CUSC Modification Proposal CMP432

Improve "Locational Onshore Security Factor” for TNUoS Wider Tariffs

WG2

5th February 2025

Two parts of TNUoS long-run incremental price signal

What makes a useful price signal

- **Should reflect**: A useful and cost reflective price signal given to individual users should reflect the incremental cost caused by individual user decisions if they can usefully respond to those price signals.
- **Should not reflect**: By contrast, price signals should not reflect cost that are not caused by individual user decisions. E.g.
  - Costs caused by a collective group of users, where individual user decisions cannot control the behaviour of the group, such as where locational generation and network are determined by strategic planning,
  - Costs caused by future users,
  - Snk costs already incurred.

Two parts to the current Wider TNUoS price signal

1) Incremental flows: Long-run incremental network cost caused/avoided to accommodate incremental flows

- ICRP DCLF uses incremental flow based expansion of average existing network as a proxy for incremental network investment.
- Method: Modelled in MWkm, converted to cost via Expansion Constant and Expansion Factors

2) Incremental security: Long-run incremental network cost caused/avoided to provide incremental security

- Method: This is the purpose of the Security Factor
- Defect: Currently the Security Factor wrongly reflects average existing security when it should instead reflect long-run incremental security

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

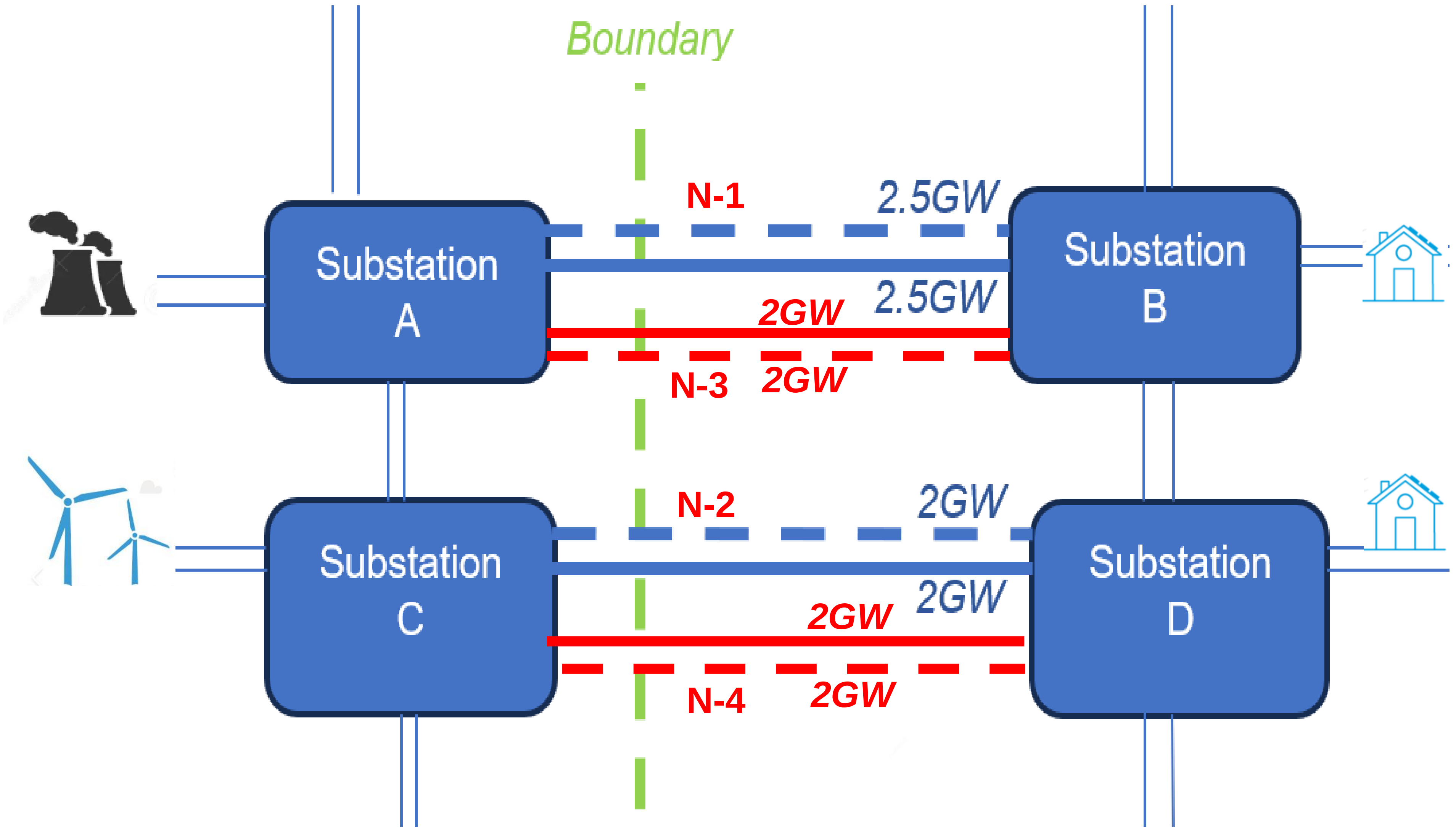
CUSC Full paragraph for context

“*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.*

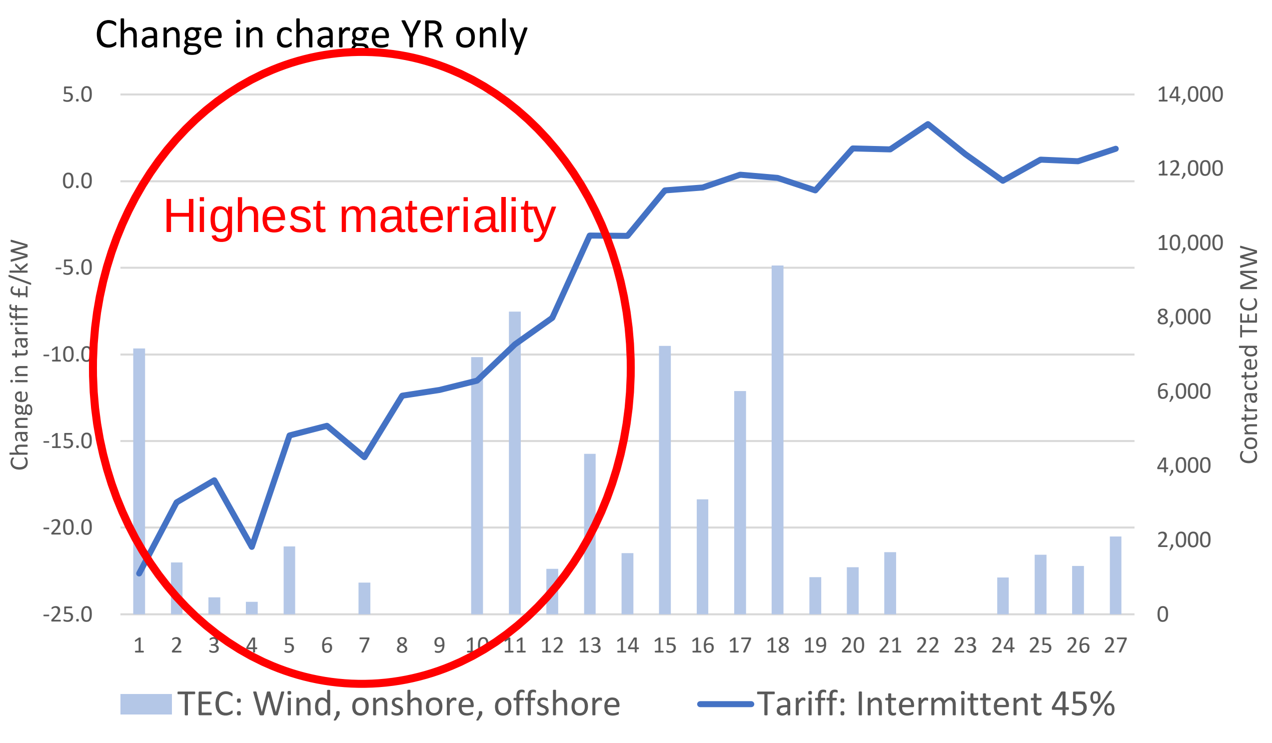
The ESO Licence requires The Company to operate the National Electricity Transmission System to specified standards. In addition The Company and transmission licensees are required to plan and develop the National Electricity Transmission System to meet these standards. These requirements mean that the 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.”

