Australian Gas Networks
Access Arrangement 2016/17 to 2020/21
South Australian Natural Gas Distribution Network

Review of Capex Forecasts
for
Selected Projects

Report
to
Australian Energy Regulator
by
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1. Background

1.1 Australian Gas Networks Limited (**AGN**) has submitted to the Australian Energy Regulator (**AER**) proposed terms for access to the South Australian Gas Distribution Network (**Network**) for the period 2016/17 to 2020/21.

1.2 I have been asked by the AER to review capital expenditure (**Capex**) forecasts for selected projects included by AGN in its plans for the Network over the period 2016/17 to 2020/21.

1.3 The objective of the review is to provide recommendations regarding what would be prudent and efficient Capex for each of the projects in question. To be allowable for tariff setting purposes, Capex must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

1.4 My review, and my recommendations to the AER regarding prudent and efficient Capex, are set out in the following sections of this Report.

2. Augmentation Capex

2.1 Augmentation Capex is Capex that is required to reinforce the Network to ensure it has capacity to meet forecast gas demand[1]. I have reviewed the three largest components of Augmentation Capex. My findings are set out below.

2.2 Southern Transmission Line (Business case SA21)

i) The 45 year old Southern Transmission Pipeline is 5.16 km long, 200 mm nominal diameter and is the sole source of supply of gas to 20,000 customers. Pitting corrosion[2] has been identified under each of 20 heat-shrink sleeve coated, field-welded joints recently excavated for inspection.

ii) AGN proposes to replace[3] the Southern Transmission Pipeline at a cost of $7.5m ($2014–15, direct costs).

iii) I consider the inspection programme[4] carried out by AGN gives a high level of confidence that the pitting corrosion problem is widespread on the pipeline in question.

iv) However, while the pitting corrosion is of concern it does not, in my view, necessitate expedited replacement of the pipeline. Australian Standard AS2885.3-2001[5] incorporated a mechanism for review of corrosion parameters. Application of that mechanism indicates the Southern Transmission Pipeline remains fit for purpose[6].

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1 See paragraph 8.5.5, page 143, of "Access Arrangement Information for Australian Gas Network's South Australian Natural Gas Distribution Network", July 2015 (**AAI**).

2 Pit corrosion up to 2.4 mm deep (representing 38% of the pipeline wall thickness) was identified. AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA21", July 2015, p. 2.

3 At the same time, a pipeline crossing at Christies Creek (where the pipeline has been exposed by flood activity) will be reconstructed.

4 20 excavations / inspections were carried out. I estimate this represents of the order of 4% of welds along the Southern Transmission Pipeline.

5 AS2885.3-2001, "Australian Standard: Pipelines – Gas and liquid Petroleum; Part 3: Operation and maintenance", included in "Appendix D – Assessment of a corroded pipeline" guidance for assessment of a corroded pipeline. Although AS2885.3-2001 has been replaced by AS2885.3-2012 and Appendix D removed, the historic assessment arrangements nonetheless provide a useful guide. AS2885.3-2012 adopts a "*level assessment approach*" that deals with a broader range of anomalies through differing levels of engineering assessment.

6 On the basis of available information (as set out in AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA21", July 2015) I estimate the critical length for the worst pitting corrosion found by AGN to be in excess of 40 mm. The corrosion evident in photographs in AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA21", July 2015, is considerably less than the critical length which means the pipeline remains suitable for operation as designed.

v) The Southern Transmission Pipeline operates at up to 1.95 MPa which conservatively means [7] a pipeline wall thickness of not less than approximately 3 mm is adequate. For the worst circumstance identified by AGN to date, the residual wall thickness was marginally under 4 mm. I agree with AGN's view [8] that a burst failure of the Southern Transmission Pipeline is highly unlikely.

vi) I recommend statistical analysis of the findings of the inspection programme be carried out to quantitatively identify the probable range of pitting corrosion depths, and a programme implemented to monitor pipeline condition so as to reliably determine when replacement is justified. A suitable monitoring programme can be incorporated into the further exploratory excavation work, as proposed by AGN and referred to in section 2.3 below.

