Stakeholder Consultation
Gas Transmission RIIO-2 Incentives

19TH DECEMBER 2019

nationalgrid

CONTENTS

INTRODUCTION

National Grid Gas Plc (National Grid) is the owner and operator of the high-pressure gas National Transmission System (NTS) in Great Britain. We are currently operating within the first price control under the RIIO regulatory framework model (Revenue = Incentives + Innovation + Outputs). As part of the RIIO-1 framework, incentive schemes were introduced to focus on delivering the outputs that customers and stakeholders highlighted were of value to them. This first RIIO price control period (known as RIIO-1) runs from 1 April 2013 to 31 March 2021.

Our financial incentives are designed to make sure we focus on work that aligns with customers, consumers and stakeholders' interests as far as possible. This in turn helps to deploy management focus and organisational effort to produce the outcomes that matter most to consumers. Incentive performance also reveals what levels of achievement are possible and informs where future performance may be driven. Incentives replicate the effects of competition in our business and they have been a key component of the regulatory framework since the 2002 Transco price control.

AIM OF THE CONSULTATION

We continue to believe being transparent with our stakeholders is of paramount importance both now and into the future. Following our RIIO-2 December business plan, which we sent to Ofgem on December 9th 2019, this document details our proposals for gas transmission financial incentives.

It is designed to help you better understand the overall proposals, how we have incorporated your feedback into our business plan and provide a further opportunity to provide any subsequent feedback you may have on their design.

CONSULTATION OUTPUT

On conclusion of this consultation process, we intend to produce a public document. This will summarise any feedback we receive and any further recommendations we draw from it, that either support our business plan proposals or demonstrate a case for change. We will also send this report to Ofgem, the independent Stakeholder User Group and RIIO-2 Challenge Group in Q1 of 2020.

SCOPE OF CONSULTATION

This document is concerned with the following incentives being proposed for inclusion as part of the next gas transmission price control under the RIIO regulatory framework model (known as RIIO-2), which will run from 1 April 2021 to 21 March 2026:
- Capacity Constraint Management (CCM)
- Residual Balancing
- Maintenance – Use of Days (expanded) and Changes scheme
- Quality of Demand Forecast – Day Ahead (D-1) and D2-5 Day scheme
- NTS Shrinkage
- Green House Gas emissions (Venting)
- Environmental Action Plan
- Customer and Stakeholder (CSAT/SSAT/SEI)

For each of these incentives we ask the following three questions:

Q1. Do you agree with the principle and proposed structure of the Incentive?
Q2. Do you agree with proposed changes to the Incentive for the RIIO-2 period?
Q3. Do you have any additional feedback on the Incentive?

STAKEHOLDER ENAGEMENT

Stakeholder engagement has been central to our activity throughout the development of our RIIO-2 business plan. We have run regular operational forums and external events, prepared newsletters, met customers and stakeholders individually, attended industry groups and liaised with Ofgem.

The output from our activities have been independently verified and triangulated by Frontier. The purpose of the triangulation was to determine robust conclusions and requirements for our business plan, based on a fair reflection of our stakeholder input.

We consider that this consultation provides you with a further opportunity to understand the detail and rationale of our incentive business plan proposals. This enables you to provide any final feedback to us on our business plan proposals. This in turn enables us to build upon your feedback received throughout our RIIO-2 stakeholder engagement activities and to set out any recommendations accordingly.

DOCUMENT STRUCTURE AND CONTACT DETAILS

To support the consultation, we have created this high-level summary in which we:

- Set out the key criteria we applied to inform the design and scope of the incentive schemes.
- Describe the expected energy landscape in which the incentive schemes will operate in, and the associated Network Operational challenges.
- Describe how we believe each proposed incentive is going over and above business as usual and delivers consumer value.
- Summarise the key proposed changes to the incentives schemes.
- Describe the key aspects of each proposed incentive.
- Request your response to specific questions and seek your general feedback.

In Annex 1 a more detailed explanation of each incentive is available.

In Annex 2 we will publish points of clarification and responses to general questions received during the consultation period.

All our proposals are for five formula years (April 2021 to March 2026) until the end of the RIIO-2 period. For more detailed information on how the current incentive schemes operate, please visit: https://www.nationalgridgas.com/about-us/system-operator-incentives

Please provide any comments on these proposals by **30th January 2020** to**:** incentives@nationalgrid.com.

If you'd like to discuss any aspects of this consultation, please don't hesitate to contact:

Mike Wassell (Mike.J.Wassell@nationalgrid.com) or Carol Carlin (Carol.Carlin@nationalgrid.com)

RIIO-1 INCENTIVE PERFORMANCE

Our incentives have worked as intended by creating demonstrable consumer value in the last price control by:

- Reducing upward pressure on wholesale energy prices via managing risks and returning value via incentive performance
- Minimising external costs (such as system balancing and constraint management actions).
- Allowing the market to function as effectively and efficiently as possible, ensuring shippers can flow gas so that demand can be met at the cheapest cost and ultimately lowering energy prices for GB consumers.
- Minimising the environmental impact of our operations; ensuring that environmental costs are sufficiently internalised in our business.

The table below provides a brief description of the purpose of each incentive, their value ranges and our incentive performance during RIIO-1 so far. A detailed breakdown of the incentive target level and our performance against the target by year can be found in section 3 of our System Operator Incentives Report[1], along with more information on the current incentive structures.

	Purpose	Value (£m)	Incentive financial performance per formula year					
			2013/14 (£m)	2014/15 (£m)	2015/16 (£m)	2016/17 (£m)	2017/18 (£m)	2018/19 (£m)
Capacity Constraint management (CCM)	Minimise constraint costs, encourage capacity release and make balanced investment decisions.	+20 to -60 (subject to RPI) (+25 to -76.4 in 2018/19)	12.6	12.6	12.6	13.3	14.2	13.8
Residual balancing	Efficient balancing of supply and demand on the gas day whilst minimising the market impact of any actions.	+2 to -3.5	1.0	1.1	1.2	1.1	0.6	1.0
Transmission support services *(ended Sept 18)*	Minimise the cost of tools to support the network in periods of high demand.	+4.1 to -unlimited	3.7	3.9	3.9	3.9[2]	4.1[2]	2.1
Shrinkage	Minimise overall cost of shrinkage through efficient system operation and energy procurement.	+7 to -7	5.1	4.8	6.3	2.5	5.4[2]	7.0
Maintenance – change and use	Align maintenance and minimise the number of changes to planned maintenance days.	+0.7 to -1 (from 2016/17)	1.1	0.9	0.4	0.7	0.7	0.7
Demand forecasting	Produce accurate forecasts for the day ahead (D-1) and D-2 to D-5 demand.	+10 to -1.5 (D-1)	2.5	3.7	3.2	2.5	2.5	-0.7

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[1] *https://www.nationalgridgas.com/document/123121/download*

[2] *Errors identified in our business plan submission that have been corrected in this document.*

		+10 to -1 (D-2 to D-5)						
Greenhouse gas (GHG) emissions	Minimise the amount of GHG that enters the atmosphere.	0 to -unlimited	-0.5	0.0	-0.2	-1.0	-1.4	0.0
Stakeholder engagement incentive (SEI)	Ensure the ongoing delivery of an efficient network that embraces wider social and environmental objectives. Network companies need to engage with a range of stakeholders.	Panel based reward value up to 4.1	1.10	1.49	1.48	1.80	0.21	0.59
		Assessed Performance Level (Max score 10)	*5.75*	*6.25*	*6.15*	*6.5*	*4.25*	*4.85*
Stakeholder satisfaction (SSAT)	Understand stakeholders' needs and proactively engage with them to make sure these are met.	2.48 to **-2.48**[2]	N/A*	N/A*	N/A*	0.8	0.9	0.8
		Target 7.4/10	7.79	7.94	8.02	7.98	7.96	8.08
Customer satisfaction (CSAT)	Understand consumers' needs and proactively engage with them to make sure these are met.	+5.8 to **-5.8**[2]	0.7	2.0	2.0	3.5	2.5	3.5
		Target 6.9/10	7.15	7.59	7.55	8.03	7.6	7.79
Total (£m)	n/a	n/a	27.3	30.4	30.9	29.1	**29.7**[2]	**28.8**[2]

CRITERIA FOR FINANCIAL OUTPUT DELIVERY INCENTIVES (ODI)

Ofgem confirmed in their July RIIO-2 decision document[3] that RIIO-2 will continue with the principles of incentive regulation, with rewards and penalties shaping the behaviour of networks so they deliver outputs and value that are in the public interest. We support this view and continue to believe that the principles of incentivisation remains the best way to deliver improved performance; aligning outcomes and behaviours with customer/consumer interest; replicating market competition; delivering timely value and effective management of appropriate risk via upside and downside schemes (subject to final scheme incentive designs, the overall financial metrics and sharing factors[4]).

When we began to consider what consumer value we deliver, we looked beyond the activities that we are already incentivised on. Starting with a blank page, we looked across the business to detail all activities we undertake and aligned these activities to the areas you have told us are important to you and that there is consumer value. This confirmed that our existing incentive portfolio are the right areas to incentivise, would continue to deliver value into RIIO-2 and identified new areas for consideration.

As part of this process we adhered to the following guiding principles, which we believe are imperative to ensuring our incentives are in the best interests of consumers and customers:

- Focus on those areas that matter most to consumers and customers.
- Stretch performance to go beyond our business as usual obligations.
- Recognise the changing landscape in determining the scheme design and target performance.
- Promote investment and innovation to unlock further consumer value.
- Unlock consumer value, both now and into the future (financial or otherwise).
- Have a clear data set that enables performance to be easily measured.

[3] *https://www.ofgem.gov.uk/system/files/docs/2018/07/riio-2_july_decision_document_final_300718.pdf*
[4] *Our proposal assumes the same sharing factors remain for RIIO-2 as RIIO-1. Changes to the sharing factors may result in changes to our position.*

- Are supported by stakeholders and in line with their priorities.

RIIO- 2 NETWORK OPERATIONAL CHALLENGES

We believe our incentives under RIIO-2 should be designed to stretch beyond our RIIO-1 performance levels. However, this needs to be considered against the backdrop of an energy landscape that has been rapidly evolving has become more operationally challenging during RIIO-1, which is a trend we expect to continue throughout RIIO-2. This will bring additional challenges in operating the network and our associated activities. Key factors we considered when developing our proposals include:

- Increasing customer demand for flexibility and linepack.
- Underpinning decarbonisation of energy and supporting the energy transition.
- Helping our customers optimise the efficiency of their own operations.
- Improving market participation and providing downward pressure on market prices and operational costs.
- The requirement to run compressors more often and variably.
- Managing greater levels of demand intermittency, and changing supply and demand patterns within and between days.
- An ageing asset base, with 2-3 times the level of maintenance required compared to RIIO-1 whilst minimising customer disruption, as our asset base approaches or has exceeded its natural design life.

CAPACITY CONSTRAINT MECHANISM INCENTIVE (CCM)

Capacity Constraint Management (CCM)							
Target	⬇	RIIO-2: -£22.1m (average annual) RIIO-1: -£28.9m (18/19 prices)	Cap	⬇	RIIO-2: £20m RIIO-1: £26m (18/19 prices)	Collar	⬇ RIIO-2: -£20m RIIO-1: -£79m (18/19 prices)

Headlines
- Consumer benefit is created through efficient activities to avoid and manage constraints, reducing overall costs and risks for consumers.
- Based upon a more comprehensive risk analysis (300+ Gb of data analysed vs 8 Gb for RIIO-1) to generate an incentive cost target.
- A symmetrical Cap and Collar of £20m.
- Removing a proportion (~50%) of the modelled constraint risk cost from the scheme target as a proxy for BAU managed risk.
- Removing forecast revenues from the scheme target (£2.3m per annum).
- An annual cost target of between £18.2 and £26.9m (annual average £22.1m) - subject to RPI.
- Remove revenue from the scheme where we scale back interruptible and/or off-peak capacity (e.g. if we scale back 5% of capacity, we reduce the associated element of the scheme revenue by 5%).
- A scheme reopener can be triggered if we cap out under the scheme two years in a row or collar out in any single year.
- No proposed changes to the incremental buyback (100% downside) and accelerated release (100% upside) elements to the scheme.
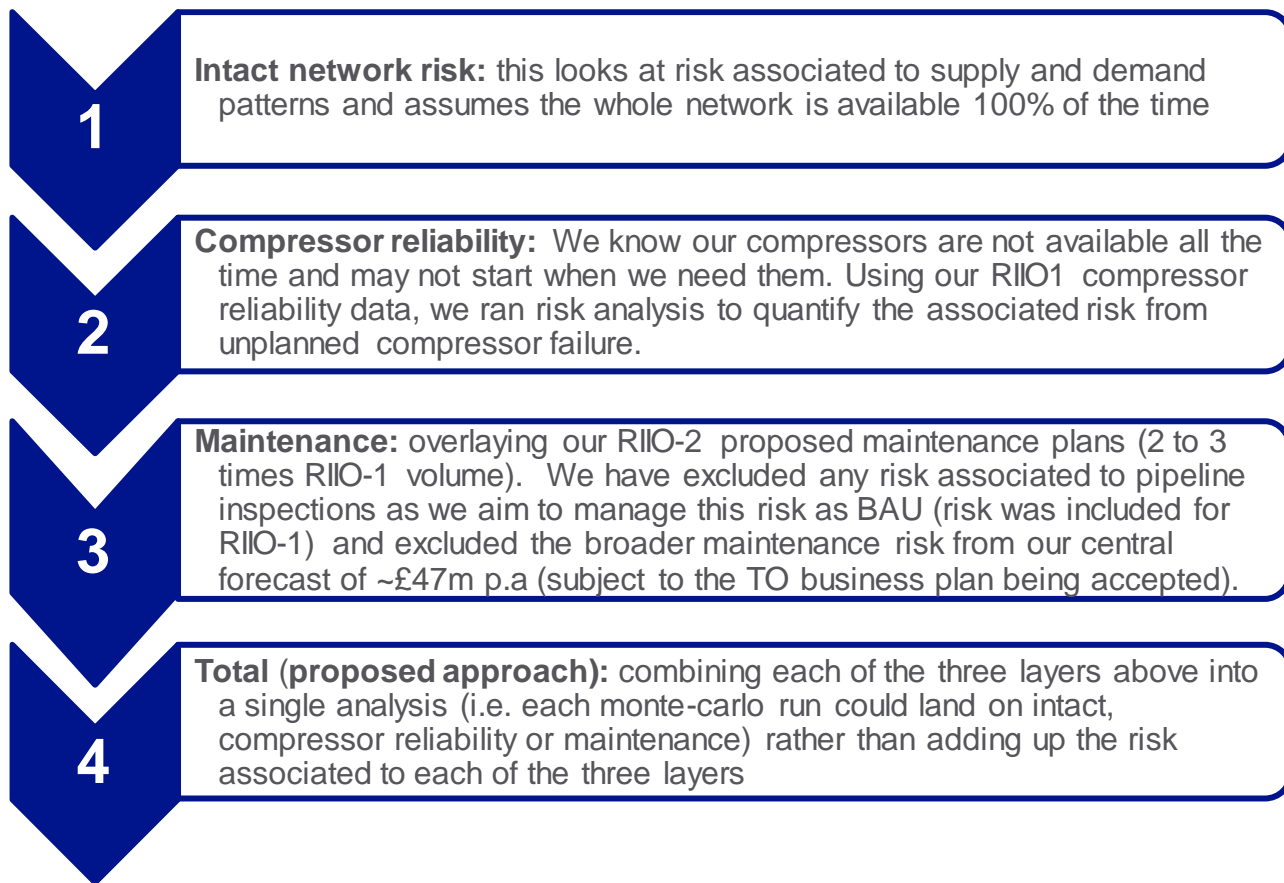
We are currently obligated to release Entry and Exit capacity at around double peak demand (top down regime). Flows of gas at these levels cannot be physically accommodated concurrently, meaning there is an inherent risk of constraints that must be managed. As well as this inherent risk, we also manage the risk associated to asset reliability, maintenance and changing flow patterns (both within day and between days). To manage this risk, we use rules, tools (physical and commercial) and asset options. Both actual constraints themselves and the management to avoid or deal with constraints, incur costs for customers and can impact energy prices both within day and in the longer term. We consider the Constraint Management incentive to be integral to the gas access regime.

The purpose of the constraint management scheme is to incentivise us to maximise the release of capacity and minimise the costs of constraints against a set financial target. If we manage the level of constraint costs passed through to consumers below the target through management/operation of the network, the constraint management tools we deploy and how we ensure our assets are available, then we receive a revenue from the incentive. If costs are higher than the incentive target, then a cost is incurred (subject to sharing factors and cap and collar).

A capacity constraint can be broadly described as an event where we are unable to flow gas on or off our network to meet customer flows within the contracted levels of capacity our customers have procured.

To understand the risk of constraints within the RIIO-2 period, we ran comprehensive risk modelling which can be summarised as follows:

We have run Monte Carlo analysis across four layers:

1 **Intact network risk:** this looks at risk associated to supply and demand patterns and assumes the whole network is available 100% of the time

2 **Compressor reliability:** We know our compressors are not available all the time and may not start when we need them. Using our RIIO1 compressor reliability data, we ran risk analysis to quantify the associated risk from unplanned compressor failure.

3 **Maintenance:** overlaying our RIIO-2 proposed maintenance plans (2 to 3 times RIIO-1 volume). We have excluded any risk associated to pipeline inspections as we aim to manage this risk as BAU (risk was included for RIIO-1) and excluded the broader maintenance risk from our central forecast of ~£47m p.a (subject to the TO business plan being accepted).

4 **Total (proposed approach):** combining each of the three layers above into a single analysis (i.e. each monte-carlo run could land on intact, compressor reliability or maintenance) rather than adding up the risk associated to each of the three layers

RIIO-2 analysis - supply and demand data sets

FES	**Uniform**	**Historic**
Four FES scenarios with a high continent and high LNG bias (8 scenarios in total) **~10 constraint events per annum**	For South Wales, replaces the FES South Wales supply forecast with a uniform distribution (0 to ~86 mcm/d) as a proxy for non-seasonal behaviour **~60 constraint events per annum**	Replaced the FES supply scenarios for the South East and South Wales with historic supplies as a proxy for RIIO-2 supply behaviour **~14 constraint events per annum**

Combination (our proposed approach)

- Combination of the above **~14 to 17 constraint events per annum**
- This runs further Monte Carlo on the Uniform, historic and FES data sets
- Weighted towards FES (8 FES scenarios vs 1 uniform and 1 historic)

SE (South East) Entry:	**SW (South Wales) Entry:**	**SO (Southern) Exit:**
Excludes Uniform as we have not seen such variability in SE flow and as such believe this risk should be excluded	FES, historic and Uniform are included as we consider each of these supply scenarios are realistic	Only use FES as historic closely matches FES and exit zone flows typically follow similar patterns based upon weather and demand

The risk analysis identified constraint risk at South Wales Entry, South East Entry, Southern Exit and Scottish Exit. The Scottish Exit risk is minimal and towards the back end of the RIIO-2 period, and hence has been excluded from the RIIO-2 scheme. However, this will need to be considered for RIIO-3. The output from the risk model is a forecast of between 14 and 17 constraint events per annum with an average central cost forecast of circa £48m per annum. This is ultimately the risk we believe we will be managing in the RIIO-2 period on behalf of consumers.

To date, under RIIO-1 we have managed some constraint risk without deploying commercial tools. For example, we have returned assets from outage earlier than planned, run our compressors outside of their normal operating envelopes and ensured flexibility is built into third party contracts to allow us to move the maintenance dates for key plant and manned compressor stations 24/7 to guard against failure.

Based on our learnings from RIIO-1, we propose removing a proportion (~47%) of constraint cost as a proxy for BAU managed risk and removing forecast revenues from the scheme target (£2.3m per annum). This results in a proposed scheme cost target of £22.1m (annual average). It is important to note that removing cost from the scheme target as a proxy for BAU carries an inherent risk and is below the level of risk we are forecasting for RIIO-2. The mechanism for setting the target is further detailed in the Incentive Annex and has been tested with stakeholders.

For RIIO-2, based on the risk identified, we propose profiling the risk with an annual scheme target that varies year to year to better align to the cost reflectivity principle.

We consider the scheme cap should be high enough to mean capping out under the scheme is unlikely, given that capping out could consequently result in a performance plateau, but should also be set low enough to ensure windfall gains don't occur and revenue can be returned to customer and consumers. As such we are proposing the cap is reduced from £26.3m (18/19 prices) to £20m (18/19 prices). We are also proposing the collar is reduced from -£79m (18/19 prices) to -£20m (18/19 prices) as we consider a symmetrical cap and collar ensures balanced focus under the scheme with regards to risk and reward.

We believe the incentive mechanism is integral to the capacity commercial and regulatory framework and requires us to go beyond BAU performance. For example, the incentive encourages us to:

- take on more risk in releasing capacity over and above obligations
- realign outages at cost to NGG to mitigate / manage potential constraints
- return assets from outage early at additional cost
- ensure key investment decisions are balanced against risk
- be less risk averse in carrying out constraint management actions

Ultimately the scheme facilitates customers being able to bring gas on and off the network when and where they want, meaning the cheapest gas can be sourced with minimal disruption. This will result in:

- Improved quality of service
- Lower Consumer bills
- Improved safety and reliability

Questions
Q1. Do you agree with the principle and proposed structure of the CCM Incentive?
Q2. Do you agree with proposed changes to the CCM Incentive for the RIIO-2 period?
Q3. Do you have any additional feedback on the CCM Incentive?

RESIDUAL BALANCING INCENTIVE

Residual Balancing							
Target	LPM RIIO-2: 2.8 mcm/day & 5.6 mcm/day (shoulder months) RIIO-1: 2.8 mcm/day	↔	Cap	↓	RIIO-2: £1.6m RIIO-1: £2m	Collar ↓	RIIO-2 -£2.8m RIIO-1 -£3.5m
	PPM : 1.5%						

Headlines
- This incentive encourages the minimisation of residual balancing activity, minimising impacts on the market, customers and ultimately cost to end consumers.
- A 20% reduction of the cap and collar for both components changes performance gradient. For example, to put this into context this would mean that a greater level of performance will be required in RIIO-2 to achieve the same level of reward as RIIO-1.
- Wider 5.6 mcm/day target applicable in shoulder months (Oct, Nov, Feb, Mar) to better align with NTS operational strategy when Linpeack needs to increase into winter and fall into summer, reducing the probability of the incentive creating inefficient behaviour.

In our role as residual balancer, we can enter the market and undertake trades as a signal for Shippers to resolve any residual imbalance on the system. The net costs or revenues from our market balancing actions are shared back to Shippers via balancing neutrality.

We consider the incentive to be integral to the residual balancing role and framework, providing us with a baseline performance level for the activity via the targets set. The incentive encourages us to maximise the effect of our residual balancing actions but minimise their impact on the market and places a greater focus on:
- Strategic trading activity (less risk averse) and keeping pace with a changing market.
- Investing and innovating in commercial insight, analysis and supporting tools.
- Less market intervention (we currently avoid entering the market roughly 250 days per year).

The result for customers and consumers is lower balancing costs because:
- We enter the market in a measured way to avoid incurring unnecessary costs for consumers.
- More efficient, transparent and predictable management of linepack creates a more informed market, supporting market driven correction rather than increasing our intervention.

The operating environment is changing. At the start of RIIO-1, the market environment meant that we only had to trade in the market between 10%-20% of days in the year. We are currently typically trading between 30%-50% of days in the year for residual balancing purposes, because of greater volatility of supply and demand between and within days. As we continue to meet our customer requirements in a more volatile market, we trade more frequently to provide the same level of service. By minimising residual balancing actions, we benefit the consumer by not unduly moving market prices.
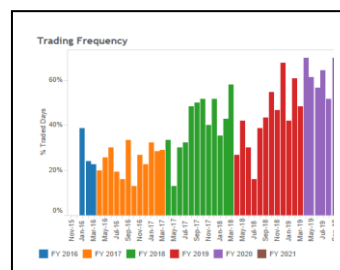
We are proposing to evolve the Linepack Performance Measurement (LPM) target to include a shoulder months' target of 5.6mcm/day, rather than 2.8 mcm/d all year round. In these periods, a preferred operational strategy can be to move linepack levels by more than the 2.8 mcm/d target. We can also experience a situation where shipper positions create an imbalance greater than the 2.8 mcm/day target, which the incentive would encourage us to rectify, but is moving linepack in the same direction as our preferred strategy. In these scenarios, the incentive and operational requirements are not necessarily aligned.

The 20% reduction in cap and collar changes the performance gradient, meaning that higher levels of performance will be required in RIIO-2 to achieve the same level of reward against an increasing volatile supply and demand backdrop.

Questions

Q4. Do you agree with the principle and proposed structure of the Residual Balancing Incentive?
Q5. Do you agree with proposed changes to the Residual Balancing Incentive for the RIIO-2 period?
Q6. Do you have any additional feedback on the Residual Balancing Incentive?

MAINTENANCE

Maintenance							
Targets	Existing ⟷	Use of days: 11 (RVO) Changes: 7.25% of overall plan	Cap ⬆	RIIO-2: £1.2m RIIO-1: £0.7m	Collar ⬆		RIIO-2 -£1.5m RIIO-1 -£1.0m
	New ⬆	75% Use of days (other)					

Headlines
- This incentive encourages alignment of maintenance plans with customers to minimise potential disruption to them and wider markets. This ultimately reduces costs to end consumers.
- Maintenance plan day changes scheme and Remote Valve Operation use of days' scheme both to continue unchanged.
- Introduction of an additional use of days' scheme element. 75% of planned customer impacting maintenance (excluding RVO) to be aligned to customer outage (performance measured through use of maintenance days as defined under UNC).
- Caps and collars increased to account for additional maintenance covered by scheme.
- Volume of planned maintenance, based upon our business plan, will be two to three times higher in RIIO2 making scheme naturally tougher to perform against.

We must periodically carry out maintenance on the NTS and publish a planned maintenance schedule. Where the work requires customers to cease or reduce offtake flows, we may 'call' one or more 'maintenance days' (as defined in UNC). We are currently incentivised to: a) use 11 days or less for Remote Valve Operation planned maintenance and b) to keep changes initiated by us to our planned maintenance schedule to less than 7.25%.

As an indication, if all maintenance that required customers to cease or reduce offtake flows, could be aligned to customer own outage plans, we calculate this would save customers c£14.5m per annum. Changes to the plans can also add significant costs to customers.

The amount of maintenance planned for the RIIO-2 period will be 2-3 times more than RIIO-1 as our ageing asset base approaches or exceeds its natural design life. This will make it more challenging to maintain current levels of performance. Our proposal is to keep the same targets, caps, collars and rates in place for RVO maintenance days and Changes to Planned Maintenance given the increased level of planned maintenance required.

In response to your feedback regarding the value of the scheme, we are proposing to widen the scope of maintenance activity incentivised. In addition to aligning planned RVO maintenance, we propose an additional alignment target of 75% of customer impacting planned asset replacement and reinforcement works. This element will have its own caps and collars which will be added to the overall scheme. These activities would, as BAU, require use of maintenance days, hence the incentive will drive us to further minimise customer disruption and cost by aligning our works with customer outages wherever possible.

Maintenance days (RVO)	Cap: £215k, Collar -£0.5m	First 5 days used -£25k/d, then -£15k/d
Change of Days	Cap: £0.5m, Collar -£0.5m	Each change over/under target £50k
Maintenance days (other)	Cap: £0.5m, Collar -£0.5m	Each day under/over target +/-£20k

Questions

Q7. Do you agree with the principle and proposed structure of the Maintenance Incentive?
Q8. Do you agree with proposed changes to the Maintenance Incentive for the RIIO-2 period?
Q9. Do you have any additional feedback on the Maintenance Incentive?
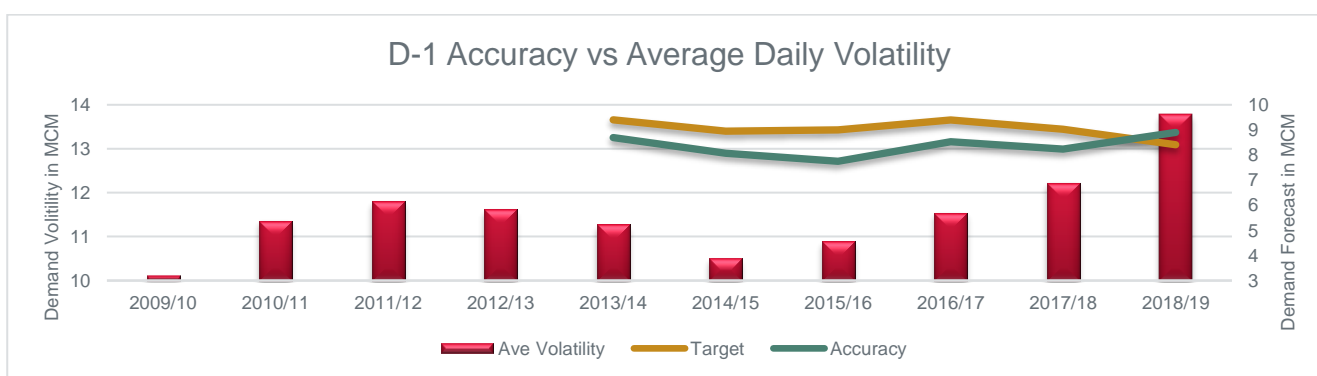
DEMAND FORECASTING INCENTIVE

Demand Forecast								
Targets	D-1	⬌	8.5mcm/d	Cap	⬇	RIIO-2: £4m per scheme	Collar ⬌	-£2.5m
	D2-5	⬌	13.7mcm/d			RIIO-1: £10m per scheme		

Headlines
- Our information and insights provide value for consumers by ensuring that the gas market runs smoothly. It also promotes competition in the wholesale market – allowing participants to plan, prepare and operate effectively.
- Reduction in cap reduces the performance gradient, requiring greater levels of performance in RIIO-2. To put this into context this would mean that a greater level of performance will be required in RIIO-2 to achieve the same level of reward as RIIO-1.
- Demand volatility (the amount actual demand varies from one day to the next) has been steadily increasing during RIIO-1 (~20%) and this trend is expected to continue in RIIO-2. Increasing demand volatility increases the challenge of accurate demand forecasting.
- Storage adjuster mechanism updated to ensure that it cannot go negative.
- A universally available demand forecast lowers industry costs and reduces barriers to entry. The cost of purchasing a 3rd Party forecast is in the region of £50k to £100k per annum.

Under our licence and UNC obligations, we provide NTS demand forecasts. The demand forecasting incentive is in place to improve the accuracy of both the day ahead (D-1) and two to five days ahead (D-2 to D-5) demand forecasts that we provide to industry daily. Our proposal is to continue to incentivise both forecasts but reducing the scheme cap and consequently the performance gradient.

Improved demand forecasting accuracy delivers consumer value because:

- Industry can make more informed decisions enabling savings to be passed to consumers.
- A barrier to entry for smaller industry participants is reduced.
- Increased forecast accuracy is likely to benefit wholesale market prices.

The level of demand volatility (defined as the magnitude actual demand changes from one day to the next) is increasing due to the changing energy landscape and we anticipate this will continue in RIIO-2.

