

Chapter five



Current Projects



Future Projects

Establish Portfolio

Risks of 'Do Nothing' option. Consider 'rules', 'tools' and 'assets'.



Asset Development

This chapter considers the most efficient way of delivering current and future network needs where asset investment has been evaluated as the preferred option. It sets out sanctioned National Transmission System (NTS) reinforcement projects, projects under construction in 2015/16, and potential investment options for later years as a result of the Industrial Emissions Directive (IED) and our asset health review. These are assessed against the scenarios and sensitivities in our Future Energy Scenarios (FES) publication. This chapter also explores the Establish Portfolio stage of our Network Development Process (NDP).

Key messages

- Increasing uncertainty around supply and demand scenarios makes planning future capability on the Gas National Transmission System (NTS) more challenging
- All of our gas-driven compressors that produce emissions above the Industrial Emissions Directive (IED) threshold must comply with new limits by 31 December 2023
- The decline of flows from St Fergus means we must be able to move more gas south-to-north. We currently have limited capability to do this but we do have time to assess potential solutions against the network changes resulting from the Industrial Emissions Directive. Flows are monitored and we expect to meet the necessary timescales to deliver any investments
- Delivering Asset Health works is a key Ofgem RIIO measure, in terms of allowances and output. Over the next three years we will make effective asset management decisions so we can deliver the right levels of network performance for our customers and stakeholders.

Introduction

5.1 Introduction

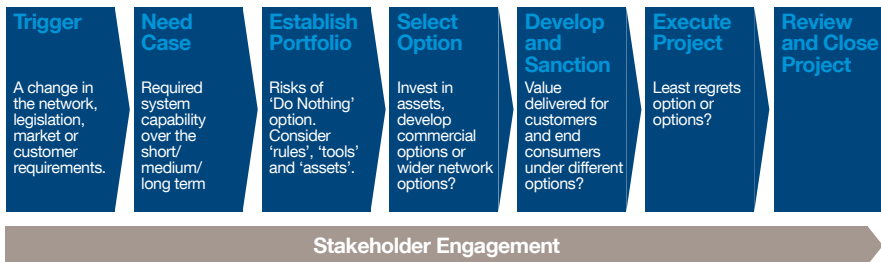
Chapter 1 introduced our Network Development Process (NDP), in this section we expand on the asset solution element of the ‘Establish Portfolio’ stage. This stage is only reached if a solution to a trigger cannot be found within the existing capabilities of the system.

The aim of this stage is to establish a portfolio of, in this case, physical investment options that address the Need Case. A range of options are investigated during the network analysis phase, including a ‘Do Nothing’ option. This

allows for the comparison of options both in terms of effectiveness at meeting the Need Case requirements and overall cost. The implications of each option we have considered are summarised and discussed at stakeholder engagement workshops. The options are then narrowed down to identify a preferred option which not only addresses the Need Case but delivers the most cost effective solution.

Figure 5.1 shows the stages of the NDP between Need Case and project closure.

Figure 5.1
The Network Development Process





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5.2

Industrial Emissions Directive (IED)

As we outlined in Chapter 3, IED has a significant impact on our current compressor fleet.

RIIO-T1 outlined our initial baseline allowance this included; £150m (2009/10 prices) for the Integrated Pollution Prevention and Control (IPPC) Directive-affected units at Peterborough and Huntingdon and Large Combustion Plant (LCP) Directive units at Aylesbury; £269m for the remaining IED LCP affected units. There was no defined solution for the LCP-affected units and so are subject to what is called a re-opener window in 2018. During the re-opener window the £269m allowance for the LCP affected units will be reviewed by Ofgem.

Through our NDP we analysed the LCP-affected units and developed an optimised set of investments. These investments were developed to make sure the NTS can continue to best meet our customer needs and future challenges in the most efficient way.

On 15 May 2015 we delivered our IED Investments: Ofgem Submission which was based on our network analysis and the stakeholder feedback we had received. In our submission we requested an additional £41m of funding in order to deliver our IED investment strategy.

