

Chapter four



System Operation



What are System Operator Capabilities?



Deciding between System Operator Capabilities and Assets?



Investing in our System Operator Capabilities



Deferred Asset Investments

Establish Portfolio

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



System Operation

This chapter describes how we are investing in our capabilities as System Operator to make the most of our network. These investments mean we can continue to plan to operate, and then operate, our network safely and efficiently.

The non-asset solutions, the ‘rules and tools’, we are developing are triggered as part of the Establish Portfolio stage of our Network Development Process; we discuss this progression in more detail.

Key messages

- As System Operator we must provide a safe and reliable network for you to use. We know you want to flow gas using within-day profiles that meet your operational, commercial and contractual drivers, and you want minimal restrictions
- Our challenge is to make the most efficient investment decisions to make the most of our existing network before we build new assets
- We are enhancing our capabilities as the System Operator by improving our processes and investing in our systems and tools
- We are deferring investment in assets by continuously improving our approach to optimise our existing network.



Introduction

4.1 Introduction

As System Operator (SO), our primary responsibility is to transport gas from supply points to offtakes providing a safe and reliable network for you to use. Where operational strategies cannot be used to maintain transportation of supply we need to make physical changes to our network. These physical changes are outlined in Chapter 5. Here we discuss how we operate our current network. The way we operate the National Transmission System (NTS) is affected by a number of obligations.

Safety and system resilience:

- We must plan and develop the NTS to meet Pipeline System Security Standards
- We must maintain NTS pressures within safe limits
- We must maintain the quality of gas transported through the NTS to meet the criteria defined within the Gas Safety (Management) Regulations (GS(M)R) to comply with UK gas appliances.
- We must maintain network capabilities to effectively manage or mitigate a gas supply emergency.

Environment:

- We must minimise our environmental impact.

Facilitating efficient market operation:

- We must meet the pressures contractually agreed with our customers
- We must provide you with information and data that you need to make effective and efficient decisions
- We must make NTS entry and exit capacity available in line with our licence obligations and contractual rights
- We must take commercial actions in the event that system capability is lower than contractual rights

- We must manage gas quality (calorific value) at a zonal level to ensure consumers are fairly billed for the gas they use
- We must optimise the use of NTS infrastructure.

You have told us that you value the ability to flow gas using within-day profiles to meet your operational, commercial and contractual needs, with minimal restrictions. You want us to maximise our performance in this area. To do this, we are focusing on:

- Operating the NTS effectively and efficiently to maximise its capability while meeting our statutory and commercial obligations
- Developing methods to quickly identify, manage and mitigate any network issues to minimise the impact on you
- Optimising, scheduling and managing access to the NTS for maintenance and construction activities to minimise the impact on you
- Providing you with flexibility to flow gas at the most efficient profile for you, even where this flexibility exceeds contractual rights. As you would expect, we must make sure that this operational flexibility does not create unacceptable system risks or have a detrimental impact on our other customers.

So our challenge is to maximise value from our existing network by investing in our capabilities as the SO.

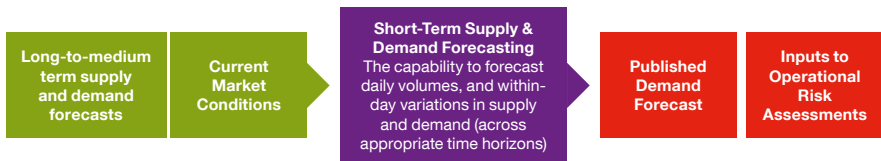
In this chapter we describe current and planned developments to our SO capabilities and explain how we make decisions between investing in our capabilities and installing new assets.

What are System Operator Capabilities?

4.2 What are System Operator Capabilities?

Our SO capabilities describe what we need to do to be able to produce outputs that, when combined, deliver the most value for you.

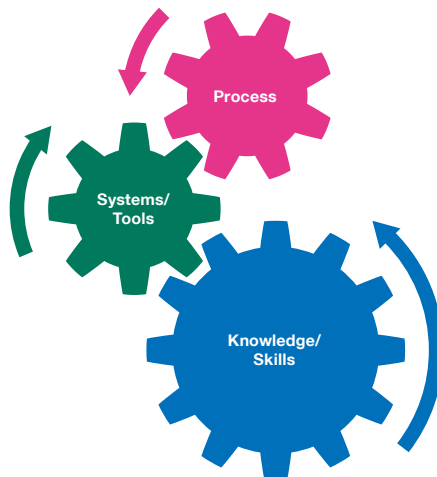
Figure 4.1
Examples of some of the inputs and outputs from our SO capability



To make sure our outputs are fit for purpose, each SO capability requires a combination of efficient business processes, effective

technology (systems/tools), skilled and knowledgeable people.

