Australian Government
Clean Energy Regulator

Office of the Chair

EC20/4

Ms Audrey Zibelman
Chief Executive Officer and Managing Director
Australian Energy Market Operator

Submitted via email to: isp@aemo.com.au

Dear Ms Zibelman

Submission on the Draft 2020 Integrated System Plan

The Clean Energy Regulator welcomes the opportunity to submit comments on the Draft 2020 Integrated System Plan (ISP). The CER operates the Australian carbon markets and administers elements of Commonwealth Government emissions reduction policies. The key intersect with energy markets is through our administration of the Renewable Energy Target. We maintain a close liaison with renewable energy investors and can offer some views on the outlook for renewables investment and other matters that may help to inform the finalisation of the ISP.

This submission focusses on transmission system planning issues arising from the growing renewable penetration. The submission does not address the inter-related issue of managing system security challenges that arise from the variable and generally non-synchronous character of renewables generation.

We strongly support the development of a dynamic, whole of system roadmap with an actionable ISP. We expect this will be a useful addition to the current incremental transmission investment approval process. Our view is that, in current circumstances, this approach offers a better prospect of aligning the timing, level and location of transmission system investments with the ongoing transformation in the generation fleet, the emergence of storage and other prospective technologies. Specifically, a planning approach may be better able to assess and balance the risks and consequences of pursuing early investment versus late investment if it is well calibrated to the future out-turn of events.

In recent years we have seen renewables investment run well ahead of most predictions (see Figure 1 at Attachment A) and the consequences of delayed transmission investment have now become evident in the Western Murray region with curtailment and connection delays and a shift in the pattern of renewables investment. This confirms that the level of investment in renewables and transmission system are not independent processes.

In our view, there are reasons to think that the tendency to under estimate renewables investment could, on balance, continue – these are outlined below. If that is the case, and if the ISP roadmap is based on an underestimate of renewables investment it will increase the likelihood of further transmission constraint risks crystallising because transmission investment will be lower than otherwise. If so, it would then be

evident that using a "low" renewables scenario had become a "self-fulfilling prophesy" and it would be likely that it was not a least cost outcome. This could be contrasted with the risk of early transmission investment which may carry a lower consequence, with any excess capacity likely to be taken up at some point in the transformation of the electricity sector.

We note there are other relevant initiatives, such as the recent Commonwealth-State agreements, that may assist in accelerating key transmission system investments.

Current Large-scale renewable trends

As shown in Table 1, average delivered utility-scale capacity in the NEM will be around 3.4 gigawatts per annum over the current three-year period.

In the 2019 calendar year, 2 gigawatts of projects reached financial close and based on liaison information and recent reporting, 2020 may exceed this level. While this was down on the record 4.4 GW in 2018, it was five times the average annual capacity of 0.4 GW that reached financial close in the first 15 years of the RET. It is still expected that the 2020 Large-scale Renewable Energy Target of 33,000 GWh will be met in 2020.

Some analysts predicted that renewables investment would fall markedly after it was clear that the RET would be met – that view proved to be wrong with around 6 gigawatts of additional capacity beyond the target now under construction or built.

According to the draft ISP, there is another 13 gigawatts of transmission capacity for connections in the NEM outside of presently constrained areas. We note that around 87% of the current investment pipeline that has not been accredited lies outside of the Western Murray region (see Attachment A, Figure 4). During the early phase of the boom in renewables many large investments were directed to locations with a strong wind or solar resource but without strong transmission links. Our discussion with potential investors indicates that additional weight is now being given to transmission strength in location decisions, including to the point of accepting weaker wind or solar resource. Other innovations that are relevant include the incorporation of large batteries into renewables projects and scaling projects to less than 30MW located closer to load. In effect, investment choices have become more sophisticated.