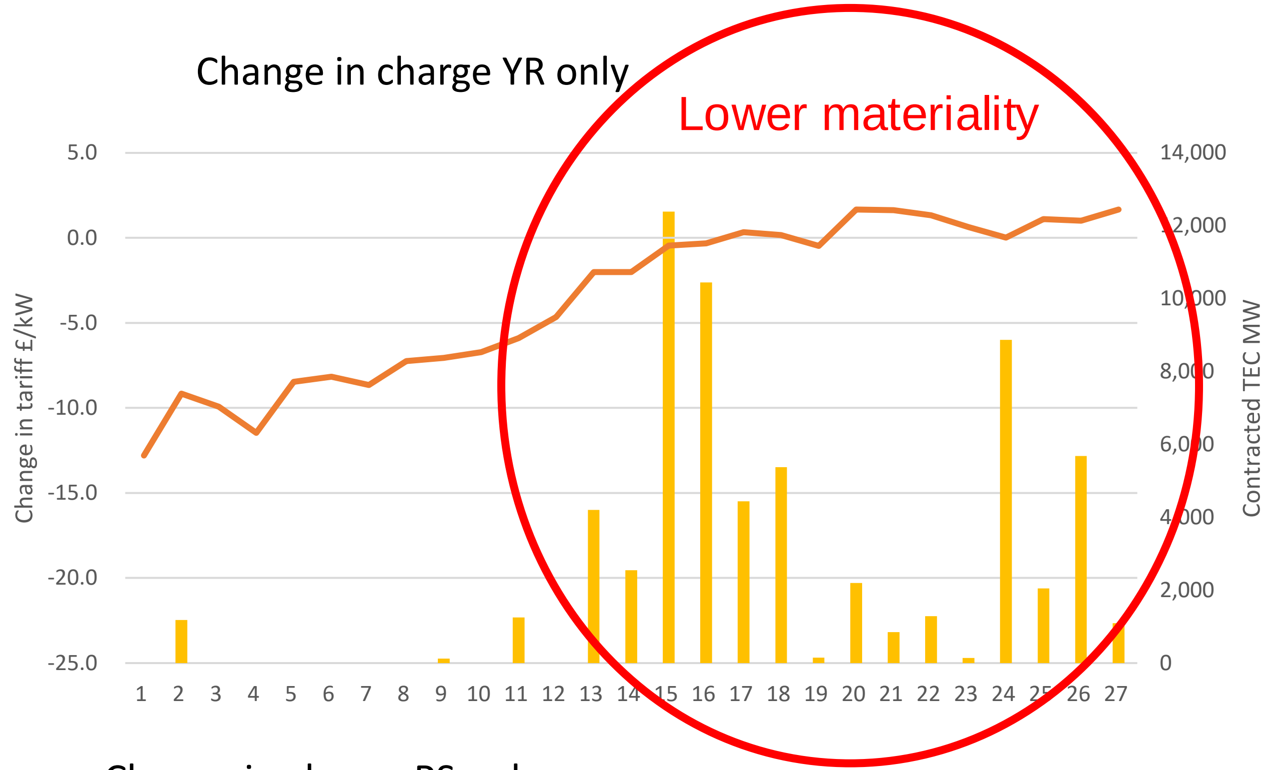
(CUSC 14.14.6 – underlying rationale behind TNUoS Charges)

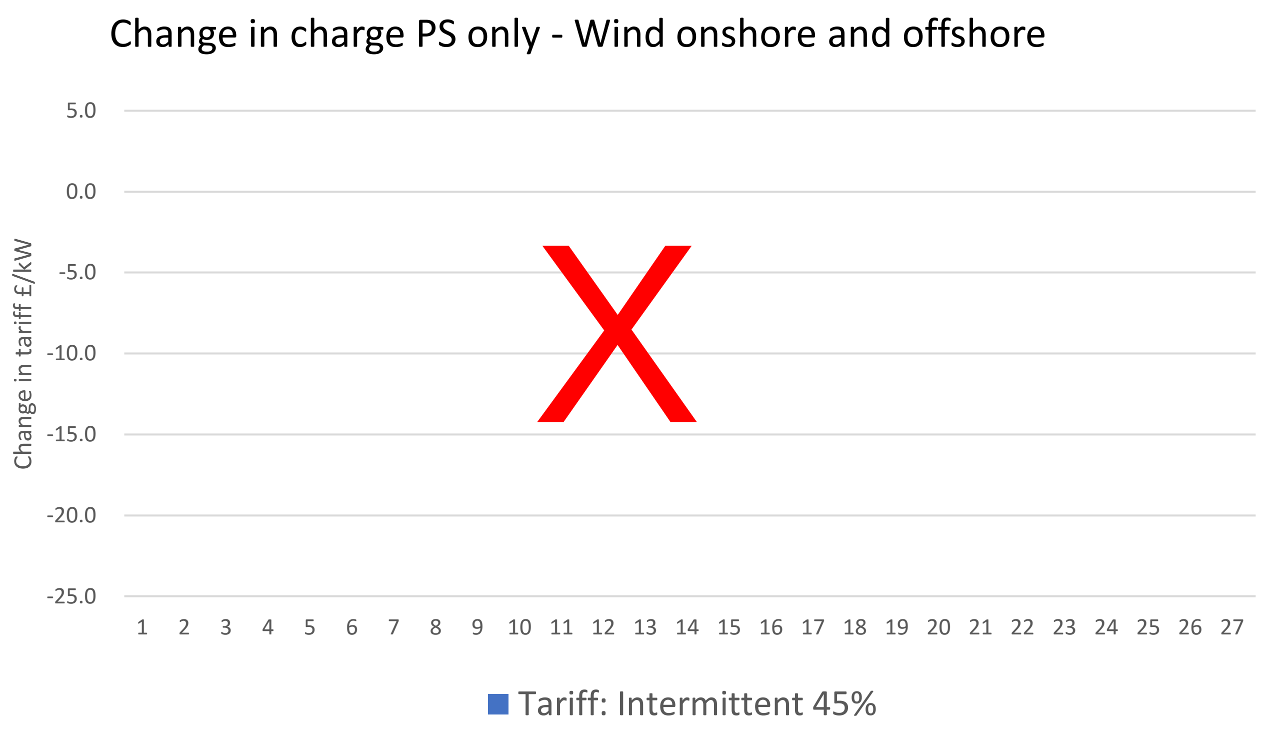
Illustrating how charging wrongly implies N-1,2,3,4… - New build circuit example

