CMP361: IMPACTS OF RECOVERING BALANCING SERVICES COSTS WITH AN EX ANTE FIXED CHARGE

Additional analysis of the impact of forecast horizon on BSUoS uncertainty

INTRODUCTION

In August 2021, Ofgem published a report by Frontier Economics[1] which assessed the impacts of introducing an ex ante fixed BSUoS tariff, as recommended by the Balancing Services Charges Task Force. This change was being considered through CUSC modification CMP361.

In that report, Frontier concluded that for each of the fixed charge options considered, there would be benefits from reduced risk premia because supplier risks would be transferred to the ESO which has a lower cost of capital.

However, despite the benefits of change under CMP361 being reasonably clear, it was ambiguous as to which of the various combinations of fixed and notice periods considered would be most beneficial. This was important because while the Task Force had recommended that the charges should be fixed in advance with a combined notice period of 14-15 months, it also did not make a clear recommendation as to how this should be divided between the notice and fixed period.

Therefore, Ofgem has commissioned Frontier Economics to provide some further advice regarding the relative benefits of different combinations of fixed and notice periods totalling 15 months, in particular:

- **Option 1**, a 12 month notice period with a charge fixed for three months *(12N3F)* ; and

- **Option 2**, a three month notice period with a charge fixed for 12 months *(3N12F)*.

In our original assessment, the cost to parties of managing BSUoS risk exposure changed over time, in that it was assumed to decline as more information is revealed regarding realised losses or gains i.e. the model accounted for the fact that BSUoS risk management would be more expensive for a party 12 months from the point at which it could make adjustments (i.e. in the case of the ESO the BSUoS

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charge or in the case of a supplier a retail contract) than three months. This resulted in some modelled differences between the options.

However, we also noted that we made a simplifying assumption that forecast accuracy did not change the further into the future that the forecast was being made. We recognised that this was unlikely to be representative. However, we did not have a basis on which to make an alternative assumption, and industry engagement during the assessment did not yield feedback on a timescale that could have been taken into account in the analysis.

This assumption is potentially important in the context of Ofgem's policy choice between these options, as a key difference between a 12N3F option and a 3N12F option is the horizon over which a BSUoS forecast must be made by both the ESO and suppliers. This is explained in Figure 1 below.

Figure 1   Implication of different options on the required forecasting horizon
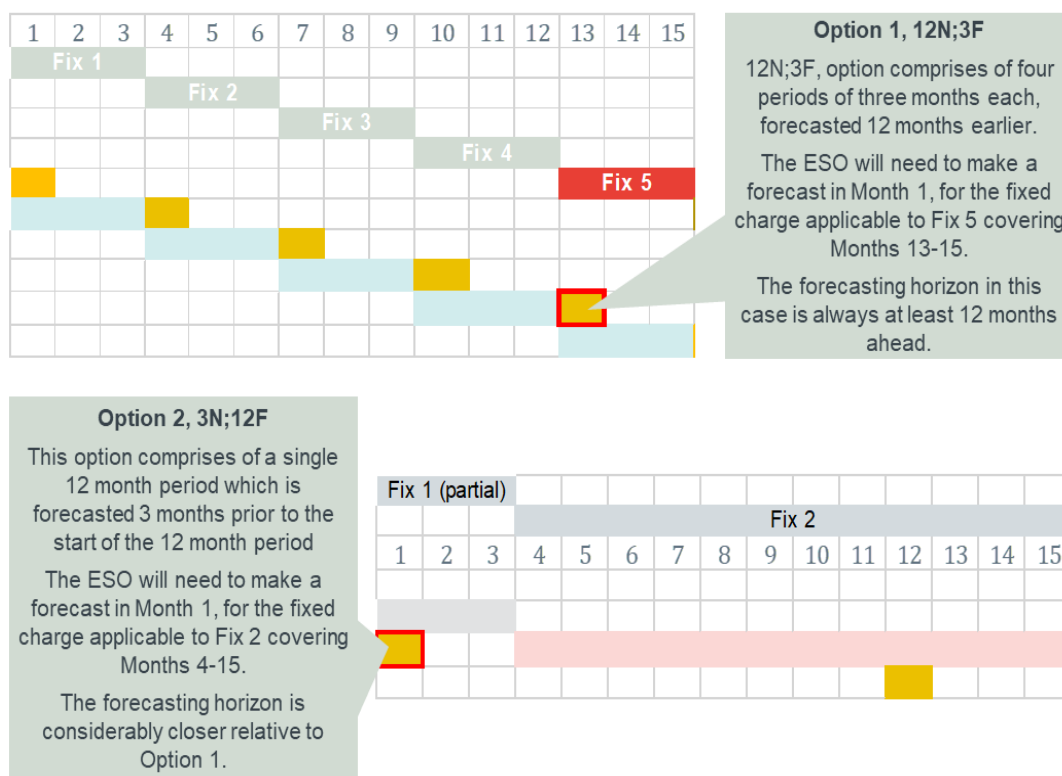
Source: Frontier Economics

In other words, the final 3 months of the fixed period in Option 2 have a similar forecast horizon to Option 1; but the first 9 months of the Option 2 fixed period (months 4-12) are all forecast with a shorter horizon, and therefore may be subject to greater accuracy.

Since the publication of our first study, Ofgem has received further views on the assessment of CMP361 during the consultation period, including from ESO. Specifically, ESO identified this assumption as potentially important to the original assessment and presented some quantitative illustrations of how forecast

inaccuracy could increase as the forecast horizon increases.[2] While we cannot be sure how exactly forecast inaccuracy will change with the timing horizon, the ESO analysis provides a potential basis on which to test this principle within our model. It allows us to consider the impact of this alternative assumption within a clear and structured framework that considers both the impact on ESO and suppliers in both the counterfactual and the factual.

Therefore, in this annex we present a sensitivity to the analysis contained in our first report, based on an adjusted model which takes into account increasing forecast inaccuracy as the forecast horizon increases. We recognise that there may also be other reasons to update the original analysis e.g. to take into account more recent BSUoS data. However, the purpose of this report is focused on the impact of this alternative assumption, and therefore no other changes to the original modelling have been made.

The remainder of this annex is structured as follows:

- We first explain the **key insights from the original report** related to the relative benefits of the different options;

- We then set out our **approach to adjusting our model**, including some of the detail of ESO's illustrative analysis that will be incorporated into our modelling framework, and its expected impacts on the model calculations;

- We then explain the **results and implications of the updated analysis**; and

- Finally, we explain some **important limitations** that should be considered alongside these additional results.

