An overview of Australia’s electricity transmission networks

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In Australia, there are transmission networks in each state and territory, with cross-border interconnectors that link some networks. The National Electricity Market (NEM) in eastern and southern Australia provides a fully interconnected transmission network from Queensland through to New South Wales, the Australian Capital Territory (ACT), Victoria, South Australia and Tasmania (Figure 1).

The transmission networks in Western Australia and the Northern Territory do not interconnect with the NEM or each other.

The NEM transmission network is unique in the developed world in terms of its long distances, low density and long, thin structure. It reflects the often long distances between demand centres and fuel sources for generation.

The 290 kilometre link between Victoria and Tasmania, for example, is one of the longest submarine power cable in the world.

By contrast, transmission networks in the United States and many European countries tend to be meshed and of a higher density. These differences result in transmission charges being a more significant contributor to end prices in Australia than they are in many other countries - for example, transmission charges comprise about 10 per cent of retail prices in the NEM3 compared with 4 per cent in the United Kingdom.

Electricity can be transported over alternating current (AC) or direct current (DC) networks.
Most of Australia’s transmission network is AC, whereby the power flow over individual elements of the network cannot be directly controlled. Instead, electrical power (which is injected at one point and withdrawn at another) flows over all possible paths between the two points.

As a result, decisions on how much electricity is produced or consumed at one point on the network can affect power flows in other parts of the network.

Australia also has three DC networks, of which all are cross-border interconnectors.

**Ownership of transmission networks**

*Table 1* lists Australia’s transmission networks and their current ownership arrangements. Historically, government utilities ran the entire electricity supply chain in all states and territories. In the 1990s governments began to separate the generation, transmission, distribution and retail segments into stand-alone businesses.

Generation and retail were opened up to competition, but this approach was not appropriate for the transmission and distribution networks, which became regulated monopolies.

1. The regulated asset bases are as set at the beginning of the current regulatory period for each network, converted to June 2008 dollars.
2. Investment data are forecast capital expenditure over the current regulatory period, converted to June 2008 dollars.

3. EnergyAustralia’s transmission assets, at 1 July 2009, are treated as distribution assets for the purpose of economic regulation. Future performance of the network will be assessed under the framework applicable to distribution network service providers.

4. SP AusNet’s investment data include forecast augmentation investment by AEMO (formerly VENCorp).

5. Not all interconnectors are listed. The unlisted interconnectors, which form part of the state based networks, are Heywood (Victoria – South Australia), QNI (Queensland – New South Wales), Snowy – New South Wales and Snowy–Victoria.

6. Given Basslink is not regulated, there is no regulated asset base. The asset value listed is the estimated construction cost.

7. Data from the ERA’s draft decision on proposed revisions to Western Power’s access arrangement for the period 2009–10 to 2011–12.

8. At July 2009 Western Power’s access arrangement for the period 2009–10 to 2011–12 was not finalised. Principal sources: AER, Transmission network service providers: electricity performance report for 2007–08, Melbourne, 2008, and previous years; AER/ACCC revenue cap decisions; ERA (Western Australia).

Scale of the transmission networks
Figure 2 compares asset values and capital expenditure in the current regulatory period for the transmission networks. It reflects asset values as measured by the regulated asset base (RAB) for each network.

**The RAB is the asset valuation that regulators use, in conjunction with rates of return, to set returns on capital to infrastructure owners.**

In general, it is set by estimating the replacement cost of an asset at the time it was first regulated, plus subsequent new investment, less depreciation. More generally, it indicates relative scale.

**Powerlink** (Queensland) and **TransGrid** (New South Wales) have significantly higher RABs than those of other networks.

Many factors can affect the size of the RAB, including the basis of original valuation, network investment, the age of a network, geographic scale, the distances required to transport electricity from generators to demand centres, population dispersion and forecast demand profiles.

The combined RAB of all transmission networks is around $15.6 billion. This amount will continue to rise over time, with investment in the current regulatory periods forecast at almost $10 billion.

**Reference:** Australian Energy Regulator – State of electricity market (aer.gov.au)