



SUBMISSION TO THE AUSTRALIAN ENERGY MARKET OPERATOR ON THE INTEGRATED SYSTEM PLAN CONSULTATION

MARCH 2018

EXECUTIVE SUMMARY

The CEFC welcomes the opportunity to make a submission on the Australian Energy Market Operator's Integrated System Plan consultation paper.

To date, large-scale renewable energy projects in Australia have clustered around existing transmission networks, but have also gravitated towards higher quality energy resources. This pattern is explained by project developers seeking to maximise energy generation while minimising transmission investment costs.

As the generation mix shifts from fossil fuels to wind and solar and distributed energy resources, transmission planning will need to refocus to deliver least-cost reliable electricity from variable renewable energy (VRE) resources.

AEMO's analysis of Australia's renewable energy resources is very welcome and should promote transmission investment that enables geographically balanced renewables development, achieves access to high quality VRE resources, unlocks VRE resources that are correlated with electricity demand, and delivers economies of scale.

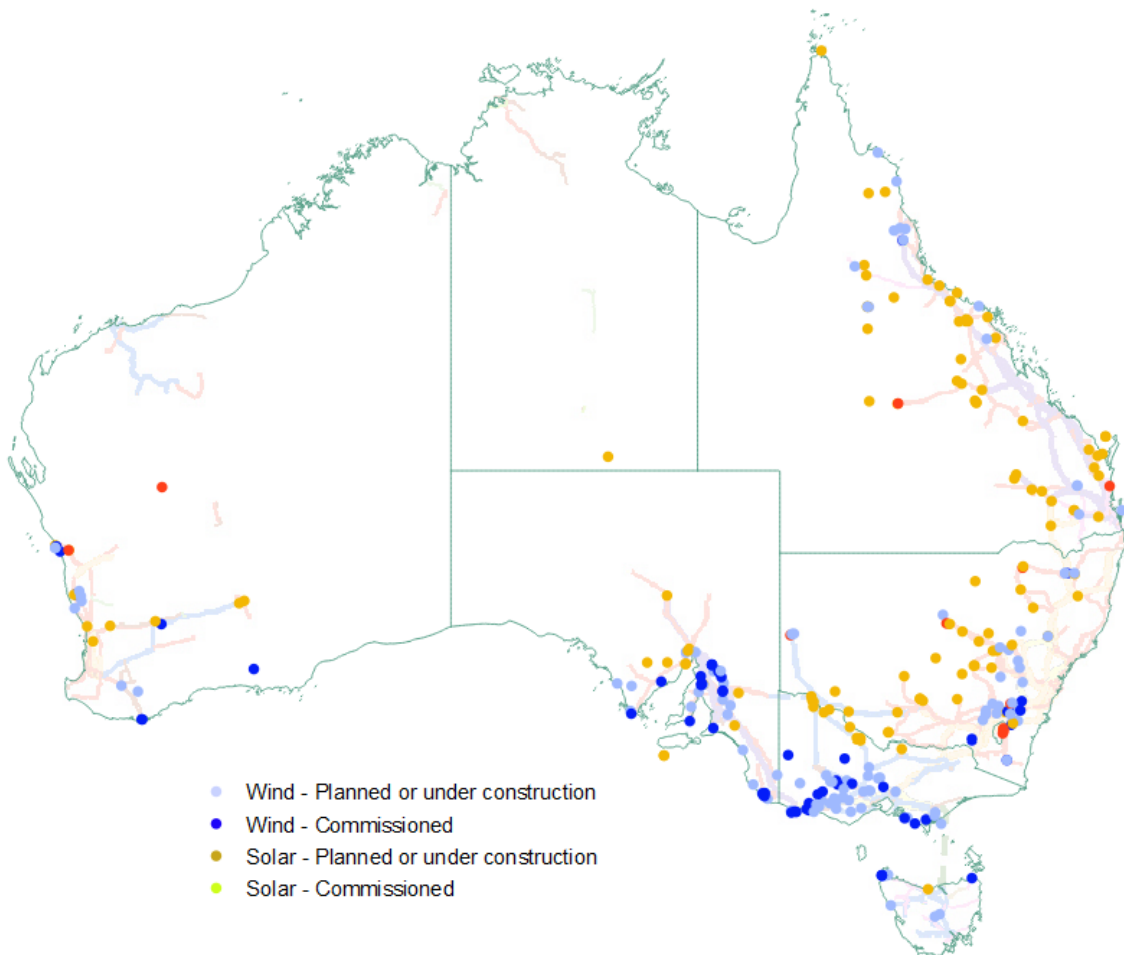
Further economic analysis would help the market understand the trade-off between accessing higher quality and more geographically balanced renewable energy resources and increasing investment in transmission. It would also help to inform the sequencing of renewable energy zone development to promote the least-cost investment pathway consistent with reaching the emissions reduction target.

RENEWABLE ENERGY PROJECTS ARE CLOSE TO THE EXISTING NETWORK

Australia's electricity system is heavily reliant on fossil fuel generation and has the highest emissions intensity among IEA member countries ([IEA 2017](#)). Access to fossil fuels has been a major influence on the location of Australia's transmission network, which bridges long distances between fuel resources and load centres.