Figure 4.2
Key inputs required for our SO capabilities





Deciding between System Operator Capabilities and Assets?

4.3

Deciding between System Operator capabilities and assets?

We use our Network Development Process (NDP) to assess system capability requirements; this was introduced in Chapter 1. Here we discuss how we consider and improve the capability of the system and use the NDP to assess our capability as System Operator (SO).

Following on, Chapter 2 explored some of the triggers for this process and Chapter 3 described the Need Case stage of the NDP where we calculate the NTS's capability requirements.

Understanding our system capability and our capability as the SO allows us to determine where rules, tools or asset solutions need to be found to meet our customer requirements. This chapter will discuss where, as SO, we can better use rules and tools to make more efficient use of the system. Chapter 5 will follow on from this by discussing how the asset solutions are developed.

Under RII0, we are incentivised to think about Total Expenditure (TOTEX) as well as Capital Expenditure (CAPEX) and we need to demonstrate good value for money. We therefore focus on the need of the SO, both now and in the future, when considering the solutions to meeting our system capability requirements.

We do this through the use of our Whole Life Prioritisation scoring model as detailed in Appendix 7. This uses a qualitative approach comparing a range of solutions against key criteria including: flexibility, customer charges, future proofing, current capability and obligations, resilience, and barriers to new investment. We use this scoring method to rank the available options for the next

stages of our processes. These can be asset solutions or non-asset solutions or sometimes a combination of the two. At the Establish Portfolio stage no options are fully discounted nor final choices made. These are the least regrets options used to set the bounds for further investigation and options development. Should optioneering result in the breaking of these bounds the projects will return to earlier stages of the process for reassessment.

An asset solution may not always be the most efficient way to meet a system capability requirement and deliver financial benefits to the industry and consumers by reducing costs and minimising the risks of balancing the system. We therefore, in our role as SO, consider our non-asset solutions.

A non-asset solution, in simple terms, is where we 'sweat our assets' by assessing what the maximum capability is of our existing network. We also look at contractual solutions. We may be willing to accept commercial risk rather than invest in a more expensive asset solution; an example of where we have done this is at Avonmouth detailed in section 4.5. We actively work with our customers to ensure we understand their needs and that together we can make informed decisions that are right for end consumers. Later on in this chapter we will give some examples of work we are doing in this area.

We are constantly reviewing our current systems and processes in order to refine what we do and how we do it. This maximises the value we get from our existing network (through improved forecasting, analysis, risk assessment and decision making (across all time horizons)) before we invest in asset solutions.

Investing in our System Operator Capabilities

4.4 Investing in our System Operator capabilities

Our SO capabilities can be grouped into categories, these have been summarised in Figure 4.3 below.

Figure 4.3
Examples of our SO capabilities

Commercial Balancing, Settlement & Wholesale Operation				
Information Provision & Market Facilitation	NTS Shrinkage Management	NTS Capacity Management	Energy Balancing & Settlement	Energy Trading & Risk Management
Operational				
Supply & Demand Forecasting	Planning	Operational Strategy	Operational Control	Situational Awareness
Review	Emergency Planning & Management			
Support & Change				
Business Support	Systems Support	Customer & Stakeholder Management	Capability and Change Management	Leadership & Governance

In the following sections we focus on our operational capabilities. We use a combination of these capabilities to deliver our daily

operational strategies and plans which make sure we provide a safe and reliable network for you.

