

**Amadeus Gas Pipeline  
Access Arrangement 2016/17 – 2020/21**

**Review of Actual and Forecast Capex  
for  
Selected Projects**

**Report  
to  
Australian Energy Regulator  
by  
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**22 September 2015**



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## Contents

	Page
1. Background .....	2
2. Bi-directional Pigging Project.....	3
3. Below Ground Station Pipework Recoating.....	5
4. Channel Island Lateral Piggability Project .....	8
5. Conclusions .....	11

## 1. Background

- 1.1 APT Pipelines (NT) Pty Limited (**APTNT**) has submitted to the Australian Energy Regulator (**AER**) proposed terms for access to the Amadeus Gas Pipeline (**AGP**) 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 APTNT in its plans for the AGP over the period 2016/17 to 2020/21, as well as actual and estimated Capex on selected projects in the 2011/12 to 2015/16 access arrangement period.
- 1.3 The objective of the review is to investigate whether the proposed Capex is prudent and efficient and, if necessary, make recommendations regarding the level of Capex that might be prudent and efficient. 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 network renewal Capex, are set out in the following sections of this Report.

## 2. Bi-directional Pigging Project

- 2.1 APTNT has completed modifications to allow the AGP to be pigged in a southerly direction between Ban Ban Springs (where gas enters the AGP from the Blacktip gas field) and Palm Valley. The modifications were accepted by the AER as being necessary and prudent since the AGP was designed and constructed to accommodate northerly gas flow but the dominant direction of gas flow is now southerly.
- 2.2 For the Access Arrangement period preceding 2016/17, the AER approved a sum of \$0.5m to complete modifications to facilitate bidirectional pigging (that is, pigging in both a southerly and northerly direction).
- 2.3 Actual expenditure incurred by APTNT in completing the bi-directional pigging project amounted to \$5.1m. The AER has requested advice regarding the prudence and efficiency of APTNT's actual expenditure relative to the approved expenditure.
- 2.4 APTNT has advised that the excess of actual over approved expenditure was a consequence of two factors:
  - i) the need for existing pig launching stations to be physically modified, rather than simply adapted<sup>1</sup>, to facilitate pigging in a southerly direction; and
  - ii) the need for installation of facilities to create a pressure/flow regime sufficient to propel pigs through the AGP in a southerly direction.
- 2.5 The factors set out above are in my opinion valid.
- 2.6 APTNT has provided information<sup>2</sup> to explain why the use of insertion sleeves proved to be infeasible. In essence, there was material risk that a pig exiting the pipeline might strike the door of the pig receiver. This necessitated modification of eleven scraper stations.
- 2.7 I also accept that the present low rate of gas flow in a southerly direction is insufficient to propel pigs at a speed that is steady and meets requirements for intelligent pigging. Through use of pressure control facilities, a pressure gradient and gas flow regime can be created to facilitate pigging activities.

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<sup>1</sup> The original Capex estimate was based upon use of 'insertion sleeves' to allow pig launching stations to also receive pigs.

<sup>2</sup> "APTNT Response to Information Request Number 4".

- 2.8 In completing the bi-directional pigging project, APTNT incurred \$4.6m of expenditure in excess of what was approved for the period preceding 2016/17. I note that the \$4.6m figure covered the costs of:
- modifications to pig launching stations to allow them to receive pigs (overcoming the problem set out in paragraph 2.6). These modifications were relatively extensive, with the pig launcher having to be extended by 1.9 metres, kicker and vent lines relocated and balance lines installed;
  - fabrication of a mobile pressure reduction skid (to be used to overcome the problem set out in paragraph 2.7); and also
  - modification to pig receival stations to allow safe movement of pigs and to allow connection of the mobile pressure reduction skid. This represents around \$0.4m per scraper station modified.
- 2.9 I consider the expenditure incurred to be reasonable for the relatively extensive modifications, as summarised in paragraph 2.8, that were completed.
- 2.10 It is my opinion that expenditure incurred by APTNT on the bi-directional pigging project is prudent and efficient.