Many analysts have been expecting that LGC prices will fall to zero a year or so after 2020 when supply catches up with statutory demand and that this will exhaust the stimulus from the RET. This view apparently underpins forecasts that renewables investment will fall markedly. Our view is that this outlook for LGC prices is only a partial analysis and is likely to be wrong.

- It is correct that the statutory RET obligation plateaus after 2020 and new renewables power stations are eligible to be accredited for the RET after 2020 – accordingly fixed statutory demand will be met with rising supply. However, beyond the statutory obligation voluntary demand for LGCs can be used to offset scope 2 electricity emissions. There are some branding mechanisms currently in place that recognise and validate such surrenders. There is a strong shift in private companies to voluntarily adopt a lower emissions footprint ambition. As LGC prices decline, voluntary demand can be expected to grow substantially. To the extent that voluntary demand meets additional supply we expect that there will be a floor under LGC prices and this will continue to support forward investment in renewable power stations.
- Recent liaison evidence has indicated that some project developers have asked for sensitivity analysis in a project business case to include a non-zero LGC price.

- There is no inherent constraint on LGCs being claimed as a voluntary offset for scope 1 emissions. In this circumstance, voluntary demand would have the effect of integrating LGC and other offset markets. In that event LGCs would have a floor price that was linked with the ACCU price based on the implicit carbon value of an LGC (e.g. ACCU price times the emissions intensity of the grid). Offsetting scope 1 would be a further source of voluntary demand. Recent liaison evidence has indicated a number of innovative business models are being contemplated that would incorporate this approach.
- The strong project pipeline will continue to drive down prices of new-build renewables1.

Rooftop solar PV trends

The total rooftop solar PV capacity installed in the NEM in 2019 was 2 gigawatts. Early data for 2020 points to approximately 2.3 gigawatts of installations in 2020. Continued growth in recent years has occurred notwithstanding the progressive phase out of SRES support over the period which will continue to 2030.

The assumptions in the Step Change Scenario look like being materially exceeded (see Table 1 and Attachment A). Modelling we commissioned in August 2019, based on payback periods, suggests it is likely at least 2 gigawatts of rooftop solar PV will be installed per year in the NEM through to 2030. The reports can be found on the Clean Energy Regulator website[2].

We acknowledge that there are potential constraints on how to support increasing volumes of rooftop solar PV and discussions are still at an early stage as to whether distribution network service providers (DNSPs) will continue to allow rooftop solar PV to be exported. However, we believe limits on solar PV installation are unlikely to eventuate as industry, consumers and DNSPs are already beginning to innovate to allow rooftop solar PV to continue to be installed including:

- Changes to Australian Standards to improve the response of inverters to grid disturbances such as rapid voltage or frequency changes, and to introduce minimum requirements for remote communications and control of solar PV inverters and grid connected batteries (interoperability).
- Reconfiguration of DNSP business models as evidenced by three Victorian DNSPs (Powercor, UnitedEnergy and CitiPower) seeking approval to invest in network upgrades to allow 95% of customers to install at least 5 kW of solar PV with unlimited export capacity.
- Consideration of shifting regulated loads (such as off-peak water heaters) or other loads to periods of high rooftop solar PV generation.
- Concurrent installation of solar PV and batteries to enable excess electricity generated during the day to be stored for use during peak evening hours.
    - » Our data indicates concurrent installations have grown from 1,250 at the start of 2016 to over 20,000 at the end of Quarter 4 2019 with a cumulative battery capacity of at least 85 MW. We

[1] For example BNEF New Energy Outlook 2019 states the fixed solar PV price has dropped from $2.16/W in 2015 to $1.15/W estimated in 2020.

[2] Interim modelling reports - http://www.cleanenergyregulator.gov.au/RET/Scheme-participants-and-industry/the-small-scale-technology-percentage/small-scale-technology-percentage-modelling-reports

estimate a total of 150 to 200 MW of household battery storage when accounting for battery installations not captured through our data.

