CMP432 Improve Locational Onshore Security Factor for TNUoS Wider Tariffs

Workgroup 2 (05 February 2025)

Online Meeting via Teams

NESO
National Energy System Operator

WELCOME

NESO
National Energy
System Operator

Agenda

Topics to be discussed	Lead
Introductions	Chair
Action Log Review	Chair
Proposer’s presentation	Proposer
Presentation – Current treatment of the Locational Security Factor	Paul Jones
Any Other Business	Chair
Next Steps	Chair

Expectations of a Workgroup Member

Contribute to the discussion

Be respectful of each other’s opinions

Language and Conduct to be consistent with the values of equality and diversity

Do not share commercially sensitive information

Be prepared - Review Papers and Reports ahead of meetings

Complete actions in a timely manner

Keep to agreed scope

Email communications to/cc’ing the .box email

Your Roles

Help refine/develop the solution(s)

Bring forward alternatives as early as possible

Vote on whether or not to proceed with requests for Alternatives

Vote on whether the solution(s) better facilitate the Code Objectives

NESO National Energy System Operator

Workgroup Membership

Role	Name	Company	Alternate	Name
Chair	Sarah Williams	NESO		
Tech Sec	Prisca Evans	NESO		
Proposer	John Tindal	SSE	Alternate	Damien Clough
Workgroup Member	Neil Dewar	NESO		
Workgroup Member	Tom Steward	RWE	Alternate	Lauren Jauss
Workgroup Member	Ryan Ward	Scottish Power Renewables	Alternate	Hector Eduardo Perez
Workgroup Member	Andrew Rimmer	Engie	Alternate	Simon Lord
Workgroup Member	Paul Jones	Uniper	Alternate	Sean Gauton
Workgroup Member	Alan Kelly	Corio Generation	Alternate	Dan Gilbert
Workgroup Member	Giulia Licocci	Ocean Winds		
Observer	Loukas Papageorgiou	RWE		
Observer	Kyle Murchie	Roadnight Taylor	Alternate	Catherine Cleary
Observer	Sally Young	SSE		
Observer	Zahira Rafiq	NESO		
Authority Representative	Sinan Kufeoglu	OFGEM		

What is the Alternative Request?

What is an Alternative Request? The formal starting point for a Workgroup Alternative Modification to be developed which can be raised up until the Workgroup Vote.

What do I need to include in my Alternative Request form? The requirements are the same for a Modification Proposal you need to articulate in writing:
- a description (in reasonable but not excessive detail) of the issue or defect which the proposal seeks to address compared to the current proposed solution(s);
- the reasons why the you believe that the proposed alternative request would better facilitate the Applicable Objectives compared with the current proposed solution(s) together with background information;
- where possible, an indication of those parts of the Code which would need amending in order to give effect to (and/or would otherwise be affected by) the proposed alterative request and an indication of the impacts of those amendments or effects; and
- where possible, an indication of the impact of the proposed alterative request on relevant computer systems and processes.

How do Alternative Requests become formal Workgroup Alternative Modifications? The Workgroup will carry out a Vote on Alternatives Requests. If the majority of the Workgroup members or the Workgroup Chair believe the Alternative Request will better facilitate the Applicable Objectives than the current proposed solution(s), the Workgroup will develop it as a Workgroup Alternative Modification.

Who develops the legal text for Workgroup Alternative Modifications? ESO will assist Proposers and Workgroups with the production of draft legal text once a clear solution has been developed to support discussion and understanding of the Workgroup Alternative Modifications.

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Timeline for CMP432 as of 29 January 2025

Pre-Workgroup		
Proposal raised	07/03/2024	
Proposal submitted to Panel	22/03/2024	
Workgroup Nominations	09/04/2024	
Urgency Decision Granted	21/01/2025	
Workgroups		
~~Workgroup 1~~	~~29/01/2025~~	~~Objectives and Timeline/Review and Agree Terms of Reference / Proposer presentation~~
Workgroup 2	05/02/2025	Solution Development / Workgroup Discussions/Legal Text
Workgroup 3	14/02/2025	Draft Legal Text/Draft Workgroup Consultation /Specific Questions
Workgroup 4	21/02/2025	Final Workgroup Consultation Review
Workgroup Consultation	26/02/2025 – 06/03/2025	
Workgroup 5	13/03/2025	Review of Workgroup Consultation Responses / Alternative Requests Discussion/Review Solution position
Workgroup 6	20/03/2025	TOR Discussion/Alternative Requests Presentations and Vote (if required)/
Workgroup 7	26/03/2025	Draft Legal text and WACMs Legal text (if required) review
Workgroup 8	03/04/2025	Final Workgroup Report Review / ToR Sign-off / Final Legal Text Review (WACMS legal text)

Timeline for CMP432 as of 29 January 2025

Post Workgroups		Key info
Workgroup Report submitted to Panel	14/04/2025	
Panel to agree whether ToR have been met	17/04/2025	Special Panel invites to be shared
Code Administrator Consultation	22/04/2025 – 02/05/2025	
Code Administrator Consultation Analysis and DFMR generation	02/05/2025 – 08/05/2025	
Draft Final Modification Report to Panel	09/05/2025	
Panel Recommendation Vote	15/05/2025	Special Panel
Final Modification to Ofgem	15/05/2025	
Decision Date	30/09/2025	
Implementation Date	01/04/2026	

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CMP432 - Terms of Reference

Workgroup Term of Reference	Location in Workgroup Report (to be completed at Workgroup Report stage)
a) Consider EBR implications	
b) Consider the methodology for calculating the security factor (Locational Onshore Security Factor Section 14.15.88 – 14.15.90) and the further objectives of the Charging Methodology set out in Section 14. 14.11	
c) Consider whether reinforcement with a larger capacity circuit, compared with the previous, increases the fault condition.	
d) Consider the impact of whether reinforcement is achieved by upgrading an existing circuit to a larger capacity, therefore increasing the fault condition	
e) Consider whether some types of technology require additional MITS redundancy, e.g. large inflexible conventional such as nuclear	
f) Consider and evaluate the evidence that the current Security Factor is reflective of how TOs make network reinforcement decisions	
g) Consider the scope of work identified and whether this is achievable within the timeframe outlined in the Ofgem Urgency decision letter	

Action Log Review

Sarah Williams - NESO Code Administrator

Action Log

Action	Description	Owner	Due	Status
1	Share the SECULF model with the work group to enable replication of the calculation	ND	WG 2	Open
2	Submit written arguments detailing the implications of the security factor on network reinforcement and incremental cost, including perspectives on whether it implies an ever-growing N minus number.	Proposer/PJ	WG2	Open
3	NESO to speak to teams internally to request industry access to VBA code within the Transport and Tariff Model	Proposer	WG2	Open
4	Share the Consultants report	Proposer	WG2	Open
5	Liaise with the Chair of CMP444 to ensure modifications are running in alignment	Chair	WG2	Open

Proposers Presentation

John Tindal – SSE

CUSC Modification Proposal CMP432

Improve "Locational Onshore Security Factor” for TNUoS Wider Tariffs

WG2

5th February 2025

sse

Rationale for TNUoS Charges (need more discussion ?)

