VERMILION ENERGY

Appendix 1: Shorthaul/Optional Charge analysis Vermilion ref MOD 678 alternatives

INTRODUCTION

National Grid (NG) has provided some analysis on the Optional Charge (OC) under the MOD 678 Alternatives.[1] This analysis was a "snapshot in time" by considering the shorthaul routes used in Gas Year (GY 2017/18 and compared the OC tariff under the respective MOD 678 Alternatives with the standard capacity charges (CWD or Postage Stamp methodology respectively); NG did not consider any behavioural analysis.

Vermilion builds further on this analysis by extending it in the following manner:

- Considering GY 2019/20 data with respect to tariffs and Forecasted Contracted Capacity (FCC)
- Considering all potential entry-exit routes and checking whether these routes could be profitable under the OC tariff compared to the standard charges; this to provide an indication of potential behavioural changes of shippers in contracting capacity
- For entry capacity the analysis is extended by considering the (average) tariff under existing contracts as well
- Considering the impact of Non-Transmission (formerly SO[2]) charges (commodity) that are applicable in combination with the standard regime but not when shippers take the Optional Charge.

Our approach is further explained in the paragraphs below.

In the section thereafter we provide our analysis on the Optional Charge for the alternatives 678D, 678G, 678H and 678J, as they have a comparable Optional Charge.

Then we have a section in which we provide our analysis on the Optional Charge for the alternative 678B.

In the final section we provide a summary of our findings.

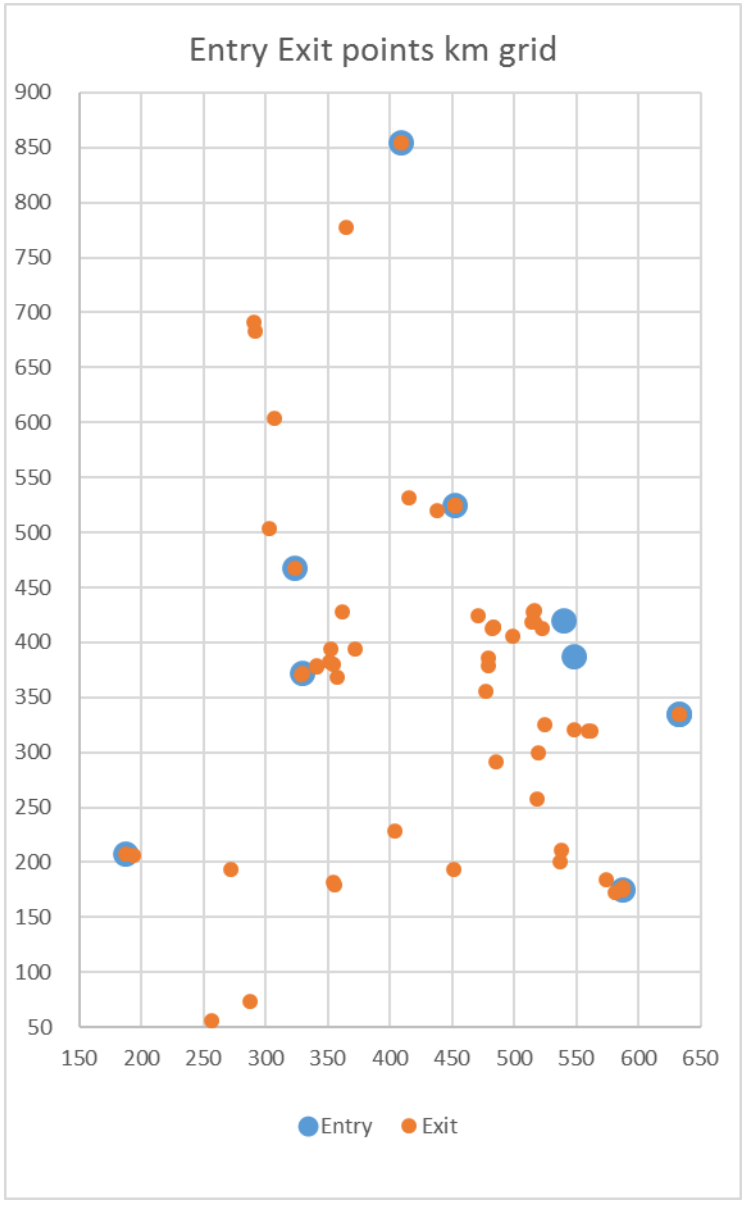
[1] NG Optional Charge Analysis v1.3 April 2019