D-1 Accuracy vs Average Daily Volatility

We propose reducing the incentive gradient on both demand forecasting schemes by reducing the financial caps from £10m to £4m for each scheme combined with changing the performance cap from 0 mcm to 4.5 mcm for D-1 and 6.85 mcm for D2-5. For context, this means that demand forecasting accuracy performance below 4.5 mcm (D-1) and 6.85 mcm (D2-5) is capped at £4m and that the same level of performance in RIIO-2 as RIIO-1 will result in decreased incentive reward, as illustrated in the following diagrams which shows the comparison between the RIIO-1 and RIIO-2 schemes:

D-1 Demand Forecasting RIIO-1 and RIIO-2 schemes

D2-5 Demand Forecasting RIIO-1 and RIIO-2 schemes
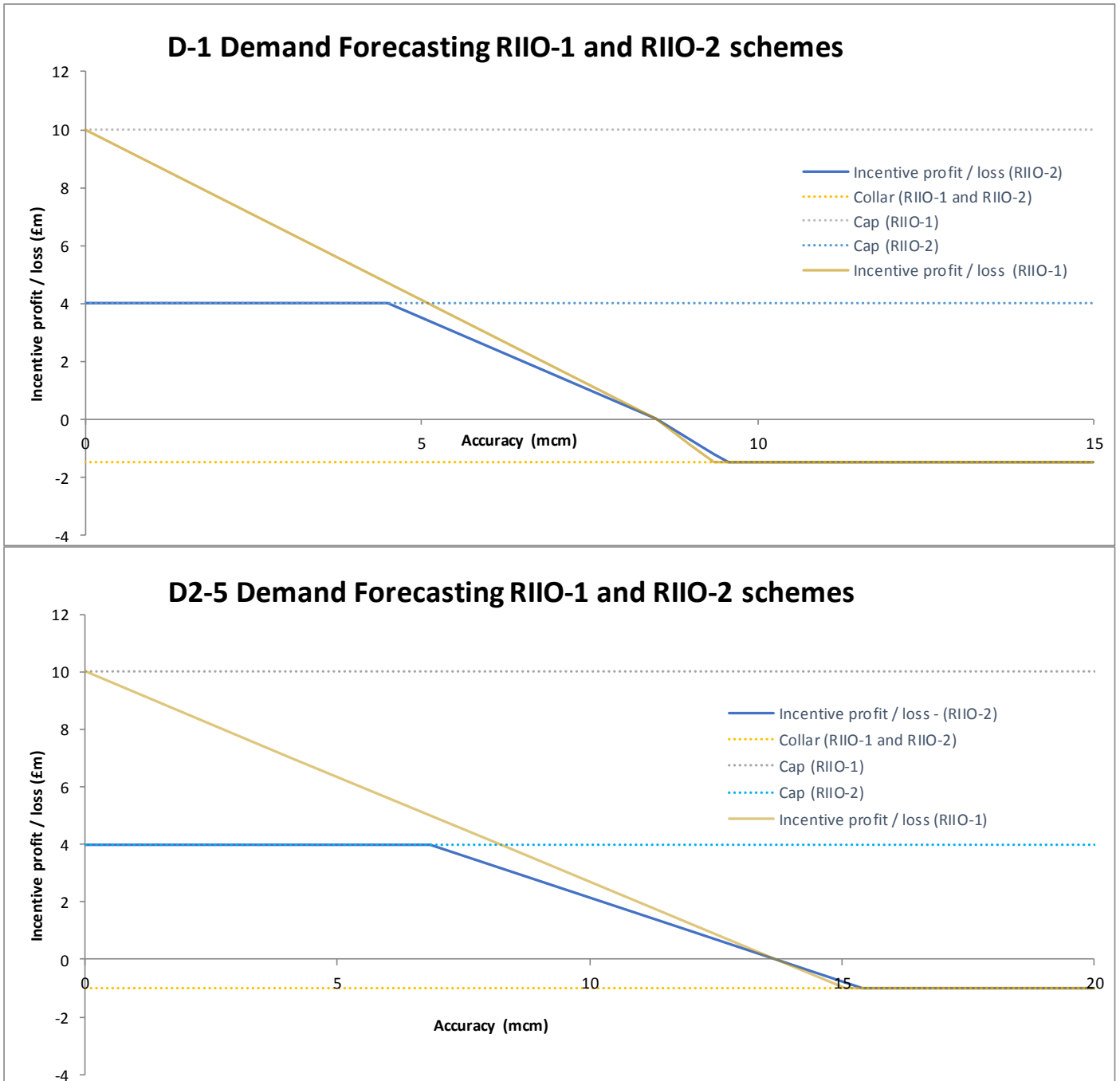
We propose retaining the existing incentive collars at -£1.5m for D-1 and -£1m for D2-5.

We believe the proposed scheme caps are at levels that are stretching, but challenging when you consider both the increasing level of demand volatility and our RIIO-1 performance levels shown below:

Performance	D-1 performance		D-2 to D-5 performance	
	mcm	£ (m)	mcm	£ (m)
Worst	8.9	-0.9	13.5	0.2
Average	8.4	1.1	12.6	1.2
Best	7.8	2.0	12.1	2.2

This shows that our RIIO-1 incentive returns to date have been between -£0.9m and £2.2m, taking the best and worst financial performance to date for each of the schemes and our accuracy performance has ranged from 7.8 to 8.9 mcm (D-1) and 12.1 to 13.5 mcm (D-2 to D-5).

We propose maintaining the weighted average calculations. In addition, the current scheme allows the storage adjuster to take a negative value, which effectively removes performance from the scheme. We believe this is a mathematical anomaly in the current scheme. We therefore propose, in the absence of this being amended within the RIIO-1 period, that for RIIO-2 the storage adjuster is retained but updated to ensure it cannot produce a negative value.

Questions

Q10. Do you agree with the principle and proposed structure of the Demand Forecasting Incentive?
Q11. Do you agree with proposed changes to the Demand Forecasting Incentive for the RIIO-2 period?
Q12. Do you have any additional feedback on the Demand Forecasting Incentive?

NTS SHRINKAGE INCENTIVE

NTS Shrinkage						
Targets	Target set annually using Shrinkage Methodology	Cap	⬇	RIIO-2: £5m RIIO-1: £7m	Collar ⬇	RIIO-2: -£5m RIIO-1: -£7m
Headlines						
▪ The incentive means that we manage shrinkage to minimize consumer cost exposure by procuring shrinkage energy at below average market price and minimize the amount required ▪ Introduce greater liquidity in shrinkage trading options through access to seasonal markets. Estimated cost saving of £320k - £480k p.a. ▪ A reduced cap would mean more value returned earlier to customers if outperformance is achieved ▪ Review Shrinkage Methodology with industry to ensure robust, visible and understandable targets are set ▪ Retain all components of Shrinkage (CFU, UAG, CVS) and existing framework						

UNC designates us as NTS Shrinkage Provider, meaning we are responsible for managing the end-to-end service of forecasting, accounting for, and procuring energy to satisfy the daily NTS shrinkage components. It is important to note that due to our unique position there are limitations to our role (for example, speculative trading is not permitted).

The shrinkage scheme incentivises us to minimise costs associated with managing NTS Shrinkage. An annual target cost is created by the Shrinkage Methodology. For the purposes of the incentive, the methodology is used to determine:

- The target price and volume of gas and electricity for Compressor Fuel Usage (CFU) and replacing Unaccounted for Gas (UAG) and Calorific Value Shrinkage (CVS).
- Energy efficiency target for CFU and CVS.
- The TNUoS allowance to cover running electric compressors during Triad periods.[5]

As the cost to manage NTS shrinkage is recovered from NTS Users as part of the Commodity Charge, our decisions and actions impact customer charges and therefore ultimately consumer bills. When we buy energy below the target price, are energy efficient, and keep costs such as TNUoS to a minimum, we share the benefit with customers and ultimately end consumers.

We also manage the risk of market price volatility and uncertainty through our trading strategies. This provides a level of price protection, including against short term price spikes resulting from difficult market conditions.

We propose keeping the same shrinkage incentive framework in place for RIIO-2, but are proposing changes to deliver more value. A challenge with the current incentive scheme is that there are periods when we must trade at times of low liquidity/higher prices because the incentive calculation is based on forward quarter prices, potentially adding a potentially avoidable cost.

Our proposal is to introduce Seasonal markets to the scheme and adjust our target price accordingly, as seasonal markets tend to have better liquidity further out. We forecast this could reduce shrinkage costs by £320k-£480k per year. For RIIO-1 the incentive calculation is based on Quarterly and Week Ahead energy forward prices only.

We also propose that the Shrinkage Methodology is reviewed with Industry to help ensure clarity on how the target costs are calculated, as this is currently a complicated calculation.

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[5] *On 21st November Ofgem published their Targeted Charging Review: Decision and Impact Assessment. This covers elements of TNUoS charging. We are currently reviewing how these changes interact with the Shrinkage Incentive as proposed*

We are proposing that the cap and collars reduce from +/-£7m to +/-£5m to recognise our RIIO-1 performance.

Questions

Q13. Do you agree with the principle and proposed structure of the Shrinkage Incentive?
Q14. Do you agree with proposed changes to the Shrinkage Incentive for the RIIO-2 period?
Q15. Do you have any additional feedback on the Shrinkage Incentive?

GREENHOUSE GAS INCENTIVE (GHG)

Greenhouse Gas						
Targets	⟷	No change Vent less than 2,897mt Methane	Cap	⬆	RIIO-2: £1.5m RIIO-1: £0	Collar	⬇	RIIO-2: -£1.5m RIIO-1: unlimited

Headlines
▪ Improving the environment (air quality, carbon emissions, local community and the environment) is very important for domestic consumers. This incentive will help drive progress in this area over and above our baseline.
▪ We are proposing to increase the charges for venting more than 2,897mt of methane by changing the CO2 to methane conversion factor from 1:21 to 1:25 (19% increase).
▪ The CO2 calculated volume is multiplied by the BEIS Non-Traded Cost Comparator (NTCC) which is forecast to increase, meaning a higher incentive penalty when the target isn't met and requiring a performance improvement to achieve equivalent results in RIIO-2.
▪ An upside is proposed to incentivise us to innovate, seek further performance improvements and to deliver these potentially earlier.
▪ The proposal to remove unlimited downside reflects the fundamental principles of incentives and the level of influence we have, given that the key driver of venting is supply and demand patterns.
▪ We have calculated the collar by adding 10% to our worst performing year and believe this level is proportionate.

Compressors are used to increase pressures in parts of the network and to move gas from the sources of supply to areas of demand. Whether we need to operate an individual compressor on any given day depends on several factors including the sources of supply and demand, the prevailing network conditions and the need to accommodate essential maintenance, emissions testing and construction plans. The compressor fleet is subject to several environmental regulatory compliance requirements.

The amount of natural gas vented from NTS compressors is dependent on several elements which include starting compressors, purging or depressurising compressors to switch off, and emissions of gas through compressor shaft seals.

This scheme incentivises us to make the trade-off between the costs incurred by choosing to depressurise compressor units (venting the gas within them) or to keep units on standby, which incurs costs associated with ancillary electrical equipment (vent fans, oil pumps etc.) and a level of emissions through the shaft seal. The scheme also encourages us to continually challenge and review existing tools and KPI's, and influences the decisions on whether to maintain existing assets and/or make alternative investments.

Ensuring that we minimise emissions from compressor venting is important given that methane has 25 times the emissions impact of carbon dioxide.

We are proposing to maintain the existing target level of 2,897 metric tonnes of methane. As well as not consistently meeting this target over RIIO-1 period, we also expect an increasing need for compressor use and a corresponding uplift in venting. This need is largely driven by the growing complexity and volatility of supply and demand flow patterns, and the increasing maintenance required for ageing assets.

We are proposing a symmetrical cap and collar of £1.5m per annum for RIIO-2 instead of the RIIO-1 unlimited downside only scheme. We believe an upside to the incentive scheme could support investigation and investment in innovative solutions, as well as providing a driver to exceed the target rather than performance plateau. The collar supports the principles of an incentive and is set at a level above our historic performance levels.

We are proposing a tougher Methane to CO2 conversion for RIIO-2 of 1:25 rather than the current 1:21. When this is combined with the rising cost of carbon the penalty for missing target in RIIO-2 will be naturally higher.

Questions

Q16. Do you agree with the principle and proposed structure of the GHG Incentive?

Q17. Do you agree with proposed changes to the GHG Incentive for the RIIO-2 period?

Q18. Do you have any additional feedback on the GHG Incentive?

ENVIRONMENTAL ACTION PLAN

Environmental Action Plan incentive						
Target	New incentive 7 targets linked to deliverables	Cap		£2.5m	Collar	-£2.5m

Headlines
- Improving the environment (air quality, carbon emissions, local community and the environment) is very important for domestic consumers. This incentive will help drive progress in this area over and above our baseline
- Seven deliverables with target, penalty and reward levels specified for each year of RIIO-2. Proposal includes a dead band to balance reward/penalties incurred across the multiple deliverables.
- Deliverables focussed on air quality, carbon emissions, local community and waste reduction.
- Proposal includes a dead band to balance reward / penalties incurred across the multiple deliverables.

Our commitments around caring for the environment and communities is influenced by global and government ambitions, stakeholder, society and end consumer impacts. We are signatories to the United Nation's Global Compact, which have a strategy to drive business awareness and action in support of achieving the UN Sustainable Development Goals (SDGs) by 2030. These goals promote prosperity while protecting the planet.

Improving the environment (air quality, carbon emissions, local community and the environment) is important for domestic consumers. The proposed incentive will help drive progress in this area over and above our corporate commitments.

We are proposing that 7 metrics from the Environmental Action Plan are subject to financial incentivisation.

- Percentage of our fleet that are alternative fuel vehicles
- Percentage reduction in carbon emissions from business transport from 19/20 baselines
- Percentage of our operational and office waste that is recycled in year
- Percentage reduction in the waste we create at our offices from 19/20 baselines
- Percentage reduction in water use in our main offices from 19/20 baselines
- Percentage increase in the environmental value of our non-operational land from 19/20 baselines
- Percentage increase in environmental value on our construction projects in year

Annual targets for each metric are proposed with penalty and reward levels specified. Not all measures in the EAP would be suitable for incentivisation as they can't be readily measured, and a baseline would not be able to be established before the start of RIIO-2.

We propose a symmetrical incentive with a cap and collar of £2.5m p.a, with a performance dead band to ensure a balanced assessment of performance:

		Metrics above reward threshold (£m)							
		0	1	2	3	4	5	6	7
Metrics below penalty threshold (£m)	0	£0.0	£0.0	£0.5	£1.0	£1.5	£2.0	£2.5	£2.5
	1	£0.0	£0.0	£0.0	£0.5	£1.0	£1.5	£2.0	
	2	-£0.5	£0.0	£0.0	£0.0	£0.5	£1.0		
	3	-£1.0	-£0.5	£0.0	£0.0	£0.0			
	4	-£1.5	-£1.0	-£0.5	£0.0				
	5	-£2.0	-£1.5	-£1.0					
	6	-£2.5	-£2.0						
	7	-£2.5							

Questions

Q19. Do you agree with the principle and proposed structure of the EAP Incentive?
Q20. Do you agree with proposed changes to the EAP Incentive for the RIIO-2 period?
Q21. Do you have any additional feedback on the EAP Incentive?

CUSTOMER AND STAKEHOLDER INCENTIVES

Customer and Stakeholder Incentives							
CSAT Baseline Target	⬆	RIIO-1 6.9/10 RIIO-2 7.8/10	Cap	⬌	RIIO-1 8.5/10 RIIO-2 8.5/10 RIIO-1 = + 0.7% revenue (+£5.8M) RIIO -2 = + **0.5%** revenue (+ £tbc)	Collar	⬆	RIIO-1 5.3/10 RIIO-2 7.1/10 RIIO 1 = - 0.7% revenue (-£5.8M)- - **0.5%** revenue (- £tbc)
SSAT Baseline Target		RIIO-1 7.4/10 RIIO-2 Reputational			RIIO-1 9/10 RIIO-2 – n/a RIIO-1: +0.3% revenue (+£2.5M) RIIO-2: non-Financial			RIIO-1 5.8/10 RIIO-2 – n/a RIIO-1: -0.3% revenue (-£2.5M) RIIO-2: non-Financial
SEI		Panel assessment with maximum financial reward to NGG of £4.1m. RIIO-2 BAU.						

Headlines
- The incentive produces positive impact on the operating costs of the businesses directly serving consumers
- 3 financial incentives in place for RIIO-1 period: Stakeholder Engagement Incentive Scheme (SEI); Customer Satisfaction (CSAT); Stakeholder Satisfaction (SSAT)
- SEI becomes BAU in RIIO-2.
- SSAT changes from a financial incentive to form part of a reputational incentive based on stakeholder perception which will be shaped with our Stakeholder User Group during 2020.
- CSAT remains a financial incentive, continuing to use the current recognised methodology.
- CSAT baseline target has been recalibrated to reflect our latest published performance
- CSAT Cap performance level (the point at which no further financial reward can be earnt) of 8.5 out of 10 to remain the same for RIIO-2, reflecting that incremental improvement in score requires proportionally greater effort to achieve
- CSAT Collar performance level (the point at which we are reach our maximum financial penalty) is proposed to be more severe by raising the point from 5.3 to 7.1 to discourage reduction of performance
- The financial reward/penalty associated with the caps and collars is reduced from 0.7% to 0.5% of revenue.

Customer satisfaction (CSAT)

How we operate our day to day services has an impact on our customers' time, effort and ability to make informed decisions which in turn impacts their operating costs. Measuring their satisfaction through this universally recognised surveying method is designed to drive improvements in the quality of customer service at all core touchpoints. It includes a financial reward and penalty mechanism and brings the voice of the customer into our business to help us focus on where we need to improve.

Ofgem have indicated that the caps and collars for this incentive should be +/- 0.5% base revenues. In terms of our specific proposals these can be summarised as follows:
- We propose the question should be made more relevant for the customer contacts who interact with us across all our service areas:
  - Based on your experience of *[service touchpoint]* - on a scale of 1-10, how satisfied are you with National Grid Gas?
- We propose that the satisfaction rating remains on a 10-point scale for continuity and trending.
- We propose to Increase the baseline (target) to 7.8, which is our latest published score (2018/19 year end).
- By moving our baseline to our last published position, we propose to maintain the Cap at 8.5 to recognise the increasing stretch to achieve each increment from our current position.
- We propose a revised severity of Collar to mirror the shortened gap between the new Baseline and proposed Cap – moving it from 5.3 to 7.1

We have learnt through our experiences and those who follow best practice in other industries, that the higher the score in a year, the harder it becomes to advance further. Experts in the field of CSAT state that the halfway point on a 10-point scale is a score of 8 – this is because it is recognised that it takes as much effort to incrementally move up from a score of 8 as it does to reach a score of 8 in the first place.

Our CSAT RIIO-1 improvement has been largely down to improving the experience driving very low satisfaction scores, meaning that we are now providing a more consistent experience across NGG. However, our customer feedback highlights where improvements are still needed to meet their growing expectations and to move our average soundly and constantly above 8.00 will require a step change in our performance along with further investment in our people and systems.

The incentive we earn will help us to continually invest in the evolving demands on the experience we provide.

Stakeholder Satisfaction (SSAT) and SEIS
Following a full-scale review of the SEI scheme we identified and laid out a clear strategy for improvement, from capability, systems, tools and data management to externally benchmarked best working practices and governance.

We propose to continue tracking the experience of all our Stakeholders, and to design a suite of stakeholder perception metrics with our Stakeholder User Group. These will become reputational metrics. 'Satisfaction' will be a part of this along with a means to measure the quality of our engagement with the communities impacted by construction.

Q22. Do you agree with the principle and proposed structure of the Customer and Stakeholder Incentives?
Q23. Do you agree with proposed changes to the CSAT, SSAT and SEI Incentives for the RIIO-2 period?
Q24. Do you have any additional feedback on the Customer and Stakeholder Incentives?

NEXT STEPS

Please provide any comments on these proposals by **27th January 2020** to**:** incentives@nationalgrid.com

If you'd like to discuss any aspects of this consultation, please don't hesitate to contact:

Mike Wassell (Mike.J.Wassell@nationalgrid.com) or Carol Carlin (Carol.Carlin@nationalgrid.com)

APPENDIX 1 - **NATIONAL GRID GAS TRANSMISSION RIIO-2 INCENTIVE PROPOSALS**

1.Capacity Constraint Management (CCM)

How the incentive works	CCM incentivises us to maximise the release of capacity and minimise the costs of constraints against a set target. If we manage the level of constraint costs below the target through management/operation of the network, the constraint management tools we deploy and how we ensure our assets are available, then we receive a revenue from the incentive. If costs are higher than the incentive target a penalty is incurred subject to a cap and collar.
Proposals	We are currently proposing: -Retaining the cap, collar, and target principles of the operational buy back scheme. -Retaining the existing cost and revenue components of the scheme. -Managing a proportion of risk as BAU, and therefore removing a cost allowance from the scheme target. -Remove a proportion of interruptible / off-peak capacity revenue where we scale back. -Incorporating network capability outputs to inform constraint risk. -Reduced and symmetrical cap and collar -Retaining the incremental buy back element of the scheme as-is. -Retaining the accelerated release mechanism as-is.
Consumer benefit	Consumer benefit is created through efficient activities to avoid and manage constraints, reducing overall costs and risks for consumers.

Figure 1: CCM summary

Overview
The current regulatory and commercial frameworks oblige us to release obligated levels of capacity around double peak demand at both entry and exit points on the network, which means there is an inherent risk in the network. Flows of gas at these levels of capacity cannot occur concurrently, so we take a view of the combinations of supply and demand patterns likely to occur and assess the most efficient solution to meet customer capacity and likely flow requirements. We consider the rules, tools and asset options available to manage any resultant risks.

A capacity constraint can be broadly described as an event where we are unable to flow gas on or off our network to meet customer flows within the contracted levels of capacity our customers have procured. The reasons for a potential capacity constraint are numerous. For example, a constraint can be caused by both anticipated or unforeseen supply and demand patterns, unplanned outages on our network through asset failure (such as a compressor trip) and planned maintenance on our assets which makes them unavailable for a period. An entry constraint occurs when we are unable to flow gas onto the network where the pressure in the network is at, or approaching, the defined maximums for that section of the network. An exit constraint occurs where pressures at the exit point would fall below the minimum pressure defined for that part of the network. We always aim to avoid such events through the deployment of commercial and physical constraint management actions to keep pressures manageable and we minimise disruption wherever possible. The capability of the network to accommodate flows onto and off the network is often described as 'Network Capability'.

The incentive

Through the operational buyback incentive for RIIO-1, we are exposed to 44.36%[6] of the cost and revenue components of the constraint management scheme up to a cap (£26m) and collar (£79m) (both values in 2018/19 prices). Additionally, sales of non-obligated capacity feed into the incentive as a revenue, as do sales of obligated capacity on the day, sales of interruptible and off-peak capacity, shipper entry overruns charges and locational sell revenue (including Physical Re-Nomination Incentive (PRI) charges). Sales of non-obligated capacity for the period prior to incremental capacity release attract a 100% sharing factor whilst buying back incremental capacity, due to late delivery, attracts a 100% downside sharing factor. Therefore, we are incentivised to maximise capacity availability, but may be exposed to the costs of capacity constraints if we sell too much or deliver incremental capacity late.

There is a target cost associated with the operational incentive each year of £29m (in 2018/19 prices). If we keep constraint management costs below target, then we will receive a revenue from the incentive whereas if costs are higher than the target a cost is incurred. This is detailed in the diagram below:
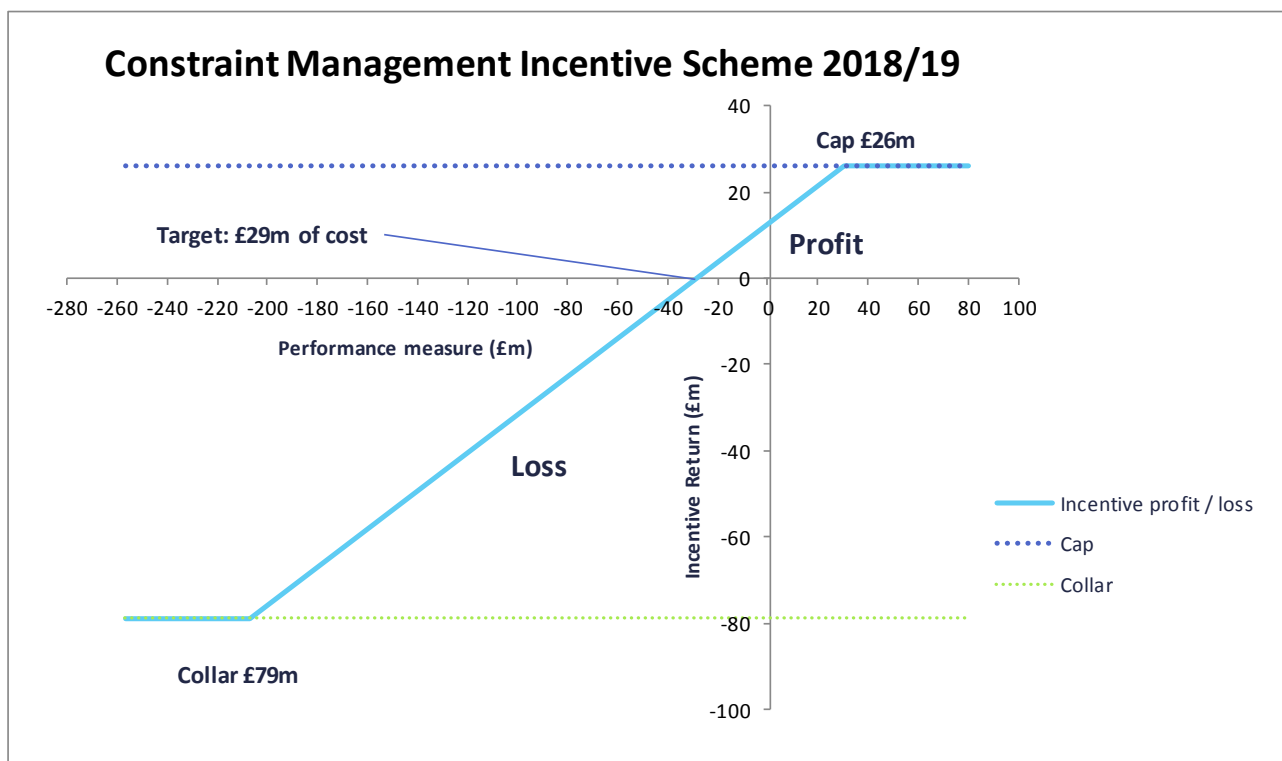
Figure 2: CCM RIIO-1 scheme parameters (2018/19)

For RIIO-1, the target for the scheme was based on the risk modelling carried out to support the business plan submission.

The energy landscape is changing, with an increase in renewables, a focus on decarbonisation and more reliance on gas imports. Therefore, we expect a greater level of supply and demand variability than previously seen, which applies to both day to day and within day variability. This brings with it an increase in the associated risk of constraints. In addition, the ageing asset base means that maintenance and outages will be higher. Our proposed maintenance plan is set to be between two and three times greater in RIIO-2 than the previous price control.

You have challenged us on how the Constraint Management incentive scheme goes beyond BAU. We believe that the CM incentive scheme is integral to the GB access regime, inherent to both investment,

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[6] *Note: The incentives proposed for RIIO-2 assume the same sharing factors as RIIO-1. If the sharing factors change for RIIO-2 this may require changes to the scheme designs, targets, caps and collars.*

operational activity and associated risk management. The current capacity regime is "top down" meaning we oversell capacity (double peak day demand) beyond expected levels of network capability on a day to day basis, which has an inherent risk associated to it for us to manage on your behalf and which the scheme should continue to recognise. We also believe that we should incorporate our learnings from RIIO-1 going forward and therefore that a level of risk management could be considered as BAU in RIIO-2.

Value for consumers

Why is a constraint management incentive scheme good for consumers?

Consumer value is the bedrock of our RIIO-2 incentive proposals and we acknowledge the need to demonstrate the links between incentive outputs and consumer value. There are several drivers that could increase consumer bills in the event of a constraint which include:

- Constraint Costs: The cost associated with managing a constraint, both during the constraint (such as operational costs) and post-event costs (such as post-event reconciliation of costs). It is likely that all costs borne by shippers during a constraint would be ultimately passed onto consumer bills.
- Entry constraint impact: Increase in the wholesale gas price as the cheapest entry source cannot be facilitated and more expensive gas is sourced. This cost could be substantial in the event of a constraint and we would also expect the electricity wholesale price to rise.
- Exit constraint impact: If CCGTs are impacted there would be a consequential increase in electricity wholesale prices. If industrials are impacted, there would be a consequential operational cost to them. The downstream effect of CCGT loss would also likely lead to operating costs increases to industrials and consumption costs to end consumers.
- In addition, a more constrained network is likely to result in a broader increase in wholesale gas and electricity prices, due to the market building a risk premium into prices.

We commissioned a consultancy company to independently validate the consumer value of the CM incentive. In summary, their report concluded that for RIIO-2, the CM incentive could generate up to £111m of additional consumer value based on the existing RIIO-1 incentive scheme.

The CCM incentive drives us to focus on managing constraints efficiently with least cost to consumers meaning the impacts of constraints are less likely and that we maximise capacity availability.

It is important to acknowledge the changing level of challenge in operating the network. Supporting the energy transition, managing demand intermittency, changing demand and supply patterns within and between days, and ageing assets with increasing maintenance needs all add up to a more operationally challenging situation. For example, entry and exit flows are generally lower during the summer months but we are experiencing difficult operating conditions in these low demand periods due in part to large proportions of UK demand being met through single supply sources. There is also an increasing need for flexibility from the network where instantaneous demand and supply is not matched, and this has been seen via an increasing and variable trend in annual compressor running hours. Running compressors more often and variably enables the flexibility that the market requires, supports the network and ensures we can deliver for our customers and demonstrates that the value of the network can't be measured simply through end of day demand. We recognise that compressor running hours can fluctuate significantly, this is a strong indicator of the flexibility required from the network.

We also carried out an exercise that examined the case for no constraint management incentive scheme, and how this may change related outputs (Figure 4).

For these reasons, we consider a constraint management incentive remains appropriate to help ensure constraint risk is managed in the best interest for consumers. We also understand that the constraint management risk and incentive scheme is intrinsically linked to Network capability and therefore we have incorporated the network capability boundary outputs into our risk analysis.

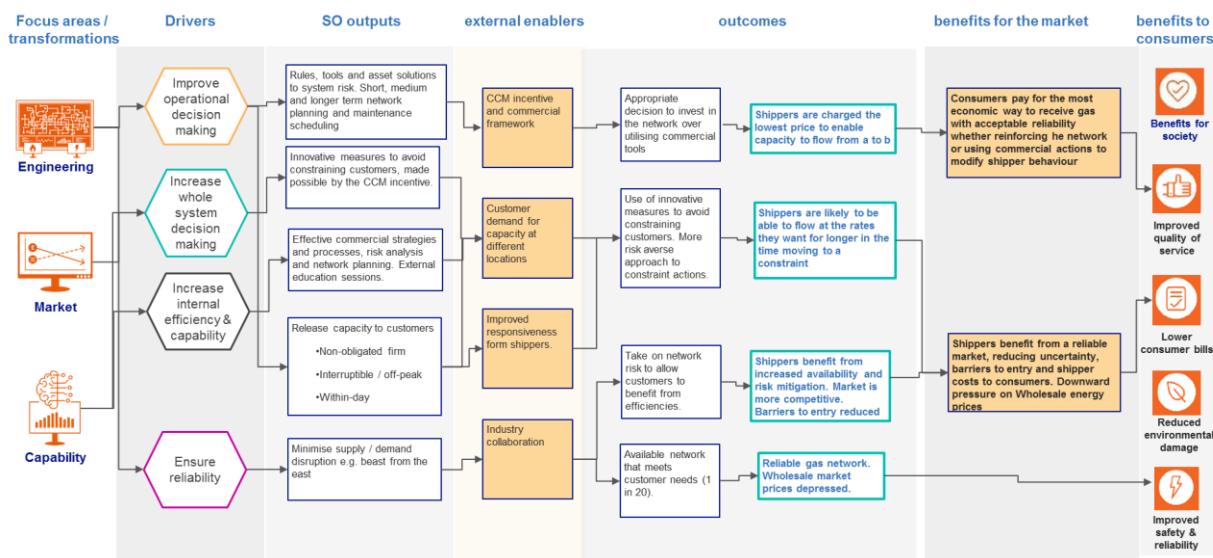Our consumer value framework has been used to inform the incentive package:

Figure 3: CCM consumer value framework

We reviewed this incentive scheme to assess the benefits to consumers and worked our way back to assess benefits to the market and ultimately the focus/transformation areas within National Grid Gas Transmission.

Consumer value as defined by a counterfactual exercise (what could happen without a CCM incentive?)

We have considered how the removal of the constraint management incentive could impact, from both an operational and end consumer perspective. We will always strive to be as efficient and economic as we can be, however in the absence of a constraint management incentive we consider it is reasonable to conclude that the likelihood of behavioural and output change increases. In general, incentive schemes provide measures to push and enhance performance of the organisation to deliver consumer value. The table below summarises the conclusions from the internal workshop which we have also tested with stakeholders:

Operate the network	Constraint Management
- Run less compression or different compressor strategies -more reserved on asset running beyond standard conditions as there no upside balance of an incentive. - Take on less risk in deciding whether to release additional capacity. - Take commercial actions earlier if a suitable option is available or wait to nearer real time for certainty. - Less innovation applied to operational constraint management solutions - Weaken commercial contract negotiation position as it may be perceived we have less risk exposure to outcome - Could disproportionally impact smaller shippers through the smearing of constraint costs if those increase	- Socialised CM costs > we act differently > market participants may choose to act accordingly. - Ofgem more heavily integrated into decisions on how to mitigate risk, based on their funding of asset based solutions > if we get financed then we would be more likely invest to mitigate risk > if we do not get funded then we would be more likely take out more commercial based contracts as a direct cost pass through. - Discourages temporary build/asset solution as TOTEX does not include cover for such ad hoc activity.

CBAs	Asset Management
- Ofgem become more integral to decision making process > we only act on strong evidence that Ofgem will remunerate investment. - Increase stakeholder engagement to achieve a greater level of certainty> time & cost. - Use of commercial solutions closer to real time when requirements become firm/clearer.	- Greater level of funding required for increased job costs and time scales > greater uncertainty of project cost - Reputational damage becomes key governing factor for us > trade this off against project costs - Increased asset intervention if we are funded, use contracts if not funded adequately for asset investment > take less risk on asset performance

Figure 4: Potential impacts of the removal of the CCM scheme

Incentive description
The RIIO-1 story and learnings for RIIO-2

What were the principles behind the CCM incentive?
The structure of the capacity regime results in an inherent level of constraint risk on the system to manage. The RIIO-1 regulatory and commercial frameworks oblige us, on every day of the year, to release levels of capacity more than double peak demand at both entry and exit. Flows of gas commensurate with these levels of capacity cannot occur concurrently, so we take a view of the likely combinations of supply and demand patterns likely to be experienced and an assessment of the most efficient solution to meet them considering the rules, tools and asset options available to us.

