NGGT_Annex_Network Capability
September 2020

As a part of the NGGT Draft Determination Response

nationalgrid

1 Introduction

This document is National Grid's response to the Ofgem sponsored report, following a requested audit carried out by AFRY between December 2019 and April 2020. However, as AFRY conceded in their report "we requested to see the underlying models, and undertook a few 'spot checks' of underlying assumptions and code/systems, to check the models presented were consistent with documented assumptions and processes (i.e. it was not a full audit)".

We believe AFRY's report has misinterpreted or misrepresented some important points which in turn has influenced Ofgem's view of the Network Capability methodology and therefore, the results drawn from it.

The first part of this response will address the first two "perceived weaknesses" in our methodology which Ofgem have raised concerns about. The third point, regarding assumed prices, is also covered in an additional independent report by FTI. The second section examines AFRY's report and its "detailed examination" of our Network Capability analysis (section A.5).

Although AFRY's report was dated 3 April 2020, we were disappointed that an executive summary was only released to us in mid-May and the full report not until early-July. This gave us little opportunity to engage with AFRY and Ofgem in order to clarify or challenge the audit's content before the Draft Determination was published. AFRY also noted in their report that "a number of aspects of the process are resource intensive making iterative recalibration difficult" thereby acknowledging the lengthy timescales and effort required to thoroughly investigate any suggested process improvements.

2 Ofgem's areas of concern

The following is an extract from Ofgem's Draft Determination regarding the Network Capability Assessment (NCA):

"AFRY concluded that the NCA results are dependent on underlying network analysis assumptions (e.g. relating to pressure and within-day flow patterns) and these may understate actual network capability and overstate the number of constraints, and the volumes and costs of these constraints. AFRY also concluded that using different assumptions could integrate BAU into the process, negating the requirement to cover it in step 2.

AFRY obtained further details about the methodology and assumptions through a set of targeted questions that NGGT responded to. Following its own assessment, AFRY identified a number of weaknesses in NGGT's methodology and assumptions, particularly relating to:

- *assumptions in the network analysis models regarding within-day flow patterns*
- *assumptions in the network analysis models regarding the requirements for pressure*

- *assumptions regarding the price paid for effecting constraint management actions.*

This led to Ofgem stating:

"We are concerned that the use of relatively extreme and as yet unjustified assumptions in NGGT's analysis has materially understated the physical capability of the NTS. This undermines our confidence in the results of NGGT's network capability assessment and limits our ability to rely on them when assessing NGGT's Business Plans, e.g. in assessing the CCM target and investment Cost Benefit Analyses (CBAs) and monitoring out-turn performance in RIIO-GT2."

2.1 Assumptions in the network analysis models regarding within-day flow patterns

2.1.1 AFRY's contention

AFRY *"note that:*

- *for entry, as the approach only considers backloading and disregards any coincident frontloading, it is likely to be overstating an average requirement for within-day flow;*
- *for the power-sector, the approach does not filter out those situations which are otherwise considered as un-forecasted within-day change (e.g. for a sudden loss of wind generation), which may mean that some historical observations are double-counted; and*
- *for GDNs, the approach assumes that all GDNs simultaneously demand all of their capacity rights."*
- *"These approaches seem skewed…"*
- *"We would expect less extreme assumptions on within-day flow patterns to yield greater levels of network capability. NGG has presented no information on why they chose the approach/assumptions they have beyond it being consistent with the TPC approach."*

2.1.2 Our response

Network Capability assessment is carried out separately for both Entry and Exit. The two activities apply their assumptions in slightly different ways that recognise specific differences in the way in which they, and the customers behind them, need to flow. The way in which these two activities are treated, is explained in section 5.8 of the NTS Capability Brief, 2019, which AFRY cite.

For Entry Capability, curves are drawn based on a minimum of three points whilst for Exit the 1 in 20 demand is a single point.

The elements of the process that AFRY have expressed concerns over are principally applied to ensure security of supply for Exit Capability at high demands. This is included in our "pipeline security standard" license obligation.

For Entry Capability the level of the assumptions that AFRY highlight are reduced, in line with planning and operational data to more closely reflect a business as usual approach at lower demands. It is at these lower demands that the majority of Entry Constraints are currently predicted but where assumptions more closely reflect network operation.

