RIIO T1

nationalgrid

System Operator External Incentive Plan – 2017 Review Final Proposal

National Grid
Gas Transmission

October 2017

About this document

This document sets out our System Operator incentive final proposals for the three incentives being reviewed during 2017/18. The incentives included in the scope of this document are Demand Forecasting (D-2 to D-5), Maintenance and Greenhouse Gas Emissions. The document describes the latest position regarding the operating environment against which the incentives are set, and highlights how these have been considered in our proposals for the next incentive period.

System Operator External Incentive Plan

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Executive Summary

1 National Grid Gas (NGG) undertakes the role of System Operator (SO) for the high pressure gas National Transmission System (NTS) in Great Britain.

2 NGG is currently operating within the price control set up through the RIIO regulatory framework model (Revenue = Incentives + Innovation + Outputs). In setting out this framework Ofgem consulted on the incentive principles that should support the wider RIIO framework.

3 One of the key principles that underpins the RIIO framework was the doubling in length of the previous regulatory periods to cover an eight year period ending in March 2021. Accordingly where it was possible to design incentives that removed enough risk of landscape change, they were set for eight years. Under the first RIIO framework two new incentives were introduced, to ensure focus on delivering the key outputs that stakeholders highlighted. This led to the introduction of a Maintenance incentive and the extension of the Demand Forecasting incentive to cover the D-2 to D-5 time period. These incentives were originally set for two years in duration so that they could be subsequently reviewed to test the value they were delivering to customers. At the last review, in 2014/15 they were set for a further three years from 1 April 2015.

4 As well as these two incentives, as part of the 2014/15 review, the Greenhouse Gas (GHG) incentive framework was set for another period of three years. This was to allow National Grid to undertake further work to review operational venting sources and to further investigate current internationally accepted best practice. These were bought together under a scheme of works to meet the Special Condition 8D licence obligation.

5 These three incentives, (maintenance, demand forecasting D-2 to D-5 and greenhouse gas emissions) are up for review in 2017/18, the outputs from the review are set to be implemented from 1 April 2018. NGG initially discussed its proposals with Ofgem in April 2017. This document provides more detailed proposals that build upon customer and stakeholder comments received into NGG. We engaged customers and stakeholders by means of consultation documents, and from additional events that we have held and or attended. This document sets out the shape of potential incentive frameworks that are designed to encourage us to innovate in the delivery of key outputs valued by customers, whilst ensuring continued focus on delivering real value for consumers.

6 Our high level proposals for the incentives that fall within the scope of the review are summarised in Table 1 below:

Table 1: High Level overview of proposals for System Operator Incentive Schemes in scope of review

Scheme	Key features
Demand Forecasting D-2 to D-5	Financial incentive scheme extended for a further three years as is Continue equal weighting on each of the four forecasts, whilst also maintaining greater weighting on accuracy at times of higher demand Scheme cap of £10m with collar of -£1m Scheme performance to be calculated on an annual basis
Maintenance and Outage Planning	Financial incentive scheme extended for a further three years Scheme performance to be calculated on an annual basis **Change of days scheme** Continued cap of £0.5m and collar of -£0.5m, with a £50k value for each day changed **Use of days scheme** Remote Valve Operations (RVO) target to continue at 11 days For RVO, continued cap of £0.215m and collar of -£0.5m, with £15-25k value for each day used Extend the scheme to cover additional maintenance activities Target of 10%, days aligned over target will produce revenue £0.02m, with a cap of £0.5m and a collar of £0.5m, with a 20K value for each day used
Greenhouse Gas Emissions	Scheme extended for a further three years Scheme structure to be based on a symmetrical basis (cap/collar) Scheme cap of +£1m and collar of -£1m Performance to be calculated on an annual basis Incentive to remain focussed on compressor emissions Scheme not to include any types of seal leakage

7 In delivering the proposed incentive structures, we have sought to meet the principles as set out by Ofgem who will hold us accountable for delivering the outputs that our stakeholders value.

Document Structure and Next Steps

Structure

8 This document sets out our proposals for the gas SO incentives, which expire on 31 March 2018 and are currently subject to review namely:

- Demand Forecasting D-2 to D-5
- Maintenance and outage planning
- Greenhouse Gas Emissions

9 In order to shape our proposals, we have engaged with a wide breadth of customers and stakeholders to capture their views on the incentives and to best understand the outputs that they require us to deliver over the next three year incentive period (the remainder of the RIIO-T1 period).

Supporting Information

10 A summary of our current SO incentives and past incentive performance can be accessed on the link below. These dedicated web pages also provide all information regarding the incentive review process.

http://www2.nationalgrid.com/uk/Industry-information/gas-system-operator-incentives/

Contact details

11 If you would like to discuss any issue on our SO Incentives, please contact us via the details below:

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Stakeholder Engagement

Overview

12 In developing our plans we have engaged with NGG customers and stakeholders. We want to understand how the incentives have and will be used. We also want to quantify the benefits our customers have and continue to realise to date. The feedback we receive is integral to our proposals. We believe that it is critical that we are incentivised to deliver the outputs that our customers/stakeholders require. The views that were feedback to us have been used to shape the shallow incentives business plan.

Engagement Process

13 This section describes the engagement we have undertaken and how the views of customers and stakeholders have been incorporated into this business plan.

14 Our engagement strategy is about seeking and listening to a wide breadth of customers and stakeholders in order to understand their needs and therefore understand the value that they derive from the outputs that the incentives aim to deliver. The views expressed by our customers and stakeholders have been used to evolve the three existing incentives that are under review, to further focus on what really matters to them in those incentive schemes.

15 Based on previous incentive consultations and subsequent lessons learnt, we have sought to obtain and consider broader customer and stakeholder input. Our strategy for this approach is to provide as wide a breadth of input across the industry as we can. We understand the burden that is continually being placed on our customers and stakeholders with regards to the number of consultations being conducted by the industry and the associated draw on their time. With that in mind we have worked closely with our internal customer and stakeholder team to ensure we work as efficiently as possible, when seeking to obtain feedback and information.

16 This approach has led to us presenting at a wide breadth of events, (see Table 2) covering the three incentives under review. Prior to these meetings we made the appropriate material available so that representatives at these events could gauge the wider views of their organisations in advance of attending. We have also consulted directly with our customers either by email, telephone or face to face and opened two consultation windows on both the proposed modifications and the mechanisms underpinning the modifications. We believe that utilising this approach has made it possible for us to deliver a realistic view across the industry.

Table 2: Customer and Stakeholder Engagement

Event(s) / Comms	Customer and Stakeholder groups covered
Operational Forum	Predominantly the Shipper community
Gas Customer Seminar	Shippers, direct connects and other industry parties
Gas Storage Operators Group	Shippers, direct connects and other industry parties
Transmission Work Group	Major industry parties, and regulatory bodies

Liaison Visits and 1:1 meetings	Predominantly industry parties, NGG customers
Emails to customers	Industry parties and stakeholders, NGG customers
Energy Networks Association distribution list	Shippers, direct connects, regulatory bodies and other industry parties

17 From our engagement activities we have been provided with a variety of views regarding the various elements of the three incentives that are being reviewed. In most areas, these are consistent, although in some cases stakeholders have contradictory views and requirements. Our plans have considered these in proposing the changes to the incentives.

18 This document should help provide a further level of detail to the community, allowing further challenge to our proposed incentive structures and making sure that the frameworks clearly deliver the outputs that are most valued by our customers and stakeholders.

Next steps

19 Having provided Ofgem the views of industry respondents, we await feedback from the authority as to the future of these incentives. We continue to welcome discussion on the proposals or provide any further information deemed necessary.

The System Operator Role: Now and into the future

The role of the SO

20 Our principle role as the System Operator (SO) is to operate the NTS to ensure that gas is transported safely, reliably and efficiently across our network. Alongside our other obligations, in our role as the residual balancer we ensure that gas supply and demand is balanced nationally and help facilitate the economic operation of the market.

21 As the SO, our challenge is to continually ensure that we have the appropriate level of operational capability to meet our obligations, and deliver the level of service that our customers and stakeholders expect.

Incentive Challenges

22 NGG recognises the importance of the external environment, and recognises how critical it is to understand how this will shape the way that we operate the system, when setting incentive frameworks. The knowledge we gain from the industry and our customers make it possible to create incentive frameworks that are suitable to deliver longer term outputs for our stakeholders and customers. In presenting our incentive proposals we have been mindful of the changing operational landscape and the changing industry requirements.

Operating in a changing supply and demand environment

23 Supply and demand in the UK gas market continues to be increasingly changeable, and we expect this trend to continue. Even with the forecast increases in UKCS supply, we continue to be reliant on imports via LNG and Interconnectors during winter. The resulting diversity of supplies means that gas can be supplied from any terminal in varying volumes from one day to the next. Similarly, fast cycle storage connections, increasing wind volumes driving more intermittent CCGT operation and changes to Distribution Network (DN) requirements to take larger volumes of diurnal storage from the NTS. All of these elements have the ability to impact how our customers wish to use the NTS.

24 Increasingly, user behaviour is being driven by commercial considerations and the opportunity to take advantage of price differentials within day and between UK and European markets. Interconnector, LNG and fast cycle storage facilities have the capability to vary their volumes quickly allowing shippers to balance their position later in the day. In addition, the closure of coal plants means that CCGTs are likely to be run intermittently meeting fast cycle requirements as renewable generation grows over the incentive period. The cessation of the Rough storage facility is changing the commercial landscape, which has led to a change in behaviours from the remaining storage facilities.

25 This intermittent behaviour will continue to challenge our ability to operate the NTS in an efficient manner as our customers continue to place increasing demands on the flexibility of our system. Such requirements will continue to challenge our ability to forecast demand and correspondingly configure our network to accommodate these flows.

26 Accommodating this demand variability is also challenging how we meet our pressure obligations and altering how we use our compressor assets to ensure gas is transported to the required locations at the right pressure. Similarly, we continue to evolve our planning processes to facilitate the level of outages and maintenance required to meet the demands of the current and future operating environment.

27 As Britain begins to separate from the European Union (Brexit), a number of factors increase the uncertainty in the UK energy market.

Facilitating markets and supporting regulatory change

28 We are now four years into the RIIO-T1 period, EU driven regulatory requirements such as the suite of European network codes are further shaping how we operate and the obligations that we have to adhere to.

