

NATIONAL GRID GAS TRANSMISSION'S GAS DEMAND FORECASTING INCENTIVES

A note from AFRY Management Consulting¹ to Ofgem

20 December 2019

1. EXECUTIVE SUMMARY

This note is based on reviews of the draft and final Business Plans and accompanying evidence provided by National Grid Gas Transmission (NGGT) in support of its proposals for RIIO-2 incentives to improve gas demand forecasting. This note sets out internal comments to support a discussion with Ofgem regarding their position on NGGT's demand forecasting incentive. This note considers that there may be a requirement to obtain further information from NGGT before conclusions on the appropriateness of the incentive can be drawn.

NGGT performs gas demand forecasting at D-1 and between D-5 and D-2 for gas system stakeholders. Stakeholders report that the published data is widely-used, helpful to customers and provides system benefits. NGGT's demand forecasting is incentivised under RIIO-T1, and to date, NGGT have received rewards under the incentive mechanism. With or without a specific RIIO-2 incentive, NGGT will continue to provide demand forecasts over a range of timescales in accordance with UNC and licence obligations². However, in Annex A3.03 of its December business plan, NGGT states that "In the absence of an incentive [...], it becomes more likely that demand forecasting accuracy would ultimately decline"³. The RIIO-2 incentive proposed by NGGT has a lower cap than RIIO-1. Apart from that, performance between the cap and the collar is rewarded in largely the same way as in RIIO-1. If NGGT performs in RIIO-2 at the same level as RIIO-1, there would be a 2% reduction in expected rewards under this incentive scheme.

Ofgem has asked us to review the report on the consumer value of the D-1 demand forecasting incentive. We do not consider that the proposals are well justified:

1. NGGT has stated that the principal factors impacting the forecast accuracy are the increased volatility and variability of the gas demand. On the basis of the evidence provided, we are not convinced that the relationship between variability and forecast errors is as clear as NGGT suggest. We believe that their analysis needs reinforcing and, in general, that further evidence should be provided to the relationship between these two factors and the level of forecast errors.
2. Supporting evidence from FTI Consulting provides a projection of the system cost of D-1 forecast errors should there not be a RIIO-2 incentive. [REDACTED].

¹ Poyry Management Consulting (UK) Ltd., now trading as AFRY Management Consulting

² NGGT Business Plan Submission, "Output Delivery Incentives to the Business Plan", December 2019. Annex A3.03 (page 74).

³ This statement implies that the incentive funds activity and/or investment which we would expect to be funded through the totex allowance.

3. Customers state that the D-1 forecast is more important to them than the D-5 to D-2 forecast. However, during the RIIO-1 period, NGGT received more revenue from the D-5 to D-2 forecast. We suggest that there should be a greater incentive weighting to improving the D-1 forecasts than the D-5 to D-2 forecasts.

We note that, driven by an expected change in electrical generation mix, gas demand for generation may be considered as a leading factor of the volatility and variability. It is therefore important for there to be a better understanding of the sectoral differences in forecasting, so that sources of volatility and variability of overall gas demand can be appropriately understood.

We recommend that Ofgem obtain further information from NGGT in respect of:

- A breakdown of the forecast errors associated with each sector;
- If possible, the change in forecast errors for different sectors prior to and during RIIO-1;
- A discussion on the developments to the forecast methodology performed in RIIO-1 and how that impacted on forecasting performance;
- More detailed discussion on the proposed forecasting developments to be implemented in RIIO-2, the expected improvements of each and a 'high/medium/low' assessment of the likelihoods of success;
- Industry feedback on the usefulness of other forecasting data including within-day updates to the forecasts and the forecast confidence interval.

2. INTRODUCTION

The accurate forecasting of the gas demand is important to the economic operation of the gas system. The information plays a key role for a number of system users including producers, consumers, shippers and network operators. National Grid Gas Transmission (NGGT) note that, in particular, the data is used by “small industry participants who are less likely to be able to produce their own in-house forecast”⁴ allowing them to operate effectively in the market and removing a barrier to entry to the gas market. NGGT also state that it is therefore the case that customers and consumers benefit from the utilisation of the forecasting data published by them.

We also recognised that NGGT provide additional services in that they continue to update their forecasts beyond 1300 on D-1, with regular updates up until midnight on the gas day. This provides information to customers allowing them to re-evaluate their gas portfolio as the day progresses.