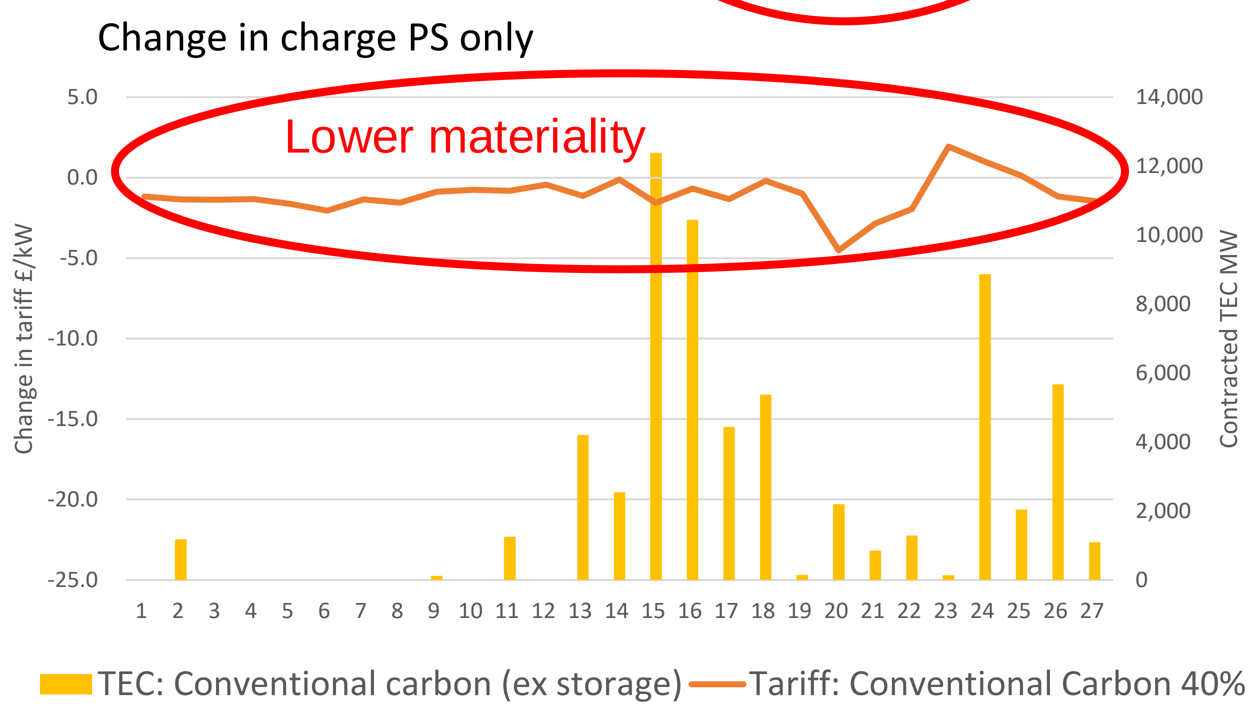


Materiality highest: Year Round for Northern Intermittent









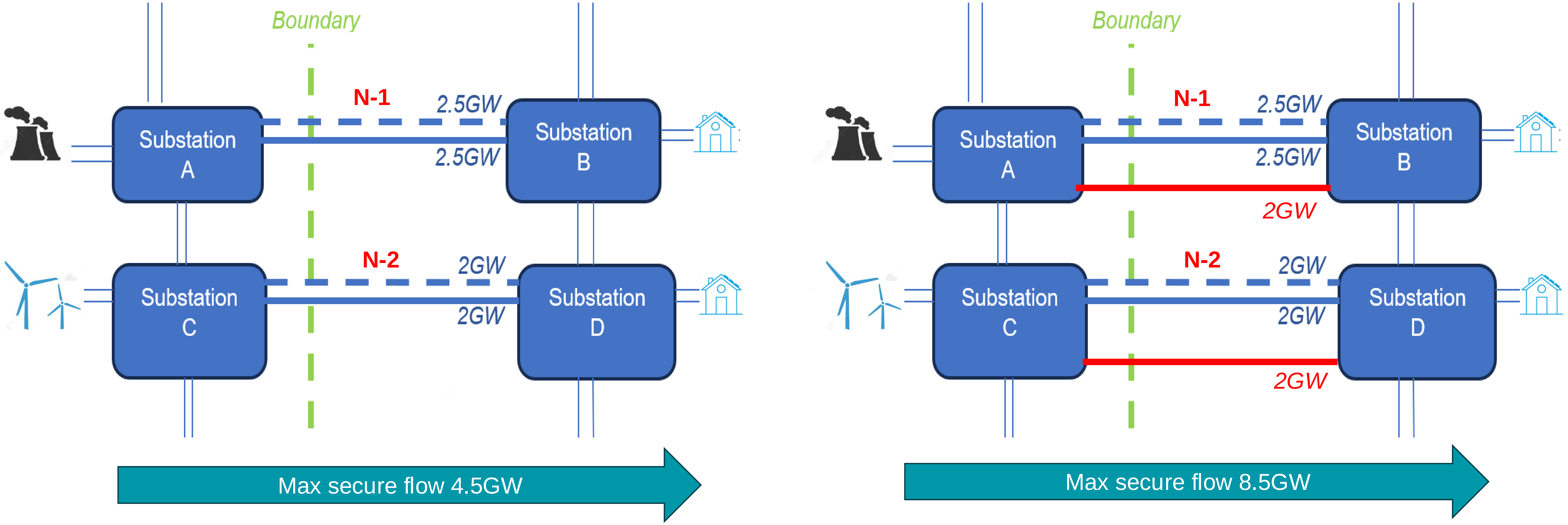
Conclusion: If Conventional Carbon, and/or Peak Security are different for security, then treat them differently

Understand different examples

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: ??