Figure 4.4
How our operational capabilities link together

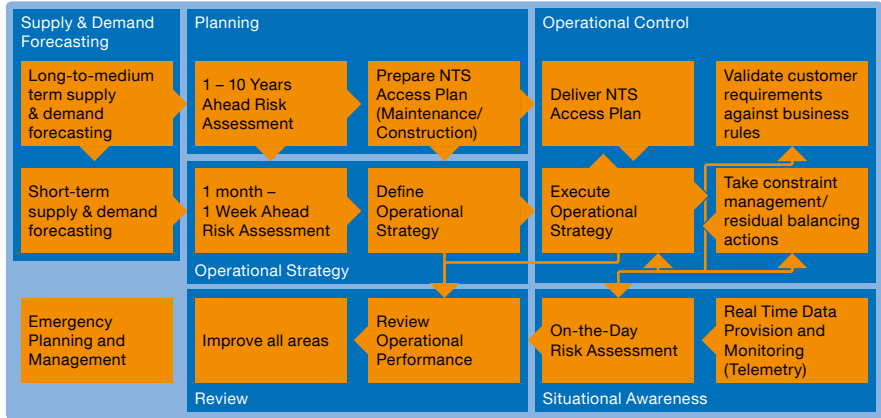


Figure 4.4 above shows how information flows between our operational capabilities; it does not represent our organisational structure. We are committed to developing our people to make sure they have the right knowledge, skills and experience to drive efficiency and maximise our process and system performance to deliver a reliable network for our customers.

The following tables provide more detail on each of our operational capabilities including how we are improving our processes, and what investments we are making to develop our systems and tools.

Investing in our System Operator Capabilities

4.4.1 Supply and demand forecasting

What is it?

- Effective and accurate forecasting is critical to our SO decision-making processes, particularly with increasingly uncertain future supply and demand patterns
- Our supply and demand forecasts are based on our Future Energy Scenarios as well as latest market information. Forecasts are produced annually, monthly, weekly and daily, depending on the time horizon being forecast
- The forecasts we produce are used by all of our operational capabilities.
- The forecasts feed into Planning (one to ten years ahead), Operational Strategy (one month to one week ahead), Operational Control and Operational Situational Awareness in real time.
- We share our forecasts with you through our information provision systems to facilitate an efficient market¹, by helping you manage your supply/demand balance position.

Drivers for change

- Diversity of supply imports
- Increased arbitrage through interconnectors
- Changes in UK installed gas generation capacity and gas/coal forward spread
- Price sensitive operation of fast cycle storage.

How are we improving?

Process

Long to medium term

- We continuously improve our long-to-medium term supply and demand forecasts by ensuring we have an effective feedback loop from the operational and short-term teams to the longer-term forecasting teams to capture and resolve any data gaps or inconsistencies quickly.

Short term

- We aim to maximise the efficiency of our current processes using our existing tools and systems. As we develop new forecasting tools, we revise and optimise our existing processes to make the most of the new technology.

¹ <http://marketinformation.natgrid.co.uk/gas/frmPrevalingView.aspx>

Systems/Tools

Long to medium term

- As we discussed in Chapter 3 we are working with Baringa Partners LLP to develop the GasFlexTool. This tool will allow us to produce a large number of supply and demand scenarios into the future, based on our Future Energy Scenarios (FES). The additional functionality of this tool provides significant benefits in ensuring that our network, and our capabilities as the System Operator, enable us to meet our customers' requirements. You can find further information on the GasFlexTool in Chapter 3.

Short term

- We have initiated a project to develop a new prototype for short-term supply and demand forecasting. The project will deliver enhanced modelling of market behaviours that currently limit our forecasting abilities (e.g. price sensitivities and interactions between gas and electricity markets). It will provide more detailed outputs to feed into our other operational capabilities (e.g. supply and demand ranges with confidence levels and improved within-day flow forecasts)
 - This will help us to plan to configure our network on a day-to-day basis to continue to meet your flow and pressure requirements in an evolving operational environment
 - This prototype will be funded via our Network Innovation Allowance
 - Once delivered, tested and proven capable, the prototype will be incorporated into our core control room and support systems.
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Investing in our System

Operator Capabilities

4.4.2 Planning

What is it?

- Planning considers a time horizon of approximately one to ten years ahead. Analytical risk assessments (incorporating commercial and physical factors) are used to identify and quantify possible future system constraints, which may affect our system capability
- We assess the capability of our system to operate safely while meeting our regulatory and contractual obligations, e.g. Assured Offtake Pressures (AOP), while delivering your anticipated flow profile requirements
- If the network has insufficient capability we are able to use our SO constraint management tools, such as capacity substitution, bilateral contracts, constrained Liquefied Natural Gas (LNG) and on-the-day flow swaps as part of long-term commercial and operational strategies to deliver a reliable service for you
- We consider whether variations to existing industry rules and our associated obligations would impact our network capability
- Other outputs from Planning include our NTS Access Plan where we agree mutually acceptable timescales with the TO for maintenance and construction activities. This enables us to notify you when critical maintenance activities affecting your assets will be carried out
- As described in Chapter 2, our focus on asset health means that we are likely to be undertaking a larger number of maintenance activities than we have in the past. Our aim is always to minimise the impact on you by effective works planning and clear communications
- In Planning we also identify a Need Case for Operating Margins (OM) gas. We can use OM when there is an operational balancing requirement which cannot be satisfied by taking other system balancing actions or as a result of damage or failure on any part of the NTS.