"The underlying rationale behind Transmission Network Use of System charges is that efficient economic signals are provided to Users when services are priced to reflect the ***incremental costs*** *of supplying them."*

(CUSC 14.14.6 – underlying rationale behind TNUoS Charges)

SQSS requires that MITS Transmission network is already sufficiently secure, so:

...if additional MITS network capacity does not require additional redundancy for security

...Then TNUoS Wider locational price signal should not charge for additional redundancy for security

CUSC Full paragraph for context

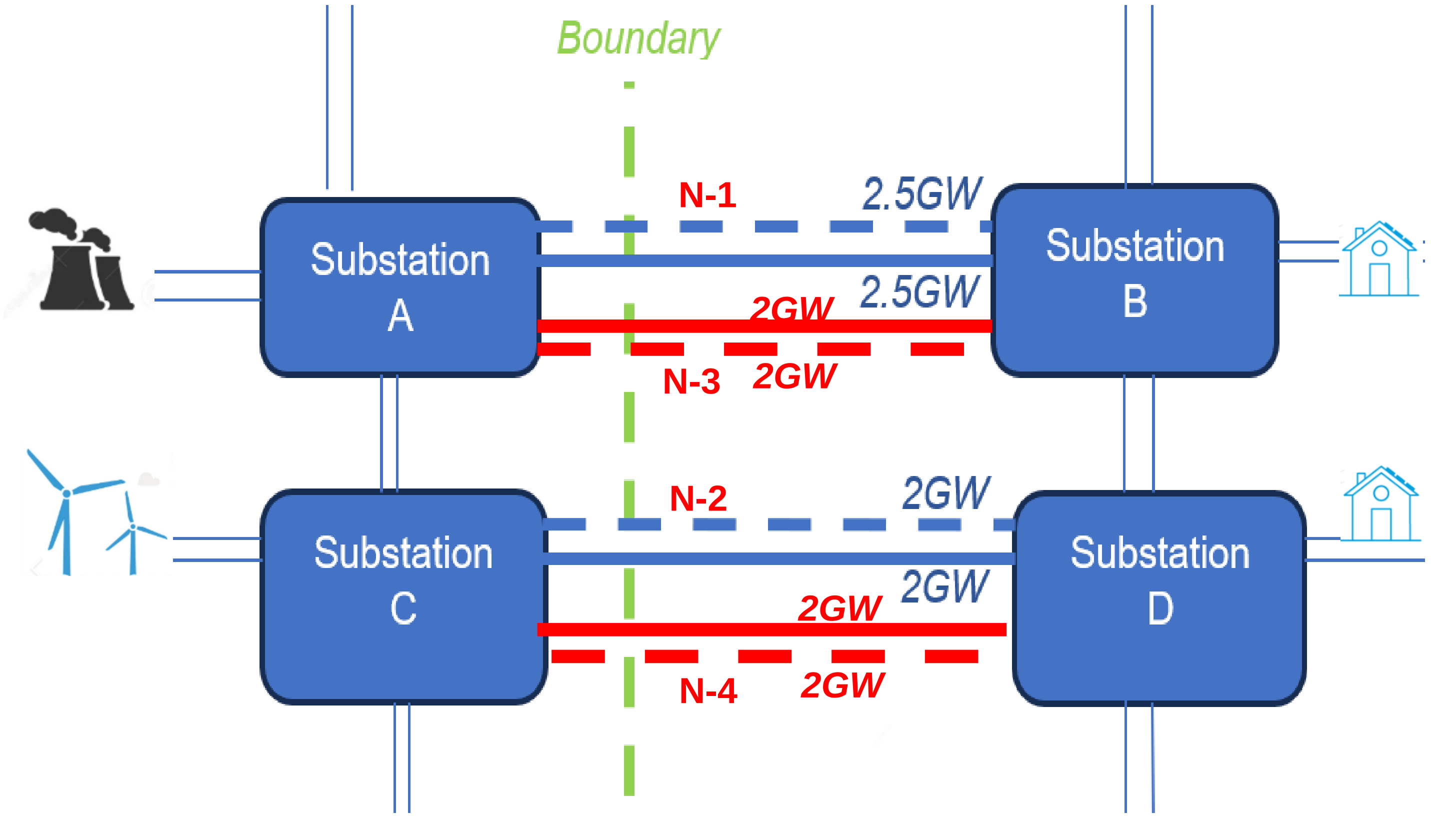
"The underlying rationale behind Transmission Network Use of System charges is that efficient economic signals are provided to Users when services are ***priced to reflect the incremental costs of supplying them****. Therefore, charges should reflect the impact that Users of the transmission system at different locations would have on the Transmission Owner's costs, if they were to increase or decrease their use of the respective systems. These costs are primarily defined as the investment costs in the transmission system, maintenance of the transmission system and maintaining a system capable of providing a secure bulk supply of energy.*

The ESO Licence requires The Company to operate the National Electricity Transmission System to specified standards. In addition The Company and transmission licensees are required to plan and develop the National Electricity Transmission System to meet these standards. These requirements mean that the system must conform to a particular Security Standard and capital investment requirements are largely driven by the need to conform to both the deterministic and supporting cost benefit analysis aspects of this standard. It is this obligation, which provides the underlying rationale for the ICRP approach, i.e. for any changes in generation and demand on the system, The Company must ensure that it satisfies the requirements of the Security Standard."

(CUSC 14.14.6 – underlying rationale behind TNUoS Charges)

sse

Illustrating how charging **wrongly** implies N-1,2,3,4… - New build circuit example



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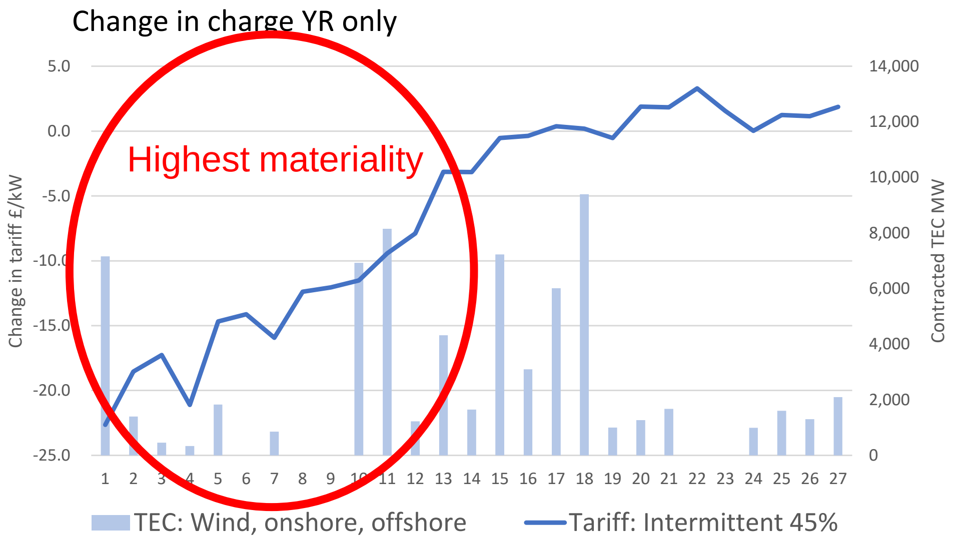
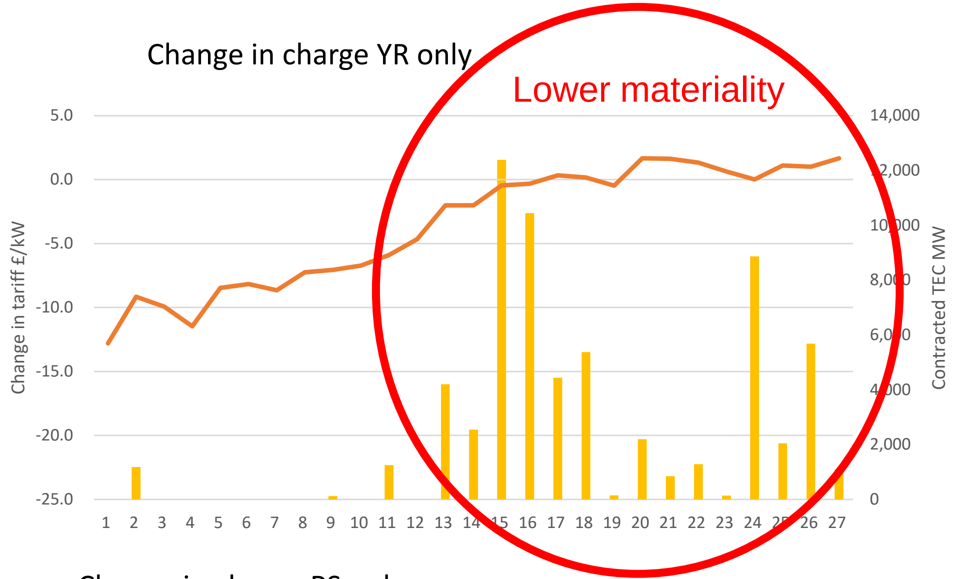
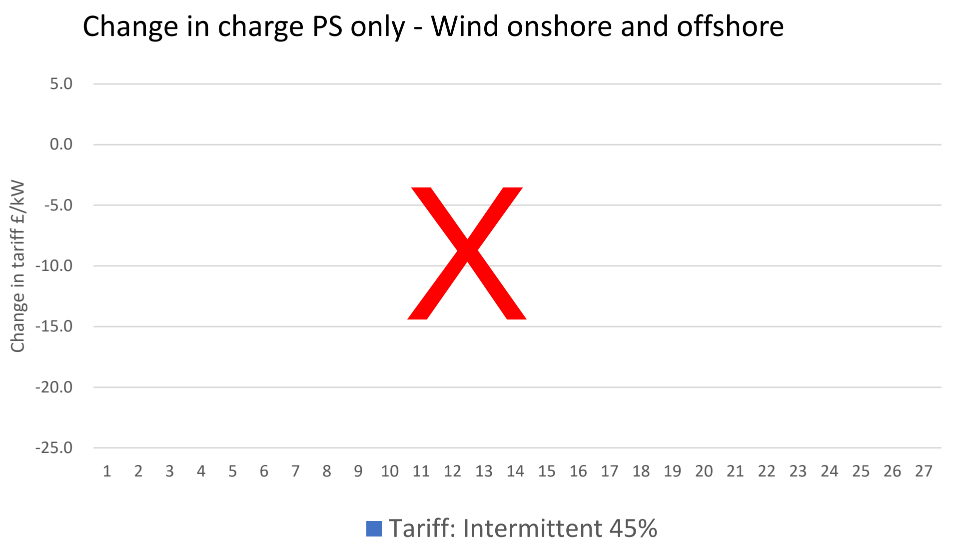
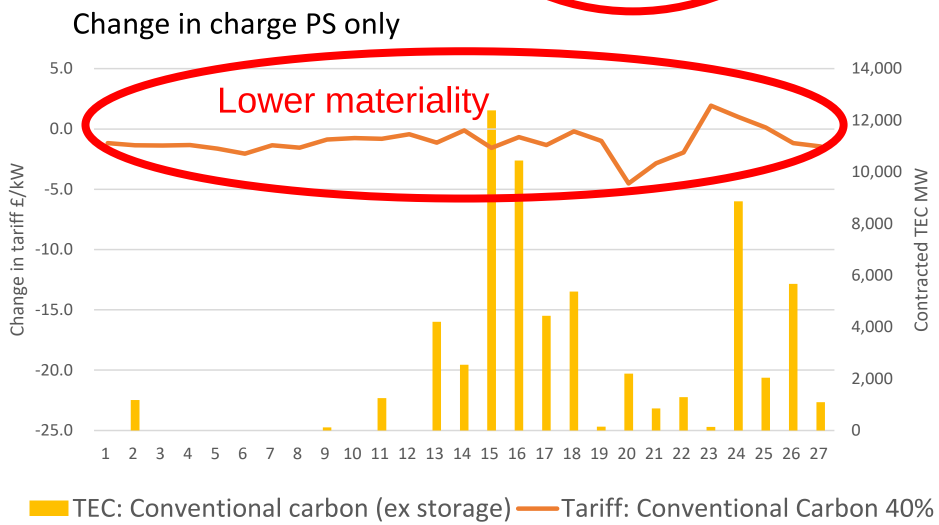
Materiality highest: Year Round for Northern Intermittent