[2] The abbreviation SO is used to refer to the new "Non-Transmission" Charges which will approximately replace the previous System Operator (SO) charges

Entry-Exit points represented geographically

All alternatives with an optional charge ("shorthaul") do not offer this service to exit in the GDN networks[3], neither to storage facilities. On the entry side it is not offered to entries from storage facilities.

This analysis is therefore focussed on the remaining exits (NTS directly connected industry, NTS directly connected power stations and IPs) and entries (beach terminals, IPs and LNG). For the entries only those with an FCC in 2019/20 above zero are included in the analysis. We have further excluded Moffat (Irish Interconnector) as entry point, as this has only interruptible capacity. This approach results in **64 exit points** and **10 entry points**. Based on google-maps the GPS coordinates are estimated and then transferred into X and Y coordinates (rounded to kilometers) as in the OSGB 1936 Coordinate Reference system. This results in the following geographical representation of the 64 exit and 10 entry points.



[3] This includes NTS/DN offtakes as well as large connected load within the DN

Straight Line Distance Matrix

Based on XY-coordinates the straightline distance for each entry-exit route can be calculated easily (it is the square root of [(Xentry-Xext)^2 +(Yentry-Yexit)^2]). A sanity check has been done with the distances provided by NG along the NTS grid pipelines. For those rare occasions that the NG pipeline distance[4] was shorter than our calculated straight line distance, derived from estimated GPS coordinates, differences were on average 3 km and highest difference less than 8 km. So we believe the straight line distances in our analysis will have an inaccuracy of less than 10 km and therefore we do not think that this inaccuracy will materially affect our conclusions.

Existing capacity tariffs (entry points)

With respect to the existing capacity tariffs the graph provided by NG[5] was used to estimate the average[6] existing capacity tariff. See table below.

Entry point	St Fergus	Teesside	Barrow	Burton Point	Easington	Theddle-thorpe	Bacton IP	Bacton UKCS	Isle of Grain	Milford Haven
p/kWh/d	0.0350	0.0090	0.0005	0.0001	0.0020	0.0120	0.0070	0.0080	0.0001	0.0050

[4] As available in the NG "Sensitivity Tool (Model) 0678 V3.1 CWD Transmission Services (21 March 2019)" – see Distance Matrix sheet

[5] In the pdf file labelled "Existing Contracts Summary Note - 08 04 2019"

[6] Only the average level per entry point was provided in the Existing Contracts Summary Note. No individual tariff levels have been provided.

ANALYSIS FOR MOD ALTERNATIVES 678D, 678G, 678H AND 678J

MNEPOR[7] values

In the MOD alternatives 678D, 678G, 678H and 678J the MNEPOR value is relevant for determination of the Optional Charge. In our analysis we have used the MSPOR values as available on NG website in 2017[8], used as preparation for MOD 636. From the 64 exits, as referred to earlier, only 3 exits were not represented in this 2017 dataset. To avoid overestimating the attractiveness of the Optional Charge we have assumed an MNEPOR value of zero for these 3 exits and together with the 7 exits[9] in the 2017 list with an MNEPOR of zero we have a resulting set of **54 exits** for our analysis for the Optional Charge under MOD 678D, 678G, 678H and 678J.

Results of analysis

Runs were made using NG sensitivity tool v3.1 for Gas Year (GY) 2019/20 assuming Modification 0678 and 0678A, so no OC tariffs are applicable and the storage discount is assumed at 50%. The resulting capacity tariffs under CWD and Postage Stamp as well as the SO commodity charges (0.014 for entry and exit respectively) are taken into consideration. It has to be noted that no iterative runs have been made that would incorporate the impact of OC tariffs on the other tariffs. So the necessary increases in tariffs to compensate for the income loss have not been taken into account. So we are probably underestimating the attractiveness of the OC product i.e. if we were to update the tariffs for this income loss most likely we would find additional entry-exit routes having lower OC tariffs than the sum of the standard tariffs.

