How we've performed

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Our Performance

Regulatory Performance Measures 2016/17	
Safety	
	No-one was injured as a result of our activities and we met all of our safety targets
Reliability	
	In general we operated and maintained the NTS to deliver the reliability that gas consumers and our stakeholders expect. There were a few days in the year where we couldn't provide the capacity that some of our stakeholders required.
Environment	
	Our work to modify our assets to reduce our impact on the environment was delivered to target. Additional compressor operation to meet challenging network conditions meant that we exceeded our emissions targets
Customer / Stakeholder	
	We have been able to meet our customer connection requests and we have received good feedback from our customers and stakeholders

Meeting customer requirements

Responsibility

National Grid's responsibility as owner and operator of the National Transmission System is for safe, efficient and economic transport of gas to meet customer requirements.

Unconstrained

The ability for customers to put gas in to and take gas out, when they want and in the quantities they want.

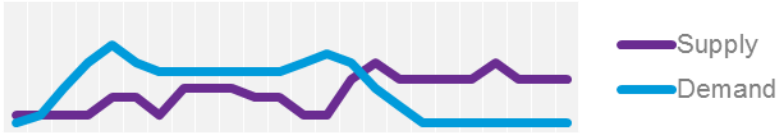
Challenges

Providing a level playing field and where possible an unconstrained service to our customers. Facilitating an efficient market, whilst maintaining gas quality and pressure requirements.

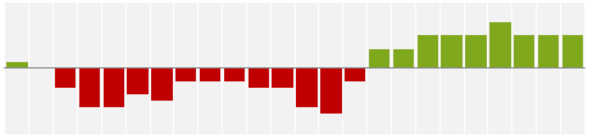
Operating a storage vessel…

The NTS transports gas from entry point (supply) to exit points (demand).

The daily profiles of supply and demand can differ significantly.



As a result of the imbalance between supply and demand, the volume of gas in the NTS varies during the day.

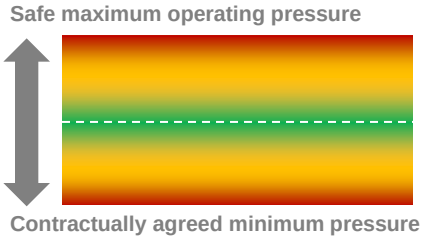


Typical daily balance

The volume of gas in the NTS at any one time is referred to as "Linepack".

System pressure is directly related to linepack.

The NTS is able to operate within a range of pressure limits.

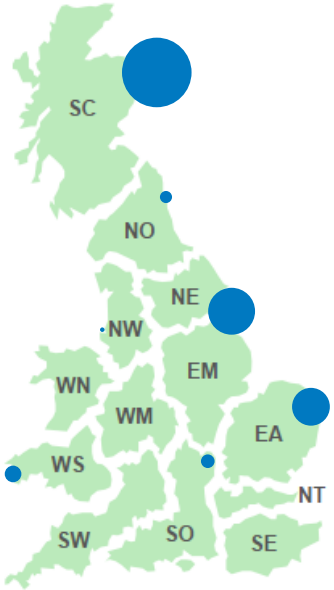


This allows for some flexibility to manage the daily imbalances and protect customers from short-term asset failures.

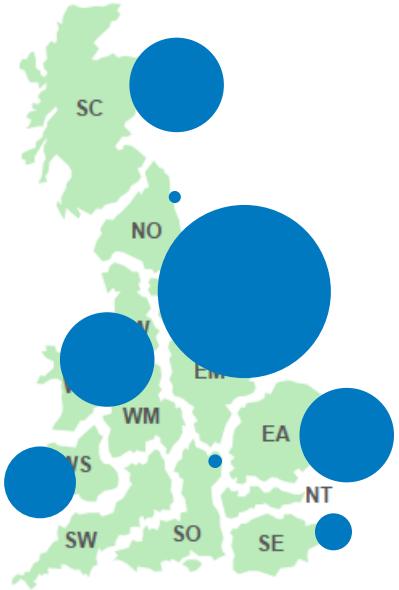
Note that the NTS was built to transport gas efficiently based on flat daily supply and demand profiles.

