Thoughts on whether or not to incorporate different investment techniques and assets types into the calculation of the Expansion Constant and Expansion Factors, and how to do so

The following are some thoughts and perspectives from Uniper on how to incorporate different network investment techniques and assets into the calculations for the Expansion Constant and Expansion Factors.

The order of calculation of the Expansion Constant should be changed

At present, the Expansion Constant is calculated with the following main steps:

- The cost of projects over the last 10 years of expanding the network at 400kV OHL are used to calculate a cost per MWkm.
- These costs are averaged, weighted by the length of the assets concerned.
- This average cost is converted to an annual cost by annuitising over 50 years

However, if different investment options are to be included into the calculation, it would appear to be sensible to change the order of the calculation. This is because the different projects will have different life durations, so should be annuitised over different lengths of time. Therefore, it would appear sensible to calculate the £/MWkm per project per annum by carrying out the annuitisation, before then obtaining an average figure overall across the projects concerned.

How should life extensions and circuit upgrades be reflected in the Expansion Constants and Factors?

Annex 3 of the consultation document shows a worked example from the proposer of CMP315 of how an investment, to create additional capacity on a line through reconductoring, could be treated in the calculation of the expansion constant. Figure 1 below aims to illustrate the example diagrammatically.

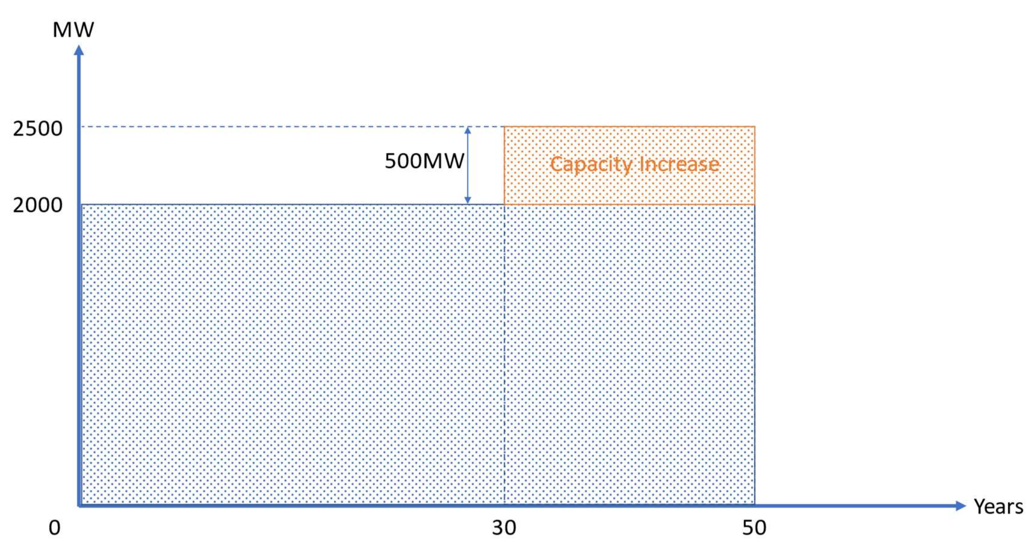


Figure 1

The proposer expresses a view that it would be incorrect to simply look at the reconductoring cost and use that in the calculation of the expansion constant (or factors where applicable). We agree, as the ability to reconductor the lines only exists if there are towers to carry those conductors.

The blue rectangle shows the initial investment in building the overhead line which created 2GW of capacity with an assumed life of 50 years. Subsequent reconductoring work is assumed to create an additional 500MW of capacity in year 30 of the asset's life. One way to assess the cost per MWkm of this additional investment would be to assume that it creates an additional 500MW for 20 years. However, this would seem to be incorrect as mentioned above as it would disregard any investment needed to get you to the point where the upgrade was possible. It would certainly not be correct to assume that the upgrade creates 2500MW for 20 years, as 2000MW of that capacity was already created by the previous investment 30 years previously.

We would propose calculating the annuitised costs of the new capacity of 500MW and the original 2000MW capacity (A and B in figure 2 below) and then calculate the weighted average based on the relative capacities (in this example weighting in the ratio 500:2000 or 1:4). If the original investment cost is not available, the cost per MWkm could be calculated using values for other similar investments undertaken where costs were available (such as from a previous Expansion Factor calculation).

