CUSC Modification Proposal Form (for Charging Methodology proposals)

CMP213

Title of the CUSC Modification Proposal: *(mandatory by proposer)*
Project TransmiT TNUoS Developments

Submission Date *(mandatory by Proposer)*
20/06/2012

Description of the CUSC Modification Proposal: *(mandatory by proposer)*

This modification proposal is submitted in order to fulfil the requirements of the direction to NGET by the Authority, arising from the TransmiT TNUoS SCR process. In line with that direction, there are three main elements making up this proposal:

(i) Recognition of network capacity sharing by generators in the Investment Cost Related Pricing (ICRP) TNUoS charge calculation;
(ii) Introduction of an approach for including HVDC links that parallel the onshore AC network into the charging methodology;
(iii) Introduction of an approach for including Island links in the charging methodology.

The specific proposals that follow are expected to facilitate and not preclude any further consideration of the relevant issues and / or development of different approaches that may better achieve the purposes and objectives of this proposal as required by the miscellaneous terms set out in the Authority's direction that this proposal should be developed so as to be consistent with the principles of cost reflectivity, whilst having regard to the desirability for stability and simplicity in transmission pricing, and as far as possible it should:

a) further the applicable relevant objectives,
b) maximise value for money to existing and future consumers,
c) be supported by a robust evidence base, and
d) give due consideration to the interests of existing and future consumers in the achievement of sustainable development.

A detailed description of the aforementioned three main elements follows.

(i) Network Capacity Sharing

In addition to recovering allowed revenue, Transmission Network Use of System (TNUoS) charges reflect the cost of installing, operating and maintaining the transmission system for the Transmission Owner (TO) activity functions of each GB Transmission Licensee. These activities are undertaken to the standards prescribed by the Transmission Licences, to provide the capability to allow the flow of bulk transfers of power between connection sites over a year of operation and to provide transmission system security.

The underlying rationale behind TNUoS charges is that efficient economic signals are provided to Users when services are priced to reflect the incremental costs of supplying them. Therefore, charges should reflect the impact that users of the transmission system at different locations would have on the Transmission Owner's costs, if they were to increase or decrease their use of the respective systems. This rationale is currently accounted for using the Investment Cost Related Pricing (ICRP) methodology which considers the incremental effect of generation and demand via a DC load flow (DCLF) based "Transport" model. The derivation of the incremental investment costs at different points on the system is currently determined against the requirements of the system at the time of peak demand.

As a greater proportion of variable, renewable generation connects to the transmission network, the output of many conventional generators has also become more variable in nature. As generators of different types change the way in which they use the transmission network, the nature of transmission capacity investment planning has also altered to ensure efficient investment is undertaken. This is exemplified in the recent changes to the NETS SQSS (GSR-009) and the increasing amount of investment justified on the basis of avoided future constraint costs (i.e. outside of the deterministic NETS SQSS standards). However, the associated commercial arrangements have yet to fully evolve to reflect these underlying physical changes.

The industry began a process of reviewing the commercial framework to reflect the aforementioned changes through the Transmission Access Review (TAR) process from 2007 to 2010. Through this process, the possibility of explicitly recognising the differential impact on network costs by generators with different characteristics into charging and access arrangements was considered. However, this process culminated in the Secretary of State rejecting this explicit recognition in favour of a form of Connect and Manage. As a result, this modification proposal does not propose to alter the form of access rights afforded to generators (in the form of Transmission Entry Capacity - TEC) through the government's decision. Rather, it seeks to improve the cost-reflectivity of TNUoS tariffs for generators by implicitly recognising that this sharing takes place and is taken into account in an equally implicit manner in the network investment planning process.

This proposal seeks to recognise the implicit sharing of the wider transmission network (local circuits are not planned on the basis of being shared and are therefore not deemed to be shared) by altering the way in which the wider tariff is calculated within the Transport and Tariff model, thus improving its cost-reflectivity.

