] /service. This increases the AER Draft Decision capex for non-AMRP services by [REDACTED] million to [REDACTED] million (2019/20).

Ongoing role of replaced HDPE mains and services

In its Draft Decision the AER noted “The insertion method of addressing poor asset performance can be viewed as an asset reinforcement or modification rather than a like for like replacement. This distinction would influence our regulatory depreciation decision in terms of whether or not the existing assets are subject to accelerated depreciation post insertion (Attachment 4 – Regulatory Depreciation).

Based on its experience, Zincara considers that mains insertion renders the existing main (and inlet services) as obsolete, with no ongoing operational or asset management value. We also consider that the process is not a reinforcement or modification.

Recommended Capex

Table 1-2: Mains Replacement Recommended Capex (\$19/20 million)

Asset category	AER - DD		AGN Revised		Zincara Recommended	
	Volume	Capex	Volume	Capex	Volume	Capex
Total Mains Replacement:	607km*	██████	770km*	██████	770km*	██████
HDPE 575 DN50 - inspection	316km	██████	316km	██████	316km	██████
Total Service Renewal:		██████		██████		██████
Total Capex:		██████		██████		██████

Note *: Piecemeal mains replacement volume (10km) is not covered in the capex length in this table it is covered within Opex.

Other Distribution Capex

In its Draft Decision, the AER accepted the majority of the capex for this category but only accepted a lower capex for two projects by reducing the scope of these projects. The projects are:

- SA103 replacement of valves
- SA105 pipeline modification for Inline Inspection

For SA103, AGN has carried out a reassessment of the valve replacement program and has resubmitted a revised program.

For SA105, AGN has accepted AER’s amendment of deferring the two FEED studies on the modifications of metropolitan transmission pipeline to make them piggable.

SA103 replacement of valves

In its Draft Decision, the AER accepted the replacement of the 16 valves that are inoperable but considered that the AGN’s maintenance program should be able to monitor the 16 valves that have previously leaked and repaired without having them proactively replaced at this stage.

Following the Draft Decision, AGN undertook a more detailed risk assessment of the criticality of each of the 16 previously leaked valves. The risk assessment is based on the number of customers that will be affected if there is a need to isolate a section of the network and if the related valve is inoperable. Based on its risk assessment, AGN's revised proposal is to replace nine of the 16 valves.

We have reviewed AGN's risk assessment and concur with the likelihood and consequence settings used to determine AGN's risk rating for these nine valves that AGN is proposing to replace. We still believe that it is unlikely that these valves would fail in the short to medium term if they are well maintained but accept that a cautious approach to replacing these valves is not unreasonable. We therefore recommend accepting the replacement of the valves as prudent.

Table 1-3: Valve Replacement Recommended Capex (\$19/20 million)

	AER - DD		AGN Revised		Zincara Recommended	
	Volume	Capex	Volume	Capex	Volume	Capex
Valve Replacement:	16	■	25	■	25	■

2. INTRODUCTION

2.1 BACKGROUND

In November 2020, the Australian Energy Regulator (AER) published its Draft Decision on AGN's proposal for its Access Arrangement for the period 2021-2025. AER's Draft Decision on capex proposed a number of amendments from AGN's Access Arrangement. In January 2021, AGN submitted its final capex plan in response to the draft decision. The three areas that AGN's final capex plan differed from the amendments in the AER's Draft Decision are:

- Its plan to complete the replace the CI/UPS gas mains and also to replace its 198km of its HDPE 575 DN40 mains.
- The most recent actual material/other costs are more reflective of the future service replacement unit cost instead of the three-year weighted average.
- Its proactive replacement plan on previously leaked valves revised from 16 to 9.

AGN also advised that it is not proceeding with the Mt Barker extension. In addition, its IT capex has also been revised due to timing of projects been updated.

Details of the capex submissions and AER's draft decision are provided in the table below.

Table 2-1: Summary of AGN's 2020 Plan with AER's Draft Decision (\$2020/21 million)

	AGN's 2020 Plan	AER's Draft Decision	AGN's Revised 2020 Plan
Mains Replacement	294.0	209.4	259.2
Meter replacement	20.7	20.6	20.9
Augmentation	11.5	11.6	11.6
Telemetry	107.2	73.3	101.2
IT System	36.5	26.3	51.3
Growth	147.4	146.8	128.9
Others distribution system assets	61.5	51.6	50.1
Other non-distribution system assets	5.1	5.1	5.2
Gross totals	578.8	481.4	529.2

(Source: AGN SA rev FP_Attachment 8.11_Response to Draft Decision on Capex_20210113_Public)

2.2 SCOPE OF THE CONSULTANCY

The AER engaged Zincara P/L (Zincara) to advise on the revised capex except for IT. The focus of the advice is to provide the AER with a view on whether the revised capex meets the requirements of the National Gas Rules (NGR) and in particular NGR 79.

For information on Zincara's recommendation to the AER prior to the draft decision refer to Zincara's report titled: "AGN Capital Expenditure 23 November 2020".

2.3 APPROACH

In carrying out this analysis, Zincara has adopted a similar approach that it had used in assessing AGN's initial information provided in July 2020:

- Analyse the information provided in AGN's final plan;
- Confirm the conclusions reached by the AER in its Draft Decision;
- Consider third parties submissions received by the AER on AGN's final plan; and
- Conclude on the prudence and efficiency of the revised capex submission.

