Annex A16.08

Redundant Assets Engineering Justification Paper

December 2019

As a part of the NGGT Business Plan Submission

nationalgrid

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Executive Summary

National Grid Gas Transmission, hereafter referred to as National Grid, are requesting funding associated with removing redundant assets on the Gas Transmission network. A redundant asset is defined as "*Any equipment or fixed assets which are no longer required (now or in the immediate future) for National Grid Gas Transmission to operate the National Transmission System (NTS)*".

We have identified 80 redundant assets, sites and groups of assets. Of the options to address we propose to undertake the decommissioning intervention approach. This involves disconnecting the assets from all supplies of energy and removing all process fluids (Methane, Condensate, Oil etc.). Useful spares are removed and reused if possible. If the whole site is redundant it is returned back to it's original, or an enhanced, environmental state. Our proposal to complete this work is aligned with the polluter pays principles[1], where customers who have benefited from our redundant assets pay for the decommissioning of them.

Our approach to managing our redundant assets has been reviewed and consulted on with stakeholders. We have heard from and agree with our stakeholders that it is important to do the right thing for society by reducing the impact of our activities on the environment.
Please see annex A16.07 Demolition Engagement Report for more information on our stakeholder engagement on this topic.

As part of our asset health submission we have not requested allowances for the ongoing maintenance of the sites and assets included in this redundant asset investment. This is on the assumption that allowances for our preferred intervention are agreed. Any redundant assets funding not approved will result in increases to our asset health and maintenance proposals and associated spend.

The decommissioning projects are currently at the end of stage 4.0 'Need Case' of our Network Development Process ND500. The purpose of this stage is to establish the need to do something and the scope of this need. All works are planned to be completed in RIIO-2 for the interventions on the specific sites, assets and groups of assets identified.

As a responsible asset manager, National Grid considers decommissioning of the redundant assets identified to be the most appropriate course of action for the following reasons:

- It reduces potential future asset health invention costs, which we may incur to ensure the safety of our assets that we get no operational benefit.
- It reduces the potential for process safety & Health and Safety incidents, with the potential to cause harm and to require asset health shocks.
- It reduces the potential for environmental contamination incidents and enables us to improve the environmental ecosystem service value of the local ecosystem by removing our industrial assets and returning sites to their original or enhanced environmental state.
- It aligns with the views and support from our stakeholders
- It aligns with views from the Health and Safety competent authority, The Health and Safety Executive (HSE) - "*Why have you not removed your redundant assets, they have more than paid for themselves many times over*".
- It also aligns with our view of societal fairness that current consumers incur the costs to decommission assets that they have had the benefit from.

[1] https://ec.europa.eu/environment/legal/liability/index.htm

The forecast cost proposed is [redacted] (18/19 prices) in RIIO-2 for disconnection and decommissioning projects. This includes [redacted] for decommissioning 80 identified sites, assets and groups of assets and [redacted] for disconnecting five customer sites.
For RIIO-3 we have forecast costs of [redacted] for continued disconnection and decommissioning activities across our network, including specific investments at Bacton Terminal, required following the investment included in the Bacton Terminal Redevelopment Justification Paper (annex A14.02). This RIIO-3 Future Decommissioning forecast is based on RIIO-2 anticipated spend

	Cost Forecast (£m 18/19 prices)										
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Customer Disconnections	[redacted]										2.99
Customer Driven Decommissioning											9.28
Decommissioning											81.07
Bacton RIIO-3 Decommissioning											13.56
Anticipated Future Decommissioning											72.31
Total	4.17	24.55	21.36	14.95	17.53	19.65	23.30	21.49	17.73	14.46	179.20
	82.57					96.64					

Delivery of our proposals will be measured via a price control deliverable as set out in annex A3.01

1. Introduction

1.1 This document sets out National Grid's investment proposals for the management of our Redundant Assets across the RIIO-2 and RIIO-3 regulatory periods.

1.2 National Grid is requesting funding associated with removing redundant assets on the Gas Transmission network. A redundant asset being defined as "*Any equipment or fixed assets which are no longer required (now or in the immediate future) for National Grid Gas Transmission to operate the National Transmission System (NTS)*". The redundancy has been driven through changes to the operation of our network driving redundancy in our assets and changes in specific customers activities.

1.3 Our redundant assets have no future operational requirements and have generally reached the end of their asset lives which constrains the potential future usages

1.4 As part of our asset health submission we have not requested allowances for the ongoing maintenance of the sites and assets included in this redundant asset investment. This is on the assumption that allowances for our preferred intervention are agreed. Any redundant assets funding not approved will result in increases to our asset health and maintenance proposals and associated spend.

2. Equipment Summary

2.1 Through reviewing our network we have identified 80 sites, groups of assets and single assets that we have classed as redundant. We have defined these terms as:

Assets: A redundant asset relates to a single asset that has been identified as redundant to operational requirements now and in the future. For example, a redundant water bath heater on an offtake site (Horndon Barking Ex Canvey Island).

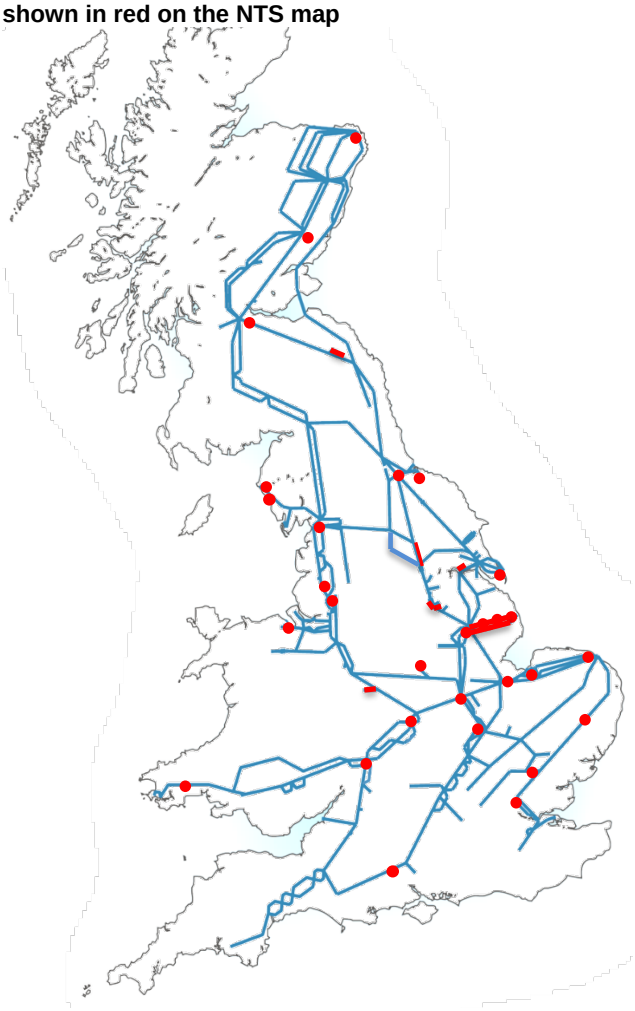
Groups of assets: Redundant groups of assets relate to a partial element or function of a site that is no longer required for operational purposes, either constituting multiple assets, or where several single assets have been identified (Roxwell).

Sites: Redundant sites are whole sites where the function of the site is no longer required for operational purpose and therefore all assets on the site are redundant. For example, Theddlethorpe Terminal where the terminal assets are no longer required to support a connection

2.2 These redundant sites and assets are located across the length and breadth of our National Transmission System (NTS) on all of our site types, such as Terminals, Multi-junctions, Block Valves, Compressor Sites and Above Ground Installations. Figure 1 overleaf shows the location, geographically, of these assets across the length of our network, with markers signifying either redundant whole sites, groups of assets or single assets, including feeders.

The redundant assets across these categories are of varying asset ages, which then impacts on our proposed intervention

Figure 1 NTS Schematic showing location of our redundant assets, group of assets and sites, shown in red on the NTS map



Blue Lines – The National Transmission System Pipelines

Red Dots – Signifies a redundant site or a site with a single or a number of redundant assets.

2.3 The 80 sites, assets and groups of assets have been identified through various methodologies. We have reviewed projects undertaken in RIIO-1 where disconnections have been undertaken that we did not receive the funding to decommission these assets. These assets were identified as redundant to operational requirements and disconnected. We have interrogated our asset database (Ellipse) to identify assets that are redundant across our network, and we have reviewed the list created with our operations teams.

2.4 The table below, Table 1, provides a summary of the types of assets that have been identified in accordance with the categories in our Network Asset Resilience Metrics (NARMs) Methodology. The list is not exhaustive but has been written to demonstrate the varying types of primary and secondary assets (inclusive of sites) included in this topic:

Table 1 Types of assets and sites identified as redundant

Site/Asset Description	
Primary Asset	**Example**
Entry Point (Terminal)	Theddlethorpe Gas Terminal
Exit Point	Ferny Knoll AGI, Upper Neeston AGI
Pipeline	Feeder 14 - Austrey to Shustoke Feeder 8 - Theddlethorpe to Hatton Multijunction Feeder 17 - Theddlethorpe to Hatton Multijunction
Secondary Asset	**Example**
Civil Assets (Buildings/Enclosures)	Bathgate Control Building, Peterborough Control Building, Peterborough Compressor Cabs
Aftercoolers	Wormington Aftercooler
Compressor Units	Churchover Units A and B Kirriemuir Unit D
Preheaters	Horndon (Barking) Water Bath Heater
Fuel Tanks and Bunds	Huntington Diesel Storage Tank for Diesel Generator

2.5 A full list of the 80 sites and assets that we have included in this investment, with the current operational status and Business Plan Data Table Category can be found in Appendix 1.

2.6 The redundant assets range from those already disconnected from the NTS and isolated from all sources of energy and control systems, to those which still form part of the operational National Transmission System.

2.7 Assets were built to a range of NTS pressures up to maximum operating pressures of 94 bar with electrical supplies up to 400 VAC, and with electronic or hydraulic control systems. Some redundant assets also have mains water supplies, phone lines and other telemetry equipment, required to be included in the scope of the redundant assets project. Many of the redundant assets include asbestos that needs specialist management.

2.8 In Appendix 2 equipment summaries for a number of the identified redundant asset types are presented. These provide a description of the asset, the failure modes these types of assets may experience, specific to a redundant type of this asset class, and the consequence of failure.

Customer Disconnections

2.9 We recognise that some customers will no longer require connections to our network in the future, dependent on the commercial regimes and market conditions they operate in.

2.10 Our internal best view forecast of the economic lives of the generation assets for a number of our Power Station customers are that they will reach a point in RIIO-2 where the plants reach a point of obsolescence. Therefore, we have forecast that a disconnection from our network at the NTS offtake site will be required to be undertaken to facilitate plant run down in RIIO-2. These disconnections are in addition

to the 80 identified redundant sites, assets and groups of assets. These sites, that could require a disconnection, are shown in Table 2.

Table 2 Sites forecast to require a disconnection

2.11 Legacy Connection Agreements for each of these customers are silent on the responsible party for the disconnection and decommissioning costs at the offtake site. Therefore we are requesting an allowance to disconnect these customers from the NTS, which will enable the customer to undertake any work they need to on their sites independently. We have planned our subsequent decommissioning activities to fall into RIIO-3.

3. Problem Statement

3.1 Our network is getting older and is being used differently. We are faced with the challenge of how we best manage our redundant assets in a way that is cost effective, affordable and consistent with our, and the country's, environmental and sustainability goals. Further details can be found in Appendix 3 Background.

3.2 Assets may become redundant for a number of reasons. The needs of stakeholders or individual customers might change, legislation changes may mean that assets cannot be used, or investments in new assets may mean that life expired assets are no longer required. Given the nature of our ageing network and future changes in how we all use energy we anticipate more work in this area will be seen in future price control periods.

Legislative Review

3.3 As part of the development of our plans on this topic a full review of legislation was undertaken to understand the specific requirements from the various acts of legislation. We additionally reviewed all international standards (ISO/BSI) and industry best practise documents. A summary of this is provided in Appendix 4 Legislation Review.

3.4 Having reviewed the pertinent legislation on this topic our understanding is that provided there are no issues of contamination or pollution there are no obligations mandating us to decommission our redundant assets.

3.5 This being said a number of our sites were purchased under Compulsory Purchase Order where planning consents can dictate the end condition of the land post operation, or where assets are installed on land through lease agreements which can

do the same. Where we have these requirements we shall adhere to all of our responsibilities.

3.6 If we did nothing we would continue to maintain assets in a manner to ensure we manage and mitigate the health and safety and environmental risks from these assets.

3.7 On a number of sites, such as compressor and terminal sites, we have environmental permits, issued by the relevant environmental regulators (Environment Agency (EA), Scottish Environmental Protection Agency (SEPA) or Natural Resources Wales (NRW)). These permits are required to be held under the UK Environmental Regulation's, and detail the assets on site, such as the number of compressor units and place a requirement on National Grid to produce a decommissioning plan.
We notify these regulators on our decisions to modify the number of assets held on these sites, such as to decommission compressor units, and submit appropriate decommissioning plans as required. The permits do not mandate specific intervention options; however they do place a requirement on us to remediate polluted land.

Network Exit Agreements/Network Entry Agreements

3.8 Our current Network Exit Agreement/Network Entry Agreements contain clauses which allow National Grid to recover the cost of decommissioning its assets at Network Entry and Exit points from the specific customer. However the legacy contracts do not provide clarity on this for the disconnection and decommissioning activities and such, where this situation has arisen, the site forms part of our funding request for this topic.

Why are we doing the work?

3.9 NTS assets have generally been constructed away from centres of population, and are situated in or close to a range of biodiverse ecosystems (e.g. Rivers, Estuaries, Farmland, Wetlands, National Parks). Our redundant assets and sites have several environmental hazards, which could lead to a potential for air, ground and watercourse contamination as well as containing asbestos. Our proposed approach to interventions on our redundant sites and assets will mitigate these hazards.

3.10 Even with appropriate asset management our redundant assets can also pose a safety risk. Our network is ageing which leads to an increased risk of loss of containment and other failures due to asset deterioration. This may require us to undertake more frequent and sometimes specialised interventions to remediate against these risks. We do not see this to be cost effective on assets that have no current or future operational requirement.

3.11 We are proposing interventions on our redundant assets now rather than later. This provides health and safety benefits to our employees and members of the public and removes the environmental risks posed by these assets. We also believe it is a fair treatment of costs, where costs are incurred by current consumers who have had the benefit from these previously operational redundant assets, rather than future consumers who will have had no benefit from these assets.

3.12 This position aligns with the polluter pays principle, which is a commonly accepted approach in the energy industry in that those who produce pollution, including those using systems and facilities bear the costs of managing it or decommissioning it to prevent future health and safety and environmental harm.

3.13 The spend is successful if we remove the safety and environmental risk posed by these assets and reduce ongoing maintenance costs. On operational sites the difficulty in

undertaking interventions is the close proximity of the redundant assets to operational assets. Undertaking an intervention on these sites can have process safety risks that need to be managed.

3.14 As part of our business plan submission we have not requested allowances for ongoing maintenance for the identified redundant sites and assets on the assumption that allowances are agreed for a redundant asset intervention. Should this not be agreed there would be an increase in maintenance activities required.

