DCP 311 Draft Legal Text

Clarification of NUF cap and collar calculations

Amend the table references of Schedule 17 as follows:

3.4 The EDCM charge components for import are listed in table 3.4~~1~~.

Table 3.4~~1~~ Charge components for import

3.6 The EDCM charge components for export are listed in table 3.6~~2~~.

Table 3.6~~2~~ Charge components for export

15.6 EDCM Customers are split into 15 categories based on the parts of the EHV network they are deemed to use. This is based on the Point of Common Coupling. The Point of Common Coupling might be at a different voltage than the Connectee's connection, and might also be at a different voltage than the voltage of connection when the Connectee was connected.

Table 15.6~~3~~ Categorisation of EDCM Customers

15.7 All references to GSP in~~ the~~ table 15.6 above relate to interconnections with the onshore National Electricity Transmission System.

15.9 The use of each network level by each EDCM Connectee is determined according the rules set out in ~~the following~~ table 15.9.

Table 15.9 Use of each network level by each EDCM Connectee

15.11 An average network asset value per kVA (in £/kVA) is calculated in respect of each network level. The average network asset value for the network level of connection is based on the Maximum Import Capacity of the Connectee, and for network levels above on consumption at peak time.

Average network asset value for capacity at level L (£/kVA) = NARL* AE /(1 + DL)

Average network asset value for demand at level L (£/kVA) = NARL* D * LAF

Where:

NAR L is the network asset rate at level L in £/kW based on the 500 MW model.

DL is the Diversity Allowance from the level exit to the GSP group (from CDCM table 2611).

D is the peak time active power consumption in (kW/kVA). This is calculated as the historical peak-time kW divided by historical maximum kVA.

LAF is the loss adjustment factor to transmission from the CDCM for the network level relevant to the EDCM Customer category of that Connectee. See table 15.11 below for the correspondence between EDCM Customer categories and network levels.

AE is the active power equivalent of capacity adjusted to transmission (in kW/kVA). This is calculated by multiplying the power factor in the 500 MW model (0.95) by the loss adjustment factor to transmission for the network level relevant to that Connectee (as above).

Table 15.11 Customer category relevant network level for loss adjustment factors

Amend paragraphs 18.3 to 18.8 (inclusive) of Schedule 17 as follows:

18.3 Adjusted site-specific assets are calculated using network use factors that have been subjected to caps and collars.

18.4 A cap and a collar are calculated for each network level as follows:

- In ascending order, list the network use factors for all EDCM Connectees in all DNO Party areas relating to that network level, excluding all the factors that are either equal to zero or 1, or not used, based on the customer categories of each EDCM Connectee.

- Divide the list into two segments, one that contains factors that are lower than 1, and the other than contains the factors that are higher than 1.

- Take the list segment containing factors that are lower than 1. Starting from the lowest factor in this list segment, calculate the factor at the 15th percentile. This is the collar.

- Take the list segment containing factors higher than 1. Starting from the lowest factor in this segment, calculate the factor at the 85th percentile. This is the cap.

18.5 The same cap and collar would apply in all DNO Party areas to network use factorsNUFs at that network level.

18.6 These caps and collars are recalculated triennially, with the three year cycle having being established when caps and collars were calculated when determining 2017/18 charges (in 2015). In years where a recalculation has not been carried out, the values used remain at the most recently calculated values.The network use factor (NUF) caps and collars for 2011/2012 and each network level were calculated using this methodology and are set out in table 4 below. The NUF caps and collars using 2015/2016 data for each network level have also been determined, and are set out in table 4A below.