This report details our findings in the specific areas where AGN had deferred from the AER's proposed amendments in the Draft Decision.

2.4 COST REPORTING

All costs shown in this report are in real 2019/20 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. MAINS REPLACEMENT

3.1 INTRODUCTION

The following table summarises AGN's initial program, AER Draft Decision and AGN's revised program:

Table 3-1: AGN revised mains replacement program (\$2019/20, million)

	AGN Initial		AER - DD		AGN Revised	
Asset category	Volume	Capex	Volume	Capex	Volume	Capex
Mains replacement:						
CI/UPS - block	520km	██████	405km	██████	520km	██████
CI/UPS North Adelaide	38km	██████	38km	██████	38km	██████
HDPE 250 remaining	14km	██████	14km	██████	14km	██████
HDPE 575 DN40 HP – insertion	198km	██████	150km	██████	198km	██████
HDPE 575 DN40 MP – direct burial	90km	██████	0km	██████	0km	██████
Total Mains Replacement:	860km	██████	607km	██████	770km*	██████
Inspection/reinforcement:						
HDPE 575 DN50 - inspection	316km	██████	316km	██████	316km	██████
Services renewal:						
MUS – priority group 1	457 sites	██████	457	██████	457	██████
Non-AMRP service replacement	2,450 sites	██████	2,450	██████	2,450	██████
Total Service Renewal:		██████		██████		██████
Total capex		██████		██████		██████

(Source: Response on Mains Replacement: Table 1.6)

Note *: Piecemeal mains replacement volume (10km) is not covered within the capex length in this table, it is covered within opex.

AGN's revised program differs from the AER's Draft Decision for the following:

- **CI/UPS block:** AGN proposes completion of 520km, with recent leakage rates suggesting increasing level of mains deterioration (██████ v AER Draft Decision);
- **HDPE 575 DN40 HP:** AGN proposes prioritised replacement of 198km of mains laid prior to implementation of improved squeeze-off techniques (ie. pre-1993) (██████);

-
- **Non-AMRP service replacement:** AGN clarifies unit rate proposal ([REDACTED]).

AGN accepted the AER Draft Decision with respect to:

- HDPE 575 DN40 MP. Defer 90 kilometres of mains replacement by direct burial to the subsequent period, noting that they will continue to monitor the condition and performance of these mains during the next AA period and reprioritise their replacement if it is warranted.
- CI/UPS – North Adelaide. Revised unit rates.

This section outlines our findings on the outstanding categories of the mains replacement program. In addition, we have also provided our view regarding Residual Value of inserted mains and services.

3.2 CI/UPS – BLOCK REPLACEMENT

The AER Draft Decision approved 405 kilometres of CI/UPS – Block mains replacement for the next AA, effectively continuing the rate of mains replacement achieved during the current period. AGN’s revised Plan considers that this rate is insufficient to address the further deterioration of mains each year they remain in service and proposes 520 kilometres it had initially submitted.

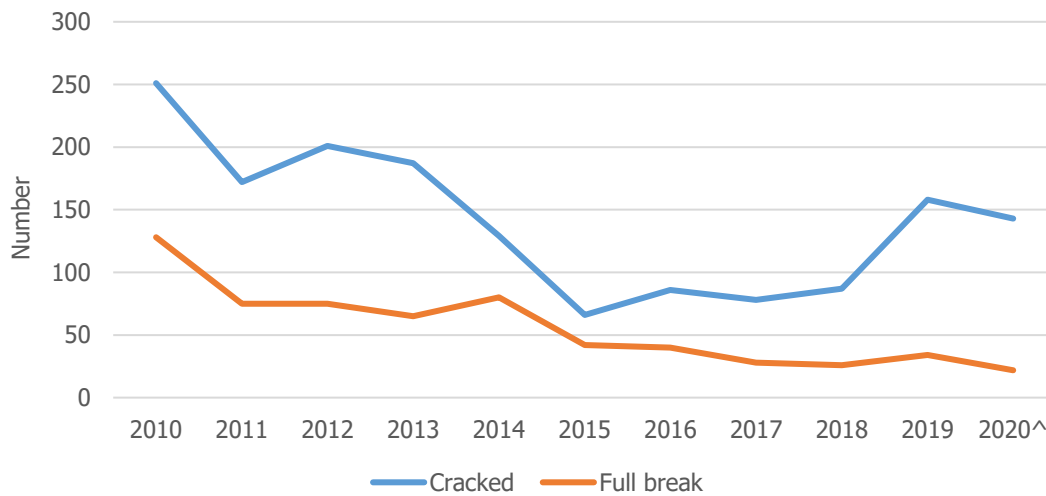
3.2.1 Updated leak data

AGN’s Distribution Mains and Services Integrity Plan (DMSIP) included cast iron failure history over time, up to 2019 (Figure 2) and historic breaks and cracks on cast iron mains remaining in the network, up to 2018 (Figure 3). The available data showed a significant increase in failures in 2019 but it was not clear whether this was a “spike” or an indication of a trend of deteriorating main condition. The number and rate of cracks and breaks, along with trends, provide a valuable insight into the condition of these mains assets.

In our report as part of the AER Draft Decision, we noted that there have been useful engagements with both AGN and the Office of Technical Regulator (OTR) on these matters and any future advice from either party would be considered after the AER’s Draft Decision. Subsequent to these meetings we requested¹ that AGN update Figures 2 and 3 in its DMSIP to include 2019 and YTD 2020. The following figures reflect the response received in IR022.