The proposed set of investment options are shown in Table 5.1 below. We made use of the derogations available under the LCP at seven of our affected sites; this was supported by our stakeholders. Where derogating and decommissioning non-compliant compressor units were shown to compromise system capability, a replacement unit was proposed. We believe, and the stakeholder feedback supports, that these proposals represent the best way forward in balancing the various needs of our customers with the requirements of IED.

Table 5.1
Summary of compressor options in the IED Ofgem submission

Station	Recommended option	Recommended option – anticipated allowance (outturn prices)
St Fergus (LCP)	17,500 hour derogation on units 2A and 2D and then decommission by 31 December 2023	<£10m
Kirriemuir	Unit D – 17,500 hour derogation and then decommission Unit E – De-rate and re-wheel (electric unit) Unit C – Decommission and install one new unit (MCP unit)	£50–£100m
Moffat	500 hour derogation both units	£10–£20m
Carnforth	Unit A – 17,500 hour derogation and then decommission Unit B – 500 hour derogation Site reconfiguration	£10–£20m
Hatton	17,500 hour derogation on three affected units and then decommission by 31 December 2023. Install three medium sized units	£100m+
Warrington	500 hour derogation both units	£10–£20m
Wisbech	Unit A – 500 hour derogation Unit B – Maxi Avon conversion to Avon	<£10m
St Fergus (IPPC)	Two replacement units and decommission two units	£50–£100m
Peterborough (IPPC)	Two replacement units and decommission three units	£50–£100m
Huntingdon (IPPC)	Two replacement units and decommission three units	£50–£100m

Ofgem published their decision to reject our request for additional funding to finance our proposed investment solutions on 30 September 2015. You can read our response to their consultation here http://consense.opendebate.co.uk/files/nationalgrid/transmission/NGGT_IED_Response.pdf.

Ofgem's decision means that we retain £419m as defined in RIIO-T1 of which £269m will be open to review in the re-opener window in 2018. This may change when we make investment decisions and how we bundle projects in order to manage both the cost and the risk of review in 2018.

We will work with Ofgem on our investment programme and in GTYS 2016 we will be able to provide an update on our plan of work to ensure compliance with the IED requirements by 2023.

We will revisit the Medium Combustion Plant (MCP) Directive programme of works as part of the 2018 re-opener window. The following outputs are appropriate for ex-ante funding during the RIIO-T1 period:

LCP element

- Kirriemuir rewheel and derate Unit E
- Moffat retained operational capability under 500 hours (asset health expenditure Units A&B)
- Carnforth decommission Unit A, site reconfiguration, retained operational capability under 500 hours Unit B (asset health expenditure)
- Hatton three replacement units in construction
- Warrington retained operational capability under 500 hours (asset health expenditure Units A&B)
- Wisbech change out of maxi Avon (Unit A) for an Avon, retained operational capability under 500 hours Unit B (asset health expenditure).

IPPC4 element

- St Fergus two replacement units commissioned
- Peterborough two replacement units commissioned
- Huntingdon two replacement units commissioned.



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5.3

Integrated Pollution Prevention and Control (IPPC) Directive

5.3.1 IPPC Phase 1 and 2

Phases 1 and 2 of our IPPC Emissions Reduction Programme are now complete. The following sites were operationally accepted and commissioned in early 2015:

- St Fergus (two new electrically-driven compressor units)
- Kirriemuir (one new electrically-driven compressor unit)
- Hatton (one new electrically-driven compressor unit).

5.3.2 IPPC Phase 3

Phase 3 of the Emissions Reduction Programme includes investment at Huntingdon and Peterborough to comply with IPPC NO_x and CO emissions limits by 2021.

Extensive network analysis completed in 2014 confirmed that both sites are critical to current and future network operation. The analysis assessed network flows across a range of supply and demand conditions using our Future Energy Scenarios. This showed that future capability requirements are very similar to current capability provided at these sites. A range of options were assessed and the preferred option was to replace the existing units.