RIIO-1 Performance

3.15 In our RIIO-1 baseline plan an allowance of £13.56m (18/19 prices) was proposed and in determining their final position Ofgem made no change to this baseline proposal.

3.16 The baseline proposals included the request for allowances for twelve specific projects, including Bathgate Compressor Station, Scunthorpe Compressor Station, and then an amount for a number of Offtake Disconnections and Compressor Engine decommissioning projects (to account for future decommissioning activities).

3.17 The table below, Table 3, shows our current view of performance against out allowances.

Table 3 Allowances vs Performance

	Cost (£m 18/19 prices)								
	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Total
RIIO-1 Allowances	0.90	0.17	11.49	0.05	0.28	0.35	0.24	0.07	13.56
RRP19 Actual & Forecast	2.57	1.21	2.31	1.29	2.00	2.22	1.09	2.07	14.76

3.18 Across RIIO-1 we have incurred costs in excess of allowances for our redundant assets intervention as we have identified and undertaken investments to make safe redundant assets that were not identified at the point of creation of our RIIO-1 submission. This has been driven by changes in customer behaviours and better identification of our redundant assets.

3.19 The largest increase in costs in RIIO-1 has been driven by our activities to rationalise assets at Paul AGI, which was not included within our RIIO-1plans. The configuration of the site meant that at the point of sale to Northern Gas Networks (NGN) in 2005 the transfer of assets was different to that on more common offtakes, resulting in National Grid having ownership for additional assets. Following communication with Ofgem, in accordance with the Standard Special Condition A27 (Disposal of relevant assets and restriction on charges over Receivables), we agreed with Ofgem and NGN a rationalisation approach for the site, which had significant asset health issues.

3.20 This improved the reliability of the network and removed safety risks associated with poor condition assets whilst enabling the proposed new Feeder 9 pipeline to enter Paull AGI in a more cost efficient location.

3.21 Across RIIO-1 redundant assets have also been created following changes in customers behaviours, both individual customers affecting offtake sites and changes to supply and demand patterns across our network affecting AGIs, Compressor Stations & Multi-junctions.

3.22 In preparing for our RIIO-2 business plan we have undertaken an in depth analysis of our assets base for this topic. This has resulted in the identification of redundant assets across our network driving the rise in projects, and therefore an increased investment proposals compared to RIIO-1.

Real Life Examples of Problem

3.23 This section of the report provides four real life examples of redundant assets. The drivers for redundancy are varied, as shown in these examples, with reasoning based on operational, customer and third party requirements.

Example 1 - Bathgate Control Building ([redacted])

3.24 Bathgate Compressor Station was located in Scotland at the junction of Feeder 10, 11 and 12.

3.25 Bathgate Compressor Station originally contained four Avon Gas Turbine units. However to reduce emissions and increase network capacity a decision was made to construct Avonbridge compressor station. This occurred in 2003, with the new site neighbouring the Bathgate site.

Figure 2 Location of Bathgate NTS site

3.26 Following acceptance of the new Avonbridge compressor station the Bathgate Compressor station, was isolated and decommissioned as mandated by the SEPA licence condition "*As from 1st July 2009, Gas Turbine Units B and C shall not be operated*" .

3.27 The scope of the decommissioning project excluded the main control building, which housed an administration building, workshop and standby generator room. At the time of the project the strategy for the office was for continued use as office accommodation and for the workshop to be used to temporarily house the spares from the decommissioning project.

3.28 The control building is located on the southern part of the site, in close proximity to the Avonbridge site as shown in the figure overleaf.

Figure 3 Bathgate/Avonbridge site layout

3.29 In the intervening years, the control building has been vacated following the procurement of alternative office accommodation. Power, water and telecoms services have been disconnected, with the building structure remaining in situ.

3.30 The building is clad in steel panels. As can be seen from the photos below, Figure 4, these material are susceptible to corrosion & degradation due to environmental conditions which can and have manifested as failures to the cladding. Additionally the building has a flat roof for which the membrane deteriorates over time and with environmental exposure. This has resulted in water ingress resulting in rotting.

Figure 4 Bathgate Control Building

3.31 Our management study for the building states that Asbestos is present in the control building and therefore doing nothing increases the risk of further deterioration of the building fabric resulting in ground, air and water contamination from this hazardous material and non compliance with Health & Safety legislation.

3.32 The problem we are faced with is how best to manage the risk posed by this redundant asset with an intervention methodology that mitigates the health and safety, environmental and financial risks associated with ongoing management of the building whilst maintaining our statutory obligations to health and safety in the workplace and also being the most cost effective method.

3.33 Our proposal is to decommission this building back to ground level, removing all asbestos. This will mitigate the risks posed by this building that provides no operational benefit to our network. We will continue to own the land due to the proximity of adjacent operational NTS assets.

Example 2 - Theddlethorpe Terminal, Multijunction and Feeder assets ([redacted])

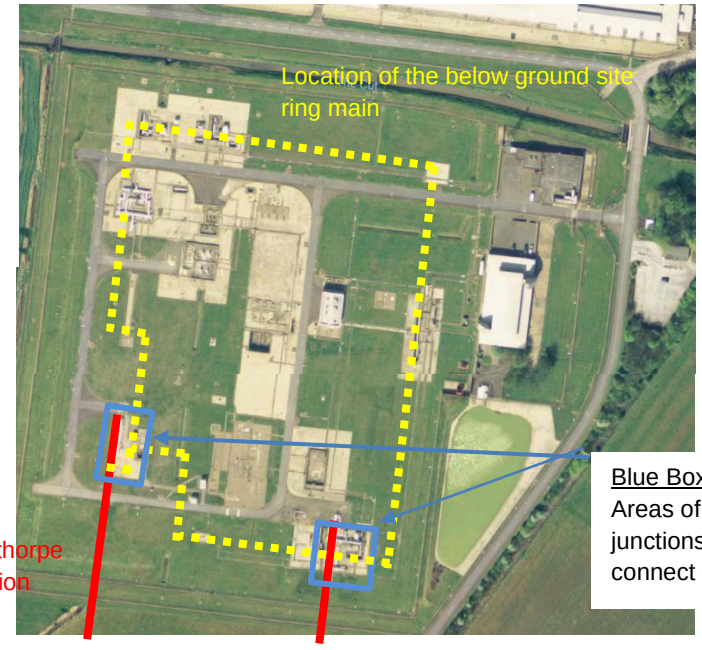
3.34 Theddlethorpe gas terminal is on the east coast of the UK as indicated in Figure 5. The beach terminal is owned and operated by ConocoPhillips, receiving UKCS gas from fields in the Southern North Sea. National Grid owns and operates the entry terminal which facilitates gas flow from the ConocoPhilips site on to the NTS. The terminal was commissioned in 1972, originally designed to accommodate significant flows; in excess of 85 mcm/day. National Grid is a significant land owner at this locality owning the land for our own terminal, ConocoPhillips site and an area of land current leased to agricultural tenants.

Figure 5 Location of Theddlethorpe Terminal

[redacted]

3.35 The National Transmission System (NTS) entry terminal site is connected to a multijunction site "Theddlethorpe Multijunction (1811)" and the wider Transmission System through two feeders, Feeder 17 and Feeder 8, which connect to Hatton Multijunction. Along the length of Feeder 17 are two block valve sites, Goulceby and Little Cawthorpe. A site aerial view is shown in Figure 6 below, where the blue boxes represent the multijunction assets, the red lines representing the feeder assets.

Figure 6 Theddlethorpe Terminal site plan



3.36 [redacted]

3.37 The site contains various different asset types and classes including various buildings (including the control building), above and below ground pipework, scrubbers, meters pig traps, electrical infrastructure including standby generators, preheaters etc. Figure 7 shows photos of the site, demonstrating the range of assets.

Figure 7 Theddlethorpe Site Photos

3.38 This investment will enable us to most appropriately manage a site whose function is no longer required. The site contains various asset types of varying ages, some of which are obsolete, and which have multiple failure types and failure rates. We need to ensure that our investment proposal addresses the requirements from the site, is cost effective, sufficiently manages the health and safety and environmental risks, and ensures compliance with legislative requirements and the relevant regulatory bodies.

3.39 In addition the terminal site, National Grid owns a significant area of land, [redacted]

3.40 This land ownership is shown in Figure 8 below, with the area demarcated within the green boundary being the land owned by National Grid. Our strategy has considered not just future requirements for the National Grid terminal site but also the ConocoPhilips site.

Figure 8 Theddlethorpe National Grid Land ownership

3.41 To develop our strategy for the site we have undertaken a robust process of external engagement, mainly in the form of 1-1 sessions with relevant stakeholder and these included:

3.42 Our engagement with enabled us to listen and understand what was important to them, this being ensuring the site provides an economic benefit to the local area in the future, through promoting jobs. We are keen to ensure synergies between our strategy for the site and the councils local strategy.

3.43 commissioned their own report around future opportunities for the site, to ensure they are in the best position to help facilitate any changes in operation of the site. Their preference would be to continue usage for an energy purpose. This proposal would require the removal of all our existing assets at the site. The council of supportive of our plans for the Theddlethorpe Terminal site included within this submission.

3.44 The National Grid land at Theddlethorpe is a potential location for the export of CO_2 for Carbon sequestration in the North Sea as part of a Carbon Capture Usage and Storage (CCUS) scheme or a location for the production of Hydrogen. These scheme and others are at a very early conceptual phase and require significant work to develop.

3.45 However these schemes would not only enable the continued use of the site for energy purposes but also enable the repurposing of existing feeder assets for these alternative innovative purposes, which may bring additional consumer benefits in the longer term.

Our current business plan includes the provision to undertake a feasibility study in RIIO-2 to consider these future activities for the site. This is included within the chapter: "*I want you to facilitate the whole energy system of the future*".

3.46 As part of the general engagement we undertook during the development of our business plan we held a number of workshops, regional events and webinars where we engaged with our stakeholders on the redundant asset's topic. In our engagement with our stakeholders we specifically asked questions in relation to the repurposing of our feeder assets. Some of the specific feedback received is shown below:

"An alternative would be to explore changes of use i.e. the transport of other products in redundant parts of the network."

"National Grid should explore and understand more fully alternative uses and management of risk in the interim, which could then allow for opportunities."

"An alternative would be to leave buried pipelines and take out compressors. This is because of the fact pipelines might have to be reused, and that the visual impact of compressors may effect National Grid's reputation."

A full summary of our engagement can be found in the appendix A16.07 Demolition Engagement Report.

3.47 We agree with these statements and therefore our proposal for RIIO-2 is to purge feeder 17 and feeder 8 from Theddlethorpe to Hatton Multijunction to Nitrogen with a view of the repurpose opportunities referenced earlier.

3.48 Our breakdown of costs for this project is as per Table 4 below. The feeder costs shown reflect the disconnection and Nitrogen filling of both pipelines to enable us to consider future opportunities before more permanent decommissioning is undertaken. Costs at Theddlethorpe and Hatton Multijunction reflect a scope including the decommissioning of our assets at these sites associated with the flow line from Theddlethorpe.

Table 4 Theddlethorpe and connected assets decommissioning costs

	£m 18/19 prices
Theddlethorpe Terminal and Multijunction	[redacted]
Goulceby Block Valve	
Little Cawthorpe Block Valve	
Feeder 17 Theddlethorpe – Hatton Multijunction	
Feeder 8 Theddlethorpe – Hatton Multijunction	
Rationalisation of Hatton Multijunction, decommissioning assets in relation to Feeder 8 and 17 connections	
Total	

3.49 [redacted]

[redacted]

Example 3 - Ferny Knoll AGI ([redacted])

3.50 Ferny Knoll AGI was the offtake point for an Industrial Customer AM Paper, a paper mill. The AGI is situated on a 42-inch stretch of Feeder 15, north and south of Crank Block Valve and Burscough Multijunction Pig Trap respectively, as shown on the NTS Schematic below (Figure 9).

Figure 9 Location of Ferny Knoll Offtake

3.51 The National Grid AGI site is located circa 1.6km away from the Paper Mill, as the crow flies, as shown below with AM Paper owning the pipeline between the NTS offtake site and customer site.

3.52 In August 1999 AM Paper was acquired by SCA Group with the paper mill mothballed in 2008.

3.53 The pipeline from Ferny Knoll AGI to the AM Paper site was disconnected from the National Grid Ferny Knoll AGI in February 2009, with a dome end installed outside the perimeter of the National Grid AGI site, as shown in Figure 10 overleaf.

Figure 10 Ferny Knoll Engineering Line Diagram showing disconnection

3.54 At the time of the disconnection we reviewed the Network Exit Agreement (NExA) in regards to the ability to recover costs from the customer for this activity. The NExA does not enable us to recover the isolation, disconnection or decommissioning costs from the customer.

3.55 The problem the investment seeks to solve is how we most appropriately manage a site, whose function is no longer required for our customer's usage of the NTS, for the lowest total cost. It also seeks to mitigate future obsolescence-related risks on assets that have no current or future operational requirement, ensuring that customers who have had the benefit of these assets incur the cost for the end of life intervention. The site is shown in Figure 11 below.

Figure 11 Ferny Knoll Site

3.56 Our baseline proposal for RIIO-2 includes the full decommissioning of the Ferny Knoll AGI site from the National Transmission System, returning the site to brownfield condition. This mitigates the health and safety and environmental risk from these assets, which have no future operational requirements.

Example 4 – Warrington Compressor Units A and B and associated infrastructure ([redacted])

3.57 Warrington Compressor Station is connected to Feeder 15 and Feeder 21, located 2 km east of the town of Warrington. The location on the NTS is shown in Figure 12, below.

Figure 12 Location of Warrington Station

3.58 The station was constructed in 1984 and has two identical gas turbine driven compressor units designed to operate independently of each other.The station was primarily designed to facilitate entry into our network at Barrow and St Fergus by moving large volumes of gas into the south. Warrington's use has reduced significantly over the last five years, with the two compressor units being run for a combined average of 34 hours per year.

3.59 The two units are not compliant with the Industrial Emissions Directive - Large Combustion Plant (IED-LCP). The IED set the minimum requirements for emissions of Nitrogen Oxide (NOx) and Carbon monoxide (CO) to the environment from the combustion of natural gas, with all non-compliant machines required to cease operation by 31 December 2023.

3.60 Both units at Warrington are affected and therefore we started operating them on 500-hour Emergency Use Derogations (EUD) in order to comply with the LCP element of the legislation. However based on the current Future Energy Scenarios (FES), Warrington is no longer required to support the entry flows it was designed for. Although there is the potential for future user signals to require additional west coast compression, there is no certainty over when these signals will be received, if at all.

3.61 The problem that the investment seeks to solve is to mitigate current and future obsolescence, safety and environmental related risks on assets that have no current or future operational requirement, ensuring that customers who have had the benefit of these assets incur the cost for the end of life intervention.

3.62 The consequence of doing nothing would result in a requirement to maintain the existing assets in line with the current statutory inspections i.e. Pressure Vessel and Pressure System Inspection (PSSR) and Dangerous Substance and Explosive Atmosphere Regulations 2002 (DSEAR). We have forecast this to be £80k per annum, broken down as shown below:

Table 5 Asset Health and Opex Costs

Activity	Cost (18/19)
Asset Health	£60k/yr
PSSR Activities	£20k/yr
Total	**£80k/yr**

3.63 With the assets still pressurised at NTS pressure the consequence of doing nothing could also manifest as a requirement to undertake interventions to mitigate health and safety and environmental risks driven by asset obsolescence issues at a site which will continue to be used by operations staff.