¹ AGN – AER meeting 24 September 2020 and further IR022

Figure 3-1: Cast iron failure history over time

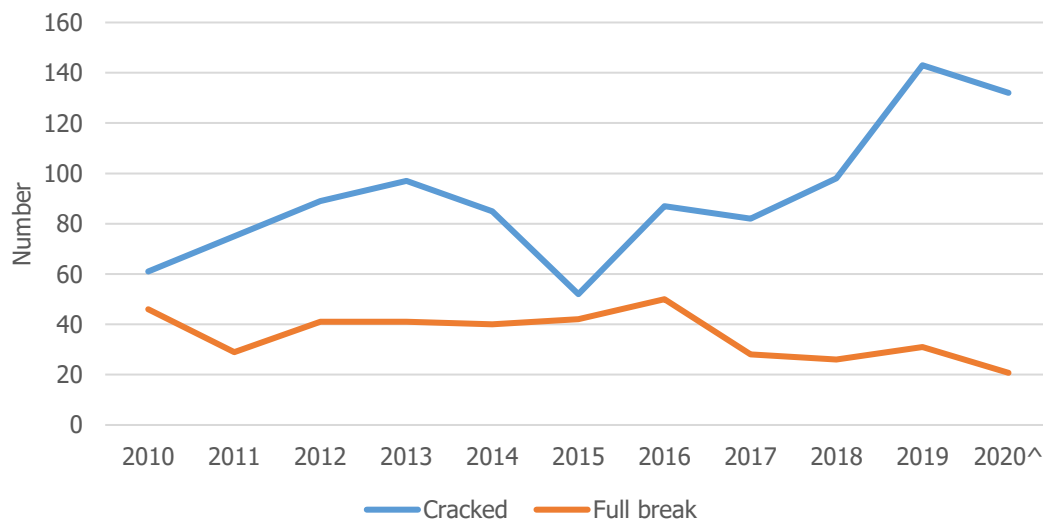


^Pro-rated based on actual failure data to November 2020
(Source: IR022: Figure 1)

While the above figure shows that the mains replacement program has had a positive impact on the number of cast iron failures, there has been an increase in cracked mains in 2019, compared with previous four years. The updated data shows that the increased number of cracks have continued in 2020. By comparison, the number of full breaks have not reflected this trend.

The following figure shows the breaks and cracks reported on remaining mains in the network, with data updated to include 2019 and 2020. As would be expected, the data generally reflects the failure history over time.

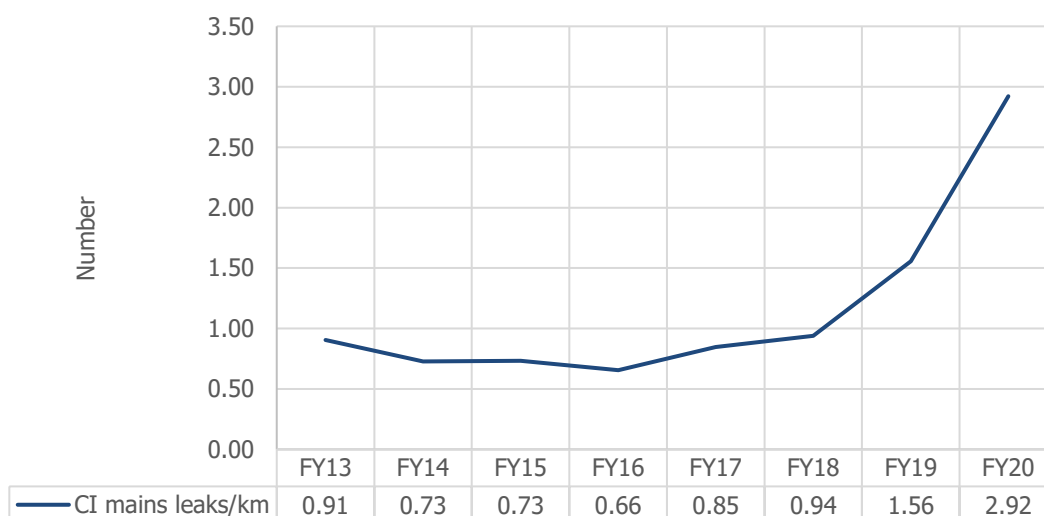
Figure 3-2: Historic breaks and cracks on cast iron mains remaining in the network



^Pro-rated based on actual failure data to November 2020
(Source: IR022: Figure 3)

In its IR022 response, AGN also provided the following figure which shows total leaks on cast iron mains per kilometre each year, noting that around 60% of these leaks are attributable to joint leaks. There is an increased rate of leaks in 2019 and further increase in 2020.

Figure 3-3: Cast iron mains leaks per km



(Source: IR022: Figure 4)

AGN said² that the leaks data indicates that the rate of mains replacement during the current period is not sufficient to address the further deterioration of mains each year they remain in service.

Other materials. AGN³ notes that approximately 60% (approximately 340 kilometres) of its proposed block replacement relates to cast iron and unprotected steel, while early generation HDPE 250 (118 kilometres) and HDPE 575 (36 kilometres) make up approximately 150 kilometres of the mains replacement program. The remaining mains length comprises the more modern PE 80 and PE 100 (approximately 47 kilometres). AGN did comment⁴ that it assesses the modern materials such as PE80 and PE100 mains and where they are in good condition and in a compliant location then they will leave them in service (ie. connect the inserted main to these existing mains, rather than replace). During the current and prior AA periods, AGN has applied this practice when undertaking block replacement of CI/UPS. This typically makes up 9% of the material in the Block replacement program and is represented in the forecast unit rates.