Conclusion: If Conventional Carbon, and/or Peak Security are different for security, then treat them differently

Understand different examples

<table>
<tr><th>Technology type</th><th>Reinforcement type</th><th>Notes</th><th>Incremental Security Factor</th></tr>
<tr><td rowspan="3">Intermittent Low Carbon
<1,800 MW infeed loss</td><td>New</td><td>Security condition unchanged
New circuits to flow bulk energy vs congestion</td><td>YR: 1
PS: n/a</td></tr>
<tr><td>Upgrade existing circuits</td><td>Security condition unchanged</td><td>YR: 1
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Increase in fault condition not a long-run incremental price signal</td><td>YR: 1
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<tr><td>Intermittent Low Carbon
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Deeper MITS: same as above <1,800 MW</td><td>Quasi local circuit
YR: n/a
PS: 1.76 or higher ?

Deeper MITS
YR: 1
PS: ??</td></tr>
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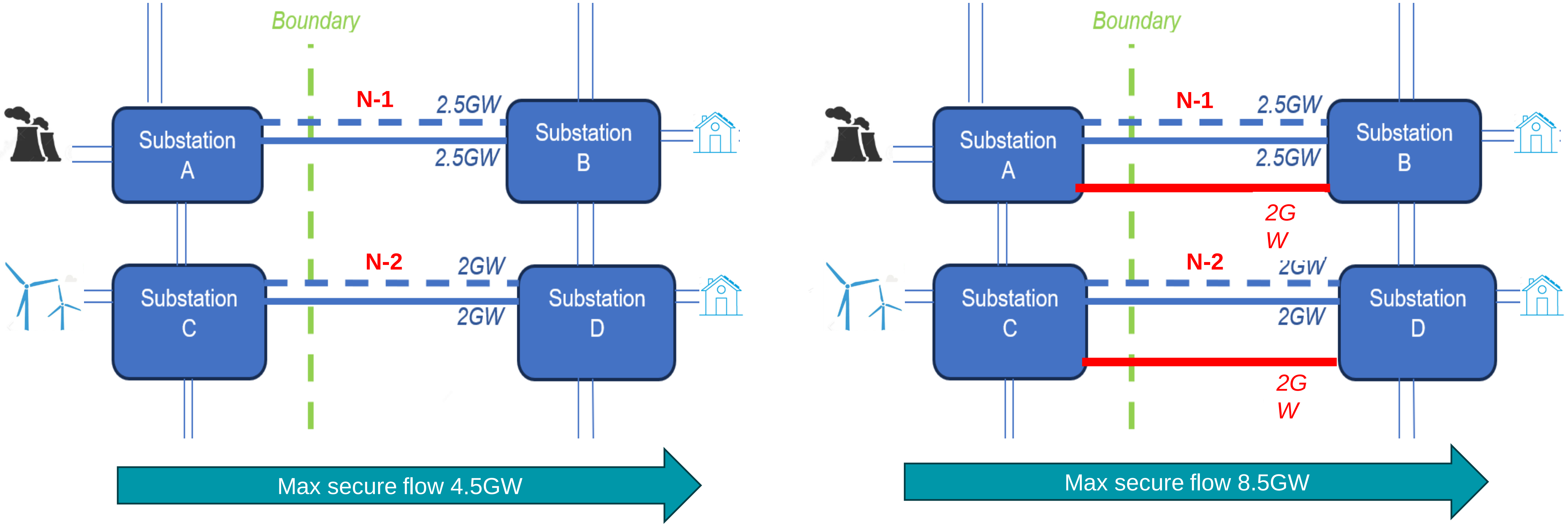
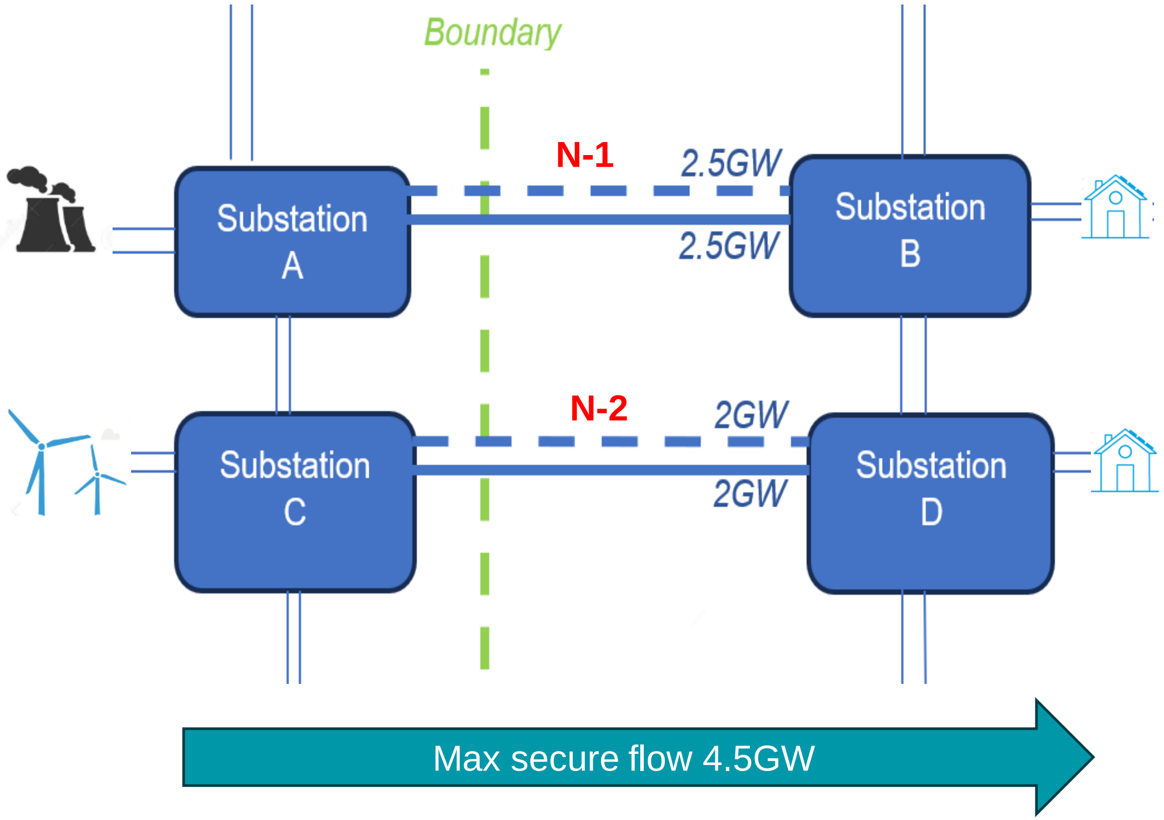
Illustrating expansion with new <u>without</u> changing fault condition