2.1.2.1 Entry backloading

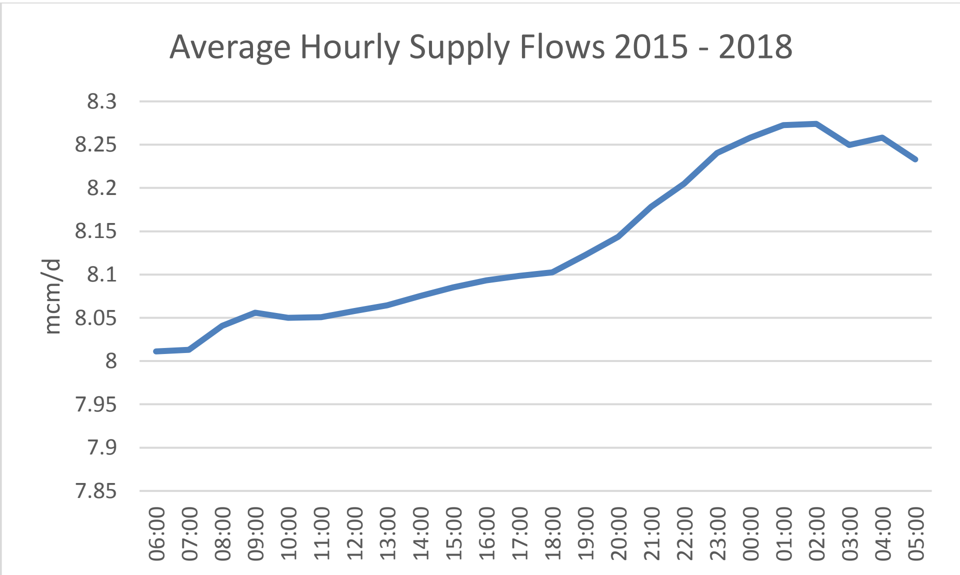
The loading of a supply describes whether a supply point supplies more gas early in the gas day (frontloading) or flows at a lower rate early on, increasing to deliver more gas later in the day (backloading). Frontloading has a positive linepack effect, reducing network linepack swings and maintaining pressures whereas backloading has a negative linepack effect, increasing linepack swing and reducing system pressures.

Nationally

For Entry points, there are a range of examples of frontloading and backloading from supplies and at each supply point for every period. Given this customer led variability, it is not feasible to model all possibilities in a meaningful way to determine the range of capability. However, analysis of historic data suggests that average Entry behaviour marginally favours backloading. Stakeholder feedback is that the commercial regime (capacity overruns, scheduling charges etc.) encourage a backloading approach and balancing late to achieve the daily (end of day) volume rather than an hour by hour flat profile or front loading which risks additional commercial costs.

In support of the assumption that we are using, Figure 1 gives a profile for the average hourly supply flow rates between October 2015 and September 2018.

Figure 1 Average hourly supply rates profile



The Transmission Planning Code (TPC) (which is consulted on with industry on a 2 yearly basis) gives this explanation, on page 68.

> *"Increasing within day flexible behaviour however, and in this case a growing tendency to backload supplies within the gas day, has led to the need to revise this approximation and explicitly model within day supply profiling, in addition to flat*

supplies. The aim of this section then is to describe National Grid's methodology for calculating such profiles for use within network analysis."

Subsequent analysis looking at South Wales suggests, through our adopted method, that this national backloading behaviour has a negligible impact on daily Entry Capability. Sensitivity analysis conducted after the audit has tested nationally flat supplies and this has shown no impact to the capability of these sites.

Locally

For the Entry zones, where Network Capability is being calculated, maximum flow rates are applied based on historic observations and known site capabilities. This has the effect of 'flattening' the local profiles as we approach maximum capability and significantly reducing the local 'backloading' potential and therefore its effect on the capability value.

This assumption was discussed with AFRY, however it does not appear to be reflected in their report.

2.1.2.2 Power station consumption

From the report alone it was unclear what AFRY's concern was regarding un-forecasted change and *"double counting"*. However, from discussions at the time we believe this again is primarily related to Exit Capability and has little impact on Entry Capability.