The operation of both sites is affected by supply flows (from the terminals to the North, Bacton terminal and Liquefied Natural Gas (LNG) imports from the Milford Haven and Isle of Grain terminals) and demand in the south of the system. The sites are needed to manage network flows in the south and east of the system particularly at the 1-in-20 peak day demand level described by our Design Standard¹ as defined in our transportation licence.

Peterborough and Huntingdon stations are critical to maintaining flows and pressures in the system. At high demand levels, for example during winter, they are required to operate together. At lower demands they can be used interchangeably, depending on network flows. This interchangeability can provide network resilience, for example allowing maintenance to be undertaken on one of the sites or maintaining minimum system pressures during unplanned outages.

Peterborough is also a key site for the north-south, east-west and west-east transfer of gas to manage flows from the north, from Milford Haven terminal and to/or from Bacton terminal.

The early stages of the Front End Engineering Design (FEED) study concluded that electrically driven compressors were not viable at Peterborough but remained a possibility at Huntingdon. However, following the tender process for Huntingdon the Best Available Technique (BAT) assessment concluded that electric drives do not represent the BAT. The BAT identified that 15.3MW gas turbine units at both sites were the most effective at reducing emissions and were cost effective.

The feasibility and conceptual design stages of the FEED study are complete. The main works contract tender process is also complete and the contract will be awarded by the end of 2015.

¹To plan the system to meet the 1-in-20 peak aggregate daily demand, including but not limited to, within-day gas flow variations on that day.



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5.3.3 IPPC Phase 4

Alrewas, Diss and Chelmsford compressor sites were originally provisionally identified for inclusion in the IPPC Phase 4 works based on prevailing and forecast future network flows at the time. As part of our Phase 4 site analysis we re-assessed compressor station running hours. All three of the provisionally identified stations were found to have declining running hours, with five-year historical averages of less than 500 hours, and similar future operating requirements. The focus of the Phase 4 works shifted to other units with significantly higher current and forecast future running hours, this flagged units at St Fergus, Huntingdon, Peterborough and Wormington.

At St Fergus two new electric drives have been commissioned as part of Phase 1 and 2. These are direct replacements for two non-compliant units at the site; however these new units are not expected to reduce the usage of the remaining non-compliant units at St Fergus. It is anticipated that the non-compliant units will continue to have a high level of running hours to maintain the entry capability at St Fergus; the installation of two additional units at St Fergus is therefore proposed.

At Huntingdon and Peterborough we considered the impact of the upcoming MCP (as described in Chapter 2, section 2.3) legislation when assessing these two sites. The BAT assessment identified that having three equally sized units at both sites was the ideal solution. One unit is being replaced at each site as part of Phase 3 and we plan to install two additional new units at both sites as part of Phase 4. This will ensure that these two critical compressor sites will be IED compliant. Installing two units at the same time provides the most efficient and cost effective option.

Commissioning Felindre compressor station in South Wales and our increasing confidence in the electric drive unit at Wormington are likely to reduce the operating hours of the two non-compliant units at Wormington. Over the last five years the running hours of the two units have been falling and there has been a growing reliance on the electric drive. While the two non-compliant units are required to provide resilience in the event that the electric drive is unavailable, for example due to maintenance, the currently forecast running hours would not support additional investment at this time. No further works are proposed at Wormington as part of Phase 4. Table 5.2 details Wormington running hours for each calendar year from 2010 to 2014.

Table 5.2
Wormington compressor run hours for the last five years

Year		2010	2011	2012	2013	2014	5yr Average
Site	Turbine Unit	Running Hours	Running Hours	Running Hours	Running Hours	Running Hours	Running Hours
Wormington	A	2561	2599	446	33	21	1132
	B	1185	2450	95	48	19	759
	C	1098	2021	961	926	615	1124
	Total	4844	7070	1502	1007	655	3015

5.4

Large Combustion Plant Directive (LCP)

The LCP has been superseded by IED. In this respect, the IED mirrors the requirements set out in the LCP. Of our 64 gas-driven compressor units, 16 are affected by the LCP. To decide what we should do we have looked at each affected site on a unit-by-unit basis. Work to comply with the LCP is currently underway at Aylesbury. Options for the other sites which have non-compliant units are included in our IED Investment: Ofgem Submission.