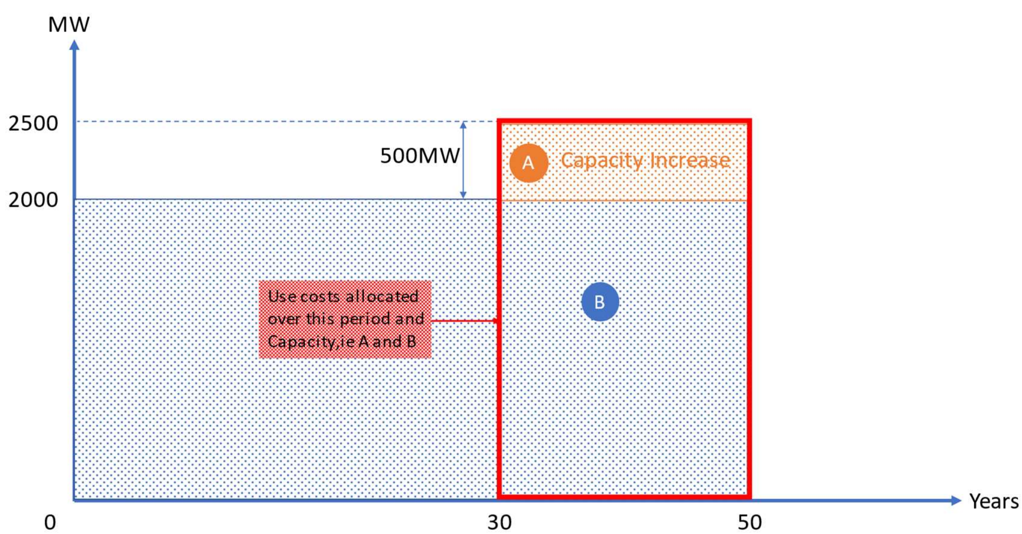


Figure 2

A similar calculation could be carried out for life extensions. Figure 3 below illustrates a life extension of 20 years. In this instance, a similar calculation to that undertaken in respect of figure 2 above could be undertaken using the annuitised costs the original lifespan for the 2000MW capacity and of the new additional lifespan of 20 years (B and C in figure 3 below). These could be averaged, weighted by the number of years in each of B and C which represent the years of asset life since the new investment is made (in this instance 20 years in each).

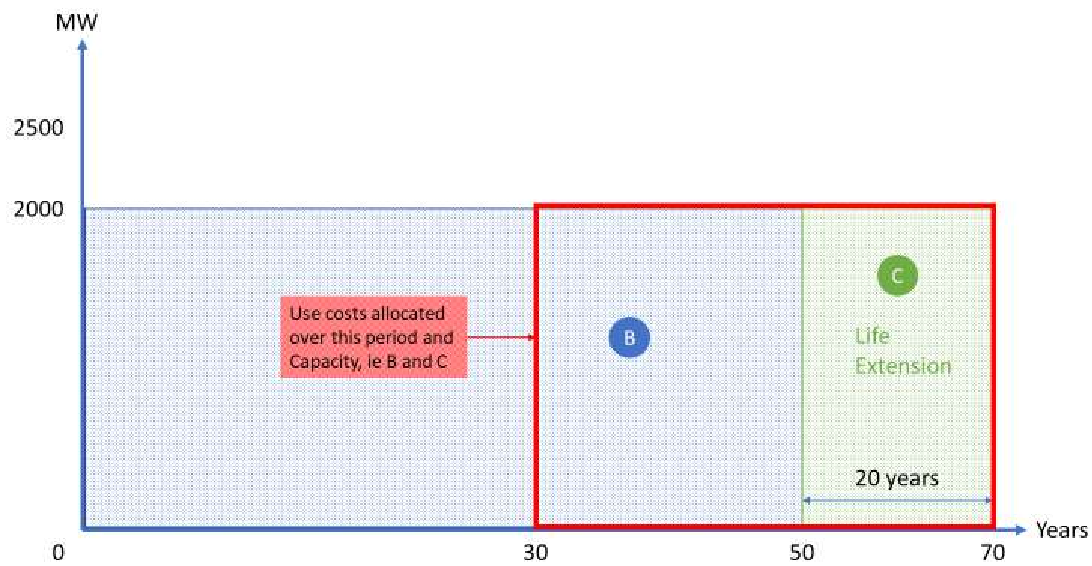


Figure 3

This approach could also be used to accommodate investments which provide both increased capacity and extended life for circuits. Figure 4 below shows an example of this.

