

CMP242: Charging arrangements for interlinked offshore transmission solutions connecting to a single onshore substation



CMP242 Workgroup Meeting – 22nd May 2015

Paul Wakeley

These slides represent material presented to the workgroup and not necessarily the views of the workgroup.

The views and conclusions of the workgroup are captured in the workgroup consultation report.

Safety Moment



Safety in different scenarios



Agenda

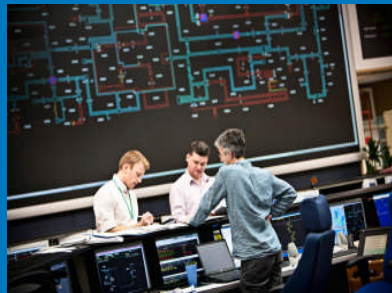
Item	Detail	Lead
1	Introduction and meeting objectives	Patrick Hynes
2	Review of previous actions	Patrick Hynes
3	Discussion arising from actions – Scenarios for consideration	Paul Wakeley
4	Discuss Workshop Terms of Reference	All
5	Next Steps	Richard Loukes

1. Introduction and Meeting Objectives



Patrick Hynes

2. Review of Previous Actions



Patrick Hynes

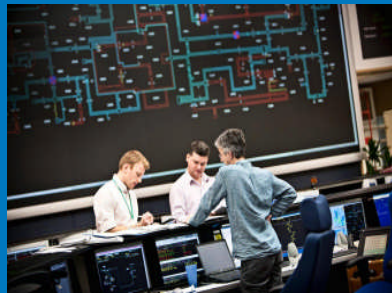
CMP242: Charging arrangements for interlinked offshore transmission solutions connecting to a single onshore substation – Action Log



No	Action	Description	Owner	Date Raised	Deadline	Status	Latest Update
1	All Workgroup members	to consider scenarios for any solution should be tested against and provide these to Richard Loukes before the next meeting.	All Workgroup members	01/05	15/05	Propose Closure	Received from GG. Further discussions today
2	All Workgroup members	to consider any further principles that could be applied in the solution, to be presented for discussion at the next Workgroup meeting.	All Workgroup members	01/05	22/05	Propose Closure	Further discussion today.
3	Edda Dirks	to update the Workgroup with Ofgem's requirements for the provision of consumer benefit evidence within the final Workgroup report.	Edda Dirks (Ofgem)	01/05	22/05	Open	
4	Provide a view on the potential	for Interlink Cabling to be mono-directional – Alternating Current vs. Direct Current.	Wayne Mullins (National Grid)	01/05	22/05	Propose Closure	Will be discussed today.
5	Provide a view as to the crossover point for distance for	Alternating Current vs. Direct Current.	Joe Dunn (SP Energy Networks)	01/05	22/05	Open	
6	Provide editable National Grid slides	that supported the 01/05 Workgroup	Wayne Mullins (National Grid)	01/05	11/05	Closed	Richard to circulate alongside action list.
7	Update the Terms of Reference - Industry Representatives - Correct spelling of names and Indicative Workgroup Timetable		Richard Loukes (National Grid)	01/05	22/05	Proposed Closure	
8	Request Workgroup members availability for the second Workgroup meeting		Richard Loukes (National Grid)	01/05	05/05	Closed	Note requesting availability sent out 05/05/2015
9							
10							

Closed Actions have been shaded grey

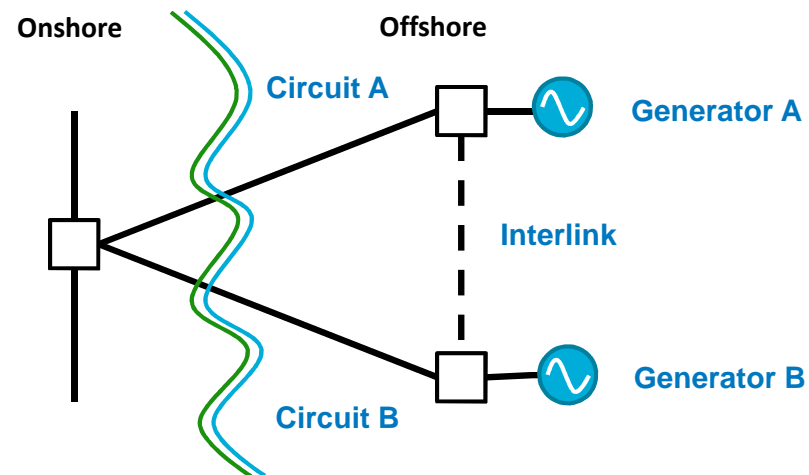
3. Discussion and Scenarios



Facilitator: Paul Wakeley

Background

- Multiple generators access the MITS via a single onshore substation.
- Additional transmission circuit installed between platforms.



- Provides a level of security with the interlink being held in open standby until a circuit to shore becomes unavailable.
- May result in no additional transmission capacity, but some added security.

Summary of Defect

- Under the current charging methodology, the cost of providing the additional security would not be reflected in the local circuit charge.
- Some offshore developers are considering developing interlinks for some of their forthcoming projects.
- Therefore there is a need to develop an appropriate cost reflective charge for the resulting links.

Proposed CUSC Modification

- This proposal seeks to modify the TNUoS charging methodology within Section 14 of the CUSC to ensure that:
 - Circuits that interlink platforms connecting to the same onshore substation are charged cost reflectively; and
 - Charges take account of any additional capacity that can be utilised on export cables to shore through use of such an interlink.