In RIIO-1, we identified the following drivers of constraints which we consider broadly remain for RIIO-2;

Driver of constraint
Inherent risk
Risk inherent in the network, driven by changes in existing gas supplies and demand expected over the RIIO-1 period. To also include unplanned outages. Note this does not include any incremental supplies or demands on the NTS.
Unforeseeable asset health events
Events triggered under an Asset health uncertainty mechanism have the potential to affect the constraint risk going forward.
Maintenance
Planned maintenance and asset health investment which requires system access (including outages) to complete. This activity is expected to increase as large parts of the network ages beyond its design life over the RIIO-1 period.
Impact of known IED requirements
The Industrial Emissions Directive requires us to replace a number of our compressor units. This exceptional event will drive a significant number of compressor station outages over the RIIO-1 period, far in excess of those required for maintenance and asset health investment.
Impact of additional IED requirements
The Industrial Emissions Directive (IED) may require us to replace further compressor units over and above those in the known IED requirements above. Investment triggered by the IED uncertainty mechanism will drive similar system access requirements to Incremental capacity.
Incremental capacity
Delivery of triggered incremental capacity will require system access for construction activities (such as pipeline tie-ins) and commissioning activities (such as in-line inspections and compressor commissioning, which both require specific gas flows to complete).

Driver of constraint
Network Flexibility
Delivery of solution triggered by the Network Flexibility uncertainty mechanism, if investment related, will drive similar system access requirements to Incremental capacity (above).
Impact of European regulatory change
Regulatory changes resulting from the implementation of the Third Energy Package (such as nomination rules under the EU Balancing code) have the potential to change constraint risk.

Figure 5: RIIO-1 drivers of constraints

For RIIO-2, we are not currently proposing to include a Network Flexibility uncertainty mechanism, as linepack swing is inherent within the network capability metrics which in turn support the risk analysis for constraint management. We also believe regulatory change beyond European led changes could be a risk driver.

This risk profile was then smeared over the eight-year price control, resulting in an incentive cost target of £22m per annum (in 2009/10 prices).

Incremental Capacity Buy back scheme and Accelerated release of incremental obligated capacity scheme

Under RIIO-1 to date we have not allocated any incremental entry or exit capacity and hence have no data available to analyse our performance under the schemes. However, we have received several incremental capacity requests that, to date under RIIO-1, have been delivered through capacity substitution. We are also currently progressing a customer application for Incremental Entry capacity that cannot be met through capacity substitution and therefore is more likely to be met through the release of incremental capacity should the application continue through to completion.

Demand for incremental Entry and Exit capacity continues to be requested from customers and we believe will continue throughout the RIIO-2 period. We are also aware that unsold capacity available for substitution in certain parts of the network is either not available or of limited availability, meaning future requests for incremental capacity are less likely to be delivered via substitution. We therefore consider the incremental buy back scheme and accelerated capacity release schemes should be retained for RIIO-2 in their existing format due to the potential for further incremental capacity requests in the RIIO-1 period, that may ultimately be delivered in RIIO-2 and/or customer requests for incremental capacity within the RIIO-2 period.

How did the Capacity Constraint Management incentive perform in RIIO-1?

(Click for further info)	Purpose	Value (£m)	Incentive performance					
			2013 /14 (£m)	2014 /15 (£m)	2015 /16 (£m)	2016 /17 (£m)	2017 /18 (£m)	2018 /19 (£m)
Constraint management *2018/19 values including RPI.	Minimise constraint costs, encourage capacity release and make balanced investment decisions.	+25 to -76.4*	12.6	12.6	12.6	13.3	14.2	13.8

Figure 6: CCM performance

To date we have outperformed our targets on this incentive, despite a challenging backdrop. Our activities to deliver this outcome have included:
- maximising access to the NTS by releasing more capacity than we are obliged to, by substituting capacity and by taking on risk rather than investing in network reinforcement
- managing network capability, balancing the associated risks, providing good commercial outcomes for consumers and enabling them to take gas on and off the network where and when they want. However, this has become increasingly challenging and we have taken constraint management actions such as scaling back interruptible/off-peak capacity rights (on 26 separate gas days), entering constraint management contract arrangements and locational energy actions
- realigning outages at cost to manage constraints on the network. Where potential network constraints were identified, we took actions to mitigate the constraint and we have also taken actions at cost to support and resolve impending issues and avoid constraints, for example with different compressor configurations and 24-hour shift working as required.

Through minimising the cost and disruption of network constraints, this incentive has supported the delivery of consumer value by reducing barriers to access to the UK market and facilitating an efficient market. Supporting customers in taking gas on and off the network where and when they want, applies downward pressure on wholesale energy prices and so leads to consumer savings. This incentive should continue to deliver benefits for consumers and customers in RIIO-2.

What are we doing differently in RIIO-2?
We recognise the need for continuous improvement and transparency in RIIO-2 regarding performance and target setting. Therefore, based on your feedback to date we are specifically focussed on several key areas.

A changing market
The market is forecast to be increasingly volatile over the next decade as renewables come onto the energy network, CCGTs are used on a flexible basis to make up any shortfall and as UKCS supplies decline, other, more variable, sources of supply will take its place. Under RIIO-1 we have seen increasing occasions where high proportions of demand are being met through single supply sources leading to operational challenges, and we anticipate this will continue. Our maintenance plan is increasing two to threefold in RIIO-2, coupled with an ageing asset base and striving to align more maintenance than ever before with customers, which brings with it associated constraint risk. We believe that these factors further justify the need for a CCM incentive to ensure these constraint risks are managed to drive a better outcome for consumers. In addition, the release of additional capacity, incentivised by the CCM scheme, will become ever more important to optimise market access and provide efficiency savings for customers which will ultimately be passed through to consumers.

Risk profiling
Since RIIO-1, we have further enhanced our analytical capability with regards to network capability. This means that the risk profile we are using to inform the size of our expected constraints is more comprehensive and has a greater level of granularity than that in RIIO-1.

Smearing risk or profiling risk
For RIIO-1 we proposed that the CM cost target should be cost reflective and vary year on year depending on the level of forecast risk. Whilst this was our preferred approach, ultimately the RIIO-1 risk was averaged across the period to provide a static annual target (subject to RPI) year to year. For RIIO-2, based on the risk identified, we propose profiling the risk with an annual scheme target that varies year to year to better align to the cost reflectivity principle.

Transparency
We recognise the need to be more transparent during RIIO-2, especially in relation to the costs incurred managing constraints.

Principles of constraint management for RIIO-2
There are concerns that the CM scheme represents an insurance policy for high impact/low probability events. The network capability analysis allows us to better quantify and articulate at a granular level the forecast constraint risk/costs and the probability of those events occurring. The network capability work provides additional confidence in our constraint risk forecasts and our ability to identify constraint events to

inform whether they should be incorporated into the CM cost target. We believe that the CM scheme should be retained broadly in its current form and the cost target should be ex ante (regulatory certainty).

It is important for us to clearly articulate the effort to keep the network as constraint free as possible. As such we are seeking to establish a clear policy and process into the business to ensure costs associated to constraint management are logged at a granularity that enables transparency on why and how those costs have been incurred going forward.

Overview of analysis
Potential scheme improvements based on consumer value

Linepack management
We know customers value the flexible use of our network and therefore we have considered a standalone incentive related to this. We believe the potential development of more fundamental new arrangements should not be constrained by the RIIO-2 timeframes but instead could be developed and considered for introduction in future price controls. From your feedback to date, this position is supported.

Linepack swing is inherent within the network capability metrics which in turn support the risk analysis for constraint management. Whilst there could be merit in a standalone incentive, the timing of this needs to be considered given the potential framework development required (e.g. potential linepack products and auctions) being required as an enabler.

The Gas Transmission Charging review could lead to customer behaviour changes and this will need to be understood prior to offering a linepack service. However, we do know that we are managing risk associated to linepack swing and the Gas Future Operability Planning (GFOP) work shows the requirement for customers to use our network flexibly is forecast to increase to facilitate the transition to low carbon. As such we intend to incorporate risk associated to linepack swing into the CM scheme as a component of the cost target.

Off-peak and interruptible capacity
Revenue from the sales of Off-peak (exit) / Interruptible (entry) Capacity feed into the CCM incentive as a revenue component. The charging review, if implemented, could generate a non-zero reserve price to these products. If this does occur, we believe it's reasonable to expect the volumes of off-peak/interruptible capacity purchased by our customers to reduce, however the value of the product on a per unit basis would increase.

If we scale-back these products the revenue from the sales of the interruptible/off-peak products would continue to feed into the incentive. We are proposing to remove the "scaled back" revenue from the CCM scheme where we scale back off-peak and/or interruptible capacity. This would, in our view, unlock further consumer value as it incentivises us to trade off risks when scaling back capacity and encourages us to restore interruptible/off-peak rights at the earliest opportunity.

Network Capability and risk analysis
The risk of constraints on the NTS is made up of several key components:

- Supply and demand patterns: managing the risk of supply or demand patterns causing issues on the network.
- Maintenance and outages reducing the capability of the network.
- Reliability of the compressor units and how likely they are to fault when required for use (all mechanical units have a fault probability). This could lead to operational challenges moving gas from where it is delivered to where it is needed.
- Linepack swing causing stock depletion which could cause a short-term localised constraint on the network.

The network capability model simulates the risk probability of these factors to the network on any given month throughout the year, with the greatest risk occurring where several different risks occur at the same time. In addition, as previously stated, we have and continue to use diminishing quantities of substitution to meet incremental capacity demand. This means the system is likely to become "more constrained" in a broad sense, as previously unused capacity is more likely to be utilised.

Constraint risk forecasting methodology

This details the high-level methodology we have followed in generating supply and demand datasets and, using these datasets, the forecasts of constraint risk for future years to support investment and managerial decision making.

Scope

This covers the background behind the creation of the constraint forecasts, including the Supply and demand forecast database creation, an overview of the boundary model creation, the methodology behind the usual forecast creation and an explanation of some changes that we have made and the rationale behind the forecasts for RIIO-2.

Dependencies

Accurate forecasting of future constraints relies upon accurate historic data, and accurate methodologies used by Future Energy Scenarios (FES) for their forecasting is needed as a basis for robust constraint forecasting.

Methodology Process

Part 1: TobySpace

"TobySpace" databases are a collection of all the possible supply and demand patterns for a given year (980 possible scenarios for each day in that year, ranging from possible minimums to maximums). TobySpace provides the nodal supplies and demands and the likelihood of certain flow patterns happening.

TobySpace is fed by forecasts from the Future Energy Scenarios (FES), which are nodal supply forecasts (non-storage supply) and demand curves. Modelling is undertaken, incorporating historical flow data, and completes the FES dataset in the TobySpace database with a full set of nodal demand forecasts (power stations, industrial sites, DN offtakes and storage demand) and storage supply nodal forecasts. Re-balancing is completed to ensure that Demands and Supplies are balanced.

The data sets have an inherent variability with 980 possible scenarios per day; there is a large amount of variability for each day, from minimum and maximum flows for supply and demand for each day in each year. This variability in the dataset is inherent to the design of this data and statistical analysis.
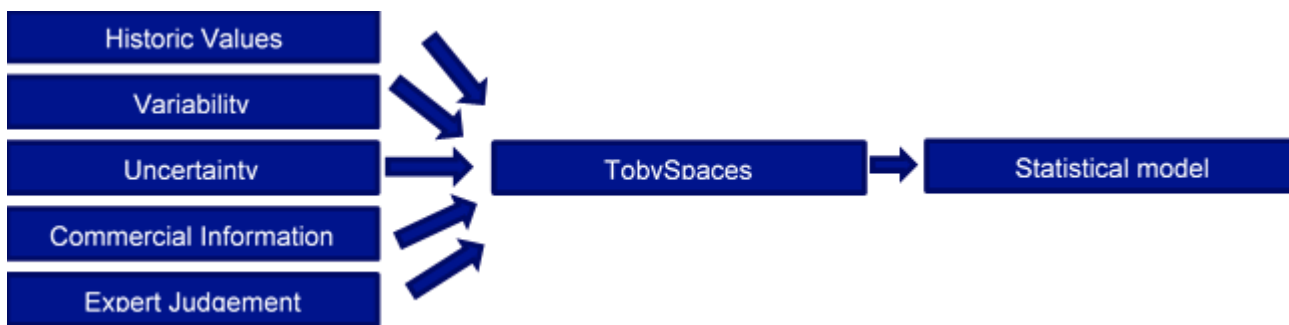

Figure 7: illustration of TobySpaces

Part 2: Boundary Curves

The boundary curves, generated through our Network Capability work, determine the capability of an area and its ability to cope with a set of local and system wide conditions.

Boundary curves are derived from network analysis carried out using the modelling tool SIMONE to simulate the behaviour of the NTS under set conditions. This is combined into a function, and this function determines the boundary.

As an example, a simple function may be nodal capability, against Total National Demand:
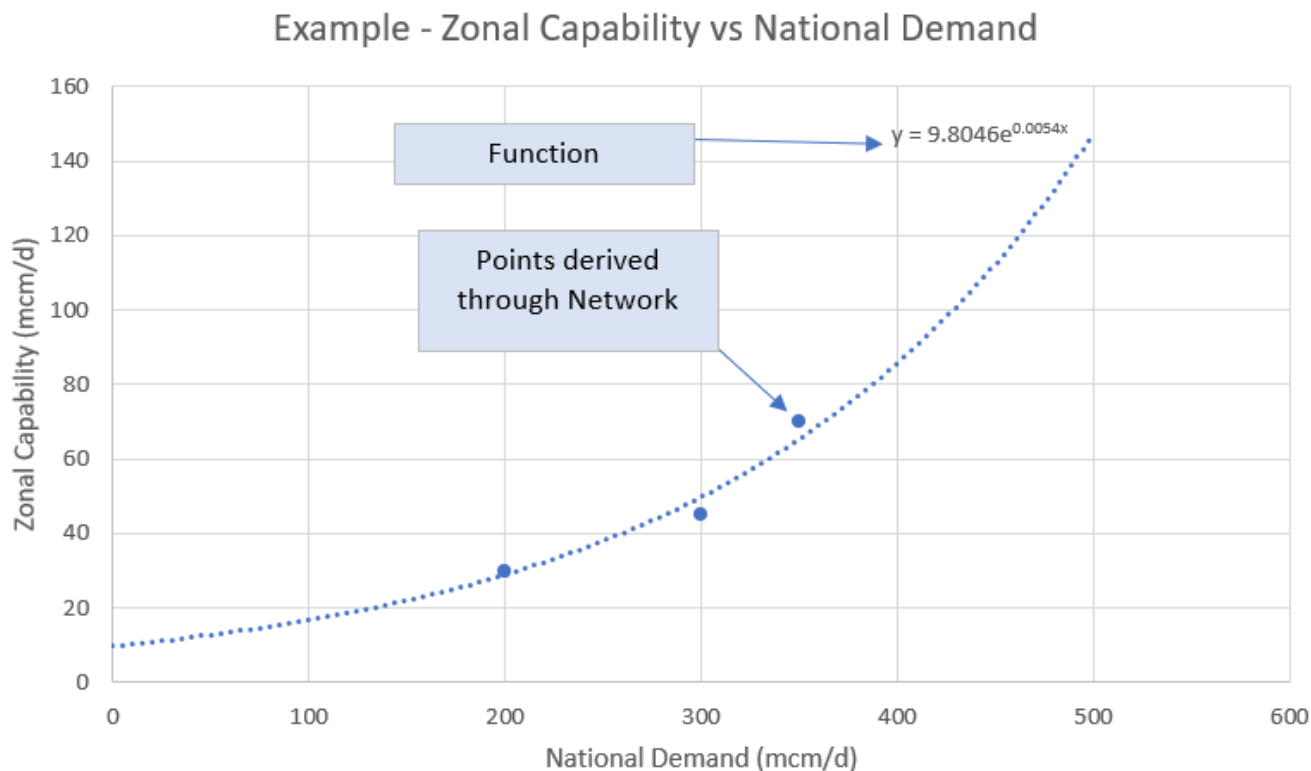
Example - Zonal Capability vs National Demand

$y = 9.8046e^{0.0054x}$

Function

Points derived through Network

Figure 8: Zonal capability vs National Demand example boundary curve

Part 3: Boundary Analysis

An automated process works through all the boundaries, which are then combined with the relevant data in the TobySpace data tables to create standalone data tables for each boundary, year, and scenario. These form the base data for each boundary model.

The boundary equations are evaluated against the TobySpace flows (Y values) and create a data table of the assessed curve evaluations (a net position that determines whether each scenario is within the boundary curve or constitutes a potential constraint scenario). If the Y value is within the boundary, constraint = 0 and if it is not within the boundary, constraint = 1.

Shortfall volume

To assess (volume) the capability shortfall (the amount of volume that is constrained) a test is performed. If constraint = 1, then the shortfall is the absolute difference between the curve value and the Y value.

Capacity Buy back volume

The capacity buy back volume is the amount of capacity that we would need to buy back in the event of a constraint. The buyback volume is calculated as Capacity Baseline (i.e. how much capacity are we obligated to make available at the node) minus the Curve Value.

Cost

For our RIIO-2 analysis, we are currently assuming a constraint price of ~60 p/therm based upon the gas price forward curve. We recognise this could be a conservative view of the unit price of a constraint (for example, beast from the east saw gas prices rise to around 500p/therm), but consider this to be a reasonable approximation based on the forward price curve.

For Entry capacity constraints, we currently assume that 50% of constraints will be resolved through capacity buy backs, 50% will be resolved through locational sell actions and 50% of those locational sell actions will require a counter locational buy action. For exit constraints, we currently assume 100% will be met through buy backs as it is likely the price of a buy back or a locational exit action will be similar, so no such distinction is needed.

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Summary

The yearly boundary models are combined and grouped appropriately (for example, daily, monthly, yearly, zonally, groupings by sum, count, average etc.).

From these groupings, we can generate sample statistics (e.g. mean, max, quartiles and probability distributions).

A key measure is the proportion of constraint events in each time period, for example:

No. of constraint days in March = 357, all days for March assessed = 31,000

Therefore, the proportion would be 357 / 31,000 = 0.012

Hence, likely number of constraint days in March = 31 x 0.012 = 0.372.

If we now use this mean expected constraint days in March with a Poisson distribution, we get Poisson (0.372).

This will generate a probability distribution for constraint days in March which we can repeat for any period.

Explanation of a Poisson Distribution

A Poisson is a discrete probability distribution that expresses the likelihood of a given number of events occurring in a fixed interval of time:
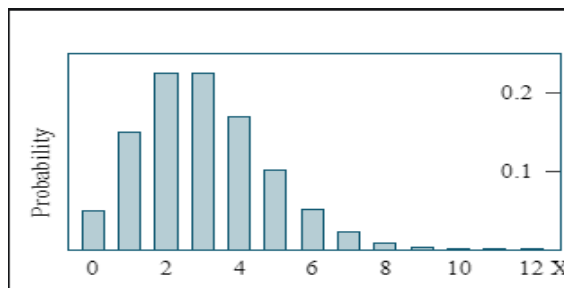

Figure 9: Poisson Distribution example

Statistical models

For the constraint event days, we use a Poisson probability distribution that expresses the likelihood of a given number of events occurring in a fixed interval of time. For the same time interval as the constraint days, we can examine the shortfall and buy back volumes, and create probability distributions to represent these values over the period in question. For costs, we apply the predefined prices to the volumes generated by the probability distributions.

Supply and Demand data sets

At a high level, the following supply and demand data sets have been used to inform our RIIO-2 constraint risk, which has identified constraint risk in the South East (Entry), South Wales (Entry), Southern (Exit) and Scotland (Exit). Scotland risk is marginal and towards the back end of RIIO-2 and we have currently discounted it from the risk analysis outputs for RIIO-2, but this will need to be considered for RIIO-3:

- FES – 4 FES scenarios with a high continent and high LNG bias (8 scenarios in total).
- Uniform – for South Wales, this replaces the FES South Wales supply forecast with a uniform distribution (0 to ~86 mcm/d) as a proxy for non-seasonal behaviour.
- Historic – we have replaced the FES supply scenarios for the SE and South Wales with historic supplies as a proxy for RIIO-2 supply behaviour.
- Combined – combination of the above (our proposed approach).

The "Combined" runs further Monte Carlo analysis on the Uniform, historic and FES data sets and is weighted towards FES (8 FES scenarios vs 1 uniform and 1 historic):

- For SE Entry, the "combination" excludes Uniform as we have not seen such variability in flow for SE Entry and as such believe this additional risk should be excluded.
- For SW Entry, FES, historic and Uniform are included as we consider each of these supply scenarios are realistic going forwards.
- For SO Exit, we have used FES only, as historic closely matches FES and exit zone flows typically follow similar patterns based upon weather and demand.

Compressor station reliability variable

To simplify this variable, we assume independence between compressor stations when it comes to unavailability, for example a trip at compressor A does not cause a trip at compressor B.

The method described in the boundary curves section also applies to the selection of the compressor availability curve for the boundary being examined.

Compressor data is taken for each individual unit and, based on operational reality, aggregated into combinations of compressors that would be used to manage pressures and flows on the NTS. These can be either pairs of compressors, individual compressors across multiple or single stations or all the compressors at a station giving station reliability.

For modelling purposes, these variables are added to determine the number of days we will have some level of compressor unavailability. The remaining scenarios are intact (all compressors are assumed available), therefore when running the model, an intact or non-intact could be selected for analysis.

Maintenance

We have incorporated into the analysis maintenance plans for all 5 years of the RIIO-2 period for Entry constraints. We have excluded any Maintenance risk analysis for exit, due to our ability to call on maintenance days.

The maintenance plan defines the outage periods for all planned work, the Aggregated System Entry Points (ASEPs) to be affected and the resulting capability for the outage period. These figures are then incorporated with the relevant TobySpaces, and likelihoods are calculated as defined earlier using Poisson distributions which are then in turn used to model the number of outage days resulting from the known maintenance. The shortfall and the buyback volumes resulting from known maintenance are then calculated using the same method as for an intact network (please see section on statistical models).

The maintenance is then combined to generate a summer forecast of days, volumes and costs, and summarised as part of the output.

For our RIIO-2 risk analysis we have excluded any maintenance risk associated to pipeline inspections as we aim to manage this risk as BAU (risk was included for RIIO-1).
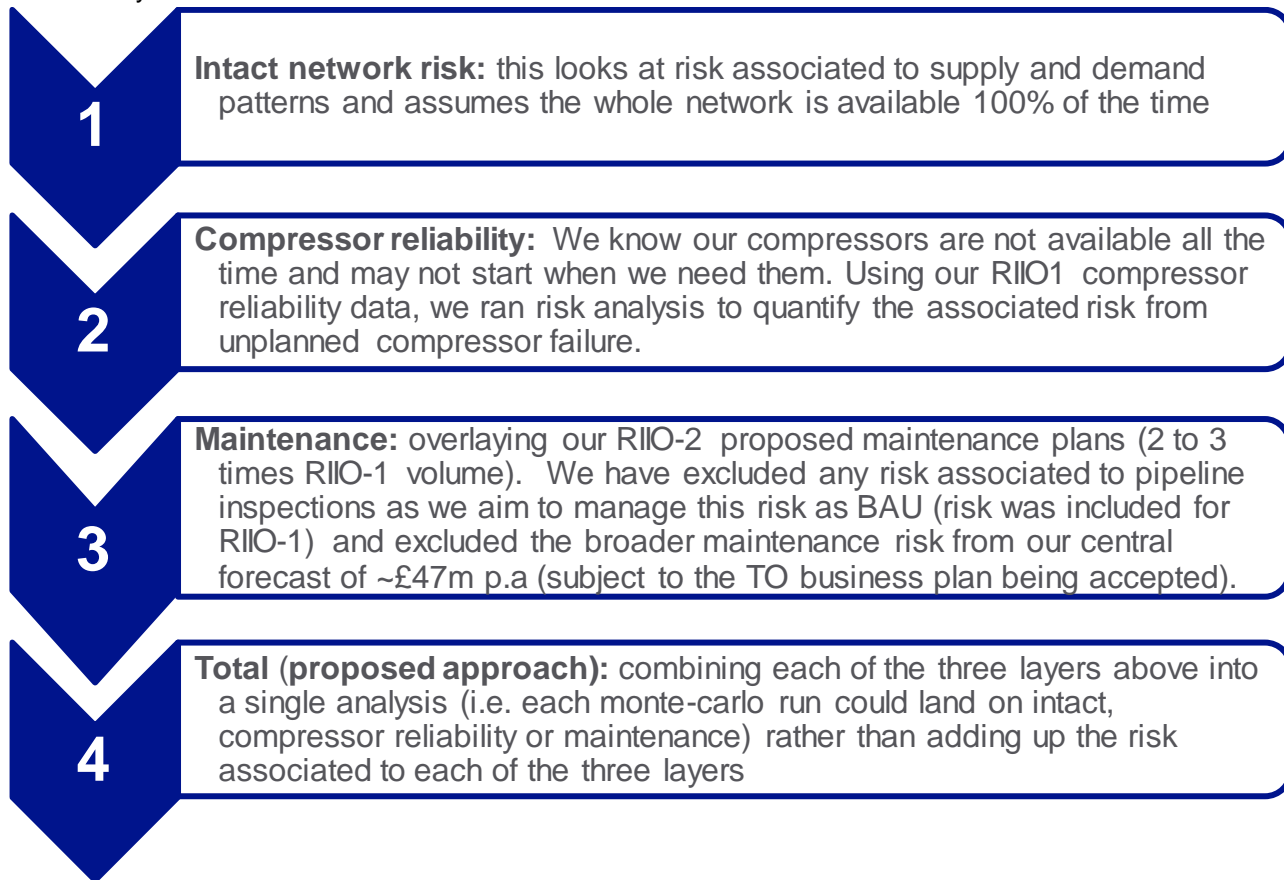
Combined output

The combined output identifies results for each formula year for:

- Number of constraints in an intact network (supply and demand driven constraints)
- Number of constraints associated with compressor reliability and availability
- Number of constraints associated with the maintenance plan
- Total number of constraints (proposed approach), combining each of the three levels above into a single monte carlo analysis.

The overall results include the breakdown of the data into key zones where constraint events are forecast. These are:

- South Wales Entry
- South East Entry
- Southern Exit
- Scottish Exit (included in the analysis but not included in the summary of events as the risk is negligible)

In summary:

1   **Intact network risk:** this looks at risk associated to supply and demand patterns and assumes the whole network is available 100% of the time

2   **Compressor reliability:** We know our compressors are not available all the time and may not start when we need them. Using our RIIO1 compressor reliability data, we ran risk analysis to quantify the associated risk from unplanned compressor failure.

3   **Maintenance:** overlaying our RIIO-2 proposed maintenance plans (2 to 3 times RIIO-1 volume). We have excluded any risk associated to pipeline inspections as we aim to manage this risk as BAU (risk was included for RIIO-1) and excluded the broader maintenance risk from our central forecast of ~£47m p.a (subject to the TO business plan being accepted).

4   **Total** (**proposed approach**): combining each of the three layers above into a single analysis (i.e. each monte-carlo run could land on intact, compressor reliability or maintenance) rather than adding up the risk associated to each of the three layers

Additional Modelling for RIIO-2

There have been several unseasonal periods of high South Wales flows that we didn't forecast for RIIO-1. By way of example, below is a chart of the distribution of the actual South Wales flows for April and May 2019, a period of relatively low National Demand:
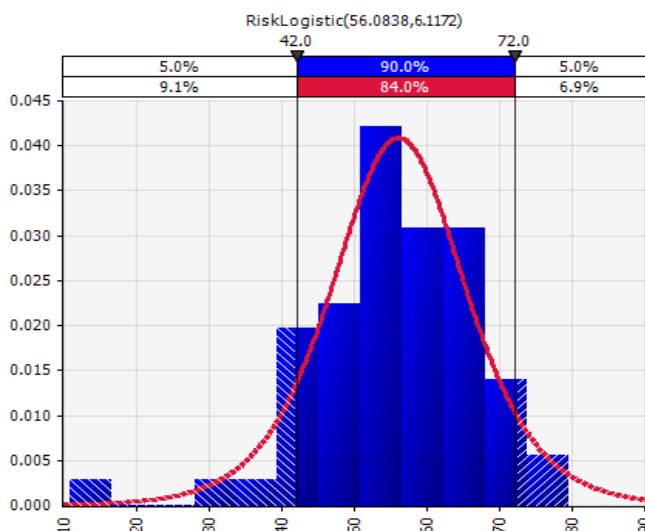

Figure 10: actual South Wales flows for April and May 2019

Therefore, for South Wales we have combined the following analysis to predict the number of constraint events.

- one set of forecasts based on a uniform distribution where any flows from 0 to ~86 mcm/d are equally likely to happen regardless of demand;
- one set of forecasts based entirely on Future Energy Scenarios forecasts, which include a heavy weighting on historic flows while still including some expert judgement and other commercial information;
- one set of forecasts based entirely on historic flows from 2010 to date, with separate historic distributions completed for flows on each month in the year.

Analysis taken forward

When generating constraint forecasts, the model performs its Monte Carlo analysis and picks the scenarios with;

- a 8/10 chance of selecting from the FES data,
- a 1/10 chance of selecting from the Historic flows,
- a 1/10 chance of selecting from the Uniform Distribution.

In overlaying our operational experiences onto the data, we have discounted some of the data sets that are not credible; uniform analysis for South East entry (due to high risk scores and typically SE entry flows do not exhibit uniform behaviour) and uniform and historic for Southern exit as historic closely matches FES and exit zone flows typically follow similar patterns based upon weather and demand.

Therefore, the analysis taken forward on each area is;

- South Wales Entry – 8 FES scenarios, 1 uniform scenario, 1 historic scenario.
- South Ease Entry – 8 FES scenarios, 1 historic scenario.
- Southern Exit – 8 FES scenarios.
- Scotland Exit – Scotland Exit risk is marginal and towards the back end of RIIO-2 and we have currently discounted it from the risk analysis outputs for RIIO-2, but this will need to be considered for RIIO-3.

RIIO-2 Constraint Results

Below is a summary table of the RIIO-2 constraint forecast results, utilising the averages from the "combined" methodology as previously explained. The RIIO-2 analysis has also generated marginal Scotland risk towards the back end of the RIIO-2 period. We have currently discounted it from the risk analysis outputs for RIIO-2, but this will need to be considered for RIIO-3.

Year	Region	Combination							
		Events				Costs (£m)			
		Avg	Max	P10	P90	Avg	Max	P10	P90
21/22	SW Entry	8	22	6	9	30.7	117.2	20.8	40.7
	SE Entry	2	18	1	3	2.8	153.4	-0.1	4.0
	SO Exit	4	37	0	8	6.3	83.3	0.0	18.0
	Total	14	77	7	20	39.8	353.9	20.7	62.7
22/23	SW Entry	9	22	7	10	32.6	103.9	21.7	43.4
	SE Entry	1	28	1	4	5.1	150.9	0.0	13.0
	SO Exit	4	24	0	9	5.8	103.4	0.0	17.2
	Total	14	74	8	23	43.4	358.1	21.7	73.5
23/24	SW Entry	9	26	7	13	35.8	151.6	22.0	54.7
	SE Entry	3	36	1	5	6.8	169.8	0.0	18.9
	SO Exit	4	25	0	7	3.8	93.9	0.0	11.9
	Total	16	87	8	25	46.3	415.3	22.0	85.6
24/25	SW Entry	11	31	7	15	41.0	143.0	23.5	65.2
	SE Entry	3	28	0	6	7.7	188.2	-0.2	27.0
	SO Exit	3	22	0	6	3.1	89.0	0.0	10.0
	Total	17	81	7	27	51.8	420.2	23.2	102.2
25/26	SW Entry	11	34	7	15	44.0	149.4	25.3	70.0
	SE Entry	4	33	0	6	10.5	234.1	-0.2	31.4
	SO Exit	2	19	0	5	2.2	74.7	0.0	6.9
	Total	17	86	7	26	56.6	458.2	25.1	108.3

Figure 11: Summary of risk analysis output

It is important to recognise that we have decided to exclude risk associated to planned maintenance from our central averaged case as a low probability / high impact event (~£250m as a worst case across the RIIO-2 period). This assumes the TO is funded for its planned maintenance activity.

CCM Revenue forecast

What is the revenue generated from CCM capacity sales?
The constraint management incentive has several revenue components. The table below details these and the revenue generated from those components to date under RIIO-1. Under the current scheme, we retain 44.36% of the revenue generated (subject to cap):

CM revenue component	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Entry Overrun revenue	£502,270	£121,077	£350,415	£635,569	£1,375,899	£2,299,116	£391,142
Daily obligated Entry	£68,905	£128,566	£121,831	£76,053	£323,715	£332,598	£201,383
Interruptible Entry	£337,355	£414,434	£343,429	£277,434	£916,263	£578,390	£513,063
Non-ob Entry	£1,100,801	£1,063,107	£733,681	£492,497	£361,124	£184,878	£148,804
Daily Obligated Exit	N/A	£12,671	£93,353	£109,910	£73,074	£331,968	£59,413
Off-peak exit	N/A	£49	£10,114	£68,349	£0	£170	£389
Non-ob exit	N/A	£1,253,945	£761,117	£293,651	£474,970	£742,725	£800,553
Total	£2,009,331	£2,993,849	£2,413,940	£1,953,462	£3,525,045	£4,469,845	£2,114,747

Figure 12: Revenue generated from the CCM scheme, including outliers

We consider that the 2016/17 and 2017/18 revenues are outliers, as they resulted from shipper errors resulting in high entry overrun costs. We shouldn't assume such errors will repeat, therefore using the average from the remaining years, it is reasonable to assume total revenues of around £2.3m per annum

into the scheme in the absence of framework changes. We therefore propose to remove £2.3m per annum from our cost target to baseline RIIO-1 revenue performance as a reasonable approximation of annual revenues for the RIIO-2 period.