Illustrating expansion with new without changing fault condition

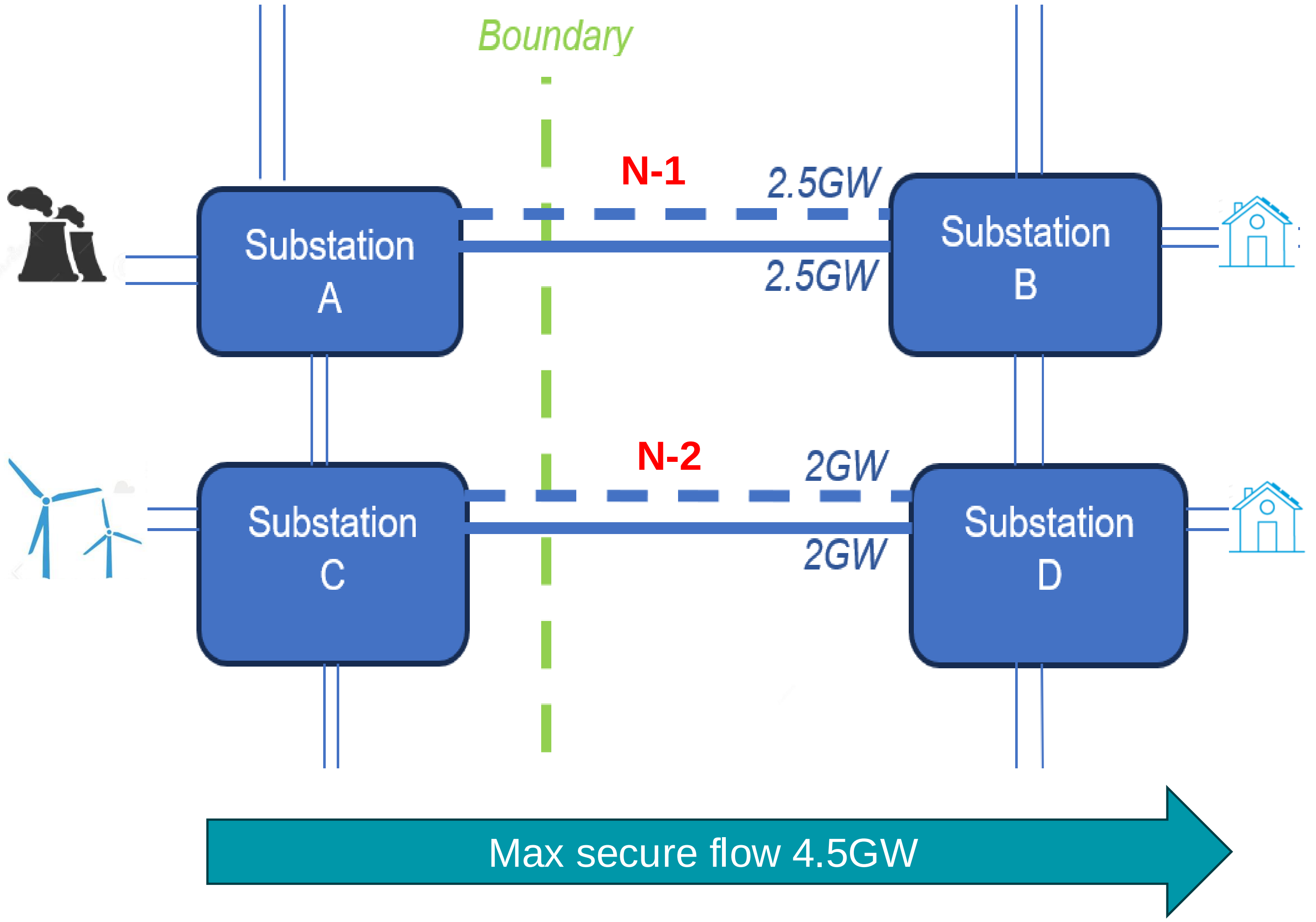


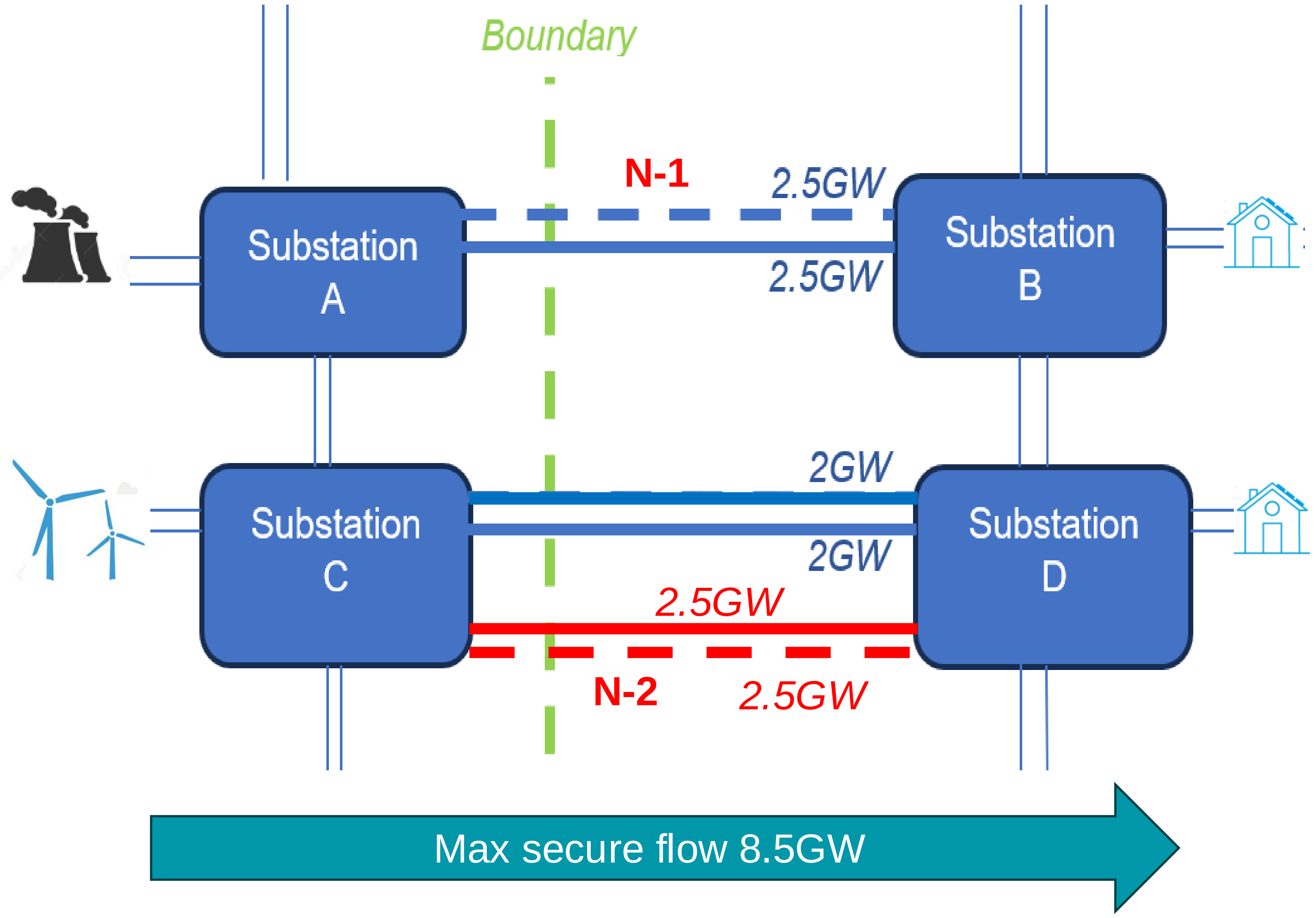
- Add 4GW of transfer capability by building new two 2GW circuit
- Security condition is unchanged

