Capital Cost of Transmission for Renewable Energy

By
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Following is a 'ball park' calculation of the cost of a trunk transmission system to support wind and solar farms spread across the continent and generating all our electricity.

The idea of distributed renewable energy generators is that at least one region will be able to meet the total average demand (25 GW) at any time. Applying the principle that 'the wind is always blowing somewhere' and 'the sun will always be shining somewhere in the day time', there will be times when all the power would be supplied by just one region – let's call it the 'Somewhere Region'.

The scenario to be costed is as follows:

Wind power stations are located predominantly along the southern strip of Australia from Perth to Melbourne.

Solar thermal power stations, each with their own on-site energy storage, are distributed throughout our deserts, mostly in the east-west band across the middle of the continent.

All power (25GW) must be able to be provided by any region.

We'll base the costs on building a trunk transmission system from Perth to Sydney, with five north-south transmission lines linking from the solar thermal regions at around latitude 23 degrees. The Perth to Sydney trunk line is 4,000 km and the five north-south lines average 1000 km each. Add 1,000 km to distribute to Adelaide, Melbourne, Brisbane. Total line length is 10,000km. All lines must carry 25GW.

Each of the double circuit 500kV lines from Eraring Power Station to Kemps Creek can transmit 3,250MW so let's say we would need 8 parallel lines for 25GW plus one extra as emergency spare.

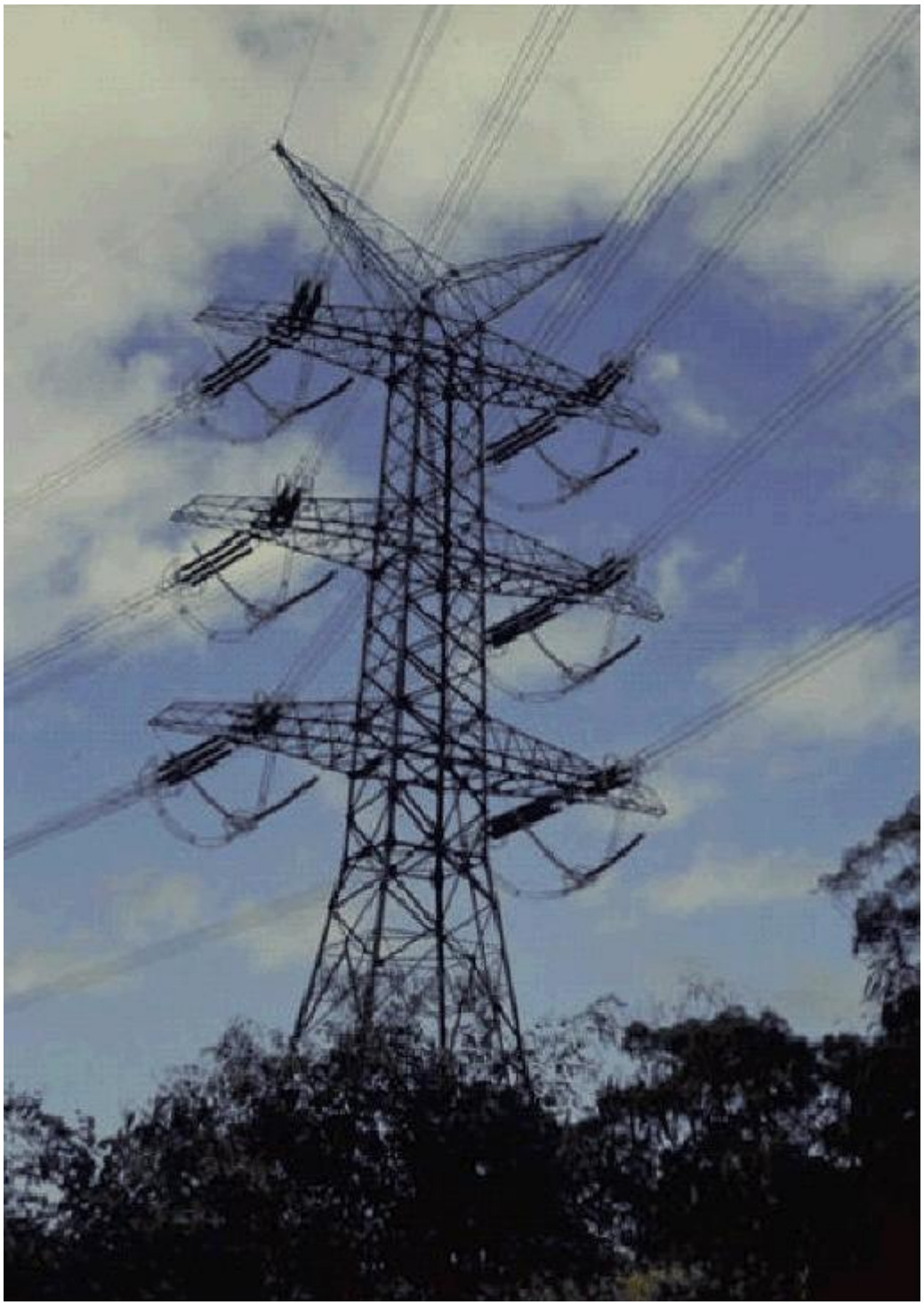
The cost of the double circuit 500kV lines is about $2M/km.[1]
For nine lines the cost would be $18M/km.

So the total cost of a transmission system to transmit from the 'Somewhere Region' to the demand centres is 10,000km x $18M/km = $180 billion

The trunk transmission lines might represent half the cost of the complete transmission system enhancements needed to support the renewable generators.

Just the cost of the trunk transmission lines alone ($180 billion) is more than the cost of the whole nuclear option ($120 billion).

[1] http://www.transmission.bpa.gov/Customer_Forums/open_season/docs/Attachment_C_-_2008_NOS_Project_Descriptions.pdf



Eraring to Kemps Creek 500kV transmission line.[2]

[2] Each of the double circuit 500kV lines from Eraring to Kemps Creek can carry 3250MW. The 500kV lines are double circuit, 3 phase, quad Orange, i.e.2 circuits times 3 phases times 4 conductors per bundle, i.e. 24 wires per tower. Orange is ACSR, Aluminium Conductor Steel Reinforced, with 54 strands of 3.25mm dia aluminium surrounding 7 strands of 3.25mm dia steel. Roughly 1/3 of the cost of a line is in the wires, 1/3 in the steel towers and 1/3 in the easements required to run the line.