Our Current Proposal

At a principle level, we believe retaining a constraint management scheme remains appropriate. In summary:

- The constraint management scheme is integral to the overarching regulatory access regime.
- The changing landscape, customer requirements from our network, ageing assets, increased maintenance and diminishing quantities of available substitution means we are managing an increasing level of operational risk.
- The incentive has generated consumer value historically and we believe further consumer value will be provided in RIIO-2.
- There are several variables that could change the risk balance over the RIIO-2 period, for example the charging review could change customer behaviour and their capacity bookings.

As such we are proposing:

- Retaining the cap, collar, and target principles of the operational buy back scheme.
- A reduced and symmetrical cap and collar
- Remove the applicable proportion of interruptible / off-peak capacity revenue from the scheme where we scale back, returning monies to the consumer.
- Removing forecast revenues from the cost target allowance.
- Removing risk from the cost target that we expect to manage as BAU.
- Incorporating network capability outputs to inform constraint risk.
- Reopening scheme if we cap out in two incentive years or collar out in one incentive year.
- Reserving the right to reopen the scheme as in RIIO-1 based on any significant changes to the operating or market environment.
- Targets, caps and collars should be subject to RPI.
- Retaining the incremental buy back element of the scheme as-is.
- Retaining the accelerated release mechanism as-is.
- Retaining the existing cost and revenue components of the scheme:

Cost Component	Revenue Component
Constraint management costs, including capacity buy backs, constraint management contracts, offtake flow reduction costs and locational buy actions	On the Day sales of Obligated Entry and Exit Capacity.
	Locational sell actions and physical re-nomination incentive charges (having the meaning given to these terms in the Network Code).
	Sales of Interruptible Entry Capacity and Off-peak Exit Capacity (subject to our proposal to remove revenue where we scale back)
	Sales of Non-Obligated Entry and Exit Capacity.
	System entry overrun charges (having the meaning given in the Network Code).

Figure 13: Constraint Management cost and revenue components

Constraint Management Scheme Metrics

Constraint management Target

We have considered two approaches to determine an appropriate Constraint Management target. The key difference between the two approaches is that our proposed approach assumes a proportion of our central risk forecast will be managed as BAU and removes this from the incentive scheme cost target. The alternative approach (not proposed) assumes that the central risk forecast reflects the overall risk we expect

to manage in RIIO-2 and that this is the basis on which a scheme should be set. Removing a level of risk from our cost target as BAU is a principle supported by you, but does mean that the cost target becomes less reflective of the risk we expect to manage in RIIO-2.

To determine the constraint management target, both approaches use the annual average constraint cost for each year from the "Combination" risk analysis detailed earlier (figure 11) as a forecast of the RIIO-2 risk we expect to manage. Our proposed approach then removes a proportion of cost from the central forecast by applying a method based upon our RIIO-1 learnings (refer to "RIIO-1 learnings" section below) as a proxy for RIIO-2 BAU managed risk. Both approaches also remove a further £2.3m per annum from the cost target as estimates for annual revenues attributable into the scheme. This has been determined from our average revenue performance to date under RIIO-1 (as detailed in the earlier CCM revenue forecast section).

Importantly, under both approaches we expect to be managing the same level of risk. The non BAU adjusted approach, which we are not currently proposing, fully recognises and funds this risk through the cost target (based upon an "average" scenario which could be viewed as conservative), whereas our proposed approach only partly funds this risk through the cost target.

For both approaches, we recognise using an average annual constraint cost could ultimately be viewed as a conservative view of risk, as it discounts low probability high cost events, or pessimistic as it averages the entire risk for all probabilities. However, we believe using an average is a reasonable and sensible approximation of the RIIO-2 constraint risk. It is important to note that our risk analysis shows a relatively narrow constraint risk cost and event range between a probable P10 case (meaning there is a 90% chance that constraint events/costs to be managed are likely to be higher than this) and less probable P90 case (meaning there is a 10% chance that constraint events/costs to be managed are likely to be higher than this). In addition, we have excluded risk from our central forecast associated to In Line Inspections (included for RIIO-1) and risk associated to planned maintenance (again, included for RIIO-1) has been mitigated based upon our proposed TO business plan.

We also recognise under our proposed approach, that applying our RIIO-1 constraint risk management performance as a logic to remove a proportion of the constraint cost allowance from the RIIO-2 constraint management scheme further supports the view that the target allowance is a conservative view of risk in RIIO-2, especially given that reasons outside of our control (although we manage any resultant risk) produce constraint risk (for example, due to market driven supply and demand scenarios). We know that the landscape under RIIO-2 is likely to be different and more challenging than RIIO-1 and our risk analysis for RIIO-2 is more comprehensive (for example, in volume terms RIIO-1 analysed around 8 GB of data compared to over 300 GB of data for RIIO-2), however, we also understand the need to assume a level of BAU managed constraint risk and stretch performance.

RIIO-1 learning

To date, under RIIO-1 we have managed some constraint risk without deploying commercial tools. For example, we have returned assets from outage earlier than planned, run our compressors outside of their normal operating envelopes and ensured flexibility is built into third party contracts to allow us to move the maintenance dates for key plant and manned compressor stations 24/7 to guard against failure.

Our RIIO-1 business plan detailed a forecast number of constraint events for intermittent years within the period 2012 to 2021. For the period 2012 to 2018, the average RIIO-1 forecast was ~**12** events per annum. For the same date range, we have looked at the number of days we took a commercial action. For this we counted the number of days we scaled back interruptible / off-peak capacity, as this is generally the first commercial action we take to manage a potential constraint on the network. On average, we have scaled back interruptible / off-peak capacity on **~4** days per annum.

This excludes any commercial contracts we have agreed to manage potential constraints, and does not factor in the number of locations we scaled back. For example, on the 1st of March 2018 (beast from the east) we scaled back off-peak capacity at 78 different locations, however we are currently counting this as 1 event for the purposes of this analysis. If we counted events by region or location, rather than Nationally, this would significantly increase the number of RIIO-1 constraint events to date.

In percentage terms, the number of scale back days compared to the RIIO-1 "events" forecast is ~**33%**.

We therefore believe it is reasonable to use **67%** as a forward approximation of the level of forecast risk we manage as "business as usual" based upon our RIIO-1 learnings. As such, we are proposing to remove **67%** of risk cost associated with the average combination forecast (excluding Uniform analysis) from the incentive target, which reduces the risk by around £14.7m per annum:

	21/22				22/23				23/24				24/25				25/26			
	SW	SE	SO	Total	SW	SE	SO	Total	SW	SE	SO	Total	SW	SE	SO	Total	SW	SE	SO	Total
Avg (£m)	5.8	2.8	6.3	14.8	6.7	5.1	5.8	17.6	10.8	6.8	3.8	21.4	16.0	7.7	3.1	26.8	16.3	10.5	2.2	29.0
33% of risk (£m)	1.9	0.9	2.1	**4.9**	2.2	1.7	1.9	**5.8**	3.6	2.2	1.3	**7.0**	5.3	2.6	1.0	**8.9**	5.4	3.5	0.7	**9.6**
Risk removed (£m)	3.9	1.9	4.2	**9.9**	4.5	3.4	3.9	**11.8**	7.2	4.5	2.6	**14.3**	10.7	5.2	2.1	**18.0**	10.9	7.0	1.5	**19.4**

Figure 14: Risk removed from combination forecast (excluding uniform)

We have excluded "Uniform" from this, given that the FES and Historic combination is more reflective of RIIO-1 supply patterns to date.

To determine the proportion of forecast RIIO-2 risk associated to uniform behaviour in South Wales, we have conducted the combination risk analysis with and without the uniform distribution for this region. This shows that the uniform distribution adds between £24.9m and £27.7m of risk per annum to the combination forecast:

Delta between average South Wales Combination forecast with and without uniform (£m)														
21/22			22/23			23/24			24/25			25/26		
SW excluding Uniform	SW including Uniform	delta	SW excluding Uniform	SW including Uniform	delta	SW excluding Uniform	SW including Uniform	delta	SW excluding Uniform	SW including Uniform	delta	SW excluding Uniform	SW including Uniform	delta
5.8	30.7	**24.9**	6.7	32.6	**25.9**	10.8	35.8	**25.0**	16.0	41.0	**25.0**	16.3	44.0	**27.7**

Figure 15: forecast costs associated to South Wales uniform supply distribution

We believe we can manage an element of this risk as BAU through management focus, operational planning and commercial insight. Importantly many of these initiatives would only be viable for intermittent constraints. A period of several consecutive constraint days in South Wales would limit our ability to manage capability shortfall without utilising commercial tools.

We have therefore analysed the reduction in frequency of South Wales capability shortfall (constraint) events if we managed an element of this risk as BAU and this is shown for each year of the RIIO-2 period below:

	Reduction in frequency of constraint events
2021/22	37.5%
2022/23	37.7%
2023/24	34.3%
2024/25	32.2%
2025/26	31.2%

Figure 16: % reduction in South Wales constraint events

We have then applied the percentage reduction in frequency of constraint events to our uniform costings to show how much cost risk we believe should be removed from the incentive as BAU:

Year	Uniform Delta cost risk (South Wales) (£m)	BAU Cost managed (£m)
2021/22	24.9	9.3
2022/23	25.9	9.8
2023/24	25.0	8.6
2024/25	25.0	8.1
2025/26	27.7	8.6

Figure 17: forecast uniform cost managed as BAU

Determination of the proposed scheme target can then be depicted by a waterfall diagram as follows:
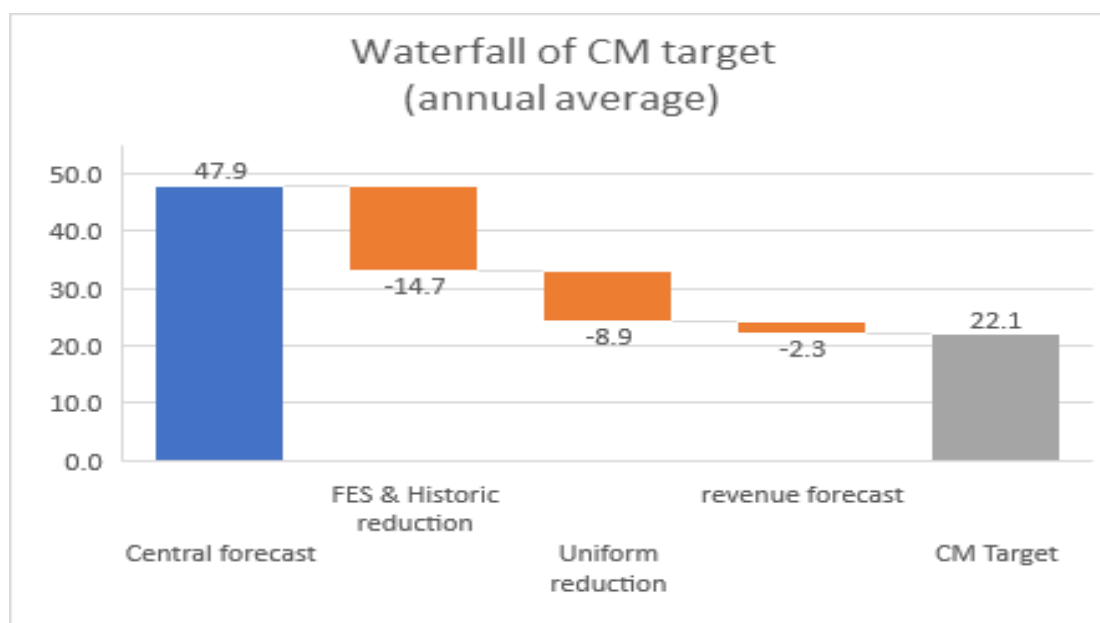
Figure 18: Constraint management target waterfall (includes £0.3m of identified plant failure risk).

This shows, using annual averages, that we are forecasting a constraint risk cost exposure of ~£48m per annum. We then remove £8.9m of this from the cost target as BAU management of the Uniform risk, a further £14.7m as BAU management of the remaining risk, and £2.3m of forecast revenues into the scheme to determine a target of £22.3m. Ultimately this is ~47% of the total cost risk per annum we expect to manage in the RIIO-2 period. The alternative approach would not remove a proportion as BAU but would remove the revenue forecast of £2.3m, to determine an annual average cost target of £45.3m.

Applying this logic to each year of the RIIO-2 period shows our proposed target and the alternative approach target for each respective year:

Year	D Total "average" risk (£m)	A FES & Historic reduction (£m)	B Uniform reduction (£m)	C Forecast revenue (£m)	A+B-C Proposed Annual cost target (£m)	% of total risk	D-C Alternative cost target (£m)
21/22	39.8	4.9	15.6	2.3	**18.2**	46%	37.5
22/23	43.4	5.8	16.1	2.3	**19.6**	45%	41.1
23/24	46.8	7	16.9	2.3	**21.6**	46%	44.5
24/25	52.3	8.9	17.4	2.3	**24**	46%	50
25/26	57.1	9.6	19.6	2.3	**26.9**	47%	54.8

Note: Additional specific £0.5m risk identified for 2023/24 onwards due to identified plant works
Figure 19: Constraint management proposed annual targets vs alternative approach

As aforementioned, we expect RIIO-2 to be more challenging, as use of flexibility and linepack increases with an ageing asset base that requires more maintenance, whilst we support the journey to net zero. It is important to acknowledge that increasing volatility brings additional challenge in operating the network. We know more system flexibility and linepack management is being demanded from our ageing asset base than ever before. This underpins the decarbonisation of energy and our essential role in it and helps our customers optimise the efficiency of their own operations and market participation.

Supporting the energy transition, managing demand intermittency, changing demand and supply patterns within and between days, and ageing assets with increasing maintenance needs all add up to a more operationally challenging situation. Effective constraint management is central to minimising the impact this has on customer and ultimately end consumers. This backdrop means managing constraints becomes increasingly difficult and therefore the incentive scheme becomes more difficult to perform against. However, we also consider that our experiences in RIIO-1 have increased our ability to manage challenging situations and as such consider it appropriate to overlay further stretch to the scheme by reducing the cost target as described.

Constraint management Cap and Collar
We believe the scheme cap should be high enough to mean capping out under the scheme is considered unlikely, given that capping out could consequently result in a performance plateau but should also be set low enough to ensure windfall gains don't occur and revenue can be returned to customer and consumers. As such we consider a reduced scheme cap of £20m is appropriate. For the alternative approach (not currently proposed), we consider a cap and collar of £40m would be appropriate based upon the same logic, recognising the increased target allowance. We believe a symmetrical cap and collar and us removing a level of risk from the cost target is also appropriate to ensure balanced focus under the scheme with regards to risk and reward.

Graphical representation of the RIIO-2 proposed scheme
The following shows a graphical representation of the proposed RIIO-2 scheme, utilising an average cost target of £22.1m. As described earlier, we consider it is appropriate for the target to vary year on year based upon the expected constraint cost risk for each year within the RIIO-2 period:
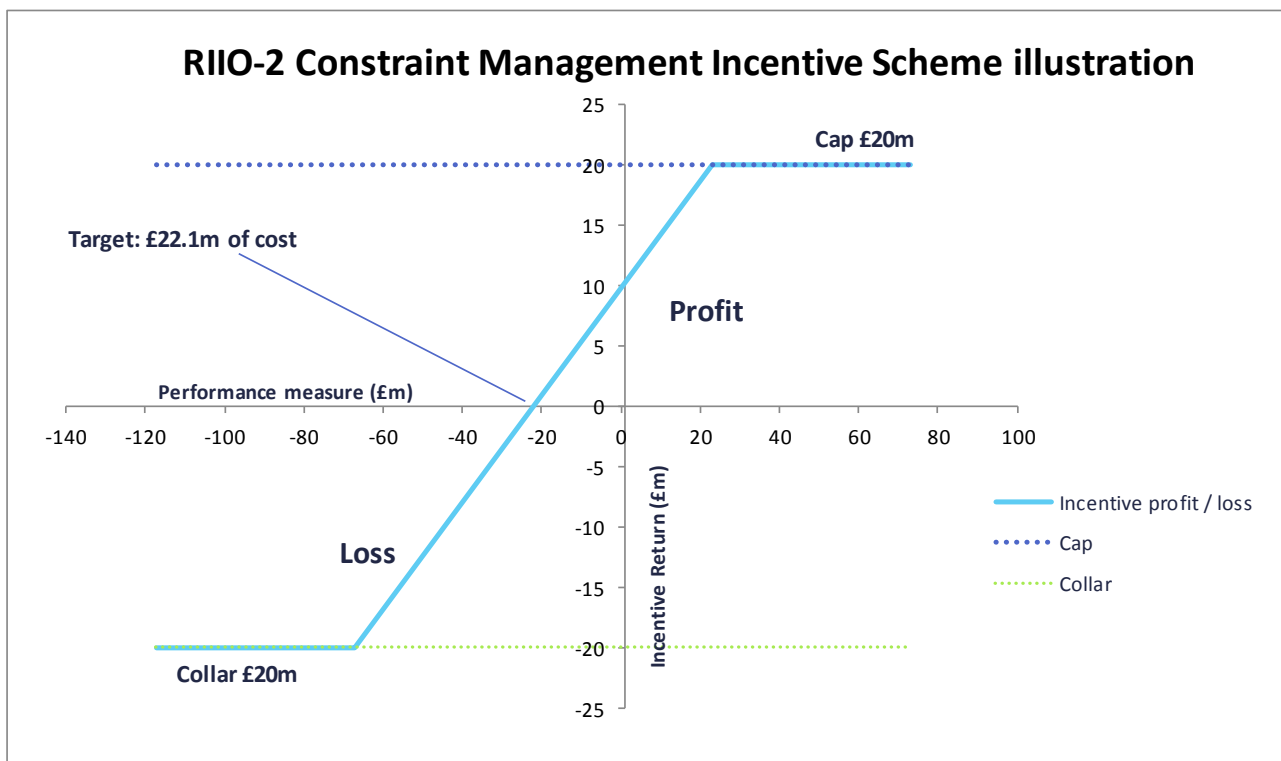
Figure 20: Proposed constraint management scheme

Remove a proportion of interruptible / off-peak capacity revenue where National Grid scale back.

Background:

The CM incentive scheme has several revenue components. This includes revenue from the sales of NTS Exit Off-peak Capacity (off-peak) and NTS Entry Interruptible Capacity (interruptible) which, under RIIO-1, we retain 44.36% of the revenues from sales of those products (subject to cap / collar).

The interruptible and off-peak capacity products currently attract a lower reserve price than firm capacity products. This is because firm capacity provides a guaranteed right to access the NTS, whereas the off-peak / interruptible products do not. We can remove off-peak / interruptible (known as "scaling back") capacity from customers without financial recompense if we believe it could alleviate a potential forecast constraint.

We are proposing removing revenue from the CM incentive scheme where we scale back off-peak and/or interruptible capacity, instead sharing 100% of the removed revenue directly back to customers.

Consumer Value:

We believe this would further encourage balancing risk in our decisions to scale back and restore interruptible / off-peak rights at the earliest opportunity to minimise revenue lost through the scheme. Consumers could benefit as those customers reliant on off-peak may be less prone to interruption, and where we do scale back, customers would receive a greater revenue share than would otherwise be the case. Less disruption to flows is good for consumers as:

- It minimises operational costs that could potentially result from full or partial cessation of flow in reaction to the scale back

- Less risk of displacement of cheaper gas for more expensive gas / electricity (as gas supply / electricity generation is resourced from elsewhere)

- Benefits security of supply on both the gas and electricity markets

- Applies downward pressure to wholesale energy prices

Business as usual:

We carefully consider our scale back decisions and as a principle, we prioritise the protection of firm capacity rights. This would continue in the absence of this option being taken forward, however, we believe introducing this element to the scheme will encourage a sharper focus on restoring capacity rights at the earliest opportunity, the timing of our scale back actions and the extent of those actions. The existing arrangements don't provide any financial consequence to us when deciding to scale back interruptible / off-peak capacity. This option is not providing additional reward to us, rather it adds a further decision and incentive component into the scheme should we decide to scale back.

How could it work?

We have considered two options, and neither would require UNC changes because both options remove revenue from the incentive scheme performance measure only, which is wholly contained with the licence:

1. Nodal model

The nodal model would reduce incentive revenue based upon the value and volume of interruptible and/or off-peak capacity sales at the specific location (or locations) compared to the volume of interruptible and/or off-peak remaining (considering restoration of rights).

2. National model

The national model would proportionally reduce revenue based upon the value and volume of interruptible and/or off-peak capacity sales at all locations compared to the volume scaled back (considering restoration of rights) on a national basis.

We also considered removing all interruptible and/or off-peak revenue where we take a scale back action, but this would discourage us to limit revenue loss through restoring interruptible / off-peak rights, and therefore has been discounted.

Example of nodal and national options

Nodal:

Location	A Interruptible capacity sold (kWh/d)	B Revenue from interruptible sales	C Scaled back volume (kWh/d)	D Restored volume (kWh/d)	E % of interruptile rights removed	F Revenue reduction
1	10,000,000	£5,000.00	10,000,000	8,000,000	20.00%	£1,000.00
2	20,000,000	£10,000.00	5,000,000	0	25.00%	£2,500.00
3	30,000,000	£100,000.00	8,000,000	4,000,000	13.33%	£13,333.33
4	50,000,000	£200,000.00	0	0	0.00%	£0.00
Total	**110,000,000**	**£315,000.00**	**23,000,000**	**12,000,000**	**n/a**	**£16,833.33**

Figure 21: Nodal example

This simplistic example considers 4 different locations on the NTS, three of which have been scaled back (C) and two of which have had a proportion of those scaled back rights restored (D). The revenue reduction at each location is determined by multiplying the revenue from interruptible sales at the location by the percentage of interruptible rights removed at the end of the relevant gas day, considering restored rights. In formula terms, the revenue reduction for the Gas day is the sum of the following for each location:

$$F = B \times (1-((A-C+D) / A))$$

National:

Location	A Interruptible capacity sold (kWh/d)	B Revenue from interruptible sales	C Scaled back volume (kWh/d)	D Restored volume (kWh/d)	E % of interruptile rights removed	F Revenue reduction
NTS	**110,000,000**	**£315,000.00**	**23,000,000**	**12,000,000**	**10.00%**	**£31,500.00**

Figure 22: National Example

Using the same example as the nodal model, the key difference is that the National option does not calculate revenue loss on a node by node basis, instead it considers the interruptible capacity sold, scale back volume (net of restoration) and revenues across the NTS. The calculation is the same as the nodal option, with the exception that is calculated on a national, rather than on a node by node basis.

Pros and cons of each option

The examples show that the revenue loss calculation between these two options can produce different results. This is because some locations may generate more revenue than others from capacity sales due to, for example, high demand for capacity at the location on a given day. To illustrate how this could make a difference, we need to consider the weighted average price (WAP) of capacity sold at scaled back locations and at all locations in the example provided:

	Total Interruptible capacity sold (kWh/d)	Revenue from interruptible sales	Weighted average price (p/kWh/d)
Scaled back locations	60,000,000	£115,000.00	0.1917
All locations	110,000,000	£315,000.00	0.2864

Figure 23: WAP example

The WAP for scaled back locations (excludes location 4), is lower than the WAP for all locations (includes location 4). This means that the value of capacity, when considering all locations in this example, is higher on a per unit basis than the scaled back locations. Thus, the revenue loss is higher under the National option as it utilises the value of capacity at all locations in determining the revenue loss. The nodal and national options will potentially produce different results where there is a marked difference in the price paid for interruptible/off-peak capacity across different locations. To illustrate how revenue loss could differ under the different options, we can consider the example where we only scale back capacity at location 4 resulting in the revenue loss being higher under the nodal option:

Nodal:

Location	A Interruptible capacity sold (kWh/d)	B Revenue from interruptible sales	C Scaled back volume (kWh/d)	D Restored volume (kWh/d)	E % of interruptile rights removed	F Revenue reduction
1	10,000,000	£5,000.00	0	0	0.00%	£0.00
2	20,000,000	£10,000.00	0	0	0.00%	£0.00
3	30,000,000	£100,000.00	0	0	0.00%	£0.00
4	50,000,000	£200,000.00	11,000,000	0	22.00%	£44,000.00
Total	**110,000,000**	**£315,000.00**	**11,000,000**	**0**	**n/a**	**£44,000.00**

Figure 24: Nodal example of revenue loss

National:

Location	A Interruptible capacity sold (kWh/d)	B Revenue from interruptible sales	C Scaled back volume (kWh/d)	D Restored volume (kWh/d)	E % of interruptile rights removed	F Revenue reduction
NTS	**110,000,000**	**£315,000.00**	**23,000,000**	**12,000,000**	**10.00%**	**£31,500.00**

Figure 25: National example of revenue loss

Either option has pros and cons and we have summarised the key pros and cons between the options below:

Option	Pro	Con
National	• Normalises the value of interruptible / off-peak capacity value across the NTS • More likely to result in a revenue loss under the scheme. • Simpler model • Discourages bias in determining which locations to scale back based on value of capacity.	• Less cost reflective
Nodal	• More cost reflective of capacity value at specific locations • Could be more penal where locations are scaled back with a comparatively high interruptible / off-peak capacity value.	• More complex • Less likely to result in a revenue loss (if for example, the locations we scale back have a zero value) • Could be less penal where locations are scaled back with a comparatively low interruptible / off-peak value. • Could incentivise bias in decisions on which locations to scale back based on value of interruptible / off-peak capacity.

Figure 26: Pros and cons of nodal and national model

Conclusion

We believe either option has merit and the potential to unlock further consumer value. However, whilst we wouldn't bias our decisions to scale back based upon capacity value, we believe it's less appropriate to introduce a mechanism that could, in theory, drive such behaviour. As such our preferred approach is to include the national option within the Constraint management incentive scheme.

Value

The CCM incentive allows us to release additional capacity every year (circa 2,000 mcm) which would not be possible without the CCM incentive mechanism to counterbalance the increased risk taken on by us to release additional capacity.

Intrinsically the incentive allows us to optimally time constraint management actions and commercial tools by having a cost target to measure against.

Summary of our Constraint Management Proposal

Scheme is based on:	• Expected modelled risk in RIIO-2 • Learnings from RIIO-1 in terms of how we managed risk against forecast
Our proposal:	• A symmetrical Cap and Collar of £20m • Removing a proportion (~50%) of constraint cost as BAU managed risk. • Removing forecast revenues from the scheme target (£2.3m per annum) • An annual cost target of between £18.2 and £26.9m (avg £22.1m) • Remove revenue where we scale back interruptible and/or off-peak capacity • (e.g. if we scale back 5% of capacity, we reduce the associated element of the scheme revenue by 5%) • A scheme target reopener can be triggered if we cap out under the scheme two years in a row or collar out in any single year • We are not currently proposing any changes to the incremental buyback (100% downside) and accelerated release (100% upside) elements to the scheme

Summary of alternative approach (not proposed)

Scheme is based on:	• Expected modelled risk in RIIO-2
Alternative approach:	• A symmetrical Cap and Collar of £40m • Removing forecast revenues from the scheme target (£2.3m per annum) • An annual cost target of between £37.5 and £54.3m (avg £45.6m) • Remove revenue where we scale back interruptible and/or off-peak capacity • (e.g. if we scale back 5% of capacity, we reduce the associated element of the scheme revenue by 5%) • A scheme target reopener can be triggered if we cap out under the scheme two years in a row or collar out in any single year • We are not currently proposing any changes to the incremental buyback (100% downside) and accelerated release (100% upside) elements to the scheme

Stakeholder feedback

Your support is a vital element of how our proposals are justified. A range of views have been gathered over many months which has helped us to shape our current proposal. We have discussed constraint risk and retaining a CCM incentive into RIIO-2 with a variety of stakeholders since 2018. You have told us:

- You want unrestricted ability to flow gas onto or take gas from the transmission network.
- You are concerned that commercial actions to restrict access to flow gas onto or off the network could have knock on impact to their business of electricity generation.
- The CCM incentive has driven the right balance of capacity released and minimised the impact and cost of constraints to customers. It appears that in RIIO-1 the incentive has worked well. The CCM Incentive has driven the right behaviour.
- The CCM incentive was one of two incentives singled out for its impact and importance.
- Managing constraints is viewed as our primary role as system operator and as such it is not clear whether an incentive is needed and there is a question as to what differs between BAU and incentive performance.
- Without an incentive, the costs of constraints on an intact network should be passed through.
- The target setting is viewed as very difficult.
- The size of capacity constraint management target and how that had been derived is a key focus.

We agree that the industry is best served when capacity release and constraint management are viewed together and optimised by us as we are best placed to manage that risk and driven to perform by the risk reward framework of a financial incentive. This is what our incentive proposal will deliver.

In response to your feedback, we further focussed on taking a clear message out to you through follow up meetings and webinars about what it could look like both with and without a CCM financial incentive. We had

positive feedback from you that those sessions provided the clarity that you wanted and you understood why a CCM financial incentive is intrinsic to the regime.

We agree that the incentive proposal target is crucial and as such have further engaged with you on the two approaches detailed and how we have determined the scheme metrics. We explained our proposal via a dedicated webinar and published a recording of the session for those who did not attend.

Some further comments relating to our CCM proposal are listed below.

'Seems it will drive the right behaviours in terms of managing risk. Making interruptible/off-peak penalty only makes sense too'

'…hopefully incentivises NG to not scale back under testing conditions.'

'I think that there needs to be more justification of the scheme parameters and the scale of the incentive.'

(We)…'are comfortable with what we have seen so far.'

'…the feedback is we're much happier with them as a) more thorough after initial feedback and b) look tighter (particularly the Constraint Mgt) and therefore should bring out better behaviours/ benefits for consumers. '

'…I think you guys do a really good job communicating clearly…'

2. Residual balancing

How the incentive works	The Residual Balancing incentive should primarily ensure that the end of day stock level within the NTS is managed in the most efficient way with minimal market impact wherever possible. The incentive is also intrinsically linked to our role as residual balancer providing us with a baseline performance level for the activity via the targets set.
Proposals	Retain scheme. Make incentive tougher to achieve against by reducing the performance gradient whilst recognising a changing and more challenging energy landscape. Propose amending the linepack component of scheme to drive the right behaviour during seasonal transitions between winter and summer and vice versa.
Consumer benefit	This incentive encourages the minimisation of residual balancing activity, minimising impacts on the market, customers and ultimately cost to end consumers.

Figure 27: Residual balancing summary

Overview

In our role as Gas Transmission System Operator, we are the residual balancer of the UK Gas market, meaning we aim to take efficient market actions to encourage shippers to balance their individual portfolios and resolve any residual national balance. The role of the residual balancer is critical in the wider context of the GB gas transmission market and end consumers to help maintain transmission system security and a balanced gas market, helping to ensure a reliable supply of gas at cost-effective prices.

The commercial framework encourages gas shippers to balance their gas supply and demand. If this balance is not expected to be achieved on any given day, we, as residual balancer, can enter the market and undertake trades to resolve any residual imbalance on the system. As residual balancer, we enter the market and set prices to indicate/incentivise shippers to balance. For example, if the system is 50mcm/d short we will buy some volume and potentially set the buy price as an incentive for "short" shippers to reduce their imbalances. The gross value of these trades is typically more than £100m a year. For market balancing actions, the net daily cost or benefit is 'smeared' (via balancing neutrality) back to the shippers that used the system on the day the action was taken.

The incentive

The Residual Balancing incentive should primarily ensure that the end of day stock level within the NTS is managed in the most efficient way with minimal market impact wherever possible. The incentive is intrinsically linked to the activity of residual balancing within the parameters of the scheme, providing us with a baseline performance level for the activity.

The incentive does however have an inherent contradiction with operating strategy at certain times of the year as the Gas National Control Centre transitions from summer linepack levels to winter linepack levels and vice versa (closing to opening linepack on the incentive does not allow for moving linepack range seasonally) which potentially erodes consumer value via more frequent trading. This conflict lies exclusively in the Line Pack Measure (LPM) aspect of the incentive, as acknowledged by Ofgem and industry[7].

The market

The operating environment is changing. At the start of RIIO-1, the market environment meant that we only had to trade in the market between 10%-20% of days in the year. We are currently typically trading between 30%-50% of days in the year for residual balancing purposes, because of greater volatility of supply and demand between and within days.

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[7] NGET NGG RIIO-2 Sector specific methodology response, P11. Available at
https://www.ofgem.gov.uk/publications-and-updates/riio-2-sector-specific-methodology-consultation

Our current proposal

We currently propose to maintain the incentive in its current form with a 20% reduction in the caps and collars (annual and daily), reducing current incentive returns by circa 25%. We also propose the addition of a wider LPM range of 5.6 mcm/d for the shoulder months to better align with operational reality and maintain the safety of the network.

Value for consumers

Why is a Residual Balancing incentive scheme good for consumers?