Drivers for change

- Increased number of possible future supply and demand forecasts
- Large day-to-day and within-day change in supply and demand
- Our large programme of asset health works out to 2021.

How are we improving?

Process

- We continue to develop improved relationships and ways of working with our TO colleagues to ensure that construction and maintenance activities can be delivered without affecting our ability to provide a safe and reliable network for you
- At the end of this chapter we describe in more detail how improvements to our processes for assessing the Need Case for Operating Margins (OM) gas has allowed us to defer asset investment as a result of the anticipated closure of Avonmouth LNG facility
- We are exploring changes to the way Assured Offtake Pressures (AOP) are agreed between ourselves and Distribution Network Operators (DNO). Changing this process may improve our current network capability, enabling us to defer asset investment.

Systems/Tools

- Given the increasingly uncertain environment, and the time horizons being considered in Planning, the number of possible supply and demand forecasts that we need to consider has increased in recent years. The ability to effectively analyse this wide range of scenarios in order to understand the impact on system operation and capability is becoming increasingly critical
 - We have developed our ability to complete Multi-Scenario (or 'Batch') Network Analysis. This allows us to better understand the operational impact of more supply and demand forecasts (using our existing network analysis software) than we have been able to in the past
 - We can use the Multi-Scenario Analysis approach to assess future Need Cases. When combined with the improvements in long-to-medium term supply and demand forecasting, this will enable us to develop more comprehensive, robust and probabilistic long-term commercial, investment and operational strategies, thereby minimising costs for the community
 - These improvements will also allow us to develop a more informed NTS Access Plan with reduced risk of maintenance activities on your assets being cancelled or deferred as a result of operational constraints
 - The next steps in the evolution of these network analysis enhancements will be to add functionality to automatically update our network model to remove / modify any assets which are planned to be out of service for the time period being considered / analysed. This is currently a lengthy manual process and reduces the time available for our experts to develop long-term commercial and operational strategies which deliver value for you.
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Investing in our System Operator Capabilities

4.4.3 Operational Strategy

What is it?

- In Operational Strategy we develop short-term plans to ensure that we can configure our network and associated assets in an optimum configuration to meet your flow and pressure requirements on each gas day
- These short-term plans are developed from approximately one month ahead, through to week-ahead and end with on-the-day control room support. Our plans are based on our long-term risk assessments and are continually refined and optimised using up-to-date market and customer intelligence plus the latest supply and demand forecasts
- Our short-term plans identify and mitigate risks to the safe and reliable operation of the system. We provide our control room with the latest, up-to-date commercial and physical information so that they can facilitate NTS access while maximising the capability of the network for you to use
- We identify opportunities to perform against our SO incentives, which have been structured and agreed with the regulator to deliver value for our customers and stakeholders.

Drivers for change

- Large day-to-day and within-day change in supply and demand
- Price sensitive operation
- Shorter customer notice periods, particularly in response to changes in the electricity market.

How are we improving?

Process

- We regularly review and develop our Operational Strategy processes to ensure efficiency and to confirm that we are continuing to deliver the needs of our control room, who, in turn, deliver for you.

Systems/Tools

- The Multi-Scenario (or 'Batch') Network Analysis enhancements described in our Planning capability are also being used to realise benefits in Operational Strategy. These analysis enhancements allow us to target our efforts into more detailed, in-depth analysis for areas at higher risk of impacting our ability to meet customer requirements or where there are system improvement opportunities for the SO
- We plan to add future functionality to automatically undertake 'What If' analysis. This will help us to quickly understand the impact of unforeseen events such as large supply losses or asset outages and what impact this has on our ability to deliver the profiles and pressures that you want
- These enhancements, when combined with the improvements in short-term supply and demand forecasting described earlier, and improved visualisation of analysis results, will allow us to provide more informed and optimised plans to the control room to mitigate the risk of your operation being affected.

4.4.4 Operational Situational Awareness

What is it?