This annex is intended to be read alongside the original report rather than a stand-alone report. We focus on only describing those parts of the original report that are most relevant given the changes that we are making.

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[2]   Page 3, Annex 5 (ESO Response to Frontier Economics Draft Analysis), CMP361 and CMP362 Work Group Consultation, accessible here: https://www.nationalgrideso.com/industry-information/codes/connection-and-use-system-code-cusc-old/modifications/cmp361-cmp362

INSIGHTS FROM OUR FIRST REPORT

In this section we describe the key insights from the original report related to the choice between the options. We do this in order to better understand the baseline for the relative benefits, against which we will compare the impact of our updated modelling.

The figure below summarises key results from our first report.

Figure 2   Industry benefits by scenario

| Scenario	ESO cost	Supplier cost	Total cost	Benefit
Counterfactual	-	£16.8m	**£16.8m**	-
12N; 3F	£4.8m	£1.3m	**£6.1m**	£10.7m
3N; 12F	£3.9m	£2.8m	**£6.6m**	£10.2m

Source: First Report, Figure 47

To describe the results, we consider first the implication of the different options for the ESO and then suppliers.

There is no quantified risk for the ESO in the counterfactual, and therefore each of the options introduces new risk management costs relating to the fact that true BSUoS costs may differ from ESO's forecast. The modelling identified that the risks were lower with a longer fixed period, and shorter notice period, on the grounds that there is a greater time between announcements and hence a bigger reduction in capital requirements in the interim.

Irrespective of the option, once a charge announcement is made, the ESO faces uncertain costs over a 15 month period (related to the sum of the notice and fixed periods), and in our analysis has to hold enough capital to cover the difference between the P95 value of BSUoS over 15 months and its mean value (which is covered by the charges set for these periods). Figure 1 illustrates the timings of announcements that the ESO must make under the 12N3F option.

Figure 3   Timetable of announcements – 12 month notice; 3 month fix
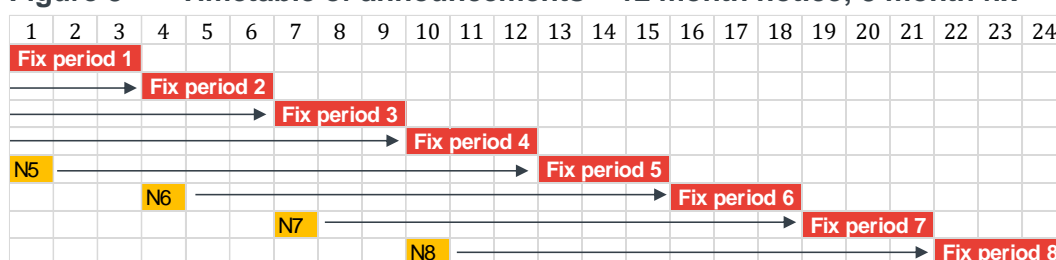

Source: Frontier/LCP

At the start of month 1, four fixed charge levels have already been announced. The ESO announces the charges for fix period 5 and from that point on is exposed to the potential variance in BSUoS costs from this forecast during period 5 (months 13, 14 and 15). Therefore, in total the ESO faces uncertain costs over a 15 month period (the total of fix periods 1 to 5).

In month 2, the value of month 1's BSUoS costs is known and as a result the risk capital requirements reduce to 14 months: the remaining two months of fix period

1, plus all the uncertainty resulting from fix periods 2 – 5.[3] Similarly, in month 3, exposure reduces to 13 months. However, in month 4 the ESO announces fix period 6, taking its exposure back up to 15 months.

A similar logic applies to the ESO under the 3N12F option. Figure 4 shows how the ESO's risk capital requirements vary for each of the two factual scenarios. In each case, the peak capital requirements are determined by the sum of the fix and notice periods, but with longer fix periods, there is a greater time between announcements and hence a bigger reduction in capital requirements in the interim. This is reflected in lower costs for the ESO under a three month notice 12 month fix option relative to the alternative 12 month notice three month fix option.

Figure 4   ESO's capital requirements without dynamic risk valuation (as presented in our First Report)
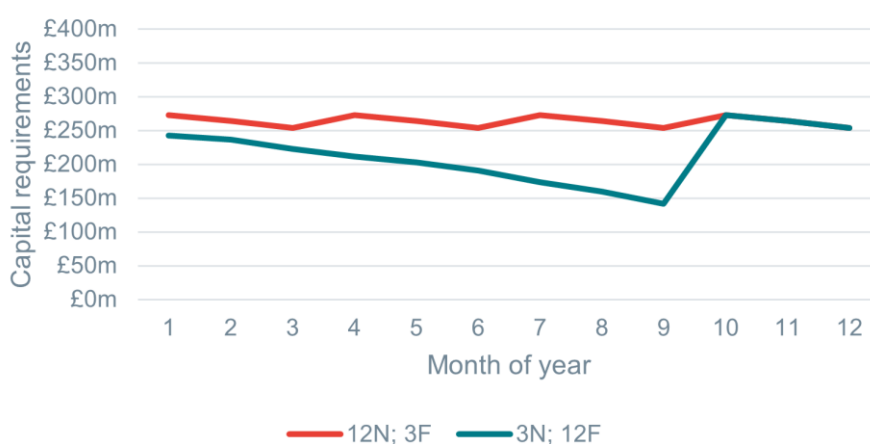
In contrast to the ESO, the original analysis suggested that suppliers would prefer the 12 month notice three month fix option. As we set out in our previous report, the impact on suppliers is more complex to assess, as they face risk management costs in the counterfactual, which is reduced but not entirely removed in the factual. The extent to which risks are reduced in the factual may be dependent on the 12N3F or 3N12F option.

First, it is important to note that there are two sources of uncertainty for suppliers:

- First, the '**K factor' risk**: which the ESO applies to adjust future charges to unwind any over- or under-recovery from previous fixed periods.

- Second **uncertainty related to the level of unannounced fixed charges**: In order for suppliers to minimise their risk exposure, they need to accurately forecast the ESO's fixed BSUOS charge in the next fixed period, which itself is based on the ESO's forecast for BSUoS over that period.

