RIIO T1

nationalgrid

System Operator External Incentive Plan – 2014 review

National Grid
Gas Transmission

July 2014

About this document

This document sets out our System Operator incentive proposals for the three incentives highlighted in the Gas System Operator incentives review consultation raised by Ofgem in April 2014. The incentives included in scope for this document are therefore Demand Forecasting (D2 to D5), Maintenance and Greenhouse Gas Emissions. It describes the latest position on the operating environment against which the incentives are set and highlights how these have been considered in our recommendations for future incentive schemes.

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 first price control to be set up through the new 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 new RIIO framework is the extension of the regulatory period to cover an eight year period ending in March 2021. Accordingly where it was possible to design incentives that removed enough risk of environmental change, they were set for eight years. Under the first RIIO framework two new incentives were introduced, focussing on delivering the outputs that stakeholders highlighted were of core value. 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. As these incentives were new, they were only set for two years in duration so that they could be subsequently reviewed to test the value they were delivering to customers.

4 As well as these two incentives, the existing Greenhouse Gas incentive framework was set for a reduced period, this time for three years. This was to allow us 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 Ofgem initiated the review into the future of these three incentives, through their consultation that was launched in April 2014. NGG initially responded to this consultation in May. This document is a more detailed response that builds upon stakeholder comments received in Ofgem's consultation and from additional events that we have held. It 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 • Two options proposed for calculating a target baseline • Continued equal weighting on each of the four forecasts, whilst also maintaining greater weighting on accuracy at times of higher demand • Reward and penalty of £0.5m for a 7% increase / decrease in performance • Tightening of scheme cap to £2m 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 • Explore extending the scheme to include Advice Notices • Continued cap of £0.5m and collar of -£0.5m, with a £50k value to changes Use of days scheme • In-line Inspections (ILIs) to be taken out of financial scheme • Remote Valve Operations (RVO) target reduced to 33.25 days • Cap of £0.665m and collar of -£0.665m, with a £20k value to changes
Greenhouse Gas Emissions	• Scheme extended for a further two years • Scheme structure to be based on a symmetrical basis • Performance to be calculated on an annual basis • Incentive to remain focussed on compressor emissions • Three options presented for resetting the baseline target

7 The proposed incentive structures have been designed in line with the principles as set out by Ofgem and will hold us accountable for delivering the outputs that our stakeholders value.

8 We look forward to engaging with Ofgem and the wider industry as we continue through this consultation process.

Document Structure and Next Steps

Structure

9 This document sets out our proposals for the future of the gas SO external incentives which are subject to review namely:

(a) Demand Forecasting D2 to D5

(b) Maintenance and outage planning

(c) Greenhouse Gas Emissions

10 The first section of this document provides context around the SO environment that we will be operating under for the remainder of the RIIO-T1 period, the principles that underpin the proposals that follow and details of how we have engaged our stakeholders. The document then concentrates on the three incentives in turn, outlining our rationale for the proposed structure of the incentives.

11 In constructing our proposals we, as well as Ofgem, have looked to consult our customers and stakeholders in order to capture their views and best understand the outputs that they require us to deliver.

Supporting Information

12 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 around the incentive review process.

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

Contact details

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

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14 To register your interest in receiving future communications on SO incentives please email: box.SOIncentives.Gas@nationalgrid.com

Ofgem website links

15 The corresponding web pages which contain Ofgem's consultation documents can be accessed through the following link:

https://www.ofgem.gov.uk/publications-and-updates/gas-system-operator-incentives-review-initial-consultation

Stakeholder Engagement

Overview

16 In developing our plans we have engaged with our customers and stakeholders so as to understand how best we can be incentivised to deliver the outputs that they require. The views that we have collected, as well as those that Ofgem received through their initial consultation have been used in shaping our SO incentives business plan.

17 This section describes the engagement we have undertaken and how views have been incorporated into our plan.

Engagement Process

18 We have listened to our stakeholders to understand the value that they derive from the outputs that the incentives look to deliver. The views expressed have been used to help evolve the three existing incentives that are under review to further hone in on what really matters to them.

19 We recognise the significant burden that is currently being placed on stakeholders with regards to the number of consultations being conducted by the industry and the associated draw on their time. Correspondingly our engagement strategy has focussed around utilising existing fora to minimise the resource requirement on the industry, whilst allowing stakeholders to articulate their views on the incentives.

20 This approach has led to us presenting at the following events, covering the three incentives under review. Prior to these meetings we made appropriate material available so that representatives at these events could gauge the wider views of their organisations prior to attending these events. Utilising this approach, over 40 organisations have been engaged to date.

Event(s)	Stakeholder groups covered
Operational Forums	Predominantly the Shipper community
Major Energy Users Council DSR meeting	Major industrial users
Gas Customer Seminar	Shippers, direct connects and other industry parties

21 We have also drawn on the stakeholder responses that Ofgem received to its 'Gas System Operator incentives review – Initial consultation'[1], which closed in the middle of May, to inform our plans. In addition to the written comments received, we sought further views from the respondees to this consultation and contacted them individually to gain a greater understanding of what outputs they value from the activities that we are incentivised to deliver.

[1] The consultation and industry responses are available at https://www.ofgem.gov.uk/publications-and-updates/gas-system-operator-incentives-review-initial-consultation

22 From our engagement activities we have been provided with a variety of views regarding the various elements of the three incentives that are up for review. In certain areas, these are consistent, whilst in other cases stakeholders have contradictory views and requirements. Our plans have considered these in proposing the changes to the incentives.

23 One common theme that has been raised is that stakeholders wish to see more details regarding how the parameters have been set for the structure of our incentives. This document should help provide this level of detail to the community, allowing greater challenge to our incentive structures making sure that the frameworks clearly deliver the outputs that they value.

Next steps

24 We will continue to work with our stakeholders in the development of the existing SO incentives through to the end of the RIIO-T1 period. Correspondingly, we will consult further if it is necessary to create any new incentives to help deliver the outputs that our customers require in response to the evolving SO landscape.

The System Operator Role: Now and into the future

The role of the SO

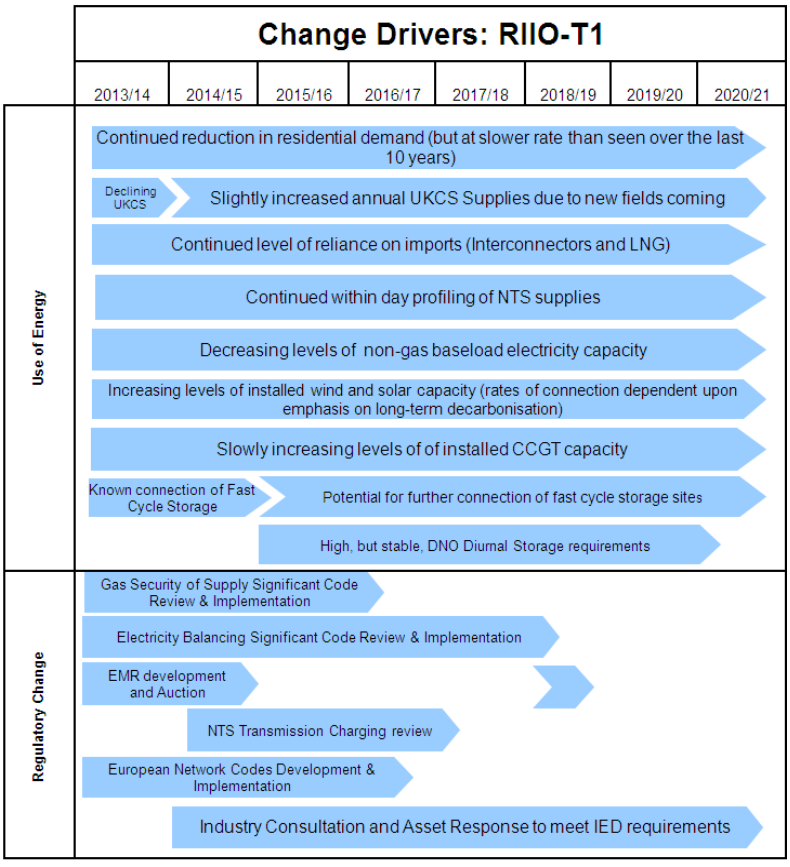
25 Our principle role as the System Operator (SO) is to operate the NTS to ensure that gas is transported safely, reliably and efficiently across our network. Alongside our other obligations, we balance supply and demand nationally for gas and help facilitate the economic operation of the market.

26 As SO, our challenge is to ensure that throughout the RIIO-T1 period we have the appropriate level of operational capability to meet our obligations, but also to deliver the level of service that our customers expect.

The challenges faced

27 In setting incentive frameworks, it is important to recognise how the external environment will shape the way that we operate the system. By doing so, it is only then possible to make a judgement on whether the incentive frameworks are suitable to deliver on the longer term outputs that our stakeholders and end consumers require. In presenting our incentive proposals we have been mindful of the changing operational landscape and the effect that this is likely to have on our ability to continuously perform against. The key change drivers are illustrated in the diagram below.

Diagram 1: Change drivers



Operating in a changing supply and demand environment

28 Supply and demand in the UK gas market is continuing to become increasingly volatile, and we expect this trend to continue. Even with the small forecast increases in UKCS supply, we will still be heavily reliant on imports via LNG and Interconnectors. The resulting diversity of supplies means that gas can be supplied from any terminal in varying volumes from one day to the next. Similarly, new 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 have the ability to significantly impact on how our customers wish to use our network.

29 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 to meet End of Day (EOD) balance. In addition, the closure of coal plants means that CCGT output will become more intermittent as renewable generation grows over the period.

30 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 variability will challenge our ability to forecast demand and correspondingly configure our network to accommodate these flows.

31 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 future environment.

Facilitating markets and supporting regulatory change

32 As we progress through 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. The programme of work to support this requires significant changes to the Uniform Network Code (UNC) and the GB regime, and to a lesser extent our transmission licence. 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 and will consult if necessary.

33 As well as adapting our operations and processes to align with the emerging European frameworks, we continue to manage the effects of regulatory changes to the GB frameworks such as:

(a) Significant code review on Security of supply;

(b) Designing and delivering a Demand Side Response mechanism

(c) Managing the behavioural changes of customers in response to Electricity Market Reform;

(d) Implications of Industrial Emissions Directive

(e) The emerging Transmission Charging Review

In summary

34 Appropriately structured incentives will be key in making sure that we adapt and overcome these operational challenges. 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

35 This section describes the principles against which we have developed our proposals. They draw on the principles set out in Ofgem's recent consultation "Gas System Operator incentives review: Initial consultation": published in April 2014, together with the views expressed by ourselves and other stakeholders in response to that consultation.

36 SO incentives deliver significant benefits to stakeholders and align meeting industry needs with our financial performance. These incentives create a focus on outputs valued by stakeholders, creating 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 consumers.

37 In particular, our view is that incentive strength 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 a balance between risk and reward for the industry, consumers and ourselves.

Over-arching Principles and Design Elements

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

39 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 look to:

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

(b) Align our commercial interests 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 is borne by current consumers. Therefore we propose that each incentive scheme operates annually within the framework.

Managing Uncertainty and Change

40 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.

41 It is our position that the three incentives should therefore be covered in line with the existing special licence condition 3E, which outlines under what conditions an Uncertain Event can be triggered.