This report comments on Section 5 of “Annex A3.03 Output Delivery Incentives of the NGGT Business Plan Submission”, dated December 2019 as well as the appendix to this document “Evaluation of consumer benefits arising from the demand forecasting incentive for National Grid Gas” written by FTI Consulting dated 19 September 2019.

NGGT also set out its proposals for the demand forecasting incentive in RIIO-2 in a Stakeholder Consultation on RIIO-2 incentives published in December 2019⁵.

Ofgem commissioned a partnership of CEPA, AFRY Management Consulting (AFRY) and Economic Consulting Associates (ECA) to provide economic advice for RIIO-2. This note has been prepared by AFRY under this Economic Strategic Partner contract for RIIO-2.

⁴ AnnexA3.03 – “Output Delivery Incentives”, NGG, p79.

⁵ <https://www.nationalgrid.com/uk/gas-transmission/document/129251/download>

3. GAS DEMAND FORECASTING INCENTIVES

Accurate gas demand forecasting is beneficial to gas consumers and NGGT are in a good position to provide this service. Customers acknowledge using the service; however, some have been disappointed in the lack of progress in reducing forecast errors.

3.1 Customer opinion on forecasting incentives for D-1

The D-1 forecast is regularly used by gas network customers. Stakeholders have indicated a strong support for it to remain and for the forecast to be as accurate as reasonably possible.

3.2 Customer opinion on forecasting incentives for D-2 to D-5

The D-2 to D-5 forecasts are less widely used by customers; however there is still a belief that there is benefit to their publication and maintaining their accuracy. With respect to how the performance of the D-2 to D-5 forecast compares with the D-1 forecasts, our analysis suggests they are correlated – strong performance in D-1 forecasts happens in conjunction with strong performance in D-2 to D-5 forecasts, with a reward payable for performance separately. There will clearly be cross-over in the methods used for each, and it appears to be the case that benefits applied to the D-1 forecast also lead to benefits to D-2 to D-5 forecast.

In RIIO-1, from 2013/14 to 2018/19 the D-1 incentive led to £6.42m in revenue and the D-2 to D-5 incentive led to £7.28m in revenue.

Based on the customer feedback and our understanding of the wider market use of the forecasts, incentives should prioritise improvements in the forecasting of D-1 ahead of D-2 to D-5.

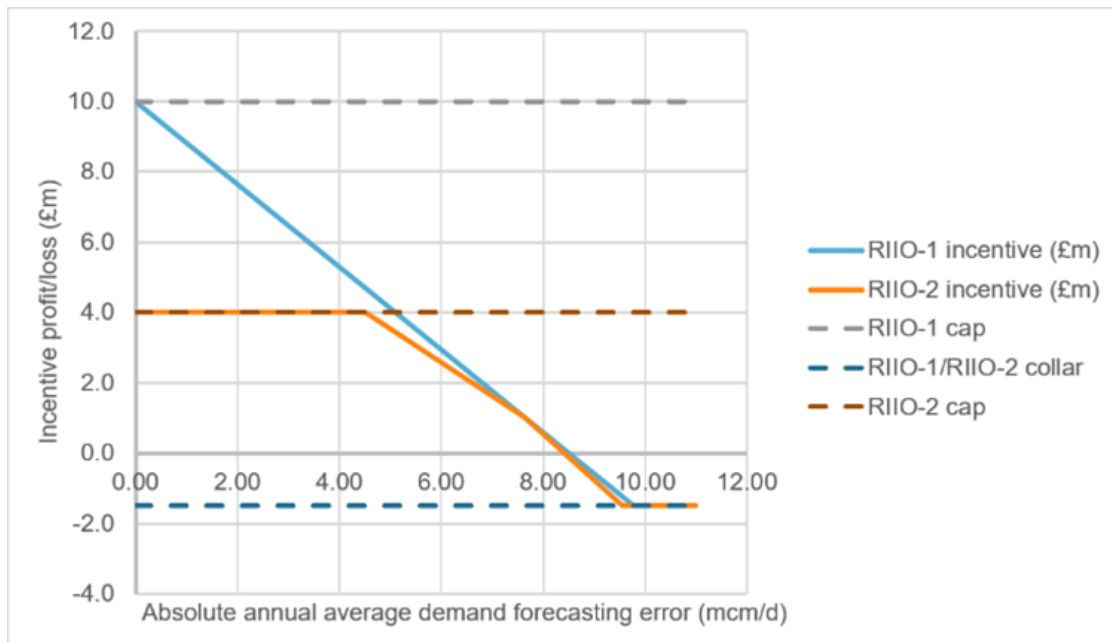
3.3 Current incentive framework

The current incentive framework uses absolute average demand forecasting error as the mechanism for assessing forecasting performance. Allied to the cap and collar mechanism, this measure provides a clear mechanism for assessing NGGT's performance and calculating the incentive reward/penalty. Its clarity allows for it to be evaluated for success by other industry partners, customers and auditors.

