nationalgrid

Stage 02: Workgroup Consultation

Connection and Use of System Code (CUSC)

CMP242

'Charging arrangements for interlinked offshore transmission solutions connecting to a single onshore substation'

What stage is this document at?

01	Initial Written Assessment
02	Workgroup Consultation
03	Workgroup Report
04	Code Administrator Consultation
05	Draft CUSC Modification Report
06	Final CUSC Modification Report

CMP242 aims to ensure that there are appropriate charging arrangements for offshore transmission network where two offshore substations, connected to the same onshore substation, have a transmission connection (interlink) between them offshore.

This document contains the discussion of the Workgroup which formed in April 2015 to develop and assess the proposal. Any interested party is able to make a response in line with the guidance set out in Section 4 of this document.

Published on: **10 July 2015**
Length of Consultation: **15 Working days**
Responses by: **31 July 2015**

The Workgroup concludes:
To be completed following the Workgroup Consultation

High Impact:
Offshore Generators

Medium Impact:

Low Impact:
All other parties liable for TNUoS

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About this document

This document is a Workgroup Consultation which seeks the views of CUSC and interested parties in relation to the issues raised by the Original CMP242 CUSC Modification Proposal which was raised by National Grid Electricity Transmission Plc and developed by the Workgroup. Parties are requested to respond by 5pm on 31 July 2015 to cusc.team@nationalgrid.com using the Workgroup Consultation Response Proforma which can be found on the following link: http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/CUSC/Modifications/CMP242/

Document Control

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1.0	10/07/2015	Workgroup	CMP242 Workgroup Consultation to Industry

Any Questions?

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1 Introduction

1.1 This CMP242 proposal aims to ensure that there are appropriate charging arrangements for offshore transmission network that links two offshore substations (used by offshore generators) which are connected to the same onshore substation i.e. are interlinked offshore. The interlink allows generators connected to either offshore substation to export some (or all) of their output to shore via either main circuit. At present the charging methodology for offshore transmission considers only main circuits and therefore does not take account of any interlink(s) that may be built. This modification does not cover the situation where increased onshore capacity would be provided or where the interlink would influence the design of onshore reinforcement works i.e. an integrated offshore network.

1.2 The Workgroup first met on 1st May 2015, and has held further meetings on 22nd May 2015 and 19th June 2015.

1.3 **Prior to confirming any alternative proposals, the Workgroup are seeking views on the options they have identified, what is the best solution to the defect identified in this CMP242 proposal and also any other further options that respondents may propose. Following this Consultation, the Workgroup will consider any responses, vote on the best solution to the defect and report back to the Panel at the September 2015 Panel meeting.**

1.4 The remainder of this document is structured as follows and provides further details on the proposal:

- Section 2 provides a summary of the **Workgroup discussions and issues**, and is structured around six key topic areas considered by the Workgroup:
  - Should a generator be able to opt-out of paying for and using an interlink?
  - Should generators be allowed to negotiate an apportionment of interlink costs?
  - Which elements of a generator's charges should change to account for the interlink?
  - How should costs associated with the interlink be apportioned between generators?
  - What happens if one generator changes their TEC?
  - How should the case of more than two generators be handled?
- Section 3 details the **proposals and possible alternatives, implementation and impacts.**
- Section 4 details how to **respond to the Consultation.**

There are also five Annexes which provide supporting information:

- Annex 1 is the original proposal form.
- Annex 2 is the Terms of Reference for the Workgroup.
- Annex 3 details the attendance at the Workgroup meetings.
- Annex 4 provides an overview of offshore charging in GB.
- Annex 5 provides the mathematical definition of the eight proposals discussed in the report.

1.5 In addition a **spreadsheet** was developed that allows the Workgroup and the reader of this Consultation to adjust the capacities of the main circuits and the interlink, and the generators' TEC and see the how apportionment under the eight different options might work. This can be found on the Consultation webpage[1].

1.6 This Workgroup Consultation has been prepared in accordance with the terms of the CUSC. An electronic copy can be found on the National Grid Website[1], along with the Modification Proposal Form.

1 http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/CUSC/Modifications/CMP242/

2 Key Issues and Summary of Workgroup discussions

Background

2.1 The current transmission charging methodology, as defined in Section 14 of the CUSC[2], defines charges to be paid by generators associated with offshore substations and offshore circuits that they use. These arrangements have been designed around the prevailing design standard for offshore transmission, specifically that they are radial circuits connecting offshore substations to onshore substations.

2.2 A number of developers of offshore generation are now planning the construction of a transmission cable linking offshore substations between some of their projects that connect to a common onshore substation. It is also possible that an interlink is required where the two (separate) developments are unrelated commercially / corporately. The intention is for this *interlink* to be held in open standby unless the cable to shore associated with one of the offshore substation becomes unavailable (through a fault or an outage). The interlink would then be manually switched in to allow some (or all) of the energy to reach the shore from either generator subject to available capacity on the remaining cable.

2.3 The situation for two offshore substations is illustrated in Figure 1. The case of more than two interlinked offshore substations connected to a single onshore substation is also within the scope of this CMP242 proposal; although this report focusses on the two offshore generators / transmission cables connected via a single interlink to illustrate what CMP242 seeks to achieve. The case of multiple interlinks is considered with Consultation Question 10 on page 20.

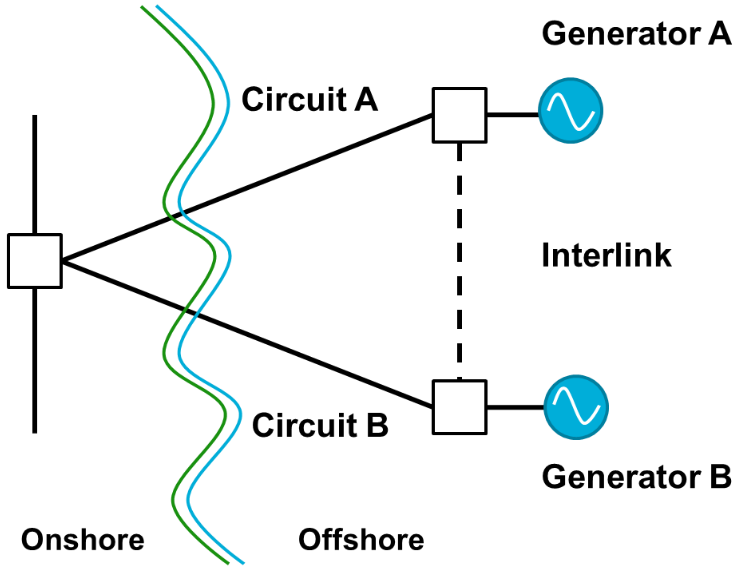

Figure 1: *The case of two offshore substations, connected to a single onshore substation, interlinked with a transmission circuit.*

[2] http://www2.nationalgrid.com/uk/industry-information/electricity-codes/cusc/the-cusc/

2.4 Such an interlink will provide additional security to each generator, as it provides an alternative transmission route to shore, without the high costs of building an additional circuit to shore. However, an offshore interlink may not necessarily provide any additional transmission capacity for the two offshore generators as the main radial circuits are already scaled appropriately to get their energy to shore, and no additional capacity to shore is being provided. Overall, an interlink solution in some cases may provide an economic insurance premium for the generator, whereas a second cable(s) to shore would be uneconomic for that single generator.

2.5 The standard design for an offshore substation is for a single busbar, to which is connected the generator via a circuit breaker, and the circuit to the onshore substation via a transformer and circuit breaker. To accommodate an interlink, an additional bay (shown in red on the diagram below) may be required on the busbar along with additional circuit breakers and associated equipment to connect a circuit to the other offshore substation.

2.6 It was noted by the Workgroup that it may be possible to include an interlink to an existing offshore substation provided there was sufficient space in the offshore substation for the necessary bay on the busbar and the associated equipment.

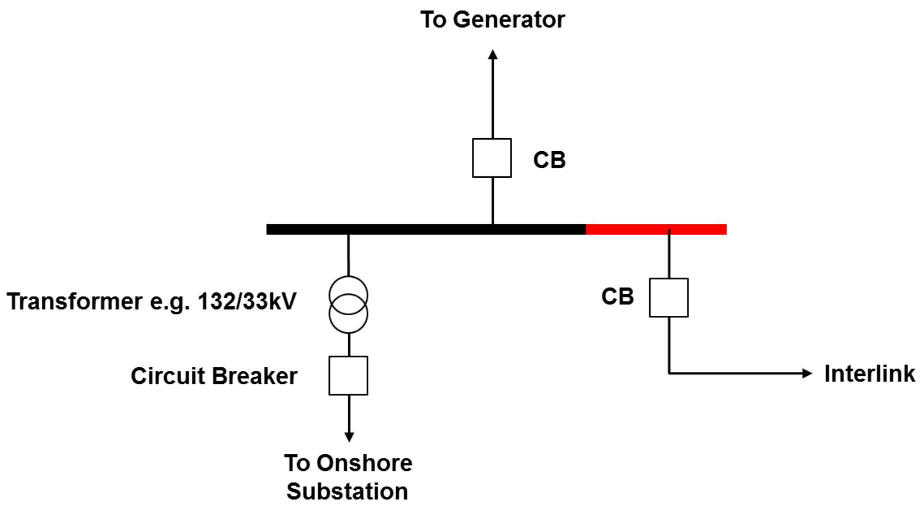

Figure 2: *Indicative offshore substation layout showing the additional single busbar with an additional bay (shown in red) to facilitate the interlink*

2.7 At present, similar low voltage cables exist for a number of offshore generators, linking offshore substations; however, these have remained as generator owned rather than transferring to the offshore transmission owner (OFTO). These cables typically exist to provide back-up supplies to a platform in the event of a fault rather than as an export route. As generator owned assets these assets are not covered in the charging methodology.

2.8 The current charging methodology within Section 14 of the CUSC does not provide a cost reflective charge for offshore transmission solutions provided by the OFTO(s) that include interlinked offshore substations connecting to a common onshore substation, as the cost of providing the additional link would not be reflected in the local circuit charge.