In our analysis we only account for the K factor risk. We assume that suppliers' risk related to uncertainty regarding the ESO's forecast to be zero. In practice, while this risk will not be zero, it should be considerably closer to zero than the risk

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[3]   Note that we are assuming that the ESO's fixed ex ante charges will be an unbiased forecast of true BSUoS. Therefore although BSUoS costs in month 1 may, in the event, be either above or below this forecast, leading to either under- or over-recovery, on average this value will be zero, and hence the ESO will be able to reduce the risk capital to which it must have access.

for suppliers of forecasting actual BSUoS under the counterfactual.[4] Furthermore, if the ESO were to publish the methodology it chooses to apply or to provide regular forward guidance on likely BSUoS charges then suppliers should be able to make a good estimate of the forecast the ESO will make.[5]

In terms of the K factor risk, the impact under each of the options is dependent on:

- The length of contract that suppliers sign with their customers; and
- The specific point in the year that a contract is agreed - contracts may be agreed immediately after the ESO has announced the next fix period, shortly before the next announcement, or anywhere in between. This affects the uncertainty the supplier faces at the point the contract starts, as well as when this uncertainty is resolved.

With a longer notice period and a shorter fix period, suppliers have greater visibility over the BSUoS charges when signing a retail contract (irrespective of when it is signed relative to an announcement) than they do with a shorter notice period and longer fix period. This is illustrated below in Figure 5 for one year contracts, under the 12N3F option and 3N12F option respectively

Figure 5   Supplier risk by contracted month, 12N3F
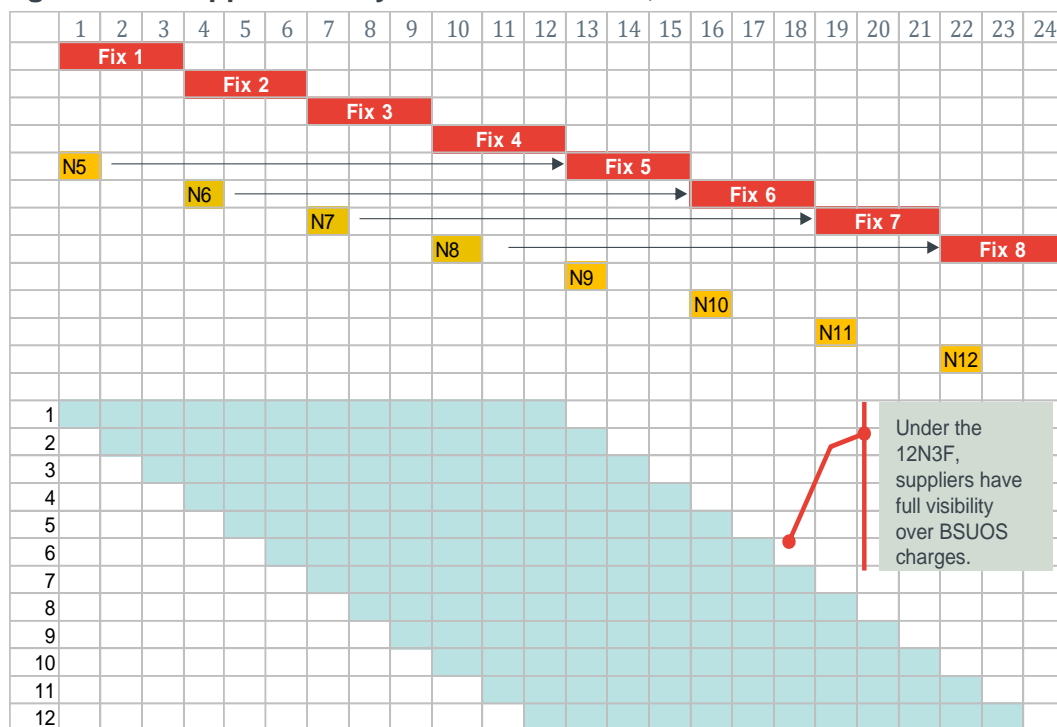
Source: Frontier Economics

As shown above, with 12N3F a supplier signing a one-year retail contract has full visibility over the charges for the whole contract irrespective of when in the year a

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4   In the counterfactual, suppliers must estimate outturn BSUOS. Thus they are exposed to the full variability of the distribution of possible BSUOS costs. In the factual scenario, suppliers no longer need to forecast actual BSUOS costs; rather they must forecast the ESO's forecast of BSUOS costs. The ESO's forecast will be based on the expected value of BSUOS, which is effectively the mean of the distribution of possible BSUOS. Statistically, estimating the mean of a distribution is subject to significantly less error than forecasting the actual outturn which is effectively a single random draw from the underlying distribution.

5   First Report, Section 4.1.4,

contract is signed i.e. across each of the light blue blocks representing a retail contract, the fixed charges have been announced for all fixed periods.

In contrast, under a 3N12F, there will be periods during the year when charges for only a part of the retail contract will be known, leaving BSUoS forecasting risk with the suppliers. This is shown in Figure 6 below.

Figure 6   Supplier risk by contracted month, 3N12F
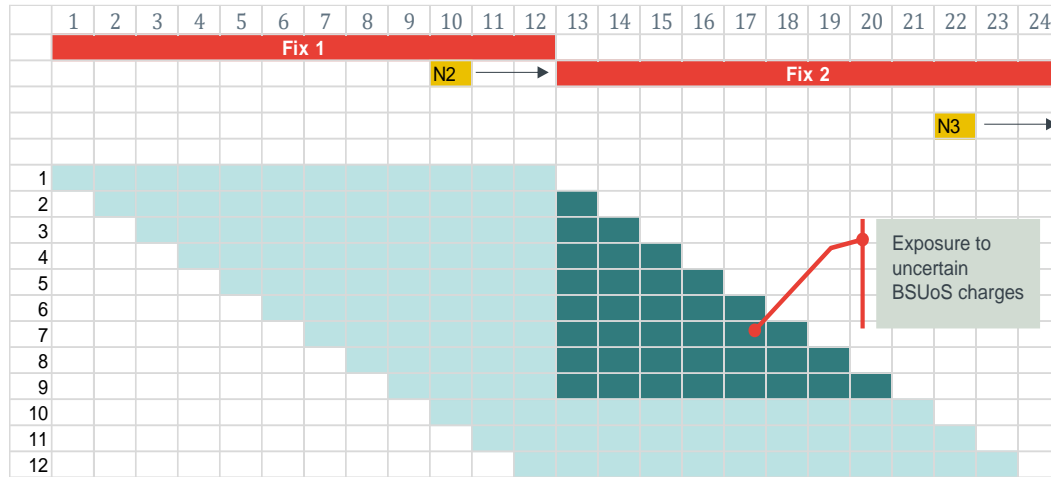
Source: Frontier Economics

As a result, while we modelled significant reductions in supplier risk management costs for each option, the reduction was greater for the 12N3F. This contrasted with the conclusion for the ESO, and therefore led to an ambiguous conclusion overall, with the differences in total benefits not significant enough to make a clear recommendation.