3.64 Based on this analysis our proposal for RIIO-2 is to disconnect and decommission the compressor station from the NTS. As part of the development of our plans for the compressor station we have looked to determine future uses for the site.

3.65 Our current strategy for the site is to retain the use of the site as an operational base and stores for our operational teams.

3.66 Our decommissioning scope of works includes the decommissioning of one of the compressor units and associated station pipework, including pressure reduction installation. However we are proposing to move one of the existing RB211 compressor units to another compressor site, to reuse this power turbine for future operational use.

3.67 We also propose to undertake modifications of the AGI to operate independently of the station. It is proposed that the control building and cab buildings will be retained for future use. Figure 13 highlights the types of assets identified as redundant, including the vent stack, compressor units, pits containing compressor inlet pipework, the pressure reduction area containing scrubbers, filters and a condensate tank and the fire pond.

Figure 13 Warrington Redundant Assets

3.68 The decommissioning proposal is subject to employee and trade union consultation

Example 5 – Moffat Compressor Station ([redacted])

3.69 Moffat Compressor Station is connected to Feeder 11 and Feeder 12, located 6km to the south of the town of Moffat. The location on the NTS is shown in Figure 14, below.

Figure 14 Location of Moffat Compressor Station

3.70 The station was constructed in 1980 and has two identical gas turbine driven compressor units designed to operate independently of each other. The station was primarily designed to provide network compression to move gas from Scotland to the south. The run hours on both units at Moffat have significantly reduced since 2006/07. This reduction in compression requirements aligns with the fall in flows coming onto the National Transmission System (NTS) via the St Fergus Terminal in Scotland.

3.71 The units are now primarily being used:

- To provide occasional network resilience to Aberdeen, Kirriemuir and Avonbridge
- To provide occasional resilience to Carnforth and Nether Kellet
- To support entry flows from St Fergus.

3.72 Our current cost forecast for asset health activities should no redundant assets intervention be made is [redacted] over a 10 year RIIO-2 and RIIO-3 period is shown in Table 6 below.

Table 6 RIIO-2 & RIIO-3 Forecast Asset Health Costs

Theme	RIIO-2 & RIIO-3 Forecast Asset Health Costs £m (18/19)
Cabs	[redacted]
Compressor	
Plant & Equipment	
Valves	
Civils	
Electrical	
Total	

3.73 However we do not believe these units are required in the longer term to meet our network capability needs. As set out in our Fleet Strategy Annex A11.04, we do not believe continuing operation of the units to be the most cost effective solution, given the current user signals for west coast compression, forecast run hours, and forecast asset health costs. Therefore the decision has been made to disconnect and decommission the compressor station in RIIO-2.

3.74 Our decommissioning scope of works includes the decommissioning the compressor site, including the compressor units and associated station pipework (pressure reduction installation, filters and scrubbers). Included within this is a proposal to retain a unit from the site as a fleet spare.

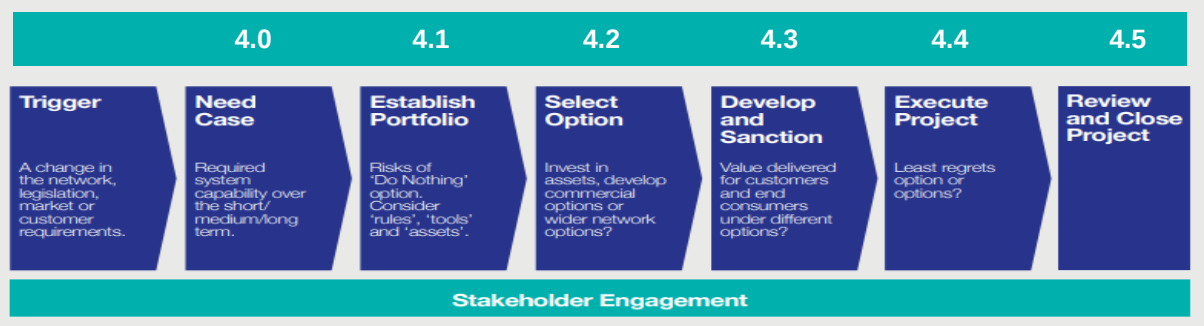
3.75 Other assets such as civil assets (buildings, fences etc), Electrical assets such as generators, telemetry etc will be decommissioning and the site returned back to ground level. Modifications will be undertaken to separate the compressor station pipework from the pipework feeding Moffat AGI, which is located adjacent to the compressor site, but supplied from the compressor site. This site is used by our customer, for the Moffat Interconnector and will continue as a live site going forward.

3.76 The decommissioning proposal at the site is subject to employee and trade union consultation.

Spend Boundaries

3.77 The spend boundaries will differ on each individual decommissioning project. This is due to the varying requirements for NTS disconnections, disconnections of SCADA and control systems and the varying scope and extent of the decommissioning intervention activities on each project.

3.78 The decommissioning projects are currently at the end of stage 4.0 ‘Need Case’ of our Network Development Process (ND500), shown below. The ND500 stage gates ensure minimum requirements are met for each phase and are shown in the figure below. Stage 4.0 is used to establish the need to do something and the scope of this need.



3.79 In general the costs included in this investment are to progress the projects through 4.1 Establish Portfolio to 4.5 Review and Close Project for the decommissioning of our redundant sites and assets. These stages includes the following activities:

- Undertaking Front End Engineering Design (FEED) activities including the development of scheme designs, including locations of isolations and disconnections, and the development of decommissioning plans.
- Isolation and disconnection of redundant assets from all sources of energy and services. Inc Control Systems, NTS Pressure Gas, HV/LV Electricity
- Decommissioning of these assets back to plinth or ground level.
- Updates to all relevant site drawings and records

3.80 For a number of investments, costs are included for additional activities to support the scope of the decommissioning. Examples of activities include dome ends and pipeline loops for our feeder assets, or reconfiguration of control systems. These investments are required to ensure the safety and integrity of our operational National Transmission System are not impacted.

4. Probability of Failure

4.1 Our redundant assets are those assets that are no longer required (now or in the immediate future) for National Grid to operate the NTS. Therefore the failure is different to that of our operational assets, where asset failures could result in direct impacts to the operation of our network.

4.2 Depending on the type of asset the probability of failure will also be different to that of an operational asset, e.g. where disconnections result in assets operating at atmospheric pressure rather than to NTS pressure, the stresses placed on the assets are lower resulting in less strain fatigue cycling. However the probability of failure could be higher or occur more quickly because of the age and condition of these assets.

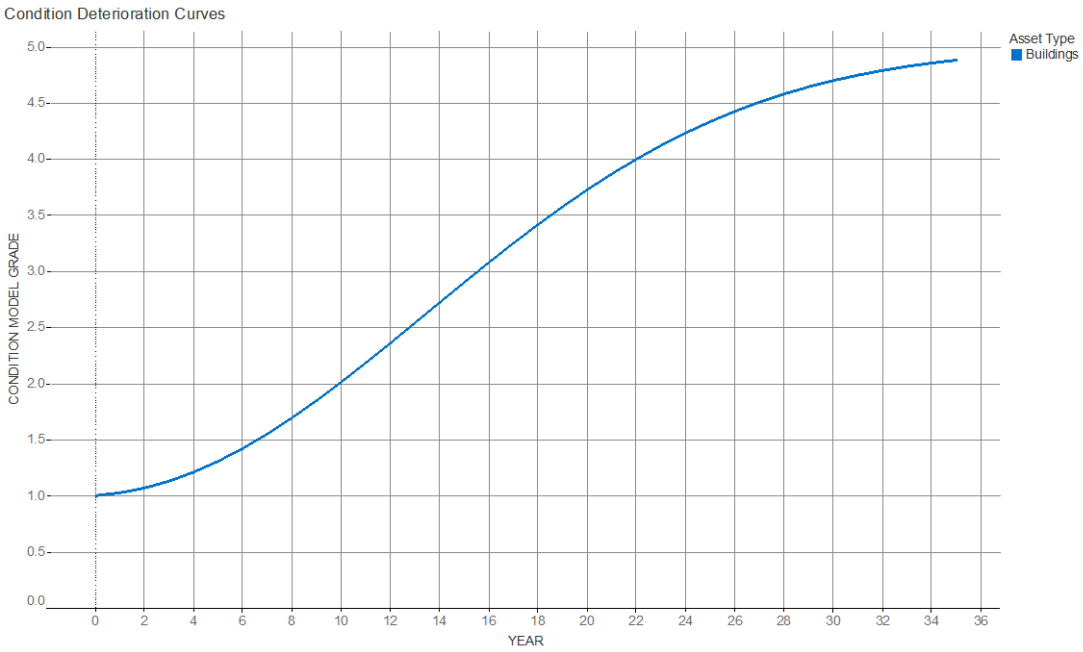
Buildings and Enclosures

4.3 However there are some assets where the probability of failure is consistent whether the asset is redundant or operational. An example of this are Buildings and Enclosures.

4.4 The chart below shows the condition deterioration curve for operational buildings and enclosure assets. The model uses the parameters derived within the development of our NARMS methodology showing how the asset degrades over time from Asset Health Condition Grade 1 to Grade 5. Grade 5 is reached sometime after 35 years

from new. The modelled asset life is plotted on the x-axis with condition grade shown on the y-axis.

Asset Health Scores	
AH1	New or as new
AH2	Good or serviceable condition
AH3	Deterioration, requires assessment or monitoring
AH4	Material deterioration, intervention requires consideration
AH5	End of serviceable life, intervention required



4.5 The condition grade is used to explain the current condition of the asset at a specific asset life, this driving the interventions that may be required to undertaken across the lifecycle of the asset. Asset Health Grade 5 is deemed to be a building at the end of its serviceable life.

4.6 For redundant buildings and enclosures the probability of failure is forecast to be similar to that of operational facilities. However without heat or power within the facility and with obsolescence-related material deterioration, a sharper curve could also be experienced, resulted in an earlier building fabric failure, reaching AH5 state earlier, resulting in a requirement to intervene to mitigate health and safety issues.

4.7 Buildings towards the end of their operational life may also experience settlement issues, which can manifest as significant cracks in supporting structures resulting in buildings being abandoned, requiring a redundant assets intervention. This can also accelerate the deterioration of the condition of the building.

4.8 In Appendix 2 a number of equipment summaries have been produced. These explain the failure modes for a number of the types of our redundant assets, and the potential consequences of failure.

Risk Prioritisation

4.9 With the constraints of our investment planning process we have implemented an approach to prioritise our treatment of redundant assets across the RIIO-2 period based on a risk score.

4.10 Our prioritisation methodology considers a number of factors such as environmental impact, asset condition, health and safety metrics (such as the risk to our operational personnel) and societal metrics (such as the proximity to centres of population). Within this methodology we utilise a probability of failure metric to assess the condition of the equipment. This being the failure rates per annum.

4.11 A full list of metrics and the explanation of these are shown in Table 7, below.

Table 7 Prioritisation Tool Metrics

Metric	Explanation
Environmental Risks Covering Asbestos, Naturally Occurring Radioactive Material (NORM) and Contaminants	Asbestos, Naturally Occurring Radioactive Material (NORM) and Contaminants such as oil can cause adverse impacts on the environment, such as to soil and water courses. Assets containing these materials are prioritised over those that do not.
Societal Risks Proximity to centres of population	Sites closer to centres of population are prioritised as these are more likely to be impacted by redundant assets.
Societal Risks Potential to re-use site	If the site or part of the site becomes available through removing redundant assets and can be reused for alternative uses it will be scored higher.
Societal/Environmental risks Makeup of surrounding land	The makeup of the surrounding land around the redundant asset or redundant site. Sites within agricultural land and green space are prioritised over industrial and hard standing areas
Site Manned/Unmanned	Unmanned sites are scored higher than manned sites due to potential changes in asset state/condition not being identified as quickly as on manned sites.
Condition Assessment/Probability of Failure	The assessment of the condition is based on the failure rates per annum, which is the likelihood of that asset deteriorating to an extent it causes asset failure. The higher the chance of asset failure the higher priority given. Assets have been split between Civil, Rotating, Mechanical and Electrical. Data has been used from Network Asset Resilience Metrics (NARMs) Service Risk Framework
Contains Energy (Process Fluids, Springs, Hydraulics etc.)	Assets that are isolated are ranked lower than assets containing any forms of energy. These forms of energy are ranked from low to high based on the assumed potential for harm.
Risk to Personnel on site	Risk to Personnel on site is determined through using NARMs Service Risk Framework values Assets have been split between Civil, Rotating, Mechanical and Electrical due to the varying potential for harm.

4.11 In our workload forecast we have prioritised projects that generated a higher risk score, whilst also aligning this work to available network outages where these are required.

Probability of Failure Data Assurance

4.12 In determining our prioritisation of redundant assets we have utilised applicable measures within our existing Network Asset Resilience Metric (NARM) Service Risk Framework. The Service Risk Framework was originally submitted for public consultation in April 2018, with three generally favourable responses received in May 2018. This been an input into the process for the determination of a risk value for each of the redundant assets and sites. Further details on this are included in Appendix 5.

5. Consequence of Failure

5.1 The consequence of an asset failure varies depending on the type of asset that experiences the failure, the pressure rating that it is operating in and, for redundant assets, the state of the disconnection on the asset.

5.2 For operational assets the consequence of failure is as per those consequences shown in each of the individual Asset Health Engineering Justification Reports. Although each type of asset has its own consequence of failure there are a number of service risk consequences. These being:

Health and Safety risk – This being the risk of harm from National Grid assets to our employees and the general public. This also includes the direct impact of ensuring compliance with the legislation relating to health and safety.

Environmental risk - This being associated with ensuring compliance with environmental legislation and any environmental incidents caused by our assets.

Availability and Reliability risk – This being associated with the potential outages caused from the loss of an asset on the operation of the NTS.

Societal risk – This being the impact on the wider society of our assets and can broadly be split into categories such as the operational consequence, the safety impact of failure and the environmental impact, with the consequences of these factors differing depending on the type of asset.

Financial risk – This being mostly associated with the costs of maintaining the asset at the current level of risk.

5.3 For redundant assets the consequence of failure can broadly be split into the same categories, with the exception of the Availability and Reliability risk. For our disconnected redundant assets the consequence of failure in relation to the impact on the operation of our network is less relevant.

5.4 By their nature redundant assets are not part of the operational transmission system and therefore there are no direct risks on security of supply. However, there is a risk that structural integrity failures of these redundant assets can result in damage to operational assets, and hence we need to ensure we manage this risk e.g. failing structures due to environmental conditions such as wind.

5.5 In Appendix 2 a number of equipment summaries have been prepared for the types of assets that have been identified as redundant. Within these equipment summaries the consequences of failure have been shown, assuming a redundant type of these assets.

5.6 There are a number of similar consequences across all of the varying types of redundant assets, with these summarised below:

Health and Safety Consequences – Asset deterioration due to obsolescence and environmental conditions has the potential to cause harm to National Grid operatives on the site and members of the public externally to our sites. Some of our assets contain hazardous materials, such as Asbestos. This was widely used at the time of the construction of many of our buildings, and therefore needs sufficient management to mitigate the risk to our operatives.Failures of buildings and equipment from falling masonry and equipment have the potential to result in harm, to both people and to any adjacent operational assets.