Table 4 Network use factor caps and collars (2011/2012)

Network levels	Collar	Cap
132kV	0.273	2.246
132kV/EHV	0.677	1.558
EHV	0.332	3.290
EHV/HV	0.631	2.380
132kV/HV	0.697	2.678

Table 4A Network use factor caps and collars (using 2015/16 data)

Network levels	Collar	Cap
132kV	0.192	1.859
132kV/EHV	0.674	1.551

~~EHV~~	~~0.367~~	~~2.366~~
~~EHV/HV~~	~~0.635~~	~~1.616~~
~~132kV/HV~~	~~0.808~~	~~1.652~~

18.7 Where year t is a charging year for which the caps and collars are being recalculated, the caps and collars calculated and used for years t, t+1 and t+2 will be based on applying the calculation detailed in paragraph 18.4 to the average of network use factors which were used in the calculation of charges applicable to years t-3, t-2 and t-1.~~The caps and collars in table 4 above were fixed for three years, and were used to calculate charges for the Charging Years 2012/2013 and 2013/2014. The caps and collars are to be re-calculated for the subsequent Charging Years. From Charging Year 2017/2018 onwards the caps and collars are to be calculated using the methodology described in paragraph 18.5 based on the NUFs described in paragraph 18.8. The NUFs themselves are calculated in accordance with paragraphs 29 and 30 below.~~

18.8 The network use factor caps and collars that are updated in accordance with paragraphs 18.6 and 18.7 will be maintained by the DNO Parties and referenced within the EDCM user manual.~~Table 5 below sets out the schedule for the calculation of the NUF caps and collars for each Charging Year.~~

~~Table 5 NUF cap and collar calculation timeline~~

~~**Charging Year**~~	~~**Caps and collars**~~
~~2011/2012~~ ~~Submission~~	~~2011/2012 caps/collars (as per table 4)~~
~~2012/2013~~	~~2011/2012 caps/collars (as per table 4)~~
~~2013/2014~~	~~2011/2012 caps/collars (as per table 4)~~
~~2014/2015~~	~~Average of 2011/2012, 2012/2013, 2013/2014 NUFs~~
~~2015/2016~~	~~Average of 2011/2012, 2012/2013, 2013/2014 NUFs~~

~~2016/2017~~	~~Average of 2011/2012, 2012/2013, 2013/2014 NUFs~~
~~2017/2018~~	~~2015/2016 caps/collars (as per table 4A)~~
~~2018/2019~~	~~2015/2016 caps/collars (as per table 4A)~~
~~2019/2020~~	~~2015/2016 caps/collars (as per table 4A)~~
~~2020/2021~~	~~Average of 2015/2016, 2016/2017, 2017/2018 NUFs~~
~~2021/2022~~	~~Average of 2015/2016, 2016/2017, 2017/2018 NUFs~~
~~2022/2023~~	~~Average of 2015/2016, 2016/2017, 2017/2018 NUFs~~
~~2023/2024~~	~~Average of 2017/2018, 2018/2019, 2019/2020, NUFs~~
~~2024/2025~~	~~Average of 2017/2018, 2018/2019, 2019/2020, NUFs~~
~~2025/2026~~	~~Average of 2017/2018, 2018/2019, 2019/2020 NUFs~~

Amend the table references of Schedule 17 as follows:

21.1 Table 21.1~~6~~ summarises the method of application of import charge components.

Table 21.1~~6~~ Application of EDCM import charge components

21.2 Table 21.2~~7~~ summarises the method of application of export charge components.

Table 21.2~~7~~ Application of EDCM export charge components

24.8 IDNO Party Distribution Systems are split into 15 categories based on the network level of the boundary between the host DNO Party and the IDNO Party, and whether or not higher network levels are used by the IDNO Party.

Table 24.8 Categorisation of designated EHV IDNO Parties[1]

24.9 All references to GSP in ~~the~~ table 24.8 above relate to interconnections with the main interconnected onshore transmission network.

[1] DCP305 deletes paragraph 24.8 (including the table in the paragraph) and paragraph 24.9. If approved DCP305 shall take precedent over this change.~~DCP305 deletes paragraph 24.8 including the table and paragraph 24.9. If approved DCP305 takes precedent over this change~~

Amend the table references of Schedule 17 - Annex 1 – Implementation Guide as follows:

4.9 As an example, if Figure 2 represents the actual network, the approach described above to produce the EHV network model would reduce it to a nodal model representation as shown in Figure 2. Table 4.9 shows an example of the data held relating to Figure 2 with the individual subsections being cross referenced to each Branch; Table ~~10~~ 4.9A lists the parameters used for the nodal model shown in Figure 3.