The residual balancing incentive ensures that, when we enter the market in our residual balancing role, we do so in a measured way to avoid incurring unnecessary costs for consumers and by minimising residual balancing actions, we benefit the consumer by not unduly moving market prices.

The incentive means that we take a risk-based approach to avoid entering the market on roughly 250 days per year. Without the incentive, we would be more likely to trade to minimise risk. We also firmly believe that this incentive is intrinsic to the residual balancing obligation as it is part of the framework under which we undertake this role.

Our role undertaking the residual balancing activity encourages shippers to balance and stabilise supply. The incentive is then designed to ensure we minimise our intervention in the market, act efficiently with buying or selling appropriate quantities at appropriate times to maximise the effectiveness of our actions.

Figure 28: Purpose of the activity and positioning of the incentive

Materially, the incentive means that we take a cost and risk based approach to avoid entering the market roughly 250 days per year, without the incentive there would be no counter balance to the risk profile meaning we would be likely to trade more and potentially on both sides of the market on the same day more frequently to minimise the risk of operating the network. On the days where we buy in the market, 61% only have a single buy action and on the days where we sell in the market, 70% of days are single sell actions showing the effectiveness of the Price Performance Measure (PPM) part of the Residual Balancing incentive limiting the trading spread.

As we continue to meet our customer requirements in a more volatile market, we trade more frequently to provide the same level of service (see Figure 29). By minimising residual balancing actions, we benefit the consumer by not unduly moving market prices.

Since the incentive came into effect, we have also improved industry engagement through industry meetings such as the operational forum and providing further information to enable stakeholders to better manage their portfolios by publishing hourly trade data and publishing LP swing data.
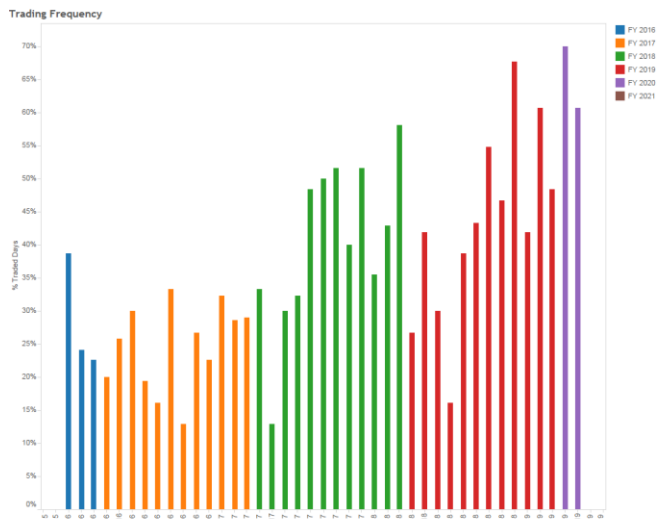
Figure 29: Increasing trading frequency
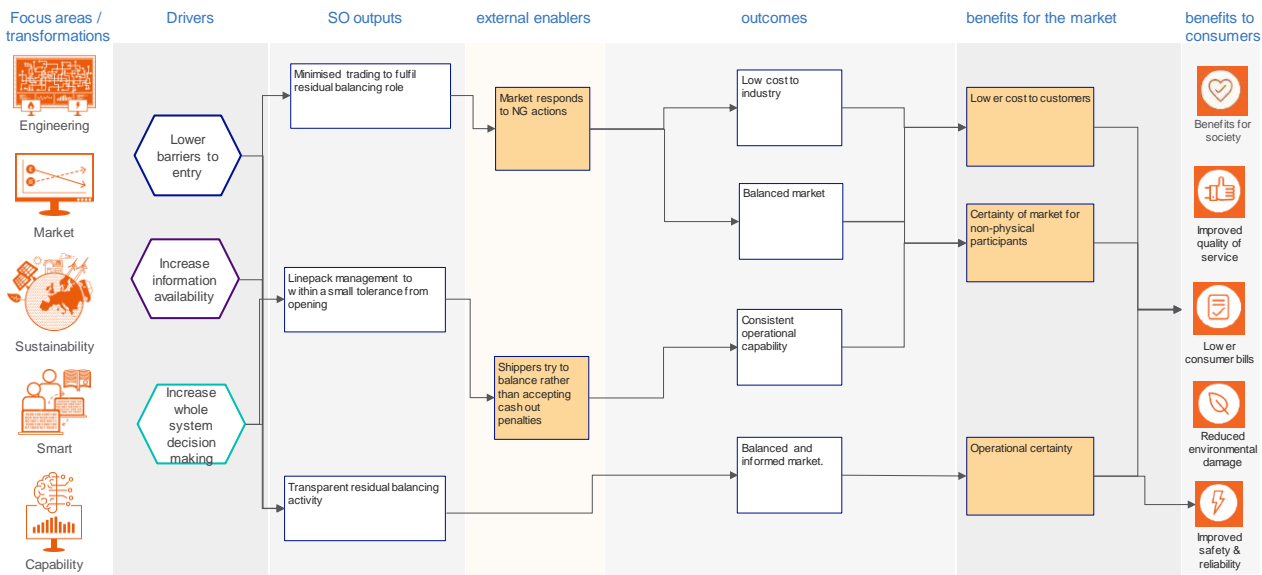
Figure 30: Residual Balancing consumer value framework

We reviewed this incentive scheme to assess the benefits to consumers and worked our way back to assess benefits to the market and ultimately the focus/transformation areas within National Grid Gas Transmission.

Incentive description

Structure of the incentive
The residual balancing incentive contains two elements:
- the price performance measure (PPM)
- the linepack performance measure (LPM)

The residual balancing incentive has existed unchanged through RIIO-1 to underpin our residual balancer role in an economic and efficient way. As stated above, there are two parts to the incentive:

RIIO-1 Price performance Measure (PPM).
The PPM is designed to minimise the impact of actions that we take to balance the market. This is governed by the formula:

PPM = (Highest Value NG Trade – Lowest Value NG Trade) / System Average Price (SAP)

The target is 1.5% of SAP meaning that if PPM < 1.5% NG receives up to £1,500 per day (linearly). If PPM > 1.5% lose up to £30,000 per day.
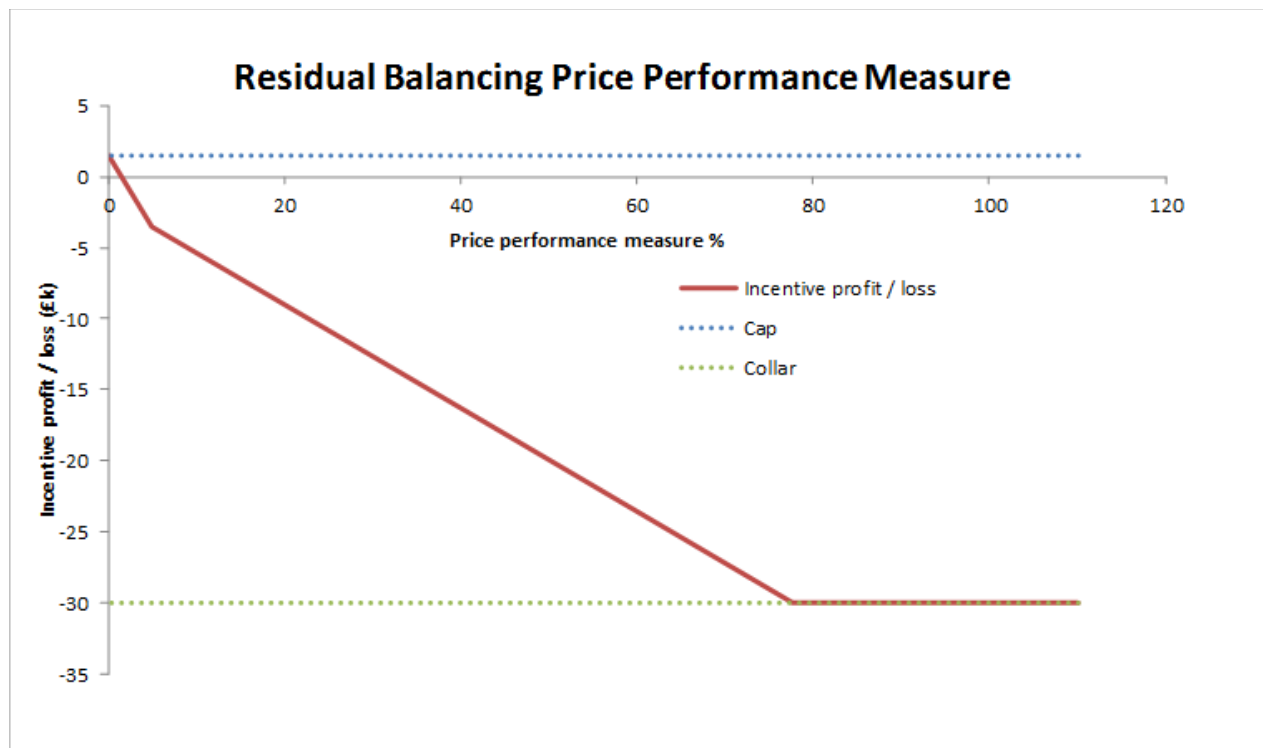

Figure 31: Residual Balancing scheme parameters

The linepack performance measure (LPM) is intended to ensure that any system imbalances are resolved on the relevant day, so that the costs of doing so are targeted to those responsible for the imbalance. The existing scheme does not reflect the operational need to change linepack levels as we transition from summer to winter and vice versa.

RIIO-1 Linepack Performance Measure (LPM)
The LPM is designed to minimise any changes between opening and closing linepack over the gas day. This is governed by the formula;

LPM = Opening linepack – Closing Linepack

If LPM < 2.8 mcm/d then NG receives up to £4,000 per day (linearly to 1.5 mcm/d at which point, there is no further gain).
If LPM > 2.8 mcm/d then NG lose up to £30,000 per day (linearly to 15 mcm/d at which point, there is no further loss).

Incentive Performance Sum

The sum of daily incentive payments for PPM and LPM are capped at +£2m and collared at -£3.5m on an annual basis:
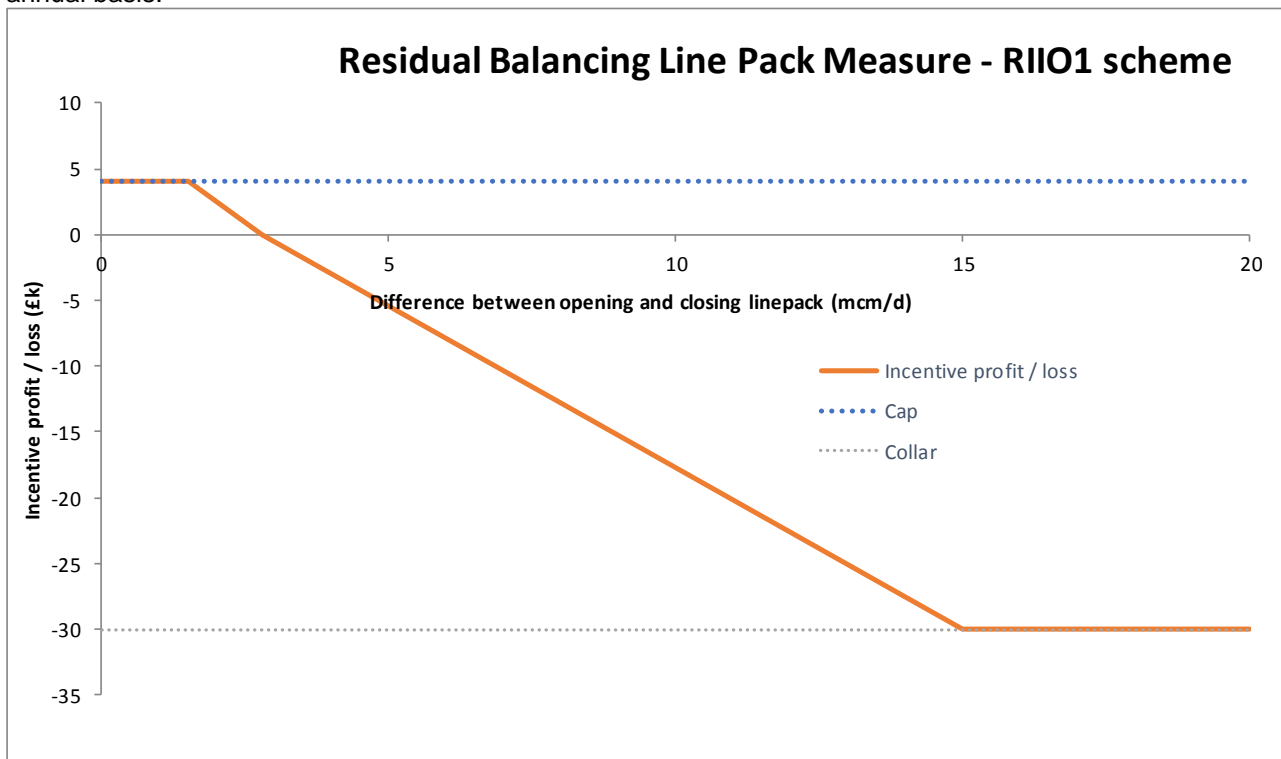
Figure 32: Residual Balancing scheme parameters

Performance to date

(click for further info)	Purpose	Value (£m)	Incentive performance					
			2016/ 17 (£m)	2014/ 15 (£m)	2015/ 16 (£m)	2016/ 17 (£m)	2017/ 18 (£m)	2018/ 19 (£m)
Residual balancing	Efficient balancing of supply and demand on the gas day while minimising the market impact of any actions.	+2 to -3.5	1.0	1.1	1.2	1.1	0.6	1.0

Figure 33: Residual Balancing performance

Potential areas for change

The intention of the Residual Balancing linepack component, LPM, to balance closing linepack to opening linepack levels does not always reflect operational need and poses a potential conflict between what linepack level is safest and most efficient for system operation and the role of residual balancer to balance the network. Whilst we would never seek to maximise incentive performance to the detriment of effective system operation, we do believe that on a principle basis that incentives should be designed to encourage the right behaviours. This conflict was acknowledged by Ofgem and industry and therefore we are proposing options to resolve this.

Overview of analysis

Is the incentive fit for purpose?

Moving linepack seasonally is a key element to the effective operation of the NTS. The current LPM mechanism encourages us to balance closing to opening linepack but discourages the seasonal movement of the linepack range where this may not be the efficient thing to do in managing the seasonal transition. As such, we have proposed to widen the linepack range for the shoulder months to ±5.6 mcm/d.

The months where summer becomes winter and vice versa creates a level of uncertainty depending on cold/warm weather snaps and the time in year when the enduring seasonal temperature comes into effect. The RIIO-1 scheme does not take this into account and occasionally during these months, the incentive scheme and operational needs diverge creating risk.

Is the incentive effective in ensuring that the NTS can be operated in a safe and efficient manner?

Gas National Control Centre (GNCC) strategy to manage linepack

Our balancing strategy is based upon a seasonal physical Linepack model, with different trading ranges underpinning the safe and efficient operation of the NTS.
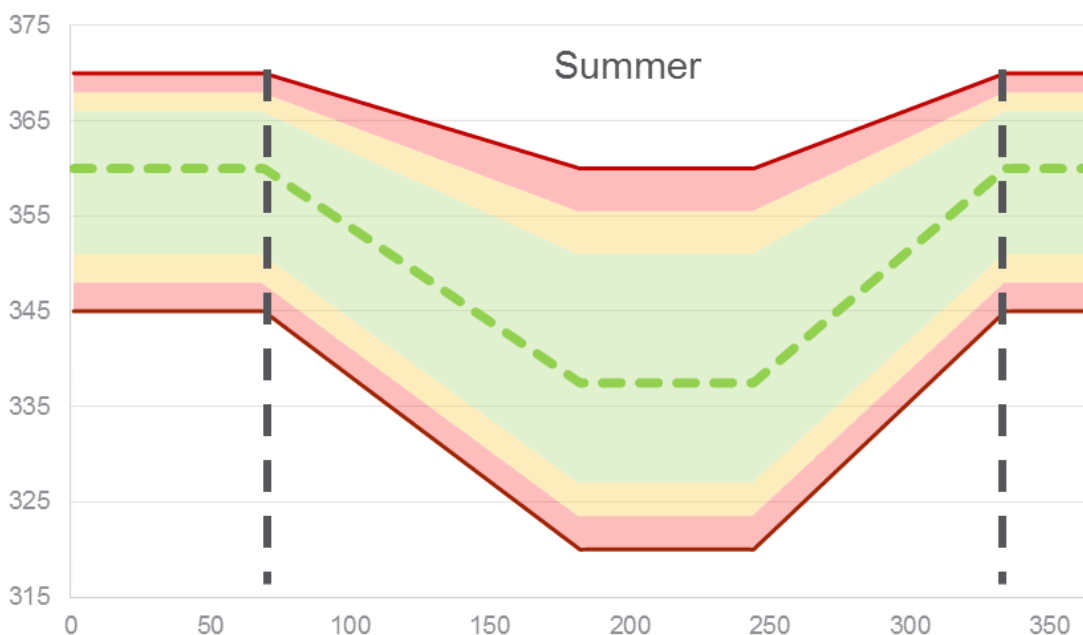
Figure 34: Seasonal linepack safety levels

At higher winter demands the safe and efficient levels of linepack to operate the system are between **345mcm and 370mcm.** Outside this range, the ability for the system to receive gas (above 370mcm) and the ability to meet assured exit pressures (below 345mcm) diminishes. The normal operating limits are **347mcm to 367mcm.** The preferred operating window for linepack in winter is **350mcm to 365 mcm.**

During summer, the operating window is wider as the system becomes supply led and failures or outages on the network are not compounded by high demands. The safe operating limits are **320mcm to 360mcm,** the normal operating limits are **325mcm to 355mcm** and the preferred operating window is around **328mcm to 350mcm.**

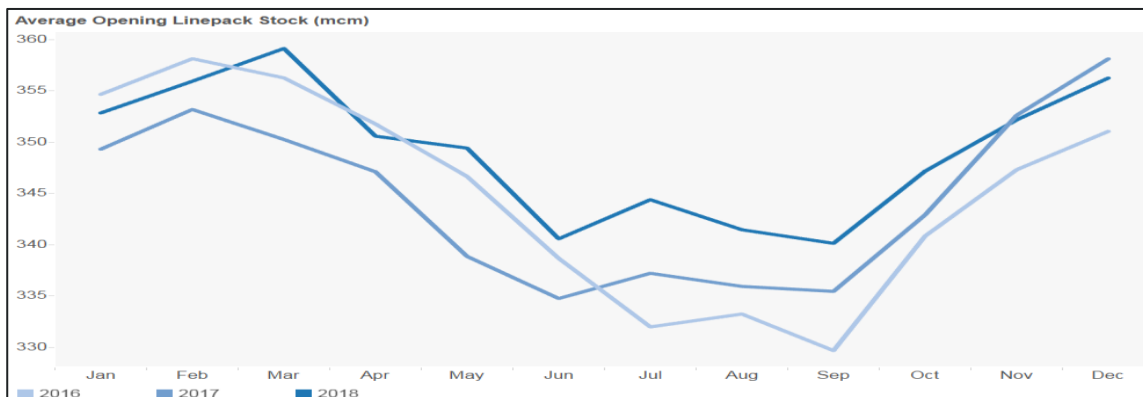The following graph shows the seasonal linepack movement over the last three years:

Figure 35: Average opening linepack (and closing linepack target)

Linepack to be more efficient

The graph shows the variation of the linepack position throughout the year. The ability to flex linepack to a greater extent in the transition between winter and summer and vice versa, could lead to efficiency savings to be passed through to consumers.

Further rationale for widening the linepack range in shoulder months

Setting seasonal linepack levels to protect the national transmission system

Seasonal linepack levels are a fundamental element of operational strategy and any incentive surrounding the linepack parameters should consider optimal physical performance to generate efficiencies that would in turn bring down the cost to the consumer whilst continuing to ensure the safe operation of the network. By optimising the system through ensuring adequate linepack for demand levels, we can use the NTS to increase the amount of time in which the GNCC must react to any changes in supply or demand. High linepack with high demand allows a reduction in compression usage, reducing costs passed through to the consumer. Similarly, low linepack with low demand reduces the need for compression at entry therefore bringing down the costs of running the NTS and associated shipper delivery costs.

Allowances for shoulder month uncertainty

The months where summer becomes winter and vice versa create a huge amount of uncertainty depending on cold/warm weather snaps, and linepack is also variable when the enduring seasonal temperature comes into effect.

Ability to capitalise on market behaviour

Occasionally, when we try to move the linepack levels for operational reasons, shippers are out of balance and are moving the linepack in the same direction as the strategy. It would be efficient to be able to hold the new linepack position without having to revert to within 2.8mcm/d of opening. For example, if shippers were imbalanced by +5mcm/d at a time where NG had a two-day strategy to increase the LP by 5mcm, it would be economical to be able to hold this position rather than trading back to within 2.8mcm/d of opening, aligning to the incentive principle of minimal market intervention.

What are the other options related to seasonal linepack?

We have considered three other options in addition to our current proposed seasonal linepack change detailed above:

Option 1: Suspension of the LPM during the shoulder months (Sept-Oct and Mar-Apr)

To facilitate efficient risk management of the NTS. The suspension would mean that we can move the linepack range in greater increments than is currently incentivised. Quicker movement of the linepack range would allow us to mitigate against cold snaps and offshore outages, both of which pose significant threats to system integrity and the delivery of gas to customers. This option has been discounted as removal of linepack parameters is unlikely to promote the right behaviour via the incentive.

Option 2: Modification of the calculation for LPM to respond to markets and imbalances

This option includes a mathematical factor within the calculated formula to replace closing to opening. This variable would be aligned to expected supply and demand. This option has been discounted due to unnecessary complexity to achieve a similar result to the proposed solution.

Option 3: Creation of a linepack provider

Creation of a 'linepack provider' shipper to trade linepack that would be operated either by the GNCC or in the ringfenced Shrinkage and Emissions team. This option has been discounted as it would require setting up a separate linepack provider role requiring UNC and licence modifications, and how this then related to our role as the residual balancer.

Proposal

When designing the scheme, we have considered two founding principles; to further stretch our performance in an increasingly volatile market and to enable the scheme to be better aligned with the operability of the NTS to deliver further consumer value. We are proposing to retain the LPM and PPM principles as the incentive is integral to the role of the residual balancer.

Scope of changes – reduction in cap and collar

For the PPM and LPM aspects of the incentive, aligned to the Ofgem May 19 decision document, we propose to maintain the current arrangements.

We recognise that in the current economic climate it is important to continue to drive performance and create value for the consumer. Therefore, we are proposing a 20% reduction in the caps and collars (annual and daily) for both the PPM and LPM elements of the incentive as this directly impacts our performance gradient i.e. the same performance in RIIO-2 as RIIO-1 would result in less revenue being generated via the incentive.

Scope of changes – widening of the linepack range in shoulder months

We are proposing to widen the linepack target range to 5.6mcm/d in the shoulder months October, November, February and March to closely align with our core operating strategy of 5-6mcm/d linepack increments. This also compliments the principles of our NTS operational strategy as events on the gas network frequently manifest within the window of 1-3 days. As can be seen from the linepack graphs, it is important to be able to step the linepack range up or down.

Value

In our role as the residual balancer we are required to ensure that supply and demand on the NTS is balanced. The residual balancing incentive brings considerable benefit to the end consumer by ensuring we fulfil this obligation in an efficient and effective way without unduly influencing the market.

This current incentive proposal will help stimulate improvements above and beyond the current value of avoiding entering the market roughly 250 days per year and only entering the market once on an average of 66% of days where we do enter the market.

Stakeholder Feedback

A range of your views have been gathered over many months which has helped us to shape our current proposal. We have discussed our role as residual balancer with you and the continuation of a proposed incentive on both price and linepack measures into RIIO-2. We shared details on caps, collars and targets including what we want to change.

- Most gave firm support to continue with the Residual Balancing incentive and gave support for amending scheme to recognise seasonal linepack movement.
- One stakeholder suggested removal of the shoulder season from the Linepack (LPM) incentive.

We were pleased that you broadly understood and supported our proposal. On balance, we felt that it was better to have the linepack incentive active in all months rather than to exclude the shoulder periods. The

amended linepack measure we put forward strikes the right balance of incentivising the right outcomes for customers and consumers.

- Some commended us for proposing reduced Caps and Collars and appreciated and supported us taking on the challenge to deliver more for customers and consumers for a lower reward.
- Some thought the Cap/Collar on this incentive was very low relative to its value and importance to the industry (for example, compared to the demand forecasting incentive).

We welcome your recognition that we propose to raise the bar of what we deliver through the incentive by lowering the caps. Whilst there were a range of views on the importance and size of this incentive, we feel that the size of this incentive remains appropriate.

3. Maintenance use of days and changes schemes

How the incentive works	The maintenance incentive is split into two schemes:
	-changes scheme – minimisation of the use of changes to maintenance days by us to the agreed maintenance plan
	-use of days scheme – minimisation of the use of maintenance days to perform remove valve operations maintenance
Proposals	We propose retaining the existing schemes and expand to cover a wider range of maintenance activities, which is supported by stakeholder feedback.
Consumer benefit	This incentive encourages alignment of maintenance plans with customers to minimise potential disruption to them and wider markets. This ultimately reduces costs to end consumers.

Figure 36: Maintenance summary

Overview

To ensure that the reliability and integrity of the NTS remains in line with regulatory and safety requirements, we must periodically carry out maintenance on the NTS. To minimise the impact that maintenance work has on customers, we time this to minimise disruption to customer operations. Where we can align maintenance to periods that have no impact on customer contractual rights, we will communicate the maintenance period as 'advice notice days'.

Where the work requires an outage, or reduces the flexibility available (e.g. where steady gas flows may be required) at one or more direct exit connections, we may 'call' one or more 'maintenance days' in accordance with the Uniform Network Code (UNC) (subject to any site-specific limitations).

In response to your feedback, in RIIO-1 a new incentive was created to increase our focus on maintenance. This incentive was to incentivise us to deliver the published maintenance plan as per Section L of the UNC and aligning our remote valve operations (RVO) with customer requests for the summer maintenance period.

The incentive provides a financial target to ensure that our maintenance is completed in accordance with the published maintenance plan as well as aligning RVOs with customers where possible. Both elements have created consumer value by reducing costs and impact on customer operability, resulting in financial savings which would ultimately be passed on to end consumers. As the RIIO-2 maintenance plan is two to three times greater in volume, we are proposing to maintain the existing incentives which will drive a step change in performance within the scheme.

The incentive currently only covers a small proportion of the maintenance plan. Given the increasing maintenance plan and the associated consumer value, we believe and have proposed that the scheme should be extended to align all types of exit related asset replacement and reinforcements works to customer outages. Without financial incentives on maintenance activity, we would endeavour to minimise impacts on customers, but we would be more likely to focus on UNC obligations (e.g. use our entitled maintenance days).

Additionally, we would be more likely to reschedule planned maintenance activities as we would focus more on operational requirements.

Current process

Under Section L of the UNC, we are required to publish our maintenance programme twice each year. The planned maintenance period is typically between April and October to minimise impacts on customers. If the work has an impact on customers and is required to be run outside of the April to October period, or there is a specific customer request raised to align maintenance with an outage outside this period, it would be subject to a bilateral discussion and exit maintenance days cannot be used. The timescales for the production and development of the Maintenance Plan with our customers, as set out in the UNC is detailed below:

	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

Figure 37: UNC timescales for maintenance

Our Maintenance Plan sets out a timetable for the work that is required on the NTS, considering affected parties' outage plans. Following publication of the maintenance plan, any requests for changes from our customers or ourselves are assessed to consider the potential impacts such as:

- The impact on other connected parties
- Flow restrictions
- Previous changes that may include, but are not limited to, resource and equipment availability, cost implications and any impact on other works

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

For exit related planned maintenance, there is a process set out in the UNC that enables us to inform customers of intended Maintenance Days where work has an impact on a specific site connected to the NTS. These Maintenance Days are notified in advance of the work to provide customers with an opportunity to discuss the timing and impact and for us to respond to any customer's requests for further information and allow us to interrupt flow to the relevant exit point without the need to deploy capacity management tools.

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 our ability to meet customer's flow requirements.

Consumer Value

Through our engagement with you, we are aware that aligning our maintenance plan can have a large potential value for customers which can be passed on to consumers. This is echoed in the stakeholder comments we received during the Shallow Incentives Consultation, 2017/18 and the Ofgem incentive workshop, 2018.

The value provided of aligning outages and operations with our maintenance plans has been calculated at approximately £14.5m per annum. Changes to our maintenance plan has the potential to cost a customer hundreds of thousands of pounds per day in lost revenue dependent on their business type and their commercial arrangements. For example, aligning RVOs with customer outages enables CCGT customers to generate electricity. When comparing this to the potential opportunity cost of lost revenue, this generates customer's revenue circa £1.5m per annum (assuming maximum efficiency).

The maintenance incentive drives additional areas of value which are not as quantifiable, however we have mapped out the different drivers and our actions leading to market benefits which ultimately benefit consumers.
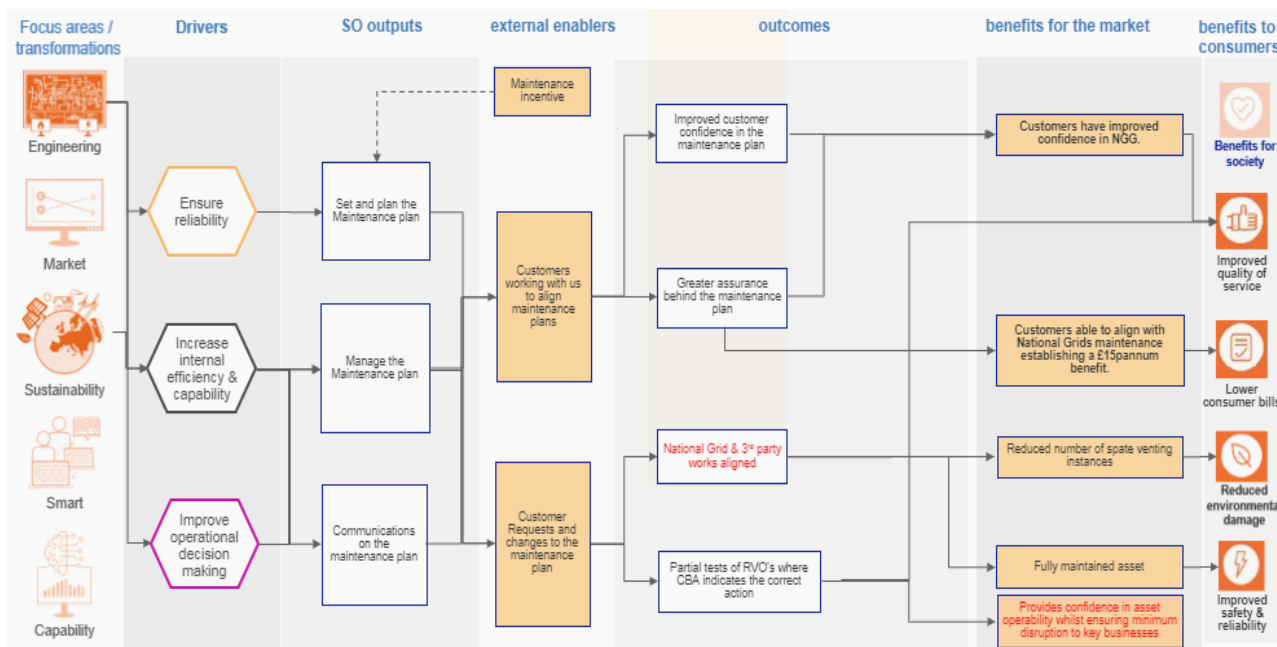
Figure 38: Maintenance consumer value framework

We reviewed this incentive scheme to assess the benefits to consumers and worked our way back to assess benefits to the market and ultimately the focus/transformation areas within National Grid Gas Transmission.

Stakeholder Feedback

The financial incentive on maintenance activity was one area that most of you agreed and felt strongly about retaining and the value delivered.
.
- Continuation of the maintenance financial incentive has broad support from you. In RIIO-1 it delivered substantial value to our customers.
- The maintenance incentive was one of two incentives singled out for its impact and importance to you.
- Identified as having quantifiable value, this should therefore continue to be incentivised and has strong support for widening the scope of the incentive to cover further maintenance activities.
- One stakeholder told us that maintenance activity in their view represented business as usual.

In all our incentive engagement to date, you spoke of the importance to your organisations and the value created in RIIO-1 by the incentive. In individual meetings, group forums and webinars there has been broad support to extend the coverage of the incentive to more types of maintenance activity. We explained what BAU activity would look like in maintenance if there was no financial upside on any incentive in response to your feedback. We have gone on to include further detail on the additional maintenance activity we propose as part of the incentive. We see this additional scope as fundamentally supporting our proposal for an increased cap and collar on this incentive.

Incentive description

The maintenance incentive encourages efficient planning and execution of network maintenance that affects customers directly connected to the NTS.

The maintenance incentive is therefore split into two scheme components:

- changes scheme - minimisation of changes initiated by us to the agreed maintenance plan. A financial incentive to reward performance where we can reduce the number of changes we make to our maintenance plan up to 7.25% of the maintenance workload days. As the size of maintenance is proposed to increase by two to threefold, the challenge will increase in absolute terms.