Delivering Outputs

42 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 a degree of influence or control over a given output, and can add value in improving the delivery of that output.

43 The incentive frameworks that we are proposing look to build on the progress that we have made to date in delivering the outputs. The three incentives under review form an integral part of a mechanism that holds us to account for delivering the outputs. The table below illustrates how these incentives will provide the framework for delivering the outputs established under the RIIO regulatory framework.

Incentive	Associated RIIO Outputs(s)
Demand Forecasting (D2-D5) 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

44 Inevitably there will continue to be uncertainty around the accuracy 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.

45 Targets, that are set could go significantly ‘off track’ over the duration of the incentive as a result of events outside our control. In order to protect consumers and ourselves from windfall gains or losses resulting from such events, we believe that the use of caps and collars continues to be appropriate.

Demand Forecasting D-2 to D-5

Overview

46 As part of our core role in the gas industry we look to facilitate 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.

47 During the incentive engagement process for the RIIO-T1 period, stakeholders expressed a desire for improved accuracy in our D-2 to D-5 forecasting. This led to a new incentive structure being introduced to support the drive in increasing the accuracy of these longer term demand forecasts. In the first year of the incentive we have driven considerable improvements in our forecasting capabilities and the subsequent accuracy of the forecasts that we publish.

48 Recently a number of stakeholders have informed us that the D-1 Demand Forecast remains the most important forecast, but that they value the improved performance in D-2 to D-5 forecasts that have been achieved in the first year of the incentive.

49 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 needs to be tested under more severe operational conditions than those faced during 2013/14. This will then further validate the value of the enhanced forecasting accuracy that the incentive is promoting.

50 As a result, we are proposing a review point to assess the value of the scheme to stakeholders in a further three years time to ensure that the scheme is promoting the right behaviour and delivering the associated value for the industry and end consumers.

51 Recognising the performance improvements made to date and listening to our stakeholders we propose that the baseline target for the scheme should be tightened from the current 16mcm target. Two options are proposed in calculating a new baseline, both fall below the existing one. The two options reflect a balance between incentivising the continuing level of enhanced accuracy but also recognising the increasing demand volatility and system complexity that we are managing.

Current Incentive Scheme Structure

52 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 to make efficient decisions in balancing their portfolios. The extension of the D-1 forecasting scheme to cover a longer term forecast, was supported through the initial RIIO-T1 incentive negotiations by the majority of those who responded to Ofgem's Initial Proposals.[2]

[2] System Operator Incentive schemes from 2013 initial proposals are available at; https://www.ofgem.gov.uk/publications-and-updates/system-operator-incentive-schemes-2013-initial-proposals

53 The resulting existing D-2 to D-5 incentive was set for two years. The diagram below illustrates the key parameters that are currently attached to the 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

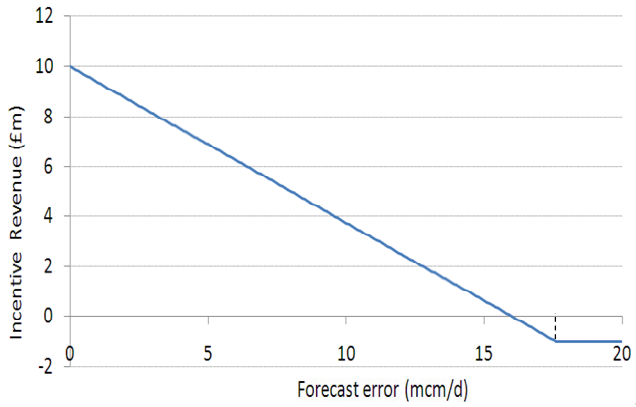
(b) Downside cap placed on the scheme which is set at -£1m and is reached if the average forecasting error is greater than or equal to 17.6mcm

(c) For every 1mcm improvement away from the 16mcm target we receive a reward of £0.63m

(d) Weighting mechanism puts focus on performance on high demand days. For example a 10mcm forecast error on a 200mcm day is worth half of what a 10mcm error forecast on a 400mcm day is

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

Diagram 2: Incentive Parameters



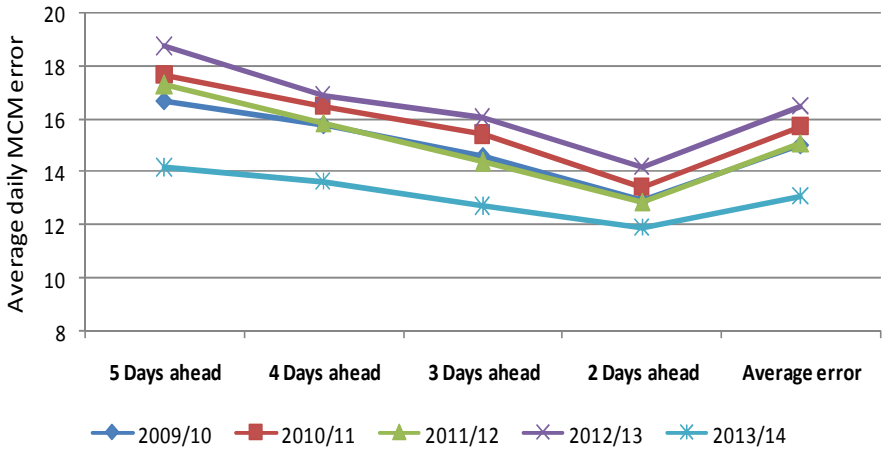
Incentive Scheme Performance

54 During the first year of operation of the new incentive scheme we have driven considerable performance improvements through the focus that we have placed on this incentive and the outputs that it supports. The table and the diagram below illustrate how there has been a step change in the accuracy of the forecasts that we provide to the industry.

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

Incentive year	Incentive target	Average Forecast error	Scheme Financial Performance
2009/10	N/A	15.02mcm	N/A
2010/11	N/A	15.74mcm	N/A
2011/12	N/A	15.11mcm	N/A
2012/13	N/A	16.47mcm	N/A
2013/14	16mcm	13.10mcm	£1.6m

Diagram 3: Demand Forecasting Accuracy Breakdown D-2 to D-5



55 As the diagram above illustrates, we have improved the accuracy for each independent forecast in comparison to historical accuracy levels. In combination, average performance has improved by 16% in 2013/14 compared to the previous 4 years.

56 It is important however to try and discern whether this has been as a consequence of our actions or whether this has been driven by external factors that are out with our control. In order to provide evidence that this improvement has been driven by the performance improvements, we have conducted a statistical analysis of the forecast errors achieved in 2013/14 compared to each of the previous four years.

57 The statistical analysis concludes that the forecast errors in 2013/14 were, for the majority, statistically different. This indicates that forecasting results achieved in 2013/14 are likely to be partially attributable to the performance improvements we have embedded. The results of these T-tests are illustrated in the table below.

Table 3: T-Test[3] for the equality of means between 2013/14 and last 4 years

Incentive year	D-5	D-4	D-3	D-2
2009/10	0.6%	1.5%	2.3%	19.4%
2010/11	0.0%	0.1%	0.1%	4.8%
2011/12	0.0%	1.0%	2.6%	14.3%
2012/13	0.0%	0.0%	0.0%	0.2%

[3] A T-test is a statistical test to compare sample populations and determine if there is a significant difference between their means. The test provides a confidence level that the data comparison falls in to the range. We undertook a T-test analysis on the null hypothesis that the two means are equal, using a 5% confidence level.

58 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

- Investment in the development and enhancement of additional mathematical forecasting techniques.
- Greater focus on continuous recalibration of models to adapt to contemporary operational considerations.
- Investment in enhanced meteorology services to feed into our models.

Business Process

- Greater focus embedded within Control Room processes in order to assess wider market signals to adapt the model results.
- Organisational re-structure to bring the different components of demand forecasting into a single team to provide expertise into the process.
- Enhanced interaction with offshore providers to support early identification and understanding of offshore supply issues that are likely to influence overall system demand.

59 In culmination these individual components have helped enhance the accuracy of the forecasts that we provide the industry.

External Operating Environment

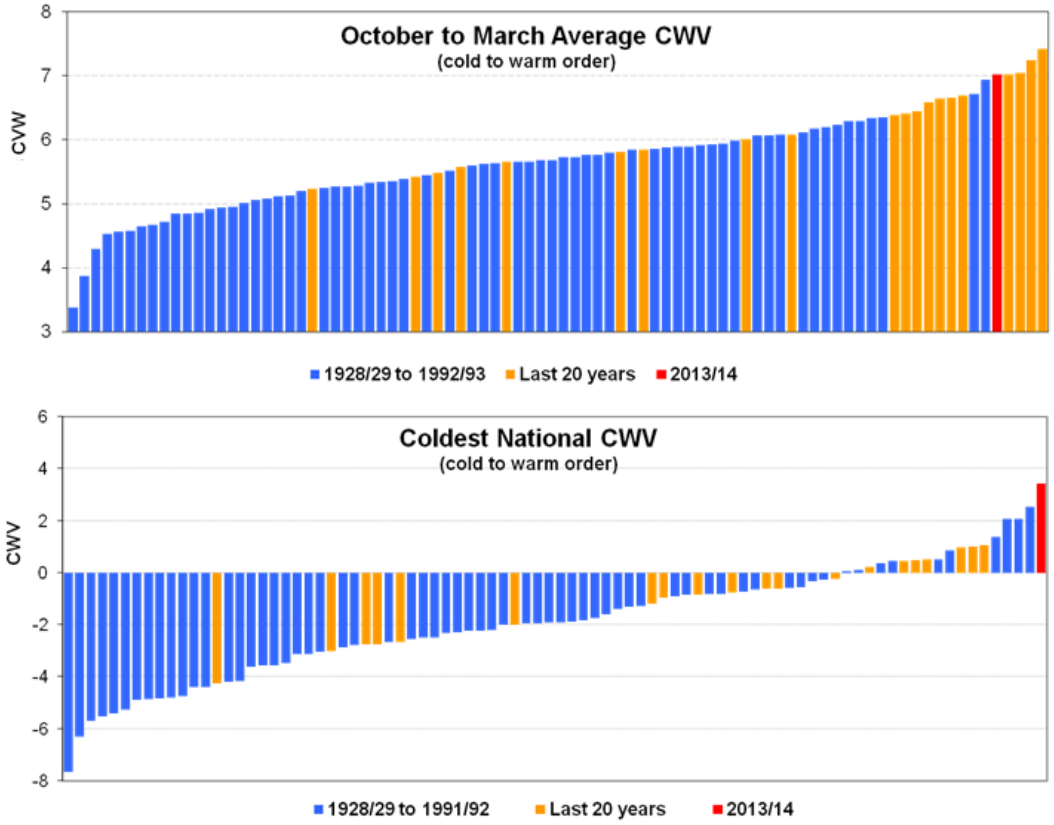
60 In isolation we can say that the performance improvement in forecast accuracy that we have delivered is likely to have been driven by the investments in systems, processes and staff capabilities that we have made. In order to test this, it is worth considering the background operational environment that we encountered in 2013/14. To do so we focus on the winter period because the current incentive puts greater weighting on higher demand days.

61 Many different elements culminate to shape the complexity and challenges of forecasting demand in any given year. However, as a proxy of the overall complexity, and as the biggest driver of demand, we can use Composite Weather Variable (CWV) figures[4].