Table 4.9 - An example of the information held separately relating to Figure 1 which is used to provide the composite Branch parameters.

Table ~~10~~ 4.9A - Composite Branch parameters used for the nodal model shown in Figure 3 above.

5.14 Diversity Factors are calculated separately for each substation at each level. In our example, Diversity Factors would be calculated for substations S, T, and G. A Net Diversity Factor is then applied to each Connection Node based on the product of Diversity Factors of all the Substations that supply that Connection Node. In the example, the following Net Diversity Factors would be applied to each of the Connection Nodes.

Table 5.14~~11~~ - Calculation of Net Diversity Factors - Hierarchical Diversity Factors.

5.18 The Net Diversity Factor in this method is equal to the calculated single Diversity Factor. In the example the following Net Diversity Factors would be applied to each of the Connection Nodes.

Table 5.18~~12~~ - Calculation of Net Diversity Factors – Single Diversity Factors

5.32 The hierarchical diversity factors are applied only to the loads on meshed sections (see table 5.34 below).

Multiple network analyses:

5.34 The final load which applied at each substation is shown in ~~the~~ table 5.34 below:

Table 5.34~~13~~ - Calculation of Diversity Factors – Multiple load sets (meshed and

radial mix).

Amend the table references of Schedule 17 - Annex 1 – Implementation Guide, Attachment 1 as follows:

4. The calculation of Network Group incremental charges is summarised in (Table 8~~14~~) for demand connected to 132 kV and in Table 8A~~15~~ for demand connected within BSP_A and BSP_D. The calculation is based on the formula given in paragraph 1.16 of the Authority's Decision Document (ref: 90/09, Annex 2):

5. The implementation of the formula given above is described in a number of steps in Tables 8~~14~~ and 8A~~15~~ below.

6. Both tables 8 and 8A are split into two parts, the shaded one which contains information on:

8. The Network Group incremental charges for Level 2 consist of the corresponding incremental charge due to reinforcements identified in the Network Group (BSP_A 1.28 £/kVA/annum, BSP_D 9.18 £/kVA/annum) and the incremental charge calculated for the corresponding higher level, which is 3.24 £/kVA/annum. The combined Network Group incremental charge for BSP_A is a sum of 1.28 £/kVA and 3.24 £/kVA/annum, which is 4.52 £/kVA/annum. Similarly, for Network Group BSP_D the combined Network Group incremental charge is 12.42 £/kVA/annum.

Table 8~~14~~ – Network Group incremental charge for Level 1 Network Group.

Table 8A~~15~~ - Network Group incremental charge for Level 2 Network Group.

Amend the table references of Schedule 17 - Annex 1 – Implementation Guide, Attachment 3 as follows:

2. The output data listed in ~~the~~ table 3 below are the minimum necessary for the calculation of the final EDCM Customer Use of System Charges. To 'link' Network Groups and Nodes representing demand (load) additional 'mapping' tables might be required.

3. It should be pointed out that the other information used to derive the output data will be retained for the interests of transparency.

Table 3~~16~~ – Output information required to calculate final EDCM Use of System Charge.

Amend the table references of Schedule 18 as follows:

3.4 The EDCM charge components for import are listed in Table 3.4.

Table 3.4 Charge components for import

3.6 The EDCM charge components for export are listed in Table ~~5~~3.6.

Table 3.6~~5~~ Charge components for export

15.6 EDCM Customers are split into 15 categories based on the parts of the EHV network they are deemed to use. This is based on the Point of Common Coupling. The Point of Common Coupling might be at a different voltage than the Connectee's connection, and might also be at a different voltage than the voltage of connection when the Connectee was connected.

Table 15.6~~3~~ Categorisation of EDCM Customers

15.7 All references to GSP in ~~the~~ table 15.6 above relate to interconnections with the onshore National Electricity Transmission System.