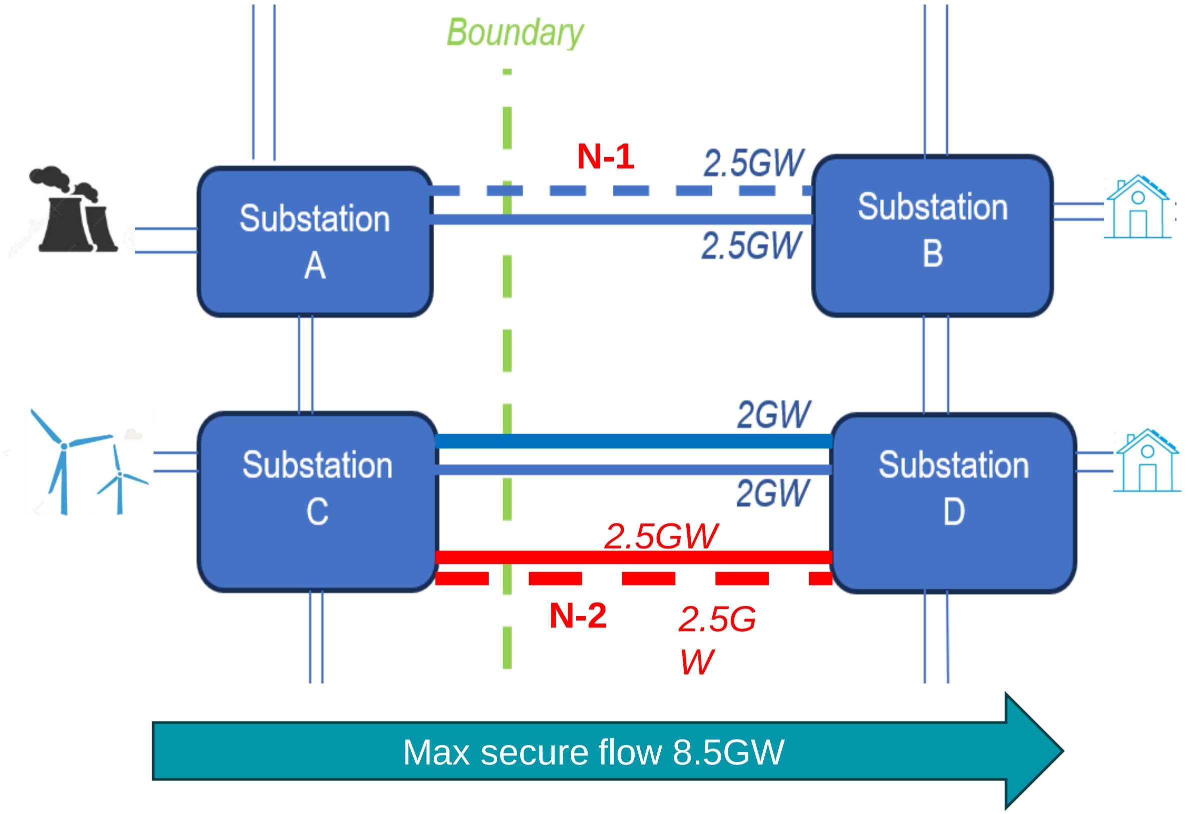


- Add 4GW of transfer capability by building new two 2GW circuit
- Security condition is unchanged