Key Assumptions

2.9 The discussions held by the Workgroup and the views presented in this report are based on a number of *key assumptions*:

- The interlink will normally be switched out of use (held in open standby). If a fault or outage occurs on one of the radial circuits, the interlink would need to be manually switched in, allowing export of some or all energy from the otherwise stranded generator. Priority for export will be given to the generator connected via the remaining main circuit, and the other generator may need to reduce their output if they wish to use the interlink to export via the remaining main circuit.

- Main radial circuits from the offshore to the onshore substation will continue to be scaled accordingly to the standard offshore design (defined in the SQSS), and in particular will neither be smaller or significantly larger than required for the main associated offshore generator.
- The interlink will be an AC cable. Due to the expected distances between the two offshore substations, a HVDC link would not be considered economic[3].
- From a system operation perspective, the interlink can be used in either direction to export energy from either offshore generator as required depending on the situation.
- Any changes to the charging methodology arising from CMP242 will apply to both developer-build and OFTO-build situations.

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3 Indicative estimates provided to the Workgroup indicate that a 600MW capacity cable, HVDC cables would become preferred over AC at a circuit length of around 130-150km. As an interlink connects two substations connected to the same onshore substation, it is assumed the distance between offshore substation will be less than this cross over value.

Should a generator be able to opt-out of paying for and using an interlink?

2.10 The question of whether a generator should be able to opt-out of paying for and using an interlink was discussed by the Workgroup. It was noted that having an 'opt-out' is related to timing of the installation of the interlink compared to that of the generators.

2.11 It was assumed that an interlink would be included in a design at one of two stages, either::

- An Interlink is proposed during the development phase for both generators, or
- An interlink is planned when one generator is already built or financially committed.

An Interlink is proposed during the development phase for both generators

2.12 It was agreed by the Workgroup that the majority of possible interlinks are likely to fall into the category of being developed when both generators are under development. This is based on the requirement for the offshore substations needing to be sized appropriately, and given the high-cost of offshore works it is unlikely that offshore substations would be significantly oversized to allow for future expansion.

2.13 The Workgroup also agreed it was appropriate for the costs of the interlink to be shared between the offshore generators (using an appropriate methodology), and that both generators would gain a right to use the interlink and be subject to an appropriate charge for doing so. This is analogous to the onshore scenario where charges are set to reflect the network and how a generator can access and use that network.

2.14 The related issue of whether the interlink may make a project economically unviable for one or both of the generators was discussed, and it was agreed that in this situation the overall project proposal would not be considered economic and efficient and an alternative solution would be needed before it could proceed.

An interlink is planned when one generator is already built or financially committed

2.15 The Workgroup noted that the situation of one generator already existing (or being financially committed) prior to an interlink being planned is less likely to occur but that nonetheless it should be considered further and consulted upon.

2.16 In this category, it is noted that the existing generator has two options:

a. The OFTO(s) and SO determine that it is efficient to build the interlink, and the existing generator incurs a share of the cost of the interlink (as does the other, to be developed / built, generator) and has the right to use it (as does the other generator).
b. The OFTO(s) and SO determine that it is efficient to build the interlink, however, the existing generator **chooses not** to pay for the interlink, and so **has no right to use it**. The other (to be developed / built) generator would be able to use the interlink (exclusively) and would pay all the associated charge for the interlink.

2.17 Option (a) mirrors the current onshore situation associated with onshore reinforcement works, although it was noted that the nature (and cost) of offshore interlinks compared to similar onshore situations may warrant a difference in treatment. Option (b) permits an 'opt-out' of using an interlink for an existing generator, allowing them to avoid potentially significant additional charges which may cause them to become economically unviable after they have financially committed / built their asset.There was a view from at least one Workgroup member that having the ability to 'opt-out' of paying (and using) the interlink should be an option to avoid a generator in this situation being left with a stranded (generation) asset through no fault of their own.

2.18 The SO noted that it would be possible to switch the interlink in such a way that it would only operate mono-directionally benefiting only the one generator paying for it. The SO further noted that, putting aside any commercial arrangement, such a mono-directional operation may not be the most economic and efficient for the system as a whole, as it would mean that generation could not export even though there was circuit capacity available for them to do so. In the case of an enduring fault on a main circuit, this situation may be harder to justify, given that end consumers pay for all charges through their bills.

2.19 In common with the 'during development phase' scenario, it was noted that in this scenario if an existing generator were to be rendered economically unviable by the installing of an interlink then this is not likely to be an overall efficient and economic solution, and therefore it is unlikely to be built.

2.20 Table 1 summarises the pros and cons of the options when one generator is already existing (or financially committed) and an interlink is subsequently planned.

Option		Pros	Cons
(a)	Both generators have a right to use the interlink and pay the associated charge	Aligns onshore and offshore regimes Allows maximum flexibility for the SO	The size / value of offshore generators, and the costs for transmission are substantially different to onshore. Risk that existing generator is rendered economically unviable with the extra cost of interlink – leads to higher regulatory risk, leading to higher cost for consumers.
(b)	One generator (A) choose to have no rights and so no cost for the interlink. The other generator bears all the costs of the interlink and has exclusive rights to use the interlink.	Removes risk that generator (A) is rendered economically unviable by the action of another party or OFTO(s) and SO.	Different regime offshore to onshore. Generator (A) could, by not paying for the interlink, be limiting an overall efficient build. SO potentially constrained by contractual obligations, and limited ability to operate system efficiently. In an enduring fault scenario, may have a generator stranded even though a transmission circuits exists to connect it.

Table 1: *Summary of pros and cons for whether a existing generator should or should not be able to opt-out of paying for an using an interlink.*

2.21 The Workgroup noted that a consequence of a generator choosing option (b) could be, at a later date, the generator may choose to pay for and have the use of the interlink. A Workgroup member believed this would likely lead to a behaviour where developers / generators do not enter into an agreement until they are forced to do so; i.e. their cable to onshore fails. The Workgroup agreed to consult on how a generator, who having initialled opted-out, and later opts-in should be treated. In particular, should the generator be subject to any retrospective charges.

2.22 The Workgroup agreed that in practice option (a) was the preferred scenario; however, at least one Workgroup member believed that option (b) should remain available for some situations to avoid financially stranding an existing generator.

2.23 The Workgroup agreed to seek industry views through the Workgroup Consultation on whether an existing generator should be able to opt-out of paying the charges and the ability to use an interlink, if an interlink it proposed to be installed at a later date after their financial close. The Workgroup also agreed to seek views on what should happen if a generator first opts-out, but later opts-in to paying for an using an interlink.

Consultation Question 5

- *For an existing or financially committed generator, when an interlink is proposed, should the generator have the right to 'opt-out' of paying for (and using for) interlink?*
- *If a generator initially opts-out, but later 'opts-in' to paying for (and using) an interlink should any costs be applied retrospectively?*

2.24 For the offshore regime, the Authority sets the final transfer value at which developers sell their assets to a new offshore transmission licensee (OFTO) prior to asset transfer. The value is based on the actual costs incurred and reflects an assessment of the economic and efficient capital costs incurred in the development, construction and installation (including civil works) of the relevant offshore transmission assets. This establishes the amount of revenue that this licence holder can earn (the tender revenue stream, or TRS); a fixed value (subject to certain income adjusting events and mechanisms) that rises annually with inflation. The value determined through the cost assessment process will only include capital expenditure incurred in an efficient and economical manner. Therefore it may not include all costs incurred by the developer.

2.25 One Workgroup member, noted that capacity on the assets built by the developer/generator which was not permitted as part of the cost assessment process, may at some future point be used (and become part of the allowed OFTO revenue) as a result of the interlink being built. The Workgroup member noted that this situation gives rise to additional revenue to the OFTO, a potential change in the existing generators charge, but no further revenue to the developer as the cost of the asset built would not have been recognised in the Ofgem initial asset transfer. Ofgem noted that this scenario is unlikely to happen as the additional capacity is either likely to have been provided as it is anticipatory investment so covered by the GFAI process, or it is because of using a standard cable rather than a bespoke size. Any particular case would be considered as part of the development of a scheme involving an interlink, and need to be agreed by Ofgem as part of the cost assessment process.

Should Generators be allowed to negotiate an apportionment of interlink costs?

2.26 The Workgroup considered the approach of allowing the affected offshore generator parties to negotiate their own apportionment of the costs of the interlink, rather than having a detailed methodology in the CUSC. It was suggested that the SO could act as the facilitator for any trilateral discussions, with Ofgem agreeing the final proposal for each development.

2.27 The Workgroup considered this a viable option to allow the negotiation of apportionment of costs between the affected parties, but that a 'fall-back' methodology would be required in the CUSC in the event that parties could not agree on the apportionment of the costs of any interlink. The Workgroup agreed to seek industry views through the Consultation on their views to this approach.

Consultation Question 6

Do you think that individual offshore generator parties affected by an interlink should be able to agree how to apportion the costs of that interlink between them, with the CUSC providing a fall-back methodology?

Which elements of a generator's charges should change to account for the interlink?

2.28 At present the current offshore charging methodology is designed around radial circuits. Details of the current offshore charging regime are detailed in Annex 4 of this report. An offshore generator is liable for a TNUoS tariff composed of three key elements:

- offshore local substation tariff;
- offshore local circuit tariff;
- wider tariff;

In addition, if the onshore substation is connected to the MITS (Main Interconnected Transmission System) by a local transmission circuit or a distribution network additional elements will be added to the tariff. These additional elements are not affected by the consideration of the interlink

Local Offshore Substation Charge

2.29 The GB charging methodology set out in Section 14 of the CUSC provides that offshore and onshore generators only pay a substation charge for the first local substation that a generator is connected to. In the case of the existing radial offshore design, this means that a generator pays a charge for the offshore substation, but no charge for the associated onshore substation.

2.30 In the case situation involving an interlink, additional substation equipment is required to be installed at the offshore substations of both generators. It was noted if Generator A should pay for part of the interlink equipment in substation B and vice-versa, that these two costs would net off as the equipment would be broadly similar at either end.

2.31 The Workgroup agreed that there was no need to change the way in which offshore substation charges are levied as a result of the interlink and the CMP242 proposal. Each generator would continue to pay a substation charge based on all the items at the first offshore substation, including those required for the interlink circuit (e.g. additional busbar bay, circuit breaker).