29 Changes to Uniform Network Code (UNC) and our transmission licence may be required to support this incentive review process. This in turn requires us to make changes to business processes, information provision requirements, IT systems and potentially network assets. As these frameworks mature we will need to sense check that the incentive frameworks are still appropriate for delivering the outputs that our stakeholders require.

In summary

30 Appropriately structured incentives are a key aspect in making sure that we adapt and meet key customer and stakeholder outputs. They have an important role to play in protecting consumers by ensuring that the outputs valued by our stakeholders are delivered against this emerging future.

SO Incentive Principles

Overview

31 This section describes the principles against which we have developed our proposals. They draw on the principles set out in our initial proposal to Ofgem, together with the views expressed by customers, stakeholders and NGG during the consultation process.

32 SO incentives deliver benefits to stakeholders, and align meeting industry needs by incentivising our performance. These incentives create a focus on outputs valued by our customers and stakeholders, promoting an environment whereby the System Operator develops innovative solutions, working closely with the NTS Transmission Owner (TO) activity, to deliver ongoing improvements in the gas transportation services we provide to customers and ultimately consumers.

33 In particular, our view is that incentives should reflect the operating environment that we work within, focusing on areas which fall within our sphere of influence. In doing so the incentive frameworks outlined within this document should deliver an appropriate balance between risk and reward for the industry, consumers and the operator.

Over-arching Principles and Design Elements

34 The principles of SO incentives are aligned to the RIIO philosophy (Revenue = Incentives + Innovation + Outputs). NGG are committed to ensuring that the SO incentive arrangements integrate with the overall regulatory framework in which we operate. The incentive framework should also promote fully integrated and co-ordinated decision making between our SO and TO activities, ensuring efficiency and long-term value for money for consumers.

35 In outlining the frameworks for the continuation of the three incentives, we continue to base our thinking on the key regulatory principles that have been set out within the RIIO framework. Noticeably our plans seek to:

(a) Continue to focus our activities on delivering the key outputs that our stakeholders require, and be held accountable for their delivery

(b) Better align our activities with the interests of consumers

(c) Deliver frameworks that reduce overall costs of system operation between the SO and TO

(d) Reflect the confidence that we and stakeholders have around the ability to deliver the required outputs at acceptable cost to the industry, as well as any known events that are likely to materially affect the viability of the schemes

(e) Create schemes where the associated reward / penalty for any outperformance / underperformance are borne by current consumers, subject to relevant sharing factors, caps and collars. Therefore we propose that each incentive scheme operates annually within the framework

Managing Uncertainty and Change

36 Uncertainty mechanisms provide a useful tool to deal with change over the remainder of the RIIO-T1 period which cannot be anticipated at this current point in time. In doing so they offer a mechanism to limit windfall gains or losses.

37 It is our position that the three incentives are covered in line with the existing special licence condition 3E, which outlines under what conditions an uncertainty mechanism can be triggered.

Delivering Outputs

38 Incentivising key outputs of regulated network utilities is at the core of the RIIO regulatory framework. Incentives ensure we align our actions with the interests of consumers where we have influence or control over a given output, and have the ability to add value in improving the delivery of that output.

39 The incentive frameworks that we are proposing continue to be challenging, but are intended to build on the progress that we have made to date on Demand Forecasting (D-2 to D-5) and on Maintenance, they also reflect the challenges NGG has faced on GHG. The table below illustrates how these incentives will provide the framework for delivering the outputs established under the RIIO regulatory framework.

Table 3: Incentives and associated RIIO outputs

Incentive	Associated RIIO Outputs
Demand Forecasting (D-2 to D-5) Incentive	**Provision of Information:** Publication of information that assists market participants to operate in the gas market. Explicitly around ensuring demand forecasts are as accurate as possible.
Maintenance Incentive	**Reliability & Availability:** Minimise the customer impact of our necessary maintenance activities to maintain system reliability **Safety:** Minimising the time spent on completing maintenance activities and the associated impact on customers whilst not compromising safety
Greenhouse Gas Incentive	**Environmental Impact:** Reduction in the volume of methane emitted to the atmosphere and consideration to how we can introduce alternatives to venting **Safety, Reliability & Availability:** Ability to optimise the running of our compressor fleet to support system reliability, whilst also meeting our pressure obligations and ability to access the compressor safely for maintenance

The Use of Cap and Collars

40 Inevitably there will continue to be uncertainty around the ability of these frameworks to capture the complex reality of the network that we operate and the increasingly uncertain environment that we operate within. This cannot be fully encapsulated through scheme design alone so it is important to utilise caps and collars to help manage this uncertainty for both ourselves and consumers.

Demand Forecasting D-2 to D-5

Overview

41 As part of our core role in the gas industry we will continue facilitating the efficient running of the market through the publication of multiple sources of information. One such widely used category of information is gas demand forecasts. We publish national gas demand forecasts over a range of timescales to assist the industry in making efficient decisions in balancing supply and demand positions.

42 During the current incentive period, customers and stakeholders expressed a desire for improved accuracy in our D-2 to D-5 forecasting. Over the last three years we have seen an improvement in the accuracy versus volatility of our D-2 to D-5 forecasts. We have seen an increase in volatility due to changing industry behaviours, resulting in further improvements being difficult to achieve. However, we are working on improving commercial intelligence by continued collaboration with internal and external stakeholders.

43 Although performance appears to have degraded by 2.3% over the last three years, over the same period volatility has increased by 9.6% meaning that absolute performance has improved by circa 7.3% over that period.

44 Stakeholder's comments confirm that the D-1 Demand Forecast continues to be the most important forecast. However, some customers and stakeholders have articulated that the D-2 to D-5 forecast delivers value; indeed they have also discussed the possibility of an increased forecast horizon.

45 We are therefore proposing to retain an annual financial incentive scheme on Demand Forecasting for D-2 to D-5. We, as well as stakeholders, recognise that the incentive does provide a benefit to customers and facilitates an even playing field. This further validates the value of the enhanced forecasting accuracy that the incentive is promoting.

46 Allowing for the increased volatility in supply and demand patterns both now and in the future, for example the cessation of Rough storage site, changes in storage behaviour and potentially Brexit, we propose that the baseline target for the scheme should remain at 13.7 mcm. Given the volatility, this target will continue to be a challenge.

Current Incentive Scheme Structure

47 The purpose of the D-2 to D-5 demand forecasting scheme is to incentivise improvements in the accuracy of demand forecasts, which in turn support market participants in making efficient decisions in balancing their portfolios. It also provides an even playing field by providing demand forecasting to all customers.

48 As part of the 2014/15 review, the existing D-2 to D-5 incentive was set for a further three years from 1 April 2015. The diagram below illustrates parameters of the current scheme. These include:

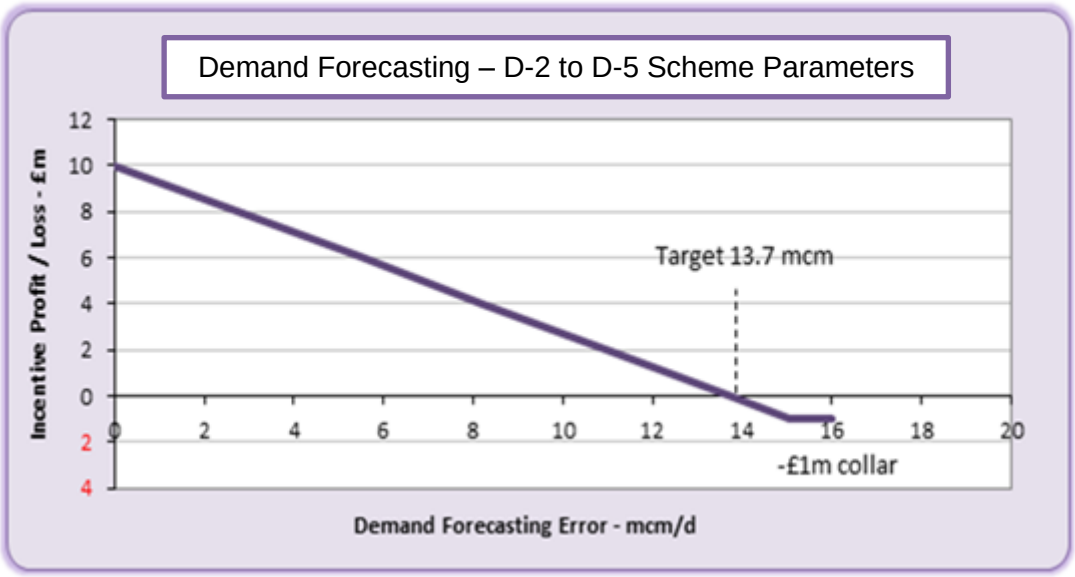
(a) A cap on the incentive scheme of £10m, which assumes the attainment of a zero forecast error for all forecasts for the year

(b) Downside cap placed on the scheme which is set at -£1m and is reached if the average forecasting error is greater than or equal to 15.1 mcm

(c) For every 1 mcm improvement away from the target we receive a reward of £0.73m

(d) Equal weighting put on the accuracy of each of the four individual forecasts

Diagram 1: Incentive Parameters



Incentive Scheme Performance

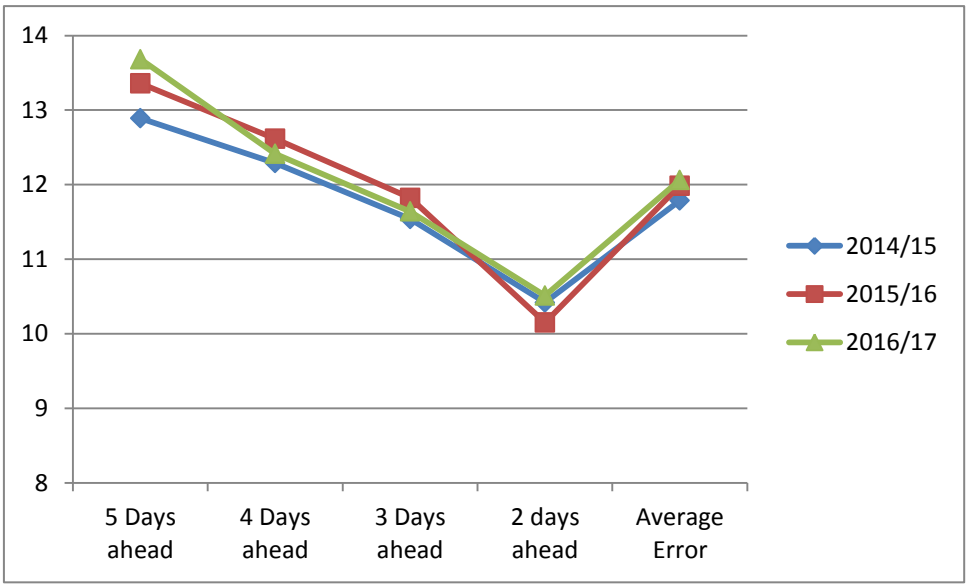
49 The table below illustrates the accuracy of the forecasts that we provide to the industry. Although performance appears to have degraded by 2.3% over the last three years, over the same period volatility has increased by 9.6% meaning that absolute performance has improved by circa 7.3% over that period. This has been achieved through increased focus on the incentive and the outputs that it supports.