Varying end of day supply

This is where gas entered the NTS in 2016/17…



But based on capacity release obligation, supply could look very different…



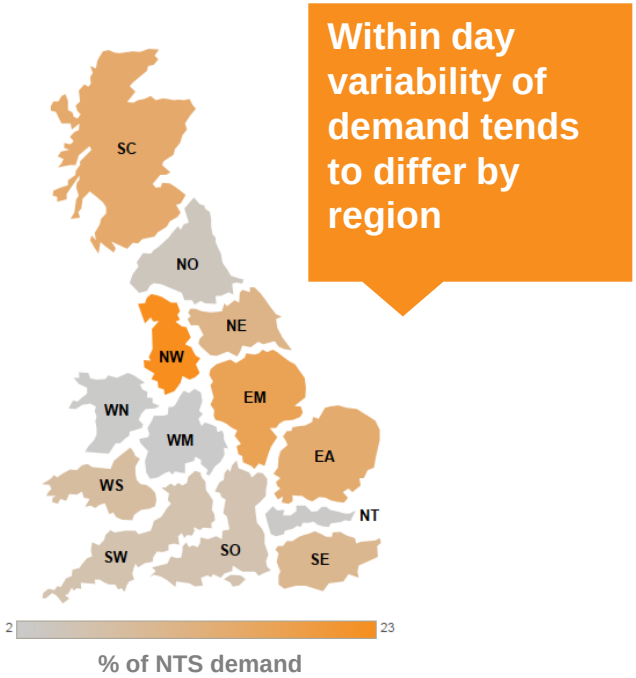
Supply profiles do change…

32% ↑

Increase in flows at St Fergus between 2015/16 and 2016/17

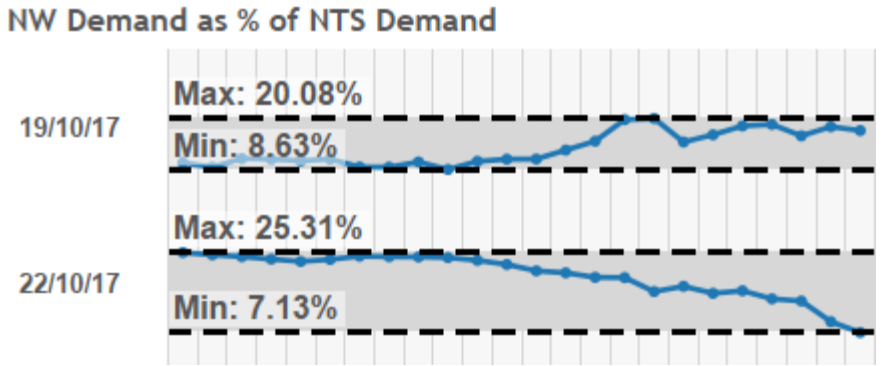
Varying within day supply & demand

Within the day demand and supply will vary regionally.



Whilst aggregate demand levels have been reducing over time, we are dealing with more volatile demand profiles within days.

For example, the North West can vary from less than 10% to more than 20%of NTS Demand and doesn't necessarily follow a predictable pattern from day to day.



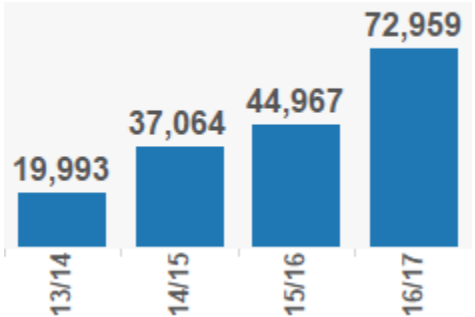
Moving gas around the NTS

We are reliant on using compression to move gas from the entry points to where it's needed.

62% Increase in compressor running hours in the last gas year.