NG had verified the shorthaul routes used in GY 2017/18 and found 17[10] qualifying routes under the CWD Model and 18 under the Postage Stamp model. As commented in the 0678 Draft Workgroup Report this analysis was not considering any other potential routes. We further note that NG states it has only compared the condition that the optional charge is less than the prevailing firm (Reference Price Methodology) RPM entry and exit prices. This naturally yields a lower number of attractive routes than if the non-transmission services commodity charge is also included in the comparison. We have extended the analysis to consider all entry-exit routes and furthermore we have analysed the impact of the entry tariffs for existing capacity (ie purchased prior to 6 April 2017) and the impact of incorporating non-transmission charges or not.

All routes are provided in the table below. To provide transparency we have included the data on MNEPOR, FCC, straightline distance and resulting OC tariff, so that our calculations/analysis can be verified.

[7] THE MNEPOR is the Maximum Network Exit Point Offtake Rate and the MSPOR is the Maximum Supply Point Offtake Rate. In this analysis both refer to the maximum daily offtake rate in kWh/day.
[8] Transitional Exit Data Publication Sep12.xls
[9] This may be an underestimate of the attractiveness of the Optional Charge
[10] NG Optional Charge Analysis v1.3 April 2019 page 11 and 18

							CWD				Postage stamp			
Exit Point	**Type**	**MNEPOR GWh/d**	**FCC GWh/d 2019/20**	**Entry Point**	**km**	**OC tariff**	**Cat1**	**Cat2**	**Cat3**	**Cat4**	**Cat5**	**Cat6**	**Cat7**	**Cat8**
Bacton (Great Yarmouth)	Power	20.0	20.0	Bacton IP	0	0.0057	1	1	1	1	1	1	1	1
				Bacton UKCS	0	0.0057	1	1	1	1	1	1	1	1
Bacton (IUK)	IP	592.1	185.4	Bacton IP	0	0.0017	1	1	1	1	1	1	1	1
				Bacton UKCS	0	0.0017	1	1	1	1	1	1	1	1
				Theddlethorpe	100	0.0341		1	1	1		1	1	1
				Easington	127	0.0426		1		1		1	1	1
				Isle of Grain	166	0.0552				1			1	1
Billingham ICI (Terra Billingham)	Ind.	58.6	33.6	Teesside	15	0.0206	1	1	1	1	1	1	1	1
Burton Point (Connahs Quay)	Power	72.6	12.3	Burton Point	0	0.0136	1	1	1	1	1	1	1	1
Deeside	Power	29.6	4.4	Burton Point	1	0.0390		1	1	1		1	1	1
Grain Power Station	Power	67.2	48.8	Isle of Grain	0	0.0034	1	1	1	1	1	1	1	1
Medway (aka Isle of Grain Power Station, NOT Grain Power)	Power	38.1	32.8	Isle of Grain	2	0.0063	1	1	1	1	1	1	1	1
Middle Stoke (Damhead Creek, aka Kingsnorth Power Station)	Power	43.2	95.3	Isle of Grain	7	0.0039	1	1	1	1	1	1	1	1
				Bacton IP	170	0.0632				1				1
				Bacton UKCS	170	0.0632				1				1
				Theddlethorpe	218	0.0804								1
Moffat (Irish Interconnector)	IP	429.0	212.9	Barrow	138	0.0376		1	1	1		1	1	1
				Teesside	166	0.0449		1	1	1		1	1	1
				Burton Point	233	0.0627				1				1
				St Fergus	270	0.0724		1	1	1		1		1
				Easington	297	0.0795								1
Pembroke Power Station	Power	121.2	121.2	Milford Haven	7	0.0041	1	1	1	1	1	1	1	1
				Burton Point	215	0.0777				1				1
Phillips Petroleum, Teesside	Ind.	7.5	3.7	Teesside	0	0.0230	1	1	1	1	1	1	1	1
Rosehill (Saltend Power Station)	Power	67.2	57.8	Easington	26	0.0201		1	1	1		1	1	1
				Theddlethorpe	53	0.0374		1		1		1	1	1
				Teesside	115	0.0782								1
Ryehouse	Power	38.7	38.7	Isle of Grain	61	0.0567				1				1
Shellstar (aka Kemira, not Kemira CHP)		16.5	11.7	Burton Point	13	0.0393		1	1	1		1	1	1
St. Fergus (Peterhead)	Power	113.5	73.3	St Fergus	0	0.0026	1	1	1	1	1	1	1	1
Stallingborough	Power	68.0	52.7	Easington	19	0.0171		1	1	1	1	1	1	1
				Theddlethorpe	37	0.0297		1	1	1		1	1	1
Staythorpe	Power	84.0	41.5	Theddlethorpe	77	0.0785								1
Sutton Bridge Power Station	Power	38.4	42.6	Theddlethorpe	67	0.0563				1				1
				Bacton IP	86	0.0736								1
				Bacton UKCS	86	0.0736								1
Teesside (BASF, aka BASF Teesside)	Ind.	15.4	9.8	Teesside	0	0.0108	1	1	1	1	1	1	1	1
Teesside Hydrogen	Ind.	6.6	13.3	Teesside	0	0.0062	1	1	1	1	1	1	1	1
Thornton Curtis (Humber Refinery, aka Immingham)	Ind.	110.4	67.0	Easington	24	0.0180		1	1	1		1	1	1
				Theddlethorpe	45	0.0309		1	1	1		1	1	1
				Teesside	124	0.0807								1
Thornton Curtis (Killingholme)	Power	88.0	48.3	Easington	26	0.0253		1	1	1		1	1	1
				Theddlethorpe	47	0.0425		1		1		1	1	1
Upper Neeston (Milford Haven Refinery)	Ind.	8.0	8.3	Milford Haven	0	0.0104	1	1	1	1	1	1	1	1
Weston Point (Rocksavage)	Power	43.6	18.8	Burton Point	23	0.0506				1			1	1
Count:				number of routes			15	30	27	38	16	30	31	45
				number of unique exits			13	20	20	23	14	20	21	24