Table 4: Demand Forecasting Accuracy D-2 to D-5

Incentive year	Incentive target	Average Forecast error	Scheme Financial Performance
2014/15	16 mcm	11.78 mcm	£2.17m
2015/16	13.7 mcm	11.99 mcm	£1.17m
2016/17	13.7 mcm	12.06 mcm	£0.95m

50 The diagram below illustrates the accuracy for each independent forecast and demonstrates that average performance has remained broadly consistent whilst we have experienced greater volatility.

Diagram 2: Demand Forecasting Accuracy Breakdown D-2 to D-5



51 In order to deliver these results, we have implemented a number of improvements to drive enhanced performance in the accuracy of our forecasts. The main enhancements that we have embedded include: forecast modelling, and business process.

Forecast Modelling

- Investment in the development and enhancement of additional mathematical forecasting techniques, as part of the Gas Control System implementation
- Greater focus on continuous recalibration of models to adapt to current operational considerations. The process has moved forward, with many of the model functions automated
- We are investigating potential further opportunities as we retender the meteorology services

Business Process

- Greater focus embedded within Control Room processes in order to assess wider market signals to adapt the model
- NGG manually forecasting supply and demand scenarios, to predict within day behaviours to balance the system
- Business focus is now directed at further improving commercial intelligence, that enable NGG to factor in industry changes that impact supply and demand forecasting

Demand Volatility

52 When considering an appropriate future forecasting target it is important to consider how the operational environment is likely to change. As described previously, there are a number of significant change drivers that will affect our ability to continue to drive further improvements in reducing overall forecasting errors.

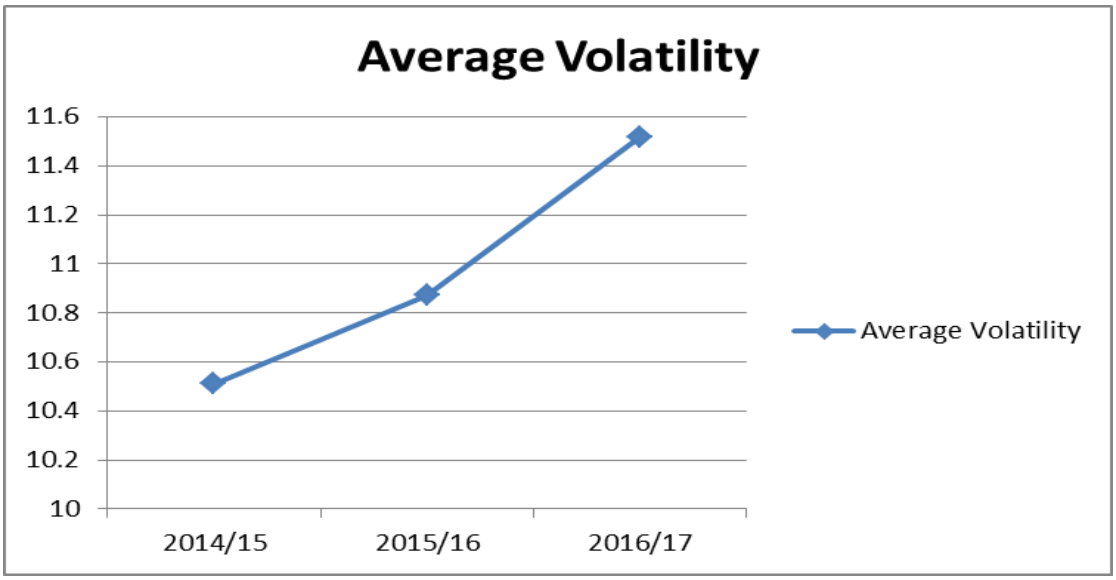
53 There is clear evidence that we are already experiencing greater volatility and uncertainty in demand and supply, especially from those components of NTS demand that are more price responsive. These drivers include:

- Continued growth in 'fast-cycle' storage, and the cessation of the Rough storage site, is changing behaviours across the fast cycle sites
- Increased flexibility across fuel types and markets including increasing utilisation of the European interconnectors, responding to spreads in European prices, as trading at other European hubs becomes more liquid.
- Changes to the fuel type mix, and increasingly dynamic operation of CCGTs to balance against the increase in volume of intermittent renewable energy, such as wind and solar
- Increased uncertainty over global LNG supply and demand which directly impacts UK supply and therefore demand

54 Volatility is expected to increase as the supply of gas from unconventional sources such as shale gas and biogas continues to increase. This will impact Distribution Network demand. There is increasing DN reliance on the NTS line-pack to provide flexibility as local LDZ facilities are decommissioned. The volatility of the gas demanded from the NTS, both day to day and within day is expected to increase.

55 There is an added uncertainty that leaving the European Union will bring, along with the unknowns that are continuing to drive difficult to predict behaviours.

Diagram 3: Average volatility D-2 to D-5

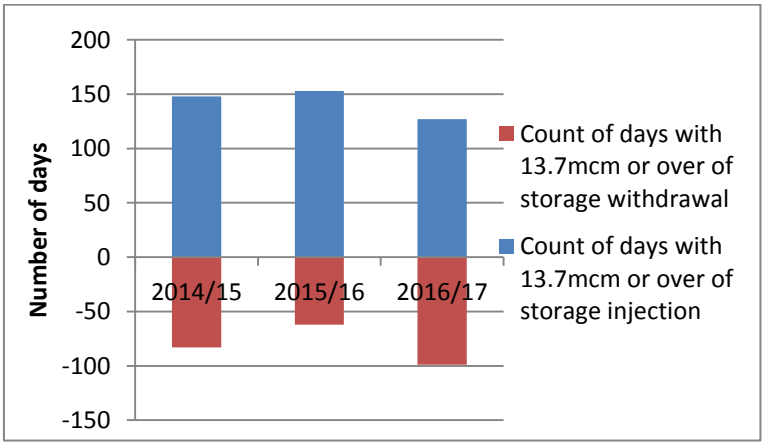


'Fast-Cycle' Storage

56 Fast-cycle storage plants have the capability to inject and withdraw within the same 24 hour period. The challenge that we face is to adapt our forecasts to accommodate and predict the potential volatility that is created from these sites being able to respond to small intraday price differentials.

57 During the unplanned outage at the Rough storage site, day to day volatility increased from storage sites. The diagram below shows the number of days where storage injection and withdrawal equalled 13.7 mcm or more. The Rough storage site has since announced its cessation. In 2016/17 even though injection decreased, the increase in withdrawal from fast-cycle sites meant that overall volatility of the system continues to increase. The graph below shows that for 2016/17 there has been more cycling of storage inventories over the 13.7 mcm threshold. This increases volatility of NTS demand.

Diagram 4: Number of days where NTS Storage sites injected or withdrew 13.7 mcm or over



Dynamic operation of CCGTs

58 We continue to observe greater day to day (and within day) volatility in demand from the fleet of installed gas fired power stations. This is expected to continue to increase as they support intermittent wind and solar generation, resulting in the requirement for fast ramping of gas demand. Although the level of wind can be forecast to a reasonable level of accuracy on a day ahead basis this becomes far more difficult when trying forecast from five days out.

59 We are experiencing day to day CCGT demand changes of over 13.7 mcm at least 30 times in a year; illustrated by the graph below. Not only are we observing an increase in the number of significantly sized changes in demand but the average day to day change continues to increase.

Diagram 5: Average day-to-day changes in NTS Power Station Demand

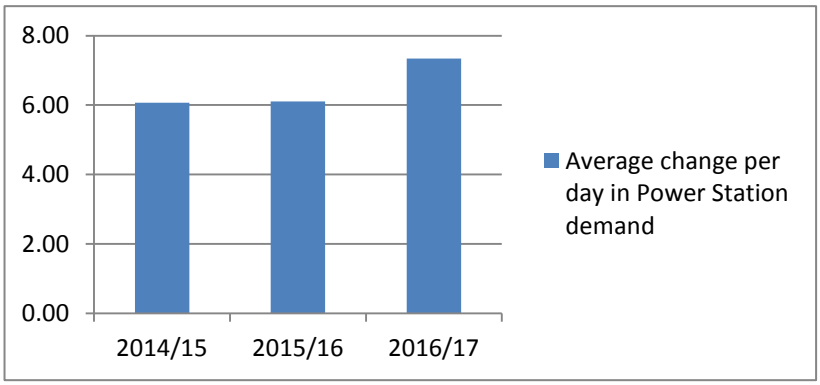
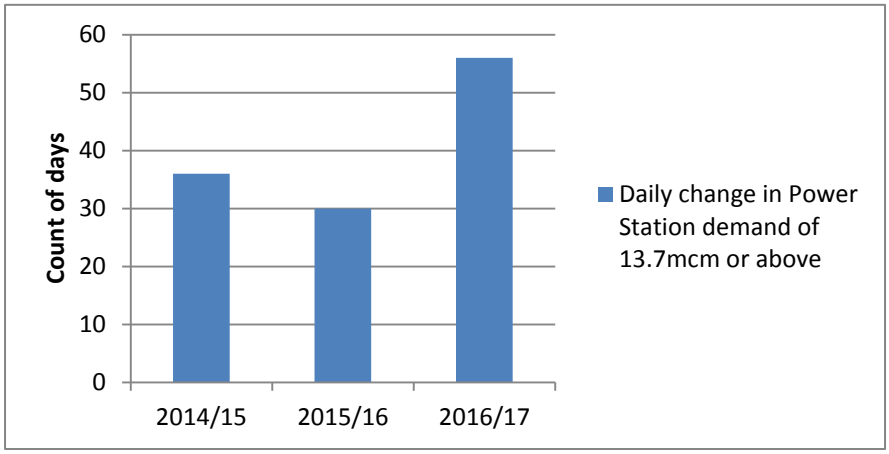


Diagram 6: Number of changes in NTS Power Station Demand above 13.7 mcm



Price Arbitrage across Interconnectors

60 The suite of European Network codes have been designed to further stimulate a more integrated and open European market, promoting competition and cross border flows. Whilst average day to day changes, measured in mcm, are not as large as those for storage and power stations, they are more responsive to price differentials between the UK and the continent, a further factor to consider when producing our forecasts.