Justification against Applicable CUSC Objectives

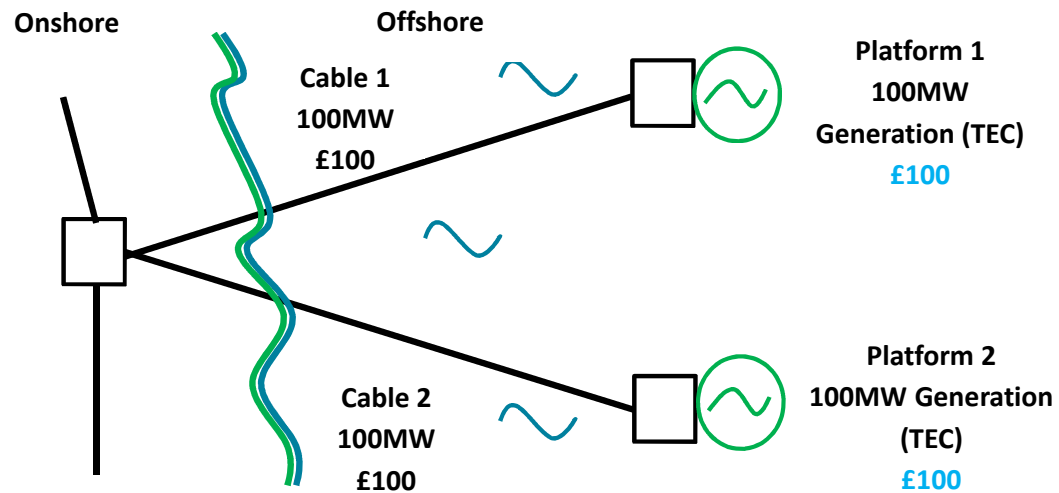
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- Ensures that the TNUoS charging methodology takes account of interlinked offshore transmission solutions.
 - Better facilitating applicable objective (c) - Taking account of transmission business developments.
- Will result in generation charges that reflect the cost of transmission assets provided as part of an interlinked solution.
 - Better facilitating applicable objective (b) – Cost reflectivity.
- As a result the OFTO revenue associated will be targeted to the generator using the interlink rather than being incorporated within the residual charge to all generation
 - Better facilitating applicable objective (a) - Competition.

Examples from Garth Graham

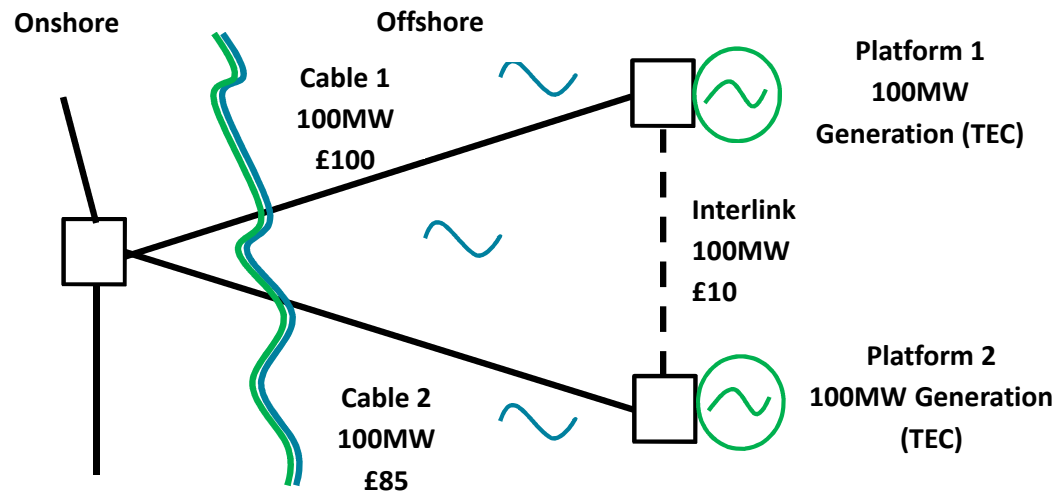


Example 1



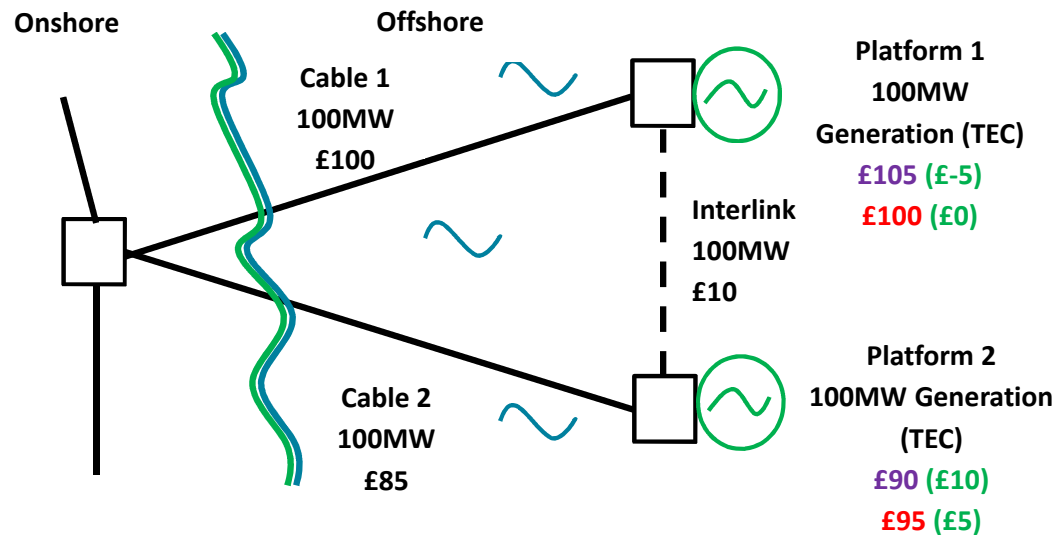
- Both generator cables are the same capacity (100MW each)
- Total Cost £200 (£100 paid by each generator for 'their' cable cost)