62 When compared to a large CWV data set, the winter period, as measured by the average CWV, features as one of the warmest on record. Looking at the recorded coldest CWV for the year compared to historical levels, on this metric, it was the warmest on record.

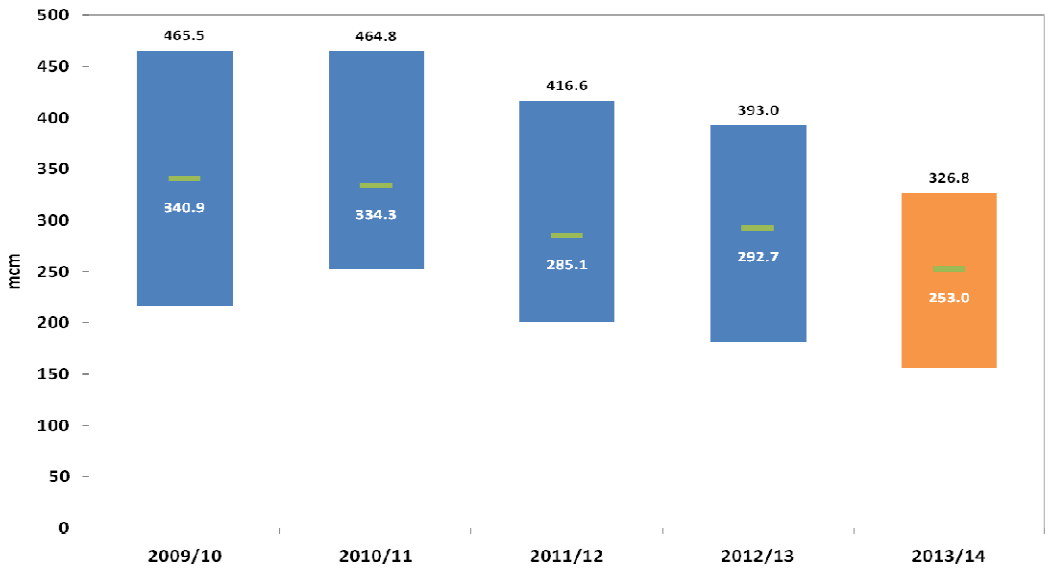
[4] The Composite Weather Variable (CWV) is a function of actual temperature, wind speed, effective temperature and seasonal normal effective temperature, and is a single measure of weather.

Diagram 4: CWV data set



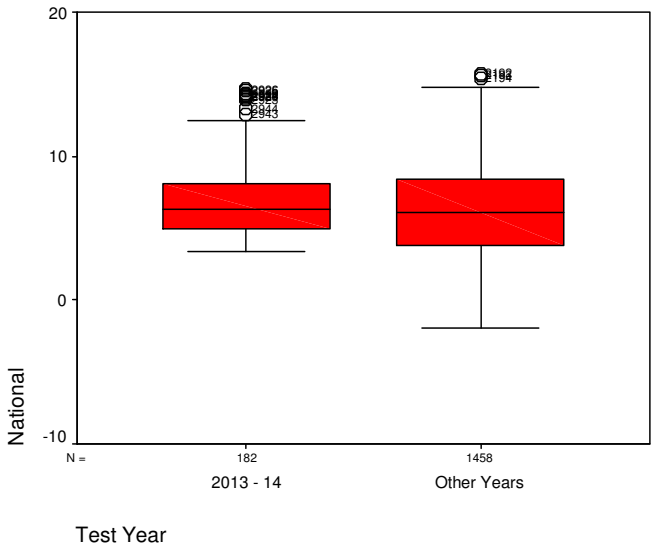
63 Focussing on the last five Winters and comparing actual mcm demands, it is clear to see that not only is the mean lower than previous years, but importantly the range of demands is smaller than other years. With these demands being lower, this meant that greater weighting from the incentive was attributed to the summer period where we had stable weather patterns in 2013/14 and a relatively consistent storage demand as shippers replenished the depleted stocks.

Diagram 5: Demand Ranges – last 5 Winters



64 Again, using statistical techniques, it is possible to examine whether the 2013/14 winter was an outlier when compared to a population of previous years, going back to 2005. The box and whisker diagram shows the comparison between the two groups[5], illustrating a much narrower range of CWVs and a shorter tail highlighting the significantly warmer winter period. The analysis that we undertook concluded that the Winter 2013/14 period was statistically different from the wider data set.

Diagram 6: Box and whisker plot



65 In conclusion, the statistical tests that we have conducted have shown that there has been a shift in our performance, with the forecast errors in 2013/14 being statistically different from the last four years. We have also proven that the weather experienced in the winter of 2013/14 was also statistically different when compared against recent years. This analysis has been taken into account when proposing a baseline target for the future scheme.

Demand Volatility

66 When considering an appropriate future forecasting target it is important to consider how the operational environment is likely to change. As articulated 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.

67 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:

(a) A continued growth in 'fast-cycle' storage, with sites [TEXT DELETED] commencing commercial operation;

[5] The test conducted gave a t-test score which was less than 5% so we can therefore conclude that the 2013/14 Winter period is statistically different and does not from part of the wider historical population.

(b) More price arbitrage across fuel types and markets including increasing utilisation of the European interconnectors in response to maturity of EU energy market reforms;

(c) Increasingly dynamic operation of CCGTs to balance against the increasing volume of intermittent renewable energy such as wind and solar;

(d) Further uncertainty over global LNG demand which directly impacts UK supply and therefore demand.

68 Further increasing volatility is expected as the supply of gas from unconventional sources such as shale gas and biogas increases. This will impact Distribution Network demand and their increasing reliance on the NTS linepack to provide storage as local facilities are decommissioned. The volatility of the gas demanded from the NTS, both day to day and within day is expected to increase.

69 Each of these price responsive elements is considered in turn so as to assess the affect that they are having on demand volatility going forward.

'Fast-Cycle' Storage

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

71 Even with relatively flat wholesale gas prices throughout 2013/14, the day to day volatility that was observed from storage sites continue to increase. The diagrams below show how this has increased during the last five years and how the number of incidents of large (Over 16mcm) day to day flow differentials has occurred.

Diagram 7: Number of changes in NTS Storage injection above 16mcm

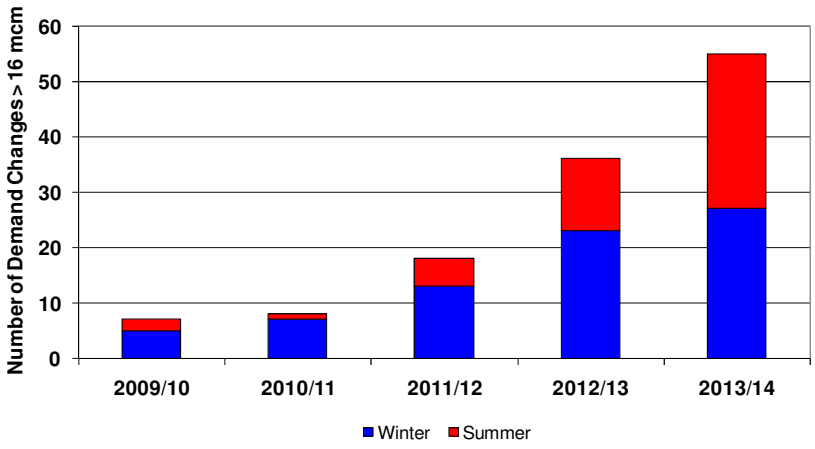
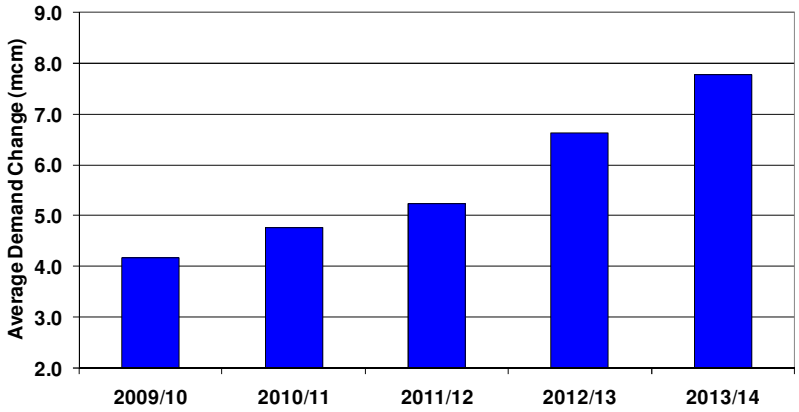


Diagram 8: Average Day-to-day Changes in NTS Storage injection



Dynamic operation of CCGTs

72 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 are used to support intermittent wind and solar generation, resulting in fast ramping of gas demand. Albeit 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 to do this five days out.

73 We are experiencing day to day CCGT demand changes of over 16mcm over 30 times in a year as 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 9: Average Day-to-day Changes in NTS Power Station Demand

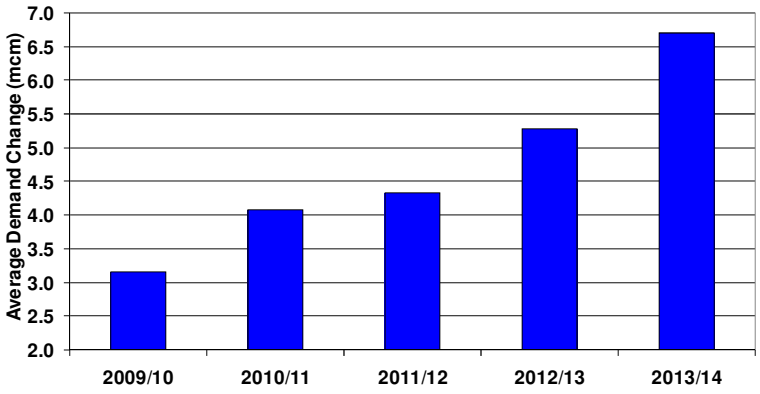
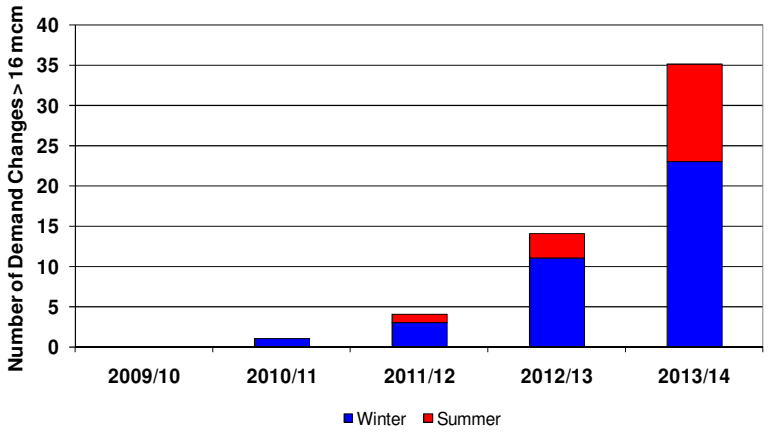


Diagram 10: Number of changes in NTS Power Station Demand above 16mcm



Price Arbitrage across Interconnectors

74 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, which is a further factor to consider, when producing our forecasts.