61 The potential size of daily movements of interconnector flows can lead to material challenges on our ability to forecast demand accurately. The graphs below illustrate volatility on the IUK interconnector as an example.

Diagram 7: Average Day-to-day Changes in IUK Demand

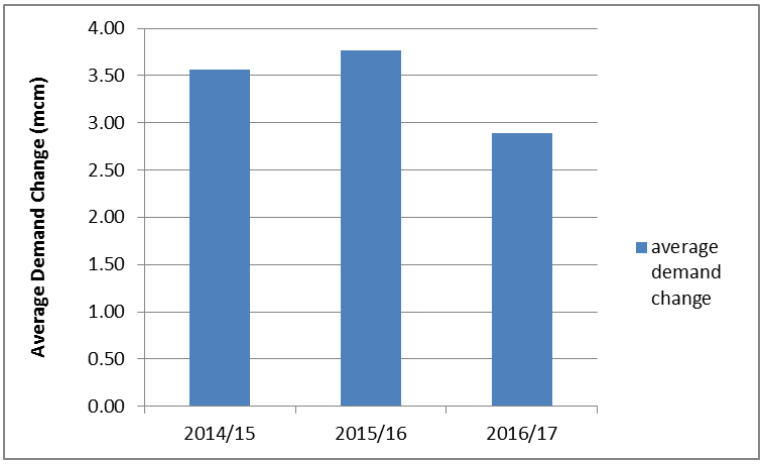
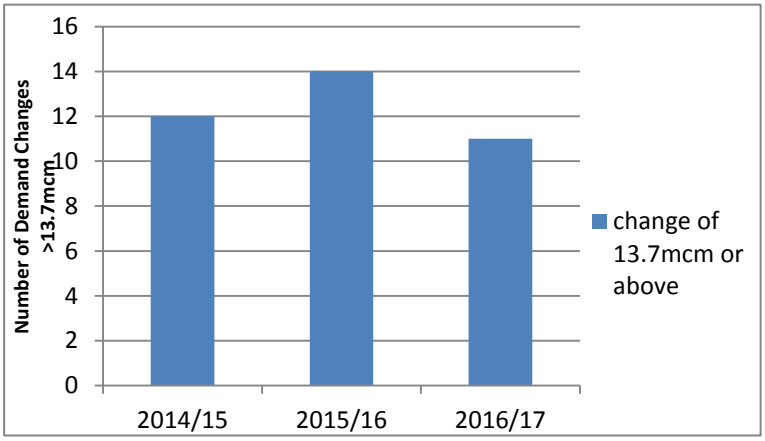


Diagram 8: Number of changes in IUK Demand above 13.7 mcm



Future Incentive Scheme Structure

62 In designing our proposals for the structure of this incentive for 2018/19 to 2020/21, we have looked to build upon the views expressed when the framework was initially designed and from our most recent stakeholder engagement. The views expressed ranged from some stakeholders suggesting that they did not currently rely on the information to inform their decisions, to those that used the Information as an active input into their commercial processes. Our unique position as the system operator allows us to utilise the best and most up to date operational data to deliver accurate forecasts.

> *"We do use this forecast and strongly wish for it to continue"*
>
> **- Centrica, 2017**

> *"We believe target-setting should be included in this review".*
>
> **- British Gas (Centrica), 2017**

63 We find that this forecast delivers value to stakeholders. End consumers benefit as the forecast looks to ensure that the industry has the best available information upon which to base its commercial decisions. Customers and stakeholders had mixed views on the value of this forecast however small customers articulated the heightened importance of this forecast during winter months and at times of stress. When asked the question, "How would you feel if this forecast was not available?" no stakeholders expressed a desire for it to end.

> *"We use our own forecast up to D-10 as nice to have. When things get more difficult, like in a cold winter, it is essential"*
>
> **- Major energy user, 2017**

> *"If this incentive is retained we consider the target should remain at the current level along with the other parameters."*
>
> **- Energy UK, 2017**

Continuation of existing scheme parameters

64 We continue to recognise that it is appropriate to use an absolute forecast error rather than a percentile measurement of demand to incentivise performance. This aligns with support have we received from stakeholders regarding this element, as based on the underlying demand levels it limits the likelihood of windfall gains and losses.

65 Recognising stakeholder's views, we propose to continue with the mechanism as is. We continue to place greater weighting on the accuracy of forecasts during times of higher demand realising that the industry can incur higher costs from forecasting errors in the winter period when cash out prices are likely to be further away from SAP.

66 Similar to other gas SO incentives we continue to support a scheme structure where performance is measured and remunerated on an annual basis.

Incentive Target

67 Some stakeholders have expressed that they believe the target for the incentive should be tightened.

> *"We believe that there should have been more improvement in this forecast"*
>
> **- Energy UK, 2017**

68 We believe that the current target is appropriate, and if we are able to maintain current performance with increasing volatility this will show improved performance.

Volatility Factor

69 As we have illustrated we have to manage a growing level of day to day volatility, as well as also considering the unknowns moving forward: storage site behaviour, unexpected flow patterns, and Brexit.

70 However we aim to ensure that the structure of this incentive remains simple and transparent. Therefore we propose that we continue with the incentive as is, using the same mechanism, cap and collar.

Incentive Duration

71 We are proposing to extend the incentive for a further three years; this will provide an opportunity to validate further outputs from the incentive, which will provide a good platform to consider this incentive in the context of RIIO-T2.

Value

72 The current incentive gave an upside and downside equivalent to £0.73m for a 1 mcm movement away from the target. This compares to the D-1 incentive structure that (assuming a zero value for the storage adjustment mechanism) rewards and penalises us by £1.67m and £-1.5m respectively for a 1 mcm movement away from the scheme target.

73 To reflect that greater value is attributed to the D-1 scheme performance by stakeholders, we believe that the reward / penalty for this incentive should remain just less than half of the D-1 scheme. Therefore we propose to continue the methodology that every 1 mcm movement away from the target we are rewarded / penalised by £0.73m.

74 Stakeholders previously expressed a preference for reducing the size of the cap on the scheme, which is currently set at £10m. However, we propose to continue using the current cap, as it continues to incentivise us and drive our behaviours. It is a theoretical cap as we would need to have a zero error in every forecast to reach it.

Maintenance and Outage Planning

Overview

75 To facilitate operation of the NTS, sometimes we carry out work that involves the need to reduce the flexibility of the network which may have an impact on connected parties. This work may be as a result of maintenance, asset replacement, inspections or new build on the network. This ensures that we continue to operate the system in a safe, reliable and economically efficient manner, delivering the outputs that our stakeholders value.

76 During the incentive engagement process for the RIIO-T1 period, stakeholders wanted us to improve our communications when informing our customers that we need to carry out our maintenance activities. They also wanted us to be more flexible to align our maintenance work with their planned outages at their sites, thus minimising the impact on their operations.

77 In response to stakeholder feedback, new incentives were created increase our focus on aligning our maintenance programme with customer led outages. The schemes provide focus for us to reduce the impact of our planned work on customers, resulting in cost savings for the industry.

78 Following the success of this initial period the incentive was extended at the 2014/15 review for an additional three years from 1 April 2015 with some aspects changed.

79 The new maintenance incentive was broken down into the following discrete elements:

- A reputational incentive to provide earlier and better communication of our outage needs to affected parties to enable better alignment to users own maintenance periods
- A reputational incentive to ensure that parties are aware of the enhanced services we offer when standard maintenance approaches are not optimal for our customers. Our customers can work with us to agree different maintenance approaches[1] paying any incremental costs of working flexibly outside normal working practices where we are able to accommodate these requests
- A financial incentive to reward good performance where we can reduce the number of changes we make to agreed Maintenance Days and Advice Notice days compared to a benchmark based on historical performance
- A financial incentive to use an efficient level of Maintenance Days for routine maintenance work covering Remote Valve Operations (RVOs)[2]

80 Following support from stakeholders on the process improvements that we implemented, we are proposing to maintain these elements of the scheme with the

[1] For further information on Minor Works Agreements please see our webpage at http://www2.nationalgrid.com/uk/industry-information/gas-transmission-system-operations/maintenance/

2 Further descriptions on these common maintenance activities is available at http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=20050

addition of a new incentive. This is supported by customers who want to see this incentive continue.

> *When asked "National Grid is currently incentivised to reduce the number of RVO maintenance days submitted to customers every year by Ofgem. Would you like to see this incentive expanded to include all maintenance days, and why?" the response was "Yes, because it will further minimise impact"*

- Centrica, Stallingborough Power Station, 2017

81 NGG have implemented process improvements that have changed the way we plan our maintenance thus reducing the impact on our customers. NGG continue to engage with the community which has resulted in a positive and better working relationship with our customers.

> *When asked: "Do you feel National Grid's maintenance day process has improved in the last 4 years?" the response was "Yes definitely".*

- RWE, Little Barford Power Station, 2017

82 Following support from stakeholders on the process improvements that we have implemented, we are proposing to maintain these elements of the scheme with the addition of a new incentive. The purpose of the new financial incentive was to reward an efficient level of Maintenance days for all other maintenance activities which have an impact on customers but are not covered by the current incentive.