3.2.2 Summary

In response to the AER Draft Decision and AGN's revised Final Plan, the Minister for Energy and Mining, South Australia, has provided its further comments⁵ "Given the additional information and engagement with the OTR, the government supports the replacement of all low pressure cast iron and unprotected steel (CI/UPS) mains in 2021-26." With respect to

² Attachment 8.3A: Executive Summary: page 5

³ Attachment 8.3A: Response on Mains Replacement: section 5.5

⁴ Attachment 8.3A: Response to Mains Replacement: section 5.5.4

⁵ Letter dated 16 February 2021

other materials included in AGN's program, the minister supports their replacement when undertaken for safety reasons.

Following review of the updated leaks data and further information provided by AGN, including the GHD report, Zincara considers that:

- CI/UPS assets are showing an increased rate of deterioration (particularly during 2019 and 2020);
- current levels and trends of leaks are considered to be high, when compared to networks containing more modern materials;
- current rate of mains replacement does not appear to be sufficient to effectively reduce the rate of leaks and to maintain these assets in the medium term;
- increasing the rate of mains replacement to address the deterioration of the remaining mains will result in the CI/UPS program being completed during the next AA period.

With respect to the other low pressure mains materials included in AGN's proposal, we agree with the OTR that the percentage of these other materials is relatively high. However, given the fact that the majority of these mains are interspersed across the network and relate to early generation HDPE, which are either not suitable for high pressure or likely to have squeeze-off damage impacting the structural integrity of these mains, it would be prudent for safety reasons, to include their replacement as part of the program. It is also noted that AGN does aim to retain the more modern PE80 and PE100 mains where they are found to be in good condition and in a compliant location, typically comprising around 9% of mains materials. The retention of the modern material has been factored into AGN's forecast unit rate.

We therefore recommend accepting AGN's proposed CI/UPS - Block replacement program of 520 kilometres, to be completed during the next AA period, as prudent.

3.3 HDPE 575 DN40 HP

Based on the available failure data, the AER's Draft Decision approved prioritised replacement by insertion of 150 kilometres of HDPE 575 DN40 HP (approximately pre-1991) during the next AA period, compared with AGN's proposal of 198 kilometres (pre-1993). AGN's revised Final Plan considers that replacement of 150 kilometres of HP mains is not sufficient to address the risks associated with early squeeze-off practices, which it says were in place before 1993 and therefore proposes replacement of 198 kilometres of HP mains during the forecast period, as initially submitted.

AGN's revised Plan refers to an internal memo⁶ from August 1991, which indicated that squeeze-off procedures at that time did not include stops on the squeeze-off jacks, and hence there was the potential for over squeezing causing damage to the structural integrity of the main. AGN notes⁷ that an improved squeeze-off practice would have taken some time to take effect in the field, with the need for new equipment and practices to be considered, introduced and adopted in the field. On that basis AGN considers that replacing mains laid up to 1993 will ensure that mains "with a high risk of failure related to squeeze-off damage are

⁶ Attachment 8.3A Response on Mains Replacement: Appendix 1.

⁷ Attachment 8.3A Response on Mains Replacement: section 5.6.

removed from our network over the next AA period.” AGN propose that replacement by insertion is the most feasible cost effective action.

As a result, AGN considers that mains laid in 1991 and 1992 should be replaced during the next AA period, increasing the length of mains replacement from the AER’s approved 150 kilometres to 198 kilometres. This represents an additional [REDACTED] million for the additional 48 kilometres compared with the AER draft decision.

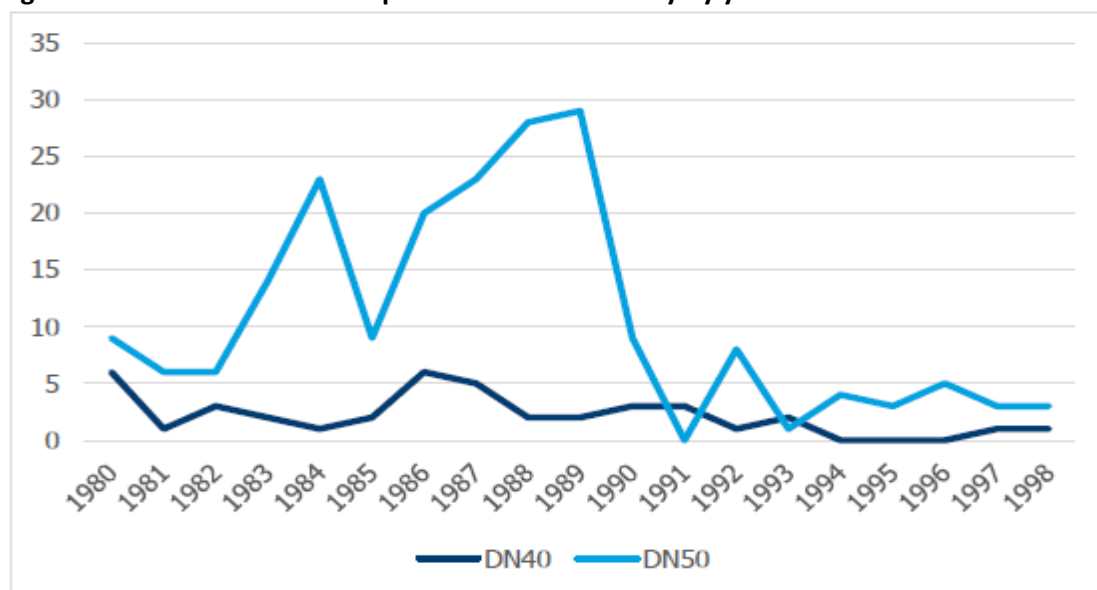
AGN engaged GHD to undertake an independent review of the scope and timing of the proposed mains replacement for the next AA period. With respect to HDPE 575 DN40HP mains, GHD concluded that:

- the differing failure rates in the DN50 data compared with the DN40 is likely explained by the lower operating stresses in the DN40 resulting in a longer time to failure. However they expect the same types of failures to be observed across the HDPE 575 fleet, albeit at different rates for this reason;
- it is possible that mains installed up to 1993 were affected by the earlier squeeze-off field practices;
- it would be prudent to adopt a conservative position based on an ALARP approach. This would be to replace the mains, because the (known) consequence is at least a major or catastrophic impact.

3.3.1 Failure data

The following figure shows the squeeze off failure history by year laid and diameter for both DN50 and DN40 mains.

Figure 3-4: HDPE 575 mains – squeeze off failure history by year laid and diameter



(Source: DMSIP Figure 8, p25)

While the above figure shows a flattening of the curve from 1993, particularly for DN50 mains, it also shows that failures in DN40 mains are consistently lower DN50 mains. Data provided by AGN in IR004, shows failure rates per kilometre are typically lower for DN40 compared with DN50.

The data showed that DN40 HP mains had around 40 failures since 2005, indicating that there were squeeze-off damages on a number of mains laid. Failure rates for 1991 (0.02 failures/km) and 1992 (0.06 failures/km) are relatively low and reduce to almost zero from 1993. The data also shows that DN40 HP failure rates are typically lower than for DN50 mains.

The failure data likely reflects the fact that DN50 mains will be subject to higher stresses than DN40 mains and also that HP mains will be subject to higher stresses than MP mains.

3.3.2 Zincara assessment and conclusion

AGN and GHD's report, identified slow crack growth (SCG) failures arising particularly from early squeeze-off practices across the early generation HDPE 575 mains. With the additional information provided in an internal memo dated August 1991 they have concluded that improved equipment and field practice were not likely to be in place until 1993. This appears to be also confirmed with the trend of SCR failures reducing and flattening from 1993, particularly for DN50 mains.

As a result, AGN proposed a suite of risk mitigation strategies with prioritised actions to address those mains laid before 1993, during current and next AA period, while mains laid from 1993 are proposed to be addressed in the following AA period. With respect to DN40 mains, which are too small to use the internal camera and reinforcement process applied to the DN50 mains, AGN says that risks of squeeze-off failures can only be mitigated by prioritised program of mains replacement during the next AA period. Such a program would lower its risk profile from Intermediate to Intermediate (ALARP).

In its report for the AER's Draft Decision, Zincara concluded that for HDPE 575 DN40 HP mains, it would be prudent to undertake a prioritised replacement by insertion of 150 kilometres (laid pre-1991), with mains laid after that time deferred to the following period. Based on our analysis of the failure data available, we saw little benefit of also prioritising replacement of mains laid in 1991 and 1992 during the next AA period.

The additional information contained in the memo of August 1991 and likely confirmed in the Figure 3-4 above, do indicate that the improved squeeze-off practices from 1993 have been effective in significantly reducing the number of squeeze-off failures, particularly with respect to DN50 mains.

The data does show that there were some failures on DN40 HP mains during 1991 and 1992, reducing to almost zero from 1993.

When considering the timeframe of mains replacement proposals by AGN and Zincara, it is possible that the 1991 and 1992 mains may be replaced later in the next AA period or at the beginning of the following AA period. As a result the practical timeframe differences are likely to be fairly minor.

In consideration of all of the information provided, and risk consequence of failure, we conclude that HDPE 575 DN40 HP mains laid up to 1993 may be subject to greater risk of structural damage associated with historic squeeze-off practices and it would therefore be prudent to undertake a prioritised mains replacement program during the next AA period. This recommendation increases the AER draft decision from 150 kilometres and capex of [REDACTED] million to 198 kilometres and capex of [REDACTED] million, an increase of 48 kilometres and capex of [REDACTED] million (2019/20 direct).

3.4 NON-AMRP SERVICES

In Zincara's report for the AER Draft Decision, we recommended a revised unit rate:

"The 3-year weighted average unit rate is [REDACTED] and the current actual (AGN proposed) is [REDACTED]. There has been significant degree of variability in the actual unit rates from year to year during the current period. Assessing the historical average unit rates, the labour component of the current year appears reasonable as a forecast, however, there is significant variability in the materials/other component and the current year is significantly higher than the other years and almost double the 3-year weighted average.

We consider that using the 3-year weighted average is more likely to reflect the rates in the next AA period. Combining this with the current actual labour rate, results in a unit rate of [REDACTED]/service."