APPROACH TO ADJUSTING THE MODEL

The methodology for the analysis in this paper involves expanding and adapting the model used to generate the assessment of CMP361 in our first report to account for potential differences in forecasting error that could arise with differences in the forecast horizon.

This section is structured as follows:

- We first briefly describe the ESO's analysis as to how forecast accuracy may change dependent on the forecast horizon;

- We then explain how we have integrated ESO's analysis into our model; and

- Finally, we explain its implications for the risk exposure calculations within the model.

Our full approach modelling is described in detail in our first report.

Overview of the ESO's forecasting horizon analysis

As noted above, the ESO has provided an illustration of how forecasting accuracy might change when forecasting over different time horizons. The full details of the ESO's analysis are described in its submission to Ofgem.[6] For ease of reference, we briefly describe its approach here, and set out the results which we have used in our modelling.

In its analysis the ESO has identified a number of potential drivers for forecast variability some of which vary with the forecast time horizon:

- **Factors which are not believed to be materially affected by the time horizon of the forecast**, for example, weather variability and network and generator outages. For these factors, which ESO calls 'snapshot variability', it is assumed that a forecast is no better or worse whether it is made 3 months ahead or 12 months ahead. Consideration of these factors is consistent with the statistical analysis of historic BSUoS costs that we used to derive the forecast error distributions in our first report.

- **Factors which do vary based on the time horizon of the forecast.** These largely relate to policy drivers, the knowledge of which will vary depending on the time horizon. The drivers considered were:

  □ *ESO policy* – the ESO assumes that on a 3-month horizon ESO policies are fixed and therefore their impact on BSUoS costs can be predicted. However, beyond a year it is reasonable to assume there could be changes to balancing services (including new services added) that are not known or easily predicted.

  □ *External policies* – the ESO assumes that government or Ofgem policies that might have an impact on BSUoS have a longer lead time and therefore create additional uncertainties for forecasts of two or more years.

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[6]   Page 3, Annex 5 (ESO Response to Frontier Economics Draft Analysis), CMP361 and CMP362 Work Group Consultation, accessible here: https://www.nationalgrideso.com/industry-information/codes/connection-and-use-system-code-cusc-old/modifications/cmp361-cmp362

☐ *Network changes* – the ESO assumes that infrastructure projects do not always run to time and given the configuration of the network is likely to affect BSUoS costs, they assume that network changes can add additional uncertainty beyond a year.

Finally, the ESO assumes that there is additional wholesale cost forecast variability over longer time horizons, which exacerbates the impact of the additional uncertainty created by the policy drivers noted above.

The ESO recognises that these factors are extremely difficult to quantify with any accuracy. However, the ESO has produced some illustrations of their potential magnitude which are set out below in Figure 7. The details of how these numbers were produced are set out in its report.

Figure 7   ESO quarterly cost variability

Lead time	Snapshot variability	ESO policy	External policy	Network changes	Wholesale costs	Total Variability (£m)
3 months	125	0	0	0	1.13	141
1 year	125	5	0	35	1.31	216
2 years	125	27.5	27	70	1.41	352
3 years	125	43.75	54	105	1.52	498

Source: Page 3, Annex 5 (ESO Response to Frontier Economics Draft Analysis), CMP361 and CMP362 Work Group Consultation

It is not the purpose of this report to comment on the detail of the ESO's analysis. However, we agree in principle that for some cost drivers, forecasting accuracy can depend on the time horizon. For the purposes of this sensitivity analysis, we therefore make the assumption that the ESO's quantitative assessment forms a useful basis from which to explore the possible implications of greater uncertainty over longer forecasting horizons.

Implementation of the ESO's analysis in our model

In our original analysis, we constructed assumptions on BSUoS forecast error by deconstructing historical BSUoS variance into variance that could be explained by specific variables (e.g. variance resulting from weather, via seasonality) and variance which was unexplained. The latter was used to construct assumptions on BSUoS forecast error. We then specified a Monte Carlo simulation to produce distributions of BSUoS forecast error covering different lengths of time (1 month through to 36 months) over which BSUoS risk is held.

From these distributions we estimated the risk exposure in each month during a year for the ESO, given the length of the notice and fix period, and for suppliers given the length of their retail contracts and the length of the fix and notice period.[7]

To incorporate an assumption related to the forecasting horizon into our modelling, these error distributions must be adjusted depending on the time horizon over which a party holds BSUoS risk. We have therefore scaled the distributions based on the difference in BSUoS uncertainty identified by the ESO for different time horizons.

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[7] First Report, Section 4.1

We have not included the actual risk exposure values from the ESO's analysis. Instead, we have calculated ratios with which to adjust the error distributions based on the increase in variability identified by ESO relative to 3 month variability. We maintain the underlying distribution for 3 month variability as per our previous analysis. This is logical given ESO's calculated total variability up to 3 months is only derived from 'snapshot variability' which does not increase for forecasts further into the future, and as noted above, is conceptually consistent (though the values may differ) with the error distributions included in our first report.

Therefore, as an example, based on the ESO's analysis, a forecast made for a period in 12 months' time could be approximately 1.5 times more uncertain than that of a forecast made three months ahead.[8]

The ESO's analysis provides values for specific points in time (i.e. three months, or one, two and three years). However, the error distributions in our model vary at a monthly granularity. We have therefore assumed a linear relationship between the ESO's values in order to develop ratios at the monthly level, as shown in Figure 8. Given what we know regarding the ESO's policy drivers for additional uncertainty, an argument could be made that the additional uncertainty is more stepped in nature. However, absent further detail on which to base this (and the illustrative nature of this analysis) we consider a linear approach as reasonable.