15.9 The use of each network level by each EDCM Connectee is determined according the rules set out in ~~the following~~ table 15.9.

Table 15.9 Use of each network level by each EDCM Connectee

15.11 An average network asset value per kVA (in £/kVA) is calculated in respect of each network level. The average network asset value for the network level of connection is based on the Maximum Import Capacity of the Connectee, and for network levels above on consumption at peak time.

Average network asset value for capacity at level L (£/kVA) = NARL* AE /(1 + DL)

Average network asset value for demand at level L (£/kVA) = NARL* D * LAF

Where:

NAR L is the network asset rate at level L in £/kW based on the 500 MW model.

DL is the Diversity Allowance from the level exit to the GSP group (from CDCM table 2611).

D is the peak time active power consumption in (kW/kVA). This is calculated as the historical peak-time kW divided by historical maximum kVA.

LAF is the loss adjustment factor to transmission from the CDCM for the network level relevant to the EDCM Customer category of that Connectee. See table 15.11 below for the correspondence between EDCM Customer categories and network levels.

AE is the active power equivalent of capacity adjusted to transmission (in kW/kVA). This is calculated by multiplying the power factor in the 500 MW model (0.95) by the loss adjustment factor to transmission for the network level relevant to that Connectee (as above).

Table 15.11 Customer category relevant network level for loss adjustment factors

Amend paragraphs 18.3 to 18.8 (inclusive) of Schedule 18 as follows:

18.3 Adjusted site-specific assets are calculated using network use factors that have been subjected to caps and collars.

18.4 A cap and a collar are calculated for each network level as follows:

- In ascending order, list the network use factors for all EDCM Connectees in all DNO Party areas relating to that network level, excluding all the factors that are either equal to zero or 1, or not used, based on the customer categories of each EDCM Connectee.

- Divide the list into two segments, one that contains factors that are lower than 1, and the other than contains the factors that are higher than 1.

- Take the list segment containing factors that are lower than 1. Starting from the lowest factor in this list segment, calculate the factor at the 15th percentile. This is the collar.

- Take the list segment containing factors higher than 1. Starting from the lowest factor in this segment, calculate the factor at the 85th percentile. This is the cap.

18.5 The same cap and collar would apply in all DNO Party areas to ~~NUFs~~ network use factors at that network level.

18.6 The caps and collars are recalculated triennially, with the three year cycle having being established when caps and collars were calculated when determining 2017/18 charges (in 2015). In years where a recalculation has not been carried out, the values used remain at the most recently calculated values.~~The network use factor (NUF) caps and collars for 2011/2012 and each network level were calculated using this methodology and are set out in Table 4 below. The NUF caps and collars using 2015/2016 data for each network level have also been determined, and are set out in Table 4A below.~~

~~Table 4 Network use factor caps and collars (2011/2012)~~

~~Network levels~~	~~Collar~~	~~Cap~~
~~132kV~~	~~0.273~~	~~2.246~~
~~132kV/EHV~~	~~0.677~~	~~1.558~~
~~EHV~~	~~0.332~~	~~3.290~~
~~EHV/HV~~	~~0.631~~	~~2.380~~
~~132kV/HV~~	~~0.697~~	~~2.678~~

~~Table 4A Network use factor caps and collars (using 2015/16 data)~~

~~Network levels~~	~~Collar~~	~~Cap~~
~~132kV~~	~~0.192~~	~~1.859~~
~~132kV/EHV~~	~~0.674~~	~~1.551~~
~~EHV~~	~~0.367~~	~~2.366~~

~~EHV/HV~~	~~0.635~~	~~1.616~~
~~132kV/HV~~	~~0.808~~	~~1.652~~

18.7 Where year t is a charging year for which the caps and collars are being recalculated, the caps and collars calculated and used for years t, t+1 and t+2 will be based on applying the calculation detailed in paragraph 18.4 to the average of network use factors which were used in the calculation of charges applicable to years t-3, t-2 and t-1.~~The caps and collars in Table 4 above were fixed for three years, and were used to calculate charges for the Charging Years 2012/2013 and 2013/2014. The caps and collars are to be re-calculated for the subsequent Charging Years. From Charging Year 2017/2018 onwards the caps and collars are to be calculated using the methodology described in paragraph 18.5 based on the NUFs described in paragraph 18.8. The NUFs themselves are calculated in accordance with paragraphs 29 and 30 below.~~