- use of days scheme - minimisation of the use of exit maintenance days to perform remote valve operations maintenance. A financial incentive to use an efficient level of maintenance days for routine maintenance work covering RVOs. Valves are used to control the flow of gas and isolate pipelines in an emergency. To ensure the safe operation of the system, we maintain key valves on an annual basis where they will need to be opened and closed to ensure operation, requiring a system bypass to maintain supply.

This incentive scheme is closely linked to the following reputational schemes that have also provided additional benefits to the industry:

- A reputational incentive to provide earlier and better communication of our outage needs to affected parties to enable better alignment to users own maintenance periods

- A reputational incentive to ensure that parties are aware of the enhanced services we offer when standard maintenance approaches are not optimal for our customers. Our customers can work with us to agree different maintenance approaches paying any incremental costs of working flexibly outside normal working practices where we can accommodate these requests.

These schemes have encouraged us to carry out our essential maintenance in a way that caused as little disruption as possible to connected customers.

Scheme mechanics

Under the changes scheme, the target number of maintenance plan days or advice notice days, subject to change initiated by us (excluding changes made by us, pursuant to customers' request), is equal to 7.25% of the total number of maintenance plan days within the year. Changes within scope include changes to dates (including reduction or increases to the number of days for a specific job) or cancellation of days.

If the actual number of days changed is equal to target, the incentive revenue is zero. If the actual number of days changed is less than the target, then a payment of £50,000 per change below target is accrued up to a scheme cap of £0.5m per annum (for 10 changes or more below target). If the actual number of days changed exceeds the target, then a penalty of £50,000 per change more than the target is accrued to a scheme collar of -£0.5m per annum (for 10 changes or more above target):
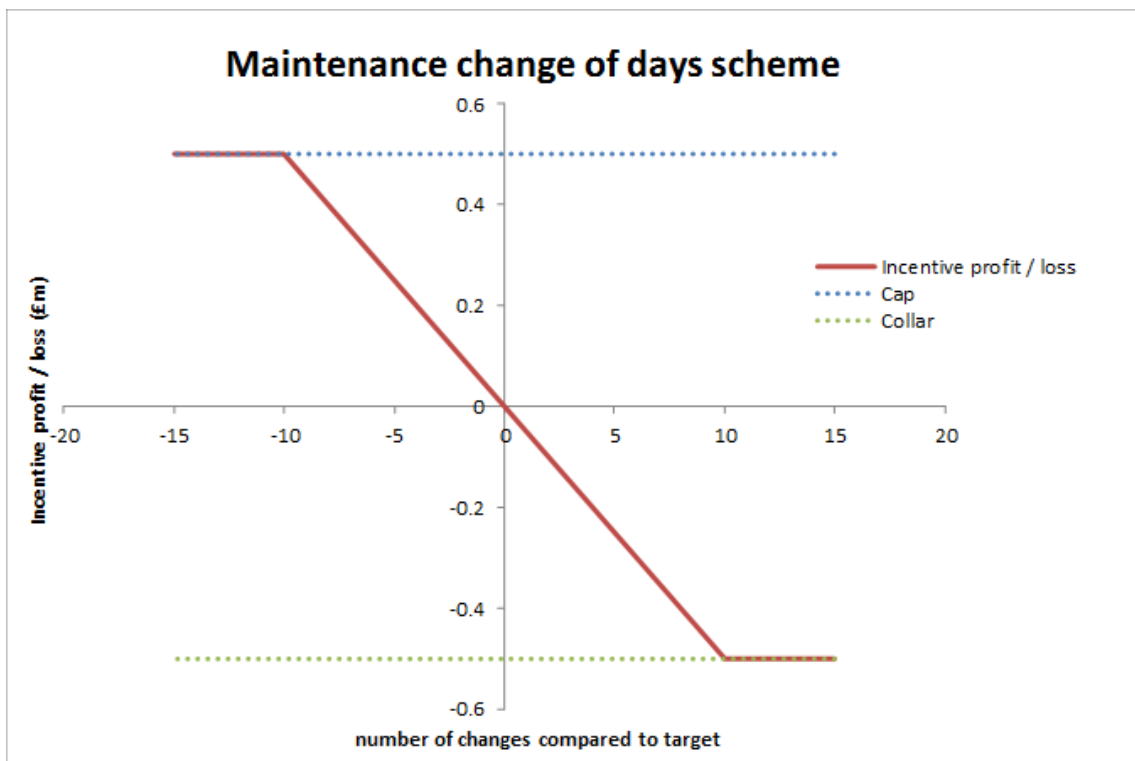
Figure 39: Maintenance incentive scheme parameters

The use of days scheme incentivises us to minimise the number of exit maintenance days (as defined under UNC) used to undertake remote valve operations. We have an annual incentive target (in days) of 11.

If the actual number of maintenance days used for these activities is equal to the target, the incentive revenue is zero. If the actual number of maintenance days used is less than target, we receive a tiered payment between £15,000 and £25,000 up to a scheme cap of £0.215m. If the actual number of maintenance days used exceeds the target, we receive a penalty of £20,000 per day up to an annual collar of £0.5m (for 25 days or more above target).
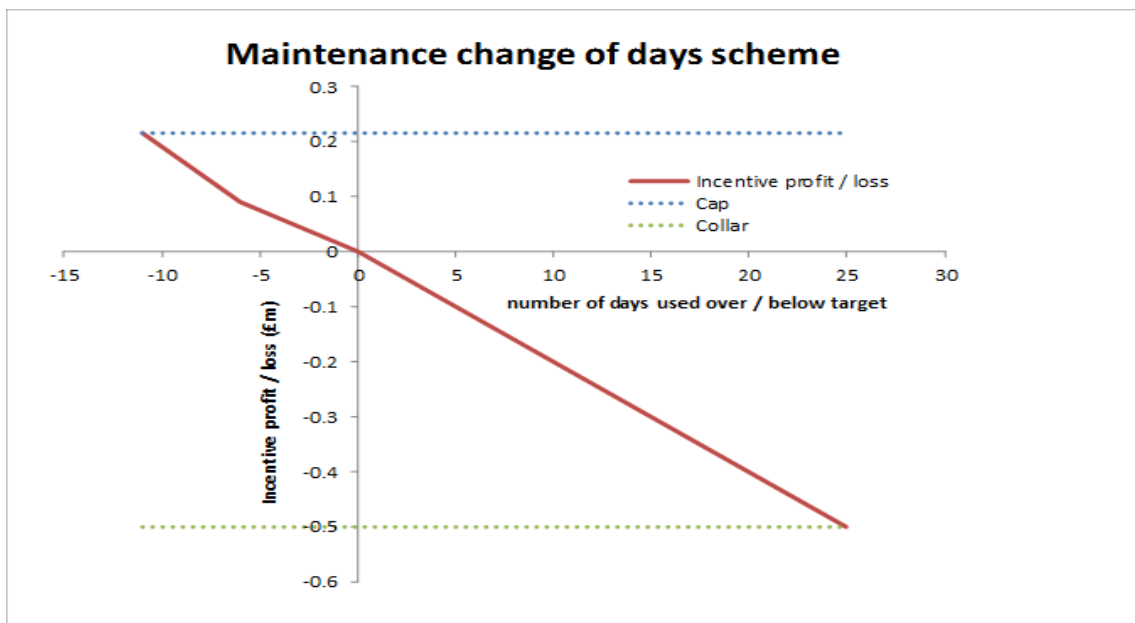

Figure 40: Maintenance incentive scheme parameters

Performance to date

Our ageing infrastructure and the increasingly unpredictable use of our network have, together, made the maintenance incentives increasingly challenging to perform against and we expect this challenge to further increase into the future. More varied use of our assets is likely to make asset use, and resultant wear (and therefore maintenance schedules) more challenging to predict. As an example, for an interconnector with bi-directional flow, the maintenance schedule would change depending on the proportion of time that the interconnector is flowing in either direction.

This incentive supports our customers in taking gas on and off the network where and when they want, thus minimising disruption to their business and supporting the efficient functioning of the market.

During RIIO-1 we worked with our customers to align our maintenance activity with their site outages wherever reasonably practical. To maximise alignment, we have implemented several improvements to our business processes and the associated systems over RIIO-1 as a direct result of the incentive.

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

Where we have been able to align work, we have implemented a process to communicate the agreed maintenance periods via a process known as an "Advice Notice". To help identify late changes by the customer we have implemented an eight week ahead call, as a check point to identify if the customer's outage plans have changed.

Where we have been unable to align maintenance to a customer outage plan, we call Maintenance Days.

Incentive Year	Incentive Targets (days)		Incentive Performance (days)		Incentive performance
	Changes initiated by NG To MD	Use of MD	Changes initiated by NG To MD	Use of MD	
2013/14	6.24	72.30	0	31	£1.138m
2014/15	1.02	44.65	0	4	£0.864m
2015/16	3.99	11.00	0	2	£0.364m
2016/17	16.82	11.00	0	1	£0.690m
2017/18	20.37	11.00	0	1	£0.690m
2018/19	13.34	11.00	0	0	£0.715m

Figure 41: Maintenance scheme performance

Because of the maintenance incentive we have not moved a planned maintenance day[8] during the scheme and have only issued 4 maintenance notices for remote valve operations (RVO) in the last four years. All other RVOs have been issued under advice notices. 128 advice notices have been issued in the last four years and we have accommodated 59 customers requested rearrangements. We did not request any rearrangements. In the same four-year period, we accommodated 19 cancellations initiated by customers. A cancellation is either a cancellation of an advice notice or an agreed move of a maintenance notice to an advice notice.

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[8] For 2019/20 incentive year to date, we have initiated 6 planned maintenance days.

Cost Incurred

One of the issues we have with aligning work with customer outages is that these outages are subject to change, either within year or from year to year. This can make it difficult for us to complete our required work if the customer's change request is at short notice. We would not be able to issue a Maintenance Day due to UNC timescale requirements or if a customer outage is bought forward as our project may not be able complete the work under compressed timescales. If we facilitate the requested changes this can add additional cost to the maintenance.

Proposal

Our current proposal assesses the business process changes and operational experience gained since the new incentive was introduced. We have also taken into consideration your feedback to date in relation to our performance and the value this incentive is providing to you. As such, we propose to:

- Continue the current incentive to encourage us to minimise changes to published Maintenance Days and Advice Notices

- Continue the current incentive to minimise the number of Maintenance Days for RVOs (penalty for each day above target, benefit for each day below target)

- Given that the use of days incentive only covers a proportion of the maintenance plan, the increasing maintenance plan and the associated consumer value, we believe that element of the scheme should be extended to align related asset replacement & reinforcements works to customer outages that are not already covered.

- Continue with the reputational elements of the incentive to provide customers with a maintenance programme that covers three years, facilitate reasonable requests from customers for changes to maintenance days and ensure customers are aware of the Minor Works Agreement which enables parties to contract for working flexibly outside normal working practices.

We recognise that this incentive scheme has been in place since the start of RIIO-1 and has delivered value for customers and consumers. Given the proposed two to threefold increase in maintenance activity in RIIO-2 and ageing assets, performance under this incentive will become even more challenging. To ensure we continue to perform beyond our regulatory obligations, it is important to retain an incentive in this area that stretches our performance against a more challenging backdrop.

Maintenance Plan Changes component of the scheme

Having reviewed this component of the scheme, we are proposing to continue to include the same elements of the current scheme and as such we are not proposing any changes as these are planned activities with a level of control over when they occur. These elements are detailed below:

- Routine Maintenance (e.g. RVOs)

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

- In-Line Inspections (ILIs)

We are currently proposing that the following activities continue to be excluded from this component of the incentive as they cannot reasonably be forecast in the baseline maintenance plan at year ahead stage or there is a reduced level of control over the timing of these works because of the reactive nature of this work:

- Emergency work and fault management, including pipeline feature inspections

- Work on behalf of customers (including minor works arrangements)

You have told us that you value the certainty delivered by not changing agreed maintenance dates as much as they value the reduction in time taken to undertake routine maintenance jobs. The views gathered during

the shallow review of incentives in 2017 provided us with this information. The more recent, summer 2019 bilateral and group engagements have reinforced that there is continued support for us to deliver more on maintenance for our customers and consequentially for consumers. We therefore propose that the existing values attributed to minimising days changed is retained at £50k per day, with the existing cap and collar of £0.5m unchanged.

Maintenance Days for RVOs

We are currently proposing to retain this incentive due to the benefit we believe it brings to our customers. The incentive has encouraged us to reduce the number of Maintenance Days used through:

- Enhancing engagement with our customers to identify their outages and successfully aligning and agreeing RVOs to be undertaken alongside confirmed customer outages as part of the maintenance planning process

- Providing an enhanced service where we have undertaken RVOs with little or no impact on customers. This has been achieved through NTS re-configuration and/or local agreements whilst retaining the associated safety and reliability requirements of the network.

- Greater alignment of RVOs with other scheduled asset replacement work where possible on the NTS to minimise the overall impact of Maintenance Days on our customers. Asset replacement work is unique in nature and therefore alignment cannot be assumed to be repeated for future years.

Whilst the process improvements and planning activities that we have undertaken to date have driven value for our customers by reducing the number of days of impact, we expect this to be more challenging in RIIO-2 due to greater outage requirements and an increase in the requirement to undertake full valve closures. This will reduce our ability to align with customers going forward.

Therefore, we currently propose a continuation of a target of 11 days and a continuation of the current incentive framework, the first five maintenance days used valued at -£25k on incentive performance, the subsequent days utilised -£15k on incentive performance starting at a cap of £215k until with a collar of £500k or 30 Maintenance Days.

Maintenance Days for other work

Any maintenance day we use will impact third parties. Efficient use of Maintenance Days (other work) is highly important and valued by our customers. RVO days only make up a small percentage of the overall maintenance plan size. Additional work that we propose aligning to our customers include but is not limited to feature inspections, in line inspection (ILI) runs, replacement, valve replacements/refurbishment, metering works, telemetry work and analyser work.

The aim of this part of the incentive is to encourage us to align a higher proportion of our work to customer outages. We will also be subject to incentive costs if we are unable to align an agreed proportion of work. Some of these activities may be linked with us meeting our safety and reliability standards and other customers' requirements for connections and diversions.

The incentive rewards us for the reduction of Maintenance Days over the baseline target set each year. The baseline target will be determined annually dependant on the size of the plan in each year. To establish an appropriate target, we have carried out analysis on the number of additional maintenance events which affected customers across the last 5 years:

Year	Number of jobs total	Number aligned	Maintenance days used	%
2019/20	101	71	30	70.30
2018/19	153	153	0	100.00

2017/18	243	196	47	80.66
2016/17	198	165	33	83.33
2015/16	47	29	18	61.70

Figure 42: customer affected maintenance summary

The past five years have had variable rates of successful alignment of these activities. We foresee a greater level of maintenance and system access required in RIIO-2. This is likely to be more than double the volume than we had in RIIO-1. We therefore propose a target of 75% alignment from total volume of customer impacting work in the year ahead plan (excluding RVOs). Due to the nature of ILI runs and maintenance spanning multiple days, aligning with customer's outages is more complicated than RVOs and we believe that 75% is a stretching target. The greater the volume of maintenance activity aligned the greater the risk that we need to manage. We proposed that a symmetrical cap and collar of £0.5m is appropriate due to the additional work in aligning maintenance work that generally spans gas days we propose a + / -£20k value for each maintenance day, depending on the performance against target.

Maintenance Incentive reputational
We propose keeping this incentive as it encourages transparency and allows our customers to plan, encouraging them to align with us and enabling the release of consumer value.
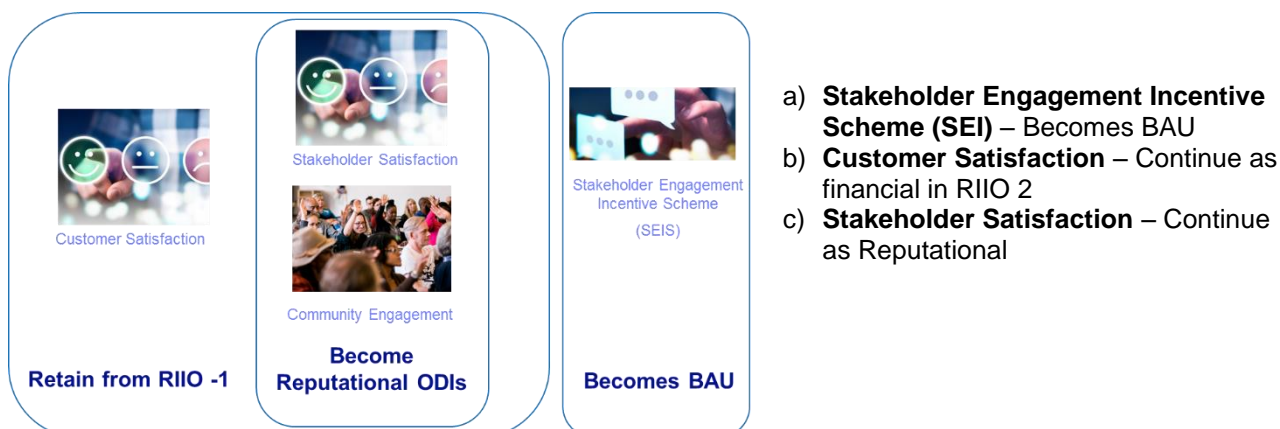
4. Customer and Stakeholder Satisfaction

How the incentive works	How we operate our day to day services has an impact on our customers' time, effort and ability to make informed decisions which in turn impacts their operating costs. Measuring their satisfaction through a universally recognised method (CSAT) is designed to drive improvements in the quality of customer service at all core touchpoints. It includes a financial reward and penalty mechanism and brings the voice of the customer into our business to help us focus on where we need to improve
Proposals	Retain customer satisfaction incentive in line with Ofgem's proposals, whilst refining it based on what has been learnt though RIIO-1 Customer feedback. Proposing reputational ODIs on stakeholder experience and quality of engagement with communities.
Consumer benefit	Positive impact on the operating costs of the businesses directly serving consumers.

Figure 43: Customer and stakeholder satisfaction summary

RIIO-1 to RIIO-2 Incentives

Our RIIO-1 incentives have driven us to perform for customers and stakeholders. Below is a summary of how the RIIO-1 package moves to an amended package in RIIO-2.

a) **Stakeholder Engagement Incentive Scheme (SEI)** – Becomes BAU
b) **Customer Satisfaction** – Continue as financial in RIIO 2
c) **Stakeholder Satisfaction** – Continue as Reputational

a) Stakeholder engagement incentive (SEI) in RIIO-1 – moving to BAU in RIIO -2

The stakeholder engagement incentive (SEI) was introduced in RIIO-1 to encourage us to be outward-facing and responsive to the needs of our stakeholders. The SEI provides a financial reward when we undertake high quality engagement and when we can demonstrate that this is used to plan and run our NGG business on an ongoing basis. Ofgem uses a panel of independent experts to help determine each participating company's annual reward.

Performance to date

	Purpose		Baseline	2013/14 (£m)	2014/15 (£m)	2015/16 (£m)	2016/17 (£m)	2017/18 (£m)	2018/19 (£m)
SEI	To ensure the ongoing delivery of an efficient network that embraces wider social and environmental objectives, network companies need to engage with a range of stakeholders.	Performance	Panel assessed	5.75	6.25 ▲	6.15	6.50	4.25 ▼	4.85 ▲
		Value (£m)	Panel based reward up to 4.1	1.10	1.49	1.48	1.80	0.21	0.60

Figure 44: SEI performance

Our relative performance to other networks can be seen in the table below:

	2013-14		2014-15		2015-16		2016-17		2017-18	
	Score	Reward (£m)	Score	Reward (£m)	Score	Reward (£m)	Score	Reward (£m)	Score	Reward (£m)
Cadent	7.15	£5.65	5.90	£3.42	6.90	£5.35	6.90	£5.18	6.00	£3.54
NGN	6.75	£1.09	5.50	£0.61	6.80	£1.18	7.25	£1.32	6.15	£0.85
WWU	6.30	£0.92	7.05	£1.25	6.05	£0.82	6.00	£0.80	5.00	£0.41
SGN	6.05	£2.07	6.40	£2.43	5.75	£1.76	7.00	£3.16	6.25	£2.34
SPETL	4.90	£0.26	5.50	£0.48	6.25	£0.75	6.25	£0.68	6.40	£0.78
NGET	5.75	£2.76	6.00	£3.50	6.25	£3.81	7.00	£5.05	5.10	£1.78
NGGT	5.75	£1.10	6.25	£1.49	6.15	£1.48	6.50	£1.80	4.25	£0.21
SHETL	5.40	£0.25	6.00	£0.44	6.00	£0.68	5.40	£0.48	3.25	£0.00

Figure 45: National Grid relative SEI performance

One of the benefits of the SEI is that it operates on a continual improvement basis, requiring us to show improvement each year. Having felt we were making good progress with embedding stakeholder engagement in our business at the midpoint of the RIIO-1 period, our performance in 2017/18 gave a clear message that we weren't. This led us to undertake a full-scale review which identified and laid out a clear strategy for improvement, from capability, systems, tools and data management to externally benchmarked best working practices and governance.

b) Customer Satisfaction (financial ODI in RIIO2), c) Stakeholder Satisfaction (Reputational ODI in RIIO2)

Our RIIO-1 incentive is designed to drive improvements in the quality of our customer and stakeholder services and engagements. It includes a financial reward and penalty mechanism and requires us to gather a satisfaction rating out of 10 on our overall performance.

The combined Customer and Stakeholder satisfaction incentives are worth up to +/- 1% of annual allowed revenues in rewards or penalties. The baseline (target) was set at 6.9/10 for customer satisfaction and 7.4/10 for stakeholder satisfaction, in recognition that customers and remaining stakeholders have different expectations of the service they are provided. The incentive is currently weighted 70:30 in favour of customer satisfaction.

Performance to date

	RIIO-1 Purpose		Baseline	2013/14 (£m)	2014/15 (£m)	2015/16 (£m)	2016/17 (£m)	2017/18 (£m)	2018/19 (£
CSAT	To improve the experience provided to Customers	Pivot point	6.900	7.153	7.593	7.552	8.027	7.598	7.790
		Value (£m)	+5.8 to -5.8	0.7	2.0	2.0	3.5	2.5	3.5
SSAT	To improve the experience provided to stakeholders	Pivot point	7.400	7.792	7.944	8.020	7.982	7.962	8.079
		Value (£m)	2.48 to -2.48	N/A*	N/A*	N/A*	0.8	0.9	0.8

Figure 46: CSAT and SSAT performance

Performance up close: Customer Satisfaction

The current incentive has driven us to better understand our impact on customers across all our touchpoints. Initially we delivered general improvements in a few key areas by asking the required satisfaction question in a survey that was sent out to a random sample of our customer base. It wasn't until we found a way to open out the survey to a much broader range of customer contacts closely after an interaction that we saw where we needed to make the big changes.
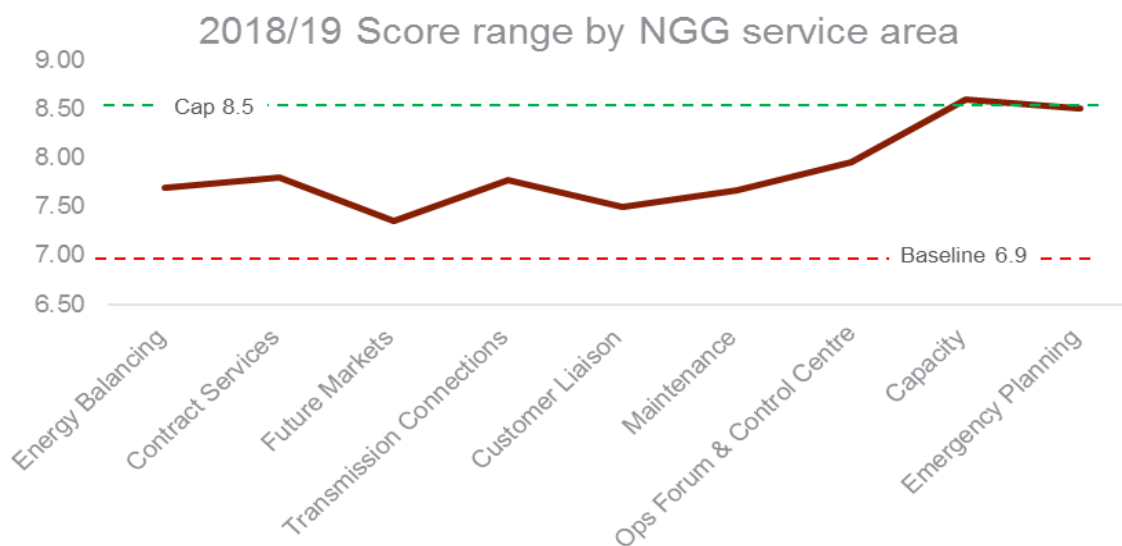

Figure 47: CSAT by touchpoint 2018/19

When asked: "*Is your score solely based on your interactions with this service area or event?*" 43% of customer contacts responding told us that they take more than one NGG 'service' area into account when scoring – their average score was 7.55 last year. In contrast the remaining 57% who only experienced one NGG service area or event, scored NGG 8.00.

Our early learnings led to the launch of our accelerated customer experience programme in 2017, delivering a central customer experience set of principles and standards (generated through customer insight), and the early development of a customer relationship management system that will eventually enable a consistent experience, drive efficiency and support our goal of delivering a personalised customer experience.
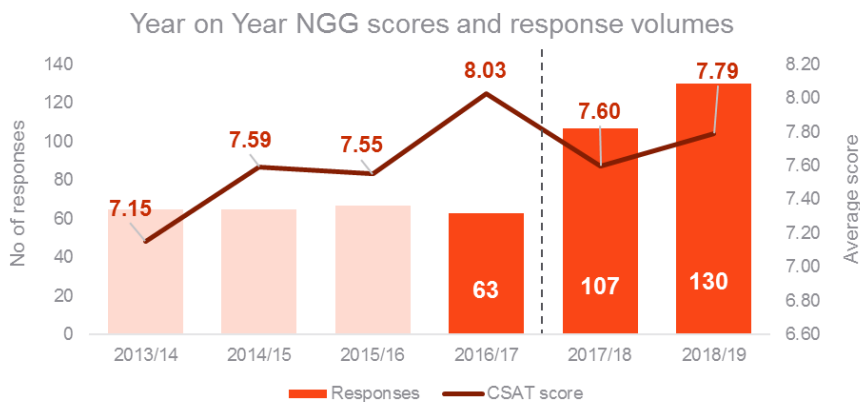
Figure 48: NGG CSAT RIIO-1 trend

This financial incentive provides us with the means to continually invest in improving the customer experience, whilst needs vary and change and expectations grow. Any investment in our service that does not deliver its intended outcome of improving customer satisfaction would not deliver an incentive return and so the cost would have to be covered through existing budgets. This ensures that we produce high quality business cases and track the delivery and outcomes of those investments to drive better consumer value. Through focusing on an upside incentive, we are incentivised to deliver far beyond 'good'.

RIIO-2 Proposal
The CSAT incentive helps us to invest in our Customer Experience beyond the end March 2026. During that time:
- Expectations and needs of current customers will evolve
- Personalisation will move from a 'nice to have', to a basic requirement
- Our range of customers will diversify

Our incentive enables us to develop our service proposition so that it can keep up with these changes and expectations.

Incentives are bounded by the overall revenue, and the ability to achieve is restricted by increasing baselines and caps.

Customer Satisfaction Survey (CSAT)

Stakeholder engagement on the proposal and poll results:
This proposal was created using learnings gathered through the voice of the customer (VOC) during the 2nd half of RIIO-1 CSAT process (n300).

Proposal shared at 2 x stakeholder webinars, 1 x customer Ops forum for comment and approval.

Results:
Favourable for this being a financial incentive:
- Webinar 1 100% overall
- Webinar 2 80% with customers, 89% with all stakeholders
Favourable for our proposed approach
- Webinar 1 100% overall
- Webinar 2 80% with customers, 88% with all stakeholders

Coverage and Methodology
Customer contacts passing through a particular service area or event are invited (through a neutral 3rd party Market Research agency) to participate in the CSAT survey through their channel of choice (digital/phone) to gather feedback on their Satisfaction of National Grid Gas based on the quality of their experience (continuous improvement).

This is a slight adjustment to the RIIO-1 CSAT due to observing that the RIIO-1 general satisfaction question (overall satisfaction of gas transmission) is too general for the participating customer contact who may have very specific operational dealings with parts of NGG – it was far easier for them to talk about a relevant experience than 'overall'.

We therefore propose the question should be:
> **Based on your experience of** *[service touchpoint]* - **on a scale of 1-10, how satisfied are you with National Grid Gas?**

If one customer contact passes through more than one touchpoint, their feedback is requested at each. This is so that we capture any consistency issues of those experiencing multiple services across NGGT. We will however, apply the 90 day rule (Market Research Society guidance) so that any one person is not invited to survey twice within a 90 day window, to limit their survey fatigue.

We propose that the satisfaction rating remains on a 10-point scale for continuity and trending.
A few additional questions would be asked after the satisfaction rating to help identify where specific action is needed. These supplementary questions would be adapted for each touchpoint and year on year to support continuous improvement. The survey would be short in length to limit survey fatigue.

The incentive score would remain an average of all the scores obtained in the year across all customer touchpoints. Due to the fluctuation of demand in some of these areas, we would bundle into 3 groups for the purpose of supporting the yearend report narrative:
• Network capability & operations
• Future markets
• Customer liaison and engagement (reactive and proactive)

The aim is to establish a representative view of each of these 3 areas (with potential minimum sample requirements), whilst the overall score (as per RIIO-1) is the average of all the individual responses received across a 12-month period. This ensures the most comprehensive view of how we are performing from a quality of service perspective and mitigates low volume volatility in scores.

Baseline and targets
Since its launch in 2013, we have moved our performance from 7.15 to 7.79 by the end of 2018/19 and have done this whilst broadening the participating audience to represent the variety of contacts passing through all service areas. Improving satisfaction is based on continual improvement but is also challenged by increasing expectations year on year, not least as these business contacts are influenced by their own, personal interactions as consumers.

We have learnt through our experiences and those who follow best practice in other industries that the higher the score in a year, the harder it becomes to advance further. This is particularly so when the score is reflective of a diverse range of services that are required by a diverse range of customer roles; from project managers out in the field to office-based finance analysts.

Experts in the field of CSAT state that the halfway point on a 10 point scale is not 5 but a score of 8 – this is because it is recognised that takes as much effort to incrementally move up from a score of 8 as it does to reach a score of 8 in the first place. Its likened to running a marathon where as much energy is spent in the final 4.2 miles as in the preceding 22. On that basis and looking to our own data we have calibrated a proposed baseline, cap and collar for RIIO 2.

In RIIO-1 the CSAT baseline was set at 6.9 with a cap of 8.5 and collar of 5.3. We appreciate that the baseline should indeed increase in RIIO-2 due to the improvements already made and request that it is recognized that we are now moving into a much harder to achieve score range which will increasingly get more difficult year

on year and for this to be reflected in the incremental reward gradient provided between the revised baseline and cap. Equally we recognize that not delivering a quality service should have a harsher penalty, if dropping below the baseline.
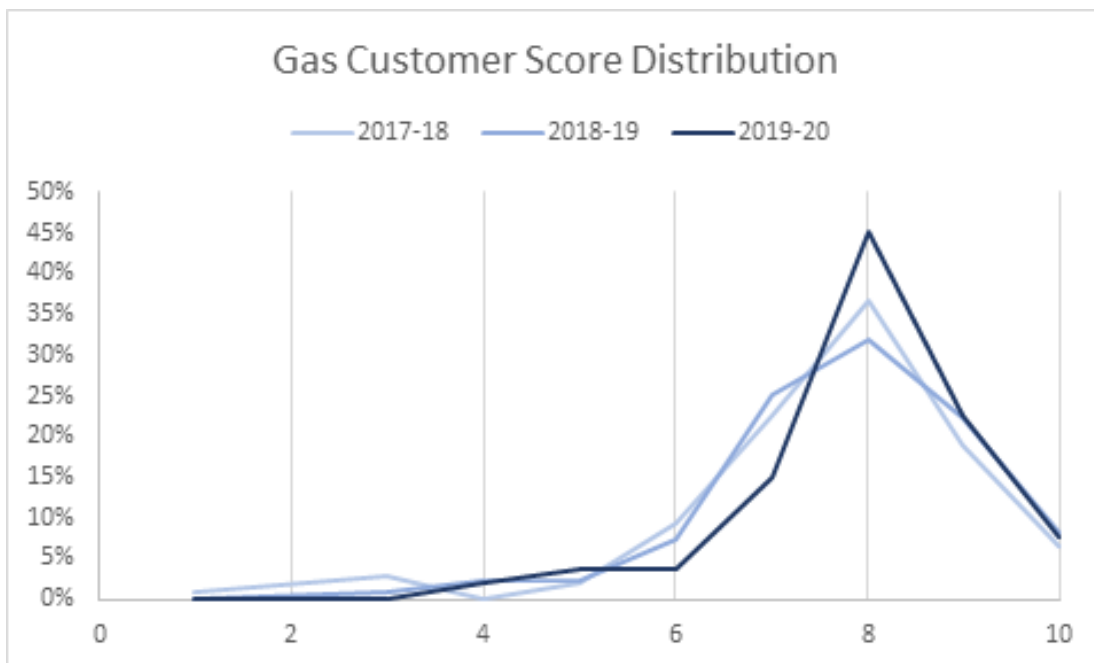

Figure 49: NGG CSAT RIIO-1 score distribution

Our improving scores in recent years have been largely based on moving low satisfaction (scores below 7) closer to an 8. The standard deviation has increased year on year meaning that we are starting to succeed in our push to provide a more consistent experience across NGG. To move our average soundly and constantly above 8.00 would require a step change to move customer contacts from scoring 7s and 8s to rating us 8 to 10 and staying there, year on year.