Observed power station behaviour impacts within day linepack depletion and our ability to ensure we are able to meet End of Day (EOD) Exit pressures linked to our 1 in 20 supply obligations. This is reflected in a more challenging way at a small number of extremity sites, consistent with ensuring security of supply on Exit. The pressure cover approach is covered later in this document, but the variation with local demand should reduce any double counting effect suggested here.

2.1.2.3 Gas Distribution Network capacity rights

Exit Capability is predicated on the 1 in 20 peak demand levels, consistent with the Pipeline Security Standard. Being 1 day in 20 years, it is, by definition, an extreme event. Again, the impact of this assumption affects Exit Capability and not Entry Capability directly. Using the level of sold capacity at each Gas Distribution Network (GDN) for our Peak 1 in 20 analysis, which is in line with our methodologies, seems prudent to ensure security of supply under our obligated conditions.

Away from peak demand, our analysis uses planning data provided by the GDNs in line with the UNC to reflect their Capacity (both Flat and Flex) requirements at lower demand levels. We also use historic agreed pressure information to replicate, where appropriate, agreed lower pressures at DN offtakes.

2.2 Assumptions in the network analysis models regarding the requirements for pressure

2.2.1 AFRY's contention

AFRY note that:

> *"Similarly to within-day flow assumptions, we would expect relaxed assumptions on pressure to yield greater levels of network capability. Despite information on the magnitude of relaxing this assumption being requested from NGG we have received no information and therefore cannot say whether it has a material impact on the Network Capability assessment."*

2.2.2 Our response

We are surprised at Ofgem being "concerned" in the light of ARFY's comment that says:

> *"[They] cannot say whether it has a material impact on the Network Capability assessment."*

There are different pressure assumptions for Entry Points and Exit Points.

The Entry Point pressures are linked to Maximum Operating Pressures (MOP) at the specific facility and are typically 1 barg below this level, to allow for any pressure fluctuation in upset conditions. These are predicated on the physical assets at the site. As a reasonable and prudent operator, we do not believe that we should alter these values and operate closer or at the MOP.

For Exit Points, there are, as AFRY point out:

- *"Assured Offtake Pressures (AOP) are the rights to pressure that have been secured by GDNs.*
- *Anticipated Normal Operating Pressures (ANOP) are the pressure levels, indicated to network users, that are anticipated to be normally available.*

Both AOP and ANOP are defined in the Uniform Network Code."

When conducting Entry Capability analysis, an Agreed Offtake Pressure is used for Exit Points at demand levels where these have historically been agreed. These points are where, historically, the Gas Control Room has consistently been able to agree, with the customer, lower pressures than the Assured Offtake Pressure when required (as described in the Transmission Planning Code). This process is also defined in the UNC and the analysis pressures used reflect the pressures historically agreed at equivalent demand levels.

These agreed pressures are generally activated on low demand days and so would have no impact on the 1 in 20 requirements of the system's Exit Capability where the Network Capability modelling is performed.

3 AFRY's impacting assumptions

AFRY's report included a number of tables. These alternate between a summary of the queries and clarifications raised with us (Tables 3,5,7,9), and describing and categorising their observations and their impact (Tables 2,4,6,8,10,11). We have included these impact tables followed by our commentary.

3.1 Table 2

Assumption	Impact of assumption	Anticipated magnitude
Definition of Network Zones.	The partitioning of the network into zones is a requirement of the process and their definition is based on the network topology, geography and whether entry or exit capacity is being modelled. It is unclear how different partitions effect the results.	Minor implications to current and target Network Capability.

The creation of the regional Exit and Entry Zones is arranged around key infrastructure assets (location of supply terminals, pipe lines, compressor stations and key demand centres). The zones best reflect how gas flows within the network based on experiential judgement. AFRY's summary of it being *"unclear how different partitions effect the results"* is unhelpful without some supporting evidence on how they would propose altering the partitions and in what way it would affect the results.

3.2 Table 4 - Network capability requirements assumptions

Assumption	Impact of assumption	Anticipated magnitude
Validity of statistical distributions used as input into the TobySpace.	Ultimately, these statistical distributions rely on expert judgement. Though, in general, the choice appear well-founded, the decision is not always supported by numerical tests. If alternative assumptions had been made, this could lead to results which may change the outcomes (i.e. changed constraint cost forecasts, changed CBA outcomes.	Moderate implications to target Network Capability.