- Implied Security Factor 4/4 = 1.00

Illustrating expansion with new with increasing fault condition

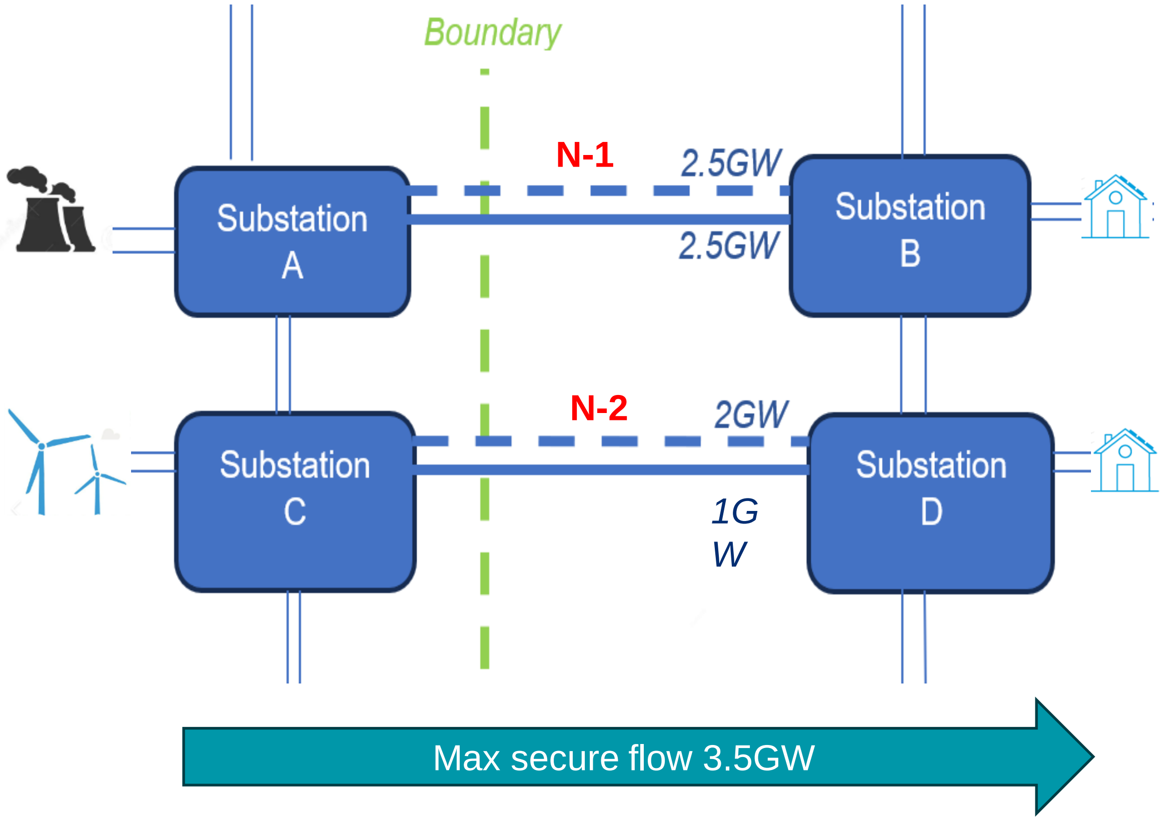


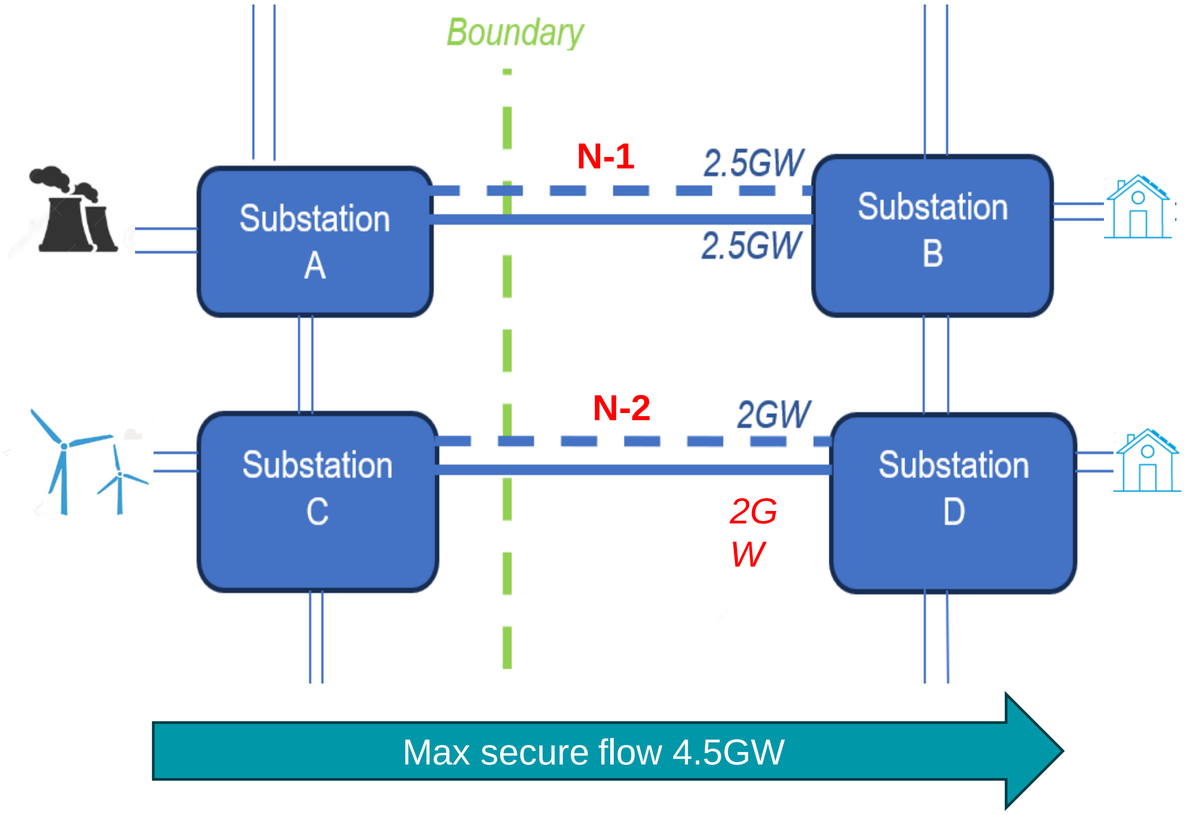


- Add 4GW of transfer capability by building 5GW at 2 x 2.5GW
- Security condition is increased from 2.5+2 to 2.5+2.5

- Implied Security Factor 5/4 = 1.25 (incremental Security Factor still only 1 because fault condition will not keep increasing in long-run)

Illustrating expansion of existing without changing fault condition

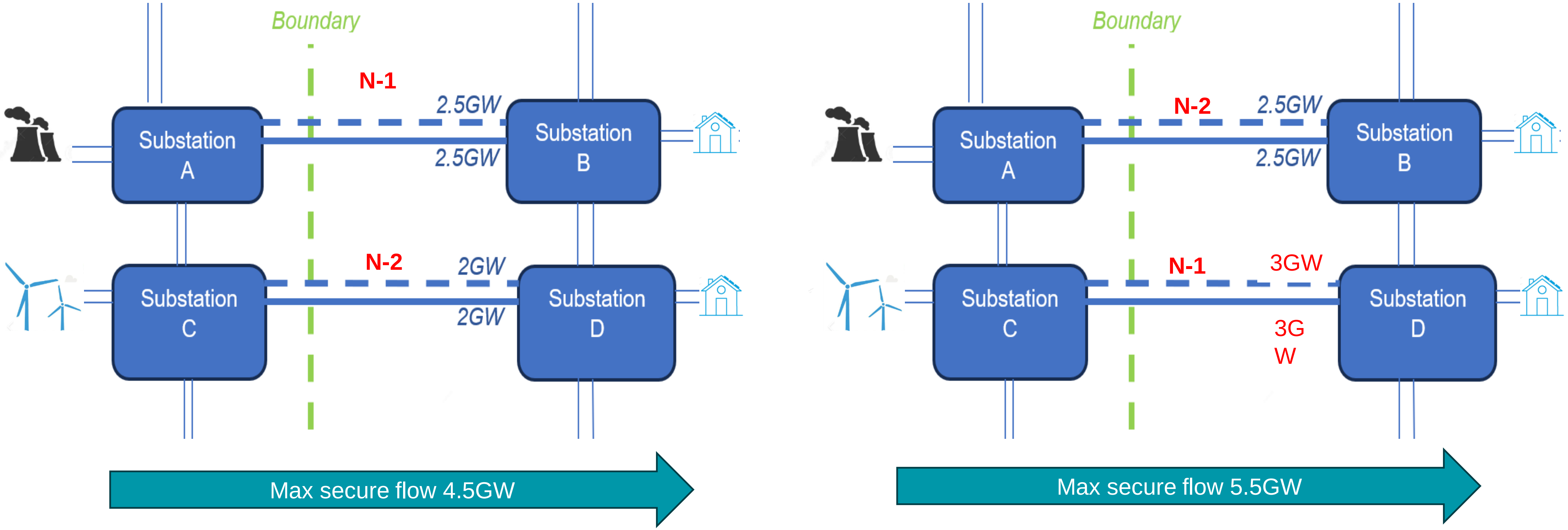




- Add 1GW of transfer capability by upgrading a 1GW circuit to a 2GW circuit
- Security condition is unchanged

- Implied Security Factor 1/1 = 1.00

Illustrating expansion of existing **with** increasing fault condition



- Add 1GW of transfer capability by upgrading two 2GW circuits to a 3GW circuit
- Security condition is increased

- Implied Security Factor 2/1 = 2.00 (incremental Security Factor still only 1 because fault condition will not keep increasing in long-run)

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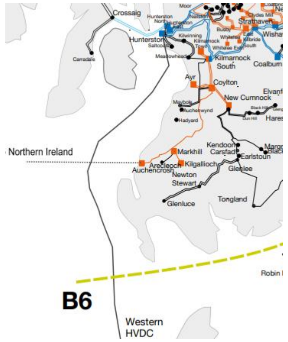
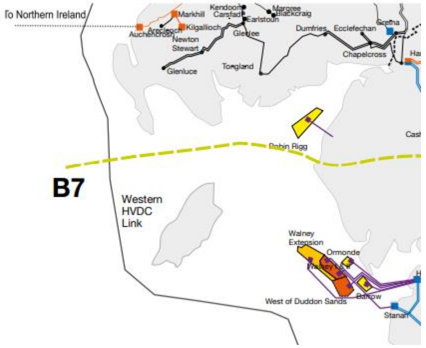
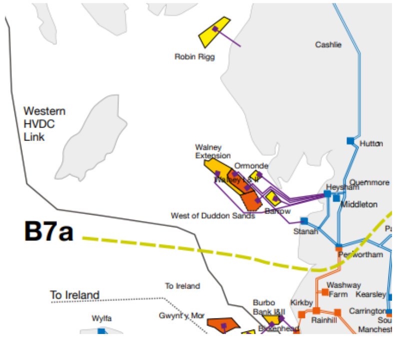
West Coast Bootstrap Example



- **B6 –** ‘the boundary capability has increased to 5.7GW compared to last year due to the addition of the new Western HVDC circuit and upgrade of cables at Torness.’



- **B7 –** ‘the boundary capability has increased to 6.5GW compared to last year due to the addition of the new Western HVDC circuit.’



- **B7a –** ‘the boundary capability has increased to 8.7GW compared to last year due to the addition of the new Western HVDC circuit.’