- Operational Situational Awareness is the first of our operational capabilities that relates to the real-time operation of the NTS
- During day-to-day operation, our control room must be aware of the level of operational risk and how this affects our ability to meet our daily customer requirements. Real-time information allows us to make informed decisions to ensure that we efficiently operate the system so that you can flow gas safely
- We continuously monitor and assess both the current and predicted status of assets, flows, pressures, linepack, gas quality parameters and national energy balance
- Operational Situational Awareness and Operational Control could be considered as a single capability. In Operational Situational Awareness we receive, process, and interpret real-time data to determine current and future operational risks. In Operational Control we resolve any system issues to maintain safe and efficient operation.

Drivers for change

- Within-day change in supply and demand
- Price sensitive operation
- Increasing range of quality of gas (within GS(M)R limits).

How are we improving?

Process

- In line with the replacement of our existing operational systems, new fit for purpose processes will be developed and implemented where appropriate.

Systems/Tools

- We are replacing our current core control room and support systems. This programme of work is being developed and implemented in phases. The new systems and infrastructure will be scalable, simpler to maintain and configured to facilitate future change more easily
- We continue to develop the use of the 'Online' version of our network analysis software in our control room. SIMONE (Online) is connected to our Supervisory Control and Data Acquisition SCADA systems and receives your flow notifications as well as our telemetered data. SIMONE allows us to undertake current state and predicted future operational risk assessments. We are developing enhancements that will maximise the benefits of real-time simulation to provide continuous advice to our control room. This will allow us to anticipate constraints on the network ahead of time, enabling us to put mitigating actions in place (in Operational Control) to minimise the risk of your operation being affected
- Our Enhanced Gas Measurement Programme is replacing ageing gas quality monitoring equipment with the latest technology. This means the gas used in your home appliances is compliant with specifications defined by the Health and Safety Executive.

Investing in our System Operator Capabilities

4.4.5 Operational Control

What is it?

- Operational Control use inputs from all of our other operational capabilities to ensure that our control room can make informed and efficient decisions when operating the network
- The processes and systems that we use in Operational Control enable us to operate NTS assets, react to unplanned events, validate customer flow notifications against commercial rules, take commercial actions such as energy balancing or constraint management and engage effectively with customers to initiate third-party actions
- As gas flows and our customers' behaviours continue to evolve, more control actions will be required to ensure:
 - our system operates safely,
 - we maintain a national energy balance and
 - that we meet our customers' daily needs.

The tools and communication methods we currently use are fit for purpose. However as the complexity of the actions required and the levels of risk being managed increase we may need to develop these tools and systems to ensure they continue to be fit for purpose in the future.

Drivers for change

- Within-day change in supply and demand
- Price sensitive operation
- Increasing range of quality of gas (within GS(M)R limits).

How are we improving?

Process

- In line with the replacement of our existing operational systems, new fit for purpose processes will be developed and implemented when appropriate.

Systems/Tools

- The replacement of our current core control room and support systems will improve the way that we collate and present operational data in our control room. This will allow us to bring together relevant information from all other operational capabilities to ensure that the control room makes operational decisions and takes control actions based upon the most up-to-date data and analysis. This will enable us to mitigate issues to minimise the risk of your operation being affected
- In the future, we anticipate increased communication with our customers. We have recently updated our Automatic Notification System (ANS) service to provide improved communications. We are planning further enhancements to our communication routes so that we can inform you of relevant developing network risks and continue to support your needs
- With increasing market volatility and uncertainty, we anticipate that you will face increasing challenges in managing your daily balancing position. To help you with this, we will be investing in improved within-day information provision systems to ensure the market is able to operate effectively and efficiently.

4.4.6 Operational Review

What is it?

- We are continuously improving how we operate our network to ensure we are providing the best service for you
- As we take on a more active role in managing and balancing the network, the number of commercial and operational actions that we make will inevitably increase. The amount of review, validation and analysis will increase as we are required to take more actions
- Given the changing, increasingly uncertain supply and demand environment, we will not be able to rely on our past experiences of operating our network. As a result, this places greater emphasis on the development of effective feedback loops from Operational Review into Planning, Operational Strategy and Operational Control
- We increasingly need to monitor our customers' compliance with contractual obligations and technical standards. We provide feedback to those parties that may be operating outside their obligations' particularly if their operation has a knock-on effect on us being able to deliver a reliable service for you.

Drivers for change

- Evolving customer requirements and supply/demand environment
- Anticipated increased number of control actions.