Having stated that *"the choice appear (sic) well-founded"* AFRY go on to say that the decision is *"not always supported by numerical tests"*. They then go on to make statements, unsupported by evidence, using such terms as *"If"*, *"could"* and *"may"*.

Where we use statistical distributions to generate the range of supply and demand forecasts in 'TobySpace' (a data set reflecting probable ranges of supply and demand), a combination of expert judgement and numerical tests are used.

Each year we validate whether the distributions used the previous year are still the best fit by back testing against historic data. This is done by numerical testing in our statistics packages. We also create several iterations of a set of specific forecasts and see which of these produce the most sensible forecasts, using our experience.

If the numbers in the test are close, inconclusive or any change could be said to be down to unusual recent historic behaviour, and unlikely to be part of sustained long term change, then we use our expert judgement along with information from Energy Insights to make informed decisions on whether to change the distributions used.

Assumption	**Impact of assumption**	**Anticipated magnitude**
Utilisation of FES scenarios, their data and the weighting of each scenario..	Examples of the inputs include the overall supply/demand patterns and the rate of depletion of supplies from the UKCS. Different scenarios will lead to different utilisation levels of assets and a number may become redundant in different scenarios. In particular, in Consumer Evolution in 2030, the Intact Entry Capability will be ~25mscm/d above the TobySpace points, while in Steady Progression, the Intact Entry Capability line remains close to the TobySpace points. It is anticipated therefore, that there will be markedly different constraint costs in each scenario. However, in the constraint risk forecasting methodology, a probability is associated to each, leading to a single set of constraint cost forecasts for each of the RIIO-2 years. This assumption is likely to overstate requirements in the long-run and could impact the network capability requirements as well as the CBA results.	Moderate implications to target Network Capability.

We assume an equal likelihood of each FES scenario occurring. Axiomatic to FES is to capture the full range of plausible future energy pathways out to 2050. We have applied equal weighting precisely because we do not know what is more likely to happen – and we are just as likely to understate rather than overstate. If we had picked a scenario then AFRY's point would have more bearing. The future is uncertain, but it is our role to manage the risk so that consumers get a safe, reliable and affordable gas supply.

We create a full TobySpace dataset for each scenario and then we sample from those equally. For RIIO-2's 5-year period, there is minimal difference in the 2018 FES and TobySpace scenarios. Consequently, there is little over or under statement in any case and the post 2030 constraints, for the compressor cost benefit analyses (CBA) were not significantly impacted by this assumption.

Assumption	Impact of assumption	Anticipated magnitude
Additional weighting for high South Wales flows.	This assumption has been based on expert judgement. Any additional weighting will lead to increases in constraints and constraint costs. The impact of the assumption depends on the confidence of the judgement applied.	Moderate implications to target Network Capability.

The application of expert judgement is part of the added value that we bring to the energy industry and whilst we accept fully that *"The impact of the assumption depends on the confidence of the judgement applied."* is true but no alternatives to expert judgement are suggested.

The numbers used in the modelling were originally based on the FES scenarios. The FES data was dominated by a period of low LNG flows and this supressed their values throughout the RIIO 2 period. However, by the time we started our modelling, we had had experienced flows, from Milford Haven, that exceeded the FES predictions. This highlights the inherent uncertainty in predicting these flows.

We judged it prudent, in the light of the more recent data, to include two extra uncertainty measures for South Wales:

1. A uniform distribution to reflect absolute uncertainty. This is as likely to under forecast as over forecast.
2. A longer-term historic element which included some of the higher flows we had seen.

We feel that the comment *"will lead to increases in constraints and constraint costs"* is not strictly speaking correct. The uniform distribution, see 1. above, is just as likely to predict low Milford Haven flows as it is to predict high Milford Haven flows. We believe the longer-term historic element also more closely reflects the historic flows that have been observed but are not commonly seen in the FES predictions.

3.3 Table 6 – Network Capability analysis assumptions

Assumption	Impact of assumption	Anticipated magnitude
That network configuration continues in an analogous manner to current practises.	The Network Capability Analysis used in the assessment of the Boundary Curves follows the TPC, and the results are quite tightly linked to the pressure bounds of the network defined by the TPC. Should there by (sic) changes to pressure covers then it is expected to have direct implications to the network capability.	Moderate implications to current and target Network Capability.