Zone	Boundary Transfer Capacity 2017 (GW) [1]	Boundary Transfer Capacity 2018 (GW) [2]	Change in Boundary Transfer Capacity (GW)	Bootstrap Capacity 2018 (GW)	Implied Security Factor 2018
B6	3.5	5.7	2.2	2.2	1.00
B7	4.3	6.5	2.2	2.2	1.00
B7a	6.0	8.7	2.7	2.2	0.81

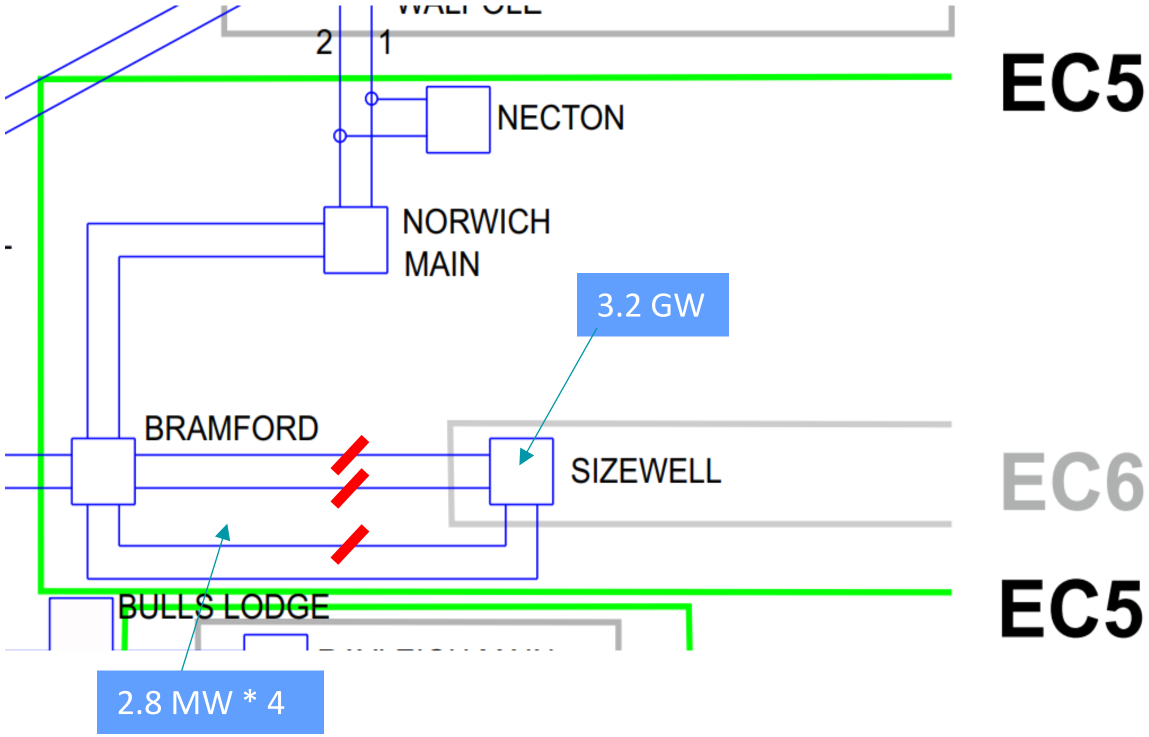
1 https://www.neso.energy/document/102616/download

2 https://www.neso.energy/document/133836/download

Planning for Large

- SQSS treatment
  - Sets 2 different generation backgrounds and uses power flow arising from them.
    - **Security** – with the purpose of meeting Average Cold Spell (peak) demand when renewable and external inputs don't contribute.
    - **Economy** – with the purpose of meeting varying levels of demand efficiently.

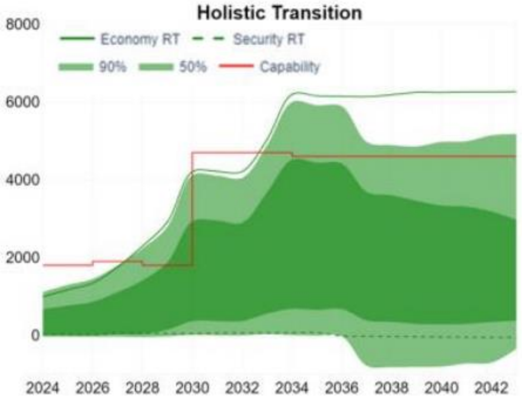
Fault Condition	Local circuit capacity (GW)	Sizewell capacity (GW)	Compliant
2 circuits (intact)	5.6	3.2	Y
n-1	2.8	3.2	N (loss of infeed)
n-2	0	3.2	N (loss of infeed)
n-D	0	3.2	N (loss of infeed)
3 circuits (intact)	8.4	3.2	Y
n-1	5.6	3.2	Y
n-2	2.8	3.2	N (loss of infeed>)
n-D	2.8	3.2	N (loss of infeed)
4 circuits (intact)	11.2	3.2	Y
n-1	8.4	3.2	Y
n-2	5.6	3.2	Y
n-D	5.6	3.2	Y

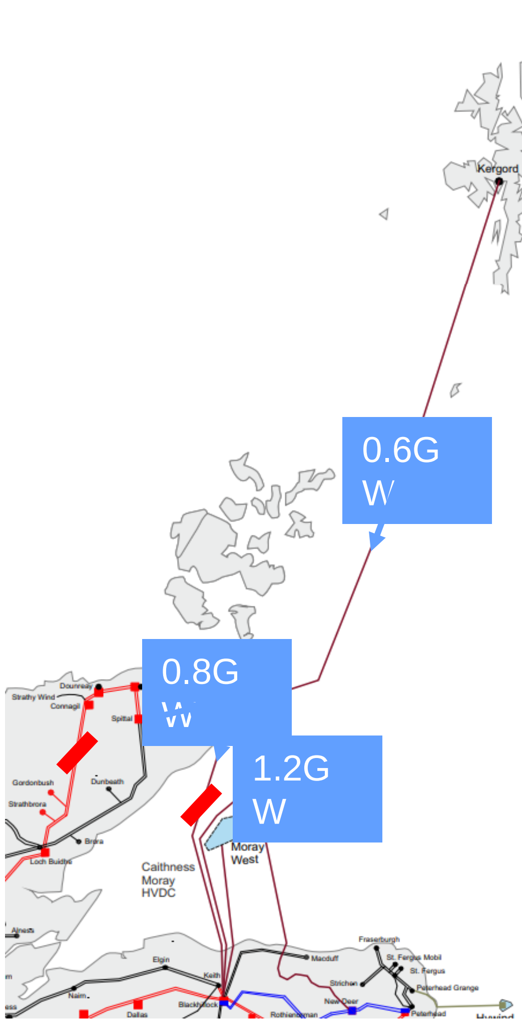


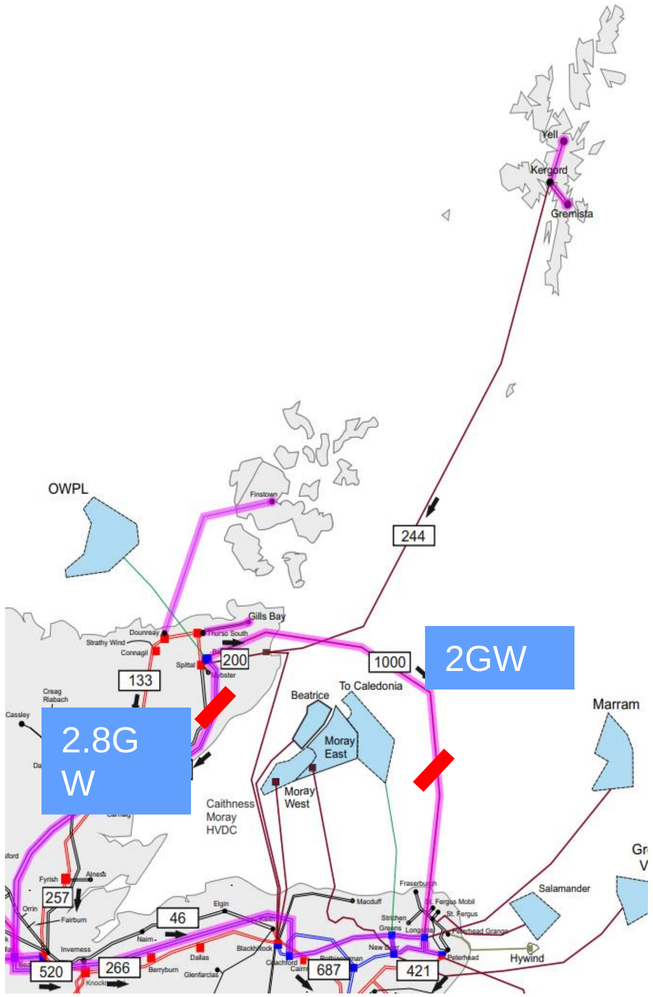
- Triggers connecting substation as a MITS node due to 4 generation circuits + GSP to Leiston.
- This happens when G capacity is
  - > infrequent loss of infeed (1.8GW) AND
  - > single circuit capacity
- If G capacity < infrequent loss of infeed then could possibly tolerate loss and could have single/double circuit connection, which would be classed as local.
- Implications of MITS node vs local components
  - Local classification wouldn't go into wider and thus 1.76 wouldn't apply
  - Would be peak security rather than year round

One-off step increase in fault condition

- Implication of a change in fault condition is that you are installing bigger circuits than currently exist cross boundary.
- Some Scottish reinforcements currently falling into this category.
- Upgrades are part of a program of works to step-change upgrade Scottish network - Once Pathway to 2030 is complete then Scotland will be upgraded to a similar position to England.
- Increasing fault condition is not recurring, and not part of long-run incremental price signal







How should different examples be treated differently?