- Balance
- Uncertainty
- Reliability

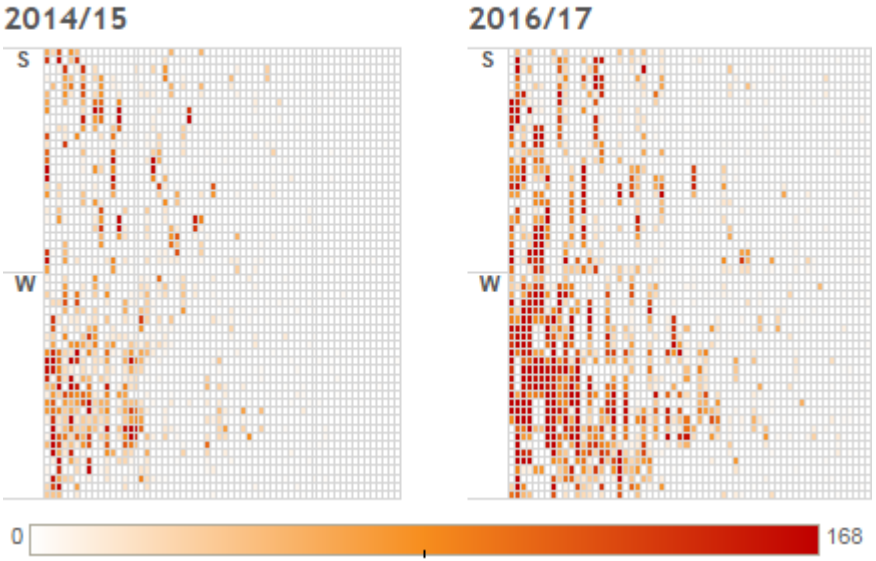
Compressor Running Hours



There is a negative environmental impact from running compressors

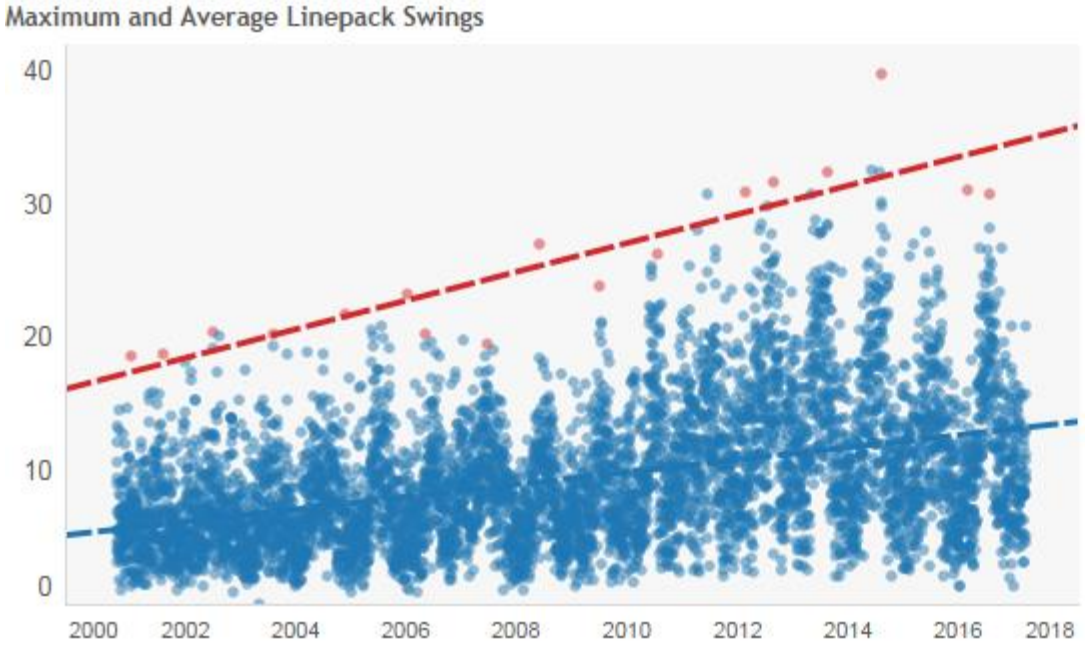
It is becoming increasingly challenging to plan and manage our outage requirements without causing customer disruption.

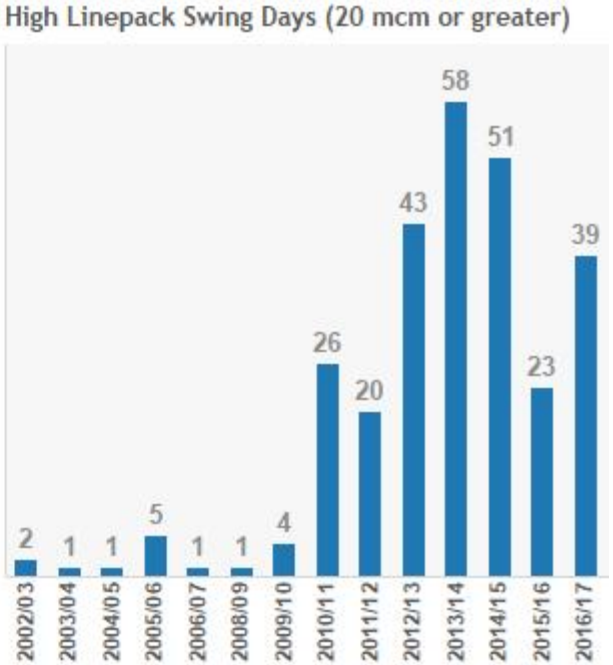
Compressor running hours by site and week