2.3 Pitting Issues Under Sleeves (Business Case SA21a)

i) AGN has identified problems associated with pitting corrosion beneath heat-shrink sleeves fitted to field-welded joints on steel transmission pipelines within the Network. The pipelines in question are of the order of 30 to 45 years old with aggregate length around 130 km.

ii) AGN proposes to undertake a programme of exploratory excavations of field-welded joints to survey and, as necessary, remediate corrosion problems. Two excavations per kilometre, representing 260 excavations in total or 52 excavations per year over a 5 year period, are proposed. [redacted]

iii) Recognising AGN's experience[10] with pitting corrosion beneath heat-shrink sleeves on the Southern Transmission Line, I consider it prudent to survey the extent of the problem across AGN's aging steel transmission pipelines. Consistent with paragraph 2.2(vi) above, I recommend the survey programme include ongoing inspection of the Southern Transmission Pipeline (as part of the proposed 52 excavations per annum).

iv) AGNs proposed exploratory excavation programme involves survey of about 2%[11] of field-welded joints. This survey programme will:

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7 Based upon hoop stress analysis assuming the pipeline is constructed from API 5L Grade B steel and is located in a built up area.

8 AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA21", July 2015, p. 3.

9 AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA21a", July 2015, p. 6 (CONFIDENTIAL).

10 20 exploratory excavations were carried out at locations along the 5 km pipeline, with pitting corrosion identified under heat-shrink sleeves at every location.

11 I estimate a total of 12,000 field-welded joints across 130 km of pipeline, based upon 12 metre pipe lengths and with an allowance for welding of valves, flanges, bends etc. 260 surveys represents about 2% of this estimate.

- afford a reasonable level of confidence that survey results will be representative of overall circumstances across the steel pipeline transmission system; and

- provide information to allow formulation, as appropriate, of ongoing survey or remediation programmes.

v) I consider the survey programme, averaging one exploratory excavation per week, to be physically achievable.

vi) I consider the estimated cost of the survey programme to be reasonable. It is based upon actual costs incurred with the survey programme undertaken on the Southern Transmission Pipeline.

vii) While I consider the proposed survey programme will contribute to ensuring the operating lives of AGN's transmission pressure pipelines are maximised, it will not change the capacity of the pipelines in question.[12] In my opinion the proposed programme of work is an operating and maintenance activity[13] (rather than capital works). I recommend consideration be given to treating the costs of the programme as an operating and maintenance cost rather than a capital cost.

2.4 Murray Bridge Augmentation (Business Case SA71)

i) AGN proposes to construct 2 km of 150 mm nominal diameter steel pipeline to supply gas into the Murray Bridge area. The new pipeline will complement an existing 50 mm nominal diameter pipeline, the capacity of which is considered by AGN to be inadequate to meet anticipated organic market growth within the Murray Bridge area.

ii) I have modeled the capacity of the existing 2 km pipeline to Murray Bridge and accept that the pressure profile[14] provided by AGN is reasonable given the assumptions upon which it is based.

iii) AGN anticipates market growth of 250 to 300 new residential customers per annum. This anticipated growth appears excessive considering there are only some 400 residential customers within the Murray Bridge township, and aggregate growth over the next 15 to 20 years amounts to 2,750 customers[15].

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12 AGN, "AER Australian Gas Networks 007_AGN response", 4 August 2015, p. 3.

13 Section 5 of "Australian Standard: Pipelines – Gas and liquid Petroleum, Part 3: Operation and maintenance" requires that inspection and assessment activities be conducted as an operation and maintenance activity and recognises bellhole excavation is an acceptable inspection method.

14 AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA71", July 2015, p. 3. The pressure profile is based upon gas demand growth being either 50 m^3/h or 100 m^3/h.

15 AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA71", July 2015, p. 2. AGN is forecasting 2 existing northern estates (>900 allotments), 3 new northern estates near the town's racecourse (approximately 100 allotments) and Gifford Hill development (an initial 300 allotments expanding to about 1,750 allotments) over the

iv) The existing 50 mm pipeline supplying gas to Murray Bridge is presently operated at a pressure of 1.65 MPa, but is capable of safe operation at considerably higher pressure[16]. In order of magnitude terms, a 20% increase in the pressure[17] at which gas enters the existing pipeline will give a 25% increase in the capacity of the pipeline. Consideration should be given to beneficially utilising this potential capacity.

v) In view of uncertainty regarding market growth, I recommend AGN seek requisite approvals, if any, for interim operation of the existing pipeline at a suitably increased pressure. This will allow the forecast residential market growth, if realised, to be satisfied whilst mitigating the economic risk associated with premature installation of the proposed new pipeline.

vi) To allow operation at increased pressure will require adjustment of regulator set points or, potentially, swap-out of regulators.

vii) In consideration of the observations set out above, I do not consider construction of the proposed new gas pipeline, to supply gas to Murray Bridge, to be necessary during the period 2016/17 to 2020/21.