75 Whilst there is not the same discernable upward trend that can be observed from the demand categories above, 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 11: Average Day-to-day Changes in IUK Demand

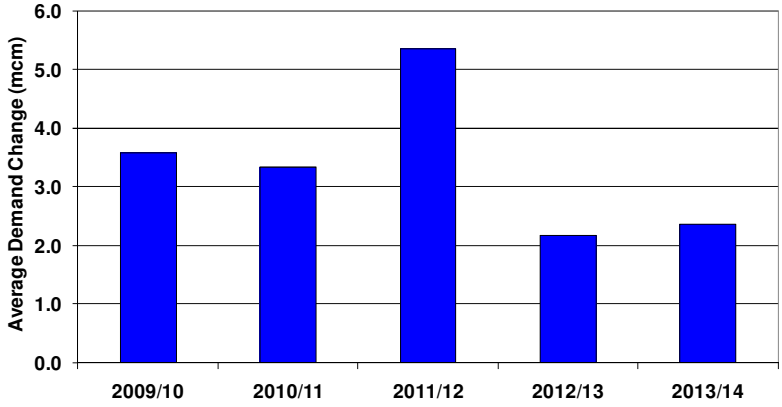
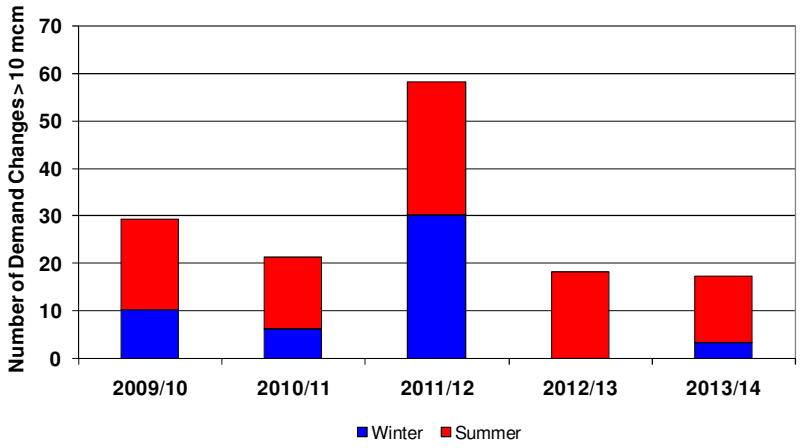


Diagram 12: Number of changes in IUK Demand above 10mcm



Future Incentive Scheme Structure

76 In designing our proposals for what an enduring future incentive should look like we have looked to build upon the views expressed when the framework was initially designed, but also from our most recent round of 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 look at this information provided and it is useful"

- Major energy user

77 We recognise that this incentive provides value to the end consumer as it looks to ensure that the industry has the best available information upon which to base its commercial decisions. Stakeholders have further highlighted to us that this is especially important at times of system stress.

"When things go well it is nice to have. When things go bad it is essential"

- Major energy user

78 With an operationally comfortable background in 2013/14 the enhanced accuracy that this incentive has driven will bring further value when higher demand levels are tested in future years during more challenging periods of operation such as when a margins notice has been called.

Continuation of existing scheme parameters

79 We still believe that it is appropriate to use an absolute forecast error rather than a percentile measurement of demand to incentivise performance. This aligns with support we received from stakeholders previously around this mechanism, limiting the ability for windfall gains and losses dependent on the underlying demand levels.

80 In our recent engagement we have asked stakeholders whether they would prefer the weighting of the incentive to be smeared in favour of those forecasts that are closer to real time. No specific comments were expressed in favour of this approach so we have therefore concluded that the most transparent mechanism is to continue to apply an equal weighting to each of the forecasts.

81 Again, recognising stakeholder's views, we propose continuing with the mechanism to place greater weighting on the accuracy of forecasts during times of higher demand reflecting that the industry will incur higher costs from forecasting errors in the winter period when cash out prices are likely to be more penal.

82 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

83 Our stakeholders have articulated that they believe that the target for the incentive should be tightened.

> *"We believe that incentive revenue cap should be significantly reduced or removed altogether and the target tightened to present more of a challenge"*
>
> **- SSE**

> *"Target needs reducing to create more of a challenge, although we do recognise that this outperformance has been under relatively benign weather conditions when forecasting is less challenging"*
>
> **- Energy UK**

84 We agree that we need to reconsider what is an appropriate target to be applied to the framework for extending this scheme. In doing so it is important to consider the potential size of replicable year on year performance improvements and what enhancements we have embedded within our performances. In combination we also need to consider the effect on our forecasting performance driven from the external operational environment.

85 As illustrated through the narrative above, we believe that the reduction in forecasting error in 2013/14 is equally attributable to our performance improvements. However we do also believe that favourable operational conditions helped enhance our performance.

86 Balancing these factors we are proposing two different mechanisms which could be used to set an appropriate reduced baseline target.

87 Option 1 is to look at deriving a yearly target for a future scheme from an average of the outturn error achieved in the last three full incentive years, and then applying a static efficiency factor.

88 Option 2 is to look at the outturn figure for 2013/14 and to then apply uplift to this figure to reflect the operational background that we experienced which was a statistical outlier. We believe that half of the accuracy improvements could be attributed to process changes and therefore a new target of 14.5mcm would represent a target that recognises the principle of continuous improvement.

Volatility Factor

89 As we have illustrated we are having to manage a growing level of day to day volatility from price responsive demand such as power stations and storage sites. For a long term scheme, where this trend is likely to continue it would normally be appropriate that there is an ex post volatility adjustment mechanism such as the one which features within the D-1 Demand forecasting incentive.

90 However we are also mindful that the structure of this incentive should continue to be simple and transparent. Therefore we propose that there should not be a specific volatility adjuster. Instead it needs to be recognised that we are taking on board more risk within the scheme parameters and hence the associated targets should remain static for the duration of the scheme with no further efficiency factor being applied.

Incentive Duration

91 As this is a new incentive, we only have one complete years worth of data to assess in regards to the enhancement in the output that we are delivering to the industry. We therefore conclude that it is too premature to extend the incentive to the end of the RIIO-T1 period. In deriving an appropriate scheme length a balance needs to be reached, in terms of providing a framework that incentivises us to continue to seek performance improvements but also minimises the overhead of the renegotiation process. Our proposal is therefore that the scheme should run for a further three years, after which we will have a larger data set to assess how well the incentive has driven an enhancement to the outputs that our stakeholders value.

92 Extending the incentive by three years is also likely to provide an opportunity to validate the output from the incentive at times of greater system stress. It will also further allow organisations to adapt their processes to put more weighting on the enhanced accuracy of the information that we are providing the market.

Value

93 The current incentive gave an upside and downside equivalent to £0.625m for a 1mcm 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 £1.65m and £-1.5m respectively for a 1mcm movement away from the scheme target.

94 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 be a third of the potential of the D-1 scheme. Therefore we propose that for every 1mcm movement away from the target we are rewarded / penalised by £0.5m.

95 The reduction in potential reward for our performance within this incentive reflects stakeholder views such as Energy UK who suggest that D-1 is more valuable to their members and that the D-1 forecast should continue to be the priority.

96 Stakeholders have also expressed a preference for reducing the size of the cap on the scheme, which is currently set at £10m.

97 We therefore propose that a cap should be introduced to the scheme that limits maximum profits in a single year to £2m. We propose the collar should remain the same at -£1m, reflecting that we are likely to see increasing levels of demand volatility over this period that is not covered under a volatility adjuster.

Maintenance and Outage Planning

Overview

98 To facilitate work on the NTS, sometimes we need to reduce the flexibility of the network which may have an impact on connected parties. For example, this work may be as a result of maintenance, asset replacement, inspections or other network investment. This ensures that we continue to operate the system in a safe, reliable and economically efficient manner, delivering the outputs that our stakeholders value.

99 During the incentive engagement process for the RIIO-T1 period, stakeholders wanted us to improve our communications around letting our customers know when 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 commercial operations.

100 In response to stakeholder feedback, new incentives were created to promote flexibility; essentially increasing 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 customer activities, resulting in cost savings for the industry.

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

(a) A reputational incentive to provide earlier and better communication of our outage needs to affected parties to enable better alignment to users own estimated maintenance periods;

(b) 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[6] paying any incremental costs of working flexibly outside normal working practices where we are able to accommodate these requests e.g. changing our planned maintenance to a non-standard arrangement; or requesting planned maintenance during non-standard hours.

(c) A financial incentive to reward good performance where we can reduce the number of changes we make to agreed Maintenance Days compared to a benchmark based on historical performance;

(d) A financial incentive to use an efficient level of Maintenance Days for routine maintenance work covering pipeline In-line Inspections (ILIs) and Remote Valve Operations (RVOs)[7].

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

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

102 Following support from stakeholders on the process improvements that we have begun to implement, we are proposing to maintain these elements within a new incentive scheme. This is supported by customers who would like to see this incentive continue.

103 Reflecting on the appropriate nature of the incentive there are a couple of changes that we propose making to the two financial incentives design and some changes proposed to take into account the improvements that we have made to date.

104 Principally we are proposing to explore expanding the scope of the maintenance change scheme to include any change made to maintenance activity where we have successfully aligned customer impacting work to a scheduled outage at a customer site. This would be enabled through the addition of customer agreed Advice Notices in to the overall benchmark number of days used within the scope of the scheme and how our performance is assessed.

105 We are further proposing that the pipeline ILI element of the Maintenance Days used scheme is taken out of the incentive scheme as we believe that delivering improvements against this output is mostly outside of our control.

106 We will continue to communicate our maintenance plans over a three year period, updating them annually.

107 We recognise that the cyclic nature of maintenance work means that over the initial period of the incentive scheme operation that not all customers will have been affected by our planned maintenance activities. With this in mind and recognising the level of changes we have implemented in our business processes, we are proposing a further review point to fully assess a broader baseline of data in at least three years time. This view aligns with stakeholder comments suggesting a further review point to monitor the effectiveness of the schemes is appropriate when we have a greater data population to assess.

> *"We do not yet believe there is enough data to fully review its effectiveness…."*
>
> - **SSE's response to Ofgems consultation, May 2014**

Background

108 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[8] that are delivered through policies and procedures.

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

109 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.

110 Under Section L[9] of the UNC, National Grid is required to publish its Maintenance Programme twice each year. A Maintenance Programme will not provide for maintenance of the NTS other than during a Planned Maintenance Period, which covers the months April to October inclusive in each year.

111 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.

112 In the event that customer impacting work 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 these timelines, it would be subject to a bilateral discussion. 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[10], is as follows.

	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

113 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;

(a) The impact on other connected parties where there may be a coincidence with their notified maintenance;

(b) Flow restrictions; and

(c) Previous changes as well as other impacts that may include resource and equipment availability, cost implications and any knock on impacts on other work.

[9] Section L of the UNC is available from http://www.gasgovernance.co.uk/TPD.

[10] 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

114 For exit related planned maintenance, there is a process set out in the UNC that enables us to inform industry parties 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 industry parties with an opportunity to discuss the timing and impact and for us to respond to any industry requests for further information.

115 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.

116 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 upon flows.

Scheme Performance Summary

117 To support the review of the current incentive scheme, this section includes details of how we have performed during the first year of the incentive, breaking down the incentive into the three component parts.

Reputational incentive to provide a three year maintenance plan

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

119 We issue letters to approximately 170 entities registered as a Maintenance Relevant Party (as defined within the UNC), which include details of the planned NTS works that are expected to impact a given site.