Example 2 (a)



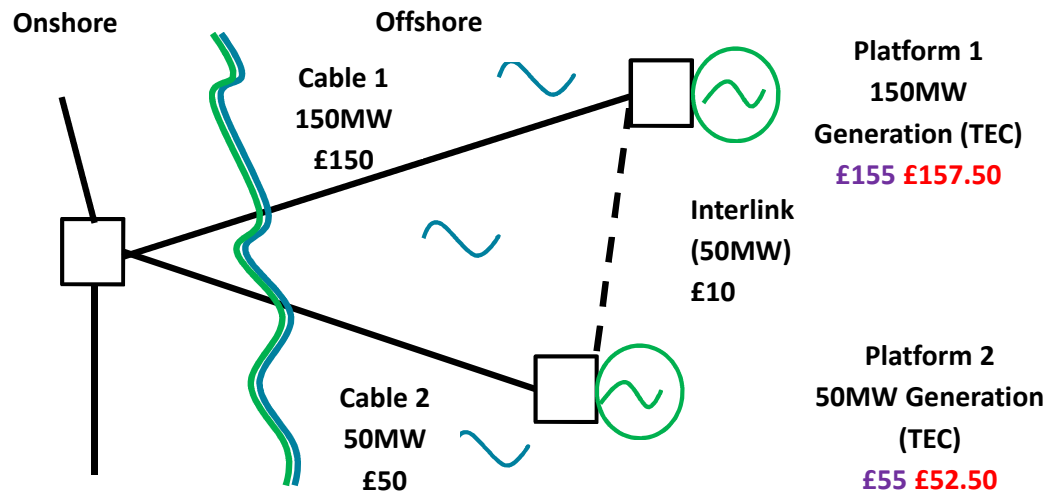
- Both generator cables are the same capacity (100MW each) but interlink means less cost for G2 cable
- Total Cost £195 (more efficient than Example 1 at £200)

Example 2 (b)



- How do we allocate the £195 between the two generators?
- 100% of 'their' cable cost plus 50:50 of the interlink cost (£10)
Or the saving to generator requesting the interlink (G2) and the other (G1) held 'neutral' (saving to option without interlink)

Example 3

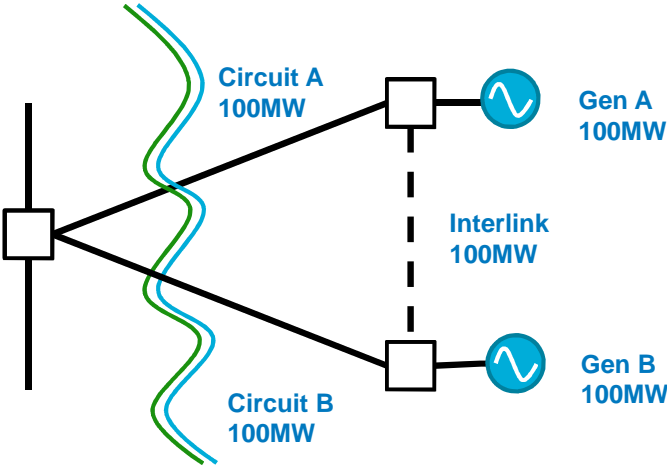


- Capacity / cable cost to shore different for each generator
- How do we allocate the £210 between the two generators?
- 100% of 'their' cable cost plus 50:50 of interlink cost (£10) or pro-rata by capacity?