- Implied Security Factor 4/4 = 1.00

sse

Illustrating expansion with new with increasing fault condition

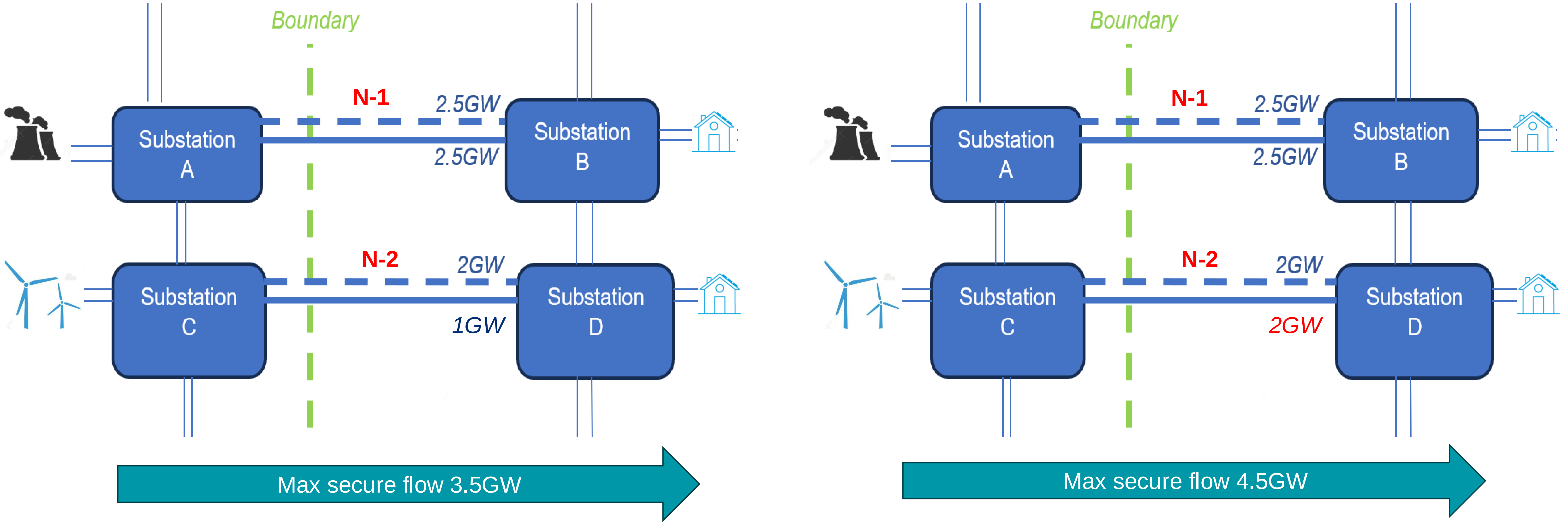




- Add 4GW of transfer capability by building 5GW at 2 x 2.5GW
- Security condition is increased from 2.5+2 to 2.5+2.5

- 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 <u>without</u> changing fault condition

