CMP432

Views on why current Locational Security Factor calculation may be appropriate

Principles

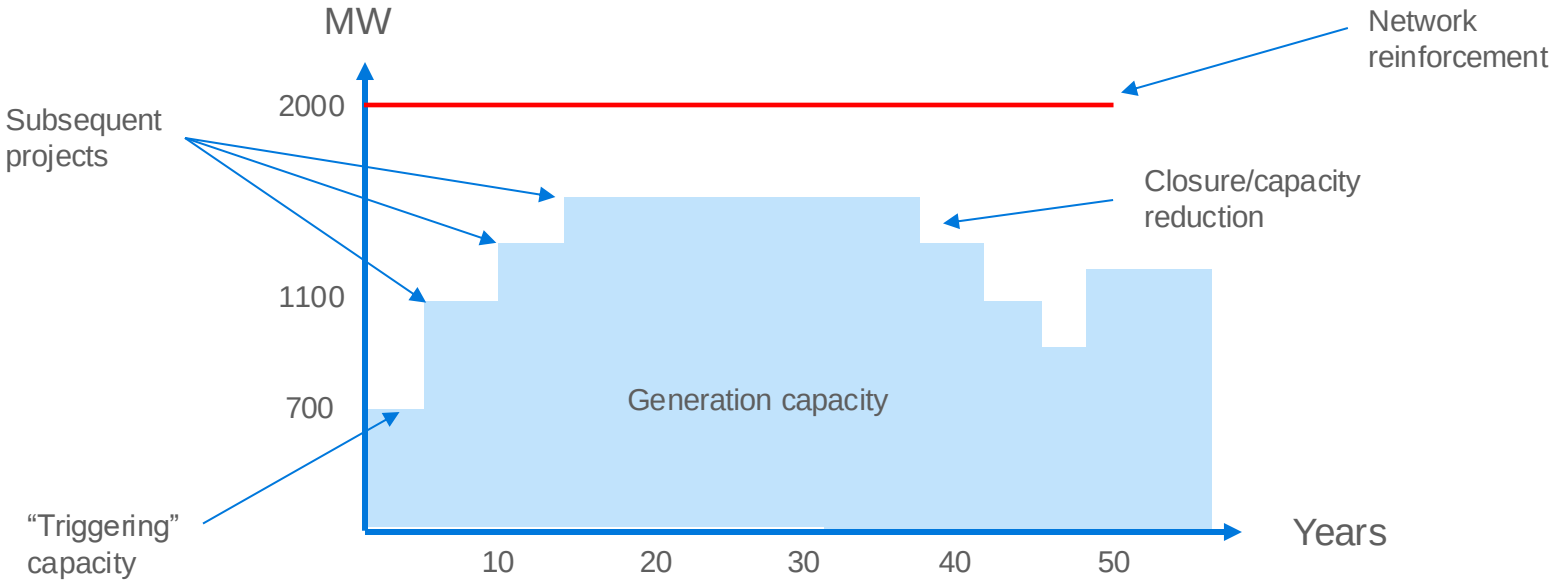
- “14.14.6 The underlying rationale behind Transmission Network Use of System charges is that efficient economic signals are provided to Users when services are priced to reflect the incremental costs of supplying them. Therefore, charges should reflect the impact that Users of the transmission system 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

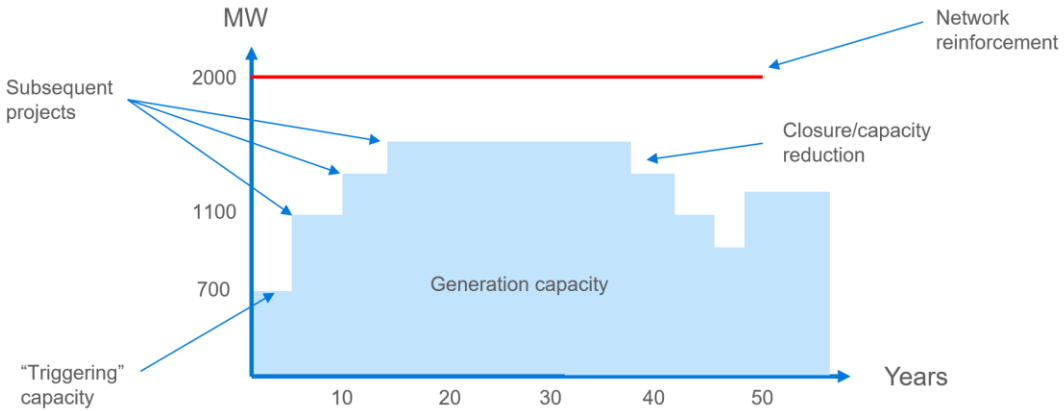
- ICRP is not a full marginal approach to pricing
- A full marginal approach would be deep connection charging
- It would charge those projects that triggered investment the cost of that investment, even if that investment was much larger in size than strictly required for the projects alone
- It would 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

