RIIO-T2 Asset Health Re-opener

St Fergus Unit Decommissioning

Engineering Justification Paper
January 2023

nationalgrid

1. Executive Summary

1.1 National Grid Gas Transmission, hereafter referred to as NGGT, are requesting funding to manage asset risks associated with the gas compression Units 2C and 2D at the St Fergus Gas Terminal.

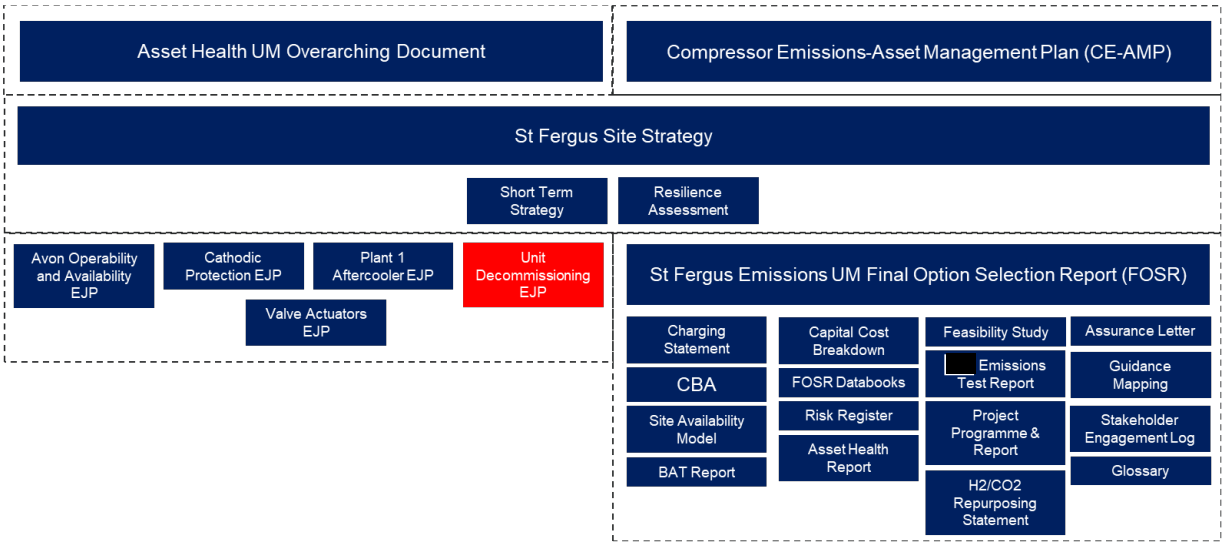

Figure 1: St Fergus Submission Documents Structure

1.2 This is part of a suite of documents, shown in Figure 1, and should particularly be read in conjunction with the St Fergus Site Strategy and its appendices. The St Fergus Site Strategy describes the Gas Terminal's function, its criticality to the network and the proposed investments in line with the site's short and long-term strategy.

1.3 These gas compression assets at the site were installed in 1977 and for many years operated, in conjunction with other site compression, to provide the required compression for supplies from the PX terminal to allow it to enter the National Transmission System (NTS). Unit 2C ceased operation in 1992. In 2014 we began annual inspections to mitigate the risk the units posed and from then Unit 2D was reserved for emergency situations. In 2020 the risk was deemed unacceptable, so Unit 2D also ceased operation and since then only essential maintenance has been carried out. The condition has now deteriorated to the point where the units must be removed due to the potential for release of asbestos containing debris to other areas of the site or beyond.

1.4 The St Fergus Short-Term Strategy, provided in Appendix 1, confirms an ongoing requirement for four Avon compressors at the site until 2030. However, there is no requirement in either the short or long-term strategies for Units 2C and 2D. Therefore, the recommendation of the Short-Term Strategy was to maintain site safety by progressing with the demolition of Units 2C and 2D due to safety concerns.

1.5 The RIIO-T2 business plan intended that all work associated with Plant 1 and Plant 2 would be captured under the St Fergus Emissions Uncertainty Mechanism, as the uncertainty about the future solution affected all of those assets. However, the condition of these two Units has deteriorated to the point where investment is needed immediately in order to maintain site safety.

1.6 The options considered for each of the units were:

- Do nothing in RIIO-T2 then decommission later
- Make safe in RIIO-T2 then decommission later
- Decommission in RIIO-T2

1.7 Both options which involve delaying the decommissioning are likely to increase the cost of removing the exhaust stacks due to their deteriorated structural integrity, as an additional structure would need to be constructed to safely remove the exhaust stacks. In the 'make safe' scenario, the immediate intervention to make the units safe would mean investing in redundant assets and result in an overall greater cost.