Cat1: OC <= existing entry capacity tariff + CWD exit capacity tariff
Cat2: OC <= existing entry capacity tariff + CWD exit capacity tariff + SO entry + SO exit
Cat3: OC <= CWD entry capacity tariff + CWD exit capacity tariff
Cat4: OC <= CWD entry capacity tariff + CWD exit capacity tariff + SO entry + SO exit
Cat5: OC <= existing entry capacity tariff + PS exit capacity tariff
Cat6: OC <= existing entry capacity tariff + PS exit capacity tariff + SO entry + SO exit
Cat7: OC <= PS entry capacity tariff + PS exit capacity tariff
Cat8: OC <= PS entry capacity tariff + PS exit capacity tariff + SO entry + SO exit

The number of routes with OC profitable are summarised in the table below.

	Entry Capacity Charge	Exit Capacity Charge	SO charges	OC profitable	
				Number of routes	Number of unique exits
Cat1	Existing	CWD	-	15	13
Cat2	Existing	CWD	SO entry + SO exit	30	20
Cat3	CWD	CWD	-	27	20
Cat4	CWD	CWD	SO entry + SO exit	38	23
Cat5	Existing	Postage Stamp	-	16	14
Cat6	Existing	Postage Stamp	SO entry + SO exit	30	20
Cat7	Postage Stamp	Postage Stamp	-	31	21
Cat8	Postage Stamp	Postage Stamp	SO entry + SO exit	45	24

The eight categories have been grouped into the following four groups for comment:

a. Standard capacity tariffs plus SO commodity charges (highlighted in darker blue)

   In 38 routes (23 unique exits) we see that the OC tariff is more attractive than the capacity tariffs under CWD (for entry and exit) plus the SO charges for entry and exit. For IP exits we see distances with attractive tariffs up to 270 km and for the non-IP exits up to 215 km.

   In 45 routes (24 unique exits) we see that the OC tariff is more attractive than the capacity tariffs under Postage Stamp (for entry and exit) plus the SO charges for entry and exit. For IP exits we see distances with attractive tariffs up to 297 km and for the non-IP exits up to 218 km.

b. Existing capacity entry, standard capacity exit plus SO commodity charges (highlighted in grey)

   In 30 routes (20 unique exits) we see that the OC tariff is more attractive than the capacity tariff for existing entry capacity plus CWD exit capacity tariff plus the SO charges for entry and exit.