Figure 8   Relationship of risk and forecasting time horizon
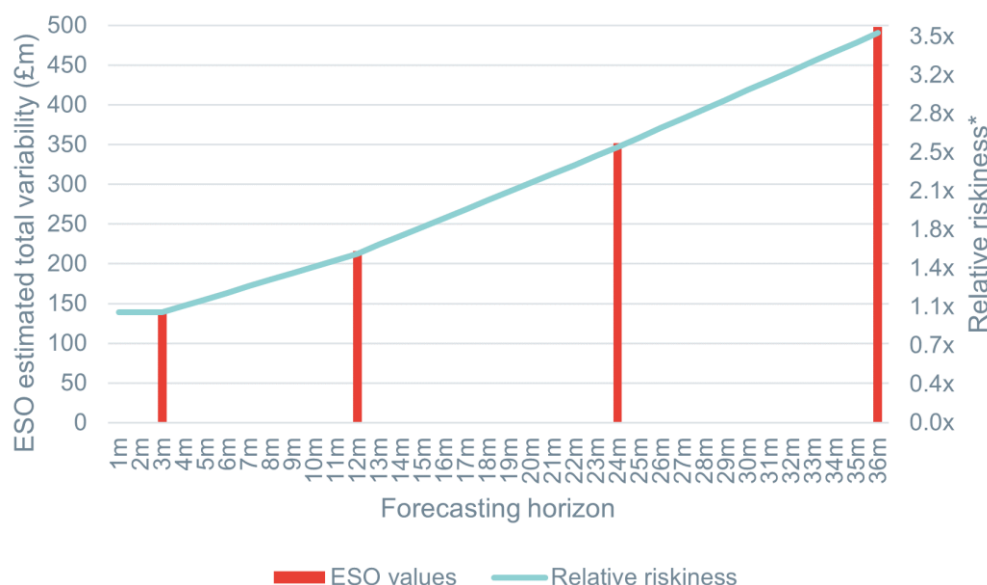
Source: Frontier Economics based on ESO analysis
Note: Relative riskiness is expressed as a ratio to the three-month forecast horizon.

By making this update to our model, we are assuming that as each month passes, forecast accuracy for suppliers related to the remaining BSUoS risk exposure during a retail contract improves. To be consistent with this concept, we have also made an additional change in the model in relation to how the risk exposure for suppliers evolves over time.

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[8]   i.e. from Figure 7, 216/141 = 1.53

In our initial analysis, we assumed that the only relevant point at which suppliers learn new information is when new charge announcements are made that reduce their risk. However, given that forecast accuracy is assumed to improve month on month, we have now also assumed that suppliers learn new information about their remaining risk exposure month on month, even if a new charge has not been announced. In other words, even though the next charge has not been announced, suppliers will be able to assess the on-going ESO under- or over-recovery month on month to better forecast remaining BSUoS uncertainty.

With these changes to the model made, we have re-run the model and cost benefit analysis to isolate the impact of forecasting inaccuracy for longer 'lead times', and assess the extent to which including these assumptions affects the key findings in our original report.

For each fixed and notice option considered in the assessment, we model the cost of holding capital for different lengths of supply contracts individually (as if all final demand were supplied with a given length of contract). The last step in our calculations involves weighting the resulting costs per contract length by the prevalence of each type of contract length in the market in order to estimate the total cost of managing BSUoS forecast error faced by the industry.

As in our First Report, the same mix of contracts is used in the factual and counterfactual scenarios, as shown in the table below (reproduced from our First Report). For a detailed description of how we arrived at the weights set out in the table below, please see section 4.1.6 of our First Report.

Figure 9   Breakdown of final consumption by contract length

Contract length	Weight
6-month fixed	22%
1-year fixed	61%
2-year fixed	12%
3-year fixed	4%
Total	100%

Source: First Report, Figure 33

Updated methodology of modelling risk exposure

In this section, we explain the impact on the changes in the model on the calculation of risk exposure. At a high level, the modelling adjustments will have an impact on the estimated costs for the ESO in the factual and the costs for suppliers in the counterfactual and factual, as explained in Figure 10.

Figure 10 **Impact of modelling updates on the high-level analytical framework.**

	Counterfactual	Factual
ESO	No impact (-) Risk exposure does not change in the counterfactual because suppliers hold all of the BSUoS risk	**Has an impact(✔)** In the factual, the ESO risk exposure will increase if it is assumed to be less proficient at forecasting BSUoS errors in far-out periods
Suppliers	**Has an impact(✔)** Suppliers hold BSUoS forecast error risk. The risk associated with making longer-term forecasts will increase, particularly for longer retail contracts.	**Has an impact (✔)** Significant portion of supplier risk shifted on ESO, but suppliers still have to forecast what their K factor might be for future charges not yet announced. The risk associated with making longer-term forecasts will increase, though risk is also reduced due to assumed learning between charge announcements

Source: Frontier Economics

We explore the ESO and Supplier perspectives in turn in the sections that follow.

Updated approach to modelling the ESO's risk exposure

We have assumed that in the **counterfactual**, the ESO faces no risk, since it is able to fully recoup BSUoS costs from suppliers using an ex post charge. The modelling update does not affect this assumption.

Under the different **factual** scenarios, the ESO must announce BSUoS charges on an ex ante basis and will face risk because the true BSUoS costs may differ from its forecast.

The updated modelling approach increases the capital requirements of the ESO overall, as it accounts for the fact that ESO has a lower ability to forecast accurately for further out periods. In other words, the peak capital requirement to cover uncertain BSUoS costs over 15 months is increased to reflect the greater uncertainty. As before, capital requirements decline from this peak in the period up to the next charge announcement, although they decline on a steeper trajectory, which can be observed below for the 12N3F and the 3N12F options below in Figure 11.