Local Offshore Circuit Charge

Costs associated with the interlink

2.32 A broad discussion was held on the advantages to the generator of having an additional route to shore via an interlink. The Workgroup agreed it was appropriate for the costs of the interlink to be shared between the offshore generators. Page 14 onwards considers the option for how to apportion the costs between the generators.

2.33 For offshore generators with a single radial circuit to shore, designed to the standard offshore design as detailed in the SQSS, detailed are placed in 'Clause 10' of the Bilateral Connection Agreements specifying what are Allowed Interruptions. The detail of Clause 10 will need to be considered for individual generators where an alternative route to shore is potentially available via the interlink.

Costs associated with capacity on the other main circuit

2.34 For a generator with an interlink, there is potentially some capacity available on the other generator's main circuit to be used in the event of a fault or outage on their main circuit. The Workgroup considered whether a charge should be levied for the opportunity and redundancy that this capacity may provide

- The Workgroup note two high-level options. do not reflect the cost of the other main circuit in a generator's local circuit charge, or
- reflect the cost, using some mechanism, of the additional redundancy provided via the other main circuit.

2.35 The Workgroup considered that there should be no charge levied to the generator for the cost of the other radial circuit which may be used in the case of an interlink. This position is different to part (iii) of the original modification proposal (see annex 1), but has been based on the following reasons:

- If Generator A pays for part of Generator B's main circuit, and vice versa, the overall effect is likely to net off and have very little difference to the overall charge, but add significant complexity to the methodology.
- The main circuit is sized appropriately for the export of the associated generator and any additional firm capacity provided by that main circuit to the other generator is only a feature of that main circuit being more efficient to install as a standard sized cable.
- The current offshore charging methodology does not charge for non-firm access.
- The interlink is only used in the situation of faults or outages and it is not capacity that can be used or guaranteed.
- The charging methodology is design to be cost reflective not cost absolute. It was felt that the current arrangement plus the cost of the interlink are reflective of the costs associated with the offshore network, without adding additional complexity.

2.36 The Workgroup agreed to seek the views of industry on this matter.

Consultation Question 7

Do you agree with the Workgroup's view to not charge a generator for another circuit other than their main radial circuit and their share of the interlink circuit, i.e. there is no charge for the use of the other generator's radial circuit? If not, what would you propose?

How should costs associated with the interlink be apportioned between generators?

2.37 Having agreed that the costs of the interlink should be apportioned between the two generators, eight options were identified and discussed by the Workgroup for how the cost associated with the interlink could be divided. The aim is to apportion the total cost associated with the interlink circuit between the two connecting parties.

2.38 A generator has firm access up to their TEC capacity on their offshore main circuit. Due to cable oversizing, there may be spare capacity on that cable beyond the generator's TEC. In addition, and in particular for offshore wind farms and other intermittent generation, a generator will often be operating below their TEC level, meaning there is spare export capacity available on their main circuit.

2.39 The Workgroup noted that this spare capacity on the main cable of one generator could provide additional transmission capacity to another generator via an interlink, some of which could be available (firm) and some of which would be available if the other generator (whose main cable it was) is operating below their level of TEC (non-firm). The concept of using the Annual Load Factor (ALF) to give a measure of the average non-firm access was suggested. It was noted that given the geographic proximity of the two offshore generators (and that they were likely to be, at least initially, all windfarms) their ALFs are likely to be very similar. Only if there were different offshore technologies at the two substations are there ALFs likely to different significantly.

2.40 Each of the options, how they score against a number of criteria, and the Workgroup's view of the options are summarised in Table 2

2.41 A spreadsheet was developed (provided at http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/CUSC/Modifications/CMP242/) that allows the Workgroup and the reader of this Consultation to adjust the capacities of the main circuits and the interlink, and the generators' TEC and ALF and see the how apportionment under the eight different options shown in Table 2 might work.

Apportionment Option	Description	Areas of concern for the Workgroup						Workgroups view to proceed
		Reflect generator size	Reflect interlink size	Reflect capacity to shore	Reflect different generator load factors	Fully defined	Unaffected by changes to TEC	
i. Equal Split	Generators pay an equal share for the interlink, regardless of circuit capacity or TEC.	No	No	No	No	Yes	Yes	No - not cost reflection and likely discriminatory
ii. Proportion of TEC	Generators are of different capacities (TEC), and their share of the cost of the interlink is based on the TEC of each generator.	Yes	No	No	No	Yes	No	No - not reflective of interlink size
iii. Shared and Unshared (equal)	Generators are of different capacities (TEC), and therefore may not ever be able to fully use an interlink, so should only pay for part of it they can use. Interlink capacity is divided into that which is shared by both generator, and that which only one generator can use. The cost of the shared capacity is divided *equally*. The cost of the capacity which can only be used by one generator it paid for by that generator.	Yes	Yes	No	No	Yes	No	Yes – but aware does not reflect capacity to shore
iv. Shared and Unshared (proportion of TEC)	As (iii) except that the cost of the shared capacity is divided based on the TEC of the generators rather than equally to be most reflective of generator size.	Yes	Yes	No	No	Yes	No	**Preferred Solution** Workgroup members liked the simplicity of the option, but are concerned it does not reflect different load factors or capacity to shore.
v. Additional Firm Access	The cost of the interlink are apportioned based on how much additional firm capacity is provided to shore via the interlink.	Yes	Yes	Yes (firm access only)	No	Yes	No	No - Not relevant for this situation as not dealing with additional firm capacity to shore.

Apportionment Option	Description	Areas of concern for the Workgroup						Workgroups view to proceed
		Reflect generator size	Reflect interlink size	Reflect capacity to shore	Reflect different generator load factors	Fully defined	Unaffected by changes to TEC	
vi. Non-firm access using ALF	The cost of the interlink are apportioned based on how much non-firm firm capacity is provided to shore via the interlink. Non-firm capacity is considered as offshore projects often have an output lower than their TEC.	Yes	Yes	Yes (non-firm access only)	Yes	Yes	No	Yes – as part of vii
vii. Combination of Firm and Non-Firm	The costs of the interlink are apportioned based on a measure of both firm and non-firm capacity, reflecting the capacity available to shore. This option apportions costs of the interlink based on a weighted sum of options (v) and (vi). The weighting is to be determined.	Yes	Yes	Yes	Yes	No (relies on arbitrary weighting)	No	Yes – but concerned about the arbitrary weighting Workgroup members wished to seek further views from the industry Consultation on a potential weighting
viii. Restricted Availability Measure (using ALF)	Does not consider access to be firm or non-firm, but rather looks at a measure of 'restricted availability' which is potential capacity available on the other main circuit, by considering circuit capacities, TEC and ALFs.	Yes	Yes	Yes	Yes	Yes	No	**Preferred Solution** Workgroup members wished to seek further views from the industry Consultation

Table 2: *Summary of the eight options for apportioning interlink costs between generators.*

2.42 The two preferred options agreed by the Workgroup, at this stage in the process, were Options (iv) and (viii). The mathematical definitions for all of the other situations can be found in Annex 5.

Option (iv) Shared and Unshared (proportion by TEC)

2.43 The Workgroup considered **Option (iv)** shared and unshared (proportion by TEC) to be a strong candidate for its simplicity and ease of use. It was noted however, that it is not reflective of the additional circuit capacity to shore that is available, or differences in generation type that may affect availability of the circuit.

2.44 This option is defined mathematically as follows[4]:

Proportion for Generator A = (P_A x Shared + A Only)/ (Shared + A Only + B Only)

Proportion for Generator B = (P_B x Shared + B Only)/ (Shared + A Only + B Only)

Where $P_A = TEC_A / (TEC_A + TEC_B)$

$P_B = TEC_B / (TEC_A + TEC_B)$

Shared = min(TEC_A, CAP_I, TEC_B)

A Only = max(0,CAP_I,TEC_B)

B Only = max(0,CAP_I,TEC_A)

Option (viii) Restricted Availability Measure (using ALF)

2.45 The Workgroup also considered **Option (vii)** which seeks to look at the availability of capacity to shore for a generator. The measure of how much additional capacity a generator is gaining could be termed the 'Restricted Availability Measure' and composes the minimum of:

- A measure of the likely capacity available on the other main circuit - the capacity of the other main circuit to shore less the other generator's TEC multiplied by its Annual Load Factor;
- A measure of the likely output of the generator (the generator's TEC multiplied by its Annual Load Factor)
- The capacity of the interlink (in case this is a limiting factor)

2.46 This option is reflective of the additional restricted availability that a generator gains by the existence of an interlink, but does not have to define that capacity as either firm or non-firm.

2.47 This option is defined mathematically as follows[4]:

Proportion for Generator A = (A via CCT B) / (A via CCT B + B via CCT A)

Proportion for Generator B = (B via CCT A) / (A via CCT B + B via CCT A)

Where A via CCT B = min(CAP_B - $ALF_B \times TEC_B$, CAP_I, $ALF_A \times TEC_A$)

B via CCT A = min(CAP_A - $ALF_A \times TEC_A$, CAP_I, $ALF_B \times TEC_B$)

[4] In this case, TEC_X is the TEC of generator X in MW. CAP_X is the capacity of circuit X (I=Interlink), and ALF_X is the annual load factor for generator X.

2.48 The Workgroup agreed to seek industry views on the preferred solution from Option (iv) and Option (viii), or if there was another suitable method that should be considered in addition to those shown in the Table in 2.38 above.

Consultation Question 8

Do you have a view on whether Option (iv) – 'shared and unshared (proportion by TEC)', Option (viii) - 'Restricted Availably Measure' or another option is the most appropriate way to apportion the costs associated with an interlink?
If you prefer option (vii) a weighted sum of firm and non-firm access, what value would you propose for the weighting between firm and non-firm?

What happens if one generator changes their TEC?

2.49 The consequences of one offshore generating party using an interlink that changes its TEC were also considered by the Workgroup, as this would potentially affect the costs to the other generator who uses that interlink. The Workgroup considered three potential options:

- do nothing – a generator's charges can be affected by another generator's change in TEC;
- the proportions of the interlink costs for each generator are fixed upfront, for say a TO price control[5], so they are not affected (in terms of paying more of the cost of the interlink) by the other generators' TEC changes (but they are by their own changes in TEC);
- a hybrid cap/collar approach is implemented – whereby each generator is capped to changes caused by the other generator, and collared against a reduction due to their own changes.