120 In 2013/14, for example, our initial draft plan was published in January, to enable feedback before it was finalised. The majority of changes took place during this consultation phase with 12 days amended as a result of customer requests for changes and 6 days amended by ourselves[11] during this period. Throughout this process, prior to the formal Maintenance Days confirmation on 1st April, value is accrued to our customers by minimising at the outset the potential for future changes.

[11] Details taken from our "Maintenance and Capacity Expansion Programme 2013-14 Review", which is available on our website at http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=33596

Number of changes made by National Grid to Maintenance Days

121 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;

a) Wider communications and engagement with our customers at industry events to discuss proposed maintenance schedules;

b) Proactively approaching our customers to understand their outage plans and track responses;

c) Review and assess other public information sources to identify other potential outages e.g. REMIT notifications;

d) Review and update customer contact lists to ensure the right parties are engaged in the end-to-end process; and

e) 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.

122 Through this activity we have been able to schedule a significant proportion of our customer impacting maintenance programme for the periods 2013/14 and 2014/15 within these outage periods. Where we have been able to align work we have implemented a process to communicate the agreed maintenance periods via an informal process known as an "Advice Notice[12]".

123 Where we have been unable to align maintenance to a customer outage plan, we have called Maintenance Days. Since the introduction of the new incentive scheme, we have had one full year of operation and one year where scheduled Maintenance Days have been confirmed to impacted customers. A summary of the number of days called which fall within the scope of the incentive is shown below.

Table 4: Incentive Summary

	2013/14	2014/15
In-line Inspection Days	30	0
Remote valve operations	7	4
Other asset works	6	3
Total number of Maintenance Days called	43	7
Scheme Profit	£312k	£51k[13]

[12] 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.

[13] This is the maximum scheme profit achievable based on no requirement to change a Maintenance Day for the entire period.

124 In the formula year 2013/14 we did not request any change to move or cancel the Maintenance Days called and as at publication of this document we have not initiated any changes (within scope of the current incentive) so far for the 2014/15 incentive year.

125 Under the existing scheme parameters the target set for the number of changes to Maintenance Days that could be changed was set at 14.5% of the overall planned Maintenance Days[14] in that particular year. Based on the 43 days called, this set a target of 6.24 days. As we didn't make any changes to the plan the scheme profit for this element was £50k multiplied by 6.24 equating to an incentive reward of £311,750.

126 Following publication of the final Maintenance Programme on 1st April 2013, we were able to facilitate requests by our customers to move Maintenance Days which totalled 7 days. 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.

Number of days used for routine maintenance

127 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 therefore included Remote Valve Operations (RVOs) and In-line inspections (ILIs) for which targets were determined based on historical data.

Table 5: Scheme outturn overview

	2013/14 Maintenance Target	2013/14 Maintenance Days In Scope	Scheme outturn profit / loss
In-line Inspection Days	27.65	25[15]	£53k
Remote valve operations	44.65	6[16]	£773k

128 Under this element of the scheme, for every day by which we exceed the target or beat the targets we receive a £20k reward or penalty. This is subject to a symmetrical cap and collar on the scheme of £1m. In 2013/14, for this element of the scheme, we achieved a financial reward of £826k.

129 Due to the rigour that we have applied to enhancing our planning processes and operations, we were able to outperform against scheme targets. For Remote Valve Operations we sought to align with other one-off NTS maintenance as well as customer outages. Additionally, we explored different maintenance methodologies,

[14] Please note that where a Maintenance Day is called on more than one party for the same work that only one day is accounted for under the incentive scheme.
[15] This number of days is five less than the 30 shown against Maintenance Days called. This was due to one scheduled run being moved outside the maintenance period at customer request, therefore being removed from the scope of the incentive.
[16] This number of days is one less than the 7 shown against the Maintenance Days called. This was due to one RVO being moved at customer request outside the maintenance period.

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 relating to the assessment of maximum flow rates through a valve bypass. This enabled us to complete all our Remote Valve Operations whilst only calling seven Maintenance Days.

130 Against the ILI run target we called a total of 25 days. We found little scope for reduction in the days called to undertake these activities due to safety and Pipeline Inspection Gauge (PIG) running speed considerations. We continued to call Maintenance Days for contingency due to the uncertainty inherent in work of this type which for example may require additional runs due to the discovery of entrained debris as a consequence of carrying out a cleaning PIG run.

Proposed Approach

131 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 the policy and assessment criteria described in the Gas System Operator Incentives Review Initial Consultation[17] raised by Ofgem. We are therefore recommending the following:

(a) Continue with the reputational elements of the incentive to provide customers with a Maintenance Programme that covers 3 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;

(b) Retain an incentive to encourage National Grid to minimise changes to published Maintenance Days and potentially extend the scope of the change incentive to maintenance activities which have been aligned with a customer outage and published as an Advice Notice;

(c) Retain an incentive to keep the absolute levels of routine maintenance work within a reasonable level of Maintenance Days for RVOs (penalty for each day above target, benefit for each day below target). We propose removing the ILI element from the Maintenance Days used scheme as we believe this element is mostly outside of our control.

Financial Incentive covering Changes to the Maintenance Plan

132 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.

[17] https://www.ofgem.gov.uk/publications-and-updates/gas-system-operator-incentives-review-initial-consultation

> ***"Changes at short notice…can be costly"***
>
> **- Energy UK**

133 During 2013/14 we made no changes to the agreed Maintenance Days issued to our customers. We were able to ensure this through a combination of a number of business process changes implemented by us in response to our customer's feedback, including:

(a) Organisational change to ensure clear accountability for the definition and communication of maintenance work with our customers;

(b) 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;

(c) Additional focus and resource allocated to analysis and assessment of work.

134 As a direct result of the process improvements implemented in driving support for aligning our Maintenance Programme to customer outages, the number of Maintenance Days called on sites has reduced against the baseline levels used to determine the original targets. A major factor in our new processes has been the introduction of the Advice Notice process, which is used to confirm an agreement with our customers for maintenance activity, where we have successfully aligned to their outage periods. These are currently outside of the scope of the coverage of the change scheme as the target is driven from the Maintenance Days only.

135 The current incentive on changes was intended to scale with the amount of maintenance that is impacting on our customers in a given year. The mechanism by which this was taken into account was using the number of Maintenance Days workload in the year as a baseline figure, such that the number of changes allowed under the scheme would scale up and down with the workload. However with the use and concept of Advice Notices this connection is subsequently not as strong a relationship to the total workload affecting customers. We therefore feel it is appropriate to explore including Advice Notices within the overall maintenance work scope from which to assess improvements against.

136 In order that this baseline more accurately reflects the workload, we are proposing that the year ahead Maintenance Plan should continue to form an initial baseline plan from which changes are defined. We are then exploring the possibility to include customer impacting maintenance, which has been aligned to customer outages as Advice Notice Days alongside any Maintenance Days. In aggregate these could then form the baseline mechanism to assess change against.

137 This will ensure that where a date has been agreed with a customer, the scheme encourages maintaining these agreements.

138 Including Advice Notices in the baseline also reflects the enhanced risk, and potential costs that we begin to carry through driving our maintenance activities in line with customer outages rather than optimising a plan, which is most efficient to National Grid operations and our resource utilisation. It takes in to account the risk we take of the potential to remobilise a project team in the event of a late change to our

customers' outage plans or the impact of changes to works that impact on a number of customers.

139 In the 2013/14 and 2014/15 formula years we communicated a total number of 49 Advice Notice days and 24 Advice Notice days respectively.

Performance measure

140 For this purpose, the baseline would be taken on 1st April for the year-ahead plan (as with the existing incentive scheme) but would include Advice Notices issued plus Maintenance Days called. The allowed number of changes would utilise the current performance percentage which is set at 14.5%. Multiplying the baseline by this percentage would derive the target changes.

Scope of changes included within the incentive

141 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, flow changes and cancellations. We propose that this incentive continues to cover date changes and cancellations only.

142 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:

(a) Routine Maintenance (e.g. Remote Valve Operations)

(b) Planned asset replacement & reinforcements (e.g. boiler replacements, work to facilitate the replacement of compressors to enable compliance with IED and incremental capacity requirements)

(c) In-Line Inspections (ILIs)

143 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:

(a) Emergency work and fault management, including pipeline feature inspections; and

(b) Work on behalf of customers (including any work under Minor Works Arrangements).

Target

144 Whilst we are confident that our process improvements have led to a step change in performance in the new scheme, we do agree with stakeholders that it is too early to undertake an informed assessment to draw long term target models without further baseline data.

145 As we gain further experience of operating the new processes, we would then expect to be able to provide a clearer baseline from which future incentive schemes may be determined. We are therefore proposing that the existing scheme parameter of

14.5% of the total customer impacted workload is retained for the duration of the scheme.

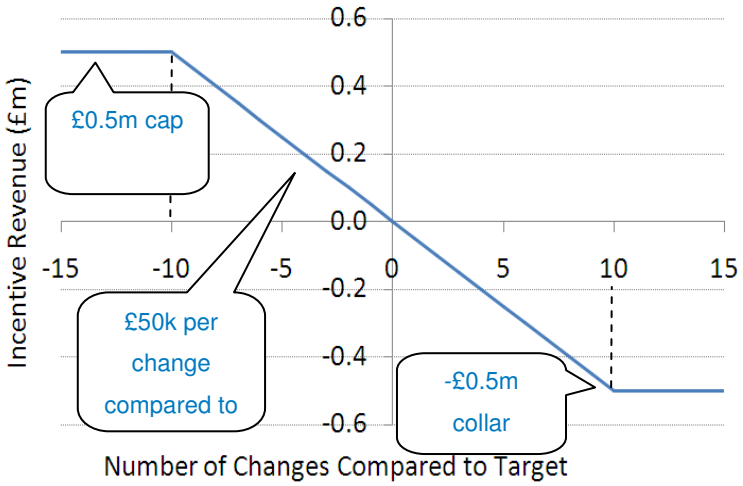
Value

146 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.

147 Stakeholders have told us that they value the certainty delivered by not changing agreed maintenance dates more than 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.

148 We are proposing to retain the existing cap and collars against the combined baseline number of Maintenance Days and potentially Advice Notices, which would be triggered at ten changes above or below the target in any year. The diagram below depicts this.

Diagram 13: Maintenance Days Change



Length

149 We propose that the maintenance change incentive is an annual financial incentive with a further review point in three years time. This review point would then ensure that the incentive is still appropriate, is based on a stronger baseline data set and include feedback from a wider customer base due to the nature of cyclic maintenance.

150 This period of time aligns with stakeholder views to insert a further review point in the future.

"…Would like to see the incentive reviewed again in another 2 years when more data is available"

- SSE

151 We have suggested three years as this will allow two full years of data to be provided against this proposed scheme, prior to further consultation.

Incentive on the Use of Maintenance Days

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

153 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 been mindful of our obligations to maintain safety and reliability from the system.

154 The incentive rewards us for any reduction in the number of Maintenance Days from a baseline level that reflects the level of work required on the NTS and penalise us for any increase in the number of Maintenance Days used above the baseline.

Performance Measure

155 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

156 In our original incentive proposals we suggested that only those maintenance activities that directly impact on our customers would be captured. Further to this we proposed to only include those activities where a historical baseline was available and for which an appropriate benchmark could be set.