We propose to Increase the baseline (target) to 7.8, which is our latest published score (2018/19 year end).

By moving our baseline to our last published position, we propose to maintain the Cap at 8.5 to recognise the increasing stretch to achieve each increment from our current position.

We propose a revised severity of Collar to mirror the shortened gap between the new Baseline and proposed Cap – moving it from 5.3 to 7.1

Sample

To ensure we have a strong representation of opinion across the three service area groups; **Network Capability and Operations**, **Future Markets** and **Customer Liaison and Events**, whilst limiting any potential volatility of the year on year scores, we welcome a **minimum overall sample discipline of 100 responses.**

Service Areas	Sample	
	Unique contact Invites	Min unique contact responses
Network Capability and Operations		
Emergency Planning		
Balancing		
Capacity		
Connections Offer		
Connections Design and Build	~180	
Maintenance		
Mods		100
Control Centre		
Metering		
Diversions		
Disconnections		
Future Markets	65	
Customer Liaison and Events		
Forums	~150	
Account Management		

Figure 50: Sample distribution

Summary of CSAT Proposals

Ofgem have indicated that the caps and collars for this incentive should be +/- 0.5% base revenues. In terms of our specific proposals these can be summarised as follows:

- We propose the question should be:
    - Based on your experience of *[service touchpoint]* - on a scale of 1-10, how satisfied are you with National Grid Gas?
- We propose that the satisfaction rating remains on a 10-point scale for continuity and trending.
- We propose to Increase the baseline (target) to 7.8, which is our latest published score (2018/19)
- By moving our baseline to our last published position, we propose to maintain the Cap at 8.5 to recognise the increasing stretch to achieve each increment from our current position.
- We propose a revised severity of Collar to mirror the shortened gap between the new Baseline and proposed Cap – moving it from 5.3 to 7.1

Stakeholder Satisfaction - Reputational ODI

We propose to continue tracking the experience satisfaction of our remaining stakeholders, through all relevant core touchpoints. Areas in which stakeholders have unreservedly provided constructive feedback include operational forums and business planning engagements. Stakeholders passing through a particular touchpoint or participating in an engagement event are invited by a 3rd party market research agency to take part in a survey through their channel of choice (digital/phone) to gather feedback on their:

- Satisfaction with NGG based on the way the engagement was conducted (including access to it),
- Capturing their thoughts on whether their needs were understood and fairly considered (continuous improvement)

We propose the scores will be gathered and reported on in the same way as CSAT

Quality of Community Engagement - Reputational ODI

Based on learnings from stakeholder feedback and observation during RIIO-1, this ODI concentrates on how we minimise our physical impact in the community, specifically the quality of engagement with communities and their representatives, before, during and post-construction. Local residents, businesses and their representatives potentially affected by a construction project are invited to provide feedback by a 3rd party MR agency through their channel of choice (digital/phone) on their:

- Satisfaction with NGG on the way the engagement was conducted in terms of feeling informed and feeling heard (continuous improvement)

This is to build on the feedback we have always sought during construction projects, making it comparable with the other experience quality check points across our operations.

We propose the scores will be gathered and reported on in the same way as CSAT

4. Demand forecast

How the incentive works	Under our licence and UNC obligations, we provide NTS demand forecasts over a range of timescales to help the industry make efficient physical and commercial decisions about balancing supply to, and demand from, the network. The demand forecasting incentive is in place to improve the accuracy of both the day ahead (D-1) and two to five days ahead (D-2 to D-5) demand forecasts we provide to industry.
Proposals	Retain schemes. Make the incentive tougher to achieve against by reducing the performance gradient, recognising that demand forecasting is becoming increasingly challenging.
Consumer benefit	Our information and insights provide value for consumers by ensuring that the gas market runs smoothly. It also promotes competition in the wholesale market – allowing participants to plan, prepare and operate effectively.

Figure 51: Demand forecast summary

Overview

Under our licence and UNC obligations, we provide NTS demand forecasts over a range of timescales to help the industry make efficient physical and commercial decisions about balancing supply to, and demand from, the network. The demand forecasting incentive is in place to improve the accuracy of both the day ahead (D-1) and two to five days ahead (D-2 to D-5) demand forecasts we provide to industry.

Market Volatility

Demand volatility has increased by ~20% over the price control to date as detailed in Figures 52 to 54. We anticipate that this increase in volatility will continue for the foreseeable future due to the changing energy landscape and as such the demand forecasting schemes will continue to be more challenging. In this changing and challenging environment we will continue to endeavour to maintain our RIIO-1 performance however, it becomes more likely that demand forecasting accuracy would ultimately decline in the absence of a financial incentive as we are less likely to innovate and keep up with the changing market. Ultimately the incentive drives us to go beyond our BAU obligations of publishing forecast demand.

Value for Consumers

We asked an independent consultancy company to independently assess and quantify the consumer value that the demand forecasting incentive provides and how the incentive delivers over and above BAU. In summary, their report concluded that the D-1 demand forecasting incentive alone could generate £62m of benefit to consumers over the RIIO-2 period.

In addition to the intrinsic value of an accurate demand forecast to the gas market, we believe our demand forecasting helps the market function well, by reducing barriers to entry
- We've heard from you that smaller market participants value and rely on our demand forecast while larger market participants can often afford their own forecast.
- There may be economies of scale in the market. Without our demand forecast, smaller market participants may not be able to operate as effectively in the market.
- The OECD's competition assessment toolkit found that cost-related barriers to entry in a range of markets were related to 19% higher prices. Although these studies cover a range of different sectors, and may not be directly applicable, the suggest that barriers to entry that reduce the number of firms able to operate in the market can reduce competition and lead to higher prices.
- There is a cost to buying in an equivalent service.

We have worked hard to improve the accuracy in the face of increasingly demand volatility day to day changes in total Gas demand of the market conditions and changing customer behaviours, resulting in further improvements being difficult to achieve.

	D-1				D-2 D-5			
Year	Volatility	Target	Actual	£ (m)	Target	Actual	£ (m)	Total £ (m)
2013/14	11.27	9.40	8.69	£ 0.88	16.0	13.10	£ 1.60	£ 2.48
2014/15	10.51	8.95	8.07	£ 1.54	16.0	12.55	£ 2.15	£ 3.69

2015/16	10.89	9.00	7.75	£ 1.96	13.7	12.09	£ 1.20	£ 3,13
2016/17	11.54	9.39	8.53	£ 1.51	13.7	12.39	£ 0.95	£ 2.47
2017/18	12.22	9.03	8.24	£ 1.39	13.7	12.06	£ 1.19	£ 2.59
2018/19	13.78	8.41	8.90	-£ 0.86	13.7	13.45	£ 0.19	-£ 0.67

Figure 52: Demand forecasting performance

However, over the RIIO-1 period the demand volatility seen on the network initially dropped for the first two years before steadily rising to levels not previously experienced on the network before. This increase in demand volatility has been reflected in the performance of the demand forecast accuracy however that has not been reflected in the forecast accuracy target.
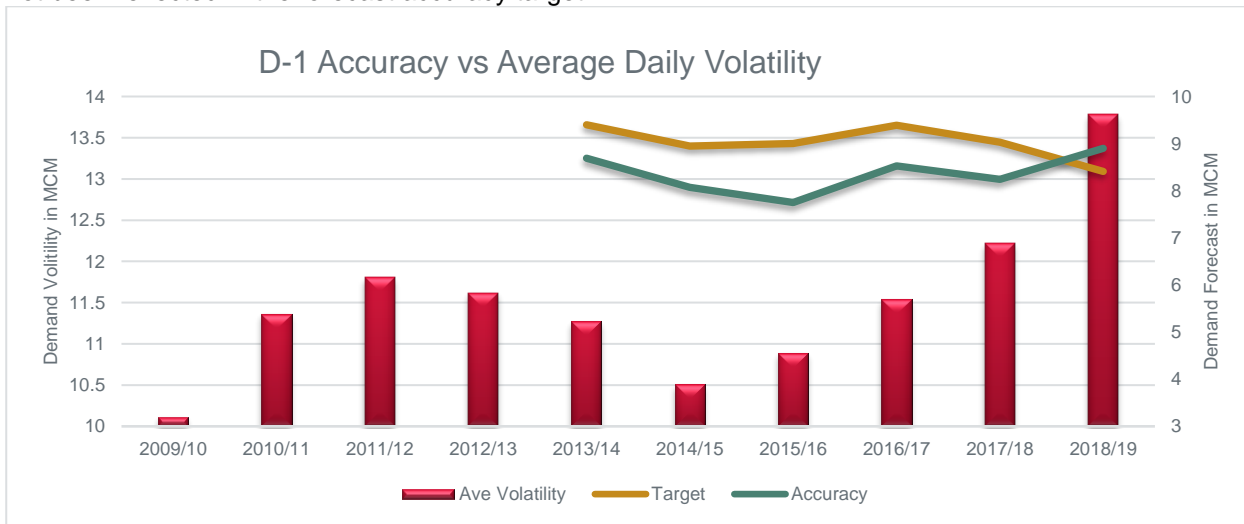

Figure 53: Accuracy vs volatility

Date	Ave Volatility (mcm/d)	Min Volatility (mcm/d)	Max Volatility (mcm/d)	D-1 Target (mcm/d)	D-1 Accuracy (mcm/d)
2009/10	10.11	0.01	49.90	No incentive	No incentive
2010/11	11.36	0.01	66.70	No incentive	No incentive
2011/12	11.80	0.05	44.21	No incentive	No incentive
2012/13	11.62	0.00	72.61	No incentive	No incentive
2013/14	11.27	0.01	63.42	9.40	8.69
2014/15	10.51	0.02	60.28	8.95	8.07
2015/16	10.89	0.05	47.61	9.00	7.75
2016/17	11.54	0.03	63.90	9.39	8.53
2017/18	12.22	0.05	66.49	9.03	8.24
2018/19	13.78	0.39	86.67	8.41	8.90

Figure 54: Accuracy vs volatility values

While our forecasting accuracy has remained reasonably constant despite the rising demand volatility, we have taken actions above business as usual activity to drive improvements in our forecasts, these improvements have helped to reduce the impact of the volatility. However, we believe we need to continue improving our forecasting by:

- Investment in the development and enhancement of additional mathematical forecasting techniques.
- Continuous recalibration of models to adapt to current operational and market considerations.
- Automation of processes that allow for more insight to be added to the forecasts.
- Continuing assessment of our service providers.
- Further improving commercial intelligence, enabling us to factor in industry changes that impact supply and demand forecasting understanding what triggers are seen and acted on by industry.

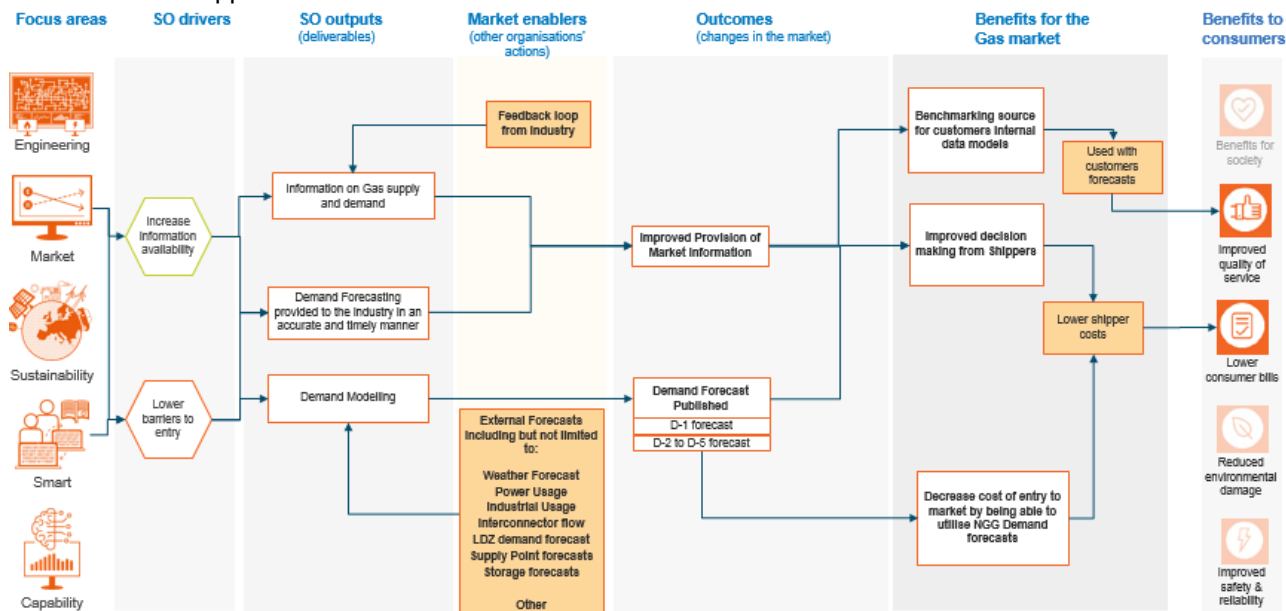We have also mapped the consumer value seen from our actions:

Figure 55: Demand Forecasting consumer value framework

We reviewed this incentive scheme to assess the benefits to consumers and worked our way back to assess benefits to the market and ultimately our focus/transformation areas.

Your feedback to date confirms that the D-1 forecast continues to be important to them, and some of you have also articulated that the D-2 to D-5 forecast delivers value and have also discussed the possibility of an increased forecast horizon. We will continue to test the value of these forecasts with our stakeholders going forward.

Incentive Description
The D-1 demand forecasting incentive has an annual average absolute error forecasting accuracy target of 8.5 mcm/d in 2018/19[9]. However, there is an adjustment for the level of short-cycle storage injection capability that considers the unpredictability of demand from short-cycle storage sites. The storage adjustment is capped at an additional 1 mcm/d.

The incentive performance is calculated as the difference (in mcm/d) between the D-1 demand forecast versus the actual demand on the appropriate day of the year. The annual average absolute forecast error is the sum of the daily forecast errors, which themselves are weighted per the relevant day's demand as a proportion of annual demand in the relevant incentive year.

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[9] *This number can vary year on year.*

There is a theoretical cap of £10m which could only be achieved if demand was forecast with no error on any day in the year If the forecast error is greater than the target, an incentive penalty will be applied up to a collar of £1.5m:
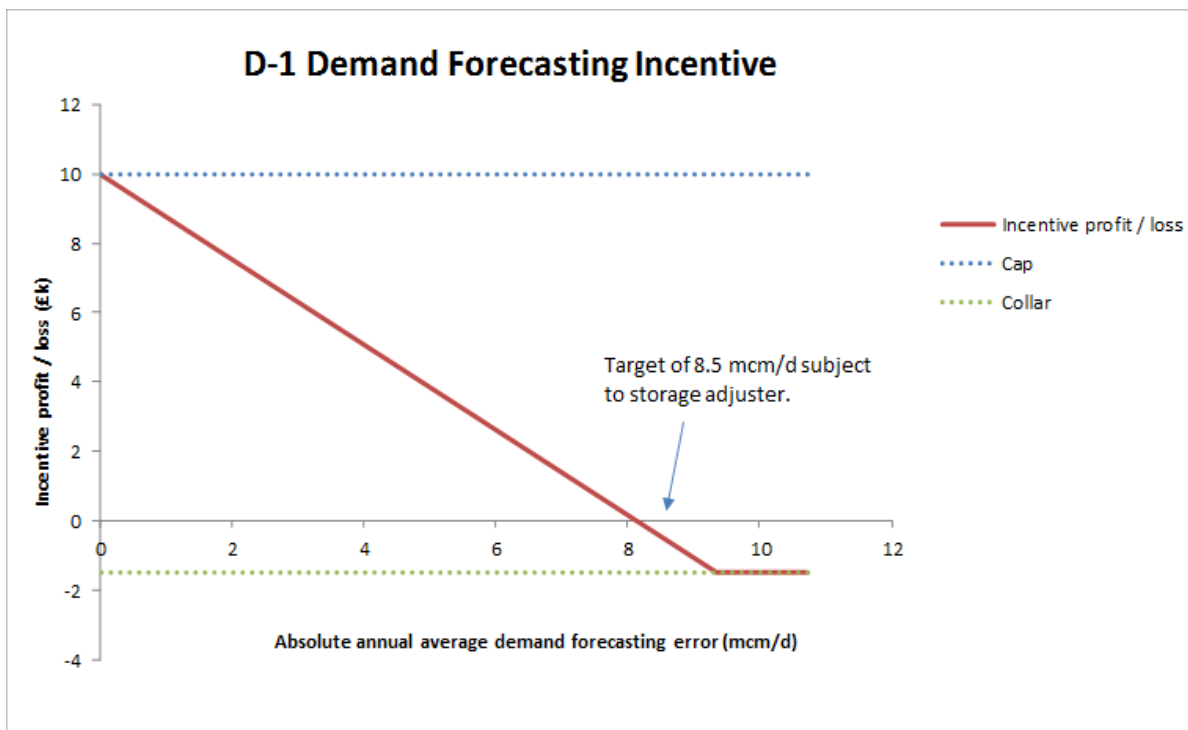

Figure 56: RIIO-1 Demand Forecasting scheme parameters (D-1)

The D-2 to D-5 incentive scheme works in a similar way but there is no short cycle storage adjustment applied to the annual average absolute error target of 13.7 mcm/d Incentive performance is calculated in the same way across all four daily demand forecasts. Again, this is up to a theoretical cap of £10m which could only be achieved if demand was forecast with no error on any day in the year If the forecast error is greater than the target, an incentive penalty will be applied up to a collar of £1.0m.
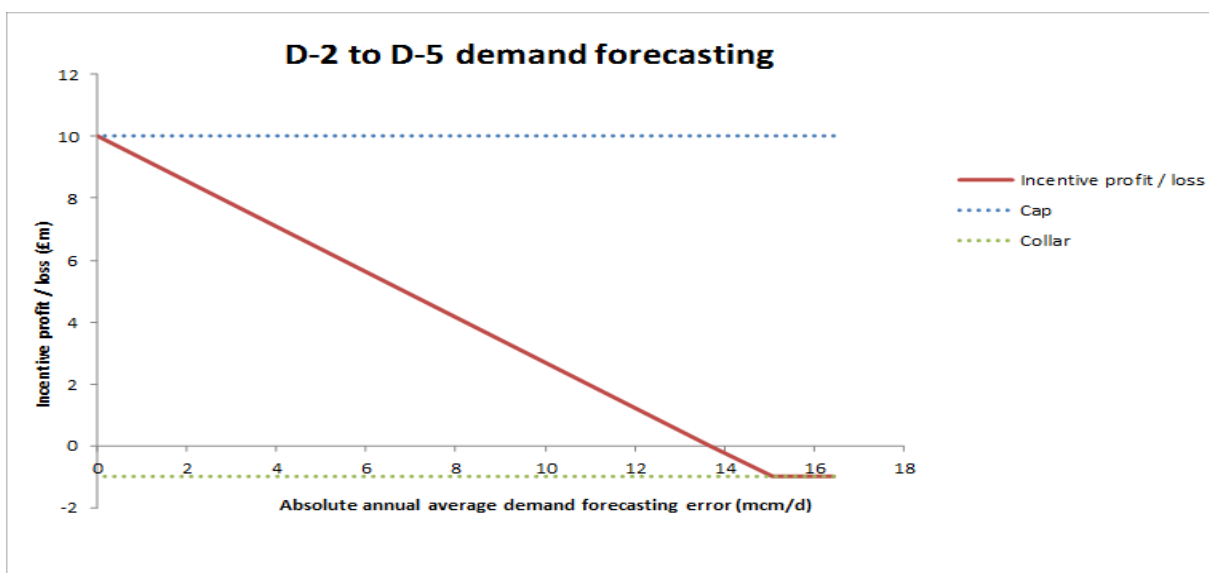

Figure 57: RIIO-1 Demand Forecasting scheme parameters (D-2 to D-5)

Performance to date

Our overall demand forecasting performance is shown below, including a breakdown of target and actual performance.

(click for further info)	Purpose	Value (£m)	2016/17 (£m)	2014/15 (£m)	2015/16 (£m)	2016/17 (£m)	2017/18 (£m)	2018/19 (£m)
Demand forecasting	Produce accurate forecasts for the day ahead (D-1) and D-2 to D-4 demand.	+10 to -1.5 (D-1) +10 to -1 (D-2 to D-4)	2.5	3.7	3.2	2.5	2.5	-0.7

Figure 58: Demand Forecasting performance

D-2 to D-5 demand forecasting incentive			
Incentive year	Incentive target	Overall performance	Incentive performance
2013/14	16.00 mcm	13.10 mcm	£1.6m
2014/15	16.00 mcm	12.55 mcm	£2.2m
2015/16	13.70 mcm	12.09 mcm	£1.2m
2016/17	13.70 mcm	12.39 mcm	£1.0m
2017/18	13.70 mcm	12.06 mcm	£1.2m
2018/19	13.70 mcm	13.45 mcm	£0.2m

Figure 59: Demand Forecasting performance (d-2 to d-5)

D-1 demand forecasting incentive			
Incentive year	Incentive target	Overall performance	Incentive performance
2013/14	9.40 mcm	8.69 mcm	£0.9m
2014/15	8.95 mcm	8.07 mcm	£1.5m
2015/16	9.00 mcm	7.75 mcm	£2.0m
2016/17	9.39 mcm	8.53 mcm	£1.5m
2017/18	9.03 mcm	8.24 mcm	£1.4m
2018/19	8.41 mcm	8.90 mcm	-£0.9m

Figure 60: Demand Forecasting performance (d-1)

Within the RIIO-1 period to date, we have focussed on our demand forecast accuracy as a direct result of this incentive. We have invested in new mathematical forecast modelling techniques, automated recalibration of the models, looked at alternate meteorological services and changed our business processes. Demand forecasting is likely to become more challenging into the future due to an anticipated increase in demand volatility. This effect can be seen with the highest volatility in RIIO-1 in 2018/19 corresponding to the demand forecasting performance in that same year.

The existence of universally available demand forecasts reduces the barriers to entry for potential NTS users, including small industry participants who are less likely to be able to produce their own in-house forecasts.

Proposal

We currently propose continuing an incentive surrounding the accuracy of our demand forecast. This has been supported by you and we consider that accurate demand forecasts provide consumer value through lowering industry costs in addition to lowering barriers of entry to the gas market without the additional cost. For example, the cost of purchasing forecasting from a third party is in the region of £50k - £100k per annum.

The incentive ensures that additional business focus is applied to the accuracy of the forecast. The incentive in RIIO-1 has been instrumental in decreasing the rate of decline in accuracy that was observed prior to the incentive being put in place which could have resulted in a loss of consumer value.

We propose decreasing the incentive gradient on both demand forecasting schemes meaning that the same level of performance in RIIO-2 as RIIO-1 will result in decrease incentive reward. These gradients have been set from a 20% reduction from the caps that were in place from RIIO-1.

To determine our proposed scheme caps, we considered our RIIO-1 performance to date (see figures 59 and 60). That shows that our RIIO-1 incentive returns to date have ranged from -£0.9m to £2.0m (D-1) and £0.2m to £2.2m (D2 to D5) and the accuracy of our performance has ranged from 12.1 mcm to 13.5 mcm (D2 to D5) and 7.8 mcm to 8.9 mcm (D-1). We therefore propose setting the scheme caps at levels we believe are stretching, unlikely but theoretically possible, reducing the cap of this incentive from £10m per annum/scheme to £4m per annum/scheme, with a capped performance dead-band of 4.5mcm and 6.85mcm cap for D-1 and D2-5 respectively.

We propose retaining the existing incentive collars at -£1.5m for D-1 and -£1m for D2-5 and maintaining the weighted average calculations. In addition, the current scheme allows the storage adjuster to take a negative value, which effectively removes performance from the scheme. We believe this is a mathematical anomaly in the current scheme. We therefore propose that for RIIO-2, the storage adjuster is retained but updated to ensure it cannot produce a negative value.

In the absence of an incentive we would endeavour to maintain our RIIO-1 performance however with the changing environment, it becomes more likely that demand forecasting accuracy would ultimately decline.

Stakeholder Feedback
We have summarised the key points gathered during our RIIO-2 engagement with you.

- You have confirmed that Demand Forecasts are widely used right across the industry. The day ahead forecast is used to make operational decisions and the accuracy is valued. It has strong support for continuation with a financial incentive.
- Some of you use Demand Forecasts, 2 to 5 day ahead, it is generally of interest but of less clear value.

We welcomed the recognition and support that demand forecast accuracy is desired by many. Most agreed or somewhat agreed with our initial proposal to retain a financial incentive on Demand Forecast accuracy.

- In proposing reduced Caps and Collars there was an appreciation and support that we were taking on the challenge to deliver more for consumers for a lower reward.
- It was also noted that the demand forecast accuracy has recently started to decline.

There have been significant challenges in forecasting demand as the energy landscape becomes ever more variable and complex. Incremental improvement will not be enough to keep accuracy at a level to which we have been accustomed. A financial incentive provides the drive to focus on this vital area with proven value to consumers. You have questioned the level of the cap set on this incentive relative to other incentives. We had initially proposed a 20% reduction from the level set for RIIO-1. We took this into consideration when we looked at whether a performance cap was appropriate for demand forecasting. Our business plan proposal is a cap at £8 million (£4million for each day ahead and 2-5 day ahead demand forecast accuracy), a 60% reduction.

5. NTS shrinkage

How the incentive works	UNC designates us as NTS Shrinkage Provider and this role is responsible for managing the end-to-end service of forecasting, accounting for, and procuring energy to satisfy the daily NTS shrinkage components. The shrinkage scheme incentivises us to minimise energy costs associated with operation of the network.
Proposals	Retain scheme and add access to seasonal products to deliver additional consumer savings for RIIO-2. Subject to proposed changes to the electricity charging regime, remove the TNUoS element. We have also reduced the caps and collars of the scheme.
Consumer benefit	The incentive means that we manage shrinkage to minimize consumer cost exposure by procuring shrinkage energy at below average market price and minimize the amount required.

Figure 61: NTS Shrinkage summary

Overview

NTS shrinkage energy is a product of the daily operation of the NTS and is categorised as Compressor Fuel Usage (CFU), Calorific Value Shrinkage (CVS) and Unaccounted for Gas (UAG).

UNC designates us as NTS Shrinkage Provider, with responsibility for managing the end-to-end service of forecasting, accounting for, and procuring energy to satisfy the daily NTS shrinkage components. The shrinkage scheme incentivises us to minimise energy costs associated with operation of the network.

Our ability to procure shrinkage energy by trading is limited by our GT Licence. We cannot speculate and are limited to procure shrinkage energy within certain timeframes, products and volumes. Our trading performance is then assessed against the average for that timeline and product.

We propose retaining a similar financial ODI for the RIIO-2 period. The incentive has been effective at managing the cost for NTS users and consumers in an area of significant and variable cost. This has been achieved by having a continual focus and daily risk assessment of commercial and operational decisions to outperform against the agreed target levels of performance. With increasingly complex customer needs and expected changes in the energy landscape, we need to provide greater operational agility to continue to manage the shrinkage costs effectively. The incentive aligns with the financial interest of NTS users and consumers when we make operational and strategic decisions. Without a financial incentive, operational driven decisions may lead to higher Shrinkage costs for NTS users and ultimately consumers, as we would have less focus on adapting to market changes and outperforming the market. After a thorough review we believe that additional value, over and above that achieved in RIIO-1 can be delivered by including the ability to trade on seasonal markets and incorporating seasonal pricing into the shrinkage incentive target.

Value for consumer

The cost to manage NTS shrinkage is recovered from the NTS users (shippers) as part of the annual commodity charge, so our decisions and actions could have a direct impact on consumer bills. The costs associated with shrinkage activities are:

- Costs of gas and electricity trading to replace CFU, UAG and CVS, including fees and other associated costs.
- Limiting Transmission Network Use of System (TNUoS) charges incurred by using electric drive compressors where appropriate.
- Costs related to balancing trades required to manage variation of daily shrinkage volumes.

We manage the risk of price volatility and uncertainty to NTS users and consumers by forward buying energy. This provides a level of protection, including against short term price spikes resulting from difficult market conditions (for example Beast from the East as we had procured energy in advance within the markets we operate.)

The incentive means that we manage shrinkage to minimise consumer cost exposure by procuring shrinkage energy at below average market price (recognising that we only have access and are assessed against certain markets).

We have also investigated the cost of contracting the forward gas trading service with a third party only, but this is estimated to add between circa £0.5m to £1m per annum depending on the volume requirement.

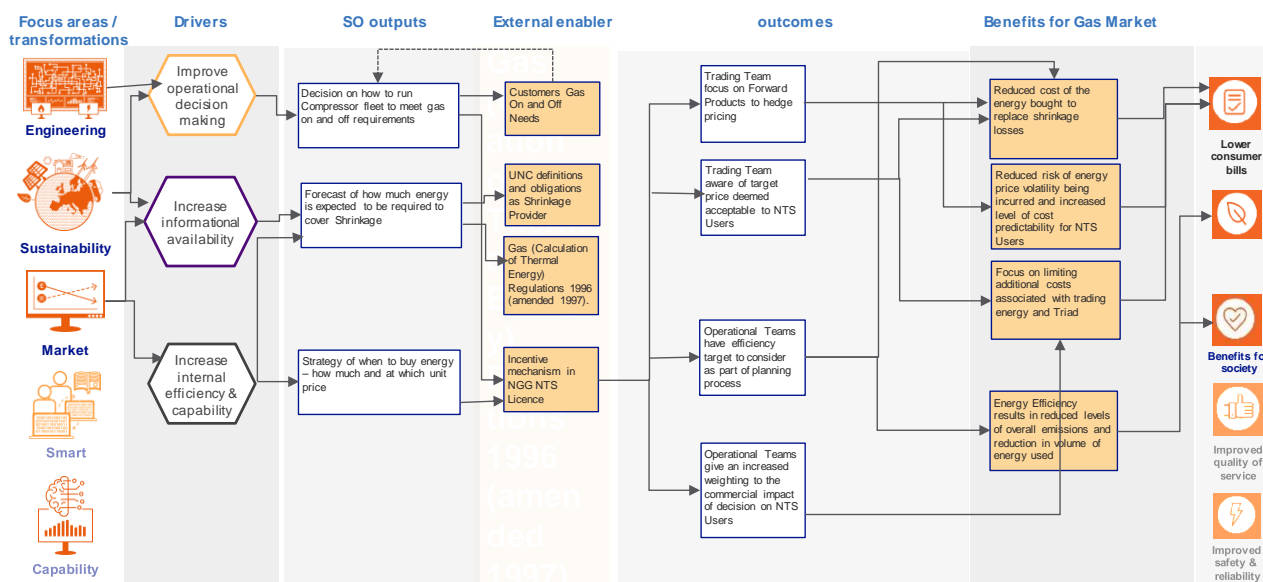We have mapped the consumer value seen from our actions:

Figure 62: Shrinkage incentive consumer value framework

We reviewed this incentive scheme to assess the benefits to consumers and worked our way back to assess benefits to the market and ultimately our focus/transformation areas.

In Ofgem's May RIIO-2 Sector Specific Methodology Decision – Gas Transmission there was also positive stakeholder feedback towards the Shrinkage ODI *"3.78 Overall, stakeholders agreed with the intent of the ODI and supported NGGT being encouraged to minimise the cost of shrinkage"*

As part of the continuing RIIO-2 stakeholder engagement we have sought further views on the incentive scheme.

Incentive description

Structure of the current incentive
The incentive scheme allows us the opportunity to earn financial reward for delivering the management of shrinkage at a cost lower than an agreed annual Target Shrinkage Cost (or a penalty for exceeding target). The cost is collected from shippers via the commodity charge and will ultimately be passed onto end consumers. The incentive has a cap and collar arrangement in place limited to +/-£7m p.a. with a 44.36% sharing factor.

The Target Shrinkage Cost has 4 components:

- **Energy procurement target**. The target cost for all the required NTS Shrinkage energy
- **Energy efficiency**. A financial adjustment at the end of the incentive year based on the actual quantity of energy against an efficiency benchmark model
- **TNUoS allowance.** A financial allowance to cover running electric compressors during Triad periods
- **Cost pass through.** The costs incurred to manage and trade energy e.g. fees, systems, emission permits, supplier charges etc.

All volume projections are calculated using a published shrinkage methodology. Target unit costs are set using average prices for energy products specified in our Licence (future quarters and week ahead).

The shrinkage incentive scheme is intended to minimise overall costs in our role as shrinkage provider. The incentive measures the NTS shrinkage costs incurred against a target and that target is principally determined by multiplying forecast and actual shrinkage volumes by benchmarked energy procurement prices and includes an assessment of energy efficiency. While this means that in periods of prolonged falling prices there is some missed opportunity buying forwards versus using SMP buy (cash out), this is balanced by customers not being exposed to the full effect of rising markets if we manage this effectively.