**Figure 11   Risk capital held by the ESO, comparison of our First Report
and our Updated analysis**
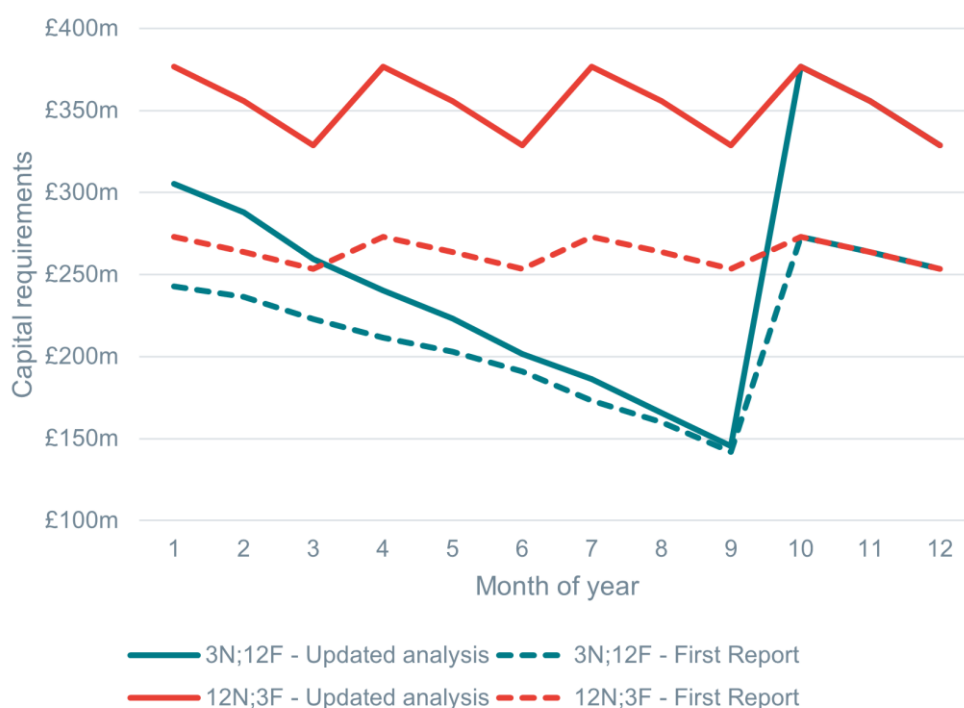
Source: Frontier Economics

In particular, the increase in capital requirements due to the update is higher for
the ESO in the 12N3F option, where the ESO's average monthly cost increase is
c. £90m (relative to the 3N12F option, where the average monthly cost increase is
c. £42m). As explained in our previous analysis, while both options have a peak
capital requirement of 15 months:

- the ESO has to renew its peak capital requirement more often in the 12N3F
  option relative to the 3N12F option; and,

- with the 3N12F option, the ESO's peak capital requirement can decline to a
  lower level due to the longer period between announcements, and actually
  reaches the same level after nine months given at this point it only holds 3
  months risk, which has not changed from the first report.

Updated approach to modelling suppliers' risk exposure

Updated supplier counterfactual

As in our first report, we assume that suppliers are exposed to the risk of forecast
error over the length of their contracts, and carry risk capital to cover this. If we
account for the forecast horizon, suppliers will have to hold more capital at the start
of a forecast period due to the assumed greater uncertainty over longer forecasting
horizons beyond 3 months. A comparison of suppliers' risk capital requirement in
our First Report and our updated analysis is shown in the Figure 12 below.

**Figure 12   Illustration of profile of risk capital held in our First Report and
our Updated analysis**
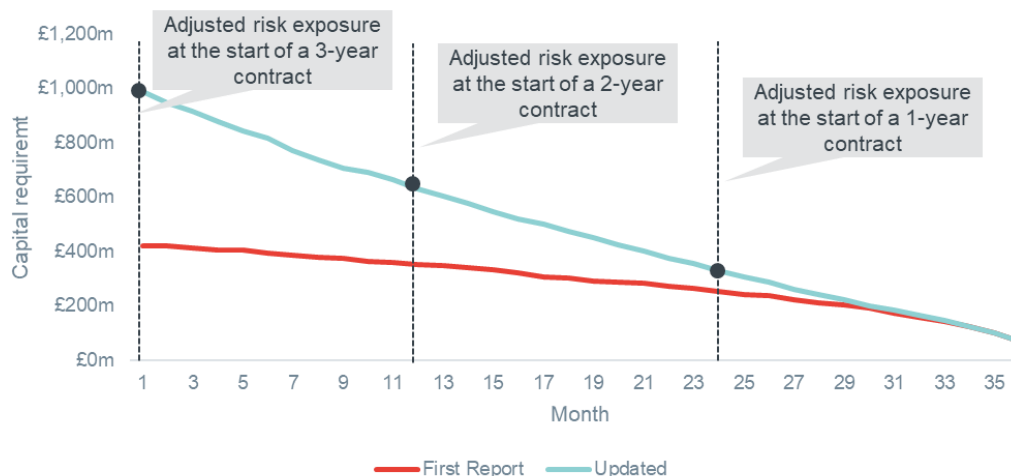
Source: Frontier Economics

Under the updated modelling framework, overall risk management costs increase, and it becomes relatively more costly for suppliers to sign long-dated contracts. However, given the significant weight given to retail contracts of 1 year or less (83%) in the cost benefit analysis, the increase in the costs associated with two and three year contracts only have a limited impact on the overall results.

Updated supplier factual

In the factual, suppliers will issue retail contracts including suppliers' expectation of the BSUOS charges that they will face over the duration of the retail contract. As noted earlier, there are two sources of uncertainty for suppliers:

- First, the '**K factor' risk;** and
- Second uncertainty related to unannounced fixed charges.

As in our first report, we only account for the K factor risk. Consequently, we assumed that suppliers would estimate the risk capital required to cover BSUOS forecast error risk under a given contract and hold the requisite level of capital until the current fixed period concludes. Once suppliers are aware of the charge in the next fixed period, the risk position unwinds and reduces to zero. An illustration of this concept is shown in the Figure 13 below.

The modelling adjustment in our updated analysis is meant to account for the higher level of forecasting inaccuracy over long forecasting horizons. Put another way, forecasters are able to make relatively better forecasts in the near-term as forecasters are dynamically incorporating new information into their forecast. On this basis, as we noted earlier in this section, we now also assume that suppliers should be able to update their expectations as new information regarding the current position of ESO's under or over-recovery becomes available over time and unwind their risk position gradually as the forecast horizon grows *shorter*.

Figure 13 below compares the approach taken in our first report against the approach taken in this updated analysis, which includes the impact of both of the changes we are making to the supplier factual.