- Increasing market expectations to invest in bigger PV arrays and battery systems that can support the operation of electric vehicles in the latter part of the 2020s.

Transmission system constraints and model result biases

The incentives from the Renewable Energy Target, together with some state incentives and the falling cost of renewables, have brought forward approximately 20 gigawatts of new capacity in the National Energy Market (NEM) over the five calendar years 2016 to 2020. Transmission infrastructure has lagged well behind these record additions of renewable energy, creating a 'backlog' of works in several locations.

As you are aware, the result is curtailment of renewable generation and increasing difficulty in connecting new power stations in parts of the grid, a circumstance that AEMO is actively managing. The ISP can play a critical role in identifying locations where infrastructure is urgently needed to resolve these constraints, address possible future constraints and schedule Renewable Energy Zones.

Our administration of the Renewable Energy Target provides some insights into the pace of renewables development at all levels. In recent years our pipeline tracking investment projects has been substantially above the consensus view. Nevertheless, our estimates have proved to be somewhat conservative. Our estimates have been incorporated into the most recently released government emissions projections. Our estimates for the next several years are based on an accounting of known investment intentions collected through a range of sources, including direct liaison, that we track through the stages of Probable, Committed and Accredited. The latter means accredited for RET purposes and eligible to be credited certificates for actual generation. We note that there has been a growing time gap between the point of accreditation and actual generation. We do not make model-based projections beyond our accounting based estimates.

Table 1 illustrates that the ISP annual renewables projections from 2022-23 for all scenarios are significantly lower than what the market will deliver between 2018 and 2020. We share the view that some step down is to be expected in new large scale renewables capacity from recent investment peaks that were driven by high prices for wholesale electricity and LGCs. The question is – how much lower? However, a lower trend does not appear to hold true for rooftop solar which is still growing strongly.

Table 1: Comparison of ISP scenarios to average delivered renewables capacity

	ISP average annual capacity increases 2022-23 to 2029-2030 – Central scenario	ISP average annual capacity increases 2022-23 to 2029-30 – Step Change scenario	Average actual capacity delivered in NEM over 2018 to 2020
Distributed PV	0.3	1.2	2.0
Utility scale	1.2	2.7	3.4
Total	1.5	3.9	5.4

This is further illustrated in the Figure 2 at Attachment A when comparing the renewables already delivered against the modelled renewables to be delivered based on ISP Step Change and Central scenarios. Both the Step Change and Central scenarios have renewables peak in line with expected coal closures - we share this view. We do not, however, see why renewables delivery declines so rapidly after 2027.

We understand that as the ISP Central pathway of the roadmap is based on current policy settings, it is being widely interpreted as the default no-regrets option. However, Figures 2 and 3 of Attachment A raise the question of whether the NEM is already on and likely to exceed the Step Change ISP roadmap pathway with respect to renewables uptake. Further, it raises the question of whether the staging of projects to augment the transmission grid should be reconsidered given the rate new renewables are being built, particularly if the rate of new renewables were to lead to an early exit of coal generation.

We understand that the ISP is based on a modelling approach that seeks joint optimisation of generation and transmission investments, and that the Central Scenario assumes no change to policy settings. We appreciate why such assumptions are utilised because it makes the modelling of investment decisions a tractable task and, if cost assumptions turn out to be correct, it would be a reasonable estimate of an optimal path. However we also observe that this approach is inherently difficult and prone to forecast error. We note:

- It appears common for models to use future cost assumptions that prove to be too high, for model results to "cluster" and also display mean reversion, irrespective of past errors. Collectively, these biases no doubt contributed to the significant, serial underestimation of renewables investment that can be observed in model results that were commissioned to inform policy exercises in recent years. See Figure 1 at Attachment A.
- the optimisation assumption does not capture real world biases that drive investment away from fully co-optimised levels. For example, real world rooftop solar and large-scale renewables decision makers do not seek to make investment decisions that are fully consistent with a co-optimised level of investment. Rather they make investments based on the cost and return they face. These decisions may not be fully informed or time consistent and for households are likely driven by a range of other factors, such as the desire to be less dependent for retail energy companies or to "do their bit" for climate change.