Background

83 In order to facilitate work on the NTS, it is sometimes necessary to take an outage on a part of the network or reduce the flexibility available (e.g. where steady gas flows may be required to facilitate an inspection). This may affect one or more parties connected to the network. Primarily the work that affects our customers is as a result of routine maintenance, asset replacement, pipeline and defect inspections, emergency and faults and work to facilitate investment in the network, which may be as a result of a new connection or capacity requirement. These works affect both entry and exit points and are principally driven by statutory requirements[3] that are governed through policies and procedures.

84 In working with our customers to plan our system access requirements, we request outage programmes from relevant and impacted industry parties to facilitate alignment of work where feasible, to reduce its impact.

85 Under Section L of the UNC , National Grid is required to publish its Maintenance Programme twice each year. Maintenance can generally only be carried out during a Planned Maintenance Period, which covers the months April to October inclusive in each year.

86 The October Maintenance Programme is significantly smaller and includes work that either has limited network impact or cannot be undertaken during the summer for specific reasons.

[3] Including Pipeline Safety Regulations 1996 and Pressure Systems Safety Regulations 2000

87 In the event that work having an impact on customers is required to be run outside of the April to October period, or there is a specific customer request raised to align maintenance with an outage outside this period, it would be subject to a bilateral discussion.

88 This would subsequently be confirmed via an associated Advice Notice. The timescales for the production and development of the Maintenance Plan with our customers, as set out in the UNC[4], is as follows.

Table 5: UNC timeline

	April Maintenance Programme	October Maintenance Programme
Users provide estimates of their maintenance dates	by 30th November	By 30th June
National Grid publish a draft of the Maintenance Programme	by 1st February	By 1st September
National Grid hold Annual Maintenance Meeting(s)	by 1st March	Users may submit comments on draft Programme until 15th September
National Grid publish the Maintenance Programme	by 1st April	By 1st October

89 Our Maintenance Plan sets out a timetable for the work that is required on the NTS, taking into account affected parties' outage plans where users have given us that information. Following publication of the Maintenance Plan, any requests for changes from our customers or ourselves are assessed to take into account the potential impacts. These may include;

- The impact on other connected parties where there may be a coincidence with their notified maintenance
- Flow restrictions
- Previous changes as well as other impacts that may include resource and equipment availability, cost implications and any knock on impacts on other work

90 For exit related planned maintenance, there is a process set out in the UNC that enables us to inform customers of intended Maintenance Days where work has an impact on a specific site connected to the NTS. These Maintenance Days are notified in advance of the work to provide customers with an opportunity to discuss the timing and impact and for us to respond to any customer's requests for further information.

91 The concept of Maintenance Days only applies to system exit points and each Maintenance Day covers a 24 hour gas day. The number of Maintenance Days for system exit points (excluding Distribution Networks) and the notice period for issuing notices vary and is dependent on what is set out in the Network Exit Agreement (NExA) or legacy agreement for each site and the UNC.

[4] The timescales in the table above apply to all customers excluding Distribution Networks. The timescale for producing the Maintenance Programme with the Distribution Network is set out Section G of the UNC Offtake Arrangement Document (OAD) – Annex G2. http://www.gasgovernance.co.uk/sites/default/files/03_08_OADG.pdf

92 For entry related planned maintenance, there is no provision for Maintenance Days. Where Network Entry Agreements (NEAs) are in place with the upstream party, they facilitate outage information sharing to enable mutually beneficial co-operation, though there are no binding obligations on either party. Where agreement is not reached, capacity management tools such as capacity buybacks could be used to enable maintenance activities where they impact flows.

Scheme Performance Summary

93 As part of the review for the current incentive we have included details of how we performed during the second period of the incentive, post 2015/16 breaking down the incentive into the three component parts.

Reputational incentive to provide a three year maintenance plan

94 To improve communications we have implemented new processes to assess future maintenance impacts and inform maintenance parties of NTS maintenance activities which are expected to impact them over a three year period.

95 Each year we issue approximately 75 notices, for year ahead, and approximately 94 letters for maintenance two and three years ahead. These are issued as per the UNC, which include details of the planned NTS works that are expected to impact a given site. The exact number of notices change depending on the maintenance we have planned in.

Number of changes made by National Grid to Maintenance Days

96 We work with our customers to align our maintenance activity with their site outages wherever reasonably practical. To maximise the ability to align together, we have put in place a number of enhancements to our business processes, some of these include;

- Wider communications and engagement with our customers at industry events to discuss proposed maintenance schedules
- Proactively approaching our customers to understand their outage plans and track responses
- Review and assess other public information sources to identify other potential outages e.g. REMIT notifications
- Review and update customer contact lists to ensure the right parties are engaged in the end-to-end process
- Flexibly working with our customers to align work following issue of notices at the end of January but prior to the formal commencement of the maintenance programme
- Work with our customers to facilitate outage change requests within the maintenance period. To help facilitate this we have increased the number of touch points with the customer

97 Where we have been able to align work we have implemented a process to communicate the agreed maintenance periods via a process known as an "Advice Notice[5]".

98 To help identify last minute changes by the customer we have implemented an eight week ahead call, as a check point to identify if the customers outage plans have changed. This helps prevent National Grid finding out last minute about changes and be able to plan our other work load more effectively.

99 Where we have been unable to align maintenance to a customer outage plan, we have to call Maintenance Days. Two years have passed with the new incentive in place. A summary of the number of days of maintenance (both maintenance days and advice notice days) is shown below.

Table 6: Incentive Summary

	2015/16	2016/17
	Planned work (days)	Planned work (days)
In-line Inspection Days	30	5
Remote valve operations	25	35
Other asset works	0	192
Total	55	232
Scheme Profit	£199k	£500k[6]

100 In the formula years 2015/16 and 2016/17 we did not request any change to move or cancel Maintenance Days and as at publication of this document we have not initiated any changes (within scope of the current incentive) so far for the 2017/18 incentive year. This has been achieved by significantly increasing collaborative working.

101 Under the existing scheme parameters the target set for the number of changes to Maintenance Days and Advice Notice days that could be changed was set at 7.25% of the overall planned Maintenance Days and Advice Notice Days[7] in that particular year. In 2015/16 based on the 55 days called, this set a target of 3.98 days. As we didn't make any changes to the plan the scheme profit for this element was £50k multiplied by 3.98 equating to an incentive reward of £199,375. 2016/17 saw a plan size of 232 days, this has been due to an increase of projects at exit points.

102 Following publication of the final Maintenance Programme we were able to facilitate requests by our customers to move nine Maintenance Days in 2015 and 26 maintenance days in 2016. These within year changes impact our project team's timescales and their ability to complete other work. We also facilitated requests for some flow condition changes that our customers requested. Both of these elements, whilst highly valued by our customers fall outside the parameters of the incentive scheme.

[5] An Advice Notice does not have firm rights associated with it unlike a Maintenance Day which is a contractual right established within customers Network Exit Agreement.
[6] This is the maximum scheme profit achievable based on no requirement to change a Maintenance Day for the entire period.
[7] Please note that where a Maintenance Day or Advice Notice Day is called on more than one party for the same work that only one day is accounted for under the incentive scheme.

Number of days used for routine maintenance

103 Only those maintenance activities that directly impact on our customers and for which target baselines were possible to create are captured in the use of scheme incentive. The scope for the existing scheme only includes Remote Valve Operations (RVOs) for which targets were determined based on historical data.

Table 7: Scheme outturn overview

Year	Maintenance Target	Days used	Scheme outturn profit / loss
2015/16	11	2	£165k
2016/17	11	1	£190k

104 The cap of this scheme is £215k, if we use zero maintenance days; the first five days we used cost £25k per day, the subsequent days cost £15k until a collar of £500k is reached.

105 Due to the rigour that we have applied to enhancing our planning processes and operations, we were able to outperform against scheme targets in both years. For Remote Valve Operations we sought to align with other one-off NTS maintenance, customer outages and worked a lot more flexibly to avoid impacting our customers. Additionally, we explored different maintenance methodologies, including the use of 15 degree movements as a last resort following specific site assessments, to minimise customer impact. Finally, an internal policy change was implemented which increased maximum flow rates through a valve bypass.

Proposal Overview

106 Our proposal assesses the business process changes and operational experience gained since the new incentive was introduced. We have also taken into consideration feedback received from our stakeholders and customers in relation to our performance and the value this incentive is providing to customers. Our proposals are:

- Continue with the reputational elements of the incentive to provide customers with a Maintenance Programme that covers three years, facilitate reasonable requests from customers for changes to Maintenance Days and ensure customers are aware of the Minor Works Agreement which enables parties to contract for working flexibly outside normal working practices
- Continue the current incentive to encourage National Grid to minimise changes to published Maintenance Days and Advice Notices
- Continue the current incentive to minimise the number of Maintenance Days for RVOs (penalty for each day above target, benefit for each day below target)
- Introduction of an incentive to encourage National Grid to align a portion of asset replacement & reinforcements works to customer outages

Financial Incentive covering Changes to the Maintenance Plan

107 Stakeholders continue to express support for discouraging change to maintenance dates once they have been agreed so as to allow optimal operational planning including other site maintenance requirements. This helps reduce any risk premiums being passed on to consumers, due to the associated implications on planning and operations processes.

> *"Changes at short notice can be costly"*
>
> **- Energy UK response to Ofgem consultation, 2014**

108 During 2015/16 and 2017/18 we made no changes to the agreed Maintenance Days issued to our customers. We were able to achieve this through a combination of a number of business process changes implemented by us in response to our customer's feedback, including:

- Organisational change to ensure clear accountability for the definition and communication of maintenance work with our customers
- Introduction of a central planning process to control our outage works with an escalation process put in place for review and approval of all proposals for calling new Maintenance Days or changing existing ones
- Additional focus and resource allocated to analysis and assessment of work
- Prioritisation of assignments with great customer impact and moving other work around customer change requests. In 2015 an unknown fault placed a customer project at risk of delay, due to valve procurement lead times; we prioritised this project over other work resulting in us being able to meet previously agreed customer days with the consequence of delaying the other project

109 Our proposal is to continue with this incentive in its current form, as we believe it drives benefit for customers. Certain projects can have long time scales for design work, ordering parts, getting planning permission etc. There is also uncertainty introduced by working with contractors, as well as unforeseen circumstances due to customer requests, reliability of network assets, and offtake/entry point demand. Ensuring we can still meet pre-planned maintenance dates in a constantly changing environment requires significant work from our project teams and sometimes resulted in cancelling other work to meet our customer commitments.