1.8 The recommended option is to demolish both Units 2C and 2D to plinth in RIIO-T2. The primary benefit of this investment is the removal of a significant site hazard.

1.9 The total requested funding for this investment is [redacted] (2018/19 price base) in line with the unit cost agreed previously with Ofgem for two units. A potential RIIO-T2 cost profile is shown in Table 1 below based on standard phasing assumptions.

£m 2018/19	FY2022	FY2023	FY2024	FY2025	FY2026	**Total**
Units 2C and 2D Decommissioning	[redacted]					

Table 1: Estimated Cost Profile

1.10 NGGT are making this funding application for the Units 2C and 2D Decommissioning RIIO-T2 investment costs through the Asset Health Re-opener, in line with Special Condition 3.14, requesting an adjustment to the value of the AHt term. This is summarised, along with other investments, within section 9 of the Asset Health Overarching Document provided as Product 1 of the January 2023 Asset Health Uncertainty Mechanism (UM) Re-opener Submission.

1.11 Due to the safety implications, work has begun to develop the plans for this investment and a draft of this paper was shared with Ofgem prior to this submission.

2. Introduction and Background

2.1 This paper provides the justification for the removal of Units 2C and 2D. Funding for this activity was initially expected to tie into the wider St Fergus Uncertainty Mechanism due to the alignment of these assets with Plant 1 and Plant 2 compression which is affected by emissions legislation. However, the condition of these assets has deteriorated to the point where investment is needed immediately in order to maintain site safety.

2.2 In developing our investment programmes at the St Fergus Gas Terminal since the RIIO-T2 Final Determinations we have adopted a two-phase strategy to ensure clarity between short-term asset health and long-term site operating strategy. Our St Fergus short-term strategy provides certainty on the terminal operation requirements, including minimum compression across Plant 1 and 2, for operation out to 2030. The long-term strategy will deliver the enduring terminal solution, including compression, required for operation beyond 2030.

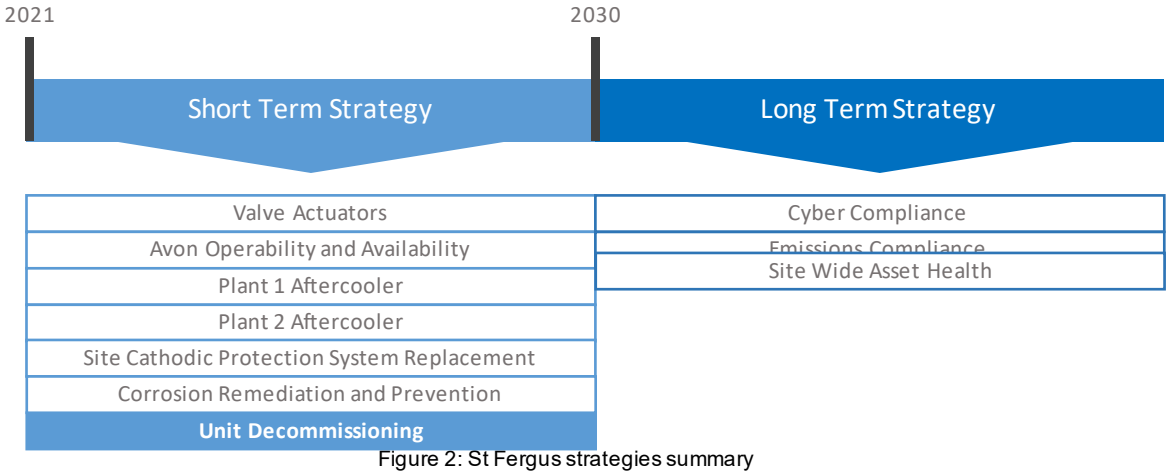

Figure 2: St Fergus strategies summary

2.3 The St Fergus Short-Term Strategy supports the decision to cease investment in specific compression units and for the disconnection and ultimate decommissioning of these units ensuring unit rationalisation and the lowest overall cost to consumers to maintain plant availability and reliability. Furthermore, the strategy sets out the approach to rationalise the compression units across Plants 1 and 2 from seven units to just four Avon units (1A, 1B, 1D and 2B) and maintain these in operation to at least 2030.