   The exact same 30 routes are found comparing OC tariff with existing entry capacity plus Postage Stamp exit capacity plus the SO charges for entry and exit.

   In these 30 routes we see distances up to 270 kilometer (St. Fergus – Moffat) to be attractive. For exit point Bacton (IUK) we see distances up to 127 km and for non-IP exits we see distances attractive up to 53 km.

c. Standard capacity charges only (highlighted in lighter blue)

   If we use the standard entry and exit tariffs, but we exclude the non-transmission services commodity charges we find 27 qualifying routes for CWD (cat3; 20 unique exits) and 31 qualifying routes for Postage Stamp (cat7; 21 unique exits). This is more than the 17 and 18 routes respectively as in NG's analysis, because NG's analysis was only considering the shorthaul routes in 2017/18 under the current charges.

d. Existing capacity entry, standard capacity exit

   This category provides the lowest numbers of qualifying routes and unique exit points. For the CWD methodology being 15 routes and 13 unique exits and for the Postage Stamp methodology being 16 routes and 14 unique exits.

Conclusion with respect to MODs 678D, 678G, 678H and 678J

We believe that NG analysis that showed only routes up to 30 km to be attractive does not provide a complete enough picture. Our analysis shows that up to 23 routes above 30 km are attractive under OC tariffs as well: 13 of them are above 100 km of which 5 routes are even above 200 km. We believe that our analysis shows that these alternative MODs offer an OC tariff that is potentially much more widely attractive than the NG analysis suggests. This increases the risk that the tariff could apply in situations where there is no likelihood of building an alternative pipeline.

ANALYSIS FOR MOD ALTERNATIVE 678B

Introduction

We have analysed the OC tariff as proposed under 678B for GY 2019/20 data. An important element of the OC tariff under this proposal is that it is related to the CWD tariffs for the standard capacity. For our analysis we have taken the results from NG OC-analysis[11] as our starting point i.e. 25% higher capacity charges for entry and 9% higher for exit compared to the CWD capacity tariffs without the OC possibility. Furthermore we have assumed the SO charges being increased from 0.014 to 0.0201 p/kWh. Last but not least we have used the System Utilisation Factor SUF as 60.1% as provided under point 19 in the NG OC-analysis.

Consideration of the OC formula under 678B

The total tariff (entry + exit) under the OC formula under 678B can be written as:

$$OCtariff = (D / CWDen \times RPen/ SUF) + (D/ CWDex \times RPex/ SUF)$$

This can be rewritten as:

$$OCtariff = D/SUF \times (RPen/CWDen + RPex/CWDex)$$

It is important to note that RPen, the entry tariff under CWD is linear with the weighted average distance to the exits, being CWDen. In other words: RPen/CWDen is a constant. RPex, the exit tariff under CWD is similarly linear with the weighted average distance from the entries, being CWDex. So, comparably to entry, RPex/CWDex is also a constant figure. Furthermore SUF is the same figure for all entry/exit routes. So the whole OC formula under 678B can be simply written as:

$$OCtariff = D \times Constant$$

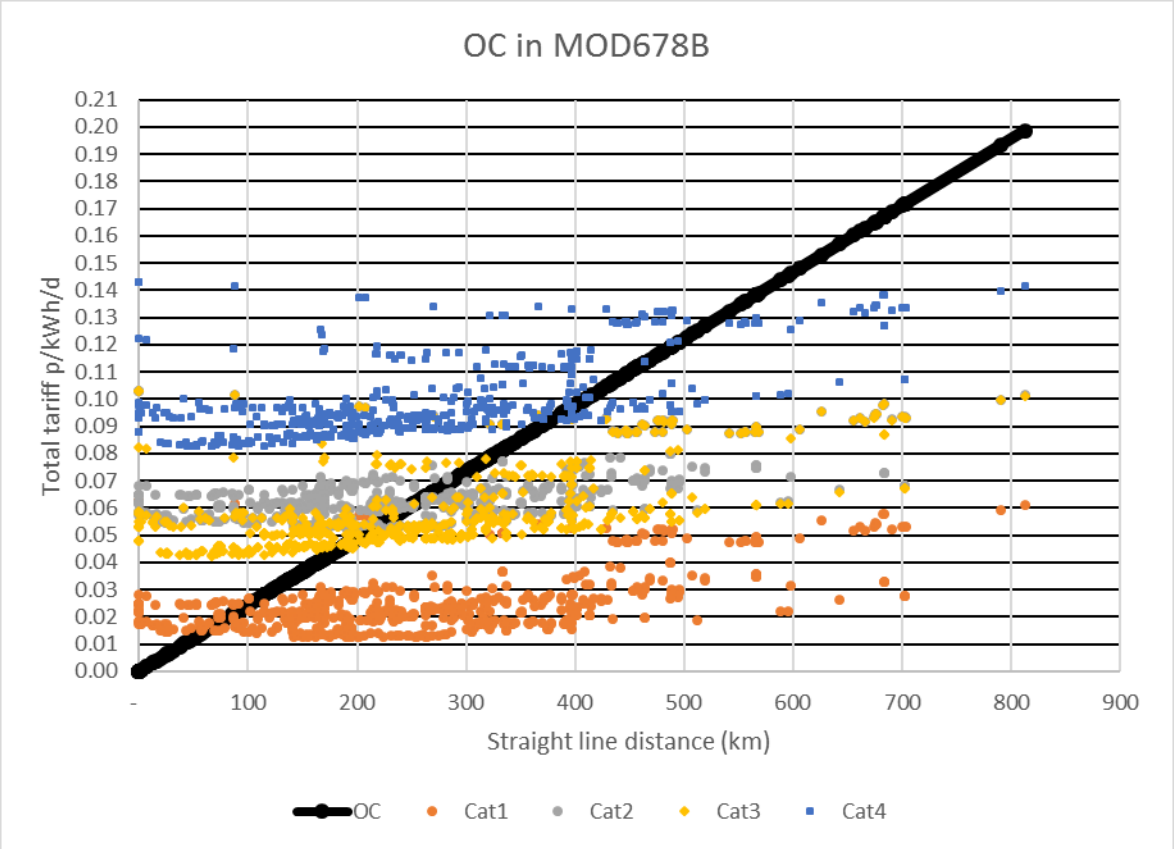
Conclusion:
So independently of the entry-exit route and independently of the OC capacity assumed, every OC (point-to-point) tariff is a constant times the straight line distance.

Comparison of OC tariff and the standard charges

Comparable to the analysis as described for 678D, 678G, 678H and 678J, we have compared the OC tariff with four different tariff combinations:
Cat1: existing entry capacity tariff + CWD exit capacity tariff
Cat2: existing entry capacity tariff + CWD exit capacity tariff + SO entry + SO exit
Cat3: CWD entry capacity tariff + CWD exit capacity tariff
Cat4: CWD entry capacity tariff + CWD exit capacity tariff + SO entry + SO exit

We have taken all 64 exits into consideration as the OC tariff is independent of FCC and/or MNEPOR. In the chart below the OC-tariff (linear dependent on the straight line distance) is compared with the 10 x 64 entry-exit routes for the four categories as specified above.

[11] NG Optional Charge Analysis v1.3 April 2019 pages 8-10



Each point shows the tariff for each route under the relevant category. For all the routes that are above the black OC line it would make sense to opt for the OC, as the OC is a lower tariff. To a certain distance it can be profitable to opt for the OC rather than the standard tariffs. This maximum distance is provided in the table below

	Description	Maximum distance with OC still profitable
Cat1	Existing entry + CWD exit	200 km
Cat2	Existing entry + CWD exit + SO entry + SO exit	370 km
Cat3	CWD entry + CWD exit	370 km
Cat4	CWD entry + CWD exit + SO entry + SO exit	530 km

The table on the next page sets out, for each entry-exit route, under which of these categories the OC would be an attractive option.