How are we improving?

Process

- We want to continue to improve our relationships and ways of working with our customers and stakeholders. When customer compliance incidents occur, particularly those which affect your ability to operate, we always review and, where possible, share any lessons learnt to reduce the risk of repeat occurrences
- We are increasingly sharing more information on our operational performance with you in the Operational and System Operator Forums. We host the forum with shippers and Distribution Network Operators, and through documents that we publish, such as this Gas Ten Year Statement.

Systems/Tools

- New systems will help us to draw conclusions more quickly, ensure that effective learning is developed and fed back into our other operational processes and systems so that we continuously improve our service to you
- The availability and quality of operational data are key to an effective operational day review. As part of the replacement of our current core control room and support systems we are investing in new software to store and visualise data in new and innovative ways which will allow us to complete more in-depth data analysis.



Deferred Asset Investments

4.5 Deferred asset investments

Here we describe how improvements in our Planning processes have helped us to defer asset investment.

4.5.1 Avonmouth

The Liquefied Natural Gas Storage (LNGS) facility at Avonmouth, in the South West, was built and connected to the NTS in the 1970s. As well as providing commercial storage services to shippers, it also provides regulated services to us to maintain operational security via Operating Margins (OM); and capacity to meet our 1-in-20 design standard via Constrained LNG (CLNG).

It also provides a service for Scotia Gas Networks (SGN) by supplying LNG via tankers to four towns in Scotland (known as the Scottish Independent Undertakings (SIUs)), which are not connected to a gas distribution network.

Figure 4.5
Avonmouth location map



National Grid LNG Storage has decided to close the storage facility as significant levels of investment are needed to continue safe and efficient operation in the long term. It is anticipated that the facility will stop operating in 2018.

An allowance was given in RIIO-T1 to build two new pipelines that would, as a minimum, replace the capabilities (capacity and locational OM) provided by Avonmouth. In the 2014 GTYS we confirmed that the construction of these new pipelines was not in the best interest of consumers.

In the past 12 months we have been discussing the impact of no longer having the OM with the Distribution Network Operators (DNO) and the Health and Safety Executive (HSE). We have also updated our 'capacity' risk analysis for the South West without the CLNG provided by Avonmouth.

Impact on operating margins

We purchase operating margins (OM) on an annual basis in line with both the Uniform Network Code (UNC) requirements and obligations as described in the National Grid Gas Safety Case in respect of the NTS (the 'Safety Case'). The Safety Case obliges us to maintain OM at certain levels and locations determined throughout the year. The OM service is used to maintain system pressures in the period before other system management services become effective (e.g. national or locational balancing actions). Primarily, OM will be used in the immediate period after any of the following have taken place and all the other SO actions are ineffective:

- Supply loss: terminal, sub-terminal, interconnector, LNG importation terminal
- Pipe break (including loss of infrastructure that renders pipe unusable)
- Compressor failure
- Demand forecast error.

A further quantity of OM is also procured to manage the orderly run-down of the system in the event of a Network Gas Supply Emergency (NGSE), while firm load shedding takes place.



Deferred Asset Investments

Operating Margin Review

Over the last 12 months we have fundamentally reviewed the process by which we assess the driver for the OM capability that Avonmouth provides. Currently the facility provides OM services for certain pipe breaks and compressor failures in the South West and for supply losses on a national basis. The national requirement for OM will need to be met by other providers across the network. We are not obligated to have the OM capability in the South West by our Safety Case and we do not provide this level of security in other parts of the network. However, we recognise that the closure of Avonmouth could be perceived as a reduction in safety so we have engaged with all affected parties, notably local Distribution Network Operators (DNO) and the Health and Safety Executive (HSE), to discuss and ensure any impacts are mitigated.

We met with the HSE in March 2014 to discuss the impact the planned closure of Avonmouth will have on our network. We outlined that OM from Avonmouth could be used for the pipeline isolation between Sapperton and Pucklechurch in the event of a pipe break. To fully mitigate this risk, the lowest cost solution would be to reinforce our network with a new pipeline between these two points.

The HSE wanted to understand the risk of doing no works compared to the cost of building a new pipeline. They were keen that a full risk assessment was carried out to demonstrate that the risk is low.

We commissioned a risk assessment in September 2014. The cost benefit analysis showed that the level of capital investment when compared to the level of risk was very high. There is an extremely low likelihood of a pipe break, between Sapperton to Pucklechurch, occurring on the high demand days.