110 When all customers were consulted, they stated they would like the current maintenance incentive scheme to continue.

> *"Over the past few years it (the maintenance day process) has improved, and continues to improve".*
>
> **- Centrica, Stallingborough Power Station, 2017**

Performance measure

111 For this purpose, the baseline would be taken on 1st April for the year-ahead plan (as with the existing incentive scheme). The allowed number of changes would be 7.25% of the total days of the plan (Maintenance Days and Advice Notice Days combined) by this percentage in order to derive the target changes.

Scope of changes included within the incentive

112 As with the existing scheme, only changes initiated by National Grid would be included within the scheme scope. The types of change during the maintenance year can generally be categorised into date changes and cancellations. We propose that this incentive continues as is.

113 On reviewing the scheme, we continue to support the original coverage of works to remain the same as in the current incentive scheme because they are planned activities with some level of control over when they occur:

- Routine Maintenance (e.g. Remote Valve Operations)
- Planned asset replacement & reinforcements (e.g. boiler replacements, work to facilitate the replacement of compressors to enable compliance with IED and incremental capacity requirements)
- In-Line Inspections (ILIs)

114 The following activities are excluded from this incentive because they cannot reasonably be forecast in the baseline maintenance plan at year ahead stage or there is a reduced level of control over the timing of these works because of the reactive nature of this work:

- Emergency work and fault management, including pipeline feature inspections
- Work on behalf of customers (including Minor Works Arrangements)

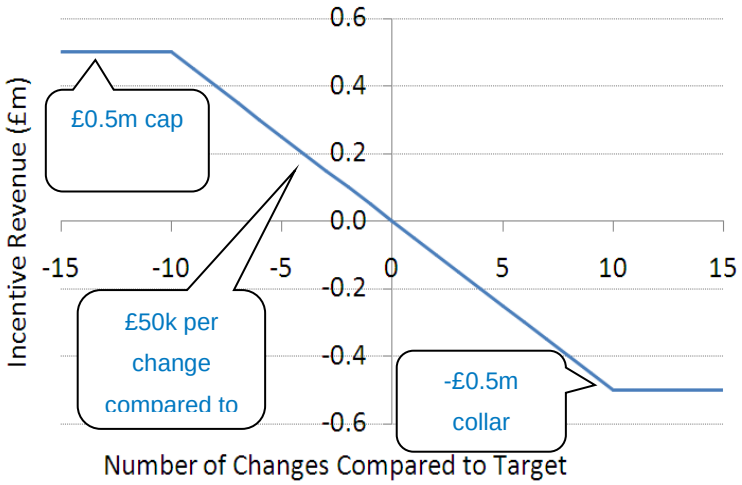
Value

115 Changes to our maintenance plan have the potential to cost our customers hundreds of thousands of pounds in lost revenue dependent on their business type and their commercial arrangements.

> *"All gas maintenance days can affect our business commercially and operationally when we do not have concurrent planned outages (with National Grid)."*
>
> **- Seabank Power Ltd, 2017**

116 Stakeholders have told us that they value the certainty delivered by not changing agreed maintenance dates as much as they value the reduction in time taken to undertake routine maintenance jobs. We therefore recommend that the existing values attributed to minimising days changed is retained at £50k per day, with the existing cap and collar unchanged. Diagram 9 depicts this.

Diagram 9: Maintenance Days Change



Length

117 We propose that the maintenance change incentive is an annual financial incentive for the remaining three years of RIIO-T1. This review point would then ensure that the incentive is still appropriate.

Financial Incentive covering the Use of Maintenance Days (Routine Valve Operations Only)

118 The efficient use of Maintenance Days for RVOs is also important to our stakeholders who value opportunities to reduce our impact of undertaking maintenance, and thus reducing the impact on their operations.

119 The aim of this incentive is to place a value on the efficient use of Maintenance Days challenging us to innovate in the way that we plan and perform our activities, whilst still being mindful of our obligations to maintain safety and reliability of the system.

120 The incentive penalises us for the use of any Maintenance Days against a Target level that reflects the level of work required on the NTS and rewards us for aligning our work with customers.

Performance Measure

121 To measure our performance in using an efficient level of Maintenance Days to deliver the work required, we propose to continue with the existing scheme measurement criteria, which assess the difference between the target number of Maintenance Days and the actual number of Maintenance Days used.

Scope

122 In our previous incentive proposals we suggested that only those maintenance activities that directly impact on our customers would be captured.

123 Using the above criteria at the time, the scope included only Remote Valve Operations (RVOs).

124 RVOs aligned to other maintenance activities are outside the scope of this incentive, as the overall impact to the customer has been reduced, which is the same as the current incentive.

Target and adjusters

125 To date we have reduced the number of Maintenance Days through:

- Engaging with our customers to identify their outages and successfully aligning and agreeing RVOs to be undertaken alongside these customer outages confirmed to us as part of the maintenance planning process
- Reviewing and confirming our ability to undertake a RVO with no impact on customers due to NTS re-configuration or local agreement whilst retaining associated safety and reliability requirements of the network
- Alignment of a number of RVOs with other scheduled asset replacement work on the NTS to minimise the overall impact of Maintenance Days on our customers. This asset replacement work is of a one off nature and therefore cannot be assumed to be repeated in future years

126 Whilst the process improvements and planning activities that we have undertaken to date have driven value to our customer base by reducing the number of days of impact, this is not necessarily something that can be repeated on a continued basis. This is due to the availability of customer outages, the ability to undertake partial valve movements and the ability to not detrimentally impact the enduring health of the assets.

127 For the reasons above we are recommending a continuation of a target of 11 days.

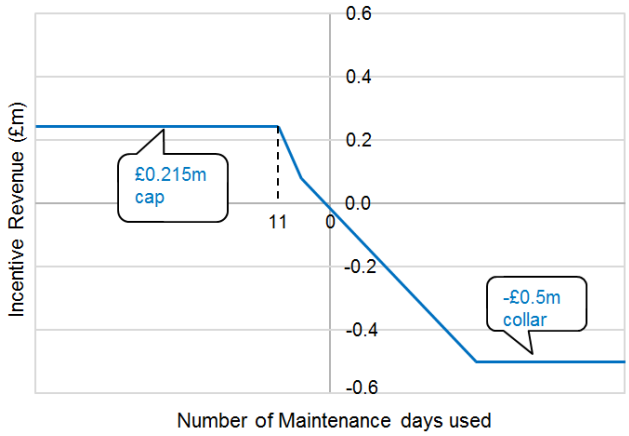
Value

128 Through our engagement with stakeholders, we are aware that by reducing the impact of our maintenance plan, this can have a large potential value for stakeholders. The value provided to power stations being able to operate when they would have been called off has been calculated at approximately £1.4m[8].

129 We are proposing a continuation of the current incentive framework; a cap of £215k, the first five maintenance days used cost £25k each, the subsequent days cost £15k until a collar of £500k; Diagram 10 depicts this;

8 Figure calculated by determining revenue generation per MW; taking into account gas, electricity and carbon price, additionally it is in line with what power stations state they generate

Diagram 10: Maintenance Days Used (RVO)



Length

130 We propose that in line with the other elements of the broader maintenance incentive that this is subject to review as part of RIIO-T2.

Financial Incentive covering the alignment of other work

131 Any maintenance day we use will impact third parties. Efficient use of Maintenance Days (other work) is highly important and valued by our customers. RVOs days only make up 13.5%[9] of 2017/18 overall plan size.

> *"Adding additional maintenance activities makes so much sense."*
>
> **- ENI, 2017**

> *"We are delighted that you are considering more maintenance activities under the umbrella of the incentive, we have wanted this for a while".*
>
> **- Energy UK, 2017**

132 The aim of this incentive is to encourage us to align a higher proportion of our work to customer outages. We will also be subject to incentive costs if we are unable to align an agreed proportion of work. We have to also bear in mind that many of these activities may be linked with us meeting our safety and reliability standards and other customers' requirements for connections and diversions.[10]

133 The incentive rewards us for the reduction of Maintenance Days over the baseline target set each year. The baseline target will be determined annually dependant on the size of the plan in a given year.

9 38 RVOs days compared to 243 other work days

10 New customer connection or customer initiated diversions

Performance Measure

134 The baseline would be taken on 1 April for the year ahead plan. We propose that 10% alignment of the total size of the plan, excluding RVOs, would be our breakeven point. This means that aligning 10% of our activities as a minimum is required before moving into positive incentive performance.

135 One of the issues we have with aligning work with customer outages is that these outages are subject to change, either within year or from year to year. This can make it difficult for us to complete our required work if the cancellation is at short notice. We would not be able to issue a Maintenance Day due to UNC timescale requirements or if a customer outage is bought forward significantly as our project may not be progressed enough to complete the work under compressed timescales; however, if NGG are able to accommodate and the work falls within certain timescales, this can cost 15%[11] of the project.

136 Aligning more work with customers increases the risk profile of National Grid. In 2016/17 the risk was £1.3m.

137 The Transmission Owner (TO) and System Operator (SO) will have to work more collaboratively to ensure this alignment is deliverable. This becomes more difficult when customers change their outages within year as it can have a knock on effect, impacting other scheduled work and can ultimately add risk to the TO deliverability of their planned work, for which they have Ofgem targets.

Scope

138 All Maintenance Day notices and Advice Day notices that directly impact customers are included within this incentive, excluding RVOs as these have their own separate incentive as the nature of RVOs is very different to other works.

139 This will include but is not limited to feature inspections, in line inspection (ILI) runs, replacement, valve replacements/refurbishment, metering works, telemetry work and analyser work.

Value

140 Through our engagement with customers and stakeholders, we are aware that all maintenance days used have commercial impacts. Reducing the number of maintenance days will provide great value for customers and stakeholders alike.