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next 15 to 20 years. If all of this growth is realised it will represent an average annual growth of up to 180 potential customers per annum. Actual growth in gas connections will be lower as not all potential customers will connect to gas.

16 I have calculated that a 50 mm nominal bore [redacted] operate at up to or in excess of 15.3 MPa, subject of course to the capability of other components of the pipeline (valves etc).

17 This will take the inlet pressure of the pipeline to the maximum allowable for ANSI Class 150 fittings. If the pipeline incorporates higher rated fittings then further pressure increase may be possible.

3. Regulator and Valve Capex

3.1 I have reviewed the three largest components of Capex on regulators and valves, as outlined in section 8.5.6.1 of the AAI[18]. My findings are set out below.

3.2 Below Ground Regulator Replacement (Business Case SA22)

i) There are 80 below ground vault-type regulators within the Network, 36 of which were (in 2012) found to be at the end of their working life. AGN received approval for replacement of 26 of those Regulators during the period to 2015/16 and will, by the end of the period, have completed 21 replacements.

ii) AGN proposes to complete the below ground regulator replacement programme by replacing a further 3 regulators per year over the period 2016/17 to 2020/21.

iii) I accept it is prudent to replace below ground regulators that are at the end of their working life.

iv) I accept that replacement of 3 regulators per annum is realistic and achievable. AGN has replaced approximately 5 regulators per annum since 2012.

v) I consider AGN's estimated cost[19] of $329,000 per regulator to be reasonable for the scope of work carried out.

vi) Since funding for 26 regulator replacements was historically approved, but only 21 replacements completed, it may be that funding for the period 2016/17 to 2020/21 should be reduced. I leave this matter for consideration by the AER.

3.3 Relocate Meters in Vulnerable Locations (Business Case SA75)

i) AGN receives around 300 enquiries per year regarding relocation of small[20] meters necessitated, for example, by building or property changes. Historically, meter relocations have been carried out at the customers' expense and, as a result, a number of customers elect not proceed with the relocation or find ways to circumvent payment.

ii) To ensure that all necessary meter relocations are carried out, AGN proposes to carry them out at its cost, with that cost to then be recovered through tariffs charged to all customers.

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18 AGN, "Access Arrangement Information for Australian Gas Network's South Australian Natural Gas Distribution Network", July 2015.

19 AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA22", July 2015, p. 8.

20 Residential and small commercial or industrial.

iii) I accept AGN's estimated unit cost of $1,560 for relocating a meter, as it is based upon actual costs incurred for this work.

iv) While there may be some merit in AGN's proposal to carry out meter relocations without direct cost to individual consumers (to the extent it ensures all necessary meter relocations are carried out) the question of whether this justifies a move from user-pays to cost recovery through tariffs is a matter for consideration by the AER.

3.4 Upgrading of Industrial and Commercial Meter Sets (Business Case SA33)

i) Of 180 meter sets installed at demand customers [21] sites, AGN estimates [22] 26 thereof are in need of attention, primarily since modifications to the customers' plant and facilities (since installation of the meter sets) have resulted in the meter sets being located within hazardous areas.

ii) Two of the unsatisfactorily located meter sets have already been relocated. AGN proposes to progressively relocate the remaining (estimated) 24 meter sets over the period 2016/17 to 2020/21.

iii) The relocation activity will involve replacement of existing meter sets. This will ensure current standards are met [23] and avoid reuse of degraded equipment.

iv) I consider the proposed programme of work is reasonable and prudent to ensure safety of operation at customer sites.

v) I consider AGNs estimated cost for refurbishment and relocation of a meter set ($83,000) to be reasonable. An itemised costing has been provided[24]. Around 75% of the unit cost relates to materials.

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21 These are customers using in excess of 10 TJ/a of gas.

22 The estimate is based upon survey work carried out by AGN, which showed 12 out of 84 meter sets surveyed (ie 1 in 7) are not satisfactorily located.

23 While updated standards are not normally retrospectively applied, compliance is essential when other work is carried out.

24 AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA33", July 2015, p. 4.

4. Other Distribution System Capex

4.1 Section 8.5.6.3. of the AAI addresses miscellaneous Capex items. Review of the largest of these miscellaneous items has been separately arranged by the AER. I have reviewed the next three largest items. My findings are set out below.