### 3. Below Ground Station Pipework Recoating

- 3.1 When the AGP was constructed, below ground pipework within stations along the pipeline was coated in an industry standard manner. This included use of both coal tar enamel (on complex-shaped fittings) and heat-shrink sleeves. Over time, these coating systems have deteriorated and defects have developed. The existence of defects has been confirmed through direct current voltage gradient (**DCVG**) surveys, cathodic protection (**CP**) surveys and through visual inspection.
- 3.2 Inspection and repair of below ground station pipework necessarily involves excavation of the pipework.
- 3.3 During the Access Arrangement period preceding 2016/17, APTNT excavated, inspected and repaired coating on below ground pipework in nine stations (out of a total of 37 stations in which coal tar epoxy was used). The cost of work carried out was \$6.25m, an average of \$0.7m per station.
- 3.4 APTNT's findings to date are summarised in Table. 1 on page 6. In all cases where pipeline metal loss was detected, the metal loss was minor. There was no threat to pipeline integrity and healthy factors of safety were demonstrated, allowing continued operation of the pipeline at its design maximum pressure.
- 3.5 One of the objectives of the work programme carried out to date was to<sup>3</sup> "help determine the expected condition of the remaining scraper stations and MLVs...". On the basis of inspection work carried out to date, the results of which are outlined in paragraph 3.4, it is in my opinion reasonable to expect that the remaining scraper stations and MLVs will have coating related issues but the pipeline itself will be in sound condition. APTNT has not provided any information to suggest otherwise.
- 3.6 APTNT has however proposed to inspect and repair below ground pipework coating at the remaining<sup>4</sup> 25 stations over the period 2014/15 to 2016/17<sup>5</sup>. The estimated total cost of the proposed programme is \$13.2m, or \$0.5m per station, representing a material reduction from historic costs. APTNT has advised<sup>6</sup> the cost reduction is attributable to undertaking future work on the basis of a fixed cost tender instead of a rates-based sole-source contract.
- 3.7 Rule 79(1) specifies that capital expenditure:  
*"... 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.**"* [emphasis added]

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<sup>3</sup> Refer to the Introduction of "Coating Assessment Report: Below Ground Station Piping Repair Project" for any of the nine stations inspected.

<sup>4</sup> I note that the "Amadeus Gas Pipeline- Access Arrangement Revision Proposal – Submission", August 2015, page 71 refers to coal tar enamel having been used at a total of 37 stations. With work carried out at 9 stations to date, this suggests 28 stations may require attention in due course. I have not attempted to ascertain why APTNT (also on page 71) refers to "...the 25 remaining stations".

<sup>5</sup> See Table 6.12, page 71 of "Amadeus Gas Pipeline - Access Arrangement Revision Proposal - Submission", August 2015.

<sup>6</sup> "Amadeus Gas Pipeline - Access Arrangement Revision Proposal - Submission", August 2015, page 71.

- 3.8 While I consider it prudent to inspect and repair below ground station pipeline coating at the remaining stations (since it is likely they will have coating related issues, as per paragraph 3.5) it is my opinion that undertaking such a programme of work on an accelerated basis, as proposed by APTNT, is inconsistent with achieving the lowest sustainable cost of providing services. Since (as per paragraph 3.5) the pipeline itself is expected to be in sound condition, undertaking work on an accelerated basis would mean costs are incurred prematurely and, in turn, the cost of providing services is not at the lowest sustainable level.
- 3.9 I recommend the remediation programme be progressed at a slower rate. Selection of an appropriate rate requires balancing between:
- the need for coating repair work to be completed in a timely (but not expedited) manner; and
  - the need for the repair programme to be coordinated so as to ensure the fixed cost tender benefits (referred to in paragraph 3.6) are secured.
- 3.10 I suggest inspection of four stations per annum would not be unreasonable. My judgement is that this will ensure all station coating repair work is completed<sup>7</sup> by the end of 2020/21, and the benefits of fixed cost tendering realised.

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<sup>7</sup> Table 6.12 on page 71 of "Amadeus Gas Pipeline - Access Arrangement Revision Proposal - Submission", August 2015, indicates that APTNT has already commenced work on the remaining 25 stations, with one completed in 2014/15. Completing 4 per year from 2015/16 to 2020/21 will see all 25 stations repaired by 2020/21.