2.50 In the case of offshore generation, it does not seem appropriate to 'do nothing'. Costs associated with offshore transmission circuits can be significantly higher than circuits of similar length onshore, and could render one generator economically unviable if their proportion of the cost of the interlink increased by the decision of the other generator. This situation does not occur onshore and is particular to the offshore transmission regime.

2.51 Fixing the proportion upfront provides stability to the generator, and the knowledge that they cannot be affected by the other generator reducing their TEC. The consequence is that the risk associated with a change of one of the generator's TEC is carried by the generator residual element of TNUoS, as any under-recovery from the generator will be made up through the residual tariff, socialising the cost of spare capacity across all generators. This approach is consistent with the current onshore and offshore methodologies.

2.52 The hybrid cap/collar is potentially difficult to implement, complex and not consistent with the rest of the charging methodology.

2.53 The Workgroup agreed that in common with the onshore regime that one party should not be *directly* affected by the TEC reduction caused by another (all other things being equal). A fixed proportion of the costs associated with the interlink, determined based on the initial TEC of the generators, should be fixed for a TO price control period.

2.54 This approach has two at least consequences. Firstly, if a generator increases their TEC, their charge will rise but the charge for the other generator remains fixed for the price control. Secondly, it might be possible to game the methodology, for example by one generator initially overstating their TEC, and then reducing it later to reduce their charge.

Consultation Question 9

Do you agree with the Workgroup that one party should not be directly affected by the TEC reduction caused by another (all other things being equal), meaning that a fixed proportion of the costs associated with the interlink, determined based on the initial TEC of the generators, should be fixed for a TO price control period?
Do you have any comments on the consequences of this approach (see 2.54)?

[5] The next GB TO price control is expected to be eight years from 2021/2022.

How should the case of more than two generators be handled?

2.55 Also within scope of the Workgroup is the case of an interlink between three (or more) offshore generators connecting to a single onshore substation. The case with three generators is illustrated in Figure 3.

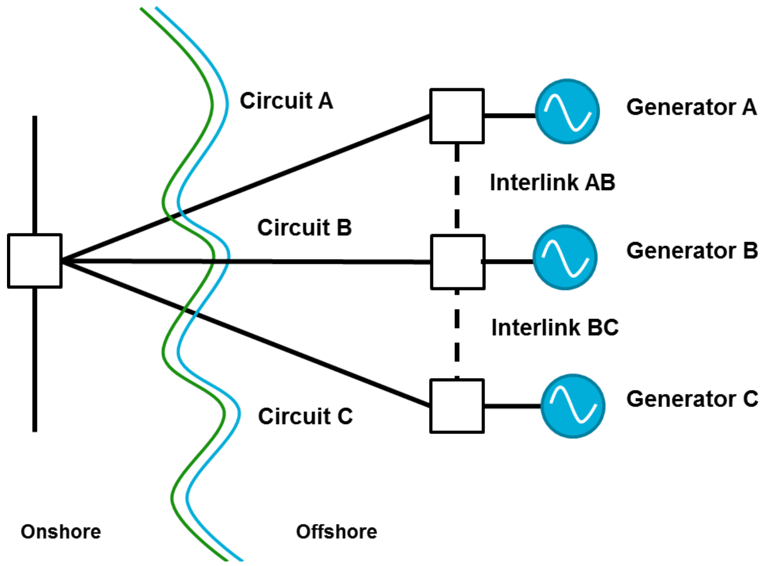

Figure 3: *Layout for a interlink scenario with three generators.*

2.56 In this scenario, Interlinks AB and BC will sit in open standby being switched in if required. The added complexity here is that Generator B has alternative routes to shore via Circuit A and Circuit C using one or other of the interlinks. Moreover, Generator A and C have routes to shore via two circuits if both interlinks are switched in (i.e. A could exit via Circuit B via Interlink AB, and Circuit C via Interlink AB and BC).

2.57 The Workgroup are interested in gathering views on how to extend the principles discussed in this report to the case of more than two generators. For example, (a) should each interlink be considered separately apportioning costs only between the two directly connected parties (noting that generator B has two such interlinks), or (b) an extension of an appropriate methodology for apportioning cost of the two interlinks over the three generators.

Consultation Question 10

How should the situation of more than two generators be treated? Should each interlink be treated separately, should an extension of the apportionment methodology be determined to share multiple interlink costs over multiple generators, or do you have any further options?

Worked Example

2.58 The following worked examples (based on the scenario illustrated in Figure 4) shows the possible allocation of revenue between two generators where Generator A has TEC of 90MW and an ALF of 45%, and Generator B has TEC of 120 MW and an ALF 40%. Circuit A has a capacity of 100MW, Circuit B has a capacity of 120MW and the Interlink capacity is 100MW, as illustrated in the following diagram.

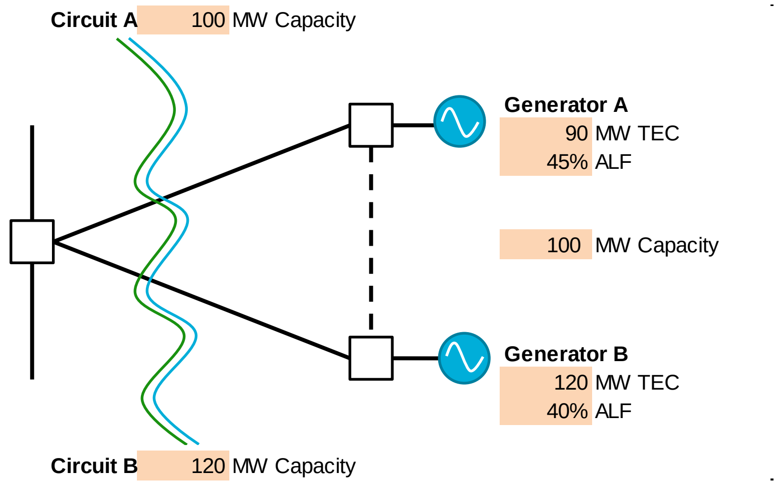

Figure 4: *Circuit capacities, generator TEC and ALFs for the worked example.*

Apportionment of interlink costs

2.59 Using Option (iii) the shared capacity is 90MW, and 10 MW is used by Generator B only, and the proportion of TEC are Generator A – 42.9%, and Generator B – 57.1% Therefore the proportion of revenue should be allocated as:

- For Generator A: (42.9% x 90) / (90 + 10) = 38.6%
- For Generator B: (57.1% x 90 + 10) / (90 + 10) = 61.4%

2.60 Using Option (viii) the measure of available capacity for the generator via the other main circuit is:

- Generator A via Circuit B = min(120 – 40% x 120, 100, 45% x 90)
  = min(72,100,40.5) = 40.5
- Generator B via Circuit A = min(100 - 45% x 90, 100, 40% x 120)
  = min(59.5, 100, 48) = 48

2.61 Therefore the proportion of revenue should be allocated as:

- For Generator A: 40.5 / (40.5 + 48) = 45.8%
- For Generator B: 48 / (40.5 + 48) = 54.2%

2.62 For all of the options in Table 2, the split between Generator A (Blue) and Generator B (Red) are shown in the following chart.

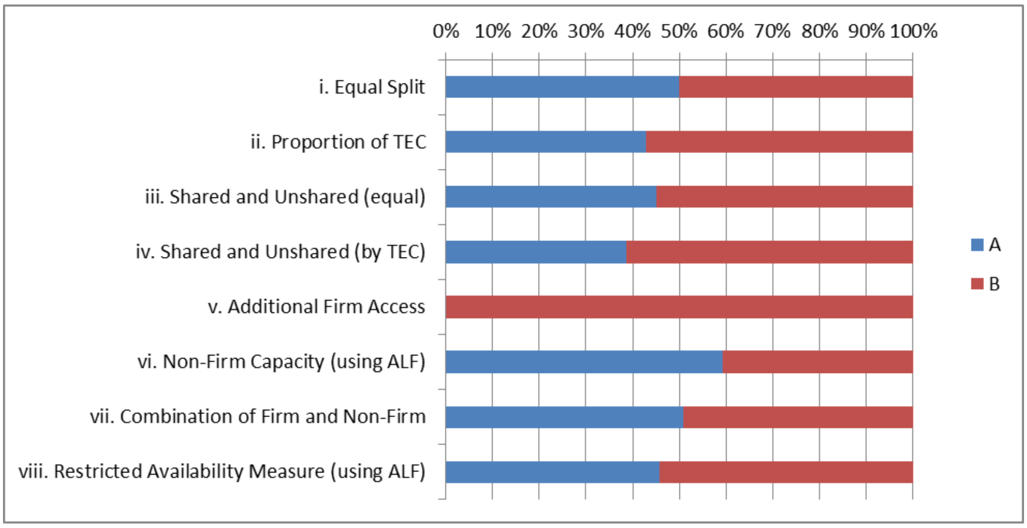

Figure 5: *Comparison of the proportion of the interlink costs apportioned to each generator under the eight options detailed in Table 2.*

2.63 This highlights the particular problem of using option (v) Additional Firm Capacity as a measure, as in this example Generator A has no firm capacity and so no charge associated with the interlink. Option (v) also fails when neither circuit has any spare firm capacity. Note the result for Option (vii) can be changed by the use of an arbitrary parameter – the weighting of firm and non-firm. This parameter would need to be codified (see Consultation Question 8)

Effect of TEC change

2.64 The following example look at the effect of fixing proportions using the initial TEC, and then varying TEC. Using the initial TEC, the proportions of the cost of the interlink are fixed. This costs and the initial TEC is then used to determine a tariff (£/kW) to ensure consistency with the offshore charging methodology.

2.65 Using the proportions calculated using Option (viii) (but equally applicable to other options), and with an assumed revenue element associated with the interlink circuit of £0.75M, then the proportion of the interlink cost for each generator is:

- For Generator A: 45.8% x 0.75M = £0.34M
- For Generator B: 54.2% x 0.75M = £0.41M

2.66 The £/kW tariff can be found by dividing this cost by the initial TEC value for each generator. Note that a generator specific tariff is required to account for the different circuit capacities and ALFs.

