

Feeder 9 CBA

National Grid Excel Model Adjustments

This note addresses the following request by Ofgem:

Please provide an updated CBA spreadsheet which incorporates all revisions to your original CBA assumptions, and any areas where you disagree with our assumptions

We have provided three models that build iteratively from the CBA developed by Ofgem, which we term Model 1.

Model 1	NPC to 2044 (£m)			NPC to 2072 (£m)		
£m (09/10)	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Tunnel 2012 Option	158.89	60.89	88.65	179.48	74.56	108.42
Mitigate	156.51	43.67	34.46	202.67	66.17	73.35
NPC Comparison	-2.39	-17.22	-54.19	23.19	-8.39	-35.08
Option Favoured	Mitigate	Mitigate	Mitigate	Tunnel	Mitigate	Mitigate

Model 2	NPC to 2044 (£m)			NPC to 2072 (£m)		
£m (09/10)	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Tunnel 2012 Option	428.51	115.87	107.17	449.09	129.54	126.94
Mitigate	787.08	176.61	78.59	833.25	199.12	117.48
NPC Comparison	358.58	60.74	-28.58	384.15	69.58	-9.46
Option Favoured	Tunnel	Tunnel	Mitigate	Tunnel	Tunnel	Mitigate

Model 3	NPC to 2044 (£m)			NPC to 2072 (£m)		
£m (09/10)	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Tunnel 2012 Option	428.51	115.87	107.17	449.09	129.54	126.94
Mitigate	822.27	189.95	98.89	868.47	212.46	137.78
NPC Comparison	393.77	74.08	-8.28	419.38	82.92	10.84
Option Favoured	Tunnel	Tunnel	Mitigate	Tunnel	Tunnel	Tunnel

Model 4	NPC to 2044 (£m)			NPC to 2072 (£m)		
£m (09/10)	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Tunnel 2012 Option	428.51	384.19	191.10	449.09	397.86	210.87
Mitigate	822.27	829.50	304.72	868.47	850.54	342.71
NPC Comparison	393.77	445.31	113.62	419.38	452.67	131.84
Option Favoured	Tunnel	Tunnel	Tunnel	Tunnel	Tunnel	Tunnel

Below is an explanation of the changes made and the underpinning logic or source of the assumption.

Model 2 – Updated Impact of Security of Supply

This model builds in four updated assumptions that have been communicated to Ofgem in a separate briefing note on CBA assumptions (Update on CBA Assumptions_31_08_18);

- Effect on wholesale domestic gas price
- Effect on wholesale domestic electricity price

- Effect on constraint cost
- Effect on value of loss of load (VoLL)

A brief overview of these changes is provided below:

- A gas price impact has been assumed of 13.6 p/th for all winter months of a Feeder 9 isolation, except the first month in winter which is modelled at 25 p/th. A gas price impact has been assumed of 2 p/th for all summer months of a Feeder 9 isolation. These are prorated to 75% of the respective values from 2024.
- The electricity price impact is a new parameter. An electricity price impact has been assumed which is a 2.9 multiple of the relevant gas price increase.
- The constraint prompt price is set at 10p/kWh, which equates to £28m per day of constraint of a Feeder 9 isolation, for 78 to 103 days per annum. This supersedes all previous constraint assumptions.
- The VoLL is a new parameter that is a fixed amount of £33.5m aligned to system constraints.

In addition a correction is made to the original Ofgem Model:

- In Model 1, a free span probability of <20m has been incorrectly inputted for scenario 1. The value used is 1.23%, where NGGT's assumption, which it should be reflecting, is 12.3%. This has therefore been updated to this value. (Tab – Input 1, cell H47)

Model 3 – Updated lease and free span logic

This model corrects some errors that we believe exist in how Ofgem have sought to take into account the potential for a tunnel to be constructed through loss of lease and >55m free span. The changes made are set out below.

- The calculation in Rows 20 and 40 of the Calculation sheets in Model 1 take the probability of a loss of lease/free span in any one year and multiply this probability by the cumulative discounted cost of building and operating a tunnel. These calculations are then discounted further to get to a discounted net present cost. Therefore, there appears to be the effect of double discounting which materially under-values the monetised element of loss of lease and monetised risk of building a pipe due to free span. To correct this, all costs have been applied in an 09/10 price base and the relevant discounting applied thereafter.
- Model 1 has a parameter that explains the likelihood that the “Probability that the lease is still in force and current pipeline is operational”. This formula (in Row 21) is used to reduce mitigation costs in the future for the diminishing likelihood that the pipeline is still operational. The formula that is used for this is;

$$y = (1 - x - z)^{n-8}$$

where

y is probability that lease is still in force

x is the probability of losing the lease in any 1 year
z is the probability of the pipe free spanning (>55m) in any 1 year
n is the number of years out from 2013/14

Note that this formula only takes effect from year 9 (for most costs - see next point), which is 2021/22, and gives a 23 year time horizon to 2044.

Considering the probabilities in a decision tree, there are 4 eventualities in any one year;

- A) NGGT does not lose the lease and the pipe does not free span.
- B) NGGT loses the lease, triggering the need for a tunnelled replacement. Feeder 9 pipeline does not free span.
- C) NGGT pipe free spans >55m, triggering the need for a tunnelled replacement. NGGT is able to maintain the lease with Associated British Ports.
- D) NGGT loses the lease and the pipe free spans >55m. These are not mutually exclusive, as a free spanning pipe may lead to a decision from Associated British Ports to cancel the lease.

Ofgem's interpretation does not consider Option D in their analysis. In order for a pipe to be fully operational, it needs to fulfil Option A above. In subsequent years, it would need to fulfil the probability of Option A multiplied by the power of the year in question, to show that subsequent years also followed Option A through the course of the decision tree.

We believe the correct formula to model this effect, and as amended in Model 3, therefore is;

$$y = ((1 - x) * (1 - z))^{n-8}$$

- There appears to be an inconsistency in Ofgem's logic with the application of the reducing factor discussed above, due to the probability of a tunnel being built, applied to most costs from 2021/22, however for the costs of building a replacement tunnel this is applied from 2013/2014. We have therefore aligned these assumptions with the reducing factor applying consistently from 2021/22.

Please note, we do believe the approach taken in this area is inconsistently applied, as it does not seem to be included for TPI, however the calculations and logic are difficult to follow and therefore we have not attempted to correct for this.

Model 4 – Updated scour and free span probabilities

The scour and free span probabilities used in Model 1 are shown below and all values stem from the scour event probability. Ofgem's low case is based on 2 scour events over 34 years. Following a number of discussions we have articulated that a more reasonable assumption would be 6 scour events over 7 years, or due to the close proximity of 4 of the scour events and potential benefit of frond matressing, 3 scour events over 7 years.

In Model 4 we have used the lower of these values i.e. 3/7 – 43% for scenario 3 and NGGT's values for scenario 2 to provide in National Grid's opinion a more robust range.