Environmental Consequences – The potential for ground and watercourse contamination from;

- the degradation of assets due to obsolescence issues, such as from the corrosion of our redundant assets,
- from the deterioration of Asbestos building materials, or
- oil or operational fluid carrying equipment.

Enforcement Action – One consequence of asset deterioration could be enforcement action by any one of our regulators, including the Health and Safety Executive (HSE), Environmental Agency (EA), Scottish Environmental Protection Agency (SPEA) and Natural Resources Wales.

Financial Consequences – If asset integrity failures do occur there could be the requirement to undertake further interventions, which would not present value for money for assets that provide no operational benefit to National Grid, however would be undertaken out of necessity. Additionally any enforcement action from the regulatory bodies could result in financial penalties. We also believe our focus should be on maintaining our operational assets vs our redundant assets.

5.7 In our assessment of our redundant assets we have only reviewed assets and sites that are currently redundant and have no forecast future use, rather than assets that may become redundant in the future due to changes in supply and demand and therefore the level of network flexibility required.

6. Options Considered

6.1 Across the ten year RIIO-2 and RIIO-3 period our business case for our redundant asset investment can be separated into five areas, these are detailed below:

Customer Disconnections – Interventions in RIIO-2 to disconnect sites from the NTS where we believe that we may receive requests to facilitate Power Station plant run down through disconnecting these generators from our network.

Decommissioning – Interventions on the 80 redundant assets identified across our network. Interventions will be undertaken across the RIIO-2 period.

Bacton Decommissioning – Following the investment included in the A14.02 Bacton Terminal Redevelopment Justification Report the incomer assets at the existing Bacton terminal site will become redundant, requiring decommissioning interventions.

Customer Driven Decommissioning – Decommissioning interventions on the customer disconnected sites identified above.

Anticipated Future Decommissioning – Provision has been included for future decommissioning in the RIIO-3 period to account for an expected level of future spend in this price control period. The level of spend is anticipated given the potential decarbonisation future and the governments net zero 2050 commitment.

6.2 For the Decommissioning, Bacton Decommissioning and Customer Driven Decommissioning the intervention options that are available to us vary depending on the type of assets that have been identified as redundant. There are also a number of additional factors that need to be considered when determining the intervention options. These include:

- Proximity to other (including below ground) operational assets
- Location of redundant asset on site
- Future plans for the site

6.3 When considering the intervention options across all of the varying types of redundant assets identified we believe there are generally four options:

- Do Nothing
- Disconnect and maintain
- Decommissioning
- Repurpose

6.4 The table overleaf, Table 8, provides a summary of the intervention options considered for this topic stating the advantages and disadvantages for each option. These options are expanded on in more detail in the forthcoming sections of the report.

Table 8 Options Summary (Advantages and Disadvantages)

	Advantages	Disadvantages
Do Nothing	• Minimises decommissioning intervention costs on redundant assets	• Defers the cost of end of life interventions to consumers who have had no benefit from these assets. • Potential for regulatory enforcement actions requiring intervention, with the possibility for financial penalties. • Ongoing maintenance costs. • Increased risk that redundant assets impact on operational assets which impacts on the operation of our NTS • Assets that have passed their original design life may be in a state of decay which could result in environmental impacts. • Reputational damage due to sites being in a visible state of disrepair. • Potential for costs to be higher in the future due to future more stringent legislation defining ways of working or specific standards. E.g. Environmental legislation.
Disconnect and Maintain	• We reduce our redundant asset cost, as just disconnect the assets from all sources of energy. • Reduces the risk of redundant assets impacting on operational assets.	• Defers the cost of end of life interventions to consumers who have had no benefit from these assets. • We may incur costs from one off asset health shocks requiring investments to undertake interventions to rectify health and safety risks from these redundant assets. • Assets that have passed their original design life may be in a state of decay which could result in environmental impacts. • Reputational damage due to sites being in a visible state of disrepair. • Potential for regulatory enforcement actions requiring intervention, with the possibility for financial penalties.
Repurpose	• Provides a continued benefit to National Grid and its stakeholders by repurposing assets for alternative uses such as for innovation or training initiatives	• Assets that have reached the end of their asset life will need considerable investment to enable continued operation, even for alternative uses.
Decommission	• Minimises the risk of asset health shocks, requiring asset health interventions to ensure the safety of redundant assets and our operational assets • Mitigates health and safety and environmental risks posed by these end of life redundant assets. • Ensures consumers who have had the benefit from these assets incur the costs for end of life intervention	• Highest cost of all intervention options in RIIO-2 and RIIO-3. • Prevents any opportunity to reuse our assets for alternative uses, such as for innovation purposes, operative training or for use with Hydrogen or CCUS.

Do Nothing

6.5 One of the interventions that we could undertake on our identified redundant assets is to do nothing in regards to a redundant asset intervention.

6.6 Assets would be left in situ with sites and assets inspected by Gas Transmission Operations teams, and where assets still have sources of energy (such as natural gas, HV or LV electricity, domestic water supply) these would remain connected. However, there are a number of considerations with this approach:

- Continued Asset Health Expenditure: Assets would still be on our asset register and potentially energised. Therefore we would still maintain these assets in accordance with our asset health and maintenance policies to maintain safety and compliance. Consumers would incur costs for the maintenance of assets that provide no benefit to the network and the network will have higher levels of risk than is necessary for operation.
- Environmental Implications: If assets are past their original design asset life, even with suitable maintenance, they could deteriorate and have the potential to cause environmental harm, requiring interventions.
- Reputational Damage: Our sites are sometimes located in proximity to the general public, with limited screening, such as trees. There could be a public perception that impacts negatively on our business.
- Regulatory Compliance: Our sites get audited by varying regulatory bodies, such as Environment Agencies and the Health and Safety Executive. [redacted]

6.7 Based on these factors, and as a responsible asset manager we do not consider this a preferable option. We do not consider it provides the most benefit to consumers or stakeholders, including communities close to our sites (some of whom do not have access to a domestic gas supply).

Disconnect and Maintain

6.8 One intervention for redundant assets and redundant sites is to disconnect the asset, group of assets or full site from the operational network and then maintain them in accordance with policy. This intervention option involves disconnecting the asset or site from all sources of energy (gas, electrical and control equipment) and the creation of a physical air gap between the redundant assets and the rest of the operational network. The asset, groups of assets or sites are then maintained, to preserve the potential future usage of those assets.

6.9 There are a number of implications with leaving assets in this state:

- Continued Asset Health Expenditure – Assets are still on our asset register and, although potentially not energised, asset health maintenance and inspections will continue to be carried out as appropriate, in accordance with National Grid policy and to ensure continued compliance with health and safety and environmental requirements.
- Environmental implications – If assets are past their original design asset life, even with suitable maintenance, they could deteriorate and have the potential to cause environmental harm requiring intervention.

- Reputational Damage: Our sites are sometimes located in proximity to the general public, with limited screening, such as trees. Although we will have undertaken a disconnection, the physical asset will still be left in situ, which could be in varying states of condition. There could be a public perception that impacts negatively on our business.
- Costs – Although costs are incurred for disconnection and continued maintenance these costs are relatively low in order of magnitude. Customers will incur the cost for maintenance of assets providing no operational benefit.

6.10 Based on these factors, and as a responsible asset manager we do not propose this option as an enduring strategy. We do not consider it provides the most benefit to consumers or stakeholders, including communities close to our sites (many of whom do not have access to a domestic gas supply in the case of Theddlethorpe).

6.11 However we will continue to use this option on a temporary basis, where it provides immediate risk mitigation, to respond to unanticipated customer requests to enable us time to review future requirements from these assets.

Decommission

6.12 The decommission intervention involves disconnecting the asset, a number of assets or a site from all supplies of energy and removing all process fluids (Methane, Condensate, Oil etc.). The assets are then de-pressurised, with useful spares being removed, or parts removed and reused where possible. If a whole site is in scope, all assets will then be removed from site and the site returned back to its original or enhanced environmental state for:

- Retention by National Grid for ongoing usage. This is the repurpose option in table 8, but at a site level.
- Transfer to another part of National Grid to determine future uses, including sale of land. Usually our sites are located in close proximity to high pressure pipeline assets which severely limits the opportunity to redevelop the site for alternative opportunities.
- Net positive environmental activities such as planting of trees, grassland etc. before the land is transferred to another part of National Grid to determine future uses and/or ownership.

6.13 For below ground assets on operational sites, our proposal is to decommission with a suitable fill material e.g. nitrogen. Decommissioning through removal of below ground assets on an operational site incurs additional cost and risk and will be deferred until the whole site is redundant to operational requirements.

6.14 There are a number of implications with leaving assets in this state:

- Reduced Asset Health Expenditure – Assets in scope are decommissioned, involving removal from site, and there will be a reduction in asset health and some site opex costs. Mitigates against the potential for having to intervene on our redundant assets when health and safety events occur.
- Health and Safety – Reduces the potential for harm to National Grid Operatives and members of the public through the full decommissioning of the redundant assets and removal from site.
- Environmental implications – The removal of process fluids and redundant assets from site negates the majority of environmental concerns.

- Repurpose – Where redundant sites are identified we could re-purpose the sites for alternative uses, both within National Grid, such as through continued usage as operational bases, sites for Innovation testing or through engagement with the local community providing a site with an alternative purpose.

6.15 Additionally we shall investigate the viability of recovering assets from the redundant sites, assets and groups of assets, to enable us to reuse these for other sites on our network or to hold as critical spares. We have currently undertaken a high level review of the identified assets, but included within our business plan the provision to undertake a feasibility study in RIIO-2 to undertake a holistic review of our redundant assets for alternative uses, such as hydrogen or CCUS. This is included within the chapter: "*I want you to facilitate the whole energy system of the future*".

6.16 The high level review of potential spares identified that the majority of the assets, included in this investment proposal, have an asset life that is exhausted, and therefore there is no value to recover them for critical spares for our network. However for a number of our Compressor power turbines we are exploring moving these to retain these for operational use or for innovation purposes.

6.17 This is our preferred intervention for our redundant assets and one that we believe provides the best value to current and future consumers and to the communities close to our sites.

Options Cost Details

6.18 To develop our costs for this submission we have built them up from a number of sources. These sources also vary depending on the investment areas defined at the start of these section. The forthcoming sections provide details of our cost forecasts:

Decommissioning

6.19 Our cost for our 80 redundant sites, single assets and groups of assets have been determined from a number of sources:

In-house estimating team – Our in house estimating team have developed costs for a number of items based on our cost library from previously completed projects. Due to the limited quantity of previous projects we do not have a substantial library of these costs.

Completed projects – We have also reviewed projects completed in the current and prior price control period to inform our cost forecasts for a number of items. Although we have undertaken limited activities in RIIO-1 there have been several projects which we have been able to draw information from.

Third Party Contractors – We have utilised third party contractors to provide quotations for a number of the redundant assets, where the scope of work is significant.

Subject Matter Expert (SME) Forecasts – Cost forecasts have been determined through consultation with our intern team of Subject matter Experts (SMEs), who have been able to draw on their expertise and experience to determine indicative cost forecasts.

6.20 The table below, Table 9, provides the unit costs used within this topic. These rates are based on projects undertaken in RIIO-1, third party quotations and engineering judgement.

Table 9 Decommissioning Unit Rates

	Unit Rates £m 18/19
Compressor Unit Decommission to Plinth	[redacted]
Control Building Decommission to ground	[redacted] /m3
Block Valve Decommissioning Pipe through	[redacted]
Condensate Tank – Disconnect and decommission	[redacted]
River Crossing Decommission two block valves and duplicate crossing feeder section	[redacted]

7. Business Case Outline and Discussion

7.1 Across the ten year RIIO-2 and RIIO-3 period our business case can be separated into five areas of investment, these are detailed below:

Customer Disconnections £2.99m – Interventions in RIIO-2 and RIIO-3 to disconnect sites from the NTS where we believe that we may receive requests to facilitate Power Station plant run down through disconnecting these generators from our network.

RIIO-2 Decommissioning £81.07m – Interventions on the 80 redundant assets identified across our network. Interventions will be undertaken across the RIIO-2 period.

RIIO-3 Bacton Decommissioning £13.56m– Following the investment included in the A14.02 Bacton Terminal Redevelopment Justification Report the incomer assets at the existing Bacton terminal site will become redundant, requiring decommissioning interventions, forecast for RIIO-3

Customer Driven Decommissioning £9.28m – Decommissioning interventions in RIIO-3 on the RIIO-2 customer disconnected sites.

Anticipated RIIO-3 Decommissioning £72.31m – An amount has been forecast for future decommissioning in the RIIO-3. Whilst these is still uncertainty around decarbonisation futures we have forecast a flat profile for non-Bacton decommissioning activities in RIIO-3.

Customer Disconnections and Decommissioning

7.2 We recognised that our customers may not require a connection to our network in the future, driven by the commercial regimes and market conditions they operate in.

7.3 Our internal best view forecast of the economic lives of the generation assets for a number of our Power Station customers are that they will reach a point in RIIO-2 where plants will reach a point of obsolescence. Therefore we have forecast that a disconnection from our network at the NTS offtake site will be required to be undertaken to facilitate plant run down in RIIO-2. These sites are shown in Table 10.

Table 10 Sites forecast to require a disconnection

7.4 Doing nothing would prevent the customer from undertaking their activities to run down their generation plant and therefore is not a valid option.

7.5 Our plans for RIIO-3 include the decommissioning of these sites, following the disconnection in RIIO-2. We also include a forecast of workload and cost similar to RIIO-2 in our RIIO-3 forecasts of customer disconnections.

7.6 Our unit cost for the disconnection of these sites is shown in Table 11 below. The costs encompass the design and delivery of the disconnection, and had been determined from delivered projects in RIIO-1 for customer site disconnections.

Table 11 Site Disconnections Unit Cost

	Unit Cost £m 18/19
Customer Site Disconnection	

Decommissioning

7.7 There are a number of drivers that influence the intervention option that we propose on our 80 identified redundant assets and the proposed RIIO-3 customer site decommissioning.
These can broadly be split into the following categories:

- Health and Safety risk
- Societal Fairness
- Environmental risks
- Financial risks
- Stakeholder Views

Health and Safety

7.8 There are health and safety risks posed by any of our assets, whether these are operational or redundant.

7.9 As our redundant assets are generally towards the end of their asset life they present a number of specific challenges that need to be managed to mitigate health and safety risks. For example, there could be a requirement for us to undertake more frequent and sometimes specialised interventions to prevent or remediate against naturally occurring or 3rd party damage to our redundant assets. e.g. damage to compressor vent stacks by weather conditions, as detailed in the consequences of failure section.

7.10 Decommissioning our redundant assets mitigates against the health and safety risks our redundant assets pose to our employees and members of the public.

Societal Fairness

7.11 Another factor which has been considered is the societal fairness in our approach to redundant assets. It is our opinion that customers who have benefited from these redundant assets and sites should incur the costs for the decommissioning of them, rather than for us to delay the decommissioning and future customers pick up the cost, when they have not incurred any benefit from these assets.