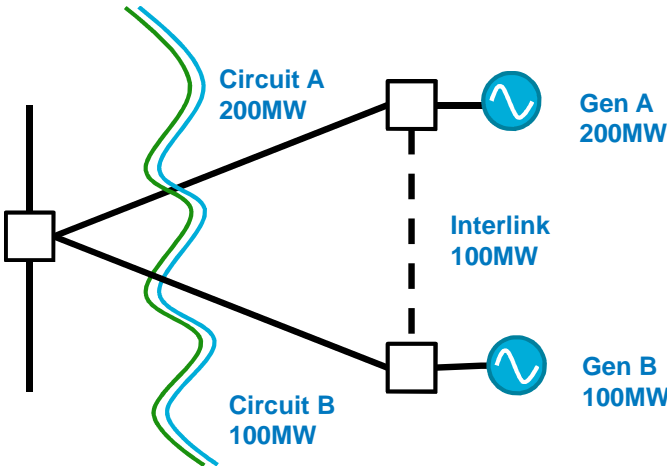
Summary of Scenarios



Possible Test Scenarios

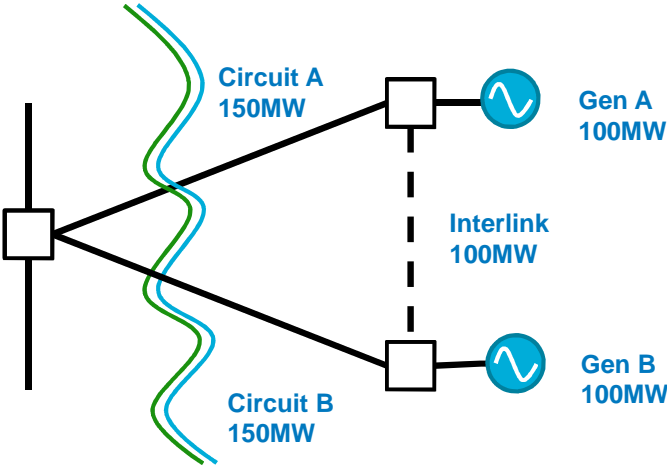


i. Non redundant.
Equal Generator

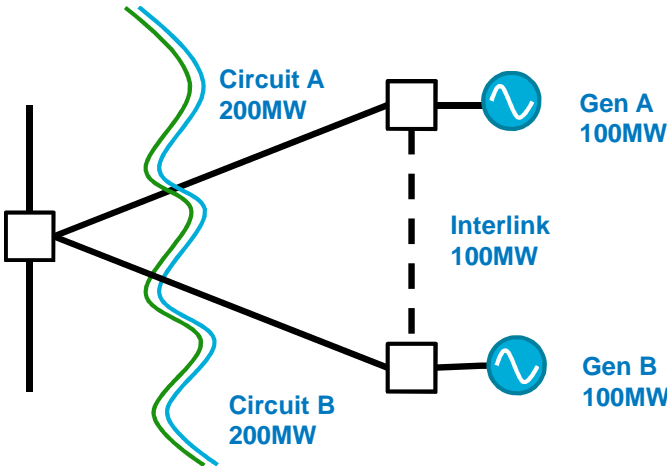


ii. Non redundant.
unequal Generator

Possible Test Scenarios

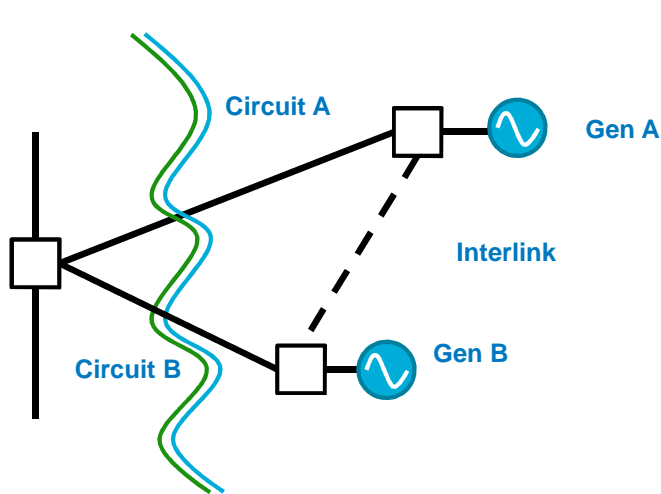


iii. Partially Redundant

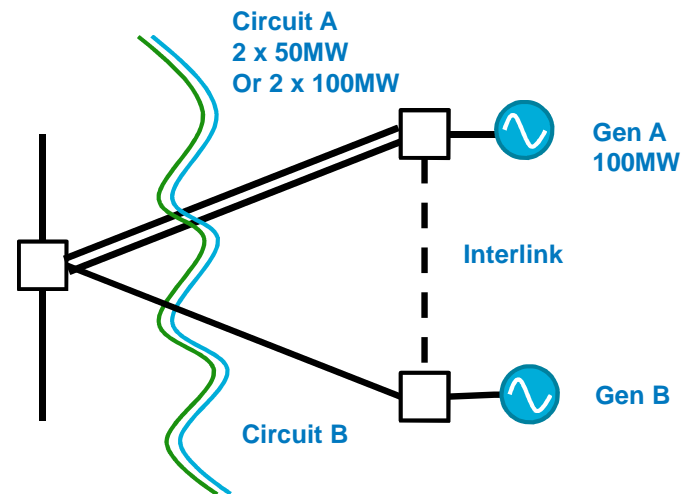


iv. Fully Redundant

Possible Test Scenarios

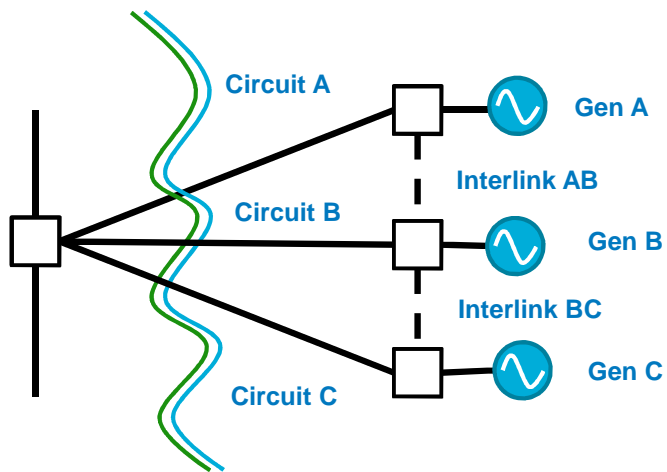


v. Different lengths
(various configurations)



vi. One or more Double Circuits
with and without spare capacity

Possible Test Scenarios



vii. The Triple Case

Any there any further scenarios we should consider?