- For Generator A interlink circuit tariff: £0.34M / 90 MW = 3.81 £/kW
- For Generator B interlink circuit tariff: £0.41M / 120 MW = 3.39 £/kW

2.67 If the TEC is unchanged, the total cost (TEC x Tariff) recovered from each generator is unchanged as follows:

- For Generator A: 90 MW x 3.81 £/kW = £0.34M
- For Generator B: 120 MW x 3.39 £/kW = £0.41M

2.68 If **Generator B choses to reduce their TEC** to say 100 MW, the calculation would change as follows:

The tariff are unchanged (all other things being equal), but now the amount of money recovered is as follows:

- For Generator A: 90 MW x 3.81 £/kW = £0.34M
- For Generator B: 100 MW x 3.39 £/kW = £0.38M

In this case there is an unrecovered of £0.07M which would be socialised and recovered through the generator residual element of TNUoS. Note that as expected Generator A's charges are unaffected by Generator B's change in TEC.

2.69 If **Generator B choses to increase their TEC** to say 140 MW, the calculation would change as follows:

The tariff are unchanged (all other things being equal), but now the amount of money recovered is as follows:

- For Generator A: 90 MW x 3.81 £/kW = £0.34M
- For Generator B: 140 MW x 3.39 £/kW = £0.47M

In this case there is an over recovery of £0.06M which decrease the generator residual element of TNUoS. Note that as expected Generator A's charges are unaffected by Generator B's change in TEC.

2.70 At the next TO price control, the proportions would be recalculated (based on the amended level of TEC for each of the two generators at that time) and the proportions changed. Using the example of Generator B reducing their TEC to 100MW, under Option (viii) and all other things being equal, the recalculated proportions are Generator A: 50.3% and Generator B 49.7%. The tariff would be recalculated as Generator A £4.19/kW, and Generator B £3.73 kW. This would, from the date of that next TO price control, again recover the total costs associated with the interlink from the two offshore generator parties and provided the TEC remains the same going forward from that date there would be no under recovery of the interlink costs (which would have needed to be recovered via the generator residual element of TNUoS).

3 Proposal, Alternatives, Implementation and Impacts

CMP242 Updated Proposal

3.1 It is proposed that the TNUoS charging methodology within Section 14 of the CUSC is modified such that:

- The local circuit charge be updated to reflect the portion of the OFTO(s) costs associated with the interlink, so that each generator party connected via that interlink pays an amount representing either [Option (iv)] a proportion of shared and unshared capacity (proportioned by TEC) or [Option (viii)] a proportion relating to the additional restricted availability measure provided by the interlink.
    - That the proportions used to apportion the interlink costs between the two parties, be fixed at the start of the each TO price control.
- That no changes be made to the methodology for calculating offshore substation tariff.
- That no charges are applied for any additional offshore substations, or the use of the other main circuit. The charge for the generator's main radial circuit are unaffected.

View of the proposer

3.2 At this stage, National Grid is comfortable that the Workgroup has looked at the main issues. Overall we would prefer a simpler solution, as attempting to codify all possible future scenarios risks developing a solution which is complex and not easy for users to understand.

Possible Alternative Proposals

3.3 Potential areas for alternative proposals (WACMs) are likely to be formed around the options outlined in this report, based on the outcome determined by the Workgroup Consultation.

3.4 Such areas may include:

- Where to include an opt-out clause for existing generators if an interlink is added later to an existing generator (see 2.10 – 2.25 and Consultation Question 5)
- Allowing for a negotiated solution (see 2.26 – 2.27 and Consultation Question 6)
- Alternative to the proposal to include no change for the other main circuit (see 2.34 - 2.36 and Consultation Question 7)
- Different methodologies for apportioning the costs associated with the interlink if the Workgroup cannot reach a consensus (see 2.37 - 2.48 and Consultation Question 8)
- The treatment of TEC changes (see 2.49 - 2.54 and Consultation Question 9)
- Situations arising from the consideration of more than two generators (see 2.55 – 2.57 and Consultation Question 10)

Proposed Implementation and Transition

3.5 It is proposed to make the amendment to the charging methodology as soon as practically possible; namely ten Working Days after an Authority decision to approve the change; so that it could be used when an appropriate configuration of interlinks is brought forward.

3.6 As there are believed to be no existing parties affected by this change, it is proposed that there is no transitional period and no transitional arrangements need to be specified. If you believe you may be affected by this change please respond accordingly to Consultation Question 2 (in Section 4.1 below).

Impact and Assessment

Impact on the CUSC

3.7 Changes to Section 14, Part 2 – Section 1 - The Statement of the Transmission Use of System Charging Methodology.

Impact on Greenhouse Gas Emissions

3.8 None identified.

Impact on Core Industry Documents

3.9 None identified.

Impact on other Industry Documents

3.10 None identified.

4 How to Respond to the Consultation

4.1 This Workgroup Consultation report is seeking the views of CUSC Parties and other interested parties in relation to the issues noted in this document and specifically in response to the questions highlighted in the report and summarised below:

Standard Workgroup Consultation Questions:

Q1: Do you believe that CMP242 Original proposal or any of the potential options for change better facilitates the Applicable CUSC Objectives for Charging?

Q2: Do you support the proposed implementation approach?

Q3: Do you have any other comments?

Q4: Do you wish to raise a Workgroup Consultation Alternative request for the Workgroup to consider? Please see section 4.3 below.

Specific CMP242 Workgroup Consultation Questions:

Q5: For an existing or financially committed generator, when an interlink is proposed, should the generator have the right to 'opt-out' of paying for (and using for) interlink? If a generator initially opts-out, but later 'opts-in' to paying for (and using) an interlink should any costs be applied retrospectively?

Q6: Do you think that individual offshore generator parties affected by an interlink should be able to agree how to apportion the costs of that interlink between them, with the CUSC providing a fall-back methodology?

Q7: Do you agree with the Workgroup's view to not charge a generator for another circuit other than their main radial circuit and their share of the interlink circuit, i.e. there is no charge for the use of the other generator's radial circuit? If not, what would you propose?

Q8: Do you have a view on whether Option (iv) – 'shared and unshared (proportion by TEC)', Option (viii) - 'Restricted Availably Measure' or another option is the most appropriate way to apportion the costs associated with an interlink? If you prefer option (vii) a weighted sum of firm and non-firm access, what value would you propose for the weighting between firm and non-firm?

Q9: Do you agree with the Workgroup that one party should not be directly affected by the TEC reduction caused by another (all other things being equal), meaning that a fixed proportion of the costs associated with the interlink, determined based on the initial TEC of the generators, should be fixed for a TO price control period? Do you have any comments on the consequences of this approach?

Q10: How should the situation of more than two generators be treated? Should each interlink be treated separately, should an extension of the apportionment methodology be determined to share multiple interlink costs over multiple generators, or do you have any further options?

As part of this Workgroup Consultation we have sought to draft this report in a 'more engaging' style. If you have time we would appreciated your thoughts as to whether this style is better than previous reports and any ideas you may have for further improvements.

Q9: Do you consider the style of this report compared with previous CUSC Workgroup Consultation reports an improvement and have any thoughts as to further improvements?

4.2 Please send your response using the response proforma which can be found on the National Grid website via the following link: http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/CUSC/Modifications/CMP242/

4.3 In accordance with Section 8 of the CUSC, CUSC Parties, BSC Parties, the Citizens Advice and the Citizens Advice Scotland may also raise a Workgroup Consultation Alternative Request. If you wish to raise such a request, please use the relevant form available at the weblink below:

http://www.nationalgrid.com/uk/Electricity/Codes/systemcode/amendments/forms_guidance/

4.4 Views are invited upon the proposals outlined in this report, which should be received by **5pm** on 31 July 2015. Your formal responses may be emailed to: cusc.team@nationalgrid.com

4.5 If you wish to submit a confidential response, please note that information provided in response to this Consultation will be published on National Grid's website unless the response is clearly marked "Private & Confidential", we will contact you to establish the extent of the confidentiality. A response market "Private & Confidential" will be disclosed to the Authority in full but, unless agreed otherwise, will not be shared with the CUSC Modifications Panel or the industry and may therefore not influence the debate to the same extent as a non-confidential response.

4.6 Please note an automatic confidentiality disclaimer generated by your IT System will not in itself, mean that your response is treated as if it had been marked "Private and Confidential".

Annex 1 – CMP242 CUSC Modification Proposal Form

CUSC Modification Proposal Form (for Charging Methodology Proposals) CMP242

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Connection and Use of System Code (CUSC)

Title of the CUSC Modification Proposal
Charging arrangements for interlinked offshore transmission solutions connecting to a single onshore substation.
Submission Date
19th March 2015.
Description of the Issue or Defect that the CUSC Modification Proposal seeks to address
A number of developers of offshore generation are planning the construction of a transmission cable linking the platforms of some of their projects that connect to a common onshore substation (held in open standby unless the cable to shore associated with either project becomes unavailable). Such a cable would provide additional security to their projects but may not necessarily provide any additional capacity, providing a cheaper alternative to building multiple cables to shore from each platform. Whilst similar low voltage cables already exist for a number of offshore generators, these have either remained within generator ownership or exist to the supply of energy to a platform in the event of a fault rather than an export route. However, the current charging methodology within section 14 of the CUSC would not provide a cost reflective charge for offshore transmission solutions that include interlinked offshore substations connecting to a common onshore substation.
Description of the CUSC Modification Proposal
It is proposed that the TNUoS charging methodology within Section 14 of the CUSC is modified to ensure that both interlinking circuits and additional capacity that can be utilised on the export cables to shore are appropriately charged, such that: i) The charge for capacity on an interlinking circuit that can be utilised by generation on either end of the link is set such that each party pays an amount representing an equal proportion of the associated OFTO revenue; ii) The charge for any capacity on an interlinking circuit that can only be utilised by a generation on one end of the link is set such that the relating generation pays a charge equivalent to the associated OFTO revenue; and

iii) The Local circuit charge for an offshore generator will reflect any additional capacity on export cables to shore that is made available through use of an interlinking circuit.