7.12 The UK's ambition is to transition to a low carbon economy and to decarbonise the energy system, this having recently been refined in the announcement of the 2050 Net Zero target. In the long term this could result in a gas transmission system with hydrogen or hydrogen blends or one that is used for Carbon Capture Utilisation and Storage (CCUS) or one that is much smaller or not required at all. All of these scenarios are likely to lead to asset changes and redundancy of some existing assets. In some scenarios this increased cost of decommissioning assets would be met by a reduced customer base.

Environmental Risks

7.13 Our redundant assets pose an environmental risk that needs to be managed. This environmental risk is dependent on the inherent environmental hazard of the specific installation, and the potential ageing related deterioration or damage, with these factors varying dependant on the type, makeup and location of the asset.

7.14 Although with appropriate levels of asset health intervention these risks can be managed we do not believe this to be a suitable strategic approach as we will be incurring cost managing assets from which our customers get no operational benefit from. Through decommissioning our redundant assets we mitigate these environmental risks.

7.15 Decommissioning activities are not currently heavily regulated for onshore transmission systems, unlike North Sea oil and gas operators. We expect increasingly stringent Environmental regulations to become adopted in the future. These regulations may define obligations for our redundant/stranded assets. This could mean there is a disproportionate cost impact of delaying the decommissioning of redundant assets, through more stringent specifications for the management of waste from decommissioned assets, and for the remediation of land or higher costs of waste management.

Financial Risk

7.16 The financial risk for our redundant assets is associated with the potential for asset health failures which necessitate further intervention to mitigate health and safety or environmental risks resulting from these failure.

7.17 The decommissioning of these redundant assets will mitigate against these asset health failures ensuring our investments are focussed on our operational assets, and we don't unnecessarily incur costs resolving health and safety and environmental issues from our redundant assets.

Stakeholder Views

7.18 Through the development of our business plan we have undertaken stakeholder engagement with a wide range of stakeholders, from Customers, Academics, Regulators and other energy industries.
There were a wide range of views from our stakeholder, which were sometimes contradictory.

7.19 A summary of these views is provided below:

- *Keep redundant assets that could have a future operational use (specifically pipelines).*
- *Deferring works could impact the local community and environment*
- *Delivering this all in RIIO-2 will minimise risk in relation to the potential to reuse.*
- *Environmental aspects should be taken into consideration when determining the intervention option*
- *National Grid needs to look at decommissioning on a risk-based approach.*
- *We should consider the experience of the North Sea oil and gas operators where assets are mandated to be removed at end of life.*

7.20 These views generally support a disconnect and maintain intervention approach and/or decommissioning intervention approach, with our preferred option for above ground assets being the decommissioning intervention approach on assets that have no current future operational requirements.

7.21 For our pipeline feeder assets our intervention proposes an approach of filling the asset with Nitrogen. This will enable us to explore alternative options for these assets in the short term.

7.22 Throughout our engagement, we have developed a stakeholder engagement log which contains further details on the engagement activities undertaken and how the outcomes of this engagement have driven our investment proposals. This engagement log is an appendix to the "I want to care for the environment and communities" chapter of our business plan (A16.07 Demolition Engagement Report).

Customer Driven Areas

7.23 As has been referenced earlier in this paper our customers' utilisation of our network has the potential to result in the creation of redundant assets. A number of sites and assets have been included in our investment plans for redundant assets (within the 80 sites, assets and groups of assets) which have been driven by specific customer activities. These include:

[redacted]

7.24 [redacted]

[redacted]

7.25 [redacted].

Bacton

7.26 In the Justification paper NGGT A14.02 Bacton Terminal Redevelopment we are proposing to undertake the development of a brownfield terminal investment.

7.27 Following the completion of this investment a number of redundant assets will be created at the site on the terminal incomers from the [redacted] and [redacted] terminals, including each of the incomer manifolds.

7.28 This will involve completion of disconnections from the site ring main and from the customer site. Following this disconnection decommissioning activities of the road crossings between the terminals, and decommissioning of the manifold areas, blending and filtering assets on the National Grid terminal is proposed to be undertaken.

7.29 We do not believe leaving these assets in situ is the correct approach to take, given the potential health and safety process safety risks and environmental risks. Deferring the investment to later price control periods will pass on the cost to customers who have not had the benefit of these assets and therefore our proposed approach is to decommission the assets in RIIO-3.

Business Case Summary

7.30 In its present form the Cost Benefit Analysis (CBA) methodology is not suited to decommissioning costs as the relevant factors that drive decommissioning are not straightforward to quantify. The key drivers such as societal and intergenerational fairness and escalating environmental regulation and costs are not amenable to CBA modelling. In particular, given the nature of the assets being redundant, the usual considerations of network risk, constraints etc which are captured in CBAs are not relevant drivers for decommissioning.

8. Preferred Option Scope and Project Plan

8.1 Our preferred option is decommissioning our identified redundant assets across RIIO-2 and RIIO-3, recovering assets for use as strategic spares where this is possible and assets are not life expired. Table 12 shows the summary of costs, with costs broken down by investment category.

8.2 The decommission intervention option involves disconnecting the asset or a number of assets on a site from all supplies of energy and removing all process fluids (Methane, Condensate, Oil etc.). The assets are then de-pressurised, with useful spares being removed, or parts removed and sold to third parties. If a whole site is in scope all assets are then removed from site and the site returned to its original or enhanced state.

8.3 The rationale behind this being our preferred option is as follows:

- It reduces potential future asset health invention costs, which we may incur to ensure the safety of our assets that we get no operational benefit.
- It reduces the potential for process safety & Health and Safety incidents, with the potential to cause harm and to require asset health shocks.
- It reduces the potential for environmental contamination incidents and enables us to improve the environmental ecosystem service value of the local ecosystem by removing our industrial assets and returning sites to their original or enhanced environmental state.
- It aligns with the views and support from our stakeholders
- It aligns with views from [redacted]
- It also aligns with our view of societal fairness that current consumers incur the costs to decommission assets that they have had the benefit from.

Spend Profiles

8.4 The table overleaf, Table 12 provides a summary of the spend profile across the RIIO-2 and RIIO-3 price control periods for a number of categories of work. The spend profile is shown in £m in an 18/19 price basis.

8.5 The cost forecast has been split into a number of categories of costs which are detailed below:

Customer Disconnections – Interventions in RIIO-2 to disconnect sites from the NTS where we believe that we may receive requests to facilitate Power Station plant run down through disconnecting these generators from our network.

Decommissioning – Interventions on the 80 redundant assets identified across our network. Interventions will be undertaken across the RIIO-2 period.

Bacton Decommissioning – Following the investment included in the A14.02 Bacton Terminal Redevelopment Justification Report the incomer assets at the existing Bacton terminal site will become redundant, requiring decommissioning interventions.

Customer Driven Decommissioning – Decommissioning interventions on the customer disconnected sites identified above.

Anticipated Future Decommissioning (RIIO-3) – An amount has been forecast for future decommissioning in the RIIO-3 period to account for an expected level of future spend. It did not seem right to reduce this spend given the potential decarbonisation future and the impact on the size of our network.

8.6 The phasing of projects has been undertaken based on the determined risk value that is an outcome of the prioritisation process and the output from our deliverability review.

Table 12 Disconnection and Decommissioning Cost Forecast

	Cost Forecast (£m 18/19 prices)										
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Customer Disconnections											2.99
Customer Driven Decommissioning											9.28
Decommissioning											81.07
Bacton RIIO-3 Decommissioning											13.56
Anticipated Future Decommissioning											72.31
Total	4.17	24.55	21.36	14.95	17.53	19.65	23.30	21.49	17.73	14.46	179.20
	82.57					96.64					

8.7 Within our Business Plan Data Table Templates (BPDT) Table 3.01 “Project Listing” is used to report our forecast investment spend profile for this topic. Data within this table is broken down into a number of sub-categories. For the Decommissioning line in the table above, the Project details table in Appendix 1 details the BPDT sub-category

8.8 Delivery of our proposals will be measured through a price control deliverable as set out in A3.01.

Appendix 1 Project Details

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site Decom Theddlethorpe Terminal and Multijunction [redacted]	Theddlethorpe Terminal & Multijunction Site Decommissioning	Decommissioning	Decommissioning of the Theddlethorpe Terminal & Multijunction site. Assets are redundant following the disconnection of ConnocoPhilips Terminal	[redacted]	Site isolated but pressurised to NTS pressure. Disconnection required
Site Block valve Decom [redacted]	Goulceby Block Valve pipe through and decommissioning	Decommissioning	Block valve site lies on Feeder 17 and will be piped through to enable the decommissioning of the feeder asset.	[redacted]	Site isolated from operational Network, but pressurised to NTS pressure due to current state of Feeder 17. Disconnection required
Site Block valve Decom [redacted]	Little Cawthorpe Block Valve pipe through and decommissioning	Decommissioning	Block valve site lies on Feeder 17 and will be piped through to enable the decommissioning of the feeder asset.	[redacted]	Site isolated from operational Network, but pressurised to NTS pressure due to current state of Feeder 17. Disconnection required
Feeder Decom [redacted]	Feeder 17 Disconnection and Decommissioning - Theddlethorpe - Hatton AGI	Decommissioning	Decommissioning of Feeder 17 pipeline, Theddlethorpe to Hatton, by Nitrogen fill	[redacted]	Feeder isolated but pressurised to NTS pressure. Disconnection required
Feeder Decom [redacted]	Feeder 8 Disconnection and Decommissioning - Theddlethorpe - Hatton AGI	Decommissioning	Decommissioning of Feeder 8 pipeline, Theddlethorpe to Hatton, by Nitrogen fill	[redacted]	Feeder isolated but pressurised to NTS pressure. Disconnection required
Site AGI Decom [redacted]	Rationalisation of Hatton AGI	Decommissioning	Rationalisation of Hatton Multijunction, including pipework, FCVs valves and pig traps. Related to the decommissioning of Theddlethorpe Terminal and Feeder 8 & 17.	[redacted]	Assets isolated but pressurised to NTS pressure. Disconnection required

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site Decom Warrington Compressor Units A & B [redacted]	Warrington Compressor Site - Unit A & B (2x RB211-24C), associated infrastructure station pipework & Buildings	Decommissioning	Decommission and disposal of Unit A & B (2x RB211-24C) back to plinth. Decommissioning of station pipework and control systems. Retention of AGI assets.	[redacted]	Assets isolated but pressurised to NTS pressure. Disconnection required
Site Compressor Station Decom [redacted]	Warrington Compressor Station - Ultrasonic Flow Meter	Decommissioning	Warrington has a 42" diameter ultrasonic flow meter installed but is surplus to operational requirements. Therefore, our proposal is to decommission this redundant flow meter.	[redacted]	Asset pressurised to NTS pressure. Disconnection required
Site Entry/Exit Decom [redacted]	Ferny Knoll AGI Site Decommissioning	Decommissioning	Customer stopped taking gas and therefore the redundant AGI site including kiosk and instrumentation to be removed. Isolation of the customer's pipeline was undertaken in 2009.	[redacted]	Site connected at NTS pressure to our network. Disconnection required
Site Decom Peterborough Control Building and Outbuildings [redacted]	Peterborough Compressor Station Buildings & Heating systems	Decommissioning	Decommissioning of the following assets at Peterborough Compressor Station: • Compressor Cab buildings • Control Building • Control Instrumentation for Compressor following the completion of the IPPC Phase 3 activities	[redacted]	Assets are operational until the new IPPC Phase 4 assets are commissioned. Disconnections of all services is required.
Site Compressor Station Decom [redacted]	Peterborough Compressor Station - Centrax Standby Generator	Decommissioning	Centrax Standby Generator and associated infrastructure will become redundant as a new installation is being commissioned as part of the new control building being constructed as part of the IPPC project.	[redacted]	Operational until the new IPPC Phase 4 assets are commissioned
Site Decom Enron Billingham AGI [redacted]	Enron Billingham AGI Site Decommissioning	Decommissioning	Decommissioning of the Enron Billingham site is required following disconnection of the customer site in RIIO-1.	[redacted]	Site is disconnected from the NTS
Feeder Decom [redacted]	Feeder 6 Disconnection and Decommissioning from Billingham ICI to Enron (Billingham)	Decommissioning	When completing the decommissioning of Enron Billingham, the section of feeder 6 from Billingham ICI to Enron Billingham will cease to be able to be in-line inspected. Pipeline to be filled with nitrogen and decommissioned.	[redacted]	Feeder is currently part of our operational network. Disconnection is required
Site AGI Decom [redacted]	Upper Neeston AGI Site Decommissioning	Decommissioning	Decommissioning of the AGI required, following the customer ceasing flows in 2015. The customer has sold the site and transferred the NExA to a third party who has not flowed gas in the intervening period.	[redacted]	Site connected at NTS pressure to our network. Disconnection required

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
			Decommissioning of the whole site required including Instrument kiosk, bypass pipework, security fencing		
Site AGI Decom [redacted]	Bishop Auckland Redundant Asset rationalisation	Decommissioning	There are some items of plant at Bishop Auckland that are surplus to operational requirements, connected to blanked dome ends. Valve 484134 and the pipework downstream to the dome end to be removed	[redacted]	Assets connected at NTS pressure to our network. Disconnection required
Site Decom Churchover Compressor Units A & Pressure Reduction Area [redacted]	Churchover Compressor Units A & Pressure Reduction Area Decommissioning	Decommissioning	National Grid has replaced Churchover A & B with one has turbine and one electrically driven unit. The physical isolation of unit A has been undertaken in RIIO-1. Full decommissioning of the Unit required in RIIO-2. The Pressure Reduction Station for Units A & B is also redundant and costs are included in this project to decommission these assets.	[redacted]	Asset disconnected from the NTS
Site Decom Churchover Compressor Unit B [redacted]	Churchover Compressor Units B Decommissioning	Decommissioning	National Grid has replaced Churchover A & B with one has turbine and one electrically driven unit. The physical isolation of unit B has been undertaken in RIIO-1. Full decommissioning of the Unit required in RIIO-2	[redacted]	Asset disconnected from the NTS
Site AGI Decom [redacted]	Horndon - Barking Power Station AGI	Decommissioning	Former Barking Power Powerstation connection AGI requires full demolition and removal, including odourisation plant, following the disconnection and decommissioning of the powerstation.	[redacted]	Site disconnected from the NTS
Site AGI Decom [redacted]	Horndon - ex Canvey Island	Decommissioning	There is abandoned a Water Bath Heather still connected to the NTS, that requires decommissioning	[redacted]	Asset disconnected from all services
Site Decom Bacton - Redundant Ex Odourant Area, Dewscope Huts and 2x boilers [redacted]	Bacton - Redundant Ex Odourant Area, Dewscope Huts and 2x boilers	Decommissioning	There are a number of redundant assets to be decommissioned on the site: • The ex odourant area and methanol tank & the ex gas quality monitoring buildings are redundant. • In the boiler house adjacent to the Control room there are 2x boilers that are redundant to be removed. • Dewscope huts including the GRP huts and concrete foundation plinths to be removed • ENI Water Pipeline	[redacted]	Assets have been disconnected from all services

