Errors in Proposed Ofcom NGN Model for the NCC 2013-2016

1. Correcting referencing mistake on Economic module EX sheets

The "operating expenses at final year MEA price" should have been calculated as the following, since this has been done in the case of investment expenditure[1]:

$$\text{Opex}_t \times \frac{\text{MEA price}_{2045}}{\text{MEA price}_t} \qquad \text{(Equation 1)}$$

Instead, the value for 2005 is given by the below expression, while 0 values have been given for all other years.

$$\text{MEA price}_{2005} \times \frac{\text{MEA price}_{2045}}{\text{MEA price}_{2005}} = \text{MEA price}_{2045} \qquad \text{(Equation 2)}$$

These zero values arise, since the former MEA price 2005 has been taken from a different row than the term in the denominator[2], in which it is the only value, so that empty cells are referenced for the remainder of years. Due to this mistake, the base price component (as well as the utilisation component, by implication) is heavily understated: The sum of the PV of operating expenditure is much lower given that it only consists of the 2005 value. In the final step of calculating base prices, this lower term is divided by the sum of the PV of output (at final year utilisation), which naturally returns a much lower value than it should. This has the consequence that the remaining cost recovery over and above that due to base prices and utilisation component is done according to the input price component calculation, which, as has been described above, is heavily dependent on the uneven profile of "excess input prices". This implies that unit costs are set higher in earlier years and fall rapidly after the "step" from 2009-2011. The expected result is that too much of cost recovery is front-loaded. This is indeed confirmed when correcting the referencing error described above.

The correction can be implemented by changing rows 77 of the EX sheets to use row 6 rather than 14.

2. Correcting linkage in sheet Input Erlang of the Network cost module

Changing cell e13 in sheet Input_Erlang of the original Network cost module has no effect. Therefore linkages need to be slightly modified

[1] See analogous calculation for capital investment in the Excel file "2. Economic", worksheets "E1"-"E200", row 28.

[2] The former term stems from Excel file "2. Economic", worksheets "E1"-"E200" row 14, while the denominator term stems from row 16. For column G (representing 2005), the values are identical, but empty for all other years in row 14.

3. Correcting the dimensioning of the call server so it depends upon both residential and business voice

On worksheet Cal_service of the network module the traffic demand does not include business traffic. Only residential is accounted for. The following correction has therefore been made

Row 55 - ' Busy hour MOU across all SCV'

Starting at G55 modify reference used in formula from 'Calc_Demand!G190:G202' to 'Calc_Demand!G274:G286'. This will pick up total traffic rather than just residential traffic.

Repeat for other columns in the row

4. Correct treatment of negative utilisation output

A logical problem contained within the proposed NGN model is that for several elements[3], the utilisation component is negative, when in fact it should be positive. This issue has the potential to aggravate the dependency of the cost recovery profile on the input price component

The utilisation component is meant to add a component to base prices to account for the fact that utilisation in early years lies below that in the terminal year

According to Ofcom, a negative utilisation component should arise in cases in which the utilisation of an asset decreases over time[4] (relative to utilisation in the final year of 2045). However, for many network elements the number of elements in operation is set to zero in early periods, but output is still positive[5]

Consequence: The concept of "output per element" or "utilisation" is ambiguous when no elements are meant to be in operation, but output volumes are still positive

Mathematically, it is not possible to divide by zero. Therefore, the "output per element" figure is set to zero in years with no elements in operation but positive output figures[6]. Thus when considering the profile of "output per element" over time, utilisation is in fact rising, given that it is positive in the final year[7]

[3] Excel file "3. Economic", worksheets "E1"-"E200", row 47. Example: Element 115, worksheet "E115"

[4] Ofcom [1]. Paragraph 5.44, page 40. "A second component is added to recover the additional costs caused by earlier underutilisation of the network compared to the final year level. If underutilisation is increasing then this could be a negative value."

[5] Excel file "3. Economic", worksheets "E1"-"E200", elements in operation in row 8, output in row 18.

[6] Excel file "3. Economic", worksheets "E1"-"E200", row 20.

[7] Excel file "3. Economic", worksheets "E1"-"E200", cell AV20.

Nevertheless, the utilisation component is negative. There is a logical inconsistency, since the utilisation component should only be negative when utilisation is falling

In the base price calculation, it is assumed that output is in fact given by "output at final year utilisation", which is calculated by multiplying units of elements in operation in the respective period by final year utilisation (output per element)[8]

If the number of elements in operation is set to zero in early periods, output at final year utilisation is zero in those years and thus, so is cost recovery[9]

However, actual output volumes are positive in those years, even though elements in operation are set to zero[10]

Therefore, total cost recovery at actual output volumes[11] may be *higher* than total cost recovery at final year utilisation, since total cost recovery is zero in years in which no elements are in operation[12]

The result of the above is that the utilisation component becomes negative[13]

Calculation example: Calculation of the utilisation component for capital investment of the element "IN_Session Border Control_GE line card" (Element 151)

Output for this network element figures are positive from 2006 onwards[14]

Elements in operation are set to zero until 2009[15], in which 40 elements are in operation

- ➔ Since it is not possible to divide by zero, output per element figures are set to 0 until 2009, in which they take a value of 10.15 million mb per year[16]

Output per element figures then increase according to a concave profile and take a value of roughly 20.6 million mb per year in 2045

- ➔ utilisation is increasing over time

[8] Excel file "3. Economic", worksheets "E1"-"E200", row 30. Output per element in 2045 is referenced in cell AV20.