Reliance on linepack flexibility has increased

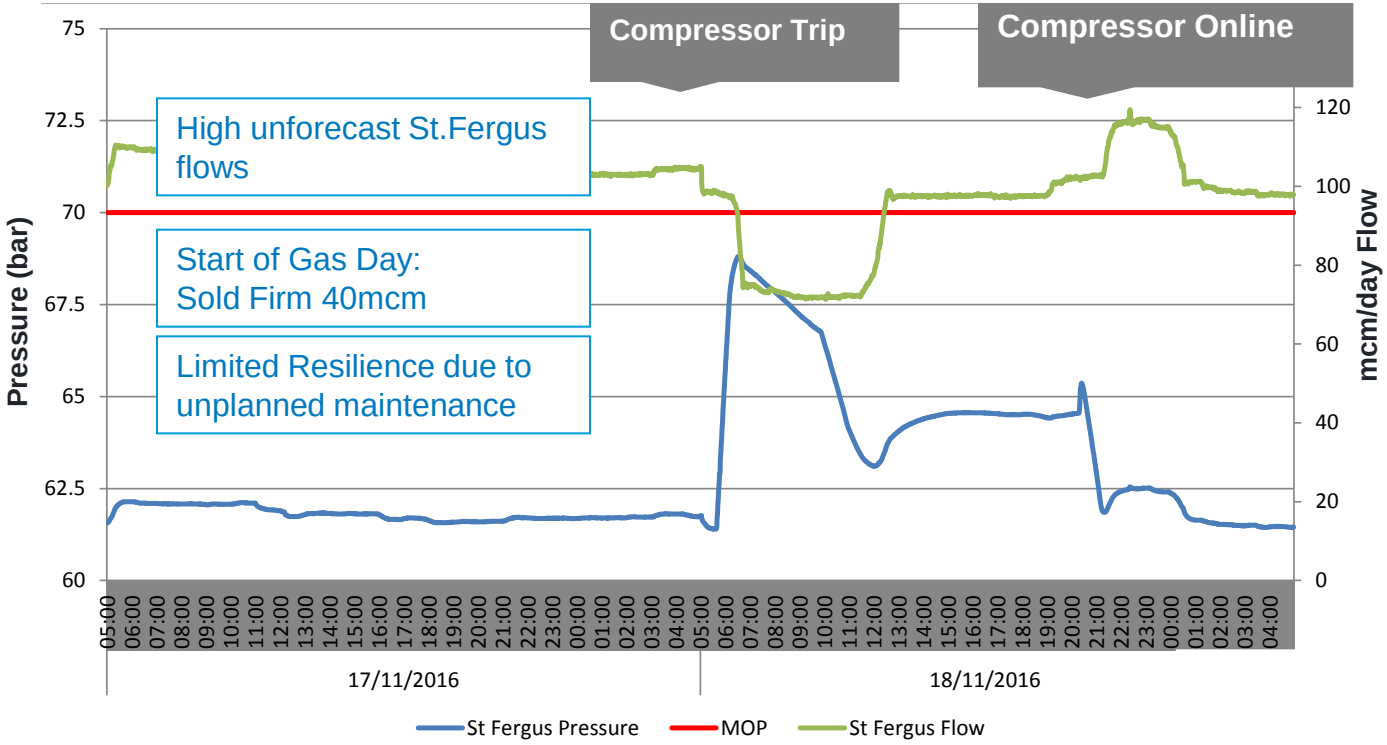
There are an increasing number of days where market operation is using up more of the available linepack flexibility, consequently the system is becoming less resilient to asset failures.





Example day – St.Fergus Terminal Restriction

What happened? 18th November – Managing overall supply uncertainty



What was the impact?