Impact on the CUSC

Changes to Section 14.15 Derivation of the Transmission Network Use of System Tariff

Do you believe the CUSC Modification Proposal will have a material impact on Greenhouse Gas Emissions? Yes / No

No

Impact on Core Industry Documentation. Please tick the relevant boxes and provide any supporting information

BSC ☐

Grid Code ☐

STC ☐

Other ☐
(please specify)

This is an optional section. You should select any Codes or state Industry Documents which may be affected by this Proposal and, where possible, how they will be affected.

Urgency Recommended: Yes / No

No

Justification for Urgency Recommendation

N/A

Self-Governance Recommended: Yes / No

No

Justification for Self-Governance Recommendation

N/A

Should this CUSC Modification Proposal be considered exempt from any ongoing Significant Code Reviews?

N/A

Impact on Computer Systems and Processes used by CUSC Parties:

N/A

Details of any Related Modification to Other Industry Codes

N/A

Justification for CUSC Modification Proposal with Reference to Applicable CUSC Objectives for Charging:

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.

☐ (d) compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency.
These are defined within the National Grid Electricity Transmission plc Licence under Standard Condition C10, paragraph 1.

Objective (c) refers specifically to European Regulation 2009/714/EC. Reference to the Agency is to the Agency for the Cooperation of Energy Regulators (ACER).

Full justification:

The proposed solution will ensure that the TNUoS charging methodology adequately takes account of interlinked offshore transmission solutions (better facilitating objective (c – taking developments of transmission businesses into account)). It will ensure that charges reflecting the cost of transmission assets provided as part of an interlinked solution are paid by generators benefitting from them rather than the costs being incorporated within the residual charge picked up by all generation (better facilitating applicable objectives (b - cost reflectivity) and (a - competition)).

Additional details

Details of Proposer: (Organisation Name)	National Grid Electricity Transmission plc
Capacity in which the CUSC Modification Proposal is being proposed: (i.e. CUSC Party, BSC Party or "National Consumer Council")	CUSC Party
Details of Proposer's Representative: Name: Organisation: Telephone Number: Email Address:	 Wayne Mullins National Grid 01926 653999 wayne.mullins@nationalgrid.com
Details of Representative's Alternate: Name: Organisation: Telephone Number: Email Address:	 Juliette Richards National Grid 01926 654580 juliette.richards@nationalgrid.com
Attachments (Yes/No): No **If Yes, Title and No. of pages of each Attachment:** n/a	

Contact Us

If you have any questions or need any advice on how to fill in this form please contact the Panel Secretary:

E-mail cusc.team@nationalgrid.com

Phone: 01926 653606

For examples of recent CUSC Modifications Proposals that have been raised please visit the National Grid Website at http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/CUSC/Modifications/Current/

Submitting the Proposal

Once you have completed this form, please return to the Panel Secretary, either by email to jade.clarke@nationalgrid.com copied to cusc.team@nationalgrid.com, or by post to:

Jade Clarke
CUSC Modifications Panel Secretary, TNS
National Grid Electricity Transmission plc
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA

If no more information is required, we will contact you with a Modification Proposal number and the date the Proposal will be considered by the Panel. If, in the opinion of the Panel Secretary, the form fails to provide the information required in the CUSC, the Proposal can be rejected. You will be informed of the rejection and the Panel will discuss the issue at the next meeting. The Panel can reverse the Panel Secretary's decision and if this happens the Panel Secretary will inform you.

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Workgroup Terms of Reference and Membership
TERMS OF REFERENCE FOR CMP242 WORKGROUP

CMP242 seeks to modify the CUSC to ensure that both circuits linking offshore platforms connecting to a common onshore substation and additional capacity that can be utilised on export cables to shore by offshore generation as a result are appropriately charged.

Responsibilities

1. The Workgroup is responsible for assisting the CUSC Modifications Panel in the evaluation of CUSC Modification Proposal **242 'Charging Arrangements for interlinked offshore transmission solutions connecting to a single onshore substation'** tabled by National Grid Electricity Transmission Plc at the CUSC Modifications Panel meeting on 27th March 2014.

2. The proposal must be evaluated to consider whether it better facilitates achievement of the Applicable CUSC Objectives. These can be summarised as follows:

   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.

   (d) compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency.
   These are defined within the National Grid Electricity Transmission plc Licence under Standard Condition C10, paragraph 1.

   Objective (d) refers specifically to European Regulation 2009/714/EC. Reference to the Agency is to the Agency for the Cooperation of Energy Regulators (ACER).

3. It should be noted that additional provisions apply where it is proposed to modify the CUSC Modification provisions, and generally reference should be made to the Transmission Licence for the full definition of the term.

Scope of work

4. The Workgroup must consider the issues raised by the Modification Proposal and consider if the proposal identified better facilitates achievement of the Applicable CUSC Objectives.

5. In addition to the overriding requirement of paragraph 4, the Workgroup shall consider and report on the following specific issues:

   a) *Should installation of an interlink be mandatory or optional for offshore generation connecting to a common onshore substation?*
   b) *Should a generator contribute to the cost of another cable when having non-firm access to the onshore substation?*
   c) *Implementation*
   d) *Review illustrative legal text*

6. The Workgroup is responsible for the formulation and evaluation of any Workgroup Alternative CUSC Modifications (WACMs) arising from Group discussions which would, as compared with the Modification Proposal or the current version of the CUSC, better facilitate achieving the Applicable CUSC Objectives in relation to the issue or defect identified.

7. The Workgroup should become conversant with the definition of Workgroup Alternative CUSC Modification which appears in Section 11 (Interpretation and Definitions) of the CUSC. The definition entitles the Group and/or an individual member of the Workgroup to put forward a WACM if the member(s) genuinely believes the WACM would better facilitate the achievement of the Applicable CUSC Objectives, as compared with the Modification Proposal or the current version of the CUSC. The extent of the support for the Modification Proposal or any WACM arising from the Workgroup's discussions should be clearly described in the final Workgroup Report to the CUSC Modifications Panel.

8. Workgroup members should be mindful of efficiency and propose the fewest number of WACMs possible.

9. All proposed WACMs should include the Proposer(s)'s details within the final Workgroup report, for the avoidance of doubt this includes WACMs which are proposed by the entire Workgroup or subset of members.

10. There is an obligation on the Workgroup to undertake a period of Consultation in accordance with CUSC 8.20. The Workgroup Consultation period shall be for a period of 3 weeks as determined by the Modifications Panel.

11. Following the Consultation period the Workgroup is required to consider all responses including any WG Consultation Alternative Requests. In undertaking an assessment of any WG Consultation Alternative Request, the Workgroup should consider whether it better facilitates the Applicable CUSC Objectives than the current version of the CUSC.

    As appropriate, the Workgroup will be required to undertake any further analysis and update the original Modification Proposal and/or WACMs. All responses including any WG Consultation Alternative Requests shall be included within the final report including a summary of the Workgroup's deliberations and conclusions. The report should make it clear where and why the Workgroup chairman has exercised his right under the CUSC to progress a WG Consultation Alternative Request or a WACM against the majority views of Workgroup members. It should also be explicitly stated where, under these circumstances, the Workgroup chairman is employed by the same organisation who submitted the WG Consultation Alternative Request.

12. The Workgroup is to submit its final report to the Modifications Panel Secretary on 17th September 2015 for circulation to Panel Members. The final report conclusions will be presented to the CUSC Modifications Panel meeting on 25th September 2015.

Membership

13. It is recommended that the Workgroup has the following members:

Role	Name	Representing
Chairman	Patrick Hynes	Code Administrator
*National Grid Representative**	Paul Wakeley	National Grid
*Industry Representatives**	Garth Graham	SSE
	Aled Moses	Dong Energy
	Simon Lord	GDF Suez
	Lewis Elder	RWE Innogy UK
	Joe Dunn	SP Renewables
Authority Representatives	Edda Dirks	Ofgem
Technical secretary	Richard Loukes	Code Administrator
Observers		

NB: A Workgroup must comprise at least 5 members (who may be Panel Members). The roles identified with an asterisk in the table above contribute toward the required quorum, determined in accordance with paragraph 14 below.

14. The Chairman of the Workgroup and the Modifications Panel Chairman must agree a number that will be quorum for each Workgroup meeting. The agreed figure for CMP242 is that at least 5 Workgroup members must participate in a meeting for quorum to be met.

15. A vote is to take place by all eligible Workgroup members on the Modification Proposal and each WACM. The vote shall be decided by simple majority of those present at the meeting at which the vote takes place (whether in person or by teleconference). The Workgroup chairman shall not have a vote, casting or otherwise. There may be up to three rounds of voting, as follows:

- Vote 1: whether each proposal better facilitates the Applicable CUSC Objectives;
- Vote 2: where one or more WACMs exist, whether each WACM better facilitates the Applicable CUSC Objectives than the original Modification Proposal;
- Vote 3: which option is considered to BEST facilitate achievement of the Applicable CUSC Objectives. For the avoidance of doubt, this vote should include the existing CUSC baseline as an option.

The results from the vote and the reasons for such voting shall be recorded in the Workgroup report in as much detail as practicable.

16. It is expected that Workgroup members would only abstain from voting under limited circumstances, for example where a member feels that a proposal has been insufficiently developed. Where a member has such concerns, they should raise these with the Workgroup chairman at the earliest possible opportunity and certainly before the Workgroup vote takes place. Where abstention occurs, the reason should be recorded in the Workgroup report.

17. Workgroup members or their appointed alternate are required to attend a minimum of 50% of the Workgroup meetings to be eligible to participate in the Workgroup vote.

18. The Technical Secretary shall keep an Attendance Record for the Workgroup meetings and circulate the Attendance Record with the Action Notes after each meeting. This will be attached to the final Workgroup report.