157 Using the above criteria at the time, the scope included Remote Valve Operations (RVOs) and In Line Inspections (ILIs) only.

158 We believe that it is inappropriate to continue to be incentivised against minimising the time taken to undertake ILIs. The rationale behind this being that it is inappropriate to further incentivise this element of work it is operationally outside of our control as to the minimum time it takes to undertake a run. The speed of being able to undertake these ILI runs is governed instead by the physical limits of the speed that a Pipeline Inspection Gauge (PIG) can travel through the NTS whilst delivering the required results and the limits of undertaking an operation safely.

159 In addition, the volume of ILI work has reduced from the peak of work seen over recent years which influenced our maintenance plans. For example in 2014/15 we have not called any Maintenance Days in accordance with undertaking ILI runs as this number has reduced to a level where no customers who fall within the scope of the incentive were impacted by the ILI runs that we have planned during that year.

160 We have also reviewed other maintenance work and have concluded that no further maintenance activities are appropriate for consideration for inclusion in the scheme at this point in time. This is due to the nature of other maintenance work being either specific to each site or that it is not possible to define a standard baseline.

Target and adjusters

161 Stakeholders have expressed the view that it is both too early to make an informed assessment of our performance due to the limited data set but also that they would welcome further tightening of the target. We further believe that the target for the scheme should be calculated from an appropriate benchmark.

162 The maintenance of specific NTS valves (RVOs) which may impact on customers is required every year and therefore the workload for this activity is relatively stable. Since introduction of the new incentive we have however had a policy change implemented which has had a direct impact on the expected baseline level of RVOs required. The internal policy change relates to the assessment of maximum flow rates through a valve bypass. The result of this change is that, under specific operational configurations, a Maintenance Day is no longer required at some sited to restrict flow rates as contractual flows can be met using existing valve bypass arrangements.

163 This change has resulted in a reduction in the total number of in scope RVOs down to a baseline of 35 from the previous level used to determine the incentive structure, which was 48.

164 Our initial experience of operating under the new incentive has indicated that we have the potential to further minimise impact to customers in undertaking RVO work by minimising the number of Maintenance Days. To date we have begun to optimise through:

(a) Encouraging our customers to notify us of 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;

(b) Reviewing and confirming our ability to undertake a RVO with no impact on customer due to NTS re-configuration or local agreement whilst retaining associated safety and reliability requirements of the network;

(c) 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.

165 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 to nest with, the ability to undertake partial valve movements and the ability to not detrimentally impact the enduring health of the assets.

166 Taking this into account, we are recommending that the target for RVO work be realigned to a new baseline. We are proposing a 5% efficiency factor to be applied against the new baseline level of RVOs to give an annual target fixed at 33.25 days for the new incentive period. This reflects the outperformance that we delivered in the first year of the scheme but also considers our ability to optimise on a more enduring basis.

Value

167 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.

168 In line with feedback from our stakeholders that the value of the change scheme takes priority over the use of scheme incentive, we propose that the value should be retained at £20k per day against the re-baseline position.

169 A natural cap is introduced to the scheme through the maximum potential reward from outperformance against the RVO baseline. This equates to £0.665m. We propose that the collar should be symmetrical and be set at the same level.

Length

170 We propose that in line with the other elements of the broader maintenance incentive that this is subject to a full review after three years to take into account an additional level of data and to ensure that the incentive remains appropriate in delivering the value and outputs that are most valued by our stakeholders.

Greenhouse Gas Emissions

Overview

171 NTS assets can release gas as an inherent part of their commissioning, operation, maintenance and decommissioning. Emissions characteristics frequently reflect the understanding of the associated social costs, together with the cost of abatement, at the time of the asset design. As environmental awareness increases, the costs and benefits of operational decisions and alternative investments need to be continually reviewed.

172 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 reduction in the volume of natural gas emitted to the atmosphere.

173 This current SO incentive seeks to minimise the release of natural gas from compressors and their associated pipework, wherever operational decisions permit.

174 To quantify other sources and scale of emissions, we alongside the TO have undertaken a detailed review of specific asset venting characteristics under Special Licence Condition C28/8D[18]. The research associated with this 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.

175 In assessing the implications of our scheme of works, 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.

176 On completion and review of the projects under the scheme of works, we propose to undertake further research on elements of venting. This may be possible through the Network Innovation Allowance (NIA) and will help further our ability to reduce our environmental impact and potentially extend the breadth of the incentive.

177 The outlook for changing supply and demand patterns over the RIIO-T1 period remains uncertain. The extent to which this will affect existing patterns of compressor operation, fuel consumption and consequential venting needs to be considered in the design of any future incentive mechanism.

178 In setting an appropriate incentive structure for minimising Greenhouse Gas emissions, we need to create an incentive which clearly aligns to the assessment criteria provided in the Ofgem consultation. We consider that in setting a new incentive it is essential to consider how compressor emissions are broken down in to factors which are:

[18] National Grid Gas Plc - National Transmission System Gas Transporter Licence Part C – Special Conditions; https://epr.ofgem.gov.uk//Content/Documents/National%20Grid%20Gas%20Plc%20-%20Special%20Conditions%20Consolidated%20-%20Current%20Version.pdf

(a) Supporting other outputs valued by our stakeholders including asset reliability to deliver customer flow requirements;

(b) Directly related to ensuring safety of our asset, the public and our employees when undertaking essential maintenance, responding to a failure in compressor operation, asset repair/replacement or in complying with other environmental legislation such as local air quality permits;

(c) A direct result of our decisions to ensure overall efficient operations, considering optimised mix of TO and SO operating costs and requirements

179 Only by doing so can appropriate structures be created that provides an incentive to minimise emissions that are within our control but do not detrimentally affect the delivery of the other associated outputs.

180 We therefore present three options that could be used to set a scheme that incentivises us to deliver on outputs that are within our control. In doing so we believe that it is appropriate to set a symmetrical incentive which has a maximum reward and penalty which is proportionate to the benefits it can deliver for system users and consumers. This aligns with Ofgem's minded to position following their Final Proposals document[19], which was to create a five year scheme that restores an upside incentive.

181 Whilst it was Ofgem's original intent to set a five year scheme through to the end of the RIIO-T1 period, we agree with stakeholders that there is value in a further review point to consider:

(a) Developments in the review of further sources of emissions;

(b) Validation of any proposed targets and methodologies, to define robust incentive arrangements;

(c) Assessing the implications on timelines for compressor fleet replacement, driven by compliance with the Industrial Emissions Directive (IED).

182 In consideration of these factors, we are proposing a review point to be held on this incentive structure and its coverage two years after the commencement of this proposed new scheme.

Background

183 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:

(a) Compressors and associated assets

[19] 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

(b) Pipeline systems undergoing maintenance[20]

(c) Pipeline Inspection Gauge (PIG) traps

(d) Filters

(e) Scrubbers

(f) Measurement, including chromatographs

(g) Valves

184 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.

185 Venting of natural gas to atmosphere is now 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 DECC's assessment of the social cost of carbon enables us to optimise investment and operational decisions for existing and alternative assets.

186 Venting levels are significantly affected by activities that are required to meet safety and environmental legislation as well as operational considerations. To control and minimise the extent of gas release, options need to be considered, optimising between safety, operational, capital and environmental costs. Examples of these being:

(a) Ensuring the correct operational strategy to balance the decision to vent a station or leaving the station pressurised. Venting incurs a cost under the incentive whilst keeping a compressor pressurised will in turn increase the levels of seal emissions, add to the requirements for asset run maintenance and carry a consequential cost of energy use of ancillary equipment;

(b) Using tools available to us to reduce the impact of an event or series of events (e.g. use of mobile recompression rigs for large de-pressurisations of gas associated with pipeline maintenance);

(c) Capital Investment, using commercially available products, to adapt or replace assets and reduce or eliminate gas release (e.g. storage, consumption or recompression of gas that would otherwise be vented);

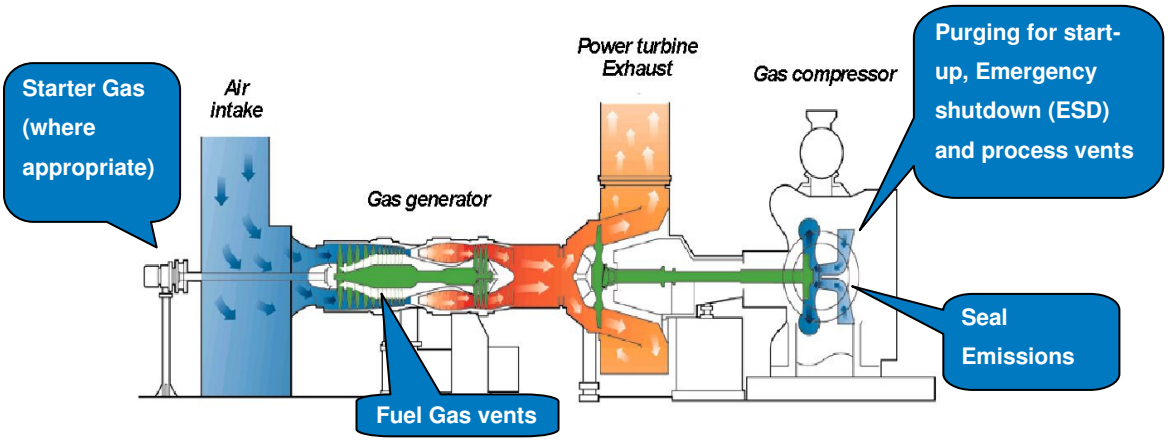
187 The GHG scheme was therefore put in place to encourage the reduction in the volume of natural gas emitted to the atmosphere, providing long term environmental sustainability for the benefit of current and future energy consumers.

Current incentive scheme structure

188 The current Greenhouse Gas Emissions incentive covers venting from compressors and associated pipework. The scheme incentivises us to minimise the level of emissions by penalising any emission levels above a defined target. Below is a diagram showing the areas of emission directly associated with a compressor.

[20] 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.

Diagram 14: Scope of Compressor Emissions



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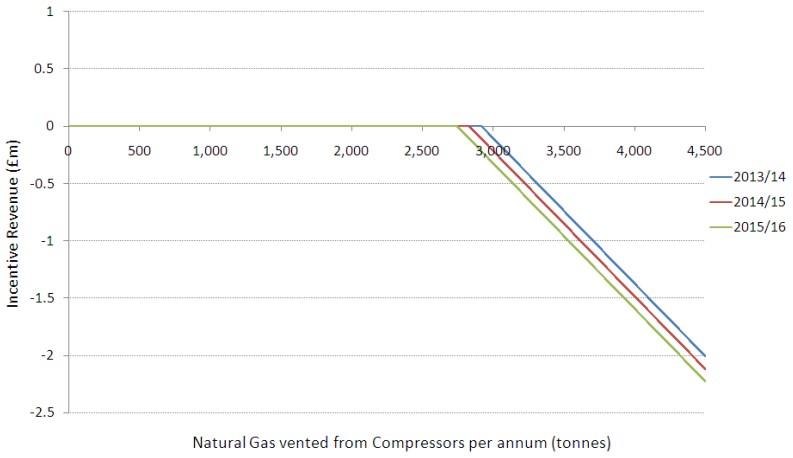
189 The incentive target for 2013/14 was 2917 tonnes. This was calculated by applying a 3% efficiency factor on the previous incentive scheme parameters. The scheme continues with the efficiency factor applied to subsequent years, so that in the 2015/16 incentive year, the target is set at 2744 tonnes as shown below.