Safety notice to reduce flows at St. Fergus Issued

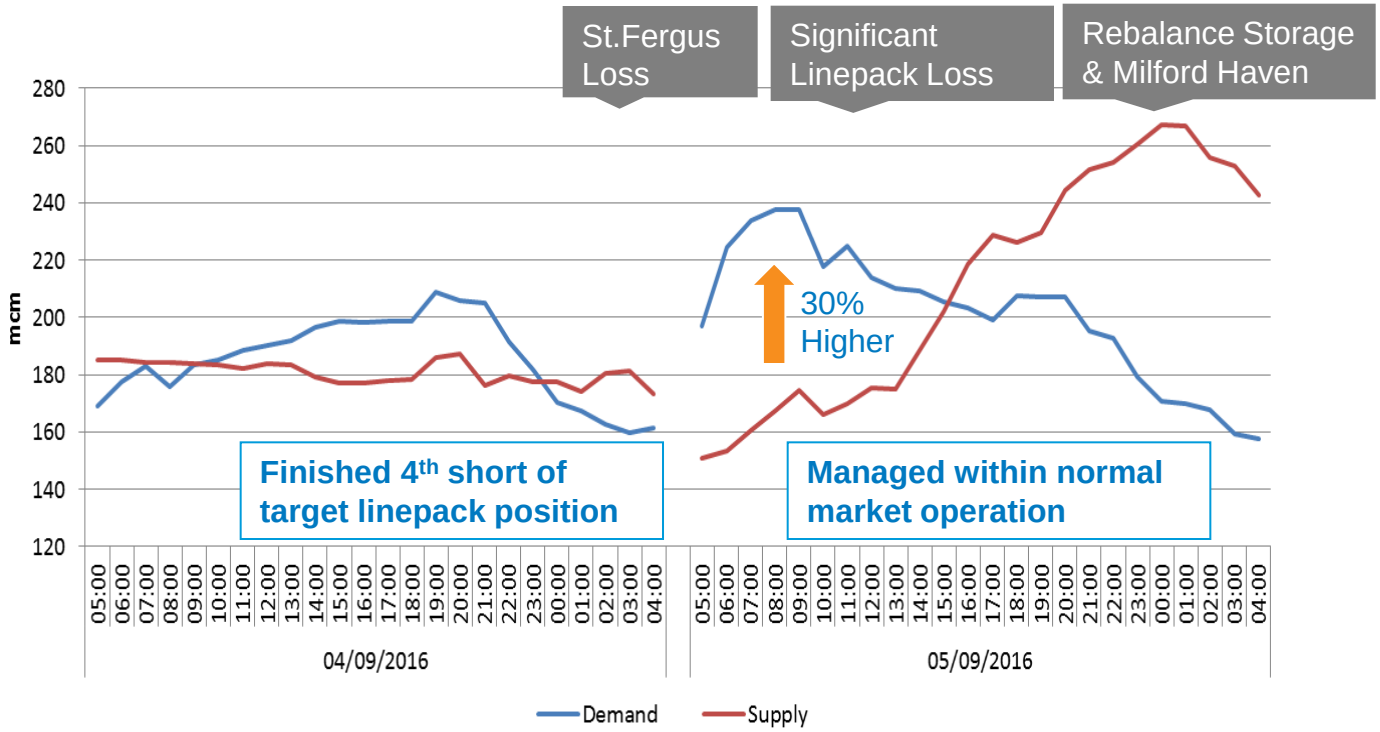
Terminal able to over deliver nomination

No Significant impact to commodity price

What could have been the Impact?

Example day - Milford Haven Terminal Restriction

What happened? 5th September 2016 : Managing within-day variation



What was the impact?