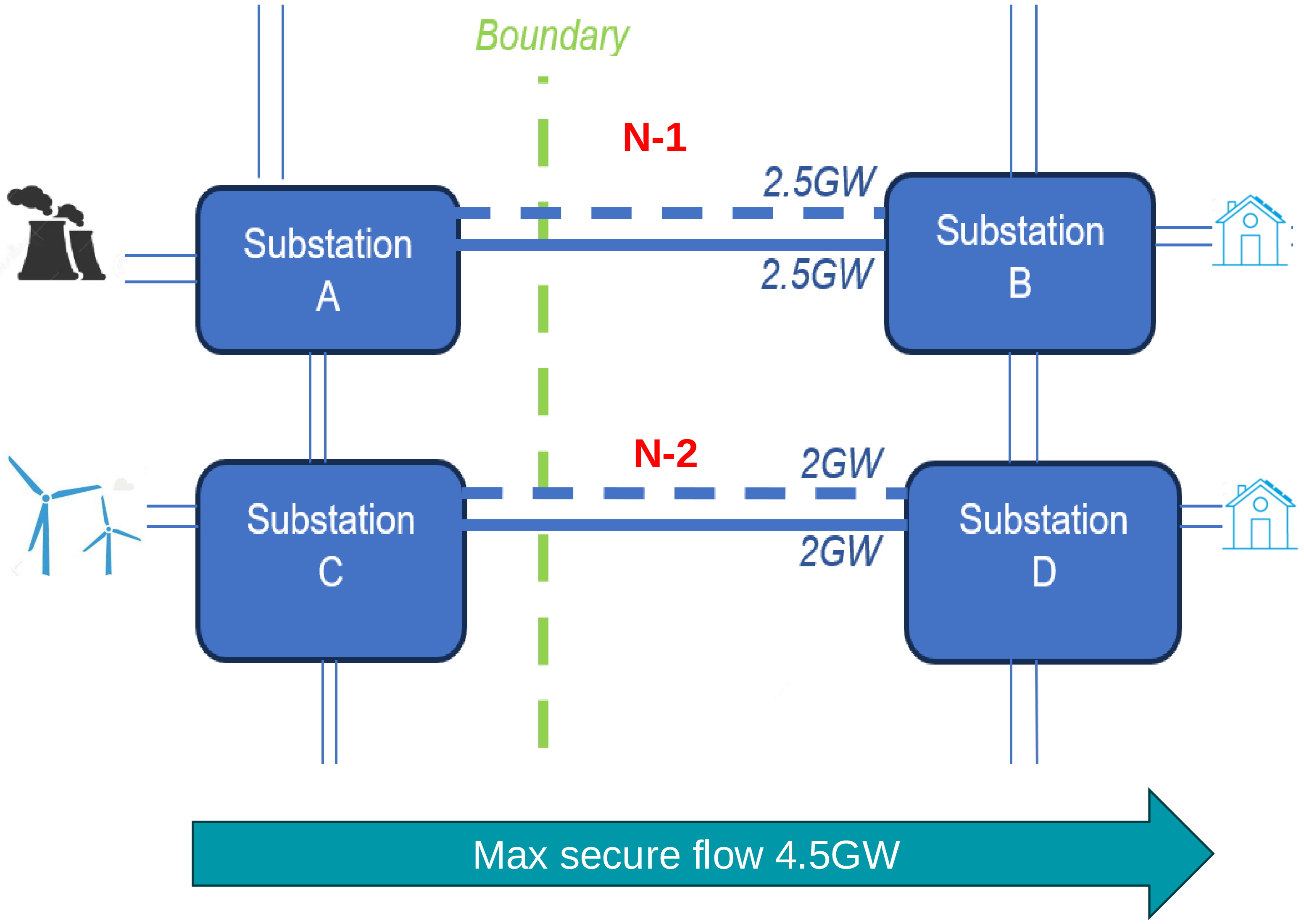


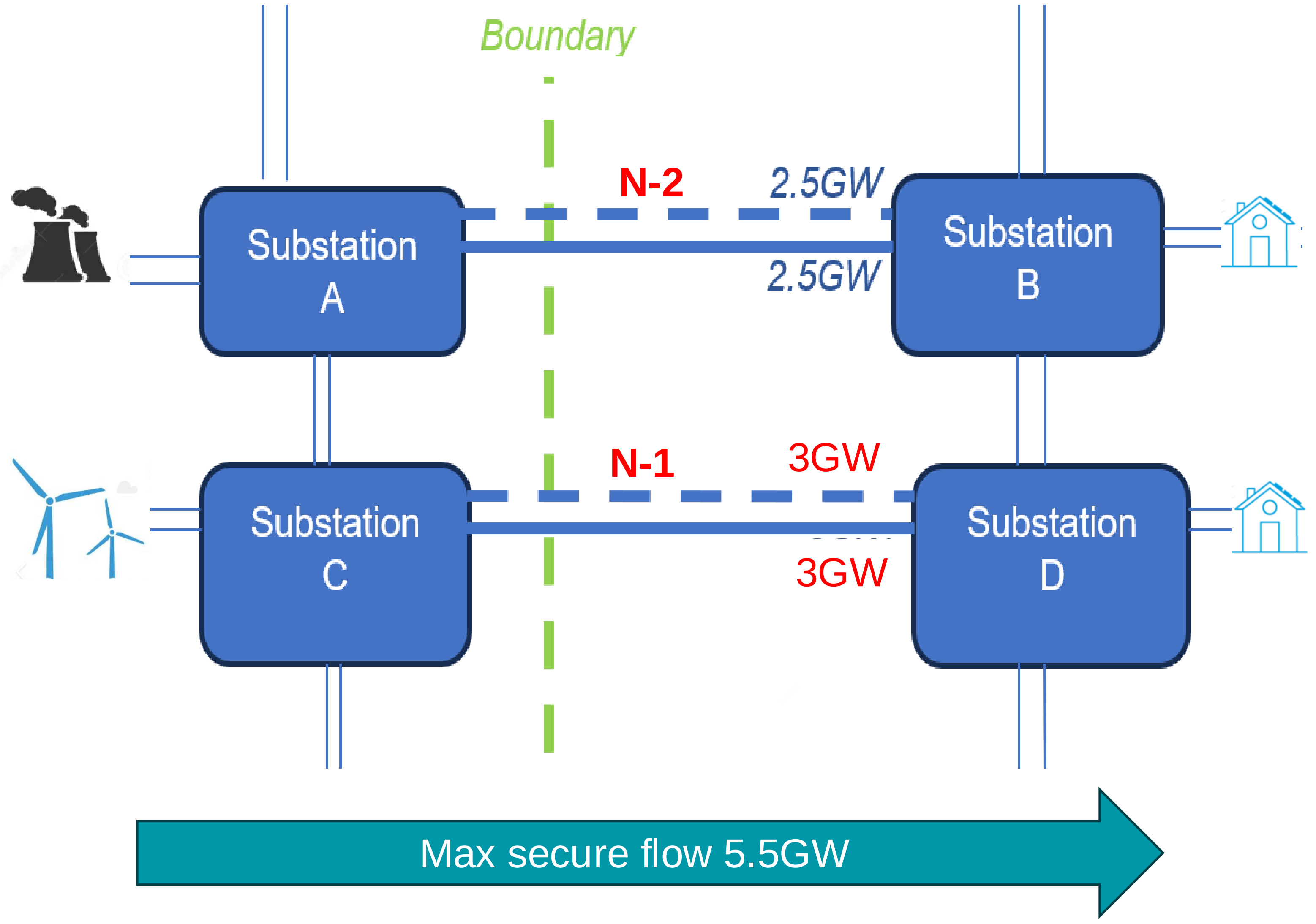
- Add 1GW of transfer capability by upgrading a 1GW circuit to a 2GW circuit
- Security condition is unchanged

- Implied Security Factor 1/1 = 1.00

sse

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

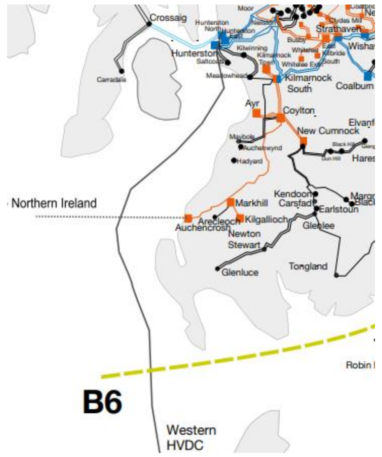




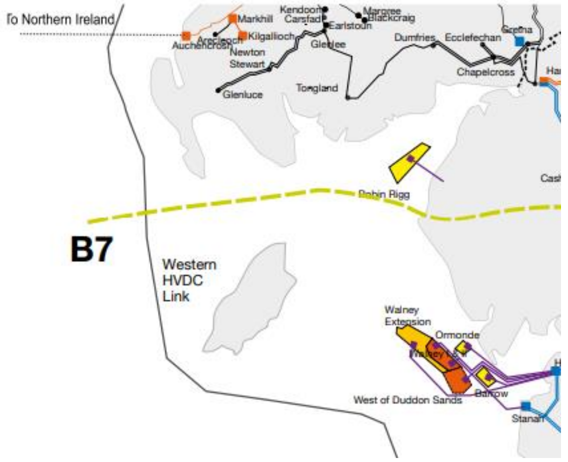
- Add 1GW of transfer capability by upgrading two 2GW circuits to a 3GW circuit
- Security condition is increased