Conclusion

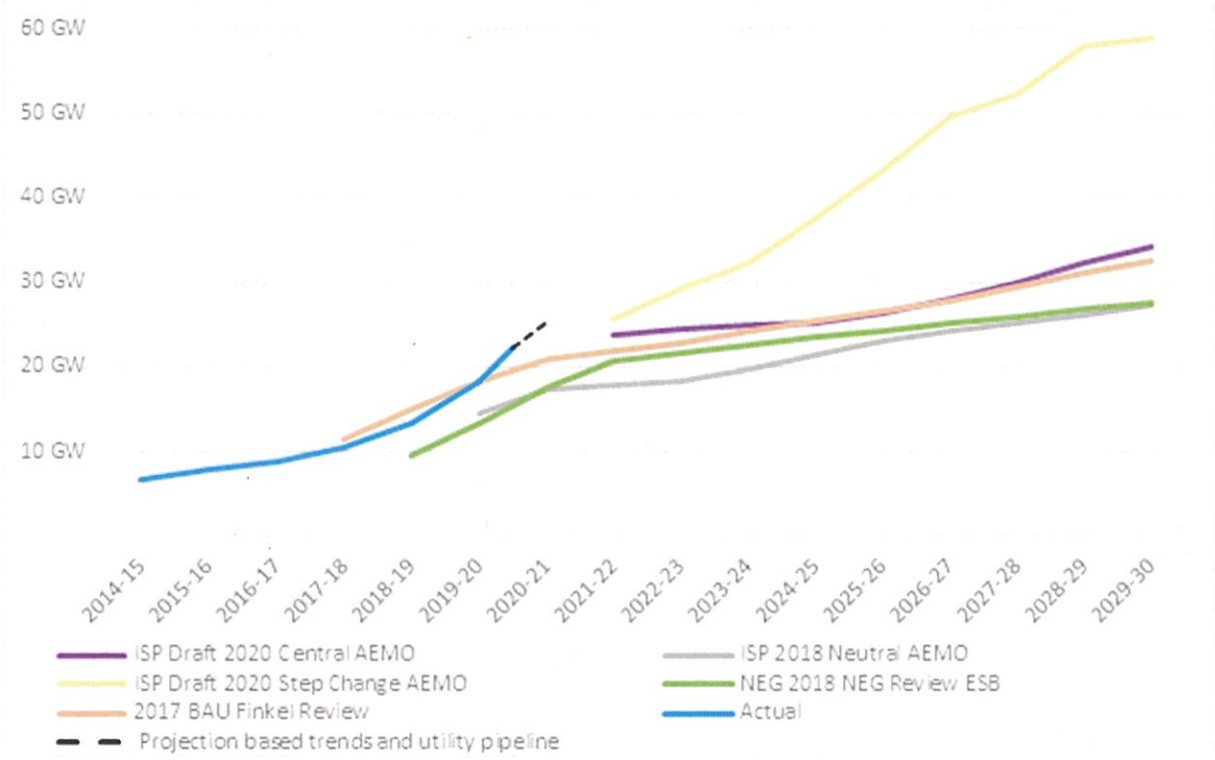
Our view is that the Central scenario roadmap may not be the lowest cost or lowest risk option for planning transmission system investment in the current circumstances. Whatever option is chosen, there is a good reason to be circumspect about locking in a particular view of the future based on model forecasts and we suggest an approach that simply and easily adapts to the actual out-turn of events to accelerate transmission investment as needed. We appreciate that deciding an optimal path is a difficult task. It may be that a rapidly adaptive approach could assist the choice between 'just in time' and 'just in case' to achieve an 'in good time' outcome.

We would be happy to further discuss these matters with you.

