Submission No 31

INQUIRY INTO FEASIBILITY OF UNDERGROUNDING THE TRANSMISSION INFRASTRUCTURE FOR RENEWABLE ENERGY PROJECTS

Organisation: Iberdrola Australia Networks

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The Hon. Emily Jane Suvaal MLC
Chair, Legislative Council Standing Committee on State Development
NSW Parliament

Via: Lodge a Submission (nsw.gov.au)

Dear Committee Chair,

Parliamentary Inquiry into the feasibility of undergrounding transmission infrastructure

Iberdrola welcomes the opportunity to provide some insights on the option of undergrounding new transmission lines in NSW.

Iberdrola has enclosed a high-level submission providing some information on items to be considered prior to assessing the feasibility of undergrounding a transmission system, which has been attached to this document. We have also summarised Iberdrola's position on the feasibility of undergrounding transmission infrastructure below.

The Iberdrola group has become one of the leaders in the Australian renewable energy market after acquiring Infigen Energy in 2020. The company operates more than 1500 MW of solar, wind and storage batteries in Australia and has a significant portfolio of projects, of which 453MW are under construction and more than 1,000 MW are in various stages of development.

Iberdrola is also recognised globally by its experience building, operating and maintaining electricity lines, substations, transformation centres and other infrastructure to transfer electrical power from the production centres to the end user across jurisdictions in Europe, UK, US and South America. Iberdrola currently operates one of the world's largest power systems, comprising more than 1.3 million kilometres of power lines and more than 4,400 substations, which carry electricity to more than 34 million people around the planet. Forty percent of the group's organic investment for the period 2020-2025 (more than €27 billion) will be invested in transmission businesses around the globe. Iberdrola Australia is actively looking to roll-out these capabilities in country, demonstrating its full commitment to Australia's energy transition.

The need for speed

In NSW, four out of the five coal-fire generators that provide three-quarters of NSW's electricity supply will reach end of life by 2034. These power stations also supply two thirds of the firming capacity required during summer heat waves.[1]

It took 30 years to build the existing coal-fire generators and according to the Australian Energy Market Operator's (AEMO's) 2022 Integrated System Plan, 10,000kms of new transmission lines is required within the next decade to connect renewable generation to replace the retiring coal fire generators currently operating in the National Electricity Market (NEM) today[2].

The Iberdrola Group believes that in NSW, transmission infrastructure needs to be built now if we are to significantly increase the the connection of additional generation required to replace the retiring coal-fire generators. As the transmission build and replacement of the coal fire generation must be accomplished by 2034, NSW has to commence the transmission build as outlined in the NSW Electricity Infrastructure Roadmap immediately, without any further delays. If not, NSW runs the risk of insufficient electricity supply to meet demand, which could lead to blackouts, reliability issues and increased energy bill prices.

There are two short-term alternatives to building new transmission that have been discussed in the media recently. These options are to extend the life of the existing coal-fire generators which have not already closed down or to use natural gas as a peaking resource for when electricity demand exceeds supply. These are short term, interim solutions as they will not replace the exiting coal fired generators in the long rung. All other options, including adding renewable generation, nuclear power or even adding additional coal power generation require new transmission lines to connect these generators as the existing transmission and distribution lines in NSW are nearly all reaching thermal capacity. New transmission lines will need to be built to accomodate new generation.

Extending the end of life of existing coal-fire generators is not without it own issues. This is because as the coal power stations get older, they start to fail more frequently, which creates outages and reliability problems. Gas peakers are not a viable long-term solution in NSW either, as NSW imports the majority of its gas (over 80%) from Victoria or Queensland. Gas availability and prices were exceedingly high in 2022 due to record international gas and coal prices which exerted pressure on domestic fuel availability and on the price of gas[3].

Nuclear and new coal fired power plants are unlikely to be able to address NSW's immediate needs for energy supplies as a nuclear reactor takes up to 10 years to build[4] and a coal-fire generator takes on average 3-4 years to build. Legislation will also have to be changed to allow nuclear reactor facilities, as these are currently banned under legislation as a fuel source in all Australian jurisdictions. Both of these types of generators are cost prohibitive and much more expensive than renewable generation. The CSIRO has established that onshore wind and solar

[1] *NSW Electricity Infrastructure Roadmap*, NSW Department of Planning, Industry and Environment
[2] *2022 Integrated System Plan*, June 2022, AEMO
[3] *State of the Energy Market*, 2023, AER
[4] Page 10, Figure 10, *World Nuclear Performance Report 2023*, July 2023, World Nuclear Association

PV remain the lowest cost new-build technologies[5] which can be built most expediently, in approximately 2-3 years.

Delays to the build of transmission lines is impacting end-use customers in NSW and will result in increases to customers' electricity bills. NEXA Advisory has modelled that on average across the National Electricity Market (NEM) that households would pay a total of approximately $600 more in electricity bills over 15 years if all transmission flow path augmentations are delayed by 2 years. This increase to a customer's energy bill increases to approximately $1800 over the same period with a transmission build delay of four-years[6].

The Iberdrola Group believes that the immediate build and investment in transmission is the only way to address the exit of the coal-fire generators. At this stage investigations into whether transmission can be undergrounded may be too late.

Recommendation to develop criteria to assess the feasibility to underground transmission infrastructure

The Iberdrola Group believes that a criteria for assessing the financial viability of undergrounding transmission infrastructure needs to be methodically assessed and developed. This criteria should then be applied to future projects. This process should not slow down transmission that needs to be built immediately due to the impact it will have on the reliability of the electricity market, due to the exit of the retiring coal fire-generators.