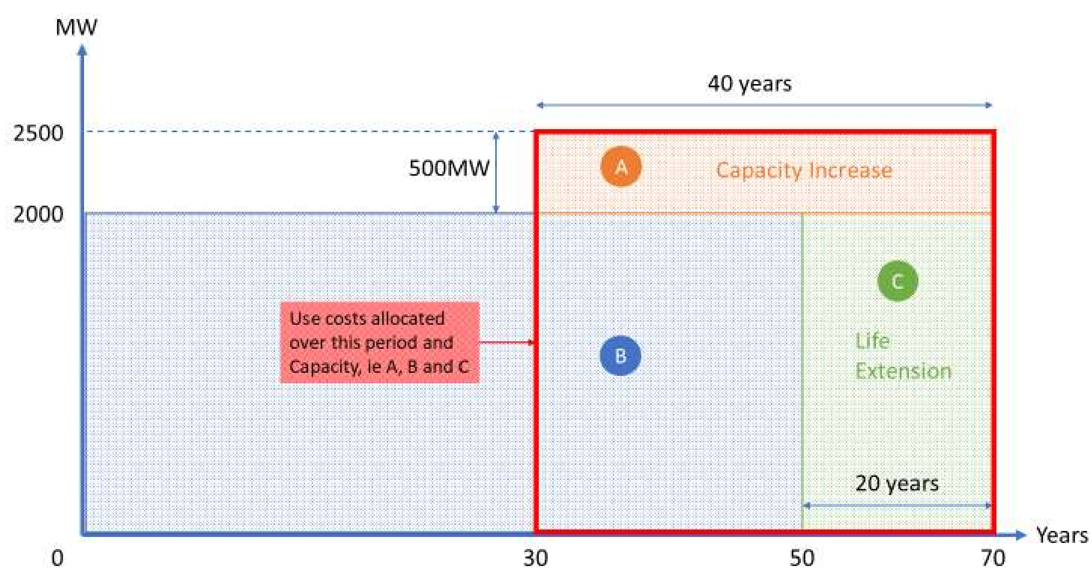


Figure 4

In this instance the investment has created additional capacity (A) and a life extension of existing capacity (C). If it is not possible to allocate specific costs between the two categories, then the cost of the investment could be spilt between each based on the number of MW years that are created in each. In this example, A has 20,000 MW years (500MW x 40 years) and C has 40,000 MW years

(2000MW x 20 years). Therefore, the costs could be split in the proportions 1:2. Once the annuitised £/MWkms are calculated for each of A, B and C, then these could be weighted to find an average. In this instance it may be sensible to weight by MW years again. So, in the above example it would be weighted in the proportions 20,000:40,000:40,000 or 1:2:2.

Should spare capacity be included in the Expansion Constants and Factors?

When considering what costs should be included in the calculation of the Expansion Constant and Expansion Factors, it is important to consider what the ICRP model and the present charging methodology aims to achieve. The methodology seeks to implement a very shallow approach to charging, in contrast to a deep connection charging regime. This was introduced in 2004 through the connection and use of system change proposals CCM-M-07 and UoSCM-M-10 respectively. Prior to these modifications, the charging boundary was less shallow with new connecting parties paying fully for network assets near to the connection, including any reinforcements required.

In a deep charging regime, if a customer connects to the network and reinforcements need to be made to the network accommodate them, then they are exposed to the full cost of those works. In reality, the nature of network build means that it is likely that a customer would trigger a larger level of works than is strictly necessary to accommodate them alone, as the network is typically built in larger "chunks" than the capacity seeking to connect to it. In a deep connection regime this full marginal cost would be levied on this connecting customer. This chunky investment creates spare capacity for future connecting parties who, as the reinforcement has already been paid for under a deep charging regime, would not be exposed to any cost unless arrangements are put in place to ensure they recompense the previous customer. Therefore, in a deep connection charging regime there is the possibility for unlucky connecting parties to cross subsidise luckier later connecting parties. The potential large costs can also act as a barrier in themselves.