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site Decom Bacton -ENI Incomer [redacted]	Bacton Eni Decommissioning	Decommissioning	The Bacton ENI former sub-terminal connection was disconnected in Spring 2016. A Decommissioning intervention is proposed to be undertaken. All National Grid assets in relation to this sub-terminal connection remain onsite, and will be decommissioned and removed, including: • Road crossing sleeves and pipeline from the old ENI terminal, • Metering and valve assets • Above and below ground pipework • Connection to the Ring Main.	[redacted]	Assets have been disconnected from the customer site and the sites Ring Main
Site Block valve Decom [redacted]	Brome Block Valve Pipe through and Decommissioning	Decommissioning	Brome BV site[1519] is circa 570m from Diss Tee[1520] on Feeder 5. It has a number of Asset Health issues associated with site. This Block Valve appears to be an original feature of Feeder 5 prior to Diss Tee being built a few years later when Diss Compressor was added in the mid 1970s. Our proposal is to decommission Brome	[redacted]	Site connected at NTS pressure to our network. Disconnection required
Site Entry/Exit Decom [redacted]	Chester road commissioning valve	Decommissioning	There is a valve shown on Feeder 5 as a commissioning valve. The valve is leaking, redundant to our requirements and would benefit from being removed.	[redacted]	Asset connected at NTS pressure to our network. Disconnection required
Site Decom Redundant Assets within Plant 1 Analyser House and Instrument House, Plant 2 Analyser House and Instrument House, Feeder 13 Instrument Shelter, Plant 6 ACH Building, Plant 6 ASH Building, Plant 4 Analyser House [redacted]	St Fergus - Redundant Assets within Plant 1 Analyser House and Instrument House, Plant 2 Analyser House and Instrument House, Feeder 13 Instrument Shelter, Plant 6 ACH Building, Plant 6 ASH Building, Plant 4 Analyser House,	Decommissioning	Redundant Assets within Plant 1 Analyser House and Instrument House, Plant 2 Analyser House and Instrument House, Feeder 13 Instrument Shelter, Plant 6 ACH Building, Plant 6 ASH Building, Plant 4 Analyser House,	[redacted]	Various services connected to these assets. Disconnections are required

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site Entry/Exit Decom [redacted]	St. Fergus Methanol Tanks	Decommissioning	Dispose of redundant Methanol tanks, bund and filling station.	[redacted]	Asset Isolated and demarcated from process assets Disconnection required
Site Entry/Exit Decom [redacted]	St Fergus Odourant Flarestacks	Decommissioning	Decommission the redundant Odorant Flarestacks at the site.	[redacted]	Asset Isolated and demarcated from process assets Disconnection required
Site Entry/Exit Decom [redacted]	St Fergus	Decommissioning	Redundant Gas Quality equipment in pits	[redacted]	Asset Isolated and demarcated from process assets Disconnection required
Site Entry/Exit Decom [redacted]	St Fergus	Decommissioning	Redundant NOX shelters 2A and 2D	[redacted]	Asset Isolated and demarcated from process assets Disconnection required
Site Entry/Exit Decom [redacted]	Condensate Tanks St Fergus	Decommissioning	Remove two condensate tanks and associate above ground equipment at St Fergus. We have launched an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Decom Kirriemuir Compressor Unit D [redacted]	Kirriemuir Compressor Unit D	Decommissioning	Decommission and disposal of Compressor Unit D back to plinth.	[redacted]	Asset has been disconnected
Site Compressor Station Decom [redacted]	Condensate Tank Kirriemuir	Decommissioning	Remove two condensate tanks and associated above ground equipment at Kirriemuir. We have launched an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Decom Huntington Control Building and Outbuildings [redacted]	Huntingdon Compressor Station Building & heating systems	Decommissioning	Decommission to plinth a number of assets following the completion of the IPPC Phase 4 scheme: Compressor Cab buildings Control Building Control Instrumentation for Compressor	[redacted]	Assets are operational until the new IPPC Phase 4 assets are commissioned. Disconnections of all services is required.

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site Compressor Station Decom [redacted]	Huntington Compressor Station - Standby Generator and Diesel Storage Tank	Decommissioning	Standby Generator, Diesel Storage Tank and associated equipment and protective building at Huntington to be removed	[redacted]	Operational until the new IPPC Phase 4 assets are commissioned
Site Decom Bathgate Control Building and Outbuildings [redacted]	Bathgate Compressor Control Building, Redundant Site Lighting, and outbuildings	Decommissioning	Dispose redundant compressor control building, including Office, Workshop, former substation and generator buildings. The building has already been isolated from all services with the exception of water. Therefore isolation of the water supply and decommissioning of the control building structure to be undertaken to plinth level.	[redacted]	Asset has had all services disconnected
			There is a store building at the back of the control building that was once used as a store building, that can also be removed to plinth.		
Site AGI Decom [redacted]	Bathgate Compressor Instrumentation kiosk	Decommissioning	Dispose redundant instrumentation kiosk	[redacted]	No Operational assets
Site Decom Deeside AGI [redacted]	[redacted]	Decommissioning	[redacted]	[redacted]	Site Disconnected from the NTS
Feeder Decom [redacted]	Feeder 21 Burton Point Tee to Deeside	Decommissioning	Decommissioning of circa 300m of 36" Feeder 21 from Burton Point Tee to Deeside.	[redacted]	Asset operational at NTS pressure to our network. Disconnection required
Site Entry/Exit Decom [redacted]	[redacted]	Decommissioning	[redacted] We hold a number of assets at this AGI site and therefore our request for this site relates to the decommissioning of these National Grid assets. Circa 35m of above ground NG pipework on the AGI. Circa 30m of below ground NG pipework to the boundary of the AGI	[redacted]	Site connected at NTS pressure to our network. Disconnection required

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site AGI Decom [redacted]	Austrey AGI National Grid Asset Decommissioning	Decommissioning	Removal of 350mm Portable Pig Trap connection arrangement, 20m of above ground 250mm pipeline, 5m of 100mm bypass pipework. 2x 350mm valves which is connected to Feeder 14 supplying Shustoke Offtake.	[redacted]	Site connected at NTS pressure to our network. Disconnection required
Feeder Decom [redacted]	Feeder 14 Austrey to Shustoke	Decommissioning	Feeder 14 between Austrey and Shustoke is 17.34km of 350mm. Once disconnected from Shustoke and Austrey we propose to nitrogen fill the pipeline, whilst we explore alternative options.	[redacted]	Asset operational at NTS pressure to our network. Disconnection required
Site AGI Decom [redacted]	Roxwell Redundant Assets - pipework and valve assets onsite that are redundant	Decommissioning	There are a number of pipework and valve assets onsite that have never been used. Some of these can no longer be maintained and have defects/PSIs that can be mitigated through decommissioning of the assets	[redacted]	Assets operational at NTS pressure to our network. Disconnection required
Site Entry/Exit Decom [redacted]	Easington BP Dimlington supply HIPPS V7383	Decommissioning	Decommissioning of the Easington BP Dimlington valve that is redundant to requirements (HIPPS V7383).	[redacted]	Asset operational at NTS pressure to our network. Disconnection required
Site Compressor Station Decom [redacted]	Condensate Tank Diss	Decommissioning	Remove one condensate tanks and associate above ground equipment at Diss. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site AGI Decom [redacted]	Peterstow compressor station redundant outbuildings	Decommissioning	There are a number of buildings that remain onsite which need decommissioning. These were not included in the scope of the original decommissioning project and are now redundant	[redacted]	Not Applicable
Site Entry/Exit Decom [redacted]	Great Wilbraham Redundant 36" valve and dome end.	Decommissioning	Remove a buried condensate vessel previously connected to NTS Pig Traps and a 36" valve and dome end.	[redacted]	Asset has been isolated. Disconnection required
River crossing from Yarm Tees North to Yarm Tees South Decom [redacted]	Yarm Tees Duplicate River Crossing	Decommissioning	Removal of one of the 750mm/30" river crossings. including block valves at either site of crossing (Generally comprising of six valves). Pipe through of the mainline valves and decommissioning of the duplicate feeder including valve arrangements.	[redacted]	Connected to Operational Network

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site Compressor Station Decom [redacted]	Condensate Tank Cambridge	Decommissioning	Remove one condensate tanks and associate above ground equipment at Cambridge. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Compressor Station Decom [redacted]	Condensate Tank Peterborough	Decommissioning	Remove one condensate tanks and associate above ground equipment at Peterborough. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Compressor Station Decom [redacted]	Wormington Aftercooler	Decommissioning	Decommissioning of the Aftercooler asset at Wormington Compressor Station. The asset is currently electrically isolated and in bypass. Proposal to decommission, and amend control systems to remove the asset from the system.	[redacted]	Asset is connected to Operational Network in Bypass Disconnection required
Site Entry/Exit Decom [redacted]	Easington Daniels 500 chromatograph	Decommissioning	The Easington Daniels 500 Chromatograph is redundant to requirements and has been isolated prior to decommissioning.	[redacted]	Asset has been isolated. Disconnection required
Site Entry/Exit Decom [redacted]	Corby Powerstation Mokveld Valve and Bristol Babcock control cabinet	Decommissioning	Decommission a Redundant Mokveld Valve and Bristol Babcock control cabinet at Corby AGI site	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
River crossing from Lennel Tweed North to Lennel Tweed South Decom [redacted]	Lennel Tweed Duplicate River Crossing	Decommissioning	Removal of one of the 600mm/24" river crossings. including block valves at either site of crossing (Generally comprising of six valves). Pipe through of the mainline valves and decommissioning of the duplicate feeder including valve arrangements.	[redacted]	Site connected at NTS pressure to our network. Disconnection required
River crossing from Asselby to Drax Decom [redacted]	Asselby to Drax Duplicate River Crossing	Decommissioning	Removal of one of the 900mm/36" river crossings. including block valves at either site of crossing (Generally comprising of six valves). Pipe through of the mainline valves and decommissioning of the duplicate feeder including valve arrangements.	[redacted]	Site connected at NTS pressure to our network. Disconnection required
Site Decom Didcot A - Pressure Reduction Area redundant assets [redacted]	Didcot A - pressure reduction equipment	Decommissioning	All assets related to the Pressure Reduction 'A' installation at Didcot are redundant, including - pipework, valves, metering and boilers. These assets have been physically isolated from the rest of the site.	[redacted]	Assets have been disconnected from all services

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site Decom Thornton Curtis C Redundant Preheating system [redacted]	Thornton Curtis C Water bath heaters A & B	Decommissioning	Thornton Curtis C Water bath heaters A & B are Gas & electrically isolated and bypassed	[redacted]	Assets Isolated and disconnected from all sources of energy
Site AGI Decom [redacted]	Sellafield Powerstation Redundant Assets	Decommissioning	Flow Control Valve and Control Cabinet are redundant to requirements and need funds to decommission.	[redacted]	Assets connected at NTS pressure to our network. Disconnection required
Site Compressor Station Decom [redacted]	Condensate Tanks Nether Kellet	Decommissioning	Remove one condensate tanks and associate above ground equipment at Nether Kellet. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Compressor Station Decom [redacted]	Condensate Tank Wormington	Decommissioning	Remove one condensate tanks and associate above ground equipment at Wormington. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Compressor Station Decom [redacted]	Condensate Tank Carnforth	Decommissioning	Remove one condensate tanks and associate above ground equipment at Carnforth. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Compressor Station Decom [redacted]	Condensate Tank Chelmsford	Decommissioning	Remove one condensate tanks and associate above ground equipment at Chelmsford. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Block valve Decom [redacted]	Haltwhistle Block Valve Decommissioning	Decommissioning	Remove 2x 900mm redundant pipe legs, constructed for potential customer that never materialised.	[redacted]	Asset connected at NTS pressure to our network. Disconnection required
Site Compressor Station Decom [redacted]	Kings Lynn Compressor Plant 1 and Water Bath Heater plinth	Decommissioning	Plant 1 consisted of 3 compressor units. These units were decommissioned circa 1980. Much of the pipework and ancillaries have been left in the ground. Take these plinths back to ground. Additionally decommission a plinth for an old water bath heater	[redacted]	No Operational assets

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
			In addition, there is some pipework from the former Plant 1 control building that is redundant and can be decommissioned.		
Site Compressor Station Decom [redacted]	Kings Lynn Compressor Station - Disused Gas Analyser	Decommissioning	Gas analyser and building is redundant and required removal	[redacted]	No Operational assets
Site Compressor Station Decom [redacted]	Kings Lynn Compressor Station - Pressure Reduction Arrangement	Decommissioning	Station Pressure Reduction Arrangement (PRA)/Pressure Reduction Station (PRS) and lube oil transfer tank for A unit to be decommissioned.	[redacted]	Asset connected at NTS pressure to our network. Disconnection required
Site Compressor Station Decom [redacted]	Condensate Tank Kings Lynn	Decommissioning	Remove one condensate tanks and associate above ground equipment at Kings Lynn. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
River crossing from Susworth Trent East to Susworth Trent West Decom [redacted]	Susworth East to Susworth West Duplicate River Crossing	Decommissioning	Removal of one of the 750mm/30" river crossings. including block valves at either site of crossing (Generally comprising of six valves). Pipe through of the mainline valves and decommissioning of the duplicate feeder including valve arrangements.	[redacted]	Site connected at NTS pressure to our network. Disconnection required
Feeder Decom [redacted]	Feeder 7 Scunthorpe (7225) to Susworth Trent East	Decommissioning	Removal and rationalisation of the Feeder 7 loop between Scunthorpe and Susworth Trent previously used for input and discharge from Scunthorpe compressor which was decommissioned and demolished in RIIO-1. Decommission 10.17km of feeder asset and commissioning of a smaller in line inspection loop to enable continued inspection of feeder 7.	[redacted]	Assets are connected at NTS pressure to our operational network. Disconnection required
Site Compressor Station Decom [redacted]	Condensate Tanks Avonbridge	Decommissioning	Remove one condensate tanks and associate above ground equipment at Avonbridge. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Compressor Station Decom [redacted]	Carnforth Compressor Station- Water bath heater control panel	Decommissioning	Water bath heater was removed some years ago but control local panel and field cabling has been left in-situ, to be decommissioned.	[redacted]	Assets Isolated and disconnected from all sources of energy
Site Compressor Station Decom [redacted]	Condensate Tank Hatton	Decommissioning	Remove one condensate tanks and associate above ground equipment at Hatton. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required

BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site Compressor Station Decom [redacted]	Condensate Tank Wisbech	Decommissioning	Remove one condensate tanks and associate above ground equipment at Wisbech. There is an innovation project for the use of a mobile condensate tanks to collect condensate directly from scrubbers. This will then make the existing condensate tanks a redundant asset, to be removed.	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site AGI Decom [redacted]	Bathgate - V28 & 29 removal	Decommissioning	Remove and dispose valves	[redacted]	Asset connected at NTS pressure to our network. Local Isolation required
Site Compressor Station Decom [redacted]	Carnforth Compressor Station	Decommissioning	AGI Flow Control Valve and Control Cabinet currently redundant, assets are to be decommissioned	[redacted]	Assets connected at NTS pressure to our network. Local Isolation required
Site Compressor Station Decom [redacted]	Huntington Compressor Station	Decommissioning	1 x transmission telemetry panel in the comms room is redundant and to be decommissioned	[redacted]	Assets connected. Local Isolation
River crossing from Paull to Goxhill Decom [redacted]	No.1 Feeder across Humber	Decommissioning	Decommissioning of the abandoned section of Feeder No 1 from Paull Multi-Junction to Skitter Multi-junction.	[redacted]	Asset Disconnected
River crossing from Paull to Goxhill Decom [redacted]	No.9 Feeder across Humber	Decommissioning	Decommission of the section of old feeder across the Humber, which is being replaced under a separate project. 5.43km of pipeline from Paull to Goxhill.	[redacted]	Asset will be disconnected on completion of Humber pipeline replacement project
Feeder Towton to Asselby Decom Project [redacted]	No7 Feeder Towton to Asselby	Decommissioning	Disconnect and decommission No.7 Feeder between Towton and Asselby, to mitigate for the potential Jackdaw quarry Encroachment. Works would be completed in four Phases: 1) Pipeline Isolation 2) Pipeline Decommissioning 3) Install Pig Trap Facilities 4) Demolition and pipe through of Cawood AGI and South Duffield BV	[redacted]	Feeder is currently part of our operational network. Disconnection is required