2.4 The investment outlined in this justification paper concerns the compressor Units 2C and 2D which were necessary units in the past but are no longer operational. The condition, primarily of the asbestos containing cladding on these units, presents significant safety and operational risks to both site personnel and site operations. As outlined in the Short-Term Strategy, neither 2C nor 2D are needed in either the short or long-term future of the site.

2.5 Work to demolish these two units could not wait until the compressor emissions Re-opener date provided by Ofgem in the RIIO-T2 Final Determinations to begin due to safety considerations and overall inefficiency if delayed.

3. Equipment Summary

3.1 Comprehensive background information about the St Fergus Gas Terminal is available in the St Fergus Site Strategy provided with the Emissions Final Option Selection Report (FOSR).

3.2 Supplies to the terminal from the Shell and Ancala sub terminals are metered then mixed and enter the NTS directly at the prevailing pressures required. Supplies from the PX sub terminal arrive at the terminal at 40barg and are scrubbed, metered, compressed and passed through aftercoolers before being mixed with Shell and Ancala gas and then entering the NTS. A high-level overview of the site layout is provided below highlighting the units relevant to this paper.

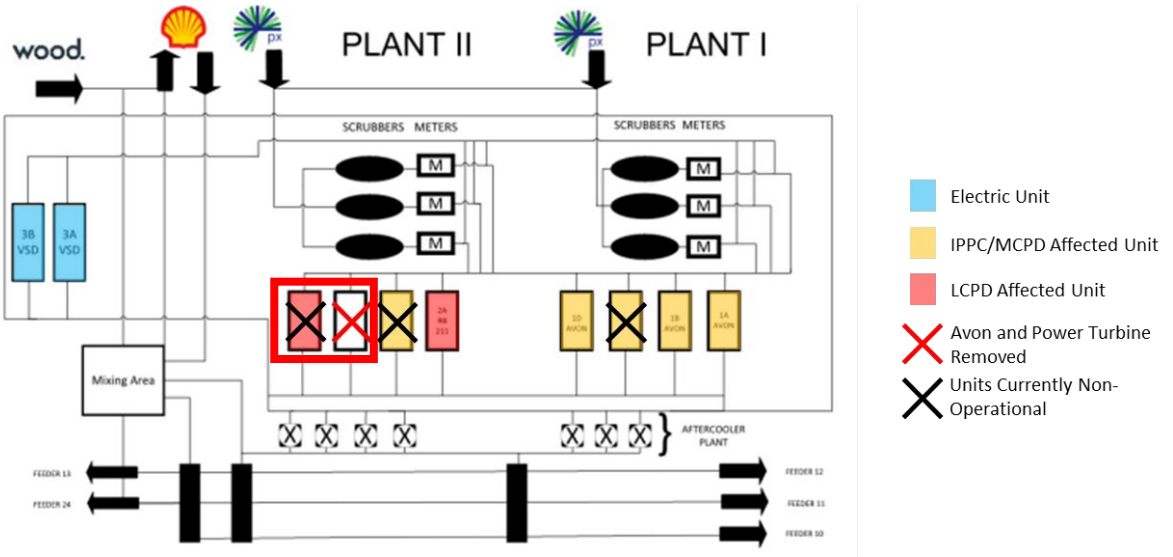

Figure *3: St Fergus Terminal site layout*

3.3 The compression on site is provided by either one of the gas-driven compression units (mostly Avons and one remaining RB211) or the electrical Variable Speed Drive (VSD) units. The terminal operates 24/7/365 and is not afforded regular outages from sub-terminals to undertake maintenance.

3.4 Units 2C and 2D were both built in 1977. Unit 2C has been an 'empty' cab for at least 20 years now, with only the gas compressor left inside which has not been maintained. Since the unit was removed from operational service there are no records of exhaust or structural inspections being carried out on the cab. In 2020, Unit 2D was removed from operational service due to concerns about the integrity of the exhaust stack. The units have been removed from operational service and isolated from fuel gas supplies. Oil has been removed from the buildings so the risk of fire and explosion is reduced.

3.5 Unit 2C is beyond the point of return to operational service, and Unit 2D is an RB211 unit which cannot be used for operational service beyond 2023. These units are not needed in either the short-term or long-term strategy.