Diagram 15: Existing incentive scheme



190 For every tonne vented above the target level the value is determined from the carbon equivalence of natural gas, and the DECC non-traded price of carbon reflecting the social cost. In the formula year 2013/14 we were subject to a reference price of £1,302 per tonne.

191 The incentive was set as a downside only scheme with no collar in place to minimise any penalties incurred.

Incentive scheme performance

192 The following table illustrates our recent performance on compressor emissions, since the introduction of an updated calculation methodology which increased accuracy of the mass of venting. This was introduced in the 2010/11 incentive year.

Table 6: Recent Compressor Performance

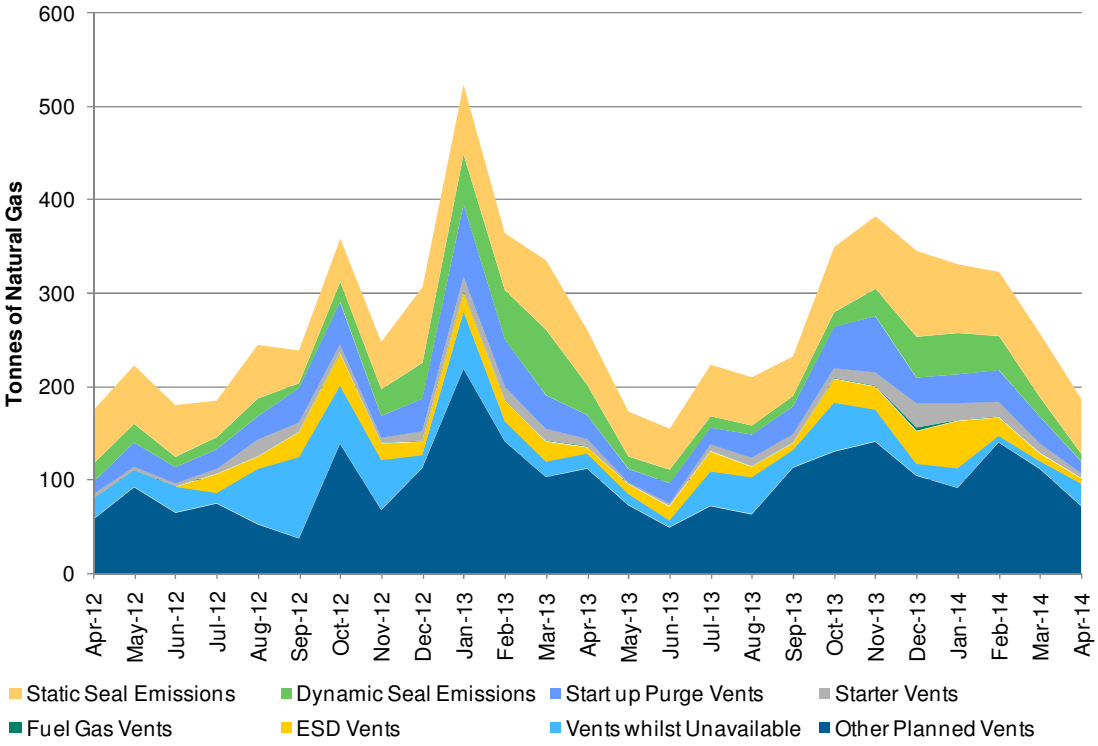
Year	Target	Performance	Venting Price	Incentive Revenue
2010/11	3,007 10% dead band	3,346 tonnes	£1,100 / tonne	- £209k
2011/12	3,007 10% dead band	3,000 tonnes	£1,145 / tonne	£0k
2012/13	3,007 10% dead band	3,443 tonnes	£1,224 / tonne	- £354k
2013/14	2917 Downside only	3,332 tonnes	£1,302 / tonne	-£540k

193 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 years 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.

194 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 restricted.

195 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. Following completion of the Special Condition C28/8D projects we are now able to quantify the emissions and give greater granularity on the component parts.

Diagram 16: Total Compressor Emissions



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

(a) Static & Dynamic Seal Emissions - On compressors, there are emissions around seals on the compressor shaft when the compressor is pressurised. This seal is used to prevent emission of process gas to the outside cab atmosphere.

(b) Emergency Shutdown (ESD) Vents – Where for safety reasons the compressor unit trips during operation venting gas within the unit and its associated pipework;

(c) Start up Purge Vents – 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;

(d) Starter Vents – Where a gas starter motor is installed, natural gas is used to start the gas turbine;

(e) Fuel Gas Vents – Venting which occurs from the fuel line to the compressor which occurs during shutdown and isolation of the compressor unit;

(f) Vents whilst Unavailable – Vents undertaken whilst a compressor unit is unavailable for operation e.g. during planned maintenance or while being repaired following a fault;

(g) Other Planned Process Vents – Depressurising a compressor and associated pipework when the compressor is no longer required for active duty for a period of time.

197 In assessing the categories of venting against our source data set, we can determine the extent to which we, as the System Operator, have direct control over the level of venting and those where we have limited or no control without significant asset re-design by original equipment manufacturer and designers. These two broad categories are explored further

Venting where we have limited control

198 Seal Emissions – As part of the inherent design of seals, there is a level of emissions which is continuous when the unit is in a pressurised state (standby mode or running). Using our data set, we are able to attribute approximately 1000 tonnes of emissions per annum to the combined impact of seal emission. At the current point in time there is no reliable product option available to us which offers a solution to this level of venting. If we were to leave all stations in pressurised state our calculations indicate that the emission level would equate to between 4000 and 5000 tonnes per annum depending on the actual runtime.

199 Emergency Shutdowns (ESD) – To protect asset integrity and safety, compressor units are fitted with appropriate fail-safes, which mean that in some instances a compressor unit will "trip" resulting in a level of venting of gas retained within the system. We monitor and assess configuration of our assets to ensure the correct action is taken, however using our source data set approximately 200 tonnes of emissions per annum can be attributed to ESDs.

200 Vents whilst unavailable – To ensure clear visibility of station availability our business process ensures that a station undergoing scheduled maintenance, emission testing, asset fix or replacement is categorised as "Unavailable" for System Operator use. In these circumstances, a unit will not be returned to operational status, until it has been fully tested as complying with associated obligations. Using our data set, we are able to quantify the level of emissions associated with this category of approximately 350 tonnes of emissions per annum.

Venting within the System Operator's sphere of influence

201 Other planned vents including starter, fuel gas and start-up – For the other categories of vent, we have reviewed our data set and approximately 2000 tonnes per annum can be attributed to these areas. Venting decisions in this area are made on the following basis but are justified either on an economic, safety or reliability basis.

(a) 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.

(b) 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.

(c) 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.

(d) 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.

202 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

203 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.

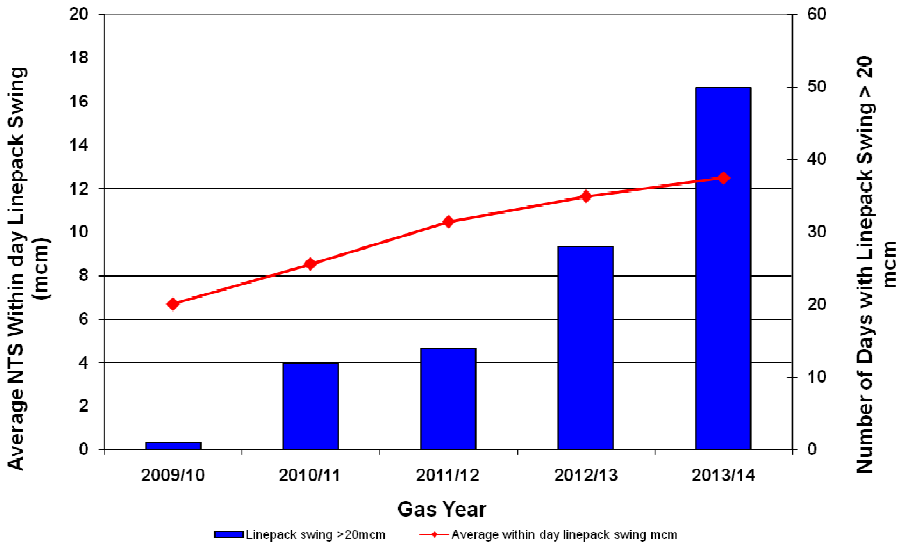
204 As we progress through the RIIO-T1 period we expect to continue to see additional volatility and uncertainty in the location and level of supply and demands on the NTS. The combined effect will alter flow patterns further on the NTS, moving away from historic, relatively steady state predictable North to South flows, to greater flow diversity in our customer's use of network capacity, necessitating greater compression flexibility. As such, there is considerable uncertainty in the future operational compressor strategy and consequential venting.

Within day supply and demand volatility

205 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.

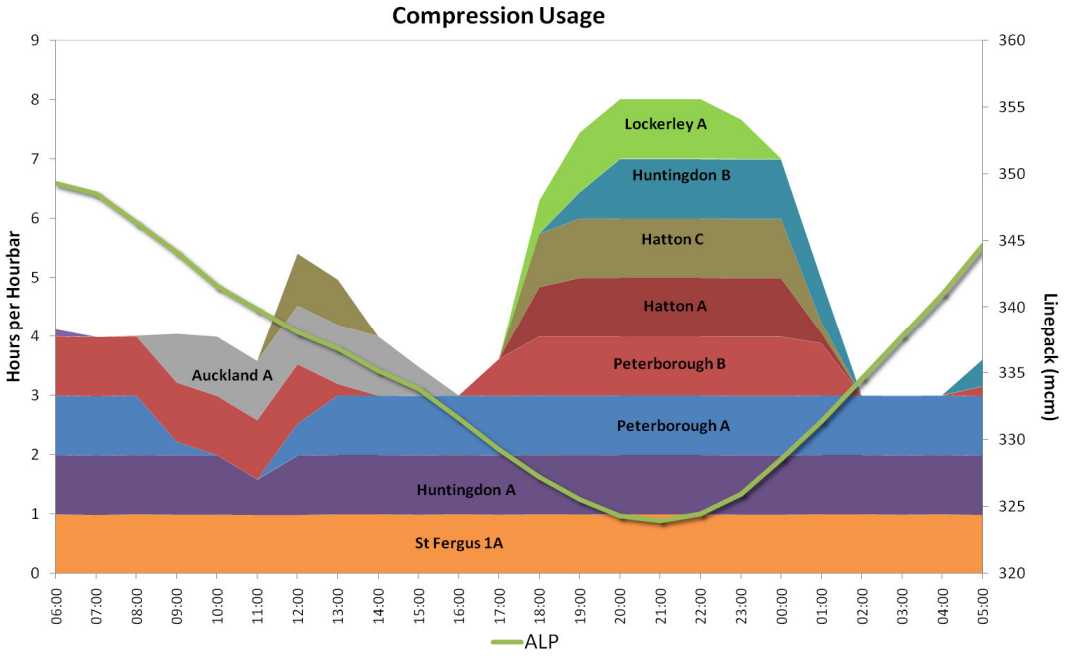
206 The diagram below shows the overall implications of increased within day Linepack swing on the NTS over the last four years of operation. The number of incidences and the volume of large Linepack swing has increased and leads us to more volatile compressor operations. This in turn is leading to greater complexity in terms of trying to balance our venting behaviour with the evolving needs of our customers.