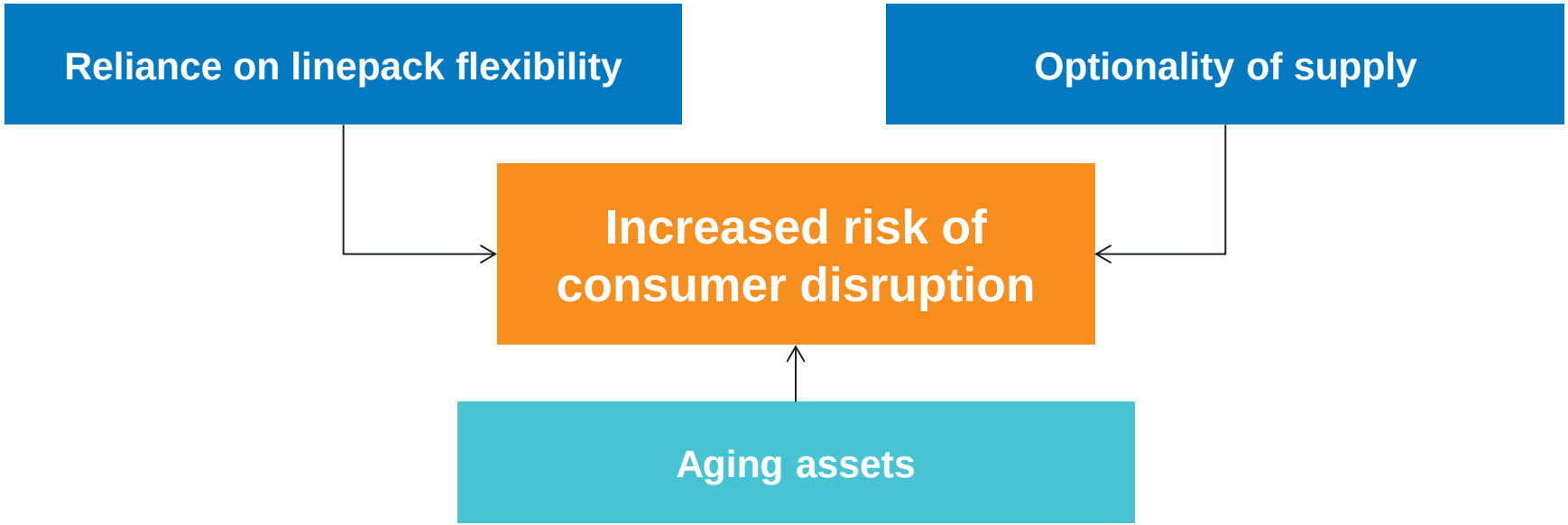
Early return to service of compressors : Limited commercial restriction at Milford

Small impact to on-the-day traded price

What was the value of managing within normal operation?

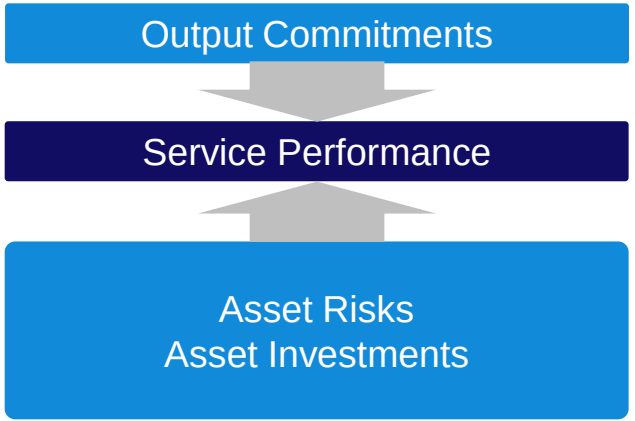
Increasing risk

Given the optionality of our entry points and reliance on using linepack flexibility to manage fluctuating profiles, we are increasingly susceptible to another coincidental event