	Entry Point									
Exit Point	St Fergus	Tees-side	Bar row	Burton Point	Easington	Theddlethorpe	Bacton IP	Bacton UKCS	Isle of Grain	Milford Haven
Abson (Seabank Power Station phase I)		4	4	2 3 4	4	2 4	4	4	2 3 4	2 3 4
Apache (Sage Black Start)	1 2 3 4	4	4							
Bacton (Great Yarmouth)		4	4	4	2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	2 3 4	4
Bacton (IUK)		4	4	4	2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	2 3 4	4
Barrow (Black Start)	4	2 3 4	1 2 3 4	2 3 4	2 4	2 4	4	4	4	3 4
Billingham ICI (Terra Billingham)	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	4	4	4	4
Bishop Auckland (test facility)	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	2 4	4	4		4
Blackness (BP Grangemouth)	1 2 3 4	2 3 4	2 3 4	4	4					4
Blyborough (Brigg)	4	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Blyborough (Cottam)	4	2 3 4	2 3 4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Brine Field (Teesside) Power Station	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	4	4	4	4
Burton Point (Connahs Quay)	4	2 3 4	2 3 4	1 2 3 4	2 4	2 4	4	4	4	2 3 4
Caldecott (Corby Power Station)		2 4	4	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	4
Carrington (Partington) Power Station	4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 3 4	4	4	4	3 4
Centrax Industrial			4	4					4	2 3 4
Deeside	4	2 3 4	2 3 4	1 2 3 4	2 4	2 4	4	4	4	2 3 4
Didcot		4	4	2 3 4	2 4	2 4	2 4	2 4	2 3 4	3 4
Eastoft (Keadby Blackstart)	4	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Eastoft (Keadby)	4	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Epping Green (Enfield Energy, aka Brimsdown)		4	4	4	2 4	2 3 4	2 3 4	2 3 4	1 2 3 4	4
Fordoun CNG Station	1 2 3 4	2 4	4	4	4					
Goole (Guardian Glass)	4	2 3 4	2 3 4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Gowkhall (Longannet)	1 2 3 4	2 3 4	2 3 4	4	4					4
Grain Power Station		4	4	4	4	2 4	2 3 4	2 3 4	1 2 3 4	4
Hollingsgreen (Hays Chemicals)	4	2 3 4	2 3 4	1 2 3 4	2 4	2 4	4	4	4	3 4
KEADBY_2 PS	4	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Langage Power Station			4	4					4	2 3 4
Marchwood Power Station		4	4	2 3 4	2 4	2 4	2 4	2 4	2 3 4	2 3 4
Medway (aka Isle of Grain Power Station, NOT C		4	4	4	4	2 4	2 3 4	2 3 4	1 2 3 4	4
Middle Stoke (Damhead Creek, aka Kingsnorth F		4	4	4	4	2 4	2 3 4	2 3 4	1 2 3 4	4
Moffat (Irish Interconnector)	2 3 4	2 3 4	2 3 4	2 4	4	4	4			4
Palm_Paper		2 4	4	4	2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	2 3 4	4
Pembroke Power Station		4	4	2 3 4					4	1 2 3 4
Peterborough (Peterborough Power Station)		2 4	4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	4
Phillips Petroleum, Teesside	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	4	4	4	4
Pickmere (Winnington Power, aka Brunner Mon	4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 4	4	4	4	2 3 4
Rosehill (Saltend Power Station)	4	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Ryehouse		4	4	4	2 4	2 3 4	2 3 4	2 3 4	1 2 3 4	4
Saddle Bow (Kings Lynn)		2 4	4	4	2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	2 3 4	4
Saltend BPHP (BP Saltend HP)	4	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Sandy Lane (Blackburn CHP, aka Sappi Paper Mi	4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4	4	3 4
Seabank (Seabank Power Station phase II)		4	4	2 3 4	4	2 4	4	4	2 3 4	2 3 4
Seal Sands TGPP	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	4	4	4	4
Sellafield Power Station	2 3 4	2 3 4	1 2 3 4	2 3 4	4	2 4	4	4		3 4
Shellstar (aka Kemira, not Kemira CHP)	4	2 3 4	2 3 4	1 2 3 4	2 4	2 4	4	4	4	2 3 4
Shotwick (Bridgewater Paper)	4	2 3 4	2 3 4	1 2 3 4	2 4	2 4	4	4	4	2 3 4
St. Fergus (Peterhead)	1 2 3 4	4	4							
St. Fergus (Shell Blackstart)	1 2 3 4	4	4							
St. Neots (Little Barford)		4	4	2 4	2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	4
Stallingborough	4	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Stanford Le Hope (Coryton)		4	4	4	2 4	2 4	2 3 4	2 3 4	1 2 3 4	4
Staythorpe	4	2 3 4	2 3 4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	4
Sutton Bridge Power Station		2 4	4	4	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	4
Teesside (BASF, aka BASF Teesside)	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	4	4	4	4
Teesside Hydrogen	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	4	4	4	4
Thornton Curtis (Humber Refinery, aka Immingh	4	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Thornton Curtis (Killingholme)	4	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Tonna (Baglan Bay)		4	4	2 3 4	4	4			4	1 2 3 4
Upper Neeston (Milford Haven Refinery)			4	2 3 4					4	1 2 3 4
West Burton Power Station	4	2 3 4	2 3 4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 3 4	4	4
Weston Point (Castner Kelner, aka ICI Runcorn)	4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 4	4	4	4	2 3 4
Weston Point (Rocksavage)	4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 4	4	4	4	2 3 4
Wragg Marsh (Spalding)		2 4	4	2 3 4	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	4
Zeneca (ICI Avecia, aka 'Zenica')	2 3 4	1 2 3 4	2 3 4	2 3 4	2 3 4	2 3 4	4	4	4	4

