

Electricity Transmission Costing Study

Summary for CMP 315

Summary

CMP 315 seeks to review the *Expansion Constant* which is used in the Transmission Charging methodology. This note uses a report by Parsons Brinckerhoff¹ (PB) setting out the costs of 400 kV overhead line and derives the expansion constant implied by these costs as 27.5 GBP/MWkm (2012 prices) – significantly different to the expansion constant used in the 2010/11 charging model of 10.6 GBP/MWkm. The derivation is on a like for like basis and does not include the cost of other equipment proposed in the CMP 315 solution.

Cost Assessment

The Expansion Constant is designed to reflect the annualised cost of a 400 kV overhead line to move 1 MW of power over 1km. CMP 315 proposes reviewing its derivation (along with including the costs of other elements of the transmission system)

In 2012, PB undertook a study of the lifetime costs of 400 kV overhead lines (alongside other technologies). PB considered 3 capacities of overhead line, 3190 MVA, 6380 MVA and 6930 MVA and 3 nominal route lengths 3km, 15km and 75 km. In this note we derive the expansion constant implied by each of these 9 combinations.

In their assessment, PB considered the Fixed Build Costs (mobilisation and establishment) and Variable Build Costs (Foundations, Tower Materials, Conductors, Access Roads, Insulation, Erection and Stringing, Engineering and Safety, Project Launch and Management (10%) and Build Contingency (10%)). In the report, PB also make an allowance for the variable costs of operating the circuit (losses and maintenance etc.,) however these are accounted for elsewhere in network charging.

From the costs identified by PB, the price per MWkm is calculate as the sum of the Fixed Build Cost and the Variable Build Cost and dividing by the product of circuit length and route capacity².

For each circuit type the implied expansion constant is calculated by multiplying the price per MWkm by 0.084. This factor is the sum of the *annuity factor* (0.066) designed to convert a capital cost into an annual charge (CUSC 14.15.64-65) plus the *overhead factor* (0.018 in 2009/10) designed to reflect ongoing costs such as maintenance and rates (CUSC 14.15.66).

The expansion constant for each of the overhead line type are presented in Table 1 and range between 20.75 GBP/MWkm and 39.50 GBP/MWkm with a simple arithmetic average of 27.52 GBP/MWkm. For comparison, the expansion constant for 2010/11 – a similar price base to the one used in the PB assessment – was 10.633 (CUSC 14.15.69).

¹ "Electricity Transmission Costing Study – An independent report endorsed by the Institution of Engineering and Technology" (January 2012) <https://www.theiet.org/media/1651/transmission-report.pdf>

² In accordance with CUSC 14.15.62 it is assumed that 1 MW = 1 MVA

The expansion constant is subject to RPI indexation (CUSC 14.15.69).

Length (km)	Capacity (MVA)	Fixed Build Cost (£M)	Variable Build Cost (£M)	Total (£M)	Price per MW-km	Implied Expansion Constant	PB report page no
3	3190	0.5	4	4.5	470	39.50	22
3	6380	0.6	4.7	5.3	277	23.26	24
3	6930	0.6	5.4	6	289	24.24	26
15	3190	1.6	19.8	21.4	447	37.57	28
15	6380	1.9	23.3	25.2	263	22.12	30
15	6930	2.2	26.6	28.8	277	23.27	32
75	3190	2.5	97.7	100.2	419	35.18	34
75	6380	2.9	115.3	118.2	247	20.75	36
75	6930	3.2	131.4	134.6	259	21.75	38

Table 1: Expansion Constants inferred from PB report

Conclusion

Derivation of the expansion constant using data presented by PB averages 27.5 GBP/MWkm. This value is significantly different to the expansion constant of 10.6 GBP/MWkm used in 2010/11. The value based on the PB data is for a 400 kV overhead line only and should be on a like for like basis with the 2010/11 expansion constant. Both derivations exclude the additional cost elements identified in CMP 315.

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