Transport Model

This proposal seeks to replace the existing peak background in the Transport model with two separate background conditions, representing peak security and year round conditions respectively. Whilst the existing DCLF in the Transport model sets up the peak demand background by scaling down the contracted TEC of all generators equally to meet total demand, the proposal would setup two peak demand conditions and scale generation differently under each to reflect the values used in the NETS SQSS. Some of these values would be fixed year on year and some would vary depending on the demand level in the year under consideration. The values that would have arisen from 2011/12 data are as follows:

Generator Type	TEC	Current Methodology	Peak Security Background	Year Round Background
Intermittent	5,460	65.5%	0%	70%
Nuclear & CCS	10,753	65.5%	72.5%	85%
Interconnectors	3,268	65.5%	0%	100%
Hydro	635	65.5%	72.5%	66%
Pumped Storage	2,744	65.5%	72.5%	50%
Peaking	5,025	65.5%	72.5%	0%
Other (Conventional)	61,185	65.5%	72.5%	66%
Values in grey vary depending on the total demand level, whilst values in black are fixed scaling factors corresponding to those used in the NETS SQSS				

In order to ascertain whether the incremental investment driver on a given circuit is related to peak security or year round conditions, the power flows on each circuit are compared and a proportion of the circuit is allocated to a given investment driver (i.e. peak security or year round). It is proposed that the allocation is done on the basis of whole circuits being either peak security or year round driven, with the background leading to the highest flows on a given circuit dictating its investment driver and allocation.

Once the allocation process is complete an incremental MW would be applied at each node in the DCLF model, as occurs in the existing methodology, in order to establish the effect of that additional MW on the transmission network as a whole. Under this proposal, the incremental MW process would occur at each node in turn for both the peak security and year round conditions. Ultimately, this process results in the incremental impact (i.e. MWkm) for each circuit under both conditions. These MWkm would subsequently be allocated to either the peak security or year round conditions, based on the aforementioned allocation of a given circuit to an investment driver. The splitting of MWkm across two background conditions, representative of different investment drivers, is the first in a two step process. A further step is required in order to make an improvement to the cost-reflectivity of this approach.

As transmission investment is no longer solely planned for peak security conditions the proposal recognises that the impact of an incremental MW on the need for network capacity varies depending on the type of generation, as well as its location. This proposal would scale the year round incremental MWkm of each individual generator depending on its impact on the transmission network, as detailed in the following paragraph. For the peak incremental MWkm it is proposed to maintain the existing uniform treatment of generation (i.e. treat all generation capacity the same regardless of plant type), with the exception that the incremental MWkm of intermittent plant is scaled to 0% in recognition of the assumptions made when planning network capacity. Where a different approach is developed through the working group process that is reasonably considered by the proposer to better meet the miscellaneous terms set out in the Authority's direction, it shall be substituted into this proposal in accordance with the proposer's rights under clauses 8.16.10 and 8.20.23 of the CUSC. It is recognised that stand-alone alternatives may also be developed through the working group process.

Explicit commercial arrangements are not in place that provide Transmission Licensees with information to assess the impact on the need for transmission network investment arising from an individual generator when planning investment. Therefore implicit assumptions over input prices (fuel, CO_2, subsidy, etc.) and generator characteristics (efficiency, availability, etc.) relative to the remainder of the market are made. In order to remain cost-reflective, any proposed scaling factor needs to be reflective of the implicit assumptions made when planning network capacity. This proposal puts forward a form of generator specific annual load factor, based on 5 years historic output, as representative of the assumptions made when planning investment and achieving an appropriate balance between simplicity and cost-reflectivity. In order to maintain what is deemed to be an appropriate balance it is proposed that the annual load factor be applied in an equal manner across all wider TNUoS zones regardless of generation plant mix. Where a different approach is developed through the working group process that is reasonably considered by the proposer to better meet the miscellaneous terms set out in the Authority's direction, it shall be substituted into this proposal in accordance with the proposer's rights under clauses 8.16.10 and 8.20.23 of the CUSC. It is recognised that stand-alone alternatives may also be developed through the working group process.