In its Revised Final Plan, AGN says "The primary driver of the increase in the material/other component of the unit rate for non-AMRP service replacements for 2019/20 is payroll and vehicle costs. The increase in payroll and vehicle costs makes up [REDACTED] of the difference in unit rate when compared to the average material/other component of the unit rate for the three years 2016/17 to 2018/19. This increase is due to a recent change in the accounting treatment of motor vehicle leasing costs that more accurately allocates these costs to the capital projects and programs in which they are incurred."

"This is an ongoing change that is already reflected as a reduction in our capitalised overhead and therefore the current actual material/other rate is a better reflection of the forecast for the next AA period than the 3-year materials/other rate. For these reasons we have rejected the AER's Draft Decision unit rate for non-AMRP service replacement and propose a unit rate of [REDACTED]/service consistent with our original Final Plan."

On the condition that the AER accepts the transfer of costs from capitalised overhead to direct costs, then Zincara recommends acceptance of AGN's proposed unit rate direct cost of [REDACTED]/service. This increases the AER Draft Decision capex for non-AMRP services by [REDACTED] million to [REDACTED] million (2019/20 direct).

3.5 ONGOING ROLE OF REPLACED HDPE MAINS AND SERVICES

AGN⁸ noted that the AER Draft Decision says “The insertion method of addressing poor asset performance can be viewed as an asset reinforcement or modification rather than a like for like replacement. This distinction would influence our regulatory depreciation decision in terms of whether or not the existing assets are subject to accelerated depreciation post insertion (Attachment 4 – Regulatory Depreciation). In its revised proposal, we expect AGN to clarify whether the existing assets will not be providing and ongoing services to consumers post insertion as well as further information on key assumptions used in Incenta’s mains replacement analysis.”

AGN engaged GHD to provide a review of the mains insertion process and to make an assessment as to whether the old main plays an ongoing role. The GHD⁹ report concluded that “The replaced mains play no role in the ongoing delivery of gas haulage services and do not provide any additional asset management support to the new main.” Also it “does not consider AGN’s mains replacement program can reasonably be considered a reinforcement or modification to improve performance, rather the replacement is being undertaken on safety grounds.”

AGN and GHD considers “there is no residual value to AGNs replaced HDPE 575 DN40 mains and, therefore it is appropriate to accelerate the depreciation of these assets within the access period as the mains are replaced. The replaced mains play no role in the ongoing delivery of gas haulage services and do not provide any additional asset management support to the new main.”

3.5.1 Summary:

Mains replacement can be undertaken using a number of methods with the most common being mains insertion.

As the name implies, mains insertion involves the insertion of the new main inside the existing main and is typically the most cost effective and least disruptive method of replacement. The existing gas main therefore acts as the conduit for inserting the new gas main. The process also results in the existing main having regular cut-outs to facilitate the connection of consumer inlets/services to the new main.

As a result, the existing main is no longer capable of supplying gas, and does not provide any additional structural integrity to the new main. The existing main is also not capable of containing leaks arising from the new main. The existing main has minimal resistance to third party damage, particularly with respect to mechanical excavation impacts. At best it might offer nominal resistance to hand digging. The existing main would only be considered as providing minimum safety protection.

⁸ Attachment 8.3A: Response on Mains Replacement: section 4.2.3: HDPE 575 DN40-HP mains insertion

⁹ Attachment 9.4: GHD Advisory: Ongoing role of replaced HDPE pipelines: executive summary

With respect to inlet/services, AGN replaces all inlet pipes that comprise any material other than the current specification HDPE, which are typically pipes older than 15 years. This practice would effectively result in the replacement of virtually all of the existing inlets/services, associated with AGN's proposed mains replacement programs. The inlet/service fittings are also replaced, including the standpipe riser.

In conclusion, Zincara considers that mains insertion renders the existing main (and inlet services) as obsolete, with no ongoing operational or asset management value. We also consider that the process is not a reinforcement or modification.

Our comments and conclusion specifically apply to the use of insertion as the method of mains replacement. However, it should also be noted that there are a range of mains rehabilitation (e.g use of anaerobic sealants) and replacement methods that can be applied across the gas and similar utility networks businesses, and as such Zincara recommends that any consideration of accelerated depreciation as a result of mains replacement should be assessed on a case by case basis.

3.6 CONCLUSION

As noted in our report as part of the AER's Draft Decision we sought updated information relating to cast iron mains failures in particular. The further communications with AGN and OTR, along with any other responses received following the AER Draft Decision have been considered in this report. The following table provides a summary of Zincara's recommendations for the mains replacement categories compared with the AER Draft Decision and AGN's revised capex.

Table 3-2: Zincara recommendations: mains replacement capex (\$2019/20 million)

Asset category	AER - DD		AGN Revised		Zincara Recommended	
	Volume	Capex	Volume	Capex	Volume	Capex
Mains replacement:						
CI/UPS - block	405km		520km		520km	
CI/UPS – North Adelaide	38km		38km		38km	
HDPE 250 remaining	14km		14km		14km	
HDPE 575 DN40 HP – insertion	150km		198km		198km	
HDPE 575 DN40 – MP - direct	0km		0km		0km	
Total Mains Replacement:	607km*		770km*		770km*	
Inspection/reinforcement:						
HDPE 575 DN50 - inspection	316km		316km		316km	
Services renewal (sites):						
MUS – priority group 1	457		457		457	
Non-AMRP service replacement	2,450		2,450		2,450	

Total Service Renewal:		████		████		████
Total Capex:		████		████		████

(Source: Zincara DD Report; Attachment 8.7A: Revised Capex Forecast Model)

Note *: Piecemeal mains replacement volume (10km) is not covered in the capex length in this table it is covered within Opex.