Diagram 17: NTS Within Day Linepack Swing Trends



207 To illustrate the implications that within day volatility has on our compressor operations, we can demonstrate the running patterns of compression on the 25th March 2014 which shows the varying usage of compression. The depletion of linepack during the day resulted in us using our compressor fleet to enable short term operational requirements to be met.

Diagram 18: Compressor usage example – 25th March 2014



Scheme of works under Licence Condition C28/8D

208 During the TPCR4 regulatory period, a new licence condition (C28/8D)[21] was introduced that specified a scheme of works which was designed to enhance our understanding of the areas of emission within our operations and to support the development of any longer term incentive schemes.

209 The main areas of focus within the scheme of works were to progress projects to quantify the magnitude of Pipeline depressurisation activities on the NTS and to provide further granularity and assessment of the breakdown of other emissions.

210 The projects under the scheme of works have now been completed and have provided us with robust data to support out understanding of our operational emissions. A summary of the projects and the key finding can be found within Appendix A of this document.

211 Whilst the outcome from the full list of projects is detailed within Appendix A it is important to clarify the course of action taken in response to a couple of the projects and its relevance to future incentive structure. These are discussed below.

Pipeline depressurisation

212 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.

213 In addition to the technical challenges in collecting data, our data analysis has confirmed that there is considerable variability in the level of vented pipeline 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.

214 To develop an appropriate baseline for any future incentive scheme would require the creation of a more automated and auditable data collection system and a longer data set to be collected in order to calculate effective incentive performance targets. It would also need to take into account a number of factors influencing our ability to be able to cost effectively reduce the levels of Pipeline venting. Some of these factors are listed below:

(a) Current recompression rigs do not re-compress below seven bar. Once this has been reached, the remaining amount of gas will need to be vented;

(b) It is not possible to use recompression rigs on all sites due to site access and space restrictions;

[21] Within the TPCR4 licence this condition was called C28. Following the introduction of the RIIO-T1 licence changes this condition was moved to section 8D.

(c) Recompression rigs cost over £1m each, so the business case of each additional rig would need to be commensurate with the level of incremental venting abatement.

215 Reviewing all of the above factors leads us to the conclusion that Pipeline Depressurisation should not be currently included within the scope of a future incentive. Instead we need to continue to investigate how we can cost effectively standardise the measurement of emissions from these events, but also how we can reduce these.

Compressor Unit Isolation Valves

216 A project was included to introduce venting calculations on our compressor unit isolation valves. This area was not expected to be a major source of venting at the time of the external review, but research was included in the Scheme of Works to gain a better initial understanding of its venting characteristics.

217 A qualitative study of valves in their current operational status was undertaken and found that compressor unit isolation valve venting could be of a larger magnitude than expected and potentially higher than operational venting from compressors. A further review was commissioned to evaluate whether the qualitative output could be used to produce more robust quantitative measurements, however the output from this review was not able to identify a robust and repeatable method.

218 The findings from this project are likely to apply to all high pressure gas transporters and are aligned to a time period where gas transporters across Europe are investing in assets to reduce compressor venting. Investment cases are often based on the use of gas recompression rigs, whose investment cases are predicated on compressor unit isolation valves sealing effectively to ensure that fugitive gas emissions do not exceed the adsorbed quantities. The research undertaken on this project is therefore challenging many of these international investment assumptions.

219 Development of a successful measure on unit isolation valves is expected to require a significant degree of experimentation and innovation to achieve the desired result. In the event that the quantification is achievable, further research would then need to be undertaken around the development of new methods to reduce or eliminate the emissions.

220 In response to this project, we are proposing to generate Network Innovation Allowance (NIA) projects to identify best practice for accurately measuring compressor isolation valve venting and undertake a research project on analysing options to reduce the level of venting.

221 As we are unable to quantify the level of venting in this area, we do not believe that it is appropriate to extend the incentive to include isolation valves until the results of any further research can be fully assessed.

Future Incentive Scheme Structure

222 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.

223 Reviewing the latest data available, and in consideration to stakeholder feedback, we consider that there are three options which could be pursued in designing a future scheme. These are explained further below.

Scheme Option 1: Reset Baseline using supporting data on previous emission levels (Symmetrical)

224 We have provided details in the scheme performance summary which provide further clarity on the breakdown of compressor emissions data over the last two formula years.

225 This articulated what areas of compressor emissions we have direct control of as an operator to influence venting efficiency, and those elements which are effectively outside of our control.

226 This scheme option proposes that a new baseline be created using our historical performance, whilst recognising that any baseline should provide us with an appropriate balance between a challenging target and one which offers us potential to be rewarded for incremental benefits delivered. We believe, that the current schemes reducing target, is unachievable and does not reflect the increasing system flexibility we need to deliver or the ability we have to reduce the volume of venting.

227 Over the last three years of operation, our total compressor emission level has been 9,775 tonnes, representing an average rate of 3,258 tonnes per annum. Under this scheme, we would propose that the average outturn for the preceding three incentive years be used with an efficiency factor built in of 1.74% which corresponds to the annual factor used by the EU Emissions Trading System. As an example for comparison, this would have given a target of 3,201 tonnes for formula year 2014/15.

228 In consideration that the overall target is influenced by emissions outside of the direct control of the operator, we are proposing that a deadband be used against the total emission levels. This would then allow for sensitivity of performance to be assessed effectively and windfall gains or losses associated with the background environment to be taken out of the scheme.

Scheme Option 2: Reset Baseline removing those factors which are outside of the control of the operator from the calculation (Symmetrical)

229 In our breakdown of emissions, we provided details around those areas of emission where the cause can be attributed to factors outside of our influence or control. This scheme option proposes that those factors be removed from the baseline level of emissions used for incentivising our performance.

230 Whilst some other elements within the breakdown of emissions are also linked directly to other key outputs including reliability and safety, we are proposing that the Emergency Shutdown (ESD), Seal Emissions and Vents Whilst Unavailable categories be removed from the scope of the performance incentive.

231 We would include the levels of emission in these areas within our reporting requirements and propose that they be treated as ex-post outturn inputs in which to provide a clear mechanism for the baseline target to be set. This approach sharpens the incentive properties of the scheme by allowing greater focus on those factors which we have a degree of influence over.

232 As with option one, we would then propose that the average outturn for the preceding three incentive years be used with the same efficiency factor built in of 1.74%.

233 Again due to the volatile background environment we support the use of a deadband within the scheme design.

Scheme Option 3: Use a methodology statement to determine associated targets on a year by year basis (Symmetrical)

234 In their consultation responses stakeholders raised some concern around determining metrics from which to set incentives. Whilst we consider that we have advanced our understanding on the associated metrics for compressor emissions, we recognise the challenge expressed in these responses.

> *"Until all the sources of methane leakage are well understood and methodologies established to determine the volumes it is difficult to put in place robust incentive arrangements"*
>
> **- Energy UK**

> *"Level of GHG emissions is not well defined so it is very difficult to establish metrics and set a meaningful incentive."*
>
> **- RWE**

235 Taking in to account stakeholder concerns, we consider that it may be appropriate to introduce a methodology statement to determine associated targets on a year by year basis.

236 The methodology for volume determination could be established against a defined set of inputs and be published ahead of each incentive year with indicative target volumes. We would, as part of this process, consult with our stakeholders to ensure their views were reflected through the methodology.

237 We would expect that any annual baseline would then be determined using a robust methodology that reflects the level of venting that is inherent within the network and asset design alongside other operational utilisation factors.

Setting the target

238 We have expressed in the three options proposed that it is important to differentiate between the factors influencing levels of emission. All of the options we have proposed look to include this as part of the assessment of targets.

Scheme Duration

239 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. Whilst we do not expect to see major compressor replacement due to the Industrial Emissions Directive (IED) until at least formula year 2018/19, the approach for our compressor replacement is likely to be defined by May 2015 for a decision to be reached by the Authority by the end of 2015 prior to the current scheme completion. The current timeline expectation is that the majority of this work will not affect our emissions in the RIIO-T1 period.

240 In addition, stakeholders have proposed that the duration of the scheme recognises the potential for other quantifiable areas of emissions to be further understood so that eventually it maybe appropriate to bring them into the incentive. We are therefore proposing that a further review point be introduced against the chosen incentive scheme after a further two years of operation.

Appendix A – Scheme of works (C28/8D)

Table 7: Summary of projects undertaken against Licence Special Condition 8D

Projects	Synopsis	Key findings	Next steps
Pipeline Depressurisation	Improve current venting calculations including compilation of asset data	Developed pipeline venting calculations using approved methodology based on characteristics of the pipeline and pressure. Data is being estimated via internal monitoring tools.	The scheme of works has supported us to identify the magnitude of venting from Pipeline Depressurisation. Further quantification would necessitate the development of automated data collection systems and significant investment in assets and CNI system changes
Centralised reporting of station vents	To introduce a centralised report for our station vents	Station vent data is now included in the 'Operational' heading in section 7.12 of the monthly reporting pack	Completed - no further work required
Compressor Venting to be split in to operational and trip categories	Split different types of venting on centralised report i.e. station trip vents	Trip and non trip vents are now included in the 'Operational' heading in section 7.12 of the monthly reporting pack	Completed - no further work required
Compressor Seal venting, Isolation valves and Unit vent valves calculations	Improve calculations for seal venting and introduce venting calculations for compressor isolation valves and unit vent valves	During this scope of work our findings on compressor isolation valves challenged existing research being used as the basis for investment cases in a number of countries. The levels of potential venting were significantly higher than all previous forecasts	We are proposing to generate NIA projects to further our understanding and identify best practice for accurately measuring compressor isolation valve venting and undertake a research project in to options to reduce the level of venting
Emissions from actuation of valves associated with Compressor Operation and valve maintenance	Study to provide better understanding of emissions from the actuation of valves associated with the normal operation of compressors and emissions from other system valves during valve maintenance	Venting as a result of valve movement including actuation and controllers totalled 294 tonnes in 2012 Sites with electrically driven actuation/controllers have a very low emissions factor as there are no gas emissions associated with these types of valves	Results confirmed levels of emission to be of low magnitude in comparison to other venting components

Seal Emission Calculations

241 A project was undertaken to review seal emission rates in comparison to our current calculation parameters. Compressor seal vent units were inspected in their operational status and detected minor venting rates consistent with or lower than National Grid's existing seal emission data.

242 No further work was required in this area and we are continuing to use existing calculation methods as part of our overall compressor emission reporting.

Compressor actuation valves

243 Valve maintenance and movements result in gas emissions, the quantity depending on the valve types, controller types and installation. Within the scheme of works a study was undertaken to provide better understanding of gas emissions from the actuation of valves and to validate levels against National Grid's calculations.

244 The results indicated that the level of emissions is of a low magnitude and aligned to existing data calculations. We continue to use existing calculation methods as part of our overall compressor emission reporting.

Compressor venting reporting

245 Additional reporting was provided from the scheme of works to distinguish between operational vents and those caused by a "trip" of the compressor unit. The root data set used to provide the additional reporting is providing additional clarity on the contributory factor in compressor emission levels and has been used in supporting further analysis of operational vents within our compressor emissions analysis.