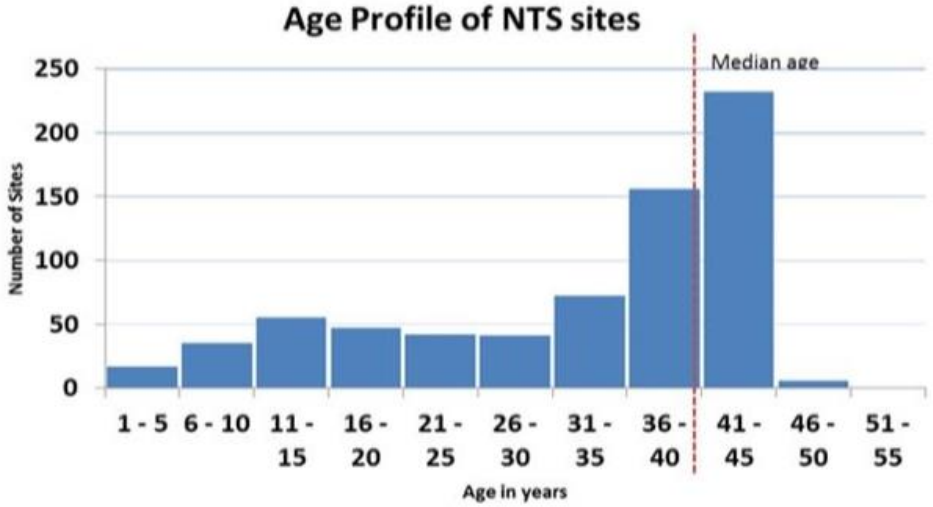


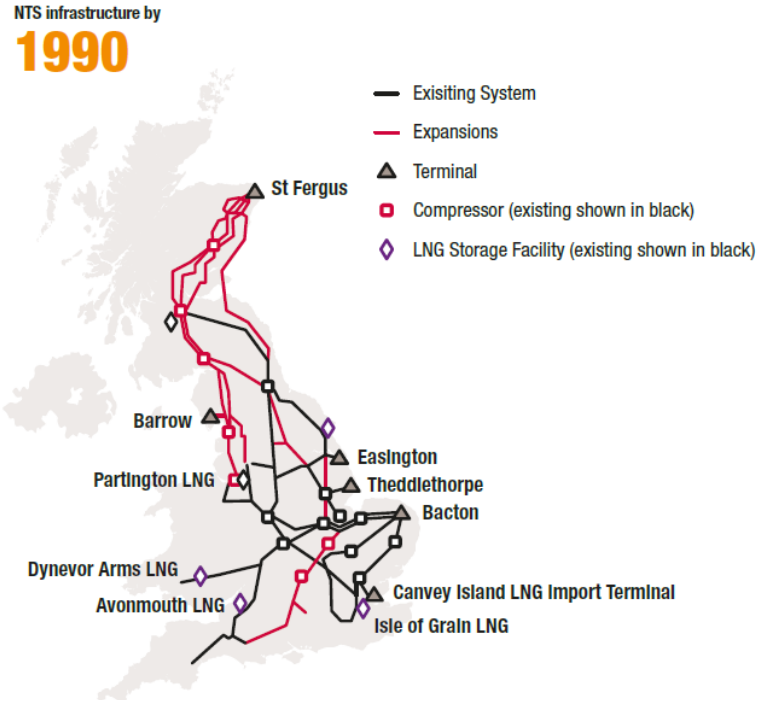
Asset performance delivers service performance

- Performance of our assets and the investments we make contribute to our ability to deliver our output commitments
- Under RIIO-T1 our output commitments cover Safety, Environmental, Reliability and Customer/Stakeholder



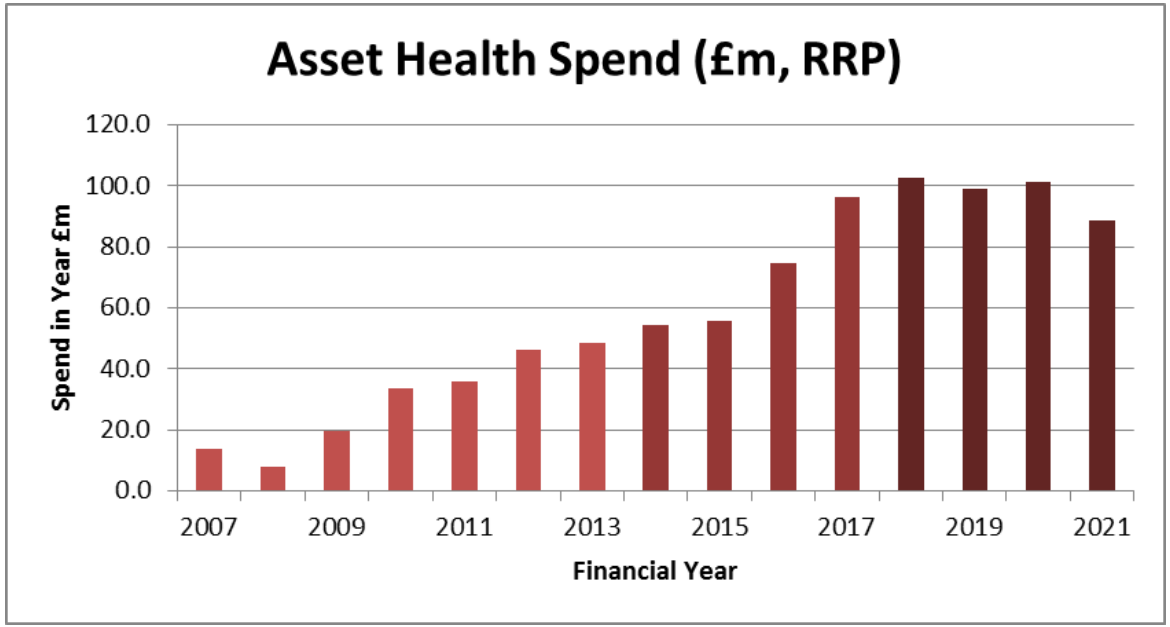
The asset base is aging and condition is declining