3.4 The RIIO-1 and proposed RIIO-2 role of incentives

The RIIO-1 and proposed RIIO-2 incentives (for D-1) have been presented graphically in Figure 70 and Figure 75 of Annex A3.03 "Output Delivery Incentives to the Business Plan", (published December 2019). To aid in the comparison of the two, Figure 1 presents both in a single figure. The structure of the proposed D-2 to D-5 incentive is similar (although allows for a larger forecast error).

Figure 1 – Comparison of RIIO-1 and proposed RIIO-2 incentives for D-1



Source: National Grid Gas "Annex A3.03 Output Delivery Incentives of the NGGT Business Plan Submission", December 2019

At the start of RIIO-T1 (2013/14), D-1 forecast accuracy stood at 8.69 mcm/d. It improved to a level of 7.75 mcm/d by 2015/16 and moved between these levels before subsequently degrading to 8.90 mcm/d for incentive year 2018/19 (figure 74 of Annex A3.03). Therefore, while the proposed cap for RIIO-2 has reduced from £10m to £4m, at the current level of forecasting accuracy, the reduced cap will rarely come into effect. Under the best historical circumstances (i.e. at a level of 7.75 mcm/d), the level of incentive reward will be approximately 2% less than that of RIIO-1 (for both D-1 and D-2 to D-5 elements).

The proposed incentive mechanism does not include any form of frontier shift where NGGT are incentivised to continually improve their forecasting accuracy, nor does it consider much of a penalty for underperformance.

3.5 Increase in demands in sectors showing volatility and variability

In Section 5 of "Annex A3.03 Output Delivery Incentives of the NGGT Business Plan Submission" and the associated Appendix, the role of volatility and variability has been discussed from different perspectives.

The impact of the volatility and variability is associated with a less accurate forecasting capability associated with certain sectors and gas end-use. This raises the question of whether greater incentive should be given to these problem sectors.

Continuing to refine sectors which are well-forecasted may in the near-term lead to improvements in the overall forecast accuracy, though this may not address the issue of

improving the poorly forecasted sectors. Should these poorly forecasted sectors grow to be significant, this may impact the medium-term development of a forecasting model.

3.6 Recommendations

We suggest that D-1 forecast performance should be prioritised because of the views of users. In addition, further evidence should be sought on the baseline performance, the calculation of the performance metric, the strength of the incentive and the interaction with longer-term forecasts.

4. [REDACTED]

[REDACTED].

4.1 [REDACTED]

[REDACTED]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]

4.1.1 [REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

[REDACTED]

4.1.2 [REDACTED]

[REDACTED]

4.1.3 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

4.2 [REDACTED]

[REDACTED]

4.2.1 [REDACTED]

[REDACTED]

1. [REDACTED]
2. [REDACTED]

[REDACTED]

[REDACTED]

4.2.2 [REDACTED]

[REDACTED]

Figure 2 – [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

4.2.3 [REDACTED]

[REDACTED]

4.2.4 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED]

4.2.5 [REDACTED]

[REDACTED]

4.2.6 [REDACTED]

[REDACTED]

5. GAS DEMAND FORECASTING

NGGT provides D-5 to D-2 forecasts, D-1 forecasts as well as on-the-day forecast updates to the gas system stakeholders. These forecasts are considered helpful to the system and NGGT have proposed means to improve the D-5 to D-2 forecasts and the D-1 forecasts. In this section, the proposed improvements are discussed along with other gas forecasting resources of NGGT.

5.1 Economic development of forecasting methodologies

Any forecasting methodology will have an associated confidence interval. While more accurate forecasting is beneficial to the system, it remains necessary to compare this with the costs associated with developing the methodologies. Therefore, the methodologies should be developed in a cost-efficient manner.

It should be noted also that there will always be a limit to how accurate a forecast can be. Methodological developments should consider which sectors' forecasts are most beneficial to the system and focus incentives appropriately.

5.2 Proposed means of improvements of forecast accuracy

The following summarises the means of improvement for the gas demands which are presented in Section 5 of Annex A3.03:

- Development and enhancement of mathematical forecasting techniques;
- Continuous recalibration to current operational and market considerations;
- Automation of progress;
- Continuing assessment of service providers;
- Improvements of commercial intelligence.