Tariff Model

The Tariff model utilises the incremental MWkm and the unit cost of these MWkms (i.e. the expansion constant and expansion factors) in order to calculate the locational signal, which forms part of the wider TNUoS tariff. Once this is completed and the proportion of revenue collected from the locational element is known, the Tariff model also calculates the non-locational, residual element to ensure that the total allowed revenue is recovered in the proportion of 27% from generators and 73% from demand users of the network. Together the locational and residual elements of the tariff form the wider TNUoS tariff in the existing methodology.

Under this proposal the structure of the wider TNUoS tariff would change to mirror the changes in the Transport model, such that the locational element is split into a peak security element and a year round element. As a result the TNUoS charge for an individual generator arising from the wider element of the TNUoS tariff would be calculated as follows:

(Peak Security £/kW + Year Round £/kW + Residual £/kW) x TEC kW = £ wider TNUoS charge

For the avoidance of doubt the methodology for calculating demand charges would be based on the existing approach.

(ii) Inclusion of HVDC in charging calculation

When calculating the wider TNUoS tariff utilising the Transport and Tariff model, various AC transmission technologies are modelled in the Loadflow element. This is done in order to include the various unit costs of these technologies into the calculation of the locational signal. Whilst overhead lines and cables of different voltage levels are included no DC technology, outside of the offshore charging methodology, is currently taken account of. With the first of two planned HVDC links (or "bootstraps") committed, the need to be able to suitably represent these links in the methodology is imminent.

Two main issues need to be addressed in order to facilitate HVDC circuits in the charging model:

(a) The treatment of base case and incremental power flows in the DC load flow element of the charging model, in light of the inherent controllability of flows through an HVDC link that parallels the AC network;
(b) The calculation of the expansion factor (i.e. relative unit cost) for HVDC circuits.

a) Power Flow

It is proposed that the treatment of power flow on an HVDC link in the Transport Model be based on a simplifying assumption. This treatment can be made due to the controllable nature of these links relative to power flows on the AC network, which are dictated solely by the impedance of a circuit and that of the remaining network. As a result, this proposal asserts that the modelling of an HVDC link as an AC circuit, for the purposes of calculating the incremental power flow element of the locational signal, represents a reasonable simplification. This approach requires the calculation of impedance for the equivalent AC transmission circuit (i.e. the circuit characteristic that dictates power flow).

This proposal would calculate the impedance by adjusting the impedance of the HVDC circuit in the DC load flow in order to achieve a pre-determined power flow through it in the base case. This power flow is determined as a proportion of the average circuit ratings of all the circuits comprising the main transmission boundaries that the HVDC circuit crosses. That is, it is assumed that the HVDC circuit is loaded to the same extent on average as the equivalent AC circuits that it parallels.

To achieve this one would first sum the ratings of all transmission circuits that cross each transmission boundary individually, excluding the HVDC circuit itself. Subsequently, the power flow across each boundary without any flow on the HVDC circuit would be used to produce a ratio of power flow to boundary total circuit rating (accounting for the direction of the boundary flow in the base case). These ratios can be used to calculate an average for all transmission boundaries that the HVDC circuit crosses. This average power flow to total circuit rating figure is used to set the impedance of the AC equivalent HVDC circuit to produce the power flow that gives this ratio to the HVDC circuit rating.

b) Expansion Factor

The charging methodology incorporates the unit cost of various transmission technologies by calculating the cost of a given technology relative to the cost of 400kV overhead line. This allows for the calculation of a multiplier, known as an expansion factor, which is used in the Transport model to calculate the locational signal within TNUoS charges. As HVDC technology does not currently exist in the Transport model, a method of incorporating its unit cost is also required.