Comparing deep and shallow charging



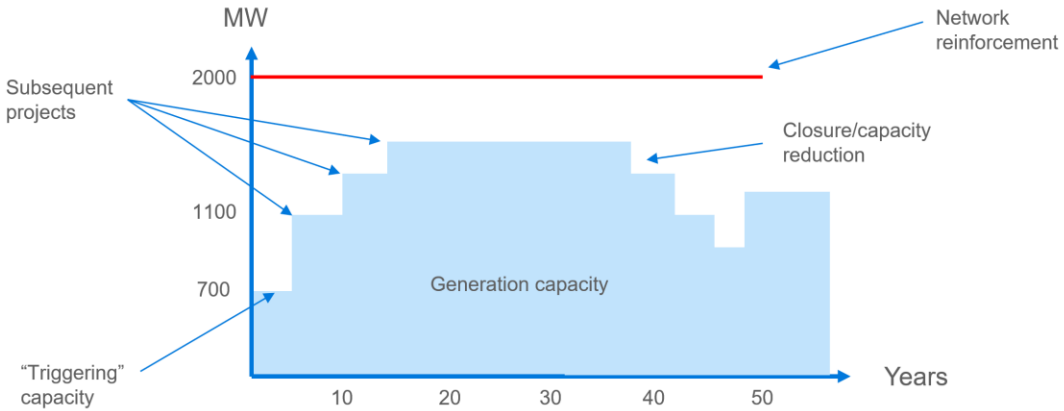
Deep charge

- 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

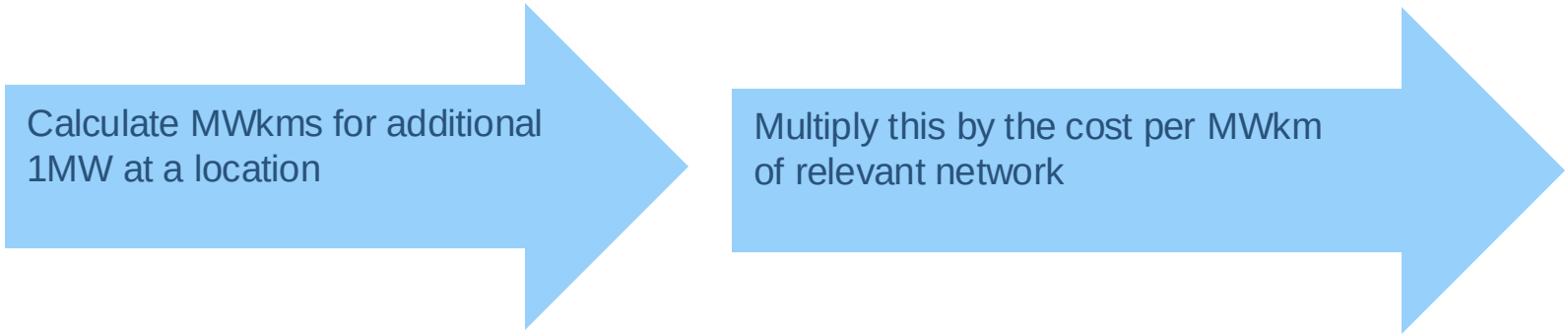
- Triggering capacity pays for only its share of the Network Reinforcement
- Costs are spread over the capacity and assumed life of the network asset, and charged per MW per year
- Subsequent projects pay the same apportioned charge per MW per year



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

ICRP high level process to calculate the locational signal



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

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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