It was therefore concluded that investment in a pipeline solution is not justified. Based on the findings from the risk assessment, the HSE accepted our proposal not to build the new pipeline. We have received formal confirmation from the HSE stating that the “HSE does not oppose your justification against construction of a parallel section of pipeline from Sapperton to Pucklechurch.”

We discussed potential DNO options with Wales and West Utilities. To facilitate the flow swaps needed to mitigate the risk, investment in 90km of pipeline and extensive offtake uprating would be required.

We have also considered the potential of contracting with local demand sources. We currently procure OM and Transmission Support Services (TSS) from providers in the South West, and we review the requirements and contracts annually. The contractual arrangements in place with these existing service providers would not fully replace the services offered by Avonmouth. It is unlikely, due to the lack of volume offered, that we would be able to fill the gap in capability with other providers in the South West.

These findings combined with the outcome of the risk assessment resulted in all options being discounted as they were not in the best interest of consumers.

Impact on NTS capability

In addition to the OM requirement in the South West, there is also a need for Transmission Support Services (TSS) which are defined in our Safety Case as a substitute for pipeline capability at high demands to support a 1-in-20 peak day. We currently have two different forms of TSS available to us: contracts under the Long Run Contracting Incentive and Constrained LNG (CLNG). Contracts funded under the Long Run Contracting Incentive are required in order to deliver obligated baseline capacity at five specifically named sites in the South West that were classed as interruptible prior to the introduction of the exit reform arrangements in October 2012. The Constrained LNG (CLNG) service is a regulated service that gives us access to instruct withdrawals from the Avonmouth LNG facility at high demands. This service has been used historically in the South West of the system to defer pipeline investment and to provide flexibility to ensure we comply with our NTS Security Standard while managing the risk of uncertainty in future supply and demand patterns.

We have seen a significant decline in the level of 1-in-20 peak day demand within our FES. As a result, we have completed further analysis to review the 'capacity' Need Case for pipeline investment following the closure of the Avonmouth LNG facility. This assessment has shown that the capability of our network will be equivalent to the anticipated capacity bookings from DNOs and power stations in the South West region. This assessment assumed that the DNOs and power stations will continue to run at their current capability. It provides no headroom to cover increased use within the current capacity baseline or to cover operational issues should our customers in the region require all of the capacity they have booked.

As part of the analysis we also considered a number of developments that could lead to a constraint as a result of the reduced capability when combined with the high level of bookings and the available headroom between current use and our baseline obligation, for example:

- (a) New power station developments
- (b) Embedded generation growth within distribution networks (DNs)
- (c) Storage injection rather than withdrawal on a high demand day
- (d) Loss of Lockerley compressor station on a high demand day.

The latest analysis confirmed that the installation of a second pipeline to retain capacity at the current levels is not in the best interest of consumers and should not be pursued. Longer term, the impact of Avonmouth's closure can be mitigated as the DN demand is shown to be reducing in the latest FES. However in the short to medium term there is a requirement to manage this risk.

We will be actively managing the associated risks once Avonmouth closes to continue to deliver a safe and reliable service for you to use, in the short, medium and long term.

We will continue to drive improvements in our Planning processes and systems. We will continue to progress our Operational Situational Awareness and Operational Control capabilities to assess real-time risk to ensure that we take the optimum control decisions at the right times.

Deferred Asset Investments

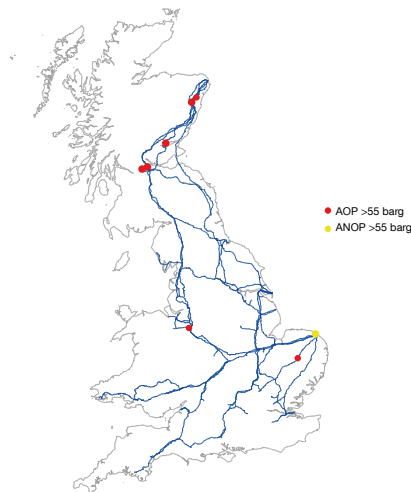
4.5.2 Scotland pressures (1 in 20)

Overview

Our network has historically been designed around high St Fergus flows and has primarily been used to transport gas from north to south. To move the large volumes of gas south, compression in Scotland was consistently used, resulting in higher network pressures when compared to the rest of our network.