It should be noted that **55 exits** have at least one entry of which the total of existing entry capacity plus CWD exit capacity (cat1) is above the OC tariff for that route.

Furthermore it can be seen that **all 64 exits** have at least one entry that would have an OC tariff that is lower than the summation of the CWD entry and CWD exit capacity tariff (cat3).

Last but not least: if SO charges are taken into account (cat2 or cat4) then we also see that **all 64 exits** have at least one entry that would have a lower OC tariff than the standard rates.

Conclusion with respect to MOD 678B

The Optional Charge under MOD678B can be characterised by a point-to-point tariff that is linearly dependent on the straightline distance. It does not take into account the real threat of the risk of a bypass as it does not take into account the capacity of the exit point. Furthermore, it is so generous that effectively **all 64** directly connected industrial and power exits as well as IPs can choose at least one entry that would result in a lower tariff than the standard tariffs.

Compared to the current system, we consider this OC under MOD678B even more generous to those who could opt for this service (directly connected industry, directly connected power and IPs) so that the cross-subsidisation by those who are denied this service, mainly the connections in the GDNs is further increased.

SUMMARY OF RESULTS

The analysis has used GY 2019/20 data with respect to tariffs and Forecasted Contracted Capacity (FCC). We have excluded entries and exits in the analysis with an FCC of zero and we have excluded Moffat (Irish Interconnector) as entry point, as this has only interruptible capacity. Furthermore we have excluded storage (entries/exits) and on exits we have only taken into consideration the directly connected power stations and industry as well as IPs. This has resulted in an analysis on all routes from 10 different entries to 64 different exits.

Based on google maps we have estimated the XY coordinates (in km) of these 75 points and then calculated the 10 x 64 straight line distances as input for the optional charge calculation.

With respect to the alternative MODs 678D, 678G, 678H and 678J we believe that NG's analysis that showed only routes up to 30 km to be attractive does not provide a complete enough picture. Our analysis shows that up to 23 routes above 30 km are attractive under OC tariffs as well: 13 of them are above 100 km of which 5 routes are even above 200 km. We believe that our analysis shows that these alternative MODs offer an OC tariff that is potentially much more widely attractive than the NG analysis suggests. This increases the risk that the tariff could apply in situations where there is no likelihood of building an alternative pipeline.

The Optional Charge under MOD678B can be characterised by a point-to-point tariff that is linearly dependent on the straightline distance. It does not take into account the real threat of the risk of a bypass as it does not take into account the capacity of the exit point. Furthermore, it is so generous that effectively all 64 directly connected industrial and power exits as well as IPs can choose at least one entry that would result in a lower tariff than the standard tariffs. Compared to the current system, we consider this OC under MOD678B even more generous to those who could opt for this service (directly connected industry, directly connected power and IPs) so that the cross-subsidisation by those who are denied this service, mainly the connections in the GDNs is further increased.