18.8 The network use factor caps and collars that are updated in accordance with paragraphs 18.6 and 18.7 will be maintained by the DNO Parties and referenced within the EDCM user manual.~~Table 5 below sets out the schedule for the calculation of the NUF caps and collars for each Charging Year.~~

~~Table 5 NUF cap and collar calculation timeline~~

~~**Charging Year**~~	~~**Caps and collars**~~
~~2011/2012 Submission~~	~~2011/2012 caps/collars (as per table 4)~~
~~2012/2013~~	~~2011/2012 caps/collars (as per table 4)~~
~~2013/2014~~	~~2011/2012 caps/collars (as per table 4)~~
~~2014/2015~~	~~Average of 2011/2012, 2012/2013, 2013/2014 NUFs~~
~~2015/2016~~	~~Average of 2011/2012, 2012/2013, 2013/2014 NUFs~~

~~2016/2017~~	~~Average of 2011/2012, 2012/2013, 2013/2014 NUFs~~
~~2017/2018~~	~~2015/2016 caps/collars (as per table 4A)~~
~~2018/2019~~	~~2015/2016 caps/collars (as per table 4A)~~
~~2019/2020~~	~~2015/2016 caps/collars (as per table 4A)~~
~~2020/2021~~	~~Average of 2015/2016, 2016/2017, 2017/2018 NUFs~~
~~2021/2022~~	~~Average of 2015/2016, 2016/2017, 2017/2018 NUFs~~
~~2022/2023~~	~~Average of 2015/2016, 2016/2017, 2017/2018 NUFs~~
~~2023/2024~~	~~Average of 2017/2018, 2018/2019, 2019/2020, NUFs~~
~~2024/2025~~	~~Average of 2017/2018, 2018/2019, 2019/2020, NUFs~~
~~2025/2026~~	~~Average of 2017/2018, 2018/2019, 2019/2020 NUFs~~

Amend the table references of Schedule 18 as follows:

21.1 Table 21.1~~6~~ summarises the method of application of import charge components.

Table 21.1~~6~~ Application of EDCM import charge components

21.2 Table 21.2~~7~~ summarises the method of application of export charge components.

Table 21.2~~7~~ Application of EDCM export charge components

24.8 IDNO Party Distribution Systems are split into 15 categories based on the network level of the boundary between the host DNO Party and the IDNO Party, and whether or not higher network levels are used by the IDNO Party.

Table 24.8 Categorisation of designated EHV IDNO Parties[2]

24.9 All references to GSP in ~~the~~ table 24.8 above relate to interconnections with the main

[2] DCP305 deletes paragraph 24.8 (including the table in the paragraph) and paragraph 24.9. If approved DCP305 shall take precedent over this change.~~DCP305 deletes paragraph 24.8 including the table and paragraph 24.9. If approved DCP305 takes precedent over this change~~

interconnected onshore transmission network.

Amend the table references of Schedule 18 - Annex 1 – Implementation Guide as follows:

4.9 Table 4.9 shows an example of the data held relating to Figure 2 with the individual subsections being cross referenced to each Branch; Table 4.9A~~10~~ lists the parameters used for the nodal model shown in Figure 3.

Table 4.9 - An example of the information held separately relating to Figure 2 which is used to provide the minimum composite branch rating.

Table 4.9A~~10~~ - Parameters used for the Nodal model shown in Figure 3.

5.17 A Net Diversity Factor is then applied to each Connection Node based on the product of Diversity Factors of all the substations that supply that Connection Node. In the example the following Net Diversity Factors would be applied to each of the Connection Nodes.

Table 5.17~~11~~ - Calculation of Net Diversity Factors - Hierarchical Diversity Factors.