4.2 Installation of Fire Safety Valves (Business Case SA31)

i) AGN has a programme underway to install Fire Safety Valves (FSVs) on meters of domestic customers who are in bush fire risk areas. AGN received approval for this programme during the period 2011/12 to 2015/16, with over 13,000 installations to have been completed over two years 2011/12 and 2012/13.

ii) By the end of 2015/16 only 4,800 installations will have been completed, at a declining annual rate[25] over the period 2013/14 to 2015/16. This leaves over 9,000[26] installations still to be completed.

iii) AGN proposes to complete the FSV installation programme during 2016/17 and to expand the programme by:

- installing FSVs at an estimated 800 domestic properties where gas meters are located in proximity to brush fences; and
- including installation of FSVs in all new (8,500 per annum) and changeover (16,000 to 37,000 per annum) domestic meter installations.

iv) In the following paragraphs I consider the prudence of the proposed FSV installation. I leave for consideration by the AER the issue that funding for installation of FSVs in bush fire risk areas has previously been approved, but the work not completed.

v) I accept that continuation of the programme of installing FSVs on domestic meters in bush fire prone areas is prudent. Key considerations in this regard are that an FSV:

- affords protection from external heat risk, such as might be caused by a bush fire; and
- affords that protection in circumstances where alternative means of isolating gas supply may not be available, since personnel may not be able to access the area in question.

vi) I do not accept that AGN can complete the programme of installing of FSVs to all domestic meters within bush fire risk areas in one year, 2016/17. Over the period 2011/12 to 2015/16 AGN will have installed 4,800 FSVs, less than half what is presently proposed for 2016/17 and also (as set out above) well below what was planned and approved for the period beginning 2011/12.

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25 AGN, AER Australian Gas Networks 007_AGN response, 4 August 2015 p. 5.

26 AGN, "Access arrangement proposal: Attachment 7.1: Business case – SA31", July 2015, p.3 sets out an updated estimate of 14,670 customers within bushfire risk areas. Of these, 4,800 FSV installations will be complete by the end of 2015/16.

vii) I suggest a realistic, achievable and manageable programme be based upon installation of 1,000 FSVs per annum, reflecting the annual installation rate most recently achieved by AGN.

viii) I accept AGN's estimated cost for installation of FSVs. The cost is based upon actual current, competitive costs.

ix) I do not accept that installation of FSVs at locations (yet to be identified) adjacent to brush fences is justified. I have this view because:

- I consider the risk of damage to a gas meter as a result of a brush fence fire to be very low, notwithstanding that AGN considers the risk of a brush fence fire itself to be "occasional" [27]; and

- In the event of a brush fence fire street access will remain available for isolation of the domestic service.

x) I do not accept that installation of FSVs in new and changeover domestic meter installations is justified. An FSV affords particular protection from external heat sources whereas I consider the greater risk to be that of an internal fire, potentially damaging aluminium, plastic or flexible equipment and leading to a gas leak that fuels the internal fire. An FSV offers little protection against this circumstance.

4.3 Replacement of Exposed Plastic Service Pipe (Business Case SA28)

i) AGN has a programme underway to replace polyethylene (PE) pipe that is located above ground in the lead up to domestic meters. Replacement work commenced in 2013 with 5,000 replacements completed by the end of 2015/16, and 20,000 replacements outstanding.

ii) AGN proposes to complete the replacement programme over the period 2016/17 to 2020/21 by replacing 3,000 above ground PE services per annum.

iii) I consider continuation of the replacement programme to be justified. In my opinion above ground PE is susceptible to deterioration and damage, and replacement is prudent.

iv) I note that the historic rate of plastic service pipe replacement achieved by AGN since 2013 is of the order of 1,700 per annum[28]. While AGN proposes[29] to ramp up operations to approximately double the historic rate of replacement of plastic service pipes, I note (as set out in section 4.2 of this Report) AGN has previously failed to deliver on similar programmes of work. I recommend provision be made for the replacement programme to continue at a rate of 2,000 replacements per annum.

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27 On 11 August 2015 AGN advised "the likelihood for brush fences is considered relatively higher (Occasional) compared to bushfire zones and general households (Possible/Unlikely)".

28 Over the period 2013/14 to 2015/16, 5,000 services will have been replaced, representing circa 1,667 replacements per annum.