Yours sincerely

David Parker AM
Chair, Clean Energy Regulator
28 February 2020

Figure 1: Comparison of Renewable Projections - Cumulative – All Renewable Capacity



The dotted line shows the projection based on the current installation trend, currently at 4.2 GW annually (2GW 100kW, 200 MW between 100kW and 5 MW, and 2 GW above 5 MW).

Caveats

- All data and forecasts are NEM only. Clean Energy Regulator national data has been adjusted downwards to cover the NEM.
- Clean Energy Regulator for calendar year 2020 are shown across the 2019-20 and 2020-21 financial years.
- Aside from the 2020 ISP step change scenario, each projection is based on the policy settings current at the time.
- Both the 2018 ISP and the National Energy Guarantee review do not publish values of the mid-scale solar uptake

Figure 2: Actual additional renewables delivered 2009 – 2019 and ISP Central and Step Change scenario renewables delivered 2021 – 2030

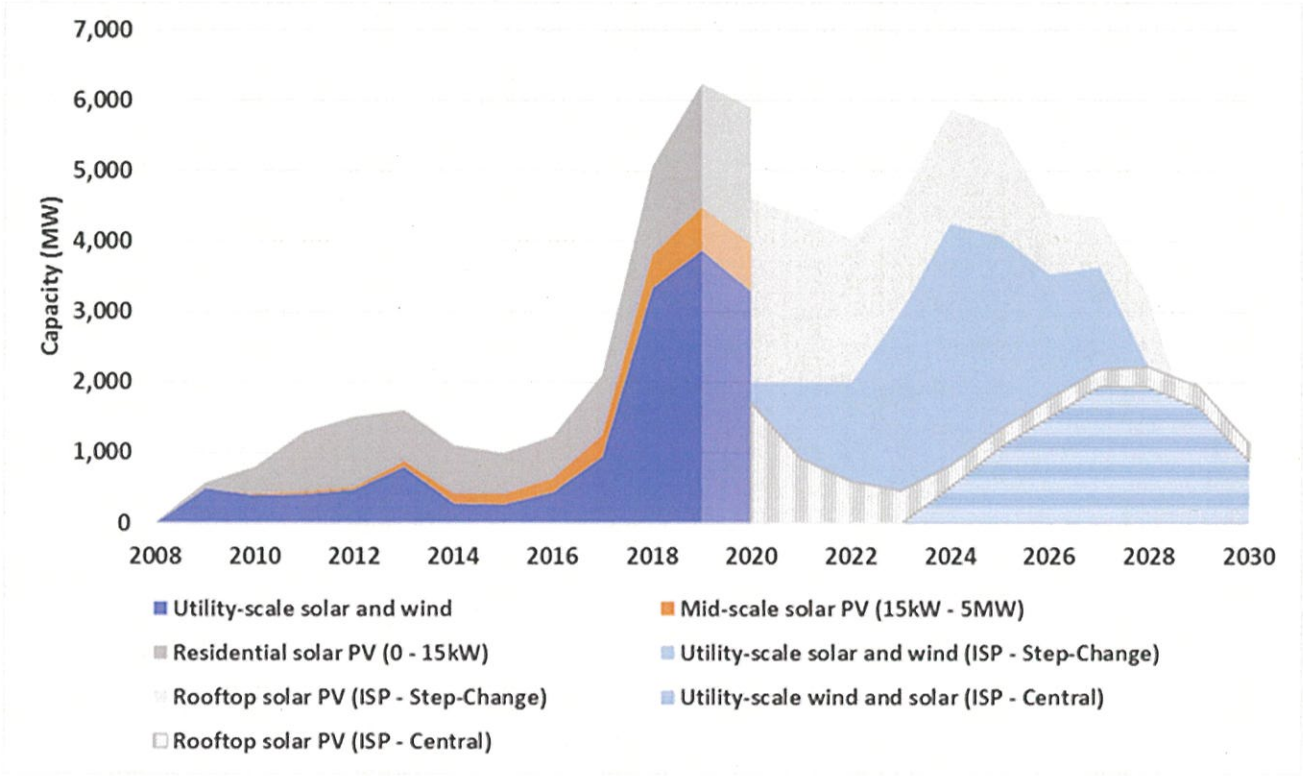


Figure 3: Average NEM capacity delivered 2018 – 2020 compared with ISP Step Change and Central scenarios