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

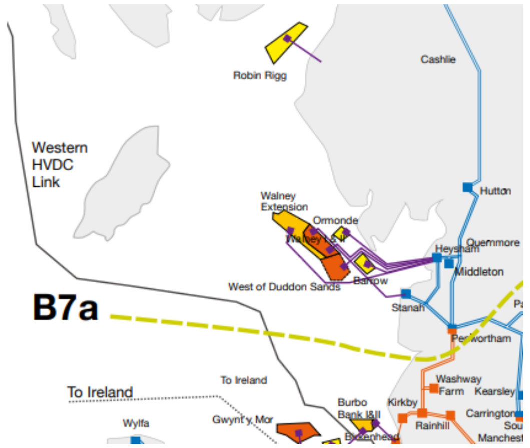
West Coast Bootstrap Example



- **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

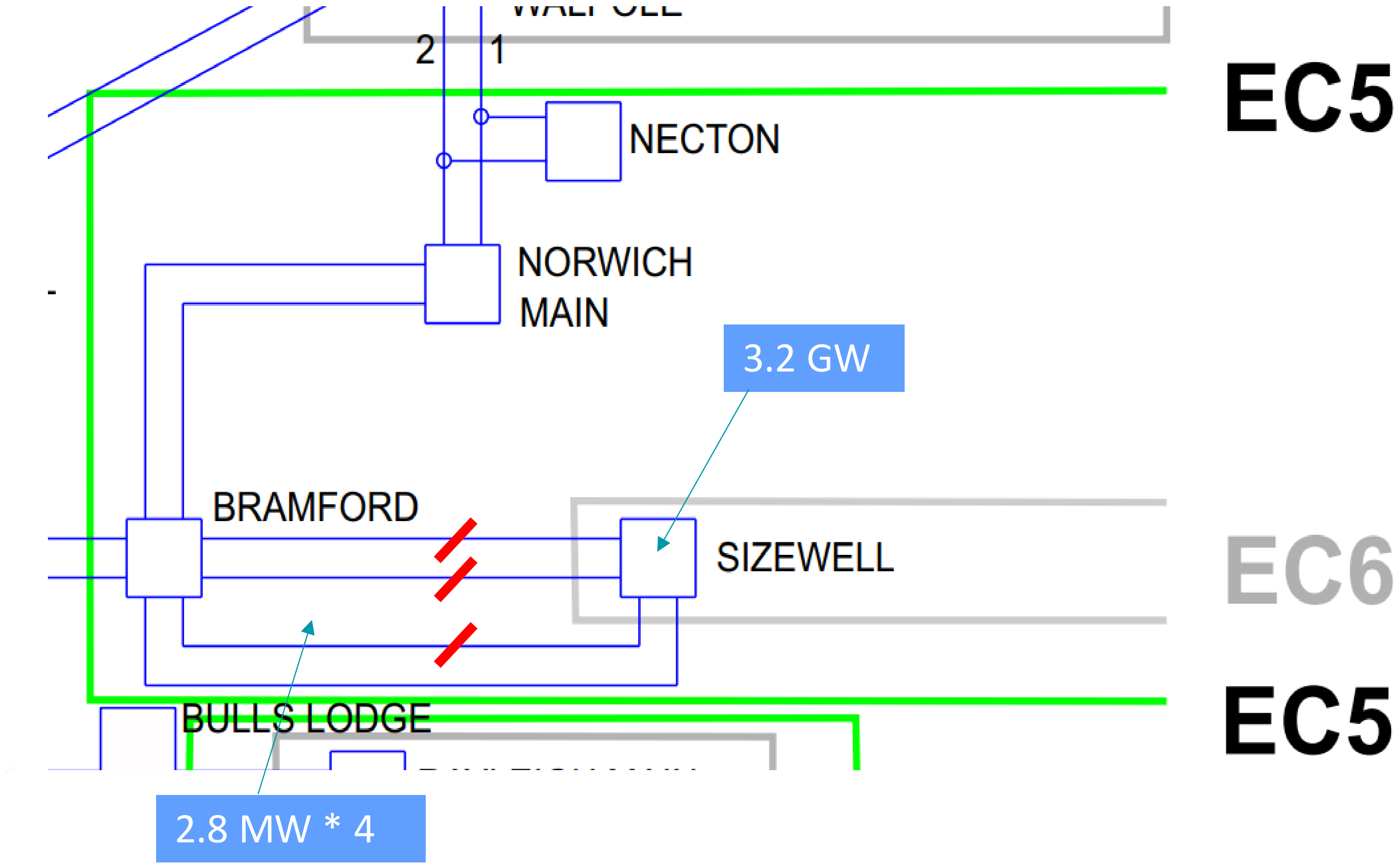
1 https://www.neso.energy/document/102616/download

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.

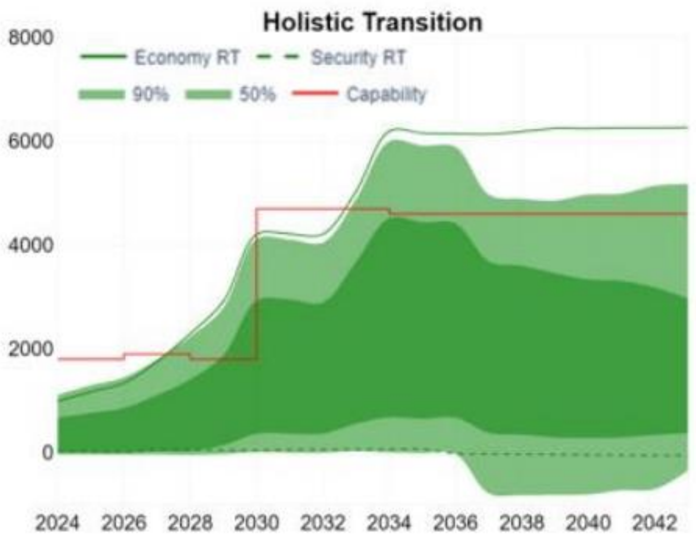
Fault Condition	Local circuit capacity (GW)	Sizewell capacity (GW)	Compliant
2 circuits (intact)	5.6	3.2	Y
n-1	2.8	3.2	N (loss of infeed)
n-2	0	3.2	N (loss of infeed)
n-D	0	3.2	N (loss of infeed)
3 circuits (intact)	8.4	3.2	Y
n-1	5.6	3.2	Y
n-2	2.8	3.2	N (loss of infeed>)
n-D	2.8	3.2	N (loss of infeed)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