This issue is discussed in section 2.2.2. Entry pressure cover is used to reflect operational compressor usage and is not applied in a way that restricts an Entry Point Capability. On

Entry we apply a limit of 1 barg below the Maximum Operating Pressure of the pipe, as per the Safety Case. It is Entry capabilities based on this approach that feed into the overwhelming majority of constraint Management costs (~97%). It is not typically the case that maintaining Exit pressure cover has the effect of restricting Entry Capability and no forecast Entry Capability shortfalls are the result of maintaining Exit pressure covers.

Assumption	Impact of assumption	Anticipated magnitude
Consideration of compressor trips in the Compressor Availability assessment and the pressure cover.	The impact of considering compressor trips both in the pressure cover as well as in the Compressor Availability assessment used in the CBA (see Section 3.5) would lead to an underestimation of the network capability. However, the number of days of outage in a year due to Minor trips is small in comparison to Medium, Severe and Critical outages. Therefore it is expected that the implication would be small.	Moderate implications to current and target Network Capability.

AFRY state that the impact of the assumption *"would be small"* but its anticipated magnitude is given as *"Moderate"*.

The above assumption is correct, but the pressure cover referred to is only applied to Exit Capability, where we are considering the 1 in 20 capability, in the event of an unplanned outage of a compressor unit. We do build in a level of security, because we are dealing with extreme events which allows for unplanned compressor trips and therefore the pressure cover level gives the Gas Control Room time to react and put in place remedial actions, such as starting an alternative compressor unit. This does not apply to the Network Entry Capability where a pressure cover is not applied, we believe this is a misunderstanding on AFRY's part.

Assumption	Impact of assumption	Anticipated magnitude
The correspondence between gas turbine output changes and pressure cover.	Analysis on historical data has been performed into the changes in gas turbine output. It is noted that this is more likely to happen in the morning and in the early evening. However, the pressure cover is applied throughout the day. This may over- allocate pressure cover and lead to a reduction in the assessed Network Capability.	Moderate implications to current and target Network Capability.

We believe that this is once again referring to Exit Capability under normal operation and does not impact Network Entry Capability. In our 1 in 20 analysis, we would expect power stations (gas turbines) to be close to or at maximum output and in this case we would apply a lower (or zero) pressure cover to account for gas turbines being unable to increase their flow rate. There are occasions where local GDN Assured Pressures impact capability but, as above, there are no forecast Entry Capability shortfalls as a result of maintaining exit pressure covers.

Assumption	Impact of assumption	Anticipated magnitude
Within-day profiles chosen in the Network Capability Analysis are indicative of constraint day behaviour.	The TPC describes the within-day flows which are used for the Network Capability Analysis. To assess the implication of within-day variations, supply flows accounting for linepack depletion (i.e., those backloading) are considered; while a proportion of those frontloading is ignored. This will reduce the network capability and impact the number of times a constraint occurs and the magnitude of the constraint.	Moderate implications to current and target Network Capability.

As supplies get closer to their daily maxima so their within day profile potential becomes flattened. We have carried out further research, with reference to the Milford Haven Entry Point using flat supplies at all terminals, and analysis shows the same capabilities as when we used profiled supplies [redacted]. This work supports our assertion that this change to linepack depletion does not impact the Network Entry Capability at Entry Points.

3.4 Table 8 – Constraint cost evaluation assumptions

Assumption	Impact of assumption	Anticipated magnitude
The fitting of statistical distributions to the number and magnitude of the constraints.	These statistical distributions are fitted to the results of the TobySpace coupled with the Boundary Curve. Given the nature of the generation of the input data there can be limited data points forming the distribution. This can mean that the statistics defining the shape parameters may be inaccurate. Moreover, there is a disassociation of the number of constraints from the magnitude of the constraints. The analysts developing the method have performed sense-checks to ensure implications are minimal, however they may lead to a constant error factor.	Moderate implications to target Network Capability.

The number and magnitude of constraints are arrived at by applying the Boundary Curve equations to each and every one of the forecasts in TobySpace. This fit tells us whether there are breaches of the boundary and if so, by how much in terms of volume. We then extract the resulting number and magnitude of constraints directly from each TobySpace. No statistical distribution is used in this part of the analysis – the results come from the databases directly and the ranges are found via a Monte Carlo simulation.