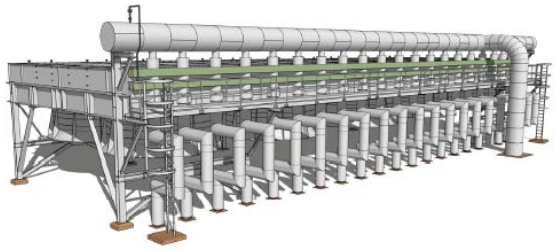
BPDT Category	Project Name	Table 13 Category	Scope of Works	RIIO-2 Cost 18/19 £m	Current State
Site Entry/Exit Decom [redacted]	Alderbury Redundant Site Civil Assets	Decommissioning	The Alderbury site was an NTS AGI site. NTS equipment has been removed, but a number of civil and security assets remain, including Perimeter fence, tarmac roadways and concrete bases. There is currently a Perimeter Fence and hardstanding tarmac and concrete bases. Proposal to decommission the site back to greenfield.	[redacted]	Assets are civil assets and therefore have no operational purpose.
Site Entry/Exit Decom [redacted]	Teesside Terminal Redundant Assets	Decommissioning	There are a number of Redundant assets on site: Including: A Redundant Odourant System Redundant Feed Analyser Kiosk Redundant Telemetry Systems	[redacted]	Local Isolations required
Site Decom Moffat Compressor Station [redacted]	Moffat Compressor Station	Decommissioning	The business has made a business decision that Moffat Compressor station is redundant to operational requirements. Proposal to decommission the site back to greenfield status, modify inlet pipework to retain supplies to Moffat AGI for Moffat Interconnection and GDN offtake.	[redacted]	Site connected at NTS pressure to our network. Compressor station disconnection required, retaining customer AGI connection

Appendix 2 Equipment Summaries

Equipment summaries are included for a number of the types of redundant assets identified on our network, included within the investment included in this paper. Given the extent of the varying types of assets equipment summaries have not been completed for all assets.

These summarise the description of the assets, linking these back to specific items on the redundant assets list, and identify the failure modes for these assets and the specific consequence of failure relating to these assets as redundant, rather than operational.

Equipment Summary: Aftercooler



Description

The compression process causes the temperature of the natural gas to increase, for which aftercoolers are constructed to reduce the has back to a level which poses no integrity risk to down-stream infrastructure.
An Aftercooler was constructed at Wormington to manage the temperatures of the gas being compressed at Peterstow, a compressor site that used to be operational upstream of the site. In 2012 we undertook decommissioning of the Peterstow compressor units. This negates the requirement for the function of the Aftercooler asset at the Wormington site.
It has been placed in bypass mode pending full decommissioning. Intervention is required to address the redundant aftercooler, aftercooler bypass valve and control system which operates the valve.

Failure Mode	Corrosion and wear to the supporting structure due to obsolescence related deterioration. Degradation of the paint on the above ground pipework from environmental weathering leading to corrosion Corrosion of the fans, supporting gantries, and pipework due to obsolescence related deterioration.

Consequence

The consequences of redundant infrastructure are more targeted at managing Health and Safety, Environmental and Financial risks, rather than an impact on the operation of the National Transmission System for National Grid and its customers.

Safety related issues as a result of the failure modes and the increased risk to our personnel operating on the manned site with this equipment on it.

There are also health and safety risks from the failure modes for our operatives working on sites with these redundant aftercoolers, risks such as loosening components such as cladding, present the potential for harm.
There is the potential for environmental conditions to damage these obsolete assets that then may manifest further Health and Safety and Environmental hazards.

Equipment Summary: Compressor Cabs

Description

Gas compressor machinery is housed within a building, generally referred to as a cab or enclosure. Cab designs vary by age and compressor technology.
Within this redundant asset topic a number of compressor cabs have been identified as redundant, along with the compressor turbine, Power Turbine, exhaust, fire and gas detection systems and control system equipment. These units have been identified as redundant to network requirements and therefore have been disconnected.
These are:

- Churchover A
- Churchover B
- Kirriemuir D

The challenge we now face is how to best manage these redundant compressor cab facilities.

Failure Mode

Age related (obsolescence) failures to roofs and the building fabric, such as corrosion, cracked brickwork from settlement, flaking paint or protection surfaces, loose cladding
Environmental condition related failure, such as damage to roofs and the building fabric from strong wind.

Consequence

The monetised risk associated with service risk measure for cab enclosures is negligible, however the consequences of redundant infrastructure is more targeted at Health and Safety, Environmental and Financial risks, rather than an impact on the operation of the National Transmission System for National Grid and its customers. Safety related issues as a result of the failure modes could manifest as an increased risk to our personnel operating on the manned site with this equipment on it. We do not accept this risk.

There is the potential for environmental conditions to damage these obsolete assets that then may manifest further Health and Safety and Environmental hazards, such as the risk of structural integrity issues and fire. Building materials such as Asbestos and Galbestos are used in our cabs and within the cladding of these cabs, and hence are an environmental and health and safety risk.

There is the potential for non-compliance with pertinent legislation, such as HSE Guidance PM84 (Control of Safety Risks at Gas Turbines Used for Power Generation) for our redundant compressors cabs.

Equipment Summary: Control Buildings

Description

Control buildings protect vulnerable plant and equipment from damage and weathering and create a safe and suitable workspace for maintenance, storage and repair operations, staff offices, control systems and related facilities.
Historic building materials such as asbestos is prevalent in a number of our control buildings which presents a risk to our staff and the environment, requiring periodic monitoring and management.

At two of our sites, Bathgate and Peterborough, control buildings have become redundant due to the construction of new facilities or buildings vacated due to business decisions.
Power, water and telecoms have been disconnected from the Bathgate control building and temporary fencing installed to demarcate the building from the remainder of the site and mitigate the health and safety risk as much as possible.

Failure Mode	Obsolescence related failures to the roof and building fabric, such as corrosion, cracked brickwork from settlement, flaking paint or protection surfaces, loose cladding Severe corrosion resulting in loosening cladding, resulting in water ingress into the buildings. Wooden elements of the building such as door frames or windows rot over time Environmental condition related failure, such as damage to roofs and the building fabric from strong wind.

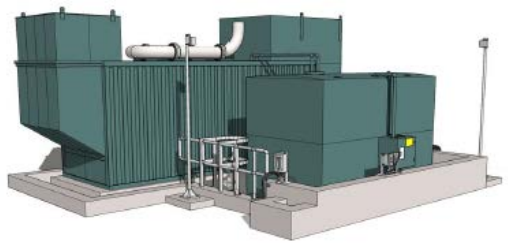
Consequence

The consequences of redundant infrastructure are more targeted at managing Health and Safety, Environmental and Financial risks, rather than an impact on the operation of the National Transmission System for National Grid and its customers.
There are environmental risks from any buildings containing Asbestos Containing materials. A number of our control buildings were built in the 1970s where asbestos was widely used as a building material. Although we have managed this Asbestos through the life of the building, some facilities still have asbestos containing materials in the structure which present environmental and health and safety risks to our operatives.

There are also health and safety risks from the failure modes for our operatives working on sites with these redundant control buildings, risks such as loosening cladding or damaged roofs with potential for wind-blown sheets damaging other plant and operatives. Also over time, there is the risk of the establishment of habitats by bats, which can significantly complicate decommissioning. There is also the risk of fire in these facilities, from the numerous sources of ignition and combustible materials.
There is also the risk of trespassers occupation of these buildings which increases the risk of harm.

The financial risk is that we are required to undertake a repair intervention to rectify health and safety risks on these redundant assets, even though they provide no operational benefit. Inspection and management are difficult and hazardous due to material deterioration, underfloor voids, un managed asbestos containing materials and potentially loose ceilings, all with no fixed lighting.

Equipment Summary: Standby Generators & Storage Tanks



Description

Standby generators are located at terminal, compressor stations and a few of the larger AGIs to provide essential electrical power in the event that the mains power supply fails, or it is not available for any reason. Most of the standby generators are powered by diel, with fuel storage tanks located separated from the units.
At a number of our compressor sites where we have replaced compressors and constructed new control buildings, new standby generators have been included as part of the scope of works. The existing standby generators are therefore redundant to the requirements for the site.
Storage tanks are used to house the fuel for the diesel standby generators.

Failure Mode

Standby generators themselves have long lives, however the associated assets are prone to obsolescence related failures, including loss of integrity and corrosion related failures.
Electrical components are sensitive to moisture, dirt and temperature.
Associated pipework, joints and valves between the storage tank and generators can fail from corrosion.

Consequence

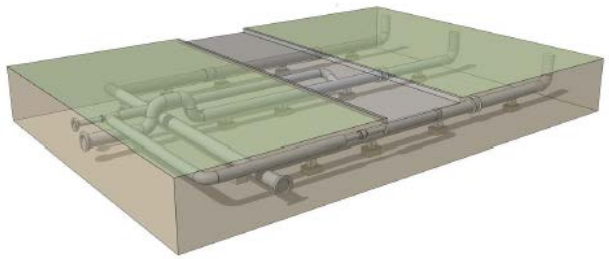
The consequences of redundant infrastructure are more targeted at managing Health and Safety, Environmental and Financial risks, in addition to our position of societal fairness across all redundant assets, rather than an impact on the operation of the National Transmission System for National Grid and its customers. This is applicable to redundant Standby Generators and Storage Tanks.

Environmental Risk - There is an environmental risk from a loss of integrity due to corrosion of a storage tank, even when the diesel has been drained, including the potential for ground and surface water contamination from diesel and metals.

Health & Safety Risk – The redundant standby generators are located adjacent to control buildings, and therefore there is a risk that obsolesce related failures impacts on the control building structures causing further failures.

Financial Risk - The financial risk is that we may be required to undertake a repair intervention to rectify health and safety risks on these redundant assets, even though they provide no operational benefit.

Equipment Summary: Pipework (Below Ground)



Description

Below ground pipework contains and conveys gas between Above Ground Installations (AGIs), Entry points and Exit points. There is approximately 7,660km of pipework on the National Transmission System (NTS).
There are a number of sections of this Feeder pipework that we believe to be redundant to operational requirements. These may be driven by a number of factors including:
Direct Customer Decisions – Feeder 6 Billingham ICI to Enron (Billingham) is a dead leg to Enron (Billingham). The customer has requested a disconnection and therefore we have a redundant dead leg to this site.
Actions of our neighbours – E.g. Jackdaw Quarry expansion encroaching on our Feeder 7 pipeline
Other investments – Feeder 7 pipeline from Susworth Trent East to the old Scunthorpe site, has the potential to be rationalised.

Failure Mode	Corrosion related failures – Corrosion is unavoidable in steel pipelines, however can be manager, such as with Cathodic protection. Damage from third party interference resulting in pipeline rupture.

Consequence

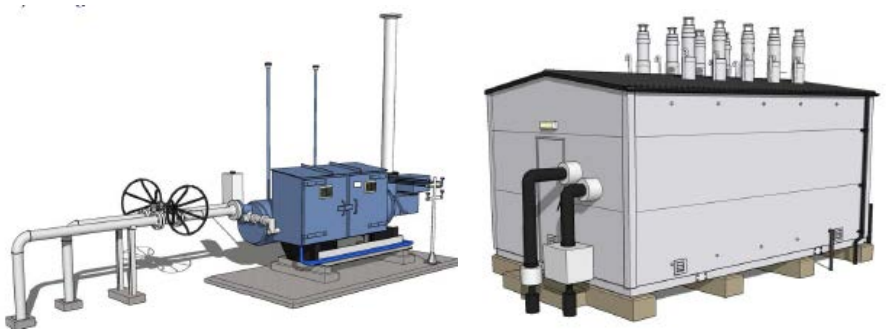
The consequences of redundant infrastructure are more targeted at managing Health and Safety, Environmental and Financial risks rather than an impact on the operation of the National Transmission System for National Grid and its customers.

For redundant pipelines the impact on the consequence of failure presents a number of risks that need management:
Restricts potential future reuse – A failed section of feeder from corrosion, would require a significant intervention to enable the future reuse of this feeder for alternative uses, such as CCUS or Hydrogen.

Environmental Risks – Environmental contamination from the degradation of pipeline assets could result in corrosion related pollution, with the potential to result in enforcement actions from Health & Safety and Environmental regulators (HSE, EA, SEPA, NRW)

Financial risks – The financial risk is that we may be required to undertake a repair intervention to rectify health and safety risks on these redundant assets, even though they provide no operational benefit.

Equipment Summary: Pre-heating systems



Description

Pre-heating systems prevents gas quality issues when depressurisation causes gas to cool (a process known as the Joule-Thompson effect).
Large scale systems are installed at specific industrial offtake sites to maintain gas quality and to meet customer contractual obligations.
The energy for gas pre-heating typically comers from gas fired boilers or water bath heaters.
A number of redundant pre-heating systems have been identified:

- Horndon Barking – Water bath heater for the old ex-Canvey island connection.
- Thornton Curtis C Water Bath Heaters A & B are redundant to requirements
- Didcot A Pressure reduction installation, including boilers and boiler houses.

Failure Mode	Material degradation in the coating, Corrosion of the metal of the asset both internally and externally resulting in loss of wall thickness

Consequence

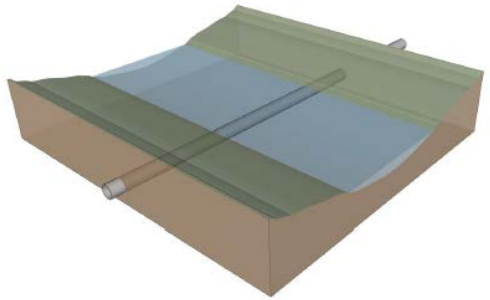
The consequences of redundant infrastructure are more targeted at managing Health and Safety, Environmental and Financial risks rather than an impact on the operation of the National Transmission System for National Grid and its customers.

The consequence of the failure mode is mainly the potential for environmental harm, as a result of the corrosion failure mode. The water held within the system could leak out of the system following material degradation resulting in ground and surface water pollution.

Where there are gas fired heating systems the gas ignition source could result in a gas escape following a corrosion related event on the gas coil line. This gives the small potential to the risk of fire at the sites. This is partially mitigated by the presence of safety systems within the assets.