5.21 The Net Diversity Factor in this method is equal to the calculated single Diversity Factor. In the example the following Net Diversity Factors would be applied to each of the Connection Nodes.

Table 5.21~~12~~ - Calculation of Net Diversity Factors - Single Diversity Factors.

6.11 The power factor and direction of the demand increments applied to the Authorised Network Model depend upon the network demand scenario considered and also the type of demand that is located at the Node where the increments are applied. This is summarised in the following table:

Table 6.11~~13~~ - Application of increments.

6.17 The process is undertaken in Incremented Flow analysis for both the Maximum Demand Scenario and the Minimum Demand Scenario in turn. This is described below:

(a) Step 1 - the Base Case Analysis is performed initially (see the Base Case Analysis section). The results of this analysis are Base Case Flows;

(b) Step 2 - the power flows across each of the network Branches are determined for the condition where the relevant increment (see Table 6.1113) is applied to a Node. The results are referred to as Incremented Flows;

(c) Step 3 - the differences between the Incremented Flows and the Base Case Flows are evaluated. For those Branches where the difference is smaller than either 1kVA or 0.01% of the Base Case Flow then the Incremented Flow for that Branch is set to the Base Case Flow for that Branch; and

(d) Step 4 - steps 2 and 3 are repeated for each Node in turn until they have been completed for each Node in the Authorised Network Model.

6.30 To illustrate the outputs from the power flow analysis the example network is shown in Figure 6and the power flow analysis results (from the application of 0.1MW increments, in the direction of demand (load), to Nodes in the Maximum Demand Scenario) is shown in Table 6.3214.

6.31 Table 6.3214 shows the Base Case Flow, Contingency Flow, Incremented Flow, the power factor of the applied demand increment and the Security Factor for each Branch per Node for Maximum Demand Scenarios.

6.32 Similar tables would need to be created for the following scenarios/increments:

(a) Minimum Demand Scenario – applying 0.1 MW at 0.95 power factor in generation direction at each Node where demand is located;

(b) Maximum Demand Scenario - applying 0.1 MW at unity power factor in demand direction at each Node where generation is located; and

(c) Minimum Demand Scenario – applying 0.1 MW at unity power factor in generation direction at each Node where generation is located.

Table 6.3214 - An example set of output results from Maximum Demand Scenario

6.34 For each Node where demand is incremented any Branch showing a power flow change greater than both 1kVA and 0.01% of the Branch Base Case Flow is listed in the table 6.32 above, which also shows the Base Case Flow, Security Factor and Incremented Flow. The filtering of the flows against the above criteria may be carried out at this stage of the power flow analysis or alternatively included in the cost modelling element of the process for pricing. It should be noted that for each Node-Branch combination the Base Case Flows, Security Factors, Incremented Flows and Branch Ratings may be different.

8.12 For Nodes where demand (load) is located:

(a) Table 8.12~~1515~~ describes the comparison performed for Branch reinforcements identified by application of increments to a Node where demand (load) is located.

(b) For the Maximum Demand Scenario the increment is applied in the demand (load) direction. If such an increase in demand (load) accelerates the reinforcement ($\Delta \boldsymbol{Cipeak}$ > 0) the demand should be charged (Table 8.12~~1515~~, the first row, column 'Credit/Charge'). For the Minimum Demand Scenario the increment is applied in the generation direction (a reduction of demand). If such reduction of demand (load) would accelerate the reinforcement ($\Delta \boldsymbol{Cioffpeak}$ > 0) than the demand charge takes the form of a credit (Table 8.12~~15~~ the third row, column 'Credit/Charge').

(c) It should be pointed out that each Branch incremental cost is considered in just one out of two charge periods (Peak or Off-Peak but not both) based on the scenario that drives the maximum absolute value of Branch incremental cost, as shown in Table 8.12~~1515~~. A calculation of Nodal incremental costs and Nodal marginal charges for a simple network example is given in Attachment 2 below.