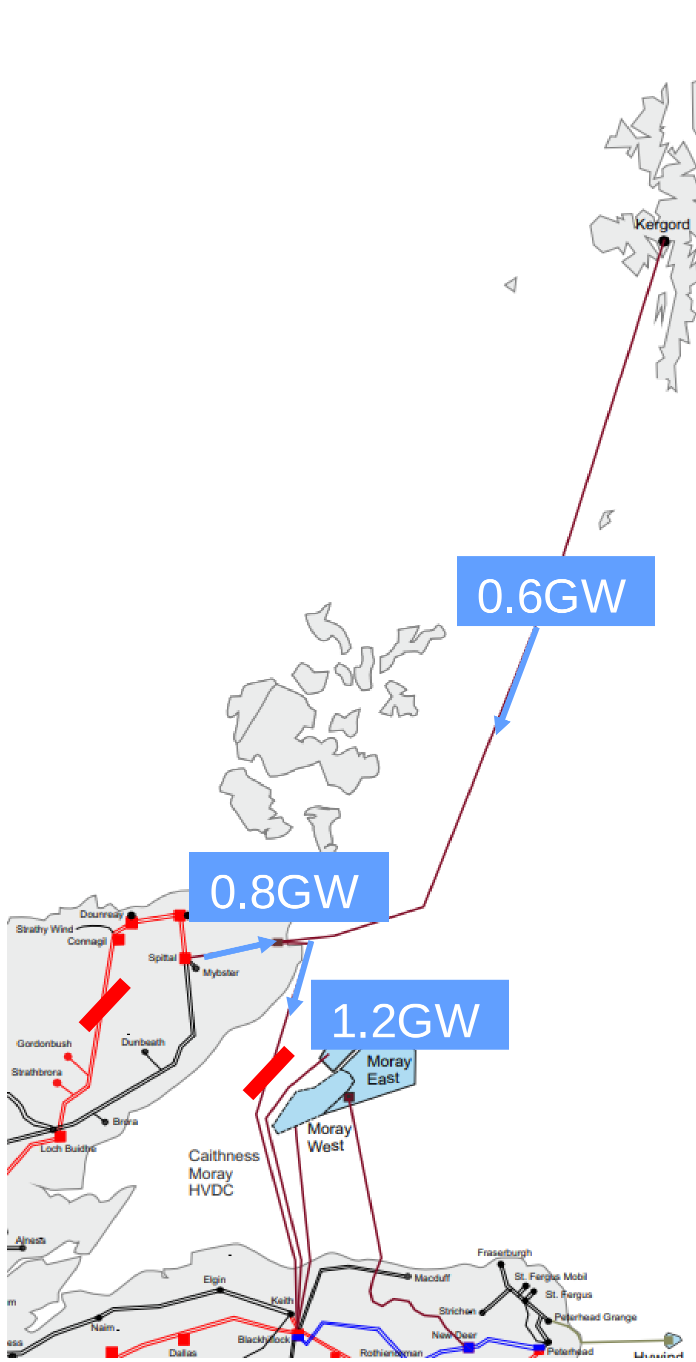


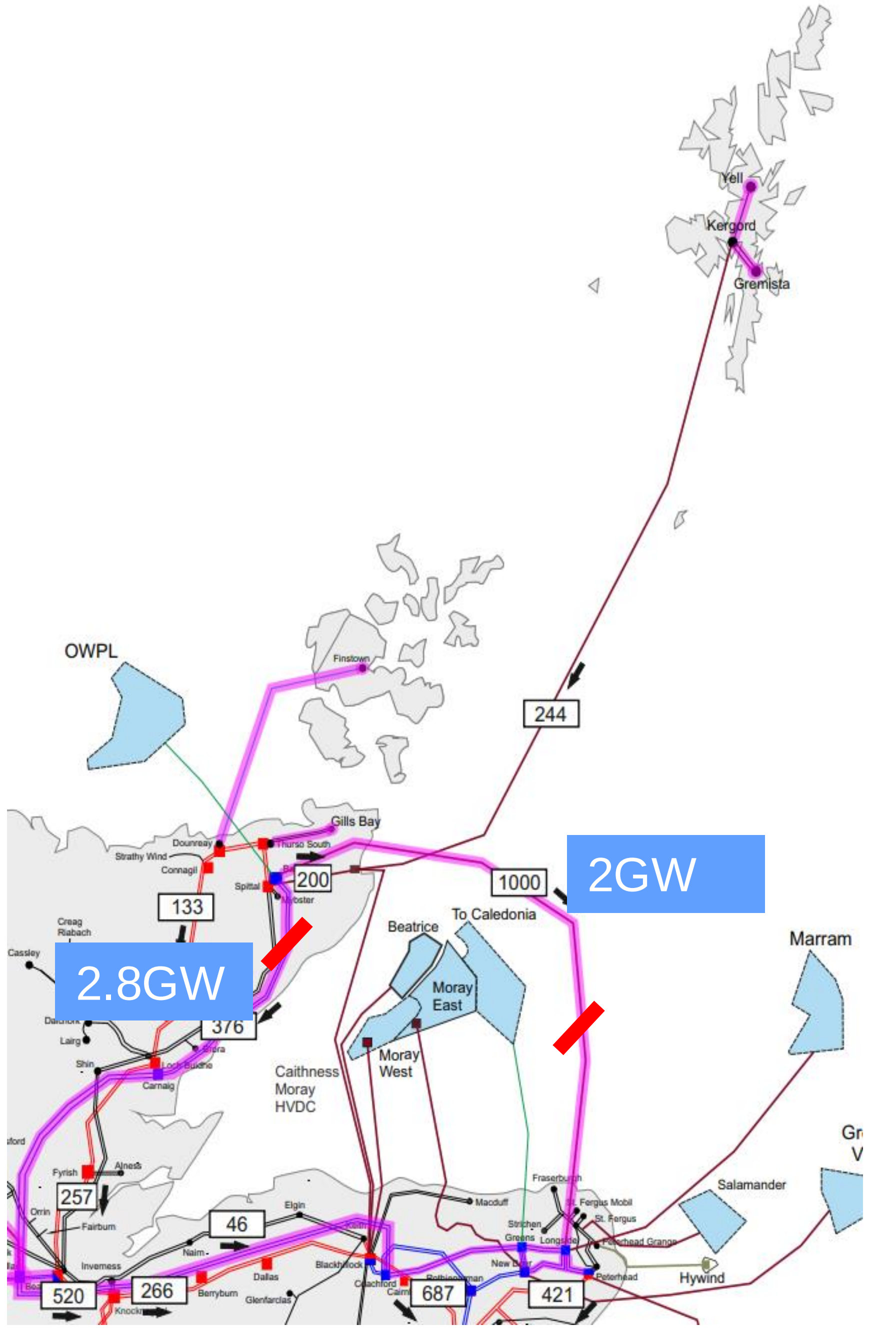
- Triggers connecting substation as a MITS node due to 4 generation circuits + GSP to Leiston.
- This happens when G capacity is
  - > infrequent loss of infeed (1.8GW) AND
  - > single circuit capacity
- If G capacity < infrequent loss of infeed then could possibly tolerate loss and could have single/double 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?

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