To date, large-scale renewable energy projects in Australia have clustered around existing transmission networks, but have also gravitated towards higher quality energy resources. Preliminary CEFC analysis suggests that half of all projects commissioned since 2000 or currently announced, in planning or under construction are less than five kilometres from existing transmission lines. As might be expected given the geographic distribution of resources, solar PV generation has generally been located inland in central and northern regions, and wind generation generally closer to the coast (Figure 1). This pattern is explained by project developers seeking to maximise energy generation while minimising transmission investment costs.

Figure 1: Large-scale wind and solar PV installations and transmission networks



Source: CEFC, BNEF, Geoscience Australia
'Planned or under construction' includes projects that are announced or have secured finance

TRANSMISSION INVESTMENT TO SUPPORT RENEWABLES

As the generation mix shifts from fossil fuels to wind and solar and distributed energy resources, transmission planning will need to refocus to deliver least-cost reliable electricity from variable renewable energy (VRE) resources.

To facilitate a rapid change in the mix of energy resources, transmission investment should seek to balance a number of objectives.

- Network investment should enable **geographically balanced renewables development** in order to smooth the aggregate output of variable renewable energy generators ([IEA 2018](#)). Geographic diversity is particularly relevant in Australia's National Electricity Market, which crosses several climate zones and sees a wide range of local weather conditions. Harnessing this diversity would tend to reduce the need for investment in firming capacity and storage.
- Transmission should provide **access to high quality VRE resources** with higher wind speeds and higher levels of solar irradiance to deliver higher capacity factors and lower generation costs.
- Transmission should unlock **VRE resources that are correlated with electricity demand**, for example by connecting wind resources that consistently coincide with evening peak demand. **Stronger interconnection between regions** will likely be required to ensure that resources are able to meet demand across the electricity system.
- Transmission investment should **deliver economies of scale**, whether by promoting larger and more cost-effective generation projects or by allowing projects to share common transmission infrastructure.

AEMO's analysis of Australia's renewable energy resources is very welcome and should support achieving these outcomes. Identifying zones with high-quality wind and solar resources and locations that are well suited to pumped hydro energy storage will help to guide the geographic focus of developers and shape transmission investment decisions, allowing higher levels of renewable energy integration over time.

AEMO's analysis of renewable energy resources will also facilitate longer-term strategic planning for the electricity system. The International Energy Agency notes that successful integration of renewable energy depends on a 'clear and consistent vision' of the amount and type of generation capacity and network and storage assets to be deployed ([IEA 2018](#)). Developing that strategy requires a complete picture of available wind and solar resources, which AEMO's analysis provides.

It is notable that many regions identified by AEMO as having strong renewables resources align with transmission development projects already under consideration, including on the Eyre Peninsula, in south eastern South Australia and south western New South Wales, western Victoria, far north Queensland, northern New South Wales and Tasmania.

As AEMO notes, around 16 GW of coal generation capacity will reach 50 years of operating life by 2040. The exit of fossil fuel generation capacity may provide opportunities to use existing transmission network infrastructure for new renewable energy capacity.

Geographically balanced renewable energy development could be further promoted with locational investment signals, for example by designing any future state government renewable energy procurement programs in tandem with targeted transmission network investment.

ECONOMIC ANALYSIS OF THE TRADE-OFF BETWEEN BETTER RESOURCES AND TRANSMISSION INVESTMENT COSTS

AEMO's analysis of physical renewable energy resources should be complemented by economic analysis that takes into account:

- the likely future cost paths of renewable energy technology, storage and transmission infrastructure
- the system value of geographically diverse renewable energy resources with different time-of-day generation profiles, proximity to load and improved matching of generation and load
- the extent to which demand response, storage and distributed energy resources may reduce the need for transmission investment.

That analysis is complicated by a number of factors. The relative costs of variable renewable energy and flexible resources are changing. Improvements in wind turbine technology can make previously mid-range sites commercially viable. In solar PV, ongoing steep cost declines mean that deployment is becoming economic even in lower resource sites.

Ongoing cost declines and strong investment in capacity that is co-located with electricity demand, such as rooftop solar PV and battery storage, may also affect the need for transmission investment.

While it is challenging, further economic analysis would help the market understand the trade-off between accessing higher quality and more geographically balanced renewable energy resources and increasing investment in transmission. It would also help to inform the sequencing of renewable energy zone development to promote the least-cost investment pathway consistent with reaching the emissions reduction target.

ABOUT THE CEFC

The Clean Energy Finance Corporation invests, applying commercial rigour, to increase the flow of finance into the clean energy sector.

Our mission is to accelerate Australia's transformation towards a more competitive economy in a carbon constrained world, by acting as a catalyst to increase investment in emissions reduction.

We do this through an investment strategy focused on cleaner power solutions, including large and small-scale solar, wind and bioenergy; and a better built environment, with investments to drive more energy efficient property, vehicles, infrastructure and industry.

The CEFC also invests with co-financiers to develop new sources of capital for the clean energy sector, including climate bonds, equity funds, aggregation facilities and other financial solutions.

The CEFC operates under the *Clean Energy Finance Corporation Act 2012*.

The CEFC's strategic framework supports sectors in the Australian economy that are the largest sources of carbon emissions to reduce their emissions and ultimately to help to transform the economy to achieve net zero emissions in the second half of the century.