4 Problem Statement and Needs Case

4.1 The site asbestos management plan (Appendix 3) highlights that clusters of residue found throughout and around the inner and outer cabs of all the gas turbine units are asbestos containing. This is because the metal cladding is lined with an asbestos containing bitumen. The Galbestos mentioned in the report is specifically on Unit 1A, however all the cabs are the same design excluding Unit 2A which had cladding replaced in 2013. The Galbestos bitumen was outlawed in the late 1970s and has been replaced on other sites across the network. A briefing on this material is provided in Appendix 4.

4.2 We still need to do essential maintenance and inspection tasks on the cabs, and the risks associated with external residual debris blowing to other areas of the plant is of significant health concern to all personnel (both staff and contractors) working or walking in and around compression facilities and the Terminal itself. Photos below of the cladding demonstrate the current condition. If the condition is not addressed, then our safety obligation to provide a safe working environment would not be upheld.

4.3 Work will also be needed to remedy the condition of Units 1A, 1B, 1C, 1D and 2B, however their condition is slightly better than the units proposed in this paper and their future is less certain as there is potential for some or all of these units to form part of the long-term solution. Therefore, it is planned that any units deemed necessary for the long-term solution will have remediation works undertaken as soon as practicable and any units that will no longer be required will be demolished. Intermediate options will be considered for units with a short-term future. This work is planned for submission in the June 2023 Asset Health Uncertainty Mechanism.

Figure 4: Coating breakdown of Galbestos cladding

4.4 In addition to this, it should be noted that evidence showing severe structural deterioration of the exhaust stacks was found on site. A conditional survey conducted by [redacted] is included in Appendix 2. For example, protective coating on the outside has started to degrade and peel off while the combustion exhaust exit section is severely corroded. The exhaust stacks present a safety risk due to the lack of information on Unit 2C and the known poor condition on Unit 2D. The earlier we can remove these exhaust stacks, the lower the overall cost will be to complete this task.

4.5 We were advised by the inspector who undertook the structural inspection and condemned the Unit 2D exhaust-stack from usage (in summer 2020) that the longer we wait the increasing risk there is that we won't be able to remove the exhaust without first engineering an outer structure to support the stack to then demolish it safely, which could as much as double the overall cost.

4.6 As of April 2022, there were 201 open defects associated with Unit 2C and 2D. A summary of these by defect category is provided below.

Defect Category	Defect Count
Breakage	1
Corrosion	141
End of Life	1
External Corrosion	5
Leakage	5
Mechanical damage	2
Obsolete Equipment	6
Other	23
Overheating	2
Perished	1
Wear	8
Swagelok	6
Total	**201**

Table 2: Plant 2C and 2D defect count (Apr-22)

4.7 As of April 2022, there were a further 1308 open DSEAR defects associated with Unit 2C and 2D. A summary of these by defect category is provided below.

Defect Category	DSEAR Defects
B	303
C	756
Note (Non-asset-condition related)	249
Grand Total	**1308**

Table 3: Unit 2C and 2D DSEAR defect count (Apr-22)

4.8 In summary, the Units 2C and 2D at St Fergus presents a range of significant risks that must be mitigated.

5 Probability of Failure

5.1 The units have already ceased operation and the severity and prevalence of cladding deterioration along with the structural integrity report of the exhaust stacks shows that asset failure is occurring and will continue until intervention occurs.

5.2 These units have over 1500 outstanding standard and DSEAR defects recorded and are well beyond their assumed asset life of 40 years.

6 Consequence of Failure

6.1 The primary failure concerned with these units is the release of asbestos containing debris to other areas of the site or beyond. This could have catastrophic consequences for site staff as well as NGGT's reputation and, given the COMAH (Control of Major Accident Hazards) status of the terminal, affect its ability to operate as such an event would demonstrate a failure to take all measures necessary to reduce risk to As Low As Reasonably Practicable (ALARP).

6.2 The secondary failure mode is due to the structural integrity of the exhaust stacks. This poses a considerable occupational safety risk to personnel working in the vicinity. If these were to collapse it has the risk that they could damage Unit 2B and potentially the discharge manifold. Units 2C and 2D do not have support chains installed. In the event of a structure failure, these chains prevent the exhaust stack from dropping into the cab in order to protect operational assets below. They have not been installed on the units proposed for demolition as they are not operational; chains were installed on Units 1C and 2B as a mitigation to support continued operation until the exhaust stacks are addressed.