As a result, when independent DNOs were created, Assured Offtake Pressures (AOPs) were agreed at higher levels in Scotland than elsewhere in the network as indicated by Figure 4.6.

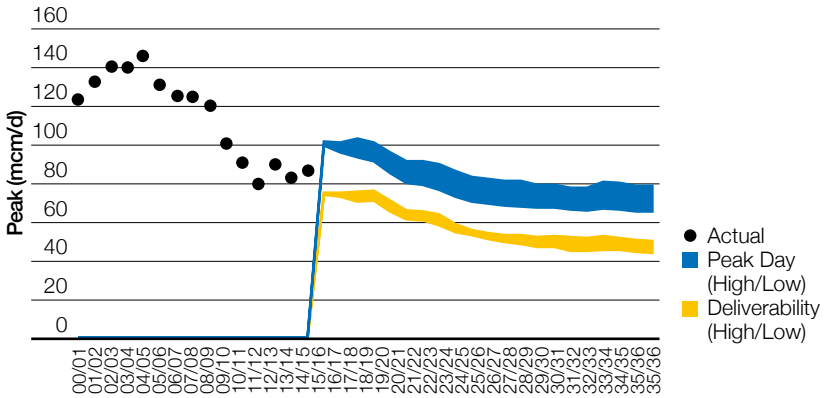
Figure 4.6
AOP and ANOP above 55 barg



We have seen a steady decline in the levels of supply at St Fergus, as can be seen in Figure 4.7. Year on year reductions in supply have stabilised in recent years, but the expected

peak supply levels are still approximately 30 to 50mcm/d lower than the terminal's full deliverability.

Figure 4.7
Forecast flows from the St Fergus ASEP 2015





Deferred Asset Investments

Changing network requirements

Against this backdrop of reduced supplies, demand in Scotland (including through the Moffat interconnector to Ireland) has risen, reaching the point where on some days this demand is greater than the supply from St Fergus.

This means we are seeing larger south to north flows with less of a requirement to run compressors in Scotland.

The rate of decline from the St Fergus terminal has reduced across our FES. However, these still strongly indicate this situation will worsen over the coming years as existing UK Continental Shelf (UKCS) supplies through St Fergus continue to decline.

Further uncertainty around levels of supply at St Fergus is mainly driven by Norwegian supplies, which can flow to European markets, or arrive elsewhere in the UK via the Easington terminal.

Our network has limited capability to actively move gas south to north. We are approaching a point where, without additional network capability to deliver south to north flows, we will not be able to provide AOPs in Scotland at high demand levels, up to our 1-in-20 design obligation levels, or when St Fergus supplies are particularly low on a given day.

The reduction in supplies at St Fergus has been compensated for by additional supplies at Southern ASEPs. However, these have not been accompanied by signals for incremental capacity sufficient, either individually or in combination, to enable us to invest via existing regulatory processes.

The existing processes are based on customer commitment underpinning the provision of incremental capacity and associated flows.

The St Fergus/Scotland AOP situation has arisen through changing flow patterns. There is currently no clear trigger mechanism to provide funding for a solution to this issue whether it be investing in assets, changing how we operate or delivering commercial change.

We identified asset investment options, designed to enhance the capability of our network to provide AOPs in Scotland and enhance south to north flows. In response to feedback received during our RIIO Talking Networks Stakeholder Consultation process, we requested funding for these projects in our final RIIO-T1 submission and categorised the funding under '1-in-20 Licence Obligation'.

In our 2014 GTYS we confirmed that we had paused our work on the Scotland 1-in-20 projects. We wanted to review, update and improve our Planning processes and the methods we use to assess Need Cases for investment given other drivers of change.

We wanted to confirm that the optimum asset investment options had been identified given the impact of the Industrial Emissions Directive (IED) on affected sites, and our latest FES.

Next steps

Over the coming 12 months we will be working together with our customers and stakeholders to develop a better understanding of the interactions between our networks. In particular we will work with Scotia Gas Networks (SGN) to investigate innovative operational and collaborative solutions that will increase the current capability of each of our networks before we further refine our options based on these discussions.

We still expect to deliver any necessary works by the end of 2020. Any asset investment options are most likely to be modifications to (and within the current boundary of) existing operational sites. This will not trigger the need for major planning applications.

Aside from the planning application process, the factors that are expected to impact our ability to deliver our asset investment options the most are the availability of long lead items and gaining network access for construction works. These factors will not affect our ability to continue to provide a safe and reliable network for you to use.