There is always a disassociation between different elements in a statistical range of results when you look at percentiles as a way of reporting range for more than one element. At percentile level (P10, P50 and P90) number and magnitude of events are statistically independent we do not expect or rely on a direct statistical relationship between number and magnitude of events at these range levels. Sense checks are done (as mentioned) purely as a validation to make sure that these levels are plausible. We do not understand how this would lead to a “constant error factor” as we do not apply a statistical correction which would lead to such an error factor.

Further investigation of the constraint forecasts indicates that even if the capability of the network were to be 5% higher than our current methodology states, this would only reduce our forecast P50 constraint cost by <15% over the RIIO2 period for the South Wales region.

Before Adjustment (Original RIIO Numbers)

[redacted]

After Adjustment (all Boundary Model lines moved up 5%)

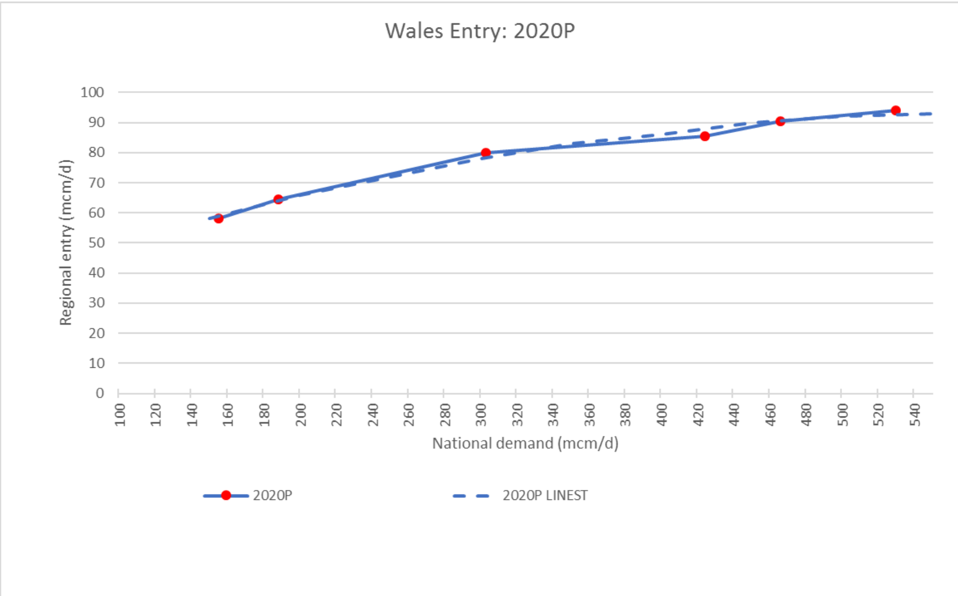
[redacted]

Assumption	Impact of assumption	Anticipated magnitude
Fitting of function to Boundary Curve.	There are a small number of data points associated with the Boundary Curve which makes successful curve fitting difficult. There are further assumptions such as a smooth curve is the best fit to the data points. A large discontinuity could impact the constraint costs, which may affect CBA outcomes.	Minor implications to target Network Capability.

Although of minor impact, we feel that this issue is worthy of comment as it once again puts forward hypothetical problems which are not supported by any evidence that there is an impact, or better alternatives. Statistical analysis involves making predictions about a population based on a sample, the only means by which absolute confidence could be gained is by sampling all the population, which is impractical and defeats the purpose of statistics.

As part of our ongoing works to refine our assumptions, further boundary curve analysis has been undertaken and Figure 2 shows the result with six data points. A quadratic curve (LINEST) is still a good approximation for a fit and as can be seen there are no *"large discontinuity"*. It is here that detailed expert knowledge of network behaviour is important to inform the correct zones and boundary shapes.

Figure 2 Wales Entry Capability using the 2020 Topology



Assumption	Impact of assumption	Anticipated magnitude
Level of coincidence between compressor availability and demand days.	The compressor unavailability assessment includes repair times and maintenance times. Each is unified in the development of the compressor units availability statistics. The Boundary Curves are defined by the number of units available and Monte Carlo simulations based on availability statistics. It is unknown how results will differ if modelling accounted for the scheduling of maintenance at times of reduced constraint risk.	Minor implications to target Network Capability.