Table 1: Findings<sup>8</sup> of Below Ground Station Piping Repair Project

Location	Darwin City Gate	Newcastle Waters	Warrego Scraper Station	Tindal MLV	Morphett Creek MLV	Aileron MLV	Tanami Road Scraper Station	Wauchope Scraper Station	Kelly Well MLV
Document No.	BGS-RP-A-0001 Rev A	BGS-RP-A-0001 Rev 0A	BGS-RP-A-0009 Rev 0A	BGS-RP-A-0005 Rev 0B	BGS-RP-A-0006 Rev 0B	BGS-RP-A-0013 Rev 0A	BGS-RP-A-0011 Rev 0A	BGS-RP-A-0009 Rev 0A	BGS-RP-A-0012 Rev 0A
Date	20/11/12	5/3/13	10/7/13	19/4/13	19/4/13	15/7/13	10/7/13	3/7/13	14/7/13
Coating defects found	21	9	11	3	7	2	9	18	3
Metal loss locations	none	6	4	2	none	1	9	17	2
Metal loss depth (worst case)	n/a	1.69 mm (Minor*)	2.28 mm (Minor*)	1.0 mm (Minor*)	n/a	0.28 mm (Minor*)	1.70 mm (Minor*)	1.37 mm (Minor*)	1.91 mm (Minor*)

\* Minor means no de-rating of pipeline operation is required. In fact, in all cases there remains a healthy factor of safety.

<sup>8</sup> Findings are from Coating Assessment Report prepared for each station inspected. Document reference numbers are as tabulated.



#### 4. Channel Island Lateral Piggability Project

4.1 The pipeline lateral, that carries gas from the Darwin City Gate Station (**DCGS**) to the Channel Island Power Station (**CIPS**), cannot be intelligently pigged as:

- it is not equipped with pig launching and receival facilities; and
- it does not have a consistent diameter for its whole length. An 800 metre long bridge-crossing section, toward the delivery end of the pipeline, is 200 mm diameter whereas the rest of the pipeline is 300 mm diameter.

APTNT has determined, and I have corroborated, that intelligent pigging tools capable of handling both 300 mm and 200 mm diameter pipeline are not available.

4.2 APTNT considers work must be carried out to allow the entire length of the Channel Island Lateral to be pigged, and has investigated three options for achieving this:

- i) install 300 mm diameter pig launching/receival facilities at DCGS and CIPS, respectively, and replace pipeline section from upstream of the bridge to the CIPS with a new, directionally-drilled 300 mm diameter pipeline leg - overall estimated cost \$11.1m;
- ii) install 300 mm diameter pig launching/receival facilities at DCGS and CIPS, respectively, and replace the 200 mm bridge crossing with a new 300 mm crossing - overall estimated cost \$11.0m; or
- iii) install 300 mm diameter pig launching/receival facilities at DCGS and upstream of the bridge crossing, respectively, install 200 mm diameter pig launching/receival facilities upstream of the bridge crossing and at CIPS, respectively, and replace the short 300 mm pipeline section from the bridge to CIPS with a new 200 mm pipeline leg - overall estimated cost \$11.7m.

4.3 APTNT has proposes to implement the first of the options outlined above, and is presently undertaking geotechnical surveys to confirm directional drilling feasibility and cost.

4.4 APTNT's proposal is of concern for several reasons, as follow:

- i) Intelligent pigging of gas pipelines, whilst desirable, is not mandated<sup>9</sup> by Australian Standard AS2885. In considering the need for intelligent pigging a prudent operator should have regard for other relevant factors - for example, the entire length of the 300 mm diameter section of the Channel Island Lateral is classed as 'heavy wall'.

The extent of work APTNT proposes to undertake to facilitate intelligent pigging of the Channel Island Lateral is excessive and is not consistent with achieving the lowest sustainable cost of providing services.

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<sup>9</sup> AS2885.3-2012 "Pipelines - Gas and Liquid Petroleum - Operation and Maintenance" provides at section 6.6 .1 that "...Licensee shall **consider** the use of an inline inspection tool..." and "Where a pipeline (or section of a pipeline) is not capable of being inspected by an inline tool, the Licensee shall **consider** whether the pipeline needs to be modified..." [emphasis added]. It is also provided that, any decision not to use an inline inspection tool or not to undertake modifications shall be consistent with the Safety Management Plan and Pipeline Integrity Management Plan.