29 On 4 August AGN advised it would increase its contract workforce to achieve the increased rate of replacement, and stated it has demonstrated capacity for increasing work programmes.

v) I consider AGN's estimated cost of replacement of above ground PE service pipe to be reasonable[30] with the exception that provision should not be included for [redacted]. My reason for this is as set out in [redacted] above[31]. This will reduce the cost of each replacement job by [redacted][32].

4.4 Sleeved Railway Crossings (Business Case SA10)

i) AGN has a programme underway to excavate, inspect and if necessary repair sleeved railway crossings on its transmission pressure pipeline system. AGN received approval to inspect 81 such crossings over the period 2011/12 to 2015/16 but, by the end of 2015/16, only 26 inspections will have been completed.

ii) AGN proposes to complete the programme of inspecting sleeved, transmission pressure railway crossings over the period 2016/17 to 2020/21, carrying out 11 inspections per year.

iii) In the following paragraphs I consider the prudence of the proposed ongoing inspection programme. I leave for consideration by the AER the issue that funding for all 81 inspections has previously been approved, but the work not completed.

iv) I consider completion of the inspection programme to be prudent to ensure safe and reliable operation of the transmission pressure pipeline system into the long-term. However, I note that the inspection programme to date has not identified any major corrosion problems. While it may be possible to carry out 11 sleeved railway crossing inspections per year, results to date confirm the inspection programme can be safely and prudently completed at a slower rate, and therefore at lower present value cost to consumers.

v) AGN completed an average of 5 inspections per annum over the period 2011/12 to 2015/16. I recommend inspections be carried out at the same rate over the period 2016/17 to 2020/21. I anticipate the initial focus of AGNs inspection programme will have been older or more exposed (in terms of both risk of damage and impact thereof) sleeved railway crossings, and recommend this approach continue (or be adopted if not already followed).

30 This is because the programme cost is based upon actual costs of carrying out work to date.

31 Note also that, [redacted]

32 [redacted]

5. Conclusions

5.1 The table on the following page provides a summary of my findings as set out in sections 2, 3 and 4 of this Report.

Summary of Findings

Business Case Reference		Comment	Capex Impact
Augmentation	SA21: Southern Transmission Line	Project not necessary. Ongoing monitoring recommended	$7.5m ($2014–15, direct costs) reduction, predominantly from 2017/18
	SA21a: Pitting Issues Under Sleeves	Project is prudent, but consideration should be given to treating expenditure as O&M in nature (rather than Capex). Carry out 52 inspections per annum (including, as appropriate, on Southern Transmission Line).	Possible move of $0.7m pa ($2014–15, direct costs) from Capex to O&M
	SA71: Murray Bridge Augmentation	Project not required. Growth assumptions too high. Potential of existing pipeline not utilised.	$3.0m ($2014–15, direct costs) reduction, predominantly from 2018/19
Regulator & Valve	SA22: Below Ground Regulator Replacement	Replacement work is prudent. 15 replacements proposed, of which 5 are carried over from previous period.	AER to consider whether provision should be reduced in 2016/17 and 2018/19 to reflect carry over of previously approved work.
	SA75: Relocate Meters in Vulnerable Locations	Project has some merit. Costs are appropriate. Matter referred to AER for decision regarding user-pays versus cost capitalisation.	To be determined by AER.
	SA33: Upgrading I&C Meter Sets	Work is prudent and costs appropriate.	No impact.
Other	SA31: Installation of Fire Safety Valves	Work in bush fire risk areas is prudent, with funding for the whole programme previously approved. Forward programme should be reduced to 1,000 installations pa. Work adjacent to brush fences and new/changeover locations is not justified.	Reduce total provision to $105,000 per annum ($2014–15, direct costs) (overall reduction of $9.94m over 5 years). AER to consider whether this provision should be reduced since work was previously approved.
	SA28: Replace Exposed Plastic Service Pipe	Proposed work is prudent, costs are reasonable, but programme is overly ambitious. Reduce programme to 2,000 replacements per annum and [redacted].	Reduce programme cost to $864,000 per annum ($2014–15, direct costs) (overall $4.3m over 5 years).
	SA10: Sleeved Railway Crossings	Work is prudent, but programme should be reduced to 5 inspections per annum. Note also that the entire programme was previously approved.	Reduce annual Capex to $198,400.($2014–15, direct costs) (overall reduction of $1.91m over 5 years)