(d) To calculate the Peak Nodal incremental cost, a sum of all peak incremental costs $\Delta \boldsymbol{C_i}^{\boldsymbol{peak}}$, each scaled by the appropriate Recovery Factor s_i, over all Branches where the Maximum Demand scenario drives reinforcements, associated with the application of an increment at the Node, should be determined. To calculate the Off-Peak Nodal incremental cost a sum of all off-peak incremental costs $\Delta \boldsymbol{C_i}^{\boldsymbol{peak}}$, each scaled by the appropriate Recovery Factor s_i, over all Branches where the Minimum Demand scenario drives the reinforcements, associated with the application of an increment at the Node, should be determined.

(e) To calculate the £/kVA/annum Peak and Off-Peak Nodal marginal charges the obtained sums should be divided by the corresponding kVA increment (using 0.1 MW at 0.95 power factor). A calculation of Nodal incremental costs and Nodal marginal charges for a simple network example is given in Attachment 2 below.

(f) The Peak and Off-Peak Nodal marginal charges are the main output results that will be used for the calculation of the total Use of System Charges. The other outputs are discussed in Attachment 3 below.

(g) The adopted sign convention with respect to Peak Charges and Off-Peak Charges (output values) is given in the last column of Table 8.12~~1515~~. It should be noted that the convention follows the sign of $\Delta \boldsymbol{C}_i$.

Table 8.12~~15~~ - Scenarios that drive reinforcement and the rules for the calculation of Branch reinforcement charges/credits for a demand (load) located at a Node.

8.13 For Nodes where generation is located:

(a) To decide which scenario drives the Branch reinforcement for a Node where a generator is located Table 8.13~~1616~~ should be used.

(b) For the Maximum Demand Scenario the increment is applied in the demand direction (a reduction of generation). If such reduction of generation delays the reinforcement ($(\Delta \boldsymbol{C}_i^{peak}$ < the generator should be charged (the second row, column 'Credit/Charge'). For the Minimum Demand Scenario the increment is applied in the generation direction (an increase in generation). If such increase in generation delays the reinforcement ($(\Delta \boldsymbol{C}_i^{off-peak} < \mathbf{0})$) the generator should be credited (the fourth row, column 'Credit/Charge').

(c) It should be pointed out that each Branch incremental cost is included in one of two charge periods (Peak or Off-Peak but not both) based on the scenario that drives the maximum absolute value of Branch incremental cost as shown in Table 8.13~~1616~~.

(d) To calculate the Peak Nodal incremental cost a sum of Peak incremental cost $\Delta \boldsymbol{C}_i^{peak}$, each scaled by the appropriate Recovery Factor S_i, over all

Branches where the Maximum Demand scenario drives reinforcements, associated with the application of an increment at the Node, should be determined. To calculate the Off-Peak Nodal incremental cost a sum of off-peak incremental cost $\Delta \boldsymbol{C_i}^{off-peak}$, each scaled by the appropriate Recovery Factor $\boldsymbol{S_i}$, over all Branches where the Minimum Demand scenario drives the reinforcement, associated with the application of an increment at the Node, should be determined.

(e) To calculate the £/kVA/annum Peak Off-Peak Nodal marginal charges the obtained sums should be divided by the corresponding kVA increment (using 0.1 MW at unity power factor). The last column given in Table ~~1616~~ 8.13 indicates the sign convention adopted for the output values. It should be noted that the convention follows the sign of $\Delta \boldsymbol{C_i}$.

Table 8.13~~16~~ - Scenarios that drive reinforcement and the rules for the calculation of Branch reinforcement charges/credits for a generation located at a Node.