**Figure 13   Illustration of profile of risk capital held in our First Report and
our Updated analysis**
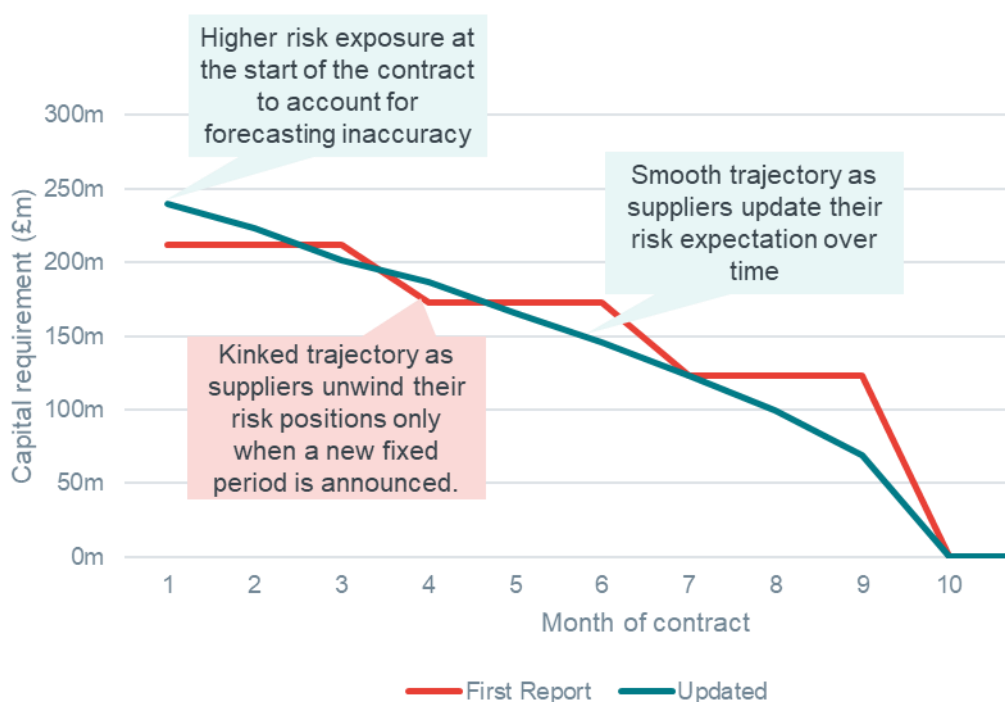
Source: *Frontier Economics analysis.*

Note: *The figure shows the risk capital held for a two year contract starting in Month 1 of a fixed period
under the 12N3F option.*

To summarise, the two key differences for the supplier's factual risk holding in our
updated analysis are:

- *First*, suppliers start off their contracts with a higher risk capital position, to
account for the higher risk they face in light of higher forecasting inaccuracy
over longer forecasting horizons; and

- *Second*, rather than unwinding their risk position only when a new fixed charge
is announced, suppliers dynamically update their expectations over time,
leading to a smoother decline in the level of risk capital held throughout the
duration of the contract. The smoothing of the curve has a relatively small
impact on the 12N3F option risk exposure given the regular charge
announcements. However, the impact is to reduce the risk exposure more
significantly on the 3N12F option, given the analysis in the first report assumed
risks remained constant for a longer period of time. This implies that the
difference in risk exposure between the two options for suppliers is much
reduced relative to estimates in the first report.

The figure above demonstrates the dynamic for a 2-year contract starting in month
1 of a fixed period. This chart would look different depending on which month of a
fixed period the retail contract is signed and the length of the retail contract.

UPDATED COST-BENEFIT ANALYSIS OF THE OPTIONS

The figure below compares the aggregate cost-benefit results in our First Report against our updated analysis.

Figure 14   Comparison of benefits

		ESO cost	Supplier cost	Total cost	Benefit
First report	Counterfactual	-	£16.8m	**£16.8m**	-
	12N; 3F	£4.8m	£1.3m	**£6.1m**	£10.7m
	3N; 12F	£3.9m	£2.8m	**£6.6m**	£10.2m
Updated analysis	Counterfactual	-	£20.0m	**£20.0m**	-
	12N; 3F	£6.4m	£1.4m	**£7.7m**	£12.2m
	3N; 12F	£4.6m	£1.9m	**£6.6m**	£13.4m

Source: Frontier Economics

In the Factual, our First Report showed that the 12N3F was marginally more attractive than the 3N12F, although the difference was too small to draw any clear conclusion. In addition, the modelling showed that 3N 12F was preferable from the ESO perspective, but 12N 3F was preferable for suppliers.

However, in this updated modelling:

- The costs to the ESO from the change have increased, but there is a clearer preference for 3N12F;

- The costs to suppliers in the counterfactual have increased significantly, increasing the overall benefits of CMP361; and

- While supplier costs in the factual are still higher for 3N12F than 12N3F, the difference between them is smaller than previously, suggesting less of a clear preference from the perspective of suppliers.

Therefore, overall, based on this analysis the 3N12F option has the higher overall benefits.

The changes can be attributed to two factors.

- **First,** with respect to the increased difference between the options from the ESO perspective, although both options imply that the ESO has a higher peak capital requirement of 15 months of exposure, the updated analysis shows that ESO costs increase much more for the 12N3F option. This is because in this option the ESO has to renew its peak capital position much more frequently, thereby bringing it back to the higher risk exposure level more regularly. For the 3N12F option, risk exposure is increased but it declines more steeply for longer, resulting in a smaller increase relative to the first report. This result therefore strengthens the conclusion from the first report with respect to the ESO, consistent with the idea that the ESO would find it easier to forecast likely BSUOS with a 3 month notice period compared to 12 months.

- **Second,** supplier costs in the counterfactual have increased given the greater forecast uncertainty beyond 3 months now assumed in the modelling. This has also marginally increased factual costs, though the overall impact is small such

that overall benefits for suppliers have increased. As in the first report, a longer notice period is preferred by suppliers as it gives greater visibility over the charges in a retail contract. However, while this remains this case, the additional risk that a shorter notice period creates for suppliers is reduced relative to the first report, due to the fact that we also account for suppliers' ability to react to new information regarding the evolving ESO under- or over-recovery as it arises (i.e. the second change we made in the supplier factual). This allows suppliers to hold lower levels of risk capital on average, relative to the approach taken in our First Report.

Overall, the updated modelling suggests the following conclusions:

- From the perspective of the ESO, there is a strengthened preference for a shorter notice and longer fixed period (e.g. 3N12F);

- For suppliers, the overall benefits case is stronger than previously, and indicates a preference for a longer notice period and shorter fixed period is logical given the workings of the model; but

- This preference for suppliers is relatively weak (much weaker than previously estimated). Combining this with the fact that modelling costs and benefits is more complex for suppliers (with more uncertainties some of which we discuss in the limitations section) it is hard to draw very clear conclusions on their preferences.

Given these two conclusions, overall we believe that the updated modelling results demonstrate a clearer overall preference for the 3N12F option.