The financial risk is that we may be required to undertake a repair intervention to rectify health and safety risks on these redundant assets identified by National Grid, or through enforcement actions from Health & Safety and Environmental regulators (HSE, EA, SEPA, NRW), even though they provide no operational benefit.

Equipment Summary: Water Course Crossings



Description

When the first high pressure feeders were constructed the early design strategy for major watercourse crossings was to install a duplicate crossing with full valve bridle arrangements at each end. The theory at the time was that if the main pipeline was damaged in some way, it could be isolated and flows directed around the duplicate section.
In practice the duplicate crossings have rarely been used and can only be inspected by our OLI/4 inspection methodology.
There is a risk therefore that corrosion features exist on duplicate sections, which have not been accurately categorised and could lead to further pipeline defects. We are unable to excavate on any potential defects, because the pipelines are beneath the riverbed.

Failure Mode	**Third Party Damage** – from erosion of the cover above the pipeline there is an increased risk of third party damage, **Lack of Structural integrity** - Erosion of the ground below the pipeline could lead to a loss of structural support. **Corrosion** - Integrity loss due to corrosion features

Consequence

The consequences of redundant infrastructure are more targeted at managing Health and Safety, Environmental and Financial risks rather than an impact on the operation of the National Transmission System for National Grid and its customers.

Environmental Risks – Watercourse presents a higher environmental risk. Environmental contamination from the degradation of pipeline assets resulting in corrosion related pollution.

Enforcement Action – The consequence of failure could result in fine from the relevant Health and Safety and Environmental Regulators (Environmental Agency, Scottish Environmental Protection Agency & Natural Resources Wales). There could also be mandatory actions that are placed upon us by these regulatory bodies.

Financial risks – Any health and safety concern would necessitate an intervention. The financial risk is that we may be required to undertake a repair intervention to rectify health and safety risks on these redundant assets, even though they provide no operational benefit. There is the potential that this could have been mitigated through an appropriate decommissioning intervention.

Appendix 3 Background

Our network is getting older and we are faced with a challenge about how we best manage our redundant assets in a way that is in line with our environmental and sustainability goals. Assets may become redundant for a number of reasons. The needs of stakeholders or individual customers might change, legislation changes may mean that assets cannot be used, or investment in new assets may mean that life expired assets are no longer required. Given the nature of our ageing network we are anticipating more work in this area, and this is exacerbated by the changing uses of the network.

In recent years, environmental policy initiatives have addressed climate change, loss of biodiversity, unsustainable use of natural resources, and environmental pressures on health. There has also been an increased appreciation that these are not separate issues but are interlinked.

The UK government's 25 Year Environmental Plan[2], published in January 2018, sets out a comprehensive long term approach to protecting and enhancing the environment. The vision at the heart of the plan is that the current generation will be the first to leave the environment in a better state than we found it. As an asset based business, the impact of our assets on the environment is incredibly important. This impact can be minimised through responsible procurement and construction processes, reusing and recycling assets and materials where possible and being responsible custodians of the environment at sites impacted by our assets.

The Department for Business, Energy and Industrial Strategy (BEIS) Clean Growth Strategy[3] explains the governments ambition to leave our natural environment in a better condition than we found it, and how the whole country can benefit from low carbon opportunities. It includes a hydrogen pathway, using Natural Gas and Carbon Capture Utilisation and Storage (CCUS) and an emissions removal pathway including CCUS, both of which impact our treatment of redundant assets, specifically assessing the potential re-use of redundant parts of the National Transmission System (NTS).

We believe it is important to address redundant assets in RIIO-2. We do not feel that leaving this issue to the future to address is in line with either the direction of travel from government policy or stakeholder feedback. Although the act of decommissioning is not currently heavily regulated, the impact of delaying this work could result in increased costs through more stringent specifications for the management of waste from decommissioned assets, and for the remediation of land or higher costs of disposal. Any increased costs would be passed on to future consumers who have not had the benefit of using those assets, and if delayed for many years could fall on a smaller number of customers who haven't benefited from the assets.

As a responsible asset owner, we also have a duty to mitigate the risks from redundant assets that are no longer required for operational use now and into the foreseeable future. The paper includes investments to address our redundant asset base

This approach is driven by our social, health and safety, environmental responsibilities, including for our own sites and the neighbouring communities.

The strategy that we have adopted is to make the investment decision based on a quantification of risk, considering societal fairness and the impacts on the local community. Due to the early stage of the development of the projects this has all been undertaken through desktop assessments.

[2] https://www.gov.uk/government/publications/25-year-environment-plan
[3] https://www.gov.uk/government/publications/clean-growth-strategy

It is recognised that doing nothing is a valid intervention approach, however following this approach does not adhere to broadly what our stakeholders have told us, does not feel aligned to the direction of travel in respect to the Government's position on the environment and does not provide the best value to current and future consumers.

Appendix 4 Legislation Review

As part of the development of our RIIO-2 redundant assets intervention programme we conducted a full literature review including Acts of Legislation and Industry Standards in relation to specific requirements placed upon us for our intervention on these assets.
Acts of legislation that have been reviewed include, but are not limited to:

- Pipeline Safety Regulations 1996
- Pipe-lines Act 1962
- Planning Act 2008
- The Control of Major Accident Hazards (COMAH) Regulations 2015
- The Construction (Design and Management) Regulations 2015
- The Waste Framework Directive 2008/98/EC

A summary of a number of pertinent extracts from these acts of legislation are shown below:

Name of Legislation	Summary of requirements
Pipeline Safety Regulations 1996	Regulation 14 specifies that "*The Operator shall ensure that a pipeline which has ceased to be used for the conveyance of any fluid is left in a safe condition"*: *Pipelines should be decommissioned in a manner so as not to become a source of danger. Once a pipeline has come to the end of its useful life, it should be either dismantled and removed or left in a safe condition. Consideration should be given to the physical separation and isolation of the pipeline*
Pipe-lines Act 1962	For pipelines Regulation 25 covers the abandonment of a pipeline section *In either of the following events, namely:* *(a) The abandonment of a pipe-line or a length thereof* *(b) The expiration of three years from the date on which a pipeline or a length therefore was last used* *The minister, if he is of opinion that the line or length is, or is likely to become, a source of danger, may serve on the owner of the line a notice requiring him to do the line or length such things as may be specified in the notice, being things the doing of which appears to the minister requisite to stop the lines or lengths being or, as the case may be, to prevent its becoming a source of danger.*
Planning Act 2008	Since the enactment of the Planning Act 2008 pipelines that are more than ten miles (16.093km) in length are considered to be nationally significant infrastructure projects and therefore the application for consent under the pipelines Act 1962 must be made to the National Infrastructure Directorate (NID) of the Planning Inspectorate under the Planning Act 2008. Pipelines that are ten miles (16.093km) or less are considered to be local pipelines, requiring planning consent from the local authority.
The Control of Major Accident Hazards (COMAH) Regulations 2015	Responsibility for enforcing health and safety law for onshore and offshore Major Accident Hazard (MAH) pipelines lies with the Specialised Industries Gas and Pipelines Unit in HSE's Hazardous Industries Directorate. The Pipelines Safety Regulations 1996 set out requirements relating to safety in the design, construction, installation, operation, maintenance and decommissioning of pipelines. The COMAH regulations specify: "*The operator of any establishment to which these Regulations apply must notify the competent authority in advance of the permanent closure of the establishment or its decommissioning*"
The Construction (Design and Management) Regulations 2015	Defines that "Demolition or dismantling of a structure must be planned and carried out in such a manner to prevent danger or reduce it to as low a level as is practicable." Structure meaning "any building, timber, masonry, metal or reinforced concrete structure, railway line or siding, tramway line, dock, harbour, inland navigation, tunnel, shaft, bridge, viaduct, waterworks, reservoir, pipe or pipeline, cable, aqueduct, sewer, sewage works, gasholder, road, airfield, sea defence works, river works, drainage works, earthworks, lagoon, dam, wall, caisson, mast, tower, pylon, underground tank, earth retaining structure or structure designed to preserve or alter any natural feature and fixed plant;"

The Waste Framework Directive 2008/98/EC	The Environment Agencies view is that decommissioned pipes left in situ fall under exclusions within the Waste Framework Directive and are therefore not classified as waste. The Waste Framework Directive then applies to all other assets, but only at the point the waste is produced, which is after the point of decommissioning has taken place.

We also reviewed a number of pertinent industry standards and guidance documents on both high pressure gas transmission assets, ageing assets and decommissioning and demolition. A list of these standards is shown below:

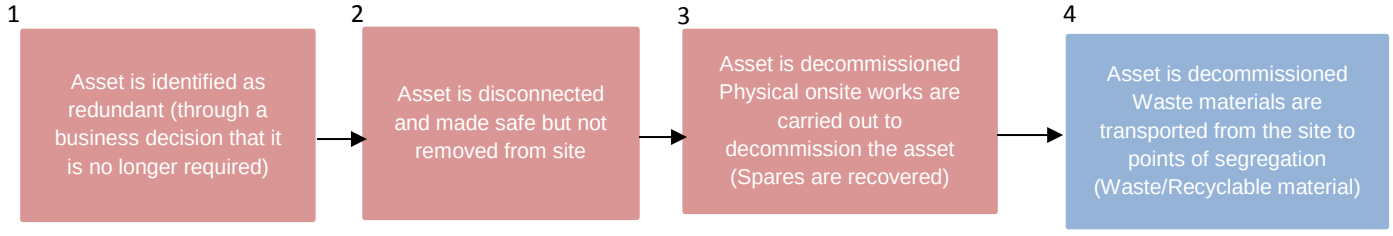
- IGEM TD/1 Steel Pipelines and associated Installations for high pressure gas transmission
- BS 6187 Code of Practise for demolition
- HSE RR509 & RR823 Managing Ageing Plant
- Institute of Civil Engineers Demolition Protocol 2008

Our legal department was consulted in developing our view for the application of legislation to this investment topic. Having reviewed all of the applicable legislation, inclusive of that listed above, our view is that legislation does not place an obligation to undertake a specify type of intervention on our redundant assets, as long as there are no issues with contamination or pollution.

Some acts of legislation do provide some guidance on decommissioning, such as the Pipelines Safety Regulations 1996[4]. However is not prescriptive on specific actions that need to be undertaken, and up to the asset owner to make the intervention decision to comply with the legislation:
"Pipelines should be decommissioned in a manner so as not to become a source of danger. Once a pipeline has come to the end of its useful life, it should be either dismantled and removed or left in a safe condition."

Waste legislation (European Waste Framework Directive (WFD) 2008/98/EC)[5] is also a key piece of legislation affecting National Grid. Our view is that this legislation is not applicable until after the act of decommissioning has been undertaken, at which point waste is produced and the Waste Framework Directive is applied.

The flow chart, below, explains the process of identifying redundant assets, undertaking the decommissioning and removing the waste from decommissioning. Waste is only produced at step 4, and this is the point that waste legislation is applicable.



Additionally on 1st February 2019 the Environment Agencies Regulatory Position Statement (RPS8) on leaving decommissioned pipes in the ground[6] was withdrawn from publication. The implications of this withdrawal are that you no longer need an environmental permit for

[4] http://www.legislation.gov.uk/uksi/1996/825/contents/made
[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098
[6] https://www.gov.uk/government/publications/leaving-decommissioned-pipes-in-excavations-rps-8

decommissioned pipelines which remain undisturbed in the ground, as land (in situ) including unexcavated contaminated soil and buildings permanently connected with the land.

To summarise, having reviewed the pertinent legislation on this topic our understanding is that, provided that there are no issues of contamination or pollution, there are no obligations mandating us to decommission our redundant assets.

Appendix 5 Probability of Failure Data Assurance

We have examined numerous existing risk assessment methodologies, such as the Process Safety Risk Assessment, As Low as Reasonably Practicable assessments and the NARMS & Service Risk Framework. Upon review we found that none of these could help us determine a suitable risk value for these types of assets and sites based on the factors that are applicable to redundant assets.
Therefore we have adapted our existing methodologies to assist with this prioritisation.

In determining our prioritisation of redundant assets we have utilised measures within our Network Asset Resilience Metric (NARM) Service Risk Framework. This has enabled us to develop our determination of a risk value for each of the redundant assets and sites where our NARMs methodology cannot assist us with determining a risk value for the site or assets.

The NARMs framework allows us to assign a common value across all the risk areas on the network creating monetised risk.
The purpose of the Service Risk Framework within this metric is to provide a consistent method of assessing the articulating the consequence of an asset failure.

The table below provides a summary of the categories of the Service Risk Framework and associated measures in these categories.

Table 14 NARMS Service Risk Framework measures

Category	Service Risk Measure
Safety	Health and Safety of the General Public and Employees
	Compliances with Health and Safety Legislation
Environmental	Environmental Incidents
	Compliance with Environmental Legislation and permits
Availability and Reliability	Impact on Network Constraints
	Compensation for Failure to Supply
Financial	Shrinkage
	Impact on Operating Costs
Societal and Company	Property Damage
	Transport Disruption
	Reputation

As can be seen a number of these Service Risk Framework measures are only applicable to our operational assets rather than our redundant assets. Measures such as “Impact on Network Constraints”, “Compensation for failure to supply”, “Shrinkage” etc. cannot be applied to redundant assets. Therefore it has not been suitable to apply all measures within the Service Risk Framework

However in developing our determination of the risk score for our redundant assets we have utilised the data behind a subset of these measures that are applicable, such as Health & Safety of Employees) to feed this data in our determination of risk for these assets.

This ensures the data used to help inform our score is consistent with our Network Asset Resilience Metrics framework.

Additional specific information about our asset base, contained within our Asset register was utilised to develop our risk value, such as the probability of asset failure data being used as a condition based metrics. It was recognised that our varying asset categories of Mechanical, Civil, Rotating, Electrical and Safety and Control assets can have quite varying failure rates and failure modes and therefore boundaries were set for each of these types of assets to ensure consistent scoring.

In addition to the metrics within the Service Risk Framework and asset data, we have considered other environmental and societal metrics, such as the proximity to centres of population, the potential to reuse sites or parts of sites for other uses in our prioritisation. These elements have been quantified through a desktop assessment of each of the items in our decommissioning register, based on the explanation provided in Table 7.

Glossary

Term, Abbreviation and acronyms	Explanation
Decommissioning	A state where the isolated plant has been disconnected, purged of all process fluids (Methane, odorant, condensate etc.) and is not pressurised. Useful spares are also removed where it is determined that this is beneficial, or parts are removed and sold to third parties. Following these steps all assets are removed from site and the site returned back to ground level. This includes below ground assets if decommissioning a full site
Disconnected	A state where there is a physical air gap separation between energy sources and assets. This includes the disconnection from gas at all pressure tiers and disconnection of all electrical and control equipment.
FEED	Front End Engineering Design
Isolated	A state where the plant is separated from every source of energy in such way that the separation is secure. This would normally entail, as a minimum, the closing of necessary valves to satisfy HSE guidance HSG253 isolation recommendations.
NExA	Network Exit Agreement
NTS	National Transmission System
Naturally Occurring Radioactive Material (NORM)	Radioactive materials which occur naturally and where human activities increase the exposure of people to radiation. NORM is produced as a by-product of gas production and therefore quantities of NORM dust can occur in our network
Redundant	Any equipment or fixed assets which are no longer required (now or in the immediate future) for us to operate the NTS