This proposal would introduce a new expansion factor for each HVDC circuit depending on its voltage. In addition, as HVDC converters are an integral element of the distance related locational signal of the link, it is proposed to include the cost of these converters into the expansion factor calculation for each circuit. Currently HVDC converters can be broadly split into two different types, current source converters and voltage source converters, leading to the potential for two additional expansion factor types. Where a different approach is developed through the working group process that is reasonably considered by the proposer to better meet the miscellaneous terms set out in the Authority's direction, it shall be substituted into this proposal in accordance with the proposer's rights under clauses 8.16.10 and 8.20.23 of the CUSC. It is recognised that stand-alone alternatives may also be developed through the working group process.

(iii) Inclusion of Island links into the charging methodology

A methodology for calculating cost reflective TNUoS charges for transmission spurs connecting generation and demand and comprised of network technology not included in the expansion factors set out in clause 14.15.47 and 14.15.49 of the CUSC, such as those which may be established between the Scottish mainland and the Scottish islands of Western Isles, Orkney and Shetland is not currently included in the methodology.

In order to calculate cost reflective charges for this type of transmission circuit this proposal addresses how the expansion factor should be calculated for underground and subsea technologies not included in the methodology.

As outlined in (ii), above, the charging methodology incorporates the unit cost of various transmission technologies by calculating the cost of a given technology relative to the cost of 400kV overhead line. This allows for the calculation of a multiplier, known as an expansion factor, which is used in the Transport model to calculate the locational signal within TNUoS charges. As the sub-sea and HVDC technologies proposed do not currently exist in the Transport model, a method of incorporating their unit cost is required.

For transmission spurs, such as those connecting Scottish islands, it is proposed to calculate new expansion factors for each type of circuit technology proposed. Where such circuits are comprised of HVDC technology, the methodology would be consistent with that outlined in (ii) above. In addition, where a significant proportion of the spur has no redundancy, but is still deemed to be part of the wider network for charging purposes, the length of that portion of the circuit in the transport model would be adjusted to compensate by multiplying its actual length by 1/(Locational Security Factor). Where a different approach is developed through the working group process that is reasonably considered by the proposer to better meet the miscellaneous terms set out in the Authority's direction, it shall be substituted into this proposal accordance with the proposer's rights under clauses 8.16.10 and 8.20.23 of the CUSC. It is recognised that stand-alone alternatives may also be developed through the working group process. Development of these alternatives should consider any precedents which it may be setting for other aspects of the charging methodology.

Description of Issue or Defect that the CUSC Modification Proposal seeks to Address:
(mandatory by proposer)

(i) Network Capacity Sharing

As a greater proportion of variable, renewable generation connects to the transmission network, the output of many conventional generators has also become more variable in nature. As generators of different types change the way in which they use the transmission network, the nature of transmission capacity investment planning has also altered to ensure efficient investment is undertaken. This is exemplified in the recent changes to the NETS SQSS (GSR-009) and the increasing amount of investment justified on the basis of avoided future constraint costs (i.e. outside of the deterministic NETS SQSS standards). In order to maintain a consistent level of cost reflectivity, Transmission Network Use of System charges must also evolve.

(ii) Inclusion of HVDC in charging calculation

With the first of two planned HVDC links paralleling the existing AC network committed, there is a requirement to properly take account of changes in the Transmission business and produce cost reflective tariffs through the ability to represent these links in the charging methodology.

(iii) Inclusion of Islands links into the charging methodology

With three links to the Islands of northern Scotland planned in the near future, each of which is likely to be in the form of a transmission spur connecting generation and demand and comprised of network technology not included in the expansion factors set out in clause 14.15.47 and 14.15.49 of the CUSC, there is a requirement to properly take account of changes in the Transmission business and produce cost reflective tariffs through the ability to represent these links in the charging methodology

Impact on the CUSC: *(this should be given where possible)*

Significant impact on Section 14 and impact on Definitions. Further impacts to be determined.