The total cost of shrinkage each year in RIIO-1 has been circa £60-90m per annum. The incentive has been effective in RIIO-1, meaning that overall NTS shrinkage costs have been £70.9m less than target and to date, customers have been returned £40.2m of shrinkage costs compared to the target allowance.

The shrinkage incentive has also been effective during RIIO-1 to reduce shipper exposure to energy price fluctuations and limit the impact of significant spikes in market prices. As an example, the cost of Shrinkage on 1st March 2018 (Beast from the East) would have been £9m if procuring energy shrinkage was cashed out with those costs ultimately passed on to consumers. Due to the shrinkage incentive and our subsequent cost management activities, the actual cost was c£1.1m, saving NTS users, and ultimately consumers, £8m in one day alone.
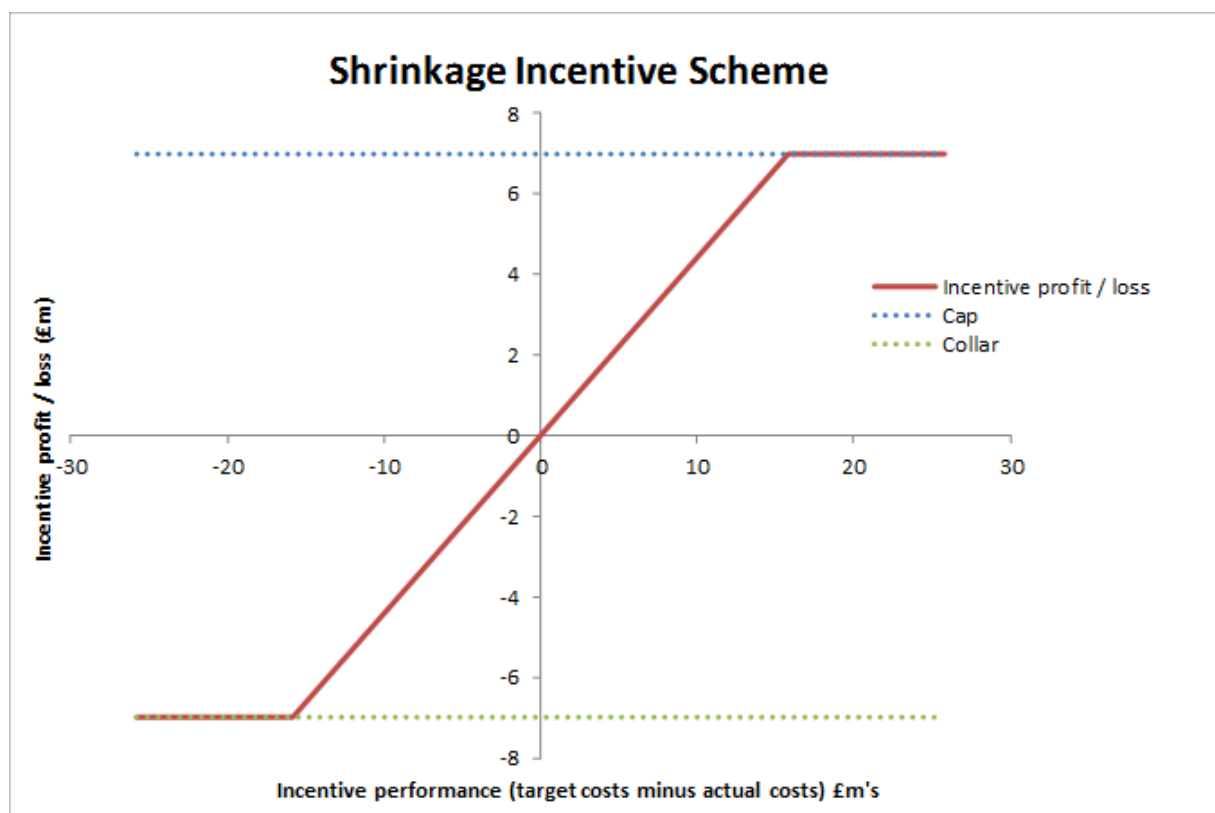

Figure 63: Shrinkage incentive scheme parameters

Performance to date

	Purpose	Value (£m)	2013/14 (£m)	2014/15 (£m)	2015/16 (£m)	2016/17 (£m)	2017/18 (£m)	2018/19 (£m)
Shrinkage	Minimise the overall cost of shrinkage through efficient system operation and energy procurement.	+7 to -7	5.1	4.8	6.3	2.5	5.4	7.0

Figure 64: Shrinkage incentive performance

The incentive has encouraged us to:

- Secure energy at prices better than the target average price of the market for provision of CFU, UAG and CVS replacement energy.
- Use a lower amount of energy for CFU and CVS than the allowance set to achieve the same outputs.
- Minimise TNUoS charges by developing compressor running strategies whilst still meeting customer needs.   Each year 20-30 Triad warning are analysed to develop appropriate compressor strategies

Options considered

A challenge with the current incentive scheme is that there are periods when we have to trade at times of low liquidity for the specified products, potentially adding cost. In response to this challenge we have considered two options to increase the likelihood of being able to trade in more liquid markets to deliver consumer value. The first and our proposed change is providing access to additional seasonal markets, this is detailed further in the proposal section below.

The second option considered (but not currently taken forward) as an alternative to Seasonal products is to reduce the reference period for Quarterly products so that we only needed to trade within the front quarter (the 3 months prior to when the energy is needed is shown in the red zone in Figure 65 below) rather than the current 9 months (shown in the green zone). While this would address liquidity issues in a rising market, it would increase the price risk of customers and consumers by them being exposed to price volatility and potentially absorbing more of market price increases as prices would only start to be fixed 3 months out. The diagram below demonstrates that in a rising market, prices would be fixed closer to point of delivery (Red Zone) rather than when prices were lower (Green Zone)
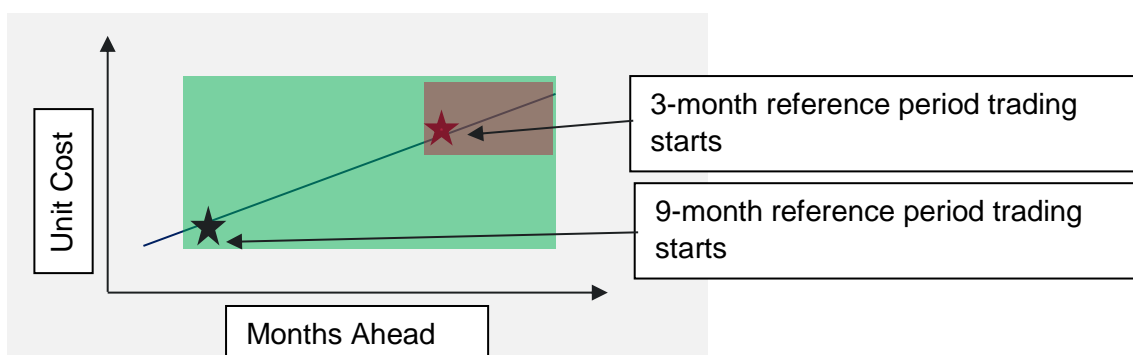

Figure 65: Potential risk of shorter reference period for Quarters

Proposal

Scope of changes

Our current proposal builds on the existing scheme by retaining the fundamentals but also adding enhancements to deliver a greater level of value for customers and consumers. To ensure we continue to perform beyond our regulatory obligations, it is important to retain an incentive in this area that stretches our performance against a more challenging market backdrop to deliver value for both customers and consumers.

We propose that the scheme continues to place an emphasis on protecting customers and consumers from price risk by trading energy on forward markets. We believe that retaining a bundled financial ODI that incentivises us to deliver the management of shrinkage at a lower total cost than the target/allowance, delivers consumer value.

We propose the continued inclusion of the three components of Shrinkage Energy as defined by UNC (CFU, UAG and CVS). We also propose the retention of the current levels of allowances for swing and TNUoS costs (subject to the proposed TNUoS changes and finalisation of the scope of the incentive); pass through costs and the efficiency adjuster mechanism to benchmark outturn volumes (would be reviewed as part of the Shrinkage Methodology).

We propose that Seasonal price targets for trading energy are added to the current Quarterly and Week Ahead trading options. By using seasonal markets, we estimate this could reduce costs by an additional £320k-£480k p.a (pre-sharing factor), potentially saving an additional c£1.6m - £2.4m over RIIO-2. This value is driven by the higher liquidity levels of Seasonal products versus Quarterly further out from point of delivery. This is supported by market liquidity figures[10]. Several licence or business changes would be needed to implement the addition of seasonal products. The reference period for Seasonal products would be 6 months and they would become the principle forward product. Quarterly products would be used closer to point of delivery to adjust the energy supply balance and would have a 3-month reference period. These changes would better align products to periods of good liquidity.

We also propose that the shrinkage methodology is reviewed/consulted upon with you to agree the best available mechanism to set robust and visible target volumes. Ideally this would be completed in time to support the start of scheme in April 2021. As this tool underpins energy procurement and energy efficiency targets, it is vital that stakeholders are satisfied that it is a robust model for setting targets and that is it more transparent.

We propose the Cap and Collar arrangement is reduced to +/-£5m. This would have the effect of returning more value earlier to customers and consumers if high levels of outperformance are achieved and performance stretched further.

Value

Shrinkage will continue to be a cost for NTS Users during RIIO-2. Using the RIIO-1 target costs as a guide, customers could reasonably expect to incur costs in the region of £90m p.a. This is likely to be conservative given the changes and challenges the NTS is likely to see during the RIIO-2 period. For example, assuming the TNUoS charge and incentive remains the same (subject to any commercial framework changes in this area), the increase in electric drives within the compressor fleet could increase difficulty in mitigating TNUoS charges. Also, the increasing volatility of flow patterns will require more agile use of compressors which may conflict with the energy efficiency benchmark model. Potential increases in non-traditional sources of gas such a biomethane may introduce greater levels of variable quality, increasing CVS losses. Therefore, we believe that the benefits of the incentive scheme continue in RIIO-2

The incentive also continues to provide commercial drivers to balance against operational decision making via the energy efficiency adjuster and the TNUoS allowance components. This will continue to create value

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[10] https://www.ofgem.gov.uk/system/files/docs/2018/10/state_of_the_energy_market_report_2018.pdf

in RIIO-2. The efficiency component encourages greater consideration of the volume of CFU energy being consumed to operate the compressor fleet directly impacting energy costs to achieve required operational outputs.

A secondary, but growing, impact of the efficiency component is the potential for societal benefits. Reduced CFU should correlate to a relative reduced level of compressor usage, and therefore the level of associated emissions should be lower.

The TNUoS component creates alignment between the priorities between us and our customers by incentivising us to reduce costs by managing compressor running during Triad periods in a similar way to industry.

It is not possible to set a static or year on year decreasing target as the drivers of required volume and unit cost of energy are dynamic, so the proposed incentive mechanism continues to set an appropriate target throughout the life of the incentive. We believe that achieving the target cost should be regarded as meeting our Licence and UNC obligations as this requires us to use the appropriate amount of energy, procure energy at average market price and recover costs incurred of the shrinkage activity. When we perform better than target, this delivers quantifiable value to consumers and represents us performing at a level that should be considered as above business as usual.

Control
We remain best placed to mitigate and influence costs across all three components of shrinkage energy. We also remain best placed to manage the additional cost drivers and risks to NTS users and consumers, given our holistic view of shrinkage.

We have direct control over the price paid for energy by determining the most appropriate time to enter the market to trade energy. This aspect of control is applicable to CFU, UAG and CVS.

We acknowledge that our control of UAG and CVS volume is somewhat restricted. UAG, has no single owner, the volume is primarily a factor of the inherent tolerance of existing metering equipment, or error in data supplied to us by NTS Users. CVS is a similar in that the volume component is not under any single party's direct control. Our position allows us to manage the energy costs of UAG and CVS on behalf of industry.

Were the financial shrinkage incentive to be removed this would most likely lead to us taking a more conservative approach to shrinkage cost management. The focus would most likely change, over time, from outperforming the agreed target costs to one of trying to meet the target.

Stakeholder Feedback

- You have in general supported the continuation of a financial incentive on shrinkage costs.

- The proposal by Ofgem to make Compressor Fuel Use element of shrinkage costs pass through was not seen as being to an incentive to drive performance and hedge price exposure by some stakeholders.

We appreciate that you generally support a financial incentive on shrinkage rather than move large elements of shrinkage to pass through cost status. We understand that shrinkage and the incentive are complex and comprise of many parts. We publish the target setting methodology, but we acknowledge that we need to do more in explaining the methodology. It is our intention to make this topic more accessible to our stakeholders.

6. Greenhouse gases (GHGs)

How the incentive works	The incentive compares actual venting quantities against a target level. For every tonne vented above this target, we are subject to a penalty. This scheme incentivises us to make the trade-off between choosing to depressurise compressor units (venting the gas within them) or to keep units on standby, which incurs costs associated with ancillary electrical equipment (vent fans, oil pumps etc.) and a level of emissions through the shaft seal. The incentive applies to both gas and electrically driven compressors. The amount of natural gas vented from NTS compressors (in tonnes) results from several areas - starting, purging or depressurising a compressor or through emissions of gas through compressor shaft seals.
Proposals	Retain scheme which includes more penal rates with an upside to encourage further performance improvements. Potentially to include within the broader environmental incentive package. We have also included proposed caps and collars to further drive performance.
Consumer benefit	Improving the environment (air quality, carbon emissions, local community and the environment) is very important for domestic consumers. This incentive will help drive progress in this area over and above our baseline

Figure 66: GHG summary

Overview

Compressors are used to increase pressures in parts of the network and to move gas from the sources of supply to areas of demand. Whether we need to operate an individual compressor on any given day depends on several factors including the sources of supply and demand, the prevailing network conditions and the need to accommodate essential maintenance, emissions testing and construction plans.

An output determined as part of the RIIO-1 regulatory framework, was minimising the impact which our operations have on the environment through emissions. NTS assets are designed to release gas as an inherent part of their commissioning, operation, maintenance and decommissioning. To ensure that we maximise consumer value the decisions between maintaining existing assets and alternative investments needs to be continually reviewed. This also supports the transition to zero carbon.

This scheme incentivises us to make the trade-off between choosing to depressurise compressor units (venting the gas within them) or to keep units on standby, which incurs costs associated with ancillary electrical equipment (vent fans, oil pumps etc.) and a level of emissions through the shaft seal. The incentive applies to both gas and electrically driven compressors. The amount of natural gas vented from NTS compressors (in tonnes) results from several areas - starting, purging or depressurising a compressor or through emissions of gas through compressor shaft seals. Ensuring that we minimise emissions from venting is important as we know that methane has 25 times the global warming potential of carbon dioxide.

Value for consumers

The GHG incentive has provided financial and reputational pressure to minimise venting on the NTS. There is a natural tension between our incentive and venting requirements associated with maintaining the assets to ensure that we can provide access to the NTS for customers who want to put gas on and take gas off our network. As an operational business, we manage the balance between customers' needs and efficient running of the NTS. Compressor use is a direct result of providing benefit for consumers by enabling customer to take gas on or off the network when and where they want.

Reduced methane emissions provide a societal benefit and the GHG incentive directly impacts this both in the short and long term. It acts as a reminder for us that we must consider the balance between our effect on the environment and providing our functionality while working efficiently

Figure 67 below depicts where we believe the benefits are for consumers from the actions that we have taken over RIIO-1 or plan to take in RIIO-2.
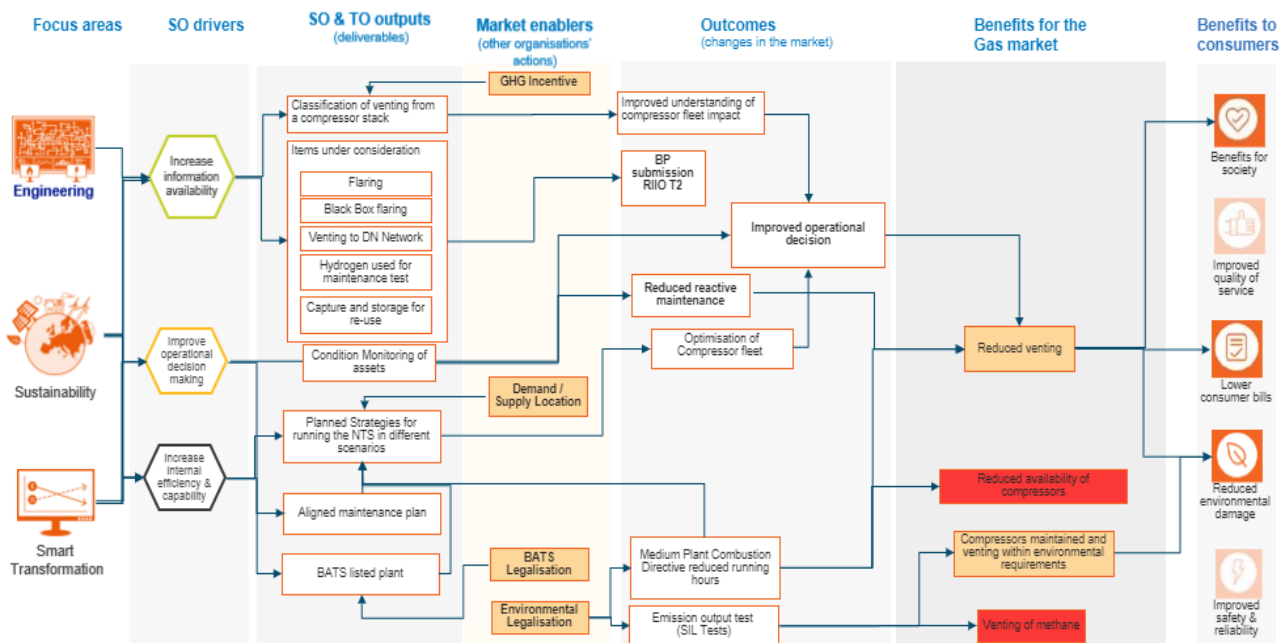
Figure 67: GHG consumer value framework

We reviewed this incentive scheme to assess the benefits to consumers and worked our way back to assess benefits to the market and ultimately our focus/transformation areas.

Incentive description

The incentive compares actual venting quantities against a target level. For every tonne vented above this target, we are subject to a penalty. The GHG calculation methodology is externally audited on an annual basis.

Through the RIIO-1 period we have furthered our understanding of the sources of venting. The categories can be summarised as follows:

- Planned Vents – Depressurising a compressor and associated pipework when the compressor is no longer required for active duty for a period.
- Dynamic Seal Emissions – On compressors, there are seals on the compressor shaft to the casing. When the compressor is pressurised these seals leak by design to create suction.
- Static Seal Emissions – On compressors, there are seals on static to static connections, whereby two non-moving parts are connected. Static seals are used to prevent emission of process gas to the outside cab atmosphere.
- Emergency Shutdown (ESD) Vents – Where for safety reasons the compressor unit trips during operation, gas within the unit and its associated pipework is vented.
- Fuel Gas Vents – Venting which occurs from the fuel line to the compressor which occurs during shutdown and isolation of the compressor unit.
- Start-up Purge Vents – Inert gas is used to purge the compressor (and fuel lines on gas powered compressors) of air prior to starting a compressor. This is necessary to remove the risk of air entering the pipeline system.
- Starter Vents – Where a gas starter motor is installed, natural gas is used to start the gas turbine. This process results in an amount of venting.

For 2018/19, the target level is 2,897 tonnes, with a penalty of £1,477[11] per tonne vented above the target. This is equivalent to £100,000 for approximately every 69 tonnes vented above the target. As a 'downside-only' scheme with no collar, we do not receive any payment for outperformance against the target:

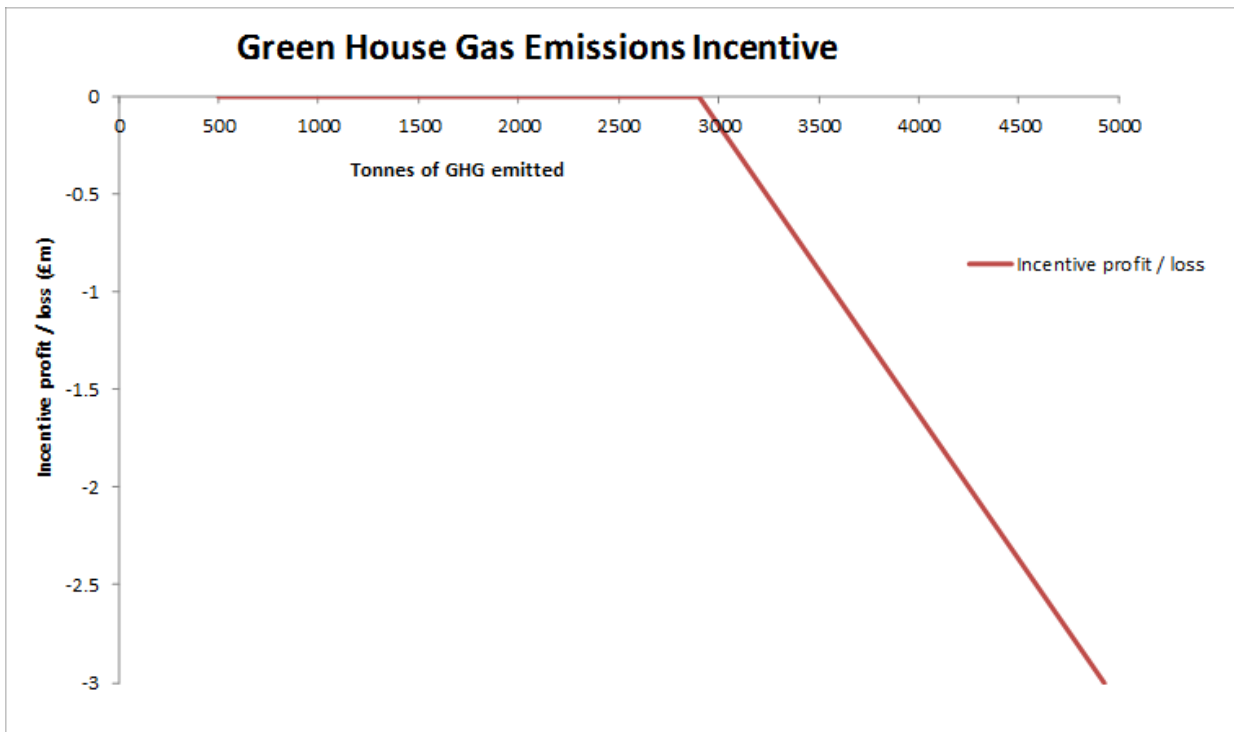[11] Price published by BEIS and changes each year.

Figure 68: GHG scheme parameters

Performance to date

Figure 69: GHG

Incentive Costs	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Total vent (tonnes)	3332	2857	2882	3590	3928	2870
Allowance (tonnes)	2917	2829	2744	2897	2897	2897
Difference (tonnes)	327	-25	77	693	1031	-27
NTCC	£1,302	£1,364	£1,417	£1,348	£1,368	£1,447
Incentive Cost	-£425,754	£ -	-£109,109	-£934,164	-£1,410,408	£ -

performance

Whilst in RIIO-1 we have made improvements to managing GHG emissions and in some years, we have achieved the incentive target level. The data above shows that the target continues to be stretching and performance is influenced by the supply and demand patterns which require differing compressor use year on year. This is shown in the table below, detailing the total compressor running hours (across the 24 compressor sites) from 2013/14 to 2018/19.

	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Total running hours	36,795	28,632	35,930	72,242	73,309	38,453

Figure 70: Compressor running hours

An example of how supply and demand variability affects our GHG emissions is at St. Fergus. In 2016 an increase in summer flows came into the terminal peaking at approximately 110mcm/day, far more than the levels seen in the previous eight years. To facilitate the revised customer needs we used every available compressor in the north of the network. Since that time, the average level of flow from St. Fergus has been higher than that experienced in 2010/11 and has resulted in variability of compressor running.

Over the last 12-18 months we've taken further action to manage our compressor use and GHG emissions across our operational sites, raising awareness of the incentive and encouraging more efficient ways to reduce venting through procedural and ownership review. We have established clearer accountability and responsibility, with additional tools

and key performance indicators (KPIs) to create further consistency, proactive monitoring of performance and bundling of activities across multiple sites and shift teams.

This incentive also focuses our efforts to deliver societal benefit for consumers at a global level with regards to reducing our carbon footprint and at a national and local level through improving air quality.

Proposal

With an increased uncertainty over supply and demand flows and an increase in maintenance expected over the RIIO-2 period there is an increasing likelihood of compressor use and a corresponding uplift in venting to operate the system as required and maintain the assets on the NTS. As such there is an increasing challenge to improve performance. We therefore are currently proposing maintaining the existing target level of 2,897 tonnes as per the current incentive scheme.

We are also currently proposing a symmetrical incentive structure with a Cap and Collar of £1.5m per year utilising the established methodology. We believe that an upside is appropriate to incentivise us to investigate and potentially invest in innovative solutions in advance of a performance issue and allowing a cost benefit analysis of any investment. We have already identified several areas that we could consider in this context, for example black box flaring. We believe that a collar is appropriate as it supports the fundamental incentive principles detailed at the start of this document. We also agree with the sentiment from the Ofgem "RIIO-2 Sector Specific Methodology Decision – Gas Transmission" where it was recognised that we may have limited influence on venting from compressors (given that a key driver of compressor use is supply and demand patterns) and therefore a collar is appropriate to reflect this and guard against penalising for events outside of our influence. We have added 10% in £m to our worst performing year to establish what we believe is an appropriate collar.

The incentive also includes a rising cost of carbon which we propose to continue. We are also currently proposing to update the Methane to CO2 conversion from 1:21 to 1:25 in line with current European standards which will increase the CO2 we emit; therefore, our performance will need to improve to achieve the same level of performance. These, in addition to an upside, further stretch our performance whilst continuing to enhance societal benefit.

As part of the wider environmental incentive discussion, we are looking to link this to the Environmental Action Plan (EAP) as well as considering if GHG should form part of the wider environmental incentive. If GHG was included in this broader environmental incentive (which isn't our proposal), we would propose to remove it as a separate incentive scheme.

Stakeholder Feedback

You have told us that the environment is something on which we must focus.

- Greenhouse gas emissions, is a key part of our environmental performance.
- In principle, the inclusion of an upside reward opportunity on an environmental incentive had some support. To drive performance to a 'step change' level beyond current performance was the rationale for an upside.
- Some supported no upside reward.

There is some support for a symmetrical incentive scheme as we propose but there was not true consensus. Some think that environment is an area of challenge that falls to our BAU performance others recognise that a step change can be driven by the provision of an incentive opportunity. In our most recent webinars, most of those attending agreed or somewhat agreed with our initial proposal for a symmetrical GHG incentive.

7. Environmental Incentive (new proposal)

How the incentive works Proposals	We are proposing a potential new ODI to incentivise additional performance above and beyond our baseline commitments in our Environmental Action Plan (EAP).
Consumer benefit	Improving the environment (air quality, carbon emissions, local community and the environment) is very important for domestic consumers. This incentive will help drive progress in this area over and above our baseline

Figure 71: Environmental incentive summary

Overview

We care about the environment and the communities we work in. This topic is important for us and for consumers and society. Having a positive impact on the environment and communities is vital if we are to operate as a socially responsible business. We have set ourselves stretching targets in our environmental action plan (EAP) which incorporates reducing our business carbon footprint.

We have chosen metrics for this incentive based on those commitments which are measurable and quantifiable, where an incentive may appropriately drive further performance.

Value for consumers

Improving our environmental impact through our business plan is in the consumers interest and through our willingness to pay studies, it has been proved that consumers value this. We recognise that this is of value to our consumers and we have stretch ourselves with our business plan commitments, but we believe that with the right incentives structure we could potentially deliver additional value in addition being held to account to deliver.

In terms of translating this into a proposed size of incentive we have based this on Ofgem's assessment of environmental value for the T1 environmental incentive for Electricity Transmission Owners called the Environmental Discretionary Reward. This equates to +£4m per year in RIIO-1 prices which would be £4.9m if updated for inflation. Our incentives proposal is below this figure, recognising that there is some reputational benefit to environmental outperformance.

Proposal

We believe our environmental action plan submitted as part of our business plan is an ambitious and stretching plan which goes above our licence obligations. We also believe that there is additional value to be achieved if we outperform our commitments and as such, we propose a symmetrical incentive rewarding out performance and holding us to account if we fail to reach our own stretching targets. Not all measures in the EAP would be suitable for incentivisation as they can't be readily measured, and a baseline would not be able to be established before the start of RIIO-2.

We propose the following metrics are used as an incentive as they are measurable and have demonstrable consumer benefit.

Year 1

	Metric	Penalty level	RIIO-2 target	Reward level
1	Percentage of our fleet that are alternative fuel vehicles	1%	2%	3%
2	Percentage reduction in carbon emissions from business transport from 19/20 baselines	1%	2%	3%
3	Percentage of our operational and office waste that is recycled in year	44%	48%	52%
4	Percentage reduction in the waste we create at our offices from 19/20 baselines	1%	2%	3%
5	Percentage reduction in water use for our main offices	1%	2%	3%

	from 19/20 baselines			
6	Percentage increase in the environmental value of our non-operational land from 19/20 baselines	1%	2%	3%
7	Percentage increase in environmental value on our construction projects in year	5%	10%	15%

Year 2

	Metric	Penalty level	RIIO-2 target	Reward level
1	Percentage of our fleet that are alternative fuel vehicles	2%	4%	6%
2	Percentage reduction in carbon emissions from business transport	3%	4%	5%
3	Percentage of our operational and office waste that is recycled	46%	50%	54%
4	Percentage reduction in the waste we create at our offices	3%	4%	5%
5	Percentage reduction in water use for our main offices	3%	4%	5%
6	Percentage increase in the environmental value of our non-operational land	3%	4%	5%
7	Percentage increase in environmental value on our construction projects	5%	10%	15%

Year 3

	Metric	Penalty level	RIIO-2 target	Reward level
1	Percentage of our fleet that are alternative fuel vehicles	5%	7%	9%
2	Percentage reduction in carbon emissions from business transport	5%	6%	7%
3	Percentage of our operational and office waste that is recycled	49%	53%	57%
4	Percentage reduction in the waste we create at our offices	5%	6%	7%
5	Percentage reduction in water use for our main offices	5%	6%	7%
6	Percentage increase in the environmental value of our non-operational land	4%	6%	8%
7	Percentage increase in environmental value on our construction projects	5%	10%	15%

Year 4

	Metric	Penalty level	RIIO-2 target	Reward level
1	Percentage of our fleet that are alternative fuel vehicles	14%	17%	20%
2	Percentage reduction in carbon emissions from business transport	6%	8%	10%
3	Percentage of our operational and office waste that is recycled	53%	57%	61%
4	Percentage reduction in the waste we create at our offices	6%	8%	10%
5	Percentage reduction in water use for our main offices	6%	8%	10%
6	Percentage increase in the environmental value of our non-operational land	6%	8%	10%
7	Percentage increase in environmental value on our construction projects	5%	10%	15%

Year 5

	Metric	Penalty level	RIIO-2 target	Reward level
1	Percentage of our fleet that are alternative fuel vehicles	25%	30%	35%
2	Percentage reduction in carbon emissions from business transport	8%	10%	12%
3	Percentage of our operational and office waste that is recycled	55%	60%	65%
4	Percentage reduction in the waste we create at our offices	15%	20%	25%
5	Percentage reduction in water use for our main offices	15%	20%	25%
6	Percentage increase in the environmental value of our non-operational land	8%	10%	12%
7	Percentage increase in environmental value on our construction projects	-5%	1%	5%

Figure 73 is a table that shows how the seven environmental metrics can be combined in an incentive scheme reward and penalty structure. For example, if we had two metrics above our individual thresholds and one below, we would not be rewarded or penalised.

95

		Metrics above reward threshold (£m)							
		0	1	2	3	4	5	6	7
Metrics below penalty threshold (£m)	0	£0.0	£0.0	£0.5	£1.0	£1.5	£2.0	£2.5	£2.5
	1	£0.0	£0.0	£0.0	£0.5	£1.0	£1.5	£2.0	
	2	-£0.5	£0.0	£0.0	£0.0	£0.5	£1.0		
	3	-£1.0	-£0.5	£0.0	£0.0	£0.0			
	4	-£1.5	-£1.0	-£0.5	£0.0				
	5	-£2.0	-£1.5	-£1.0					
	6	-£2.5	-£2.0						
	7	-£2.5							

Figure 73: EAP scoring mechanism

Stakeholder Feedback

We have engaged extensively in RIIO-2 on our approach. This has helped us to develop the Environmental Action Plan on which this incentive is based. In terms of the specific feedback on the incentive, when we discussed this with you, there was support in principle for a linked incentive to drive performance beyond BAU in wider environmental measures.

We also explored the possibility of including the proposed GHG incentive measure as one of the metrics to keep all the environment related measures together. There has been no real preference expressed amongst you and therefore this has been left out at this stage.

APPENDIX 2 - CLARIFICATIONS AND GENERAL QUESTION RESPONSES

This section will be updated as required during the consultation period