We feel that a wider range of techniques could also be considered and are summarised as follows.

5.2.1 Sectoral focus of the forecasting

A comprehensive evaluation of which sectors are forecasted well and which are not is important. It is not yet known how forecast errors in different sectors can affect the system prices and impact specific (especially smaller) market participants. It is therefore insufficient to focus attention on only improving the forecasts in one sector above another.

5.2.2 Adaptability and foresight of the methodology

A number of factors affecting the changing nature of the gas demand (e.g. the increased volatility of gas demand for electrical generation due to changes in the generation mix) have been known since before the commencement of RIIO-1. Thus there should be a target to improve the forecast, not just day-ahead and on a year-by-year basis, but over the duration of the RIIO incentive. Foresight should be used when deciding which methodological improvements should be prioritised and, with respect to the previous point, a sector-wise consideration will provide insight into how forecast errors will change in the future.

5.2.3 Implications of volatility and variability on gas demand forecast errors

While certain factors may lead to further volatility and variability in the gas demand, a comprehensive analysis should be conducted into how this affects the forecast errors. For example, it is understood that varying wind generation leads to a gas demand for generation with more volatility and variability. However, an understanding of the implications of wind forecast errors on the gas demand forecast errors is not presented.

5.3 Within-day updates to gas demand forecasts

The forecast produced at 1300 on D-1 are then continually updated throughout the gas day. Ofgem should request further information on how these additional updates are used by industry.

5.4 Gas demand forecast confidence interval

NGGT publish details of the confidence interval associated with their forecast, however its interpretation requires clarification. In particular, published on the NGGT Data Item Explorer is an item described as 'Demand Forecast Confidence Interval D-2' which has the associated description "This is the 90% confidence interval derived from historical forecasting error produced 2 days ahead of the gas flow day. The confidence interval is derived from historical forecasting error updated every 6 months. [...]"

[REDACTED].

[REDACTED].

[REDACTED].

Further investigation of this discrepancy may be interesting for industry and it would be interesting to hear feedback on the usefulness of the 'Demand Forecast Confidence Interval D-2' metric.

5.5 Future role of NGGT in wider forecasting methodologies "Whole system demand forecasting"

In the NGGT Business Plan, the Gas Demand Forecasting Incentives of RIIO-1 and RIIO-2 have been placed in the context of the Whole System Demand forecasting requirements of a Decarbonised Energy System (2021-2050), in particular with the consideration of both hydrogen and natural gas scenarios. There will be a cross-over of relevant techniques, and a full review of the demand forecasting techniques may be relevant. Much of this work would lie outside the scope of the RIIO incentives which are focused on consumer benefits. However, consideration should be given to year-on-year changes to the sector and additional focus may be paid to factors which affect the forecast accuracy in the near term.

6. CONCLUSIONS

There are elements of the methodology and the approach being presented by NGGT with which we agree in principal with, but there are some elements where we are not convinced by the evidence presented. The elements we broadly agree with are:

- The forecasting services provided by NGGT are useful to customers and there are benefits to increased accuracy of these forecasts;
- NGGT's forecasting accuracy has improved over the RIIO-1 period;
- Mean absolute forecast error provides a clear way of assessing the performance of NGGT in improving forecast errors;
- The incentive mechanism has provided rewards to NGGT for the forecast improvements;
- It appears likely that there have been customer benefits associated to forecast improvements over the RIIO-1 period.

The elements where we feel there is a lack of robust evidence are:

- The importance of gas demand variability and volatility on forecast accuracy prior to RIIO-1 and through the duration of RIIO-1;
- The quantification of the baseline performance level of the incentive;
- The projected decline of forecast accuracy without a RIIO-2 incentive;
- The magnitude of the customer costs of forecast error decline over the duration of RIIO-2 without an incentive as evaluated in the FTI report.

We think it is important that Ofgem ask for additional information from NGGT in order to come to a conclusion on the form of the demand forecasting incentive. This includes:

- A breakdown of the forecast errors associated with each sector;
- If possible, the change in forecast errors for different sectors prior to and during RIIO-1;
- A discussion on the developments to the forecast methodology performed in RIIO-1 and the accuracy improvements associated to each;
- More detailed discussion on the proposed forecasting developments to be implemented in RIIO-2, the expected improvements of each and a 'high/medium/low' assessment of the likelihoods of success;
- Industry feedback on the usefulness of other forecasting data including within-day updates to the forecasts and the forecast confidence interval.



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