Do you believe the CUSC Modification Proposal will have a material impact on Greenhouse Gas Emissions? Yes/No *(mandatory by Proposer. Assessed in accordance with Authority Guidance – see guidance notes for website link)* Yes
Impact on Core Industry Documentation. Please tick the relevant boxes and provide any supporting information: *(this should be given where possible)* **BSC** ☐ **Grid Code** ☐ **STC** ☒ **Other** ☐ *(please specify)* Possible impact on STC in order to facilitate acquisition of sufficient data for calculation of expansion factors for technologies used in island links.
Urgency Recommended: Yes / No *(optional by Proposer)* No
Justification for Urgency Recommendation *(mandatory by Proposer if recommending progression as an Urgent Modification Proposal)* N/A
Self-Governance Recommended: Yes / No *(mandatory by Proposer)* No
Justification for Self-Governance Recommendation *(mandatory by Proposer if recommending progression as Self-governance Modification Proposal)* N/A
Should this CUSC Modification Proposal be considered exempt from any ongoing Significant Code Reviews? *(mandatory by Proposer in order to assist the Panel in deciding whether a Modification Proposal should undergo a SCR Suitability Assessment)* No ongoing SCRs.
Impact on Computer Systems and Processes used by CUSC Parties: *(this should be given where possible)* To be considered.
Details of any Related Modifications to Other Industry Codes (including related CUSC Modification Proposals): *(where known)* CMP207

Justification for CUSC Modification Proposal with reference to Applicable CUSC Objectives:
(mandatory by proposer)

Please tick the relevant boxes and provide justification for each of the Charging Methodologies affected.

Use of System Charging Methodology

☒ (a) that compliance with the use of system charging methodology facilitates effective competition in the generation and supply of electricity and (so far as is consistent therewith) facilitates competition in the sale, distribution and purchase of electricity;

☒ (b) that compliance with the use of system charging methodology results in charges which reflect, as far as is reasonably practicable, the costs (excluding any payments between transmission licensees which are made under and in accordance with the STC) incurred by transmission licensees in their transmission businesses and which are compatible with standard condition C26 (Requirements of a connect and manage connection);

☒ (c) that, so far as is consistent with sub-paragraphs (a) and (b), the use of system charging methodology, as far as is reasonably practicable, properly takes account of the developments in transmission licensees' transmission businesses.

Full justification:

Submitted in order to fulfil the requirements of the direction to NGET by the Authority, arising from the TransmiT TNUoS SCR process. See proposals and defect description, above.

In summary proposals would facilitate more effective competition by increasing the cost-reflectivity of charges, such that users of the transmission network are exposed to the costs they impose by such use. Proposals would also properly take account of developments in the transmission business by evolving with the charging methodology to reflect the increase in intermittent generation, include HVDC technologies that parallel the onshore network and include links to Scottish islands.

Connection Charging Methodology

☐ (a) that compliance with the connection charging methodology facilitates effective competition in the generation and supply of electricity and (so far as is consistent therewith) facilitates competition in the sale, distribution and purchase of electricity;

☐ (b) that compliance with the connection charging methodology results in charges which reflect, as far as is reasonably practicable, the costs (excluding any payments between transmission licensees which are made under and in accordance with the STC) incurred by transmission licensees in their transmission businesses and which are compatible with standard condition C26 (Requirements of a connect and manage connection);

☐ (c) that, so far as is consistent with sub-paragraphs (a) and (b), the connection charging methodology, as far as is reasonably practicable, properly takes account of the developments in transmission licensees' transmission businesses;

☐ (d) in addition, the objective, in so far as consistent with sub-paragraphs (a) above, of facilitating competition in the carrying out of works for connection to the national electricity transmission system.

Full justification:

Details of Proposer: (Organisation's Name)	National Grid Electricity Transmission
Capacity in which the CUSC Modification Proposal is being proposed: (i.e. CUSC Party, BSC Party, "National Consumer Council" or Materially Affected Party)	CUSC Party
Details of Proposer's Representative: Name: Organisation: Telephone Number: Email Address:	Ivo Spreeuwenberg National Grid Electricity Transmission 01926 655897 ivo.spreeuwenberg@nationalgrid.com
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Attachments (Yes/No): **If Yes, Title and No. of pages of each Attachment:** N/A	