DISCUSSION OF KEY LIMITATIONS

Our updated analysis utilises the same framework set out in our first report, but for the adjustments to our modelling to account for different levels of forecasting accuracy over different forecasting horizons. Indeed, not accounting for changes in forecasting accuracy over different time horizons was a limitation that was recognised in our First Report.[9]

Although we have now implemented a refinement to our existing framework, it has still been necessary to make a number of assumptions and simplifications for the analysis to be tractable and informative. The use of assumptions and simplifications of the real world in the analysis introduces limitations that should be noted when drawing conclusions. We discuss one key limitation of the updated analysis in this section in particular.

As described above, suppliers face two types of risk. We model the K-factor risk, but do not model the uncertainty related to unannounced fixed charges i.e. we assume a supplier is able to predict what charge the ESO would set, and is only exposed to the ESO's forecast error in setting the charge. This was a limitation with the analysis in the first report, although we expected this to be small (considerably smaller than the K-factor risk), and it would also affect the different options equally.

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[9] First Report, Section 7.3.2 specifically, and the limitations of our analytical framework are set out in Section 7.3 of our First Report.

While we still consider this effect to be small, by recognising the impact of the forecast horizon on forecasting accuracy, it is now possible that the scale of this risk is different under the two options. If suppliers are making a prediction of the ESO charge within three months of the announcement, it is still consistent with this framework to assume that given the same information set, suppliers would be able to predict correctly the ESO charge (though noting the same caveats from the first report still apply).

However, to be consistent with the concept of the forecast horizon, in theory the risk of incorrectly predicting the ESO charge should increase as the number of months (beyond three months) before the announcement that the prediction is made increases.

This is illustrated using the 12N 3F in the Figure 15 below, focussing on the 'Fix 2' period. The ESO's forecast for fix period 2 is made in month 10 at the point the charge is announced and would incorporate all available information up to that point. On the other hand, suppliers with a retail contract covering fix 2 would make their forecast of the ESO charge at the point in time the contract begins, which could be much earlier than month 10. If the customer contract begins in Month 1 and lasts two years, suppliers would be making their prediction of the ESO charge 9 months prior to the ESO setting it.

Figure 15   Example of how suppliers and ESO may conduct their forecasts at different points in time
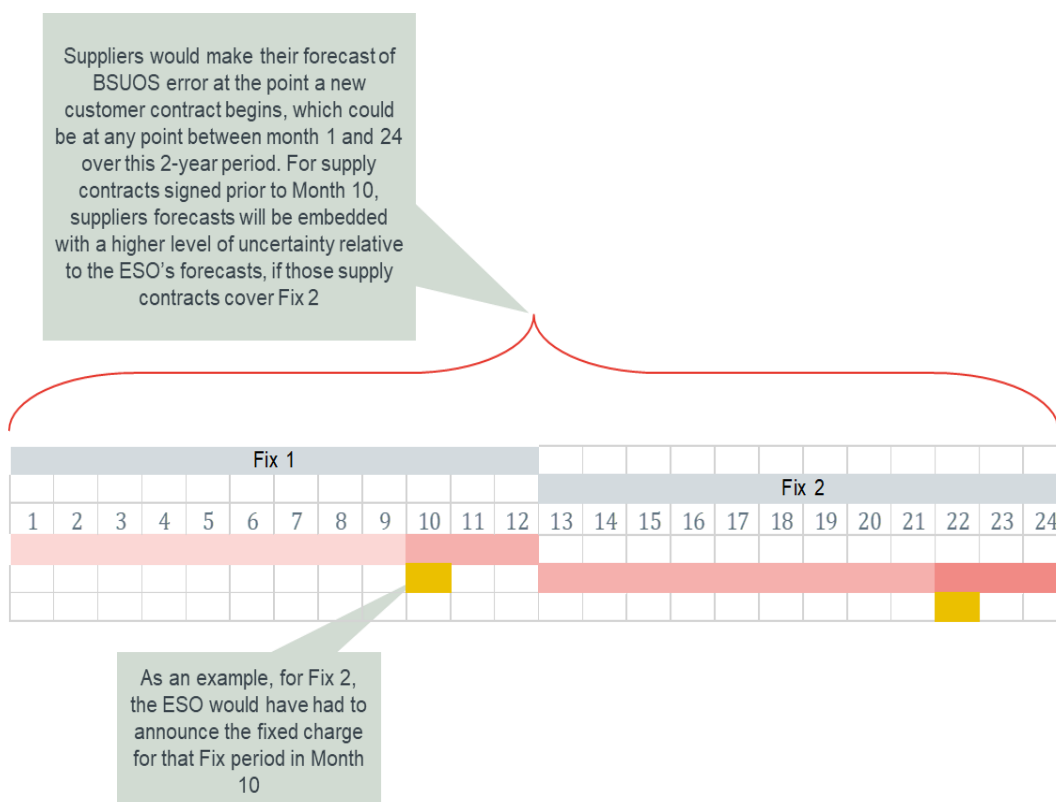
Source: Frontier Economics

Accounting for the differences in forecast timing between Suppliers and ESO is challenging from a modelling perspective. We have a limited basis on which to form assumptions regarding the possible error distribution faced by suppliers relating to errors in predicting the ESO charge. However, despite not having a sound basis on which to model this impact, there are a number of reasons why we would consider it to be small, and unlikely to fundamentally affect the conclusions of this report:

- If we were to model this risk, we would assume that it would flow through the dynamics of the model in a similar manner to that of the K-factor risk, in that it would decline over time as the extent of any gains or losses are realised, and as forecasts become more accurate.

- From this updated modelling, we have isolated the impact that relates purely to the increased K factor risk to suppliers from a longer forecasting horizon (i.e. the first change to the supplier factual, but not the second), and the impact is quite small at around £0.2m for each of the options i.e. the supplier costs in the factual were increased by £0.2m for both options in relation to this aspect of the change modelled.

- We think that is likely that the risk associated with trying to predict the ESO's forecast should be smaller than the underlying BSUoS uncertainty itself (which drives the K factor risk). The ESO's forecast will be based on the expected value of BSUOS, which is effectively the mean of the distribution of possible BSUOS. Statistically, estimating the mean of a distribution is subject to significantly less error than forecasting the actual outturn which is effectively a single random draw from the underlying distribution. Therefore, the impact on 3N12F (relative to 12N3F) of this change should be no more than £0.2m and is likely to be less. This will be especially true if suppliers employ the same data and methodology as the ESO to the extent possible, which could be supported through greater transparency of the ESO approach e.g. through publishing its methodology and data inputs.