To produce the Boundary Curves the assumption is made that all units are fully available and we do accept that this is unrealistic and we are seeking ways to display the effects of asset reliability in our future flame charts.

However, when calculating the compressor availability later on in the network capability assessment, it is assumed that 75% of maintenance is scheduled at times when the compressor is not required. This aims to reflect that for sites where flows are highly commercial, such as LNG terminals, it may not be possible to schedule all maintenance away from constrained periods. The majority of the unavailability is due to repair times for running failures.

3.5 Table 10 – Investment decisions, CBA and Capability Targets assumptions

Assumption	Impact of assumption	Anticipated magnitude
The assessment of prices in the constraint methodology.	The cost of the constraints depends the price associated with a locational buy or capacity buy back. It is assumed that these are at 60p/them in the Business Plan. This can affect the CBA results. However, in the CBA, sensitivities around the costs are performed to inform on what investment decisions are made. Therefore changes in the assumptions on price are unlikely to effect the network capability.	Minor implications to target Network Capability.

We note that AFRY does point out that this assumption is unlikely to affect the Network Capability assessment and only affects the consequences of not having enough capability. But this point is factually incorrect and is probably due to a misunderstanding on AFRY's part that was not picked up during discussions. 60 p/them is used as a base price and a [redacted] discount is applied to locational sell actions because we assume that if we need to do a buy action, we will do it at [redacted] of the base price. This process is laid out in our methodology statement.

Assumption	Impact of assumption	Anticipated magnitude
Comparative CBAs have been conducted for different options for each compressor station, though not between different options between compressor stations.	There are occasions (e.g., Felindre and Wormington and South Wales entry capacity) where alternative compressor options can interact in the reduction of constraint costs. An evaluation of the costs across stations could lead to alternative options for infrastructure developments to reach similar network capability.	Minor implications to target Network Capability.

Although of minor impact, we believe that AFRY may have misunderstood how we conducted the assessment.

For compressors, such as Wormington, the capability is based on the other compressor stations, such as Felindre and Churchover, being available. Due to the location of Wormington and the constraints seen, there were no credible investment options at other stations that would allow for an alternative investment. Only compression at Wormington is assumed not to be 100% available, due to the impact of the Medium Combustion Plant Directive.

The assessment looked at 3 compression levels; Intact (all compressors sites available), Unit C only at Wormington (all other compressor sites available but only unit C is available at Wormington) and No Wormington (all other sites available).

Consequently, investing at any of the other sites would only provide another level of resilience to sites already assumed to be at 100% availability in the assessment. The decision not to include the constraint risk for loss of compression at any other site was made because:

- both sites have on-site backup and high levels of availability
- the constraints generated from losing the units at Wormington gave sufficient “need” to do something
- the high resource requirement to assess the Network Capability for all the different combinations of compression across multiple sites would give little benefit given the availability expectation for those sites.

Assumption	Impact of assumption	Anticipated magnitude
There is a balance between expert opinion and CBA results when assessing the infrastructure changes.	In developing the long and short list of options, expert opinion has been used in the choice of solutions. It has been expected that a broad range of options has been put forward. A range of sensitivities have been conducted in each CBA, sometimes without providing a clear benefit for a single option for all. Judgement has been made based on the results to decide which option has been recommended.	Moderate implications to target Network Capability.

We agree with this assessment. The CBA should not be the sole justification for an option being selected, in fact it forms just part of the Engineering Justification Paper (EJP) template provided by Ofgem to justify these investments. In most cases the CBA does not fully justify the investment alone without the supporting EJP. Most will also be subject to an uncertainty mechanism, with only the costs to further develop the options and an understanding of the uncertainties provided.

3.6 Table 11 – Network capability assessment cycle implications

Assumption	Impact of assumption	Anticipated magnitude
Assumptions remain consistent across different parts of the methodology.	Minor changes to the assumptions impact the consistency of the modelling and the numerical evaluations. (An example of such a change is the updating of the capitalisation rate between the Engineering Justification Paper and the CBA). Should there be a substantial change then repeating the analysis or providing sensitivity studies would be required.	Minor implications to current and target Network Capability

As previously, most CBA outputs will be subject to an uncertainty mechanism, with only the costs to further develop the options and an understanding of the uncertainties provided. Should there be a substantial change then repeating the analysis or providing sensitivity studies would be required.