Zincara's revised recommendations result in an increased mains replacement length of 163 kilometres, comprising an additional 115 kilometres for CI/UPS – Block and 48 kilometres for HDPE 575 DN40 HP, with additional capital expenditure of █████ million. In addition, Zincara's revised recommendation increases the unit rate for non-AMRP service replacement resulting in an additional capital expenditure of █████ million.

This represents a total capital expenditure increase of █████ million compared to the AER Draft Decision and a reduction of █████ million compared with AGN's initial Final Plan submission in July 2020.

AGN's revised program differed from the AER Draft Decision for the following categories:

- CI/UPS block:
- HDPE 575 DN40 HP:
- Non-AMRP service replacement:

In addition to information provided by AGN, we also acknowledge receipt of a letter from the Minister for Energy and Mining, South Australia, dated February 2021. With respect to the mains replacement categories covered in our report, the Minister says "Given the additional information and engagement with the OTR, the government supports the replacement of all Low Pressure (LP) Cast Iron and Unprotected Steel (CI/UPS) mains in 2021-26 and AGN's proposal to replace 198km of HDPE 575 DN40 High Pressure (HP) mains laid up to 1993." With respect to "other materials" in the CI/UPS mains replacement program the Minister says "it is important that the approved capital expenditure relating to the LP CI/UPS block mains is prioritised to complete replacement of the remaining LP CI/UPS mains over the next five-year period and on those other materials that need replacement for safety reasons, and is not expended on other LP materials mains with lower risk profiles."

Zincara's recommendations as they relate to the three categories above, are summarised below. In addition, we have reviewed AGN's response to a request in the AER Draft Decision regarding the "ongoing role of inserted HDPE mains and services" and also include a summary below.

3.6.1 CI & UPS – Block

Updated leak data and further information has been provided by AGN in its response to the AER Draft Decision, and included a report by GHD, together with IR022 response. The updated leaks data, including 2019 and 2020, showed that the remaining CI/UPS mains are experiencing ongoing and elevated rates of leaks, indicating that the condition of these mains is deteriorating. The data also indicates that the rate of mains replacement during the current AA period and proposed by the AER to be continued during the next AA period may not be

sufficient to effectively reduce the current rate of leaks and to maintain these assets in the medium term.

Zincara recommends that it would be prudent to increase the rate of CI/UPS mains replacement to the level proposed by AGN during the next AA period, being 520 kilometres with a capital expenditure of [REDACTED] million, an increase of 115 kilometres and [REDACTED] million (2019/20 direct). This will enable the CI/UPS mains replacement program to be completed during the next AA period.

3.6.2 HDPE 575 – DN40 HP

In its response to the AER Draft Decision, AGN provided an internal memo, dated August 1991, relating to squeeze-off practices in place at that time and the slow crack growth (SCG) failures being experienced as a result of these practices. AGN also provided a report from GHD Advisory. The information concluded that early squeeze-off practices were likely not to be fully improved until around 1993 and as a result there remained the potential for mains laid prior to 1993 to have structural damage which could result in SCG failures, warranting prioritised replacement by insertion. Noting also that mains laid after this time also demonstrated risk of failure, which AGN proposed to action during the subsequent AA period. With respect to mains laid prior to 1993, they considered that there remained a risk of a “statistically low frequency event but one with a potentially high-risk consequence” and as a result proposed the prioritised replacement of these HDPE DN40 HP mains, during the next AA period.

While Zincara considered that the data showed that squeeze off failures for mains laid from 1991 were at or below rates of failure for post-1993 DN50 mains, the data did show that there had been failures on DN40 HP mains in 1991 and 1992. Considering the information provided, the likely timeframes for replacing these mains and the risk consequences, we consider that it would be prudent to increase the length of prioritised mains replacement for HDPE DN40 HP to include 1991 and 1992 during the next AA period. As a result we recommend acceptance of AGN’s prioritised program of 198 kilometres with a capital expenditure of [REDACTED] million, an increase of 48 kilometres and [REDACTED] million (2019/20).

3.6.3 Non-AMRP service

AGN has clarified why the direct unit rate for non-AMRP service replacement appeared to be disproportionately high compared to earlier years. This increase is due to a recent change in the accounting treatment of motor vehicle leasing costs that allocates these costs to the capital projects and programs in which they are incurred. “This is an ongoing change that is already reflected as a reduction in our capitalised overhead and therefore the current actual material/other rate is a better reflection of the forecast for the next AA period than the 3-year materials/other rate.”

On the condition that the AER accepts the transfer of costs from capitalised overhead to direct costs, then Zincara recommends acceptance of AGN’s proposed unit rate direct cost of [REDACTED]/service. This increases the AER Draft Decision capex for non-AMRP services by [REDACTED] million to [REDACTED] million (2019/20 direct).

3.6.4 Ongoing role of replaced HDPE mains and services

In its Draft Decision the AER noted “The insertion method of addressing poor asset performance can be viewed as an asset reinforcement or modification rather than a like for like replacement. This distinction would influence our regulatory depreciation decision in terms of whether or not the existing assets are subject to accelerated depreciation post insertion (Attachment 4 – Regulatory Depreciation). In its revised proposal, we expect AGN to clarify whether the existing assets will not be providing any ongoing services to consumers post insertion as well as further information on key assumptions used in Incenta’s mains replacement analysis.”