Options and example to facilitate discussion



Assumptions

■ Agreement between parties

- Due to needing a substation to be appropriately sized to allow for an interlink, an interlink would be included at design stage, and so both generators would agree to it.

■ Technology and Operation

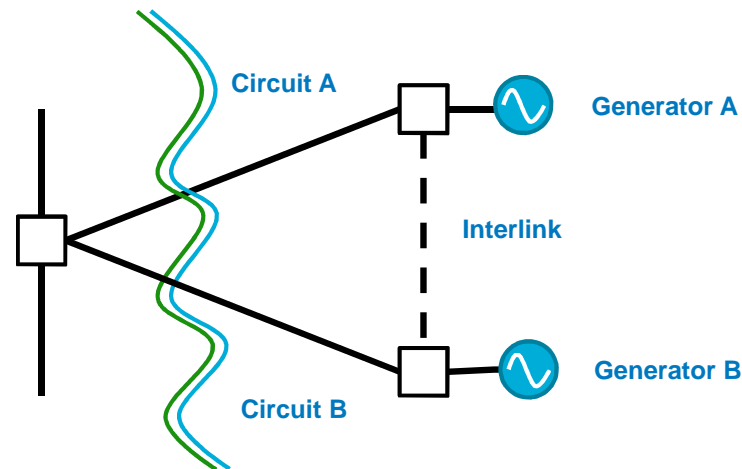
- An Interlink will be AC (due to the short distance)
- Will operate bi-directionally as needed. (In theory can design a mono-directional switching arrangement, but unlikely to be used in practice)

For discussion:

What should comprise the Charge for Generator A

- **No Interlink:** Charge based on Circuit A Tariff, and Local Substation A Tariff.
- **With Interlink:**
What should be reflected in A's Charge:

- Substation A?
- Substation B?
- Local Circuit A?
- Local Circuit B?
- Interlink?



Generator A Tariff Elements (Substations)

■ Local Substation (A)

- Additional equipment in the substation can be included in the local substation charge, as per the current methodology.

■ Other Offshore Substation (B)

- The current charging principle is that only pay for the first substation. Therefore no charge for substation B for generator A.

No methodology
change required?

Generator A Tariff Elements (Circuits)

- **Circuit A (local circuit)**

- Currently pay for firm access on Circuit A



Circuit element

- **Circuit B (other circuit)**

- Circuit B (via the Interlink) may provide additional firm access and additional security, so some cost should be reflected in the overall charge.



Circuit element

- **Interlink (new)**

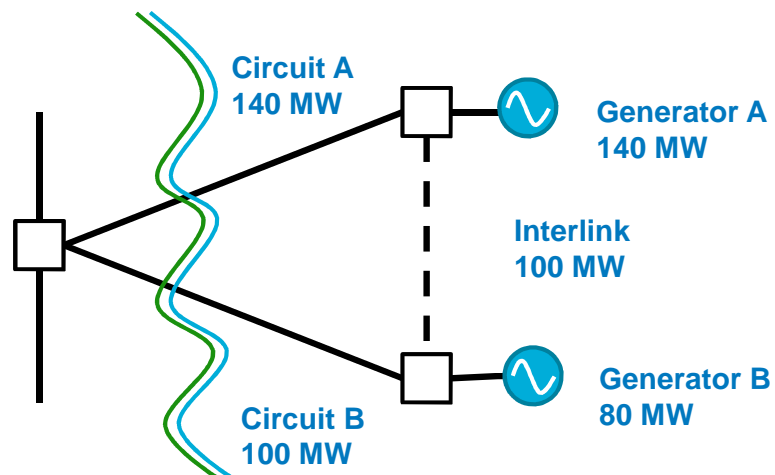
- Needs to be apportioned between the generators.



Interlink element

How much of an Interlink can a generator use?

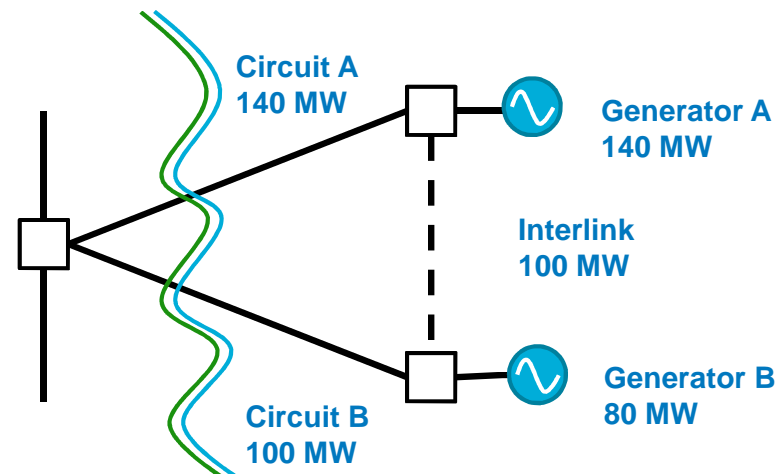
- There are three factors which limit the use of an interlink:
 - *TEC, Interlink Capacity and Other Circuit Capacity*
- In this example:
 - Generator A can export at most 100MW via Circuit B
 - Generator B can export its full 80MW via Circuit A



How much firm access does a generator have via an interlink?