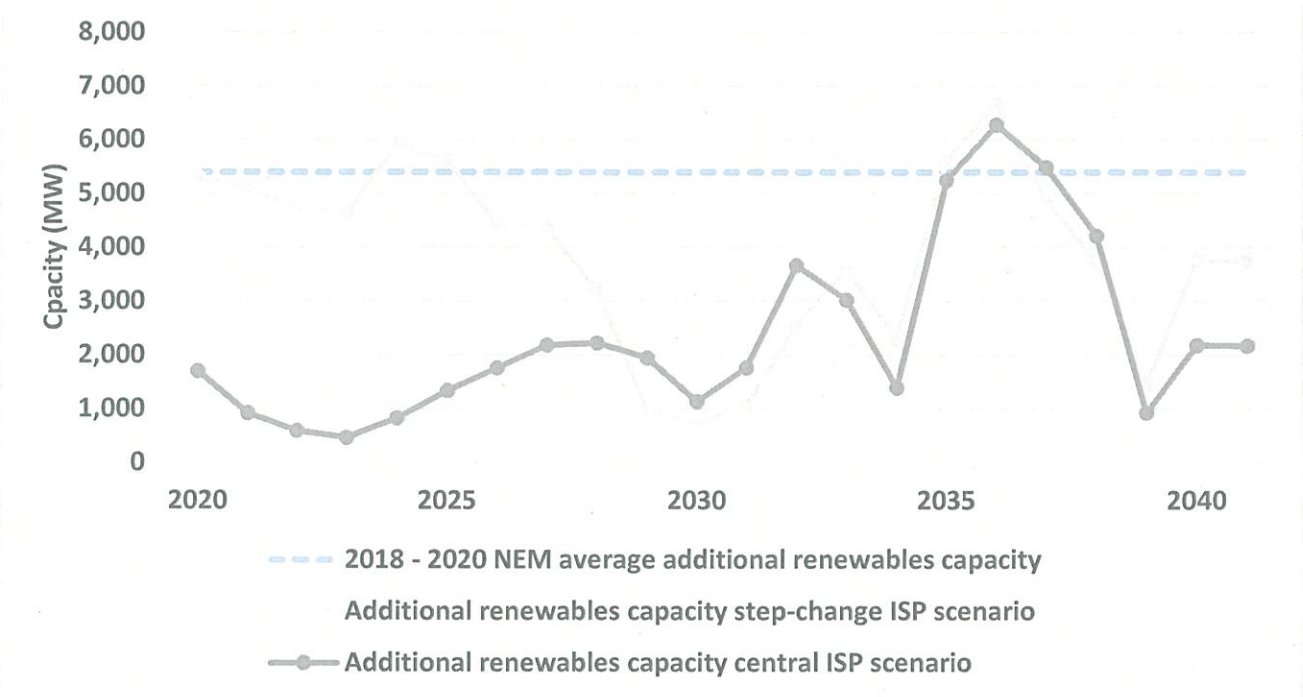
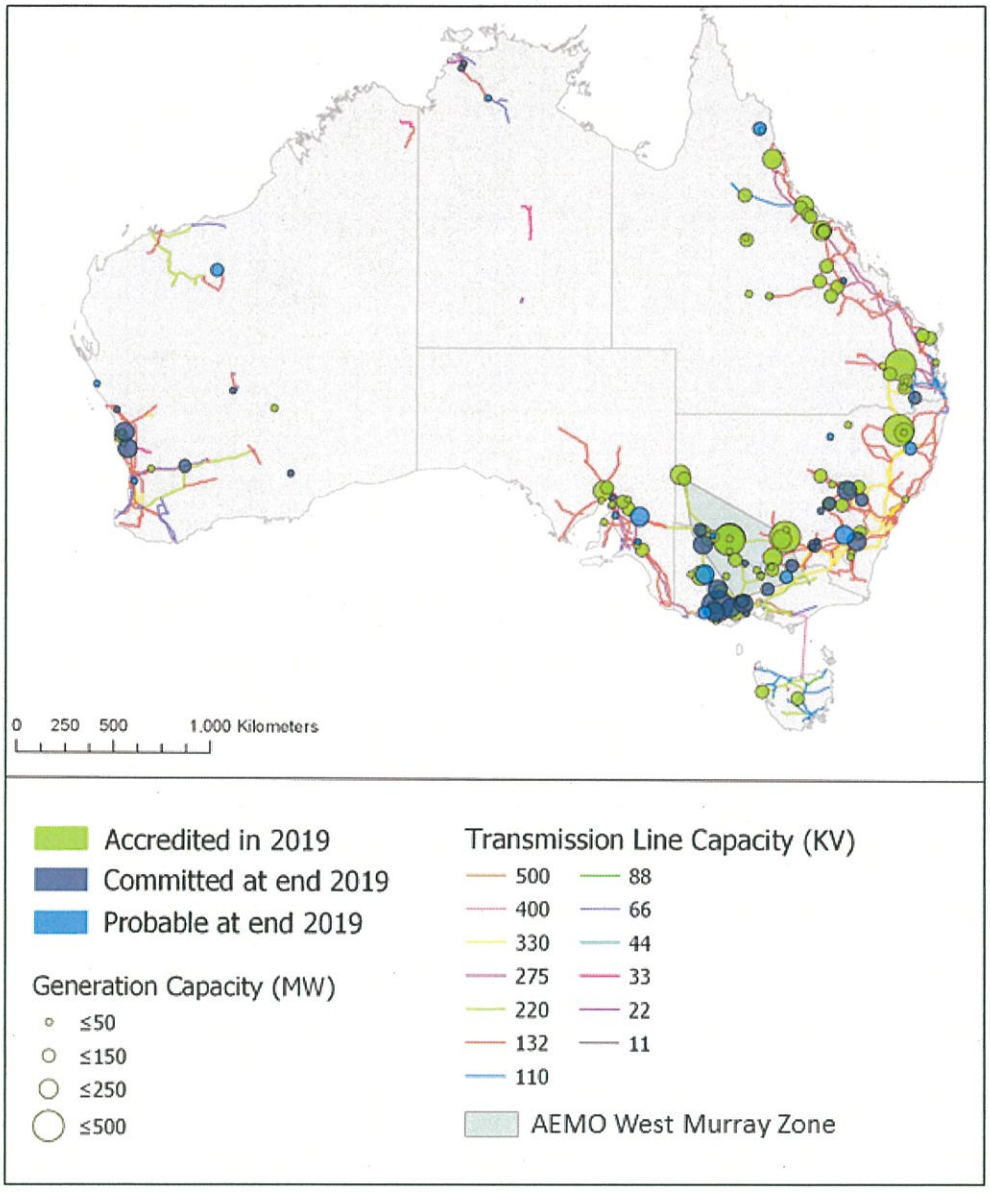


Figure 4. Delivery pipeline, 2019 to 2022, highlighting the West Murray zone.


0 250 500 1,000 Kilometers
Accredited in 2019
Committed at end 2019
Probable at end 2019
Generation Capacity (MW)
≤50
≤150
≤250
≤500
Transmission Line Capacity (KV)
500
400
330
275
220
132
110
88
66
44
33
22
11
AEMO West Murray Zone