Note that high-voltage transmission infrastructure cannot be purchased off-the shelf. The designs, cables and high-voltage underground transmission equipment is bespoke and made specifically to cater for an individual project at a specific location. This is because the terrain, length of line, topography, structures, ground conditions, geology, environmental issues such as flooding, dry conditions, waterways, rocks, and others all need to be taken into considerations as well heritage, ecological impacts, and community impacts. In addition, specialist technicians are required to install the high voltage underground equipment. There are very few skilled technicians trained to install this equipment globally. Australia will be competing for these resources on a global scale. It is for this reason that it is hard to assess how much an overhead transmission project will cost in comparison to an underground transmission project. However, in Iberdrola's experience undergrounding transmission infrastructure can cost at a minimum four times to up to twenty-five times that of overhead lines. This price may be higher in Australia, as electricity infrastructure costs have risen by approximately 30% in real costs, since last year[7].

The time it takes for the construction of underground transmission is significantly longer than installing overhead transmission infrastructure. This is because trenches must be dug and cable jointing is required for the underground transmission lines. This work must be performed in a

[5] GenCost 2022-23, Final Report, CSIRO, Paul Graham, Jenny Hayward, James Foster and Lisa Havas, June 2023.
[6] *Modelling electricity bill impact of transmission project delays*, Endgame Economics on behalf of NEXA Advisory Group, 7 June 2022. This has also been corroborated by the publication, *Electricity Grids and Secure Energy Transitions: Enhancing the foundations of resilient, sustainable and affordable power systems,* International Energy Agency, revised version November 2023.
[7] *2023 Transmission Expansion Options Report*, AEMO, September 2023

sterile and safe working environment and creating this environment for each section of cable jointing takes time and money.

Underground transmission lines also requires a continuous trench to lay the cables in. Trenches vary in size depending on the cable voltage, specific design, and soil conditions. Generally, for a 330kV cable the trench would be around 3m wide and 1.5 deep, while a 500kV cable would require a trench around 4m wide and 1.5m deep. During construction, steps are required to be built around the trenches to avoid risk of the walls collapsing and potentially injuring workers. This increases the size of the trenching requirements. Due to the need for trenching, it can easily take three to six times longer to construct underground transmission lines in comparison to overhead transmission lines[8].

Bushfires, Environmental Impacts and Visual Amenity of Underground Transmission Infrastructure

Communities have argued that the purpose for undergrounding transmission infrastructure is to prevent bushfires, for visual amenity and to reduce environmental impact.

Overhead assets are more exposed to the risk of damage from falling trees, flying debris, and direct contact with flames during a bushfire. Underground assets are less vulnerable to external fire damage, which can contribute to greater grid resilience during bushfires. They are more likely to remain operational during and after a fire event, which can support firefighting efforts, the safety of affected communities and the native flaura and fauna.

However, any part of an undergrounded asset which is exposed above the ground can be damaged during a bushfire and can be hard to fix. There is no guarantee that undergrounded high-voltage assets will not be damaged during a bushfire. Locating and replacing the damage to an underground asset is more likely to require prolonged outages and take more time to fix, in comparison to what it would take to fix damage to an overhead line. In addition, undergrounded transmission assets can be impacted by earthquakes, flooding, tree roots, moisture and lighting strikes which have the potential to damage the underground cables and require extensive repairs.

While undergrounding high voltage assets are more expensive to install than overhead lines, the reduced fire risk and increased reliability during bushfires can potentially be offset by the higher upfront costs. The cost-effectiveness of undergrounding in a bushfire-prone area may be influenced by factors like the frequency and severity of bushfires and the potential costs associated with fire damage and power outages.

In regions prone to bushfires, the choice between undergrounding and overhead high voltage assets should prioritize safety, reliability, and the reduction of fire risk. While underground systems are generally safer and more reliable in this context, the decision should also take into account the specific circumstances and budget considerations of the area in question. Balancing the increased upfront costs of undergrounding with the potential long-term benefits in terms of

[8] *Overhead vs Underground Information about buring high-voltage transmission lines,* Xcel Energy Inc, 6 June 2021

safety and reduced fire risk is a critical consideration for utility companies and communities in bushfire-prone areas.

The environment may also be impacted when underground transmission lines are constructed. Digging up trenches to underground assets can potentiallyh disturb or expose contaminated soil. In addition, heat generated from direct buried transmission cables must be dissipated through the soil. Different materials have different abilities to transfer heat. Special backfill material is likely to be used instead of soil in the trench around the cables to ensure sufficient heat transfers from the cables to the surrounding soil and groundwater. This means that vegetation growth above the undergrounded infrastructure can be impacted by undergrounding of transmission lines.

Post construction, clearances must be maintained above the undergrounded infrastructure which may impact the environment. Underground transmission easements must be kept clear of buildings, additional soil, trees and woody vegetation so that cooling of the underground cables is not affected. Underground cables must be kept away from other heat sources otherwise the cable's ability to carry current decreases. Buildings, additional soil, trees and woody vegetation add insulating value above the cables which reduce the current carrying capacity of the cable. Underground high voltage assets still have the advantage of being hidden from view and causing minimal visual issues. These considerations must be weighed up against the higher cost of undergrounding these assets.

Community engagement

Iberdrola firmly believes that new transmission lines and the addition of renewable generation to replace retiring coal fire generation, is critical to achieve Australia's net zero emissions targets. Iberdrola believes that renewable connections will only occur if new transmission lines to host the renewable connections are built. These transmissions lines will only be built if the community is engaged and happy to host these transmission lines on their properties.

It is crucial for the NSW Government to investigate the concerns being raised by communities in NSW regarding the environmental and agricultural impacts of hosting transmission lines on their properties. This is particularly the case because expansions to the power system on this scale have not occurred in the last 50 years. It is essential to communicate with, engage and provide accurate and informative material and options to landholders who will host the transmission infrastructure on their land.

The Iberdrola Group believes that effort should be made