To comply with the LCP all installations with a thermal input over 50MW must have Emission Limit Values (ELVs) below the following:

- carbon monoxide (CO) – 100mg/Nm³
- nitrogen oxide (NO_x) – 75mg/Nm³ for existing installations
- nitrogen oxide (NO_x) – 50mg/Nm³ for new installations.

5.4.1 Aylesbury

We received an upfront allowance under RIIO-T1 to fund the LCP Phase 1 works on two units at Aylesbury. The existing gas compressor units at Aylesbury have a thermal input over 50MW and therefore are required to comply with the LCP directive. The existing units are compliant with the nitrogen oxide (NO_x) Emission Limit Values (ELVs) stated in the directive but are non-compliant with the carbon monoxide (CO) ELVs.

Aylesbury is a key site in a series of compressor stations between Hatton in Lincolnshire and Lockerley in the South West. These sites move flows around the system and are critical to support 1-in-20 peak day demand levels in the South West.

At lower demand levels than the 1-in-20 peak day demand, these compressors can be operated to manage linepack within the system, maintaining system resilience to plant failure, plant unavailability and within-day flow variation to the levels experienced on the network today.

Under lower demand conditions Aylesbury provides an important role as a gas-powered backup site to Lockerley compressor station (downstream of Aylesbury). Lockerley only has electrically driven compressor units installed as a consequence of strict local planning constraints.

Network analysis completed in 2014 determined that Aylesbury is required to meet 1-in-20 peak day demand levels in the south of the system. We also identified that the site may require enhancement to accommodate additional flows from the Bacton or Isle of Grain terminals or to support system pressures if new Combined Cycle Gas Turbines (CCGTs) connect in the South West.

The Aylesbury FEED study highlighted that the CO ELV can be achieved by the addition of a CO oxidation catalyst in the exhaust stack. We are working with Siemens to develop this innovative solution. A number of other asset-related works are scheduled for delivery at Aylesbury during 2015 as part of an overall upgrade package. The project is set for completion in December 2016, subject to outages.



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5.5

Medium Combustion Plant (MCP) Directive

As we indicated in Chapter 2, section 2.3, the MCP directive is currently in draft. Based on the draft legislation we have anticipated the likely impact on our compressor fleet, however, further analysis will need to be undertaken

to assess what options are available to comply with this new legislation. Stakeholder engagement activities, as used with the IED and IPPC programmes, will be undertaken to ensure the best possible solutions are found.

5.6

Asset health review

As indicated in Chapter 2, section 2.4, the National Transmission System (NTS) is ageing. This means that asset health is becoming a more prominent issue for us. Previously, the strategy we adopted for asset health investment, as supported by you, our stakeholders, was to focus on maintaining the condition of our primary and secondary assets (entry points, pipelines, multi-junctions, compressor stations and exit points) to avoid costly asset replacement. This strategy reduces the risk of long outages and network disruption minimising the likelihood of disturbance to you our customers.

Going forward, as part of the NDP, for every asset health issue we will now consider whether the asset is still required, or if there is a more suitable alternative option. This will consider all options including whether to maintain, replace or remove the asset. Reviewing each case like this will drive the most cost effective solutions at each site.



Future Projects

5.7

System Flexibility

As described in Chapter 3, we are using the GasFlexTool to improve our modelling to give us a better understanding of the levels of System Flexibility required to operate the NTS effectively. We are not currently

establishing a portfolio of options for investment to increase System Flexibility while the GasFlexTool development and stakeholder engagement is ongoing.

5.8

Meeting future flow patterns

The way gas enters and exits the NTS is changing. As we identified in our FES document, the degree of change is highlighted by our four scenarios, offering insight into gas usage behaviour both for the consumer and the supplier.

One clear change is the decline in flows from St Fergus. Historically the NTS was designed

and operated to move the majority of UK gas supply from St Fergus (north) to demand in England and Wales (south). As part of our ongoing strategy, flows are monitored and the flow decline has not been as severe as expected, which allows us to assess potential solutions against the network changes which the IED will bring.