- ii) The key reason for considering intelligent pigging of the Channel Island Lateral is to facilitate easy assessment of external metal loss as a result of corrosion. Internal corrosion is unlikely since the pipeline is transporting dry, non-corrosive natural gas. If internal corrosion was of concern, it would have been experienced at other locations along the AGP.

The 200 mm diameter section of Channel Island Lateral that crosses the Channel Island Bridge can be readily inspected, as illustrated in Figure 1. It is not necessary to be able to intelligently pig the bridge crossing to ascertain its condition. All of the options investigated by APTNT (as summarised in paragraph 4.2) involve unnecessary work and are therefore not efficient.

Figure 1: Channel Island Lateral - Channel Island Bridge Crossing  
(Note: Channel Island Power Station visible in left background)



- iii) Alternatives to intelligent pigging are available and should be assessed. APTNT presently carries out DCVG surveys annually on the Channel Island Lateral, together with excavations and inspections as required<sup>10</sup>. In association with the excavations and inspections, girth weld sleeves have also been inspected and no significant corrosion detected.

The short section of pipeline from the downstream side of the bridge crossing to the CIPS is in elevated terrain. Its condition may be reliably assessed by a combination of DCVG surveys, excavations/inspections and extrapolation of findings from survey work carried out on pipework upstream of the bridge crossing.

- 4.5 Given the concerns set out above it is my opinion that the Capex proposed for the Channel Island Piggability Project is neither efficient nor consistent with achieving the lowest sustainable cost of providing services.

<sup>10</sup> "Pipeline Integrity Management Plan - Northern Territory APA Group Assets", page 25

4.6 I recommend consideration be given to either:

- i) ongoing use of DCVG surveys and CP surveys, backed by a programme of excavations and inspections of pipeline and coating condition at locations where problems are indicated and/or where ground conditions are unfavourable; or
- ii) installation of a 300 mm pig launcher at the DCGS and a 300 mm pig receiver upstream of the Channel Island bridge, to enable intelligent pigging of that pipeline section, with visual inspection of the 200 mm diameter bridge crossing and use of pigging results, backed by excavations and inspections, to monitor the condition of the short section of 300 mm pipeline on Channel Island.

4.7 While either of the above options should, when appropriately documented in the Pipeline Integrity Management Plan, ensure compliance with Australian Standard requirements, I consider the second option to be superior in terms of quality of pipeline condition information acquired. The investment in pig launching and receiver facilities will also allow DCVG survey costs to be avoided and excavation / inspection works to be minimised (but not avoided). I consider this option to be prudent, consistent with good industry practice and consistent with achieving the lowest sustainable cost of providing services.

4.8 My desktop investigations indicate:

- i) installation of a pig launcher at DCGS will be relatively straightforward, with the launcher (including isolation valve) to be fitted to an existing blind-flanged riser and a kicker line installed.
- ii) installation of a pig receiver upstream of the Channel Island bridge will require work including establishment of a new station, installation of the pig receiver (including riser and main line valve) and hot-taps, so that gas can continue to flow to the CIPS while the new station is established.

I recommend a Capex provision of \$1.1m (comprising \$0.4m for launcher works and \$0.7m for receiver works). This provision may need to be refined in advance of a final decision regarding tariff arrangements for the period from 2016/17, to confirm it represents a reasonable estimate of likely costs for these works.

## 5. Conclusions

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

## Summary of Findings

Project	Comment	Capex Impact
Bi-directional pigging project	Proposed Capex is prudent and efficient.	No impact
Below Ground Station Pipework Recoating	Proposed Capex is not consistent with achieving the lowest sustainable cost of providing services. Programme duration should be extended.	Delay Capex programme: 2014/15: \$0.528m 2015/16 through to 2020/21: \$2.11m pa
Channel Island Lateral Piggability Project	Proposed Capex is neither prudent nor efficient. Scope of work should be revised to incorporate one pig launcher and one pig receiver.	Reduce capital cost to \$1.1m