AGN engaged GHD to provide a review and they conclude¹⁰ that it “does not consider AGN’s mains replacement program can reasonably be considered a reinforcement or modification to improve performance, rather the replacement is being undertaken on safety grounds.” “GHD does not consider there is any residual value to the replaced pipeline, we do not consider the old and segmented main provides any ongoing asset management support. The gas supply is 100% provided through new mains and the replaced mains no longer have a role to play. It follows the replacement program is not a reinforcement or a modification.”

Based on its experience, Zincara considers that mains insertion renders the existing main (and inlet services) as obsolete, with no ongoing operational or asset management value. We also consider that the process is not a reinforcement or modification.

It should also be noted that there are a range of mains rehabilitation and replacement methods that can be applied across the gas and similar utility networks businesses, and as such Zincara recommends that any consideration of accelerated depreciation as a result of mains replacement should be assessed on a case by case basis.

¹⁰ Attachment 9.4: GHD Advisory: Ongoing role of replaced HDPE pipelines: section 3.1: page 8

4. OTHER DISTRIBUTION SYSTEM

4.1 INTRODUCTION

In its draft decision, the AER accepted the majority of the capex for this category but only accepted a lower capex for two projects by reducing the scope of these projects. The projects are:

- SA103 replacement of valves
- SA105 pipeline modification for Inline Inspection

For SA103, AGN has carried out a reassessment of the valve replacement program and has resubmitted a revised program which is discussed in the section below.

For SA105, AGN has accepted AER's amendment of deferring the two FEED studies on the modifications of metropolitan transmission pipeline to make them piggable.

4.2 SA103 REPLACEMENT OF VALVES REVISED PROPOSAL

AGN's original plan was to replace 16 valves that are inoperable and replace a further 16 valves that have previously leaked at a cost of approximately [REDACTED] million. In its Draft Decision, the AER accepted the replacement of the 16 valves that are inoperable but considered that the AGN's maintenance program should be able to monitor the 16 valves that have previously leaked and repaired without having them proactively replaced at this stage.

In response to the Draft Decision, AGN undertook a more detailed risk assessment of the 16 previously leaked valves and in its revised plan proposes to replace nine of the previously leaked valves. The revised proposal consisted of the following:

- 2 transmission valves and 3 distribution valves that are rated as having a "high" risk to operations due to potential to cause supply interruptions to more than 10,000 customers, multiple large volume customers or multiple high risk sites.
- 1 transmission valve and 3 distribution valves that are rated as having a "moderate" risk to operations due to the potential to cause supply interruptions to over 1,000 customers but less than 10,000 customers.

A comparison of AGN's revised capex with the draft decision is provided in the table below.

Table 4-1: AGN Valve Replacement Revised Capex (\$2019/20 million)

	AGN Initial		AER - DD		AGN Revised	
	Volume	Capex	Volume	Capex	Volume	Capex
Valve Replacement:	32	[REDACTED]	16	[REDACTED]	25	[REDACTED]

(Source: AGN Initial capex and AER -DD capex are from Zincara's Report 20201104

AGN revised capex from AGN SA RepFP_Attachment8.8A_Addendum to Capex Business Cases_20210113_Public)

4.2.1 Risk Assessment of previously leaked valves

Following the draft decision, AGN undertook a more detailed risk assessment of the criticality of each of the 16 previously leaked valves. The risk assessment is based on the number of customers that will be affected if there is a need to isolate a section of the network and if the related valve is inoperable. In that situation, AGN would have to use a valve further upstream to isolate the section which could result in a greater number of customers being affected. AGN said that depending on the location of the valve and whether it is transmission or distribution, the number of customers affected could vary significantly.

AGN had used its Risk Assessment Framework to determine the risk rating on each of the valve. With a likelihood of “unlikely” for each of the valve, nine of the valves have a risk rating of “high” or “medium”. AGN’s revised plan has therefore proposed the replacement of these nine valves in addition to the 16 inoperable valves which were accepted by the AER in its draft decision.

The result of the risk assessment is provided in Appendix A Table 6 of AGN’s Attachment 8.8A-Addendum to Capex Business Cases.

AGN engaged GHD to review its proposal and GHD has concluded that these nine valves should be replaced.

4.2.2 Conclusion

We have reviewed AGN’s risk assessment and concur with the likelihood and consequence settings used to determine AGN’s risk rating for these nine valves that AGN is proposing to replace. We still believe that it is unlikely that these valves would fail in the short to medium term if they are well maintained but accept that a cautious approach to replacing these valves is not unreasonable. We therefore recommend accepting the replacement of the valves as prudent.

In relation to cost, AGN had advised that it had used the same unit costs as was in its original business case¹¹. We have accepted these unit costs in our original recommendation and as such we used these unit costs to verify the capex for the revised proposal. Our calculated total capex is consistent with AGN’s revised proposal. As such, we recommend accepting the revised capex as shown in the table below.

Table 4-2: Recommended Valve Replacement Capex (\$2019/20 000)

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Valve Replacement	624.2	1,013.2	1,453.1	845.9	295.1	4,231.4

(Source: AGN SA RepFP_Attachment8.8A_Addendum to Capex Business Cases_20210113_Public)

¹¹ AGNSA_Attachment 8.8 Capex Business cases_Confidential