# Weighting: km or MW.km

The current CUSC methodology calculates the average cost of a MW.km of a circuit (be it overhead line or cable and 400kV, 275 kV or 132 kV) based on the length of the new build. Is it correct to use the length of the circuit, rather then the rating of the circuit?

Given that the tariff calculations are based on the MW.km of circuits, not simply the length (km) of new circuit build, it appears more appropriate to weight the average calculation based on the MW.km of length.

Based simple on the example data (*not* real TO data) it does not appear that this difference is particularly numerically important:

|  |  |  |  |
| --- | --- | --- | --- |
| Length (km) | Capital Cost (£) | Circuit Capacity (MW) | Cost per MW.km |
| 10 | 5,000,000 | 2000 | 250 |
| 20 | 11,000,000 | 2500 | 220 |
| 15 | 8,625,000 | 2700 | 213 |
| 75 | 52,500,000 | 3120 | 224 |

The resulting average values are:

|  |  |
| --- | --- |
| Length Weighted (GBP/MW.km) | MW.km weighted (GBP/MW.km) |
| 224.3 | 223.9 |

So the difference may be more important in principle than in practice (subject to real TO data).

If we adopted a MW.km averaging, and we include circuit uprating, we need to decide if the MW.km number is based on the total capacity of the circuit, or the incremental capacity of the circuit.

# Is the size of the dataset big enough for stable pricing?

Regardless of the validity of the method (CMP 315, CMP 375 or any potential WACMs) they may not be meaningful if the dataset is not big enough to be statistically meaningful.

An alternative might be to calculate an annual expansion constant (ECAy) for every year and then the actual Expansion Constant (as used in the tariff model) could be calculated annually on an [exponential moving average](https://en.wikipedia.org/wiki/Moving_average) as follows:

Where is the weighting factor in the range 0 – 1. Using could give a relatively stable result. CPI is the *consumer price index* for the relevant year.

The annual expansion constant (ECA) would be calculated, based on the TO data for the previous year, using the CMP 315, CMP 375, or a different method. If no data was available for the relevant year (for example there had been no new circuit build) then the ECA would simply be the previous year’s expansion constant indexed by CPI (and this would have the effect of simply increasing the expansion constant by CPI).

The effect of a moving average is to introduce price stability into the expansion constant, limiting the range the expansion constant could move by. For example, if , if in a given year could be build for free, the expansion constant would fall by 10% (after inflation); on the other hand if the cost of capacity build for a given year was twice the current value of the expansion constant, the value of the expansion constant would rise by 10% (after inflation). This would prevent price shocks (as seen at the last review) and, because the numbers would be updated annually, all market participants would be able to observe any trends.

# Is 400 kV overhead line the right technology for the Expansion Constant?

The workgroup had queried if 400kV overhead line is the right technology to base the expansion constant on – will future network build be based on 400 kV overhead lines? Its clearly difficult to answer this question as it requires future knowledge.

One solution would be to create an expansion constant for each technology in use on the network (so expansion constants for 400 kV overhead line, 400 kV cable, 275 kV overhead line etc.). Adopting multiple expansion constants allows the *expansion factors* to be removed from the model.

Using technology specific expansion constants would also add to the numeric stability of the solution (where data is sparce) if the exponential moving average (above) was adopted (for example, the price of 275 kV cable in the transport model would not change simply because the price of a 400 kV overhead line had been updated in a year where there was no new 275 kV cable construction).