- The local generator has firm access to the local circuit.
- The other generator can have firm access to any remaining capacity via the interlink.
- For example:

- Generator B is firm for 80MW on Circuit B, so Generator A may have 20MW of firm access
- Generator A is firm for 140MW on Circuit A, so Generator B may no firm access.



This leads to two concepts:

- A measure of how much a generator can use an interlink:

- **Interlink Utilisation for Generator A =**

$$\min(TEC_A, CAP_I, CAP_B)$$



Interlink element

- A measure of additional firm access a generator has to onshore via alternative route

- **Additional Firm Capacity for Generator A =**

$$\min(TEC_A, CAP_I, (CAP_B - TEC_B))$$



Circuit element

Examples provided in the two circuit / generator scenario. Three or more will need to be considered separately.

Option 1: Sharing / Non-Sharing

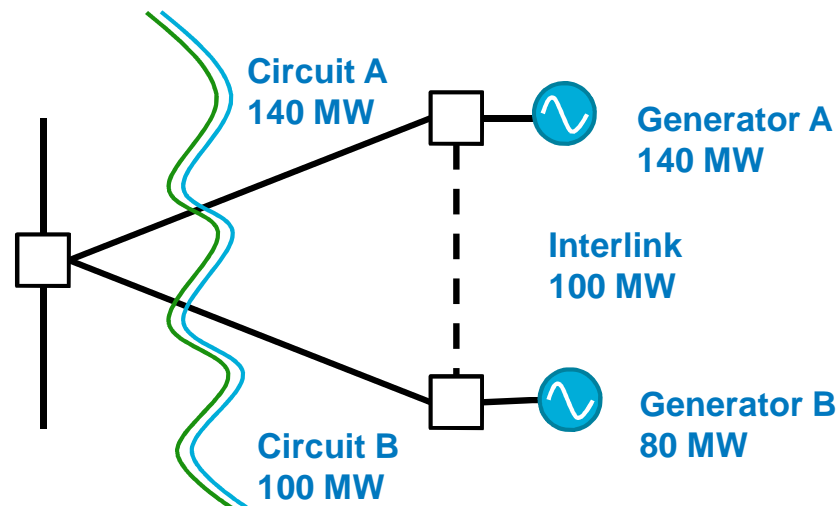
- Apportionment of interlink revenue is based on shared part and non-shared part of the interlink capacity
 - The shared part is divided equally
 - The unshared part is paid by one party only

A change in TEC affects the other offshore parties; but no residual to consumers

? Could fix tariff against TEC decreases below Day 1 level.

Option 1: Sharing / Non-Sharing

- Total Interlink Capacity = 100MW
 - Utilisation for A: $\min(140, 100, 100) = 100$ MW
 - Utilisation for B: $\min(80, 100, 140) = 80$ MW



Option 1: Sharing / Non-Sharing

- Total Interlink Capacity = 100MW
 - Utilisation for A: $\min(140, 100, 100) = 100$ MW
 - Utilisation for B: $\min(80, 100, 140) = 80$ MW

- Total revenue for the Interlink = £1M
 - 80MW can be used by either party so is shared equally
 - 20MW used by Generator A only and paid only by A.

- Generator A: $0.5 \times £800 + £200 = £600$ K
- Generator B: $0.5 \times £800 = £400$ K

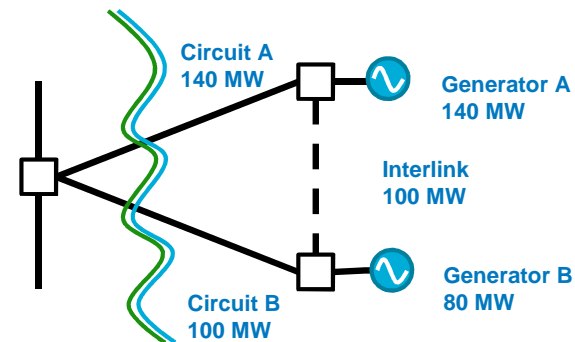
Option 2: Interlink Tariff charged based on Utilisation

- **Interlink Tariff (£/kW)** calculated as other cables with a security factor of 1.
- **Generator Interlink element (£m)=**
 $0.5 \times \text{Interlink Utilisation (MW)} \times \text{Interlink Tariff (£/kW)}$
 - The half accounts that there are generators at either end and to avoid over recovery

TEC changes do not affect the other party, but there is spill in to the residual affecting the wider tariff.

Option 2: Interlink Tariff charged based on Utilisation

- Example: Assumed Interlink Revenue of £1m.
 - Utilisation for A: $\min(140, 100, 100) = 100$ MW
 - Utilisation for B: $\min(80, 100, 140) = 80$ MW
 - Interlink Tariff = $1 \times \text{£}1\text{m} / 100 \text{ MW} = \text{£}10 / \text{kW}$
- Charges:
 - A = £0.5M
 - B = £0.4M
 - Added to residual £0.1M



Circuit element

Option 1: No Charge for other circuits

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- Not reflective of additional security gained
- Not reflective of potentially additional firm access gained via interlink

Option 2a:

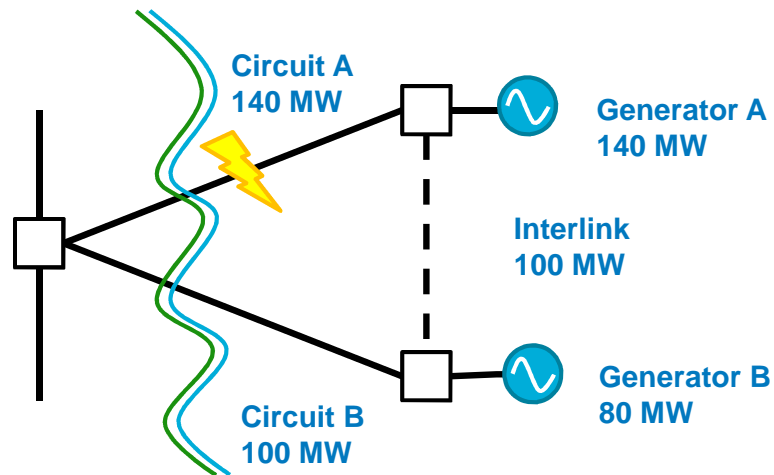
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Charge for firm access on other Cables

- Generators should pay towards the other local circuit if they have firm access; this access is measured through the **Additional Firm Capacity (AFC)**
- Generator A, has an additional circuit charge
= **Circuit B tariff x AFC.**
- This approach reflect the additional capacity, but not the additional security the firm access.

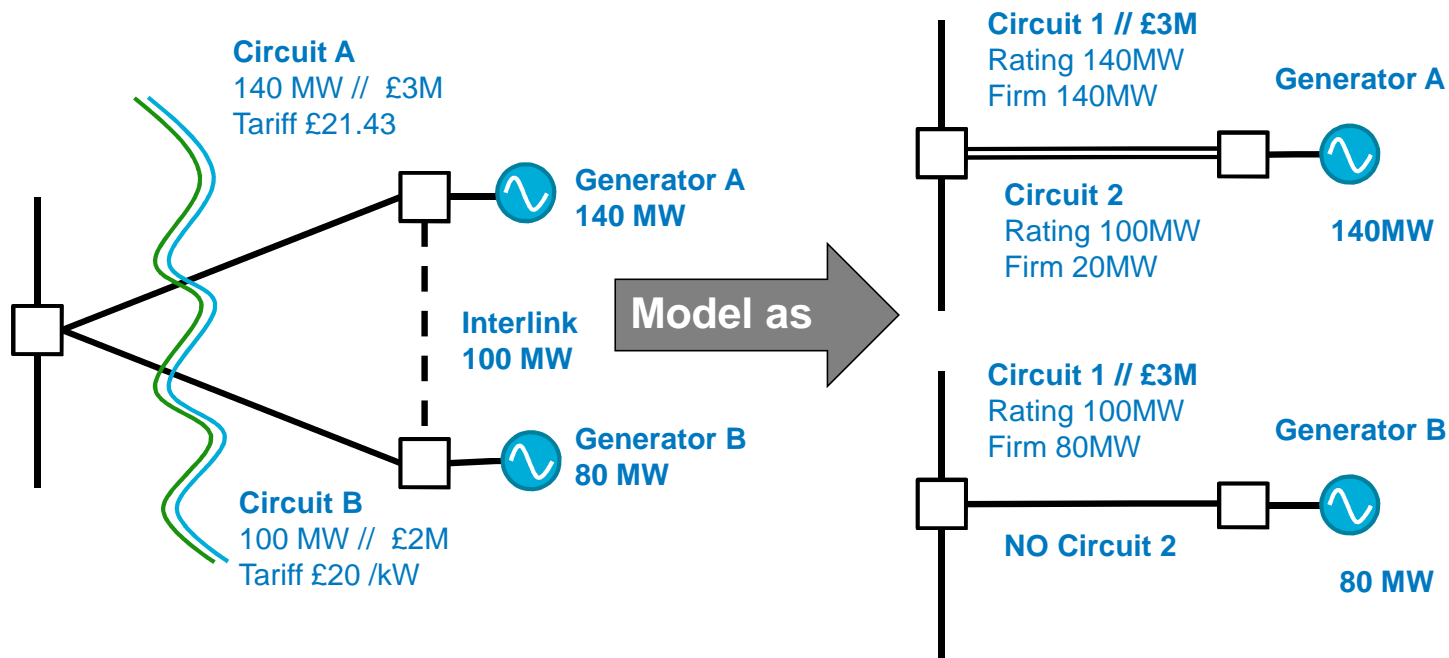
Charge for firm access on other Cables

- Example: Additional Firm Capacity
 - For Gen A, there is 20MW charge on Circuit B
 - For Gen B, there is 0MW on Circuit A, so zero charge

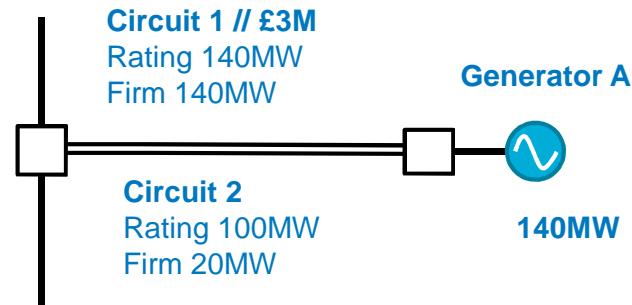


Option 2b: Mimicking a double circuit

- Generator Local Circuit Charge is modelled as an equivalent double circuit, with the firm capacity on the local circuit, and any firm capacity on the other circuit

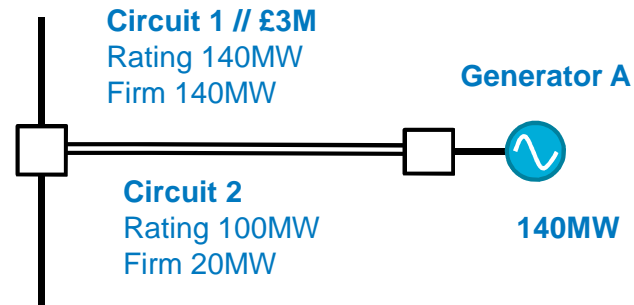


Option 2b: Mimicking a double circuit



- Calculate an **Equivalent Security Factor**
=(Local circuit rating + firm access on other ccts) / TEC
 - ESF capped at 1.8; if no firm access on other circuit = 1
- In this example, $ESF = (140+20)/140 = 1.14285$

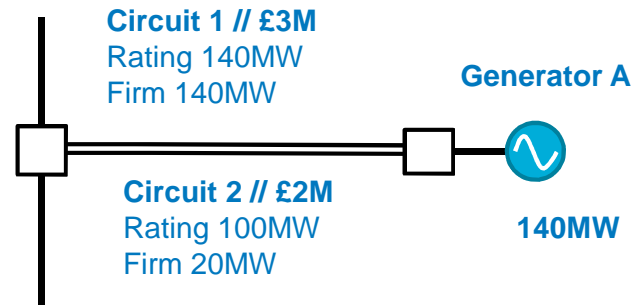
Option 2b: Mimicking a double circuit



■ Calculation proportion of each circuit used:

- Local $PL = TEC / Rating = 140/140 = 1$
- Others $PO = Firm\ access / Rating = 20 / 100 = 0.2$

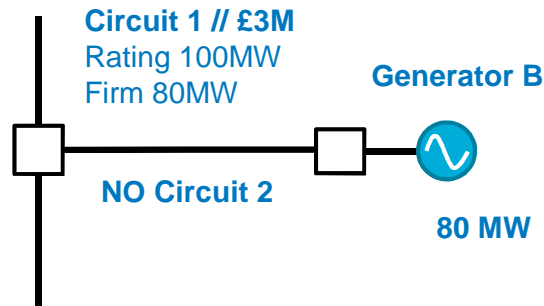
Option 2b: Mimicking a double circuit



- Calculate Local Circuit tariff (£/kW) =
Effective Security Factor × Revenue weighted by
Proportion / Rating weighted by Proportion
- E.g. Local Circuit Tariff =
$$= 1.14285 \times (1 \times 3 + 0.2 \times 2) / (1 \times 140 + 0.2 \times 100)$$
$$= £24.29 / \text{kW} \quad [\text{previously } £21.42 \text{ for single cct}]$$
- Would then set expansion factor based on this calculation.

Option 2b: Mimicking a double circuit

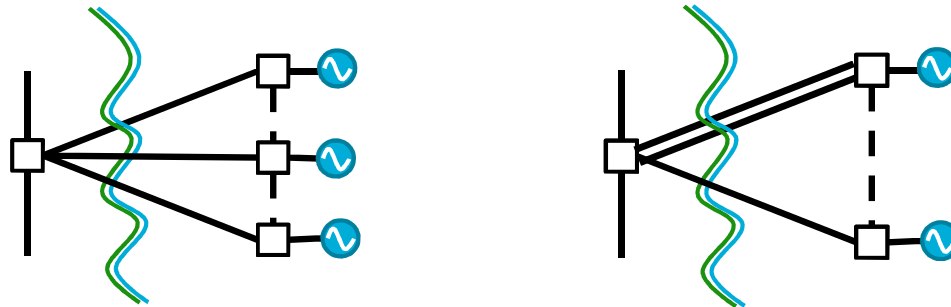
- For Generator B, No firm access on other circuit, so just treat as a single radial circuit



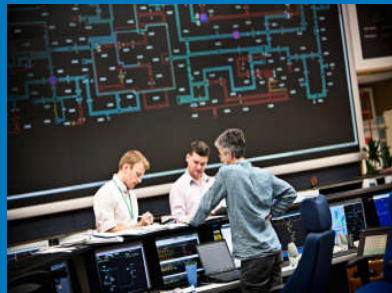
- Calculate Local Circuit tariff (£/kW) =
Effective Security Factor × Revenue weighted by
Proportion / Rating weighted by Proportion
- E.g. Local Circuit Tariff =
$$= 1 \times (0 \times 3 + 0.8 \times 2) / (0 \times 140 + 0.8 \times 100)$$
$$= £20 / \text{kW} \quad [\text{same as single circuit tariff}]$$

Further areas of analysis

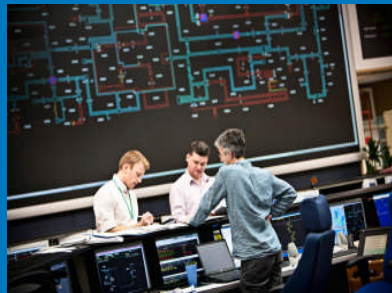
- Any other ways of allocating charges we should consider?
- Need to validate against test scenarios [i-v]?
- What if one (or more) radial circuit is a double circuit (i.e. beyond standard) [vi]?
- Extension for case for multiple offshore substation, generators and interlinks [vii]?



4. Term of Reference



5. Next Steps



Richard Loukes