19. The Workgroup membership can be amended from time to time by the CUSC Modifications Panel.

Appendix 1 – Indicative Workgroup Timetable

The following timetable is indicative for CMP242

10th April 2015	Deadline for comments on Terms of Reference / nominations for Workgroup membership
1st May 2015	Workgroup meeting 1
22nd May 2015	Workgroup meeting 2
19th June 2015	Workgroup meeting 3
W/C 15th June 2015	Workgroup meeting 4
24th June 2015	Workgroup Consultation issued for 1 week Workgroup comment
1st July 2015	Deadline for comment
6th July 2015	Workgroup Consultation published
27th July 2015	Deadline for responses
W/C 3rd August 2015	Workgroup meeting 5
W/C 24th August 2015	Workgroup meeting 6
2nd September 2015	Circulate draft Workgroup Report
9th September 2015	Deadline for comment
17th September 2015	Submit final Workgroup Report to Panel
25th September 2015	Present Workgroup Report at CUSC Modifications Panel

Annex 3 – Workgroup attendance register

A copy of the Workgroup Terms of Reference is provided in Annex 2. The Workgroup have considered the issues raised by the CUSC Modification Proposal as part of their discussions, the Workgroup has noted that there are number of potential solutions to the defect CMP242 seeks to address.

The Workgroup first met on 1st May 2015, and held further meetings on 22nd May 2015 and 19th June 2015. At the 19th June 2015 meeting the Workgroup agreed to prepare and issue this Workgroup Consultation report, based on the discussions held so far, and to inform the next Workgroup meeting prior to the Workgroup completing its work and providing its Conclusions to the CUSC Panel. A further Code Administrator Consultation on CMP242 will follow in due course.

The attendance record of Workgroup members is shown in the table below.

A – Attended
X – Absent
O – Alternate
D – Dial-in

Name	Organisation	Role	01/05/2015	22/05/2015	19/6/2015
Patrick Hynes	National Grid	Independent Chair	A	A	A
Richard Loukes	Code Administrator	Technical Secretary	A	A	A
Wayne Mullins	National Grid	Proposer (1)	A	-	-
Paul Wakeley	National Grid	Proposer (1)	-	A	A
Garth Graham	SSE	Workgroup member	A	D	-
Christoph Horbelt	Dong Energy	Workgroup member (2)	A	-	-
Aled Moses	Dong Energy	Workgroup member (2)	-	A	A
Simon Lord	GDF Suez	Workgroup member	A	D	D
Lewis Elder	RWE Innogy UK	Workgroup member	A	A	D
Joe Dunn	SP Renewables	Workgroup member	A	D	D
Edda Dirks	Ofgem	Authority Representative	A	A	A

(1). The National Grid representative and Proposer changed after the first Workgroup meeting.
(2). The Workgroup member from DONG Energy changed after the first Workgroup meeting.

Annex 4 – Guide to TNUoS Charging Methodology for Offshore Generation in GB

This section is included at the request of Workgroup members, prepared by National Grid, to help the reader understand the background to the Offshore Charging Methodology in GB

The Transmission Network Use of System Charges (TNUoS) allows Transmission Owners to recover the costs of building, owning and maintaining transmission assets. The underlying rationale behind Transmission Network Use of System charges is that efficient economic signals are provider to Users when services are priced to reflect the cost of supplying them (CUSC 14.14.6).

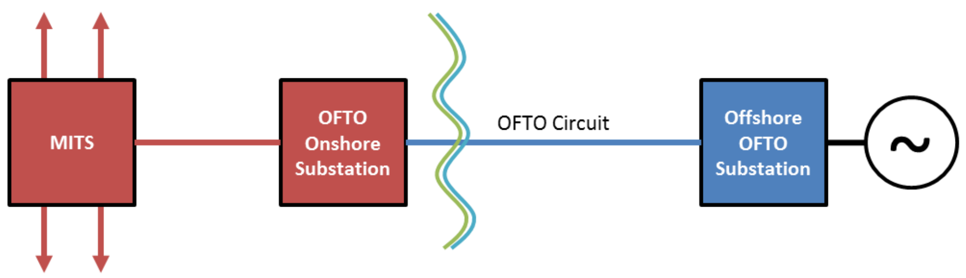
For offshore generation, the TNUOS charges recover the cost of building, owning and maintaining transmission assets required to connect an offshore generator to the onshore transmission system. The TNUoS charge recovers revenue for the Offshore Transmission System Operators (OFTO) and for the onshore Transmission Owners (TO). Both OFTOs and Onshore TOs are required to hold an electricity transmission licence as defined in the Electricity Act 1989.

The **TNUoS Charging Methodology** is defined in Section 14 of the **Connection and Use of System Code (CUSC)**. The methodology applied to offshore generation is based on the methodology used for onshore generation; however, the specificities of the costs, design and regime for offshore generation is reflected in the charging methodology as detailed below.

Design of offshore connections

The design criteria for the GB Transmission Network are defined in the (GB) Security and Quality of Supply Standard (SQSS). The SQSS specifies the Offshore Standard Design as the specification that is to be used to connect an offshore generator to the National Electricity Transmission System. The criteria for offshore design are different to those for the onshore transmission network and allow a lower level of redundancy. This difference, seeks to partly offset the high costs of building and maintaining offshore circuits and substations.

In general under the Offshore Standard Design, an offshore generator will be connected to the transmission network via a single radial circuit via an offshore and onshore OFTO substation. This general setup is illustrated in the following diagram:



The capacity of the OFTO circuit and the ratings of any of the equipment in the substations (e.g. transformers, switchgear) are chosen to support the connected generation, whilst generally being of standard sizes available on the market to reduce the additional costs of bespoke equipment. This result in potentially larger capacity equipment, such as transformers, being installed that the TEC capacity of the generator being connected.

In certain circumstances, the offshore generator will also be liable for an onshore circuit charge if the OFTO onshore substation is connected to the Main Integrated Transmission System (MITS) via a non-MITS substation. If the connection to the MITS is via a distribution circuit, then a distribution charge will also be levied.

A particular feature of the offshore single-circuit radial design is that there is no redundancy provided to the generator in the event of a circuit or other fault. As this is a known factor, and consistent with the approved position in the SQSS, the circumstances when an offshore generator is liable for compensation, known as interruption payments in the CUSC, are different to onshore generators.

Interruption Payments and Compensation

As defined in Section 5 of the CUSC (Default, Deenergisation and Disconnection) a generator becomes eligable for an *Interruption Payment* in the event of a Relevant Interruption. Relevant Interruption are defined as an Interruption other an *Allowed Interruption*.

One of the requirements for having a standard offshore design is the inclusion of Clause 10 in the Bilateral Connection Agreement (BCA) for the generator. Clause 10 provides that outages associated with a single radial circuit are considered ‘Allowed Interruptions’. This means that offshore generators are not eligible for Interruption Payments under the CUSC for circuit outages and/or restrictions associated with a single radial circuit design.

An offshore generator may decide to pay more for their connection to have additional security (such as another circuit) included in their transmission connection design. Ultimately, Ofgem decides what elements of an offshore design are permitted, when assets are transferred and the allowable revenue is determined. Subject to approval, this additional security would be reflected in their circuit charge. In this situation, different criteria would apply in the BCA which may allow for interruption payments in the event of some outages, for example, in general configuration other than a single circuit (such as a double circuit) may mean a generator would be eligible for a CUSC Interruption Payment if that circuit were unavailable, but these would be agreed on a case-by-case basis based the individual scenario.

Although offshore generators who have a Clause 10 BCA cannot claim a CUSC Interruption Payment associated with outages of their radial circuits, the licence for an OFTO includes an *availability incentive* requiring them to achieve a ‘target availability’ for their circuit. OFTOs are incentivised to achieve these figures and are penalised for failing to achieve it. The precise formulation of the target is different for the different tender rounds of OFTOs but the overall principle remains the same.

If an OFTOs fail to meet their target availability as specified in their licence, then their allowed revenue would be reduced.

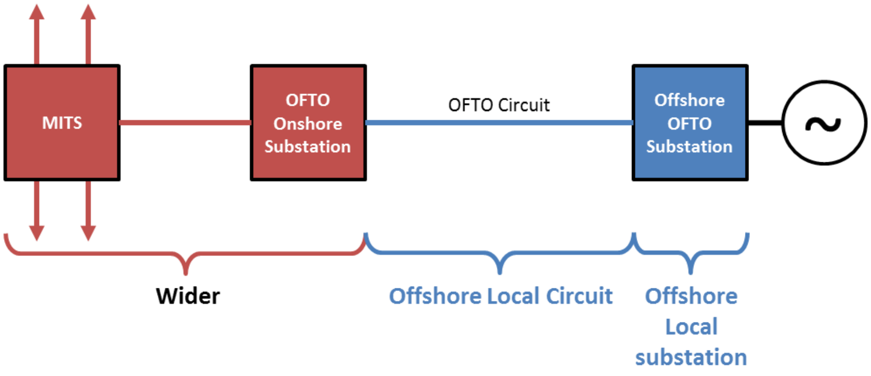
Charging methodology for an offshore generator

The TNUoS tariff for an offshore generator is composed of several parts:

- The **offshore substation tariff –** related to the assets at the offshore substation, specific to the generator
- The **offshore circuit tariff** – related to the cost of the OFTO circuit, specific to the generator
- The **wider tariff associated** with the use of the Main Interconnected Transmission System

Depending on their type of connection, offshore generators may also pay for a local onshore circuit (if there is such a circuit prior to the MITS), and for connection via a distribution system.

In common with the onshore charging methodology an offshore generator only pays onshore substation charges associated with the first substation they are connected to. The costs of the OFTO Onshore substation are socialised into the wider tariff element of TNUoS.



OFTO Revenue

The amount of money to be recovered through TNUoS for an OFTO in a given charging year is termed its revenue. National Grid pays this revenue to the OFTO and then seeks to recover it via TNUoS Charges from the User(s) in accordance with the charging methodology.

To calculate the offshore substation tariff and the offshore local circuit tariff applicable to a generator, the OFTO revenue is first tagged to the specific radial circuit and offshore substation that it relates to. Any revenue not captured through these offshore substation and offshore local circuit tariffs is included in the wider tariff which socialises the remaining revenue.

On page 42 is a worked example for a fictional OFTO and generator. In this example there is a offshore generator connected via a single radial OFTO circuit. The generator has TEC of 400MW, and the single radial circuit has capacity of 420MW. The fictional OFTO has a revenue of £25M per annum.

Local offshore circuit tariff

The amount of revenue attributed to the offshore circuit tariff is the OFTO revenue multiplied by the ratio of the circuit capital cost to the total capital cost.

In the worked example the capital cost of the circuit is £116M and the total capital cost is £303.5M; the proportion of the capital cost of the circuit (to the total capital cost) is therefore 38%. The total revenue is £25M, so the proportion of the revenue associated with the circuit is therefore, 38% x £25M = £9.55M.