> *When asked "National Grid is currently incentivised to reduce the number of RVO maintenance days submitted to customers every year by Ofgem. Would you like to see this incentive expanded to include all maintenance days, and why?" The response was "Yes, this provides commercial advantages to site"*
>
> **- Barford Power Station, 2017**

11 This is due to project delay costs; for contractor/equipment stand down

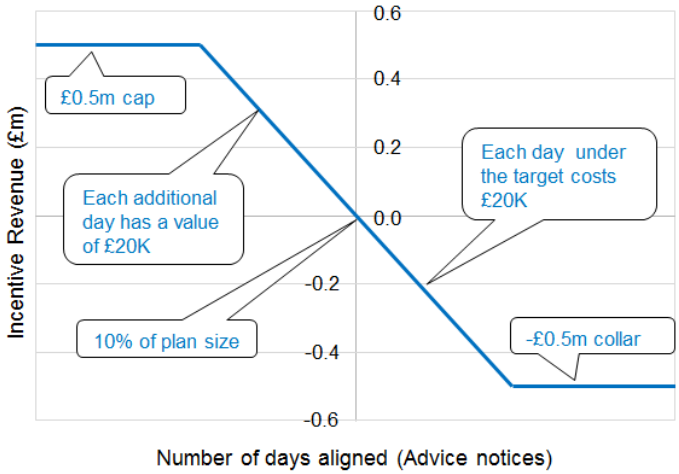
Target

141 The majority of the stakeholders we have consulted voiced support for the introduction of an incentive in regards to the use of Maintenance Days for other maintenance activities.

142 In 2017/18 the 243 other work days have an estimated revenue loss for customers of approximately £24.3M[12]. This shows a large area of potential value we can deliver to our customers, however there are factors which make alignment difficult; where the work is required compared to where customer outage are, limited control of plan size[13] and delivery deadlines by Health and Safety Executive (HSE).

143 Our proposal is to set a target for alignment at 10% of the overall size of the plan, excluding RVOs. At this 10% alignment we make no revenue nor suffer any loss. Each additional day we align over the target we are recommending is worth £0.02m, with a cap of £0.5m and each day under the target we incur a cost of £0.02m, with a collar of £0.5m. This is depicted by diagram 11.

Diagram 11: Alignment of other work



144 E.g. in 2017/18 the overall plan size was 243 based on this we would be incentivised as a minimum to align 24 days. Only alignment above 24 days would generate incentive revenue.

12 Figure calculated by determining revenue generation per MW; taking into account gas, electricity and carbon price, additionally it is in line with what power stations state they generate. Average cost per day is £0.1m, some power stations daily revenues can be up to £0.3m

13 This is because work can be based of HSE requirement, asset life, other customer requires (for new connections or diversions)

Table 8: Value created prior to making any revenue on incentive

Year	Workload	Breakeven alignment	Value created (£m)
2018/19	279	27	2.7
2019/20	320	32	3.2
2020/21	368	36	3.6

Length

145 We are proposing that in line with the other elements of maintenance incentive that this incentive is subject to a full review as part of RIIO-T2. This will insure two years' worth of data when we enter discussion.

Greenhouse Gas Emissions

Overview

146 NTS assets are designed to release gas as an inherent part of their commissioning, operation, maintenance and decommissioning. As environmental awareness increases, the costs and benefits of operational decisions and alternative investments need to be continually reviewed.

147 One of the key outputs determined as part of the RIIO regulatory framework for Gas Transmission, was minimising the impact which our operations have on the environment through emissions. In recognising this key output, an incentive scheme was defined to encourage reductions in the volume of natural gas emitted to the atmosphere wherever operational decisions permit.

148 It is crucial in the review of this incentive that we consider all stakeholders, both internal and external; whist also observing that there are no obvious direct beneficiaries for this incentive. Indirectly, the GHG incentive impacts everyone both now and in the future and NGG must consider the balance between our effect on the environment and working efficiently.

149 During the current incentive period, NGG have undertaken a detailed review of specific asset venting characteristics, both through reviewing existing processes and implementing new initiatives such as the Greenhouse Gas Investigative Mechanism. The findings associated with our work over the last three years has provided us with a better understanding of the scale and scope of our emissions and has challenged a number of principles used in wider emission calculations.

150 At the 2014/15 review stage, the scope of the GHG incentive was determined; “we have concluded that at this stage compressor emissions remain the only element of our operational activities where it is possible to create a scheme that drives the right behaviours, and recognises what is broadly within our control.” It was also previously stated that the improvements within capability and understanding would make a case to “potentially extend the breadth of the incentive.”

“We think that you are getting a handle on your GHG emissions and we support your incentive proposition.”

- Energy UK, 2017

151 The 2014/15 consultation detailed three main criteria that form the basis of a review;

- Developments in the review of further sources of emissions. We now have the ability to accurately assess the criticality and volume of different types of venting through projects such as GHGIM
- Validation of any proposed targets and methodologies, to define robust incentive arrangements. We have assessed the current mechanism for the downside only incentive and consulted with industry on how to make sure this is reviewed in order to drive maximum effectiveness

- Assessing the implications on timelines for compressor fleet replacement, driven by compliance with the Industrial Emissions Directive (IED), to which there is no change

152 In consideration of these factors, we are proposing to move to a symmetrical incentive with a cap/collar at +/- £1m and to reset the baseline target to reflect the greater use of compression to support higher system flows. We are also proposing to amend the targets and reported metrics to reflect areas where NGG is unable to influence the outcome, which is the dynamic and static seal leakage within the calculation.

153 NGG believe that it is appropriate to set a symmetrical incentive which has a cap and collar proportionate to the benefits it can deliver for system users and consumers. We believe that this reflects Ofgem's position following their Final Proposal document[14], which was to create a five year scheme that restores an upside incentive.

154 In proposing this document, we have considered the outlook for changing supply and demand patterns over the RIIO-T1 period, and this continues to remain uncertain. The extent to which external factors affect patterns of compressor operation, fuel consumption and consequential venting needs to be considered in the design of any future incentive mechanism as part of RIIO-T2.

Background

155 As part of their regular operation, NTS assets release natural gas into the atmosphere. This release, known as 'venting', occurs to varying degrees from seven NTS separate asset types:

- Compressors
- Pipeline systems[15]
- Pipeline Inspection Gauge (PIG) traps
- Filters
- Scrubbers
- Measurement, including chromatographs
- Valves

156 Each asset type has different characteristics including the extent to which gas is inherently released, or periodically vented as part of its operation or maintenance.

157 Venting of natural gas to atmosphere is known to have a detrimental impact on our environment, with a tonne of natural gas currently calculated to have the equivalent impact of 21 tonnes of CO_2. Quantifying its impact, and using BEIS' assessment of the social cost of carbon, enables us to optimise investment and operational decisions.

158 Venting levels are significantly affected by activities that are required to meet safety and environmental legislation as well as operational considerations. To control and

[14] Gas System Operator (SO) incentive schemes from 2013 final proposals consultation; https://www.ofgem.gov.uk/publications-and-updates/gas-system-operator-so-incentive-schemes-2013-final-proposals-consultation

[15] Maintenance is comprised of two elements; planned maintenance underpinning system reliability and compliance with safety regulations, and reactive (unplanned) maintenance to address unexpected system issues.

minimise the extent of gas release, options need to be considered, optimising between operational, capital and environmental costs whilst not compromising safety.

159 The 2014/15 GHG scheme was therefore put in place to encourage the reduction in the volume of natural gas emitted to the atmosphere, however the current scheme has not reduced the amount of venting. We believe the incentive can be further enhanced to achieve a reduction in venting.

Incentive scheme performance

160 The following table illustrates the level of difficulty in relation to compressor emission performance.

161 For every tonne vented above the target level the value is determined from the carbon equivalence of natural gas, and the BEIS non-traded price of carbon reflecting the social cost.

Table 9: Recent compressor performance

Regulatory Period	Year	Target	Performance	Venting Price	Incentive Revenue
Pre RIIO	2010/11	3,007 10% dead band	3,346 tonnes	£1,100 / tonne	- £209k
Pre RIIO	2011/12	3,007 10% dead band	3,000 tonnes	£1,145 / tonne	£0k
Pre RIIO	2012/13	3,007 10% dead band	3,443 tonnes	£1,224 / tonne	- £354k
RIIO T1	2013/14	2,917 Downside only	3,332 tonnes	£1,302 / tonne	-£540k
RIIO T1	2014/15	2,829 Downside only	2,857 tonnes	£1,393 / tonne	-£39k
RIIO T1	2015/16	2,744 Downside Only	2,882 tonnes	£1,417 / tonne	-£195k
RIIO T1	2016/17	2,897 Downside Only	3,592 tonnes	£1,455 / tonne	-£1m
RIIO T1	2017/18	2,897 Downside Only		£1,510 / tonne	Likely to be circa -£1.2m

162 During the first year of operation against the new incentive scheme introduced in the RIIO-T1 period, our overall performance showed a slight reduction from the previous year's emissions. However this still fell within the range of the performance seen over the preceding three years. This was despite us introducing operational process changes. As you can see, in 2016/17 controlling the vents became more challenging due to the changing flow patterns of the NTS.

163 In order to continue to focus on improving our performance on levels of emissions we have instigated a process improvement project to further standardise and optimise the operational factors contributing to venting decisions. The level of reduction in

emission levels achievable from process efficiency is however expected to be limited due to high flows. We have also instigated the GHGIM project and a network strategy optimisation which aims to release an amount of data that will allow us to identify and correct any leakage related issues. NGG believes the outputs from GHGIM will provide a strong platform when reviewing this incentive ahead of RIIO-T2.

164 In reviewing and analysing our performance, it is important to evaluate the overall breakdown of the emission levels to assess the contributory factors and the extent in which we are able to drive improvements.