- Significant parts of the NTS constructed in 1970s and 1980s
- By end RIIO-T1, a considerable amount of the network will be beyond original design life
- We are seeing increasing numbers of asset issues and failures
- We are actively managing this but need to make investment decisions

Increasing levels of asset investment



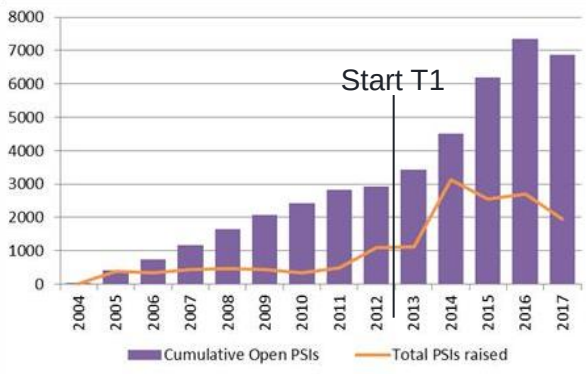
- We are investing more than ever before to keep the gas network running safely and reliably for our customers

Currently forecasting to spend over our Asset Health allowance in RIIO-T1

Asset Health spend is capital expenditure in our existing asset base, including asset replacement, refurbishment, overhaul and revalidation

Asset condition is worse than expected

As we have undertaken asset health works, we now have an improved understanding of asset condition



Number of asset issues has increased significantly since the start of RIIO-T1

Consequence of failure?

Failure to deliver output commitments:

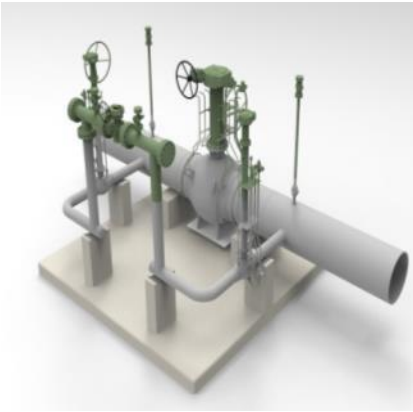
- **Safety**
- **Reliability**
- **Environmental**
- **Customer/Stakeholder**

Efficient delivery of works

- We use a “campaign” approach to deliver work efficiently and without impacting customers

One of four block valve replacements undertaken during an outage

Bundling work enables delivery efficiencies and minimises downtime on the network

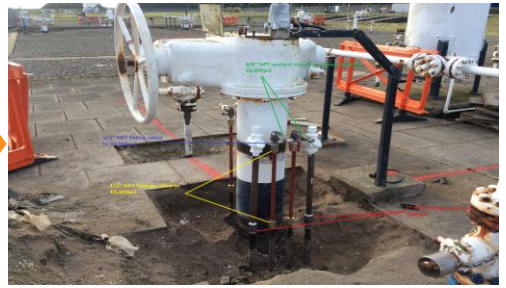


- New approach of modular block valve design with off-site build
- Above ground design **improves safety** with the removal of pit access
- 3D modelling used to reduce lifting risk by “rehearsing” complex lifts

Innovative solutions to asset issues

We continually review our work programmes to ensure that we are delivering work that benefits our customers and stakeholders

- Pit-wall transitions at St Fergus found to be in better condition than originally thought allowing deferral of this work type



- Repair of small bore vent and sealant pipework through shallow dig technique is quicker and more cost effective

Summary

- We have delivered on our outputs thus far and connected users have largely been able to take gas off and put gas on as required
- Our ability to deal challenging supply and demand scenarios is reducing as flexibility of the network is reducing with ageing assets and outages
- Larger pressure changes and volatility already experienced by connected system users
- We are investing more than ever before in asset health to manage risk and deliver a safe and reliable service for our customers
- We have developed innovative ways of ensuring that customers are not impacted by increasing asset health work and that cost impact is minimised