6.3 There is also a risk of damage to the actuating gas pipework which feeds gas to other areas of site. There are limited isolation valves to sectionalise the plant either to allow work to be carried out or in the event of a failure. Planned work on the actuators will improve this situation but, in the meantime, damage to the pipework caused by a failure of either of these exhaust stacks could result in significant sections of the site having to be isolated. This would include the entirety of Plant 2 from Incomer, through the scrubbers, suction manifold, Unit 2A, discharge manifold and aftercoolers, including all vent valves.

6.4 It is not the primary concern for this proposed investment but if a failure resulted in ceasing of compression, the impact is significant as outlined in the St Fergus Resilience Assessment available as an appendix to the St Fergus Site Strategy.

6.5 In all cases, the consequences will be significant from a safety, financial and security of supply perspective.

7 Options Considered

7.1 In total, three options have been considered for management of the condition issues and associated risks as outlined in section 4. All three options include decommissioning of the units but the timescales vary. Of these three options, one is discounted as it is not viable for compliance reasons. Options 2 and 3 were progressed however the safest and more economical option is 3.

Options Discounted (1)

Option 1: Do Nothing

7.2 Continue to operate without resolving risks associated with Units 2C and 2D

- This option would not mitigate the risks posed either by the asbestos or the condition of the exhaust stacks.
- Postponing the decommissioning to RIIO-T3 will result in further deterioration of the cladding. This is likely to make it unsuitable to support the removal of the exhaust stacks and instead an additional structure will have to be constructed, increasing the cost of the demolition.
- In the intervening years, essential maintenance would still be required resulting in some opex cost.
- **This option is not viable due to requirements to operate safe plant in compliance with Pressure Systems Safety Regulations (PSSR), COMAH and other safety regulations**

Option Progressed for Further Assessment (2-3)

Option 2: Make Safe

7.3 Carry out minimum intervention required to address primary safety concerns and then postpone full demolition to RIIO-T3.

- The immediate work required to make the cladding safe is estimated at [redacted] (18/19 price base). This investment would be money purely spent on a redundant asset and therefore, not in consumer interest.
- This work would address concerns related to the asbestos but would not mitigate the risk posed by the condition of the exhaust stacks.
- Postponing the decommissioning to RIIO-T3 will result in further deterioration of the cladding. This is likely to make it unsuitable to support the removal of the exhaust stacks and instead an additional structure will have to be constructed, increasing the cost of the demolition.
- In the intervening years, essential maintenance would still be required resulting in some opex cost.
- **Overall, this option will be the most expensive as the initial investment to make the units safe would not result in a cost saving when full decommissioning takes place and the delay is likely to increase the decommissioning cost.**

Option 3: Demolish Both Units

7.4 Demolish to plinth both Units 2C and 2D as soon as practicable.

- This option is viable
- This option results in more efficient delivery of as the demolition of both units can be carried out as part of the same project and also combined in the tender for work planned on Unit 2B
- This option eliminates the risk posed by these assets to site staff and surrounding assets

- This option creates vacant plinths on a congested site, enabling potential future building work

7.5 The scope of this work:

- Remove all Hazardous liquids and substances from the redundant compressor cabs.
- Remove gas pipe work to give a positive isolation outside of the Compressor Cab before any further decommissioning can be started. The minimum pipework should be removed in order to isolate the unit for demolition, leaving any assets which could be utilised for Long-Term strategy solutions. Any remaining pipework should be supported and made safe to require minimal upkeep to maintain.
- Remove all electrical and instrument feed cables to the Cabs with a clear brake from the supply and cap off when proved dead.
- Safely remove and dispose of Cab Cladding that contains Galbestos.
- Safely remove and dispose of any asbestos.
- Lifting Plan to safely remove and dispose of exhaust system and remaining cab structures.
- Remove all items leaving the concrete base foundations which should be made safe as to not leave trip hazards or holes that could be hazardous or allow access for vermin.

7.6 The cost of this option is currently estimated based on the existing unit cost agreed with Ofgem for decommissioning of compressor units elsewhere on the network. There will be cost efficiencies in delivering both units as part of the same project and the work can also be tendered in combination with the planned investment on Unit 2B.

8 Option Analysis and Selection

8.1 Considering the above rationale and options assessment, the following table provides a summary of the options considered. The table also highlights the recommended option.