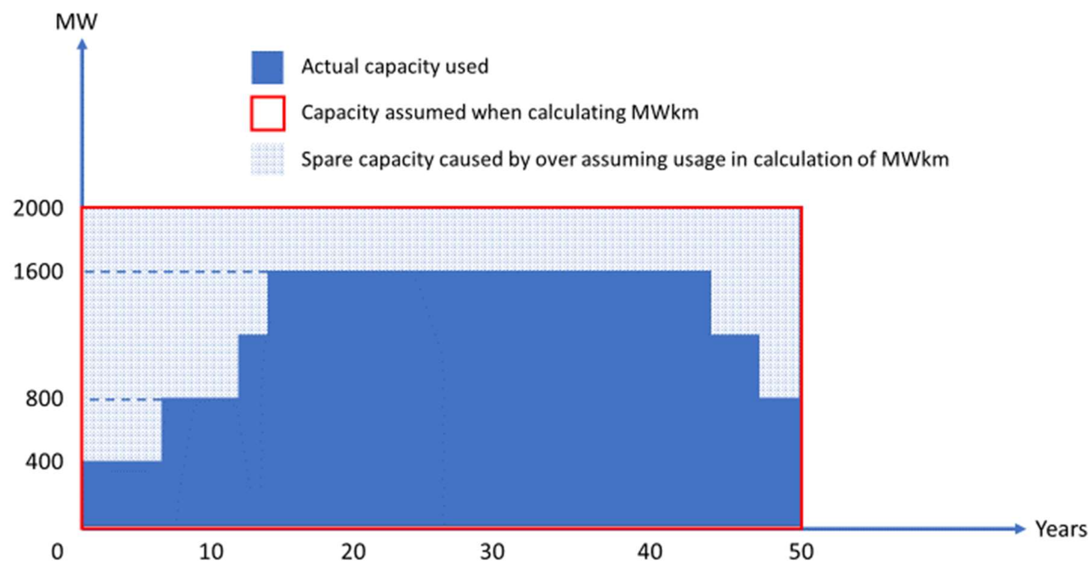
The very shallow charging regime used for transmission at present deliberately attempts to avoid this issue. It essentially replaces deeper charges with very shallow connection charges and use of system charges with locational signals that seek to reflect the impact of connecting in a certain location. It works on the assumption that an increase in use of the network of 1MW at a location can be exactly accommodated by the network by a corresponding marginal increase in capacity in the network. Therefore, if in reality a chunky investment is made in the network, the ICRP methodology ignores this. However, similarly it does not assume that there is spare capacity in the network either. Therefore, the "lucky" and "unlucky" connecting parties that would exist under a deeper charging regime are treated the same under the very shallow regime, by only charging parties their fair share of reinforcement costs.

Similarly, the costs of these marginal investments are averaged over the length of the asset's life. This recognises that subsequent connecting users, or those which use the network after other initial users have disconnected, also benefit from the initial investments made in the system. This reflects the fact that network investments often last longer than the generation and other assets that connect to use the system.

Therefore, given that the calculation of the Expansion Constants deliberately aims to spread the cost of assets over the full capacity and lifetime of the assets, the existence of spare capacity occurs when this assumption has been overoptimistic, as the capacity has not been used for the full capacity and/or time period. That is, the cost per MWkm of usage has been underestimated. If this spare capacity is then used to dilute the calculation of the cost per MWkm of a future Expansion

Factor or Constant, there is a further underestimate of the cost impact. The spare capacity distortion is further compounded.

This is illustrated below in the diagram relating to the example in appendix 3 of the consultation.



The diagram illustrates an example where the line is built and then over time is used more and less depending on how new and existing user capacity joins and leaves the network. In a deep connection world, the 400MW of capacity which triggered the line would be charged its full cost, essentially allocating 5MW of network capacity for 1MW of user capacity. However, the methodology calculates the cost based on a 1:1 relationship between user and network capacity by assuming that the full 2000MW is used for the whole 50 years (by smearing the cost across the whole of the area of the red rectangle).

It therefore underestimates the impact that 1MW of connecting user capacity has in terms of the cost of network. This underestimate is reduced as more capacity utilises the network. The spare capacity that exists at any time (ie the gap between the red line and the dark blue area above) simply represents the extent to which this assumption is incorrect. However, it has already been included in the calculation of the original Expansion Constant when the investment was made. It therefore should not be used again to further dilute future Expansion Constant and/or Expansion Factor calculations.

The final point in this respect is about consistency. The suggestion that reusing capacity freed up by a decommissioning user of capacity, such as repowering an existing generation connection, should be seen as somehow reducing the cost of the network seems inconsistent with how that connection would have been treated prior to its being repowered. For instance, if a generator decides to keep its power station open for another year then its capacity is not deemed as being reused for the purposes of the methodology. It's not clear why this would change simply because for instance 100MW of gas capacity is replaced by a new 100MW hydrogen peaking plant? The capacity being used by a different User should not trigger a further dilution of the Expansion Factor.

How should the cost of substations be factored into the network model and Expansion Factors

We agree with the proposers of CMP315 and CMP375 that substations should be treated as proxy circuits in the transport model and with a specific Expansion Factor to convert these costs into £/MWkm. This will allow the substations to be modelled more accurately as they can be specifically included where they occur in the system. The alternative, where the costs of substations are allocated to the cost of circuits themselves would create an average effect across all circuits regardless of whether or not they contain substations.

Other non-circuit build costs

The case for other initiatives to be included in the costs of the network has yet to be proven as far as we are concerned. For instance, interruptible rights or intertrips may provide an alternative approach to network reinforcement, but they should not be used in the calculation of the Expansion Factor. There is an argument for parties with such interruptible access rights to receive a discount to reflect the lower security provided to that specific user, but not for this to be reflected in the cost calculation for all users.

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