8.19 'Hybrid Customer' Nodes will, for either Demand (load) or Demand (generation) as appropriate for each individual Connectee:

(a) combine the (Charge 1) charges associated with each of the Nodes through the use of a weighted average based on the proportion of the Connectee's demand observed at each of the Nodes in the Maximum Demand Scenario, under Normal Running Arrangements;

(b) combine the (Charge 2) charges associated with each of the Nodes through the use of a weighted average based on the proportion of the Connectee's demand observed at each of the Nodes in the Minimum Demand Scenario, under Normal Running Arrangements; and

(c) aggregate Active Power and Reactive Power data for either Demand (Load) or Demand (Generation) as appropriate, relating to all relevant Nodes (Items 5 to 8 of Table 14~~2122~~ in Attachment 2 ~~3~~below)

Amend the table references of Schedule 18 - Annex 1 – Implementation Guide, Attachment 2 as follows:

7. The calculation of Security Factors is summarised in Table ~~1~~7 and Table ~~18~~ 7A for the Maximum Demand Scenario and Minimum Demand Scenario, respectively. Each table contains information (for all Branches and both Maximum Demand and Minimum Demand Scenario) related to:

- Base Case Flows.
- Maximum Contingency Flow.
- Security Factor which is a ratio of Maximum Contingency Flow and Base Case Flow.
- Contingency Case referring to the contingency case that causes the Maximum Contingency Flow.
- Branch Winter/Summer Rating.
- Branch Capacity which is a ratio of the corresponding Branch Rating and Security Factor.
- Years to Reinforcement (base) - which is a year when the corresponding Branch will reach its Branch Capacity assuming annual Branch flow growth of 1% based on an exponential growth function. For, example Branch B5 will reach its Branch Capacity after 35.49 years for Maximum Demand Scenario because:
- $34.70 = 24.38 * (1 + 0.01)^{35.49}$.

Table ~~1~~7 - Calculation of Maximum Contingency Flow, Security Factors and Years to Reinforcement (Base Case) - Maximum Demand Scenario.

Table 7A~~18~~ - Calculation of Maximum Contingency Flow, Security Factors and Years to Reinforcement (Base Case) - Minimum Demand Scenario.

8. The Incremented Flow Analysis needs to be carried out once the Branch Capacity and Security Factors are determined. For the network example used in this attachment six power flow studies are required to determine the Incremented Flows. These studies are

listed in ~~the following~~ table 8.

Table 8~~19~~ - Incremented Flow Analysis – Studies

10. Using the following Table 10~~2020~~ of Branch reinforcement cost and the algorithm in Attachment 1, Branch incremental cost is calculated for both Maximum and Minimum Demand Scenarios. The critical scenario that drives the Branch reinforcement is then identified as the scenario with the highest absolute value of associated Branch incremental cost. For example, for Branch i, if $|\Delta C_i^{peak}| > |\Delta C_i^{off-peak}|$, the scenario that drives the reinforcement of the Branch is Peak; otherwise it is Off-Peak.

Table ~~2~~10 - Branch Reinforcement Cost

11. Summaries of the Incremented Flow Analysis and the Branch incremental cost calculation are given in Table 14~~20~~. The following columns are given in the table:

12. Using the information provided in Table 14~~20~~ the Peak Nodal incremental cost and Off Peak Nodal incremental cost for the generator connected to Node D can be calculated:

13. For the demand located at Node C the corresponding costs are the sum of all Peak Branch incremental costs which based on Table 14~~20~~ the Peak Nodal incremental cost and Off-Peak Nodal incremental cost for the generator connected to Node D can be calculated: Table 14~~20~~ gives 2777.8 £/annum; and the sum of all Off-Peak Branch incremental costs which gives -10.52 £/annum.

14. The Nodal marginal charges are obtained by dividing the Nodal incremental cost by the magnitude (in kVA) of the load or generation increment, as appropriate.

Table 14~~20~~ - Incremented flow analysis

Amend the table references of Schedule 18 - Annex 1 – Implementation Guide, Attachment 3 as follows:

2. The output data listed in ~~the~~ table 3 below are the minimum necessary for the calculation of the final EDCM Use of System Charges. For each Node where demand or generation is located a single pair of charges is required. For a Node where both demand and generation are located a double pair of charges is required (there will be two entries where 'Node ID' would be the same but all other values would be different).

3. The outputs from the Power Flow Analysis, the Branch Rating Data and the network cost data (see Figure 5) will also be retained in the interests of transparency.

Table 3~~21~~ - Output information required to calculate final EHV charge

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