The local security factor (LSF) is a scaling factor included to represent the additional cost associated with the benefit of having redundancy in a design. If there is a single radial circuit (i.e. the standard offshore design), then the local security factor is 1. If there are multiple electrically connected circuits, then the local security factor is calculated as:

$$\text{LSF} = \frac{\text{Maximum Export Capacity of Circuits}}{\text{Generator TEC}}.$$

The Local Security Factor is capped at 1.8; the same as the onshore security factor.

The *local offshore circuit tariff* is calculated as:

$$\text{local offshore circuit tariff} = \text{local security factor} \times \frac{\text{OFTO Revenue}}{\text{Circuit Rating}}.$$

In the worked example, as we have a single circuit, the LSF is 1.

The local offshore circuit tariff = 1 x £9.55M / 420 MW = **22.750451 £/kW**.

Local offshore substation tariff

The offshore substation tariff is calculated to be representative of the cost of the Transformer, Switchgear and Platform at the offshore OFTO substation.

The amount of revenue attributed to the offshore substation tariff, is the OFTO revenue multiplied by the ratio of the substation capital cost to the total capital cost. This calculation is performed for each element of the substation (Transformer, Switchgear and Platform).

In the worked example, for the Transformer element the capital cost is £10M and the total capital cost of the work is £303.5M; the proportion of the capital cost of the Transformer (to the total capital cost) is therefore 3%.

The proportion of the revenue associated with the Transformer is therefore, 3% x £25M = **£823k**.

Similarly the revenue associated with of each element of the offshore substation is calculated as a proportion of the total capital costs.

The tariff is calculated by dividing the revenue for each item by its rating (MVA). This gives a tariff for each of the Transformer, Switchgear and Platform.

The local offshore substation tariff is the sum of the Transformer, Switchgear and Platform less the onshore civils cost adjustment. The onshore civil cost adjustment is a reduction to the offshore substation tariff. Onshore local circuit tariffs do not include civils cost, so this discount seeks to align the local circuit tariffs.

In the worked example, the local offshore substation tariff is **17.273804 £/kW**

Final Tariff

The final tariff for an offshore generator is the sum of (i) the local offshore substation tariff, (ii) the local offshore circuit tariff, (iii) any onshore local circuit tariffs[6], and (iv) the wider generator tariff. The wider tariff is applied based on which of the 27 TNUoS zones the generator is connected to and is detailed in the National Grid Charging Statements.

For this worked example, let us assume a connection in Zone 17 (South Lincs and North Norfolk) which has a wider generation tariff of **2.974367 £/kW.**

For this worked example the final tariff is therefore = 22.750451 + 17.273804 + 2.974367 = **42.998622 £/kW**

Therefore, the annual TNUoS charge to this hypothetical offshore generator with TEC of 400MW connecting in the South Lincs and North Norfolk zone is 400 MW x 42.998622 £/kW = **£17.2M**

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[6] Not applicable in this worked example

Worked Example

In this example, the Total Revenue for the OFTO is £25M, and the Generator TEC is 400 MW connected in TNUoS Zone 17.

		Capital Cost	Percentage of Total Capital Costs	Amount of OFTOt	Rating / Capability	Local Security Factor	Tariff
		(£k)		(£)	(MVA)		(£/kW)
Circuit	Offshore cable	100,000					
	Harmonic filtering equipment	1,000					
	Reactive plant	15,000					
	Circuit	**116,000**	**38%**	**9,555,189**	**420**	**1**	**22.750451**
Substation	Transformer	10,000	3%	823,723	640		1.287068
	Switchgear	2,500	1%	205,931	680		0.302839
	Platform	125,000	41%	10,296,540	640		16.088344
	Onshore civils cost adjustment						-0.404447
	Substation	**137,500**	**45%**	**11,326,194**			**17.273804**
Other	Onshore substation	50,000	16%	4,118,616			Not Applicable
	Other	**50,000**	**16%**	**4,118,616**			Not Applicable
	TOTAL CAPITAL COST	**303,500**					

Total Local Tariff	40.024255
Wider Generator Tariff	2.974367
TOTAL TARIFF	**42.998622**

Table 3: *Worked example for deriving offshore charges for a generator*

Local Circuit Tariff as defined in CUSC

In the CUSC, the offshore local circuit charge calculations are defined differently to the approach detailed in this paper. However, the two results are mathematically equivalent due to the particular circumstances of offshore generation.

According to the CUSC, the local circuit tariff is calculated as

$$\text{Local Circuit Tariff } (\text{£}/\text{kW}) = \text{NLMkm} \times \text{EC} \times \text{LocalSF} \div 1000.$$

NLMkm is the Nodal marginal km along the local circuit using local circuit expansion factor. One of the key elements of the charging methodology is the transport model, used to calculate marginal costs. The local marginal km cost used to determine generation TNUoS tariffs is calculated by injecting 1MW of generation against the node the generator is modelled at and increasing national demand by 1MW and calculating the effect.

EC is the **expansion constant**. This represents the annuitized value of the capital investment required to transport 1MW over 1km. Its magnitude is derived from the project cost of 400kV overhead line. As calculated at the TO price control review, this is 12.901218 £/MWkm,

For an offshore radial local circuit

For an offshore radial local circuit, there is only one possible route for electricity to reach the main network; therefore it is not necessary to run the full transport model to calculate the increase in the circuit km cost since 1MW can only travel along the length of the subsea cable. The marginal cost increase of 1MW of offshore generation can therefore be calculated as:

$$\text{NLMkm} = \text{Expansion Factor} \times \text{Length},$$

where the expansion factor is defined in the CUSC based on information provided by the OFTO; it reflects how much more expensive subsea cable is compared to 400kV overhead line:

$$\text{Expansion Factor} = \frac{\text{OFTO Revenue}}{\text{Length} \times \text{Circuit Rating}} \div \text{Expansion Constant.}$$

In the worked example assuming a cable length of 50km, we find that:

Expansion Factor = £9.5M ÷ (420 MW × 50 km) ÷ 12.901218 = 35.26869

This means that the subsea cable is 35 times more expensive than 400kV overhead line.

Local Circuit Tariff = 50 km × 35.26869 × 12.901218 × 1 ÷ 1000 = 22.75045 £/kW

Mathematical equivalence for offshore radial local circuits

Using this definition of Offshore Expansion Factor, the definition of Local Circuit tariff and the value of NLMkm, it can be demonstrated that the Local Circuit Tariff definition in the CUSC is equivalent to the method used in this paper:

$$\begin{aligned}\text{Local Circuit Tariff } (£/kW) &= NLMkm \times EC \times LocalSF \div 1000 \\ &= (\text{Expansion Factor} \times \text{Length}) \times EC \times LocalSF \div 1000 \\ &= \frac{\text{OFTO Revenue}}{\text{Length} \times \text{Circuit Rating} \times EC} \times \text{Length} \times EC \times LocalSF \div 1000 \\ &= \frac{\text{OFTO Revenue}}{\text{Circuit Rating}} \times LocalSF \div 1000.\end{aligned}$$

Annex 5 – Mathematical Definitions of the Apportionment Options

Apportionment Option		Mathematical definition
i	Equal Split	Proportion for each generator = 1/*n* where *n* is the number of generators
ii	Proportion of TEC	Proportion for each generator = $TEC_X / \sum_{\text{All generators } j} TEC_j$
iii	Shared and Unshared (equal)	Proportion for Generator A = (0.5 x Shared + A Only)/ (Shared + A Only + B Only) Proportion for Generator B = (0.5 x Shared + B Only) / (Shared + A Only + B Only) *Where* Shared = min(TEC_A, CAP_I, TEC_B) A Only = max(0,CAP_I,TEC_B) B Only = max(0,CAP_I,TEC_A)
iv	Shared and Unshared (proportion of TEC)	Proportion for Generator A = (P_A x Shared + A Only)/ (Shared + A Only + B Only) Proportion for Generator B = (P_B x Shared + B Only)/ (Shared + A Only + B Only) *Where* P_A = TEC_A / (TEC_A + TEC_B) P_B = TEC_B / (TEC_A + TEC_B) And definitions in iii.
v	Additional Firm Access	Proportion for Generator A = (A via CCT B) / (A via CCT B + B via CCT A) Proportion for Generator B = (B via CCT A) / (A via CCT B + B via CCT A) *Where* A via CCT B = min(CAP_B-TEC_B,CAP_I,TEC_A) B via CCT A = min(CAP_A-TEC_A,CAP_I,TEC_B)
vi	Non-firm access using ALF	Proportion for Generator A = (A via CCT B) / (A via CCT B + B via CCT A) Proportion for Generator B = (B via CCT A) / (A via CCT B + B via CCT A) *Where* A via CCT B = min(CAP_B-ALF_B x TEC_B,CAP_I,TEC_A) – Firm Access via CCT B B via CCT A = min(CAP_A- ALF_A x TEC_A,CAP_I,TEC_B) – Firm Access via CCT A Firm Access via CCT X is the value calculated as “where” in (v).
vii	Combination of Firm and Non-Firm	Proportion for Generator A = (w x $firm_A$ + (1-w) x $non\text{-}firm_A$)/ (w x ($firm_A$ + $firm_B$) + (1-w) x ($non\text{-}firm_A$ + $non\text{-}firm_B$) Proportion for Generator B = (w x $firm_B$ + (1-w) x $non\text{-}firm_B$)/ (w x ($firm_A$ + $firm_B$) + (1-w) x ($non\text{-}firm_A$ + $non\text{-}firm_B$) where *w* is a weighting to be determined, and $firm_X$ and $non\text{-}firm_X$ are the values of capacity calculated options (v) and (vi)
viii	Restricted Availability Measure (using ALF)	Proportion for Generator A = (A via CCT B) / (A via CCT B + B via CCT A) Proportion for Generator B = (B via CCT A) / (A via CCT B + B via CCT A) *Where* A via CCT B = min(CAP_B - ALF_B x TEC_B, CAP_I, ALF_A x TEC_A) B via CCT A = min(CAP_A- ALF_A x TEC_A, CAP_I, ALF_B x TEC_B)