165 The table below shows the emissions by component part on our full compressor fleet for a two year period. The categories can be summarised as follows:

- Static Seal Emissions - On compressors, there are seals on static to static connections, whereby two non-moving parts are connected together. Static seals are used to prevent emission of process gas to the outside cab atmosphere

- Dynamic Seal Emissions - On compressors, there are seals on the compressor shaft to the casing. When the compressor is pressurised these seals leak by design in order to create suction

- Emergency Shutdown (ESD) Vents – Where for safety reasons the compressor unit trips during operation, gas within the unit and its associated pipework is vented

- Start up Purge Vents – Inert gas is used to purge the compressor (and fuel lines on gas powered compressors) of air prior to starting a compressor. This is necessary to remove the risk of air entering the pipeline system

- Starter Vents – Where a gas starter motor is installed, natural gas is used to start the gas turbine. This process results in an amount of venting

- Fuel Gas Vents – Venting which occurs from the fuel line to the compressor which occurs during shutdown and isolation of the compressor unit

- Planned Vents – Depressurising a compressor and associated pipework when the compressor is no longer required for active duty for a period of time

Table 10: Recent compressor performance

		Planned Vents	ESD	Fuel Gas Vents	Starter Vents	Start-up Purge Vents	Dynamic Seal Emissions	Static Seal Emissions	Total[16]
		TO Control		SO Control			No Control		
13/14	%	45.61	7.28	0.25	4.13	10.88	8.71	23.14	100
	Tonnes	1479.05	236.10	7.99	134.03	352.93	282.52	750.43	3243.05
14/15	%	37.26	10.80	0.16	4.33	10.02	7.93	29.50	100
	Tonnes	1044.67	302.85	4.51	121.50	281.08	222.33	827.10	2804.04
15/16	%	35.38	12.64	0.12	3.37	9.67	9.19	29.63	100
	Tonnes	1019.61	364.37	3.57	97.05	278.62	264.71	853.78	2881.71
16/17	%	36.49	13.76	0.12	1.96	12.74	13.76	21.17	100
	Tonnes	1310.93	494.40	4.33	70.59	457.54	494.47	760.46	3592.72

166 Year to date flows and resultant venting for 17/18 are similar to the pattern seen in 16/17.

Venting

167 In assessing the categories of venting against our source data set, we can determine the extent to which we have direct control over the level of venting. In this next section we will be discussing situations where we have limited or no control without significant asset re-design.

Venting where we have no control

168 As part of the inherent design of seals, there is continuous venting when the unit is in a pressurised state (standby mode or running). At the current point in time it is not economic to consider replacing the seals that are designed to leak.

169 Static seal leakage is concerned with static joints on the compressor such as the inlet, and the technology must leak in order to create maximum seal and to maintain the integrity of the unit. Dynamic seal leakage is concerned with the seal and level of suction between rotating and static parts within the compressor. Leakage is necessary to ensure a vacuum which creates the tightest seal.

[16] The difference between this total and the RRP total on Table 10 is due to Station Vents. This type of venting is excluded from the incentive under the license however has historically been included in the RRP submission.

> *"(Incorporating the newest seal design) might cost up to £100k per seal, costing the customer millions. Therefore you are right to be doing what you are with the incentive."*
>
> **- Hatfield Moor Storage, 2017**

Venting where we have limited control

170 Emergency Shutdowns (ESD) are to protect asset integrity and safety, compressor units are fitted with appropriate fail-safe measures, which mean that in some instances a compressor unit will automatically "trip" resulting in a level of venting. This feature is integral into compressor design. This is something that we cannot prevent for safety reasons, however there is an argument to say that network planning should minimise these occurrences in the first place therefore we deem this as having 'limited control.'

Venting where we have greater control

171 Other vents including starter, fuel gas, planned and start-up we have greater control over. Categories of vent completely within our control make up approximately 1,800 tonnes per annum can be attributed to the aforementioned areas. These types of venting are predicated on decisions made by considering economic, safety or reliability factors.

- Taking a balanced operational decision to vent based on an assessment of the likelihood of the compressor being used in the near future. This decision needs to be judged in comparison to leaving the station pressurised with the associated impact on seal emissions and ancillary equipment running costs

- Where a compressor unit has been in a depressurised state for a 28 day period, our operational policy is to ensure asset reliability by undertaking a unit test. Once a test has been successfully completed the unit may be depressurised and returned to cold-standby position with an associated venting decision made. This decision will be made based on the same assessment criteria as described in the operational decision process. This practice is fundamental in helping assure that operational reliability is maintained

- Where we are undertaking short-term maintenance activities where the unit is not available for operational use for brief periods of time, but we are required to depressurise and vent gas to ensure safe access to compressor cabs to undertake the works

- A small number of our compressor stations are located close to customers who alongside ourselves have specific requirements for compression e.g. to undertake meter validations. In such circumstances it may be necessary to provide specific pressure/flow requirements for brief periods which may then require an associated venting action

172 To further understand the factors which contribute to the decision to vent, we have considered two of the main elements impacting our compressor usage patterns. These are expanded further below

Operating in a changing supply and demand environment

173 Compressors are used to safely manage system pressures and transport gas from NTS entry points to exit points. A number of factors determine the underlying operational compressor strategy and our ability to optimise between venting and retaining units in different operating modes. As we progress through the RIIO-T1 period we expect to continue to see additional volatility and uncertainty in the location and level of supply and demands on the NTS. The combined effect will alter flow patterns further on the NTS, moving away from historic, relatively steady state predictable North to South flows, to greater flow diversity in our customer's use of network capacity, requiring greater compression flexibility. As such, there is considerable uncertainty in the future operational compressor strategy and consequential venting.

Within day supply and demand volatility

174 In addition, we are also observing an increase in within day flexibility requirements from our customers. This influences our compressor operations used to ensure our pressure and contractual obligations to customers are being met.

175 We have seen an average Linepack swing of 10.4 mcm since the start of RIIO T1 compared to 9.2 mcm pre-RIIO. Similarly the number of days where the Linepack swing is over 20 mcm has increased from an average of 14 days per year pre-RIIO to 32 days per year during the first four years of RIIO T1, a substantial change that means it is becoming ever more difficult to optimise the network. Consequently compressor emissions are higher both from leakage and switching parts of the network in and out (through start up venting etc).

Pipeline depressurisation

176 To determine the magnitude of pipeline depressurisation, a methodology was developed based upon characteristics of the pipeline and pressure. Calculations require manual collection and collation of data by field-based operatives, which is then made available for associated analysis and reporting. Alternative system-based options were considered, but they were not developed, due to the requirement for additional asset investment (pressure sensors etc), costly data collection methods and amendments to Critical National Infrastructure (CNI) IT systems.

177 In addition to the technical challenges in collecting data, our data analysis has confirmed that there is considerable variability in the level of vented emissions on an annual basis. This variability is primarily due to the variations in the level of planned activity, together with volatility around urgent notice works, which need to be addressed as a priority with less opportunity to use recompression equipment.

Future Incentive Scheme Structure

178 Following completion of the scheme of works, our incentive proposals look at scheme design covering the compressor emissions area only. We believe that this is the most appropriate area for future scheme design aligning with the assessment criteria introduced in Ofgem's consultation of promoting the right behaviour in minimising environmental emissions, whilst ensuring that the SO is incentivised on outputs that are within its control.

179 We are proposing the introduction of a symmetrical incentive as suggested by Ofgem in the 2014 consultation. This symmetry would give National Grid incentive to always

drive further reductions in GHG emissions and not just limit GHG emissions to the target.

180 The proposed new parameters are:

- The scheme is to be extended for a further three years until the end of RIIO-T1
- The scheme performance is to remain calculated on an annual basis
- The incentive is to remain focused on compressor emissions, although only around the five mechanisms of venting that are in our control:

  a) Planned Vents
  b) ESD Vents
  c) Fuel Gas Vents
  d) Starter Vents
  e) Start up Purge Vents

- The two types of seal leakage are to be removed from the calculation for Greenhouse Gas Emissions:

  a) Dynamic Seal Leakage
  b) Static Seal Leakage

181 We have the capability to accurately assess the percentages of all these different types of emissions for calculation purposes.

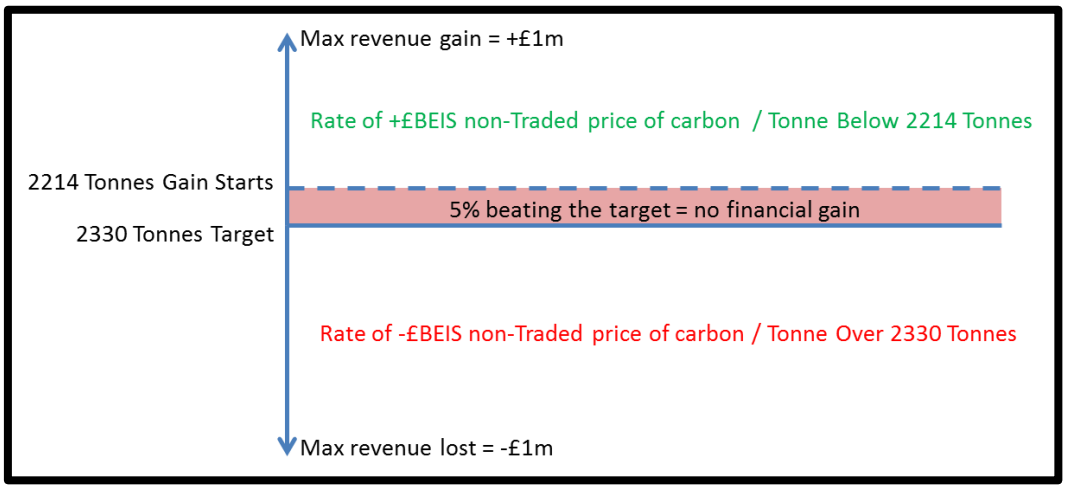
182 If the above mechanism is implemented then we propose a reduction to our targets in line with a baseline set by Ofgem.

183 We propose a symmetrical incentive capped at +/-£1m at the RPI adjusted value per tonne. The pain or gain will be linked to BEIS non-traded price of carbon reflecting the social cost. See diagram 12.

Setting the target

184 We propose to reset the target start position, at 2,330 Tonnes followed by a further 5% reduction in total over the remainder of the incentive period. This been calculated by removing the proportion for the static and dynamic seal leakage from last year's results, as this most accurately reflects the operation and potential uncertainty over the remainder of RIIO T1.

Diagram 12: Target for the year 2018/19



185 We have proposed an upside to this target for the aforementioned reasons however have also included a 5% hurdle rate as an incentive to stretch us. This means that the first 116 tonnes under the target will not have a financial gain attached, based on the 2016/17 BEIS non-traded price of carbon.

Scheme Duration

186 We acknowledge feedback from stakeholders who highlighted the need to review the incentive once there is more certainty around the implications to the compressor fleet as part of proposed compressor replacement projects. The current timeline expectation is that the majority of this work will not affect our emissions in the RIIO-T1 period.