		Options Considered		
Solution considerations		**Option 1**	**Option 2**	**Option 3**
		Do Nothing	**Make Safe**	**Demolish 2 Units**
Cost		Lowest in short-term but greater overall due to further degradation of structure	Medium in short-term but greatest overall due to inefficiency and further degradation of structure	Highest in short-term but lowest overall
Compliance	**COMAH**	Non-compliant due to risk of release of asbestos materials and risk posed to site staff	Non-compliant due to risk posed to site staff	Compliant
	PSSR	All PSSR assets can be isolated from process and removed from the written scheme of examination	All PSSR assets can be isolated from process and removed from the written scheme of examination	Compliant
	DSEAR	All DSEAR non-compliant assets can be isolated and removed from the registers	All DSEAR non-compliant assets can be isolated and removed from the registers	Compliant
Environmental Impact		High - Potential release of asbestos materials into the environment	Low	Low
Maintenance	**Ongoing OPEX**	Medium - continuous OPEX challenge to maintain	Medium - continuous OPEX challenge to maintain	Low – removes requirement for any ongoing OPEX to maintain
	Risk	High - unsafe for personnel to work in vicinity of unmitigated defects	Medium - unsafe for personnel to work in vicinity of unmitigated defects	Low
Operational Resilience	**Single Point of Failure**	N/A	N/A	N/A
	Security of Supply	Medium – risk to supply if significant failure impacts overall ability of site to operate	Medium – risk to supply if significant failure impacts overall ability of site to operate	Low
Overall Viability		**Not viable**	**Viable**	**Viable**

Table 4: Summary of options considered

9 Final Option Selection and Programme

9.1 The assessments outlined in this paper and the associated discounting demonstrates that the most cost effective and logical option to take forwards is Option 3 – Decommission Units 2C and 2D.

9.2 The focus is therefore on ensuring this is delivered at the lowest overall cost. The following factors support this:

- The St Fergus Short-Term Strategy confirms no requirement for these units for operation to 2030.
- These units are not being considered as part of the Long-Term Strategy for operation after 2030.
- Removal of these assets removes the safety risk they currently pose.

9.3 As of January 2023, these works have not been tendered. In preparation for awarding the contract, a managed procurement stage gate process will be followed to develop the contract and tender strategy. The frameworks NGGT use have been negotiated competitively, giving NGGT assurance that the rates provided by the eventual winner will offer value for money and be competitive.

RIIO-T2 Volume UIDs

9.4 Costs associated with this project have been assigned against the RIIO-T2 Unique Identifier (UID) [redacted] – ST FERGUS TERMINAL. The table below provides a summary of the UIDs and associated funding for the scope of works proposed in this paper.

UID	Baseline volume of Intervention (By PP) (by unit of measure)	Baseline total funding available (2018/19)	ECC unit cost (2018/19)	Current volume of intervention (by unit of measure)	ECC total funding required (2018/19) £2.770	Output Year	UID funding requested through UM (£m)
[redacted] – St Fergus - Decommissioning of Compressor Unit	0	0	[redacted]				

Table 5: Summary of the UIDs and associated funding for the work proposed in this EJP

NARM Benefit

9.5 As this investment is in the decommissioning pot it is outside the Network Asset Risk Metric (NARM) mechanism. The risk reduction from asset removal will be reported as part of regular reporting. For further details and a summary of UIDs please see Section 7 and Appendix 2 of the Asset Health Uncertainty Mechanism Overarching Document.

Conclusion

9.6 This report has explained the safety concerns NGGT has regarding the redundant gas compression Units 2C and 2D and the implications of these on terminal operations. The intervention is necessary to ensure the safety of site personnel and ongoing 24/7 365 operation of the terminal facility. Decommissioning of these assets to remove the safety risk is estimated at the unit cost of [redacted] (2018/19 prices). NGGT are requesting funding for this investment through the Asset Health Uncertainty Mechanism Re-opener January 2023 submission.

10 Appendices

10.1 **Appendix 1 – St Fergus Short-Term Strategy**

Full report provided, filename:

RIIO-T2 St Fergus Short Term Strategy V7.pdf

10.2 Appendix 2 – Preliminary [redacted] Report

Filename: "20606-DDR-003-A Conditional Survey Units 2C and 2D"

10.3 Appendix 3 – Site Asbestos Management Plan

Filename: "FGS077 – Asbestos Management Plan – St Fergus"

10.4 Appendix 4 – Galbestos Briefing

Filename: "St Fergus - TBT Galbestos (V2)"

10.5 Appendix 5 – Structural Integrity Inspection

Site visit report from 22 July 2014 on Unit 2D exhaust stack.

Filename: "2D Stack Survey Report 22.07.14"

10.6 Appendix 6 – Project Plan

Filename: "Project Plan OP003291_CabsSFv1"