[9] Excel file "3. Economic", worksheets "E1"-"E200", output at final year utilisation in row 30 is calculated by multiplying elements in operation in row 8 by final year utilisation in cell AV 20. Cost recovery from base prices is given in row 34.

[10] Excel file "3. Economic", worksheets "E1"-"E200", row 18

[11] Excel file "3. Economic", worksheets "E1"-"E200", row 38

[12] Excel file "3. Economic", worksheets "E1"-"E200", row 40

[13] Excel file "3. Economic", worksheets "E1"-"E200", row 47

[14] Excel file "3. Economic", worksheet "E151", row 18

[15] Excel file "3. Economic", worksheet "E151", row 8, 2009 figure in cell J8

[16] Excel file "3. Economic", worksheet "E151", row 20, 2009 figure in cell J20

Given positive base prices[17], the costs recovered by achieved output, are positive from 2006 onwards; the sum of the present value of cost recovered by achieved output sums to roughly 1.1907 million pounds[18]

However, costs recovered by output at final year utilisation (elements in operation multiplied by output per element in 2045, which is the figure above of 20.6 million mb per year) take values of zero until 2009, given that no elements are in operation until then[19]

The sum of the present value of costs recovered by output at final year utilisation is consequently given by 1.1776 million pounds[20]

Therefore, the present value of additional cost recovery required by the utilisation component[21], given by the difference between sum of the present value of costs recovered by output at final year utilisation and the sum of the present value of cost recovered by achieved output, is negative at 0.131 million pounds[22]

This causes the utilisation component (which is this figure, divided by the sum of the present value of output[23]) to be negative[24]

This contradicts the statement by Ofcom, that the utilisation component should be negative when utilisation is falling

[17] Excel file “3. Economic”, worksheet “E151”, row 33

[18] Excel file “3. Economic”, worksheet “E151”, cell F39

[19] Excel file “3. Economic”, worksheet “E151”, row 34

[20] Excel file “3. Economic”, worksheet “E151”, cell F35

[21] Excel file “3. Economic”, worksheet “E151”, row 40

[22] Excel file “3. Economic”, worksheet “E151”, cell F40, is given by F35 - F39 = 1.1776 - 1.1907 = 0.1310

[23] Excel file “3. Economic”, worksheet “E151”, cell F44

[24] Excel file “3. Economic”, worksheet “E151”, row 47, all elements contain the value of F40/F44.

5. MEA investment price referencing inconsistency

Ofcom has made an error with regard to the treatment of the MEA investment prices

Rather than using “Unit Equipment Capex by Element” as the relevant per unit MEA prices, “Unit Cost to Implement by Element” has instead been referenced to calculate investment prices over time

This appears to be a miscoding as the referenced costs are effectively labour costs[25], against which it does not seem appropriate to evaluate total investment expenditure each year

- This has to be considered against the application of the negative “capex trend by element” to 2005 prices, to arrive at the respective period MEA prices, to be able to calculate relative MEA prices[26]
- The appropriate trend to be applied to the 2005 price would be the positive labour cost trend, which is in fact the trend used to calculate “Unit Cost to Implement by Element” over time in the network cost model[27]

Note: since MEA prices are only used to calculate relative prices across time in the first step of the unit cost calculations (base prices), the incorrect referencing does not change the results.

In the final stage of unit cost calculations (input price component), the level of MEA prices matters in determining the absolute value of the excess input prices[28] as well as the output value profile. The inconsistency with respect to the “Unit Cost to Implement” series being referenced instead of “Unit Capex” is visible again

Note: Given that the ratio of outstanding cost recovery over the sum of PV of the output value profile is multiplied by excess input prices, this cancels out

[25] In the Excel file “3. Economic”, worksheet “Other inputs” cells H432-H630 reference “2. Network”, worksheet “Calc_UnitCapex” rows 8-208. These prices are then referenced in worksheets “E1”-“E200” in cell G10.

[26] In the Excel file “3. Economic”, worksheet “Other inputs”, rows 23-222 reference “2.Network”, worksheet “Input_CostTrends” rows 287-486. These trends are then referenced again in column 11 and subsequently applied to the above referenced prices in worksheets “E1”-“E200” in column 12.

[27] In the Excel file “2. Network”, worksheet “Calc_UnitCapex”, rows 9-208 reference “2.Network”, worksheet “Input_CostTrends” row 64.

[28] Excel file “3. Economic”, worksheets “E1”-“E200”, row 55.