Technology type	Reinforcement type	Notes	Incremental Security Factor
Intermittent Low Carbon <1,800 MW infeed loss	New	Security condition unchanged New circuits to flow bulk energy vs congestion	YR: 1 PS: n/a
	Upgrade existing circuits	Security condition unchanged	YR: 1 PS: n/a
	New, or upgrade existing circuits	Increased security condition as part of a step-change program to upgrade a network area to new standard Increase in fault condition not a long-run incremental price signal	YR: 1 PS: n/a
Intermittent Low Carbon > 1,800 MW infeed loss	n/a	In practice, do not build intermittent low carbon with individual connection exceeding 1,800 MW of largest infeed loss	n/a

Technology type	Reinforcement type	Notes	Incremental Security Factor
Conventional Carbon <1,800 MW infeed loss	New	Security condition unchanged New circuits may be classed as PS, or YR	YR: 1 PS: ??
	Upgrade existing circuits	Security condition unchanged Upgraded circuits may be classed as PS, or YR	YR: 1 PS: ??
	New, or upgrade existing circuits	Increased security condition as part of a step-change program to upgrade a network area to new standard Upgraded circuits may be classed as PS, or YR Increase in fault condition not a long-run incremental price signal	YR: 1 PS: ??
Conventional Carbon > 1,800 MW infeed loss	New quasi local circuits	Quasi local circuit: Stations larger than 1,800 MW can require additional security on quasi local circuits to protect against largest infeed loss Deeper MITS: same as above <1,800 MW	Quasi local circuit YR: n/a PS: 1.76 or higher ? Deeper MITS YR: 1 PS: ??

Current treatment of the Locational Security Factor

Paul Jones – Uniper

CMP444

Views on why current Locational Security Factor calculation may be appropriate

Principles

- “14.14.6 The underlying rationale behind Transmission Network Use of System charges is that efficient economic signals are provided to Users when services are priced to reflect the incremental costs of supplying them. Therefore, charges should reflect the impact that Users of the transmission system at different locations would have on the Transmission Owner's costs, if they were to increase or decrease their use of the respective systems. These costs are primarily defined as the investment costs in the transmission system, maintenance of the transmission system and maintaining a system capable of providing a secure bulk supply of energy.”

- “14.15.4 The DCLF ICRP transport model calculates the marginal costs of investment in the transmission system which would be required as a consequence of an increase in demand or generation at each connection point or node on the transmission system, based on a study of peak demand conditions using both Peak Security and Year Round generation backgrounds on the transmission system. One measure of the investment costs is in terms of MWkm. This is the concept that ICRP uses to calculate marginal costs of investment. Hence, marginal costs are estimated initially in terms of increases or decreases in units of kilometres (km) of the transmission system for a 1 MW injection to the system.”

Investment Cost Related Pricing

- ICRP is not a full marginal approach to pricing
- A full marginal approach would be deep connection charging
- It would charge those projects that triggered investment the cost of that investment, even if that investment was much larger in size than strictly required for the projects alone
- It would not charge any subsequent projects if there was already sufficient network capacity to accommodate them, or it may ask them to recompense the triggering projects for part of the cost they paid
- ICRP does not do that. It charges triggering projects, subsequent projects and existing projects the same value – essentially everyone pays their “fair share”
- This was introduced as part of the “Plugs” methodology in 2004, which introduced super shallow charging for TNUoS
- Aim is to balance cost reflectivity, predictability, fairness

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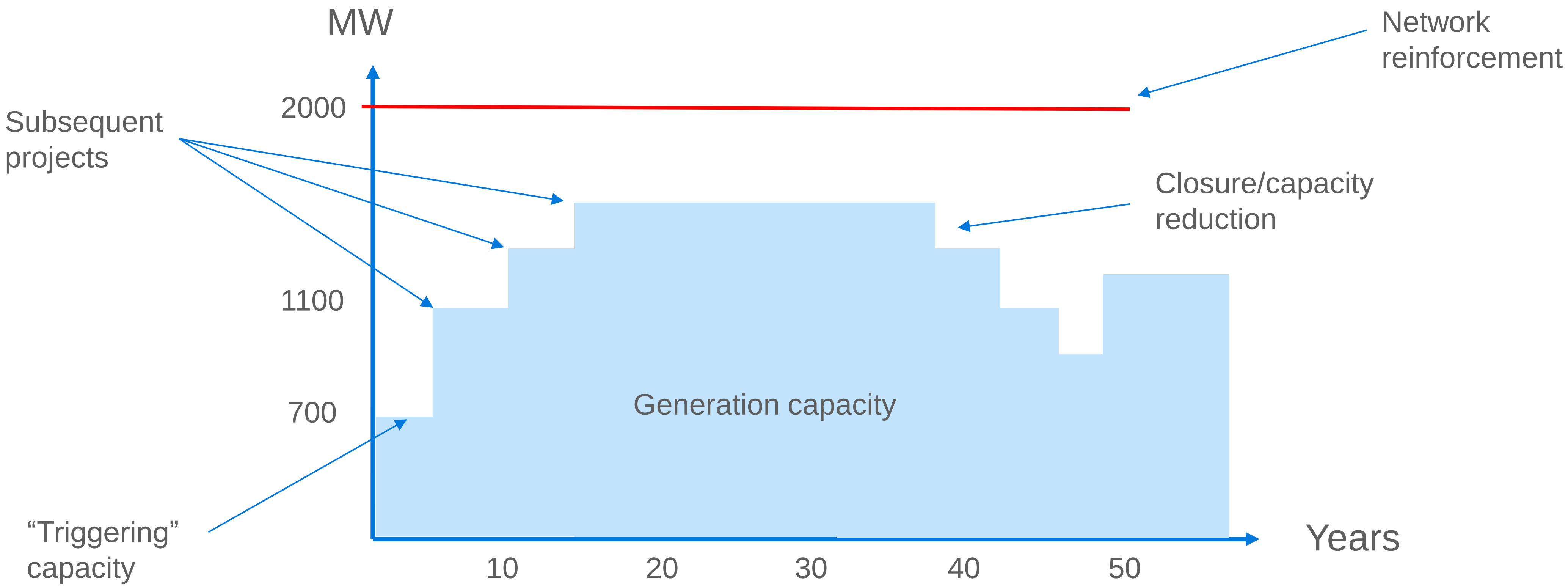
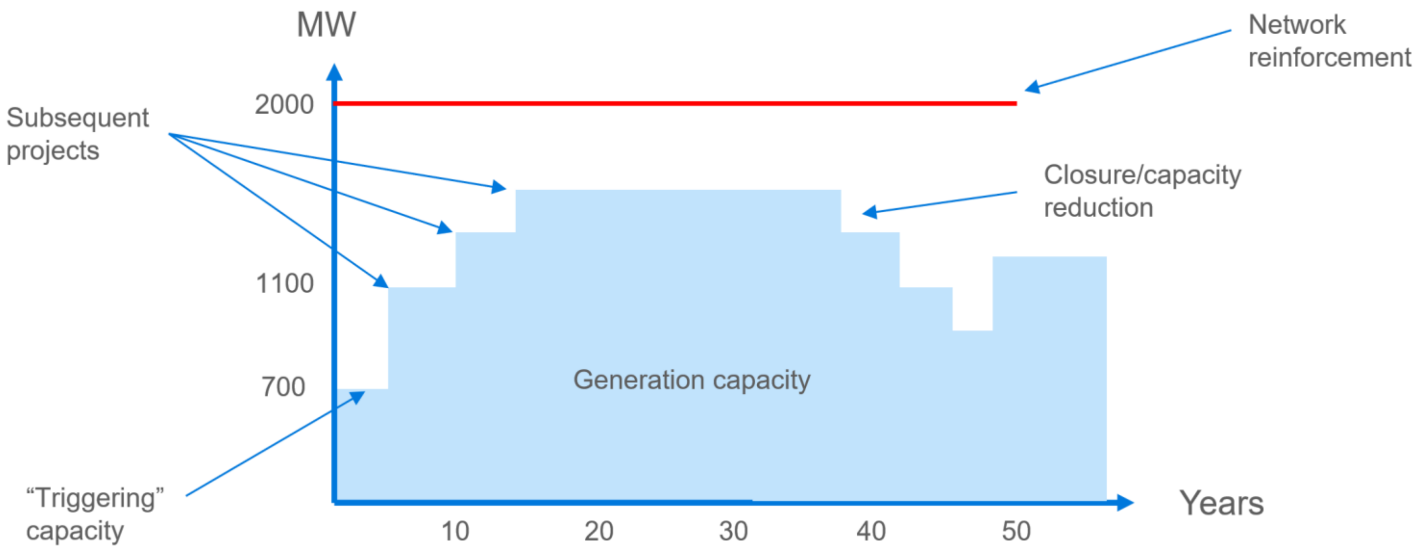
Comparing deep and shallow charging



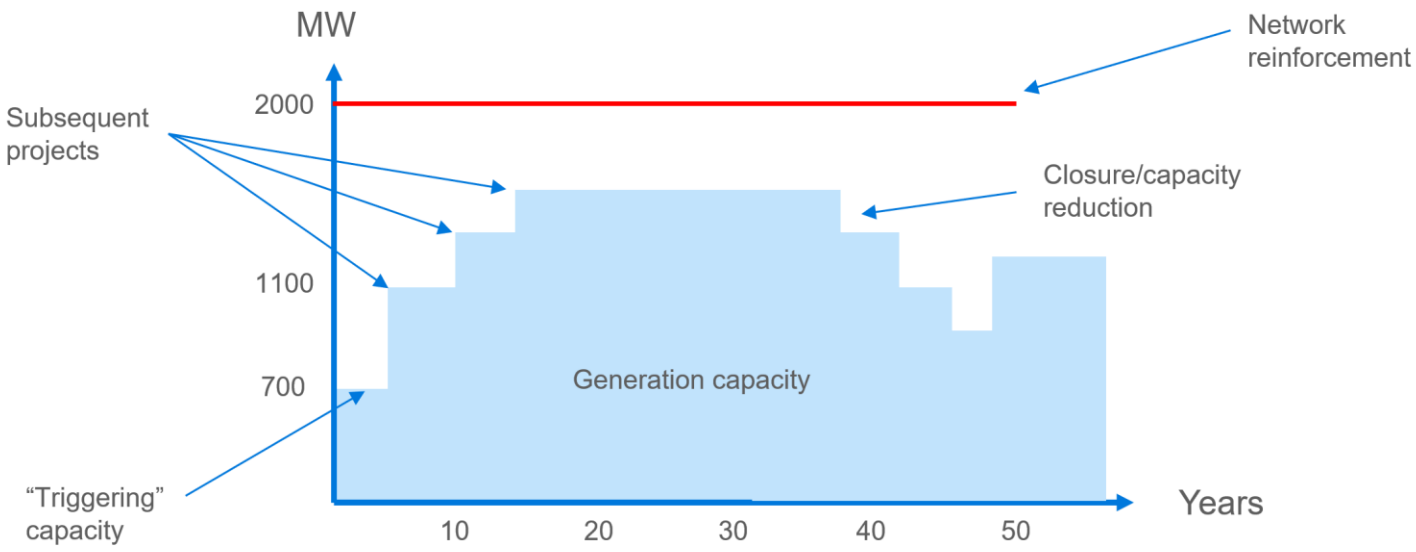
Deep charge

- Triggering capacity pays for full cost of the Network Reinforcement
- Subsequent projects may pay a charge to recompense the triggering generation for “their share” of the network reinforcement



Shallow charge

- Triggering capacity pays for only its share of the Network Reinforcement
- Costs are spread over the capacity and assumed life of the network asset, and charged per MW per year
- Subsequent projects pay the same apportioned charge per MW per year



Shallow charging leads to average historic charging

- In deep charging, the affected projects would look to write off the cost of the network charge over the period of the project, or would pay annual charges with termination fees to ensure full fee is eventually recovered over the project life
- In shallow charging the network reinforcement is recovered over 50 years on a per MW apportioned basis. This allows proportionate annual charging
- The cost of an investment cannot be “forgotten” by the methodology as soon as it is made. Otherwise, the affected generators would see only see a small proportion of the signal. They would pay for one or two years and then it would disappear
- Historic cost signals have to be reflected so that the charge can be recovered over the life of the connecting projects
- Existing projects also need to see the same signal to influence capacity reduction decisions
- This is really important as much of repowering will need efficient reuse of existing network

uniper

ICRP high level process to calculate the locational signal

Calculate MWkms for additional 1MW at a location

Multiply this by the cost per MWkm of relevant network

Run the DCLF model

Assumed background conditions

Assumed use of HVDC “onshore”

Expansion Factors

Expansion Constant

Locational Security Factor

Transport and Tariff model elements – incremental or average?

Element	Incremental or average?	Comment
Calculated MWkm	Incremental on an average basis	Incremental flows are based on existing network, but sized exactly as needed to meet the background, before incremental flows are added. These flows are assumed to flow unconstrained according to Kirchoff's laws. Does not focus on specific investments that might be made to accommodate new generation in reality. Assumes the network that is flowed across can be incrementally upgraded to accommodate the additional 1MW flow.
Expansion Constant	Average	Past 10 years of investment in 400KV overhead lines, indexed to reflect price changes in key inputs to cost, effectively assuming asset is fully used for 50 years
Expansion Factors	Average	Same as Expansion Constant
Locational Security Factor	Average	Average amount of security across existing network
Use of HVDC "onshore" links	"Average"	Assumed within DC load flow model that the DC link is used proportionately with existing onshore network. Not its actual incremental use which could be more or less than this

Some words from Ofgem when shallow charging was implemented

2.11 Transmission networks are developed to comply with relevant engineering planning standards. These standards require that sufficient capacity is built to accommodate flows across the network when circuits are, as a result of faults or planned maintenance work, not available. The cost of providing additional capacity is therefore driven by the cost of providing a network secured against such faults and outages.

2.12 The DCLF used by NGC assumes that all circuits are available. It is therefore an 'unsecured' model. NGC calculate a security factor as an estimate of the average difference (in terms of additional electrical flows) between the unsecured DCLF and a secured load flow model. NGC calculate the security factor to be equal to 1.8. This could be interpreted as saying that approximately 80% more capacity needs to be provided as contingency against network faults than would be required if faults and outages did not occur.

Ofgem's decision document on charging for BETTA - December 2004

https://www.ofgem.gov.uk/sites/default/files/docs/2004/12/9096-27504.pdf

The Authority was not persuaded by the arguments that suggested that the locational tariffs derived under the January proposals would have a disproportionate effect upon individual parties located at different points on the network. In principle the Authority considers that charges which are reflective of costs (including in taking account of network security), are fair and reasonable, have an appropriate degree of transparency and stability, and which are applied in a non-discriminatory manner, would be expected to be proportionate and consistent with the relevant European law, including the requirements of the IMED and the Renewables Directive.

March 2005 final decision

https://www.ofgem.gov.uk/sites/default/files/docs/2005/03/10033-8005_0.pdf

Page 39

Summary

1. Therefore, by design the methodology takes account of new and existing network
2. Full marginal or incremental approach would be deep connection, creates issues with fairness
3. Averaging approach is consistent with the averaging needed to promote fairness
4. It also provides incentives to efficiently reuse existing network, by reflecting the costs of building that network. Very important with current CP30 world, effecting a major change of generation mix on the network and seeking to use existing network efficiently too.
5. Inefficient use of existing network will result in unnecessary additional new investment being needed too, or inefficient constraint costs being incurred.
6. The ICRP model assumes that you have to upgrade the redundancy too, as the network is exactly sized to what you need. In reality, you may need to build another circuit to provide redundancy, reinforce existing circuits or may not need to do anything
7. If average amount of security provided on the network reduces, then the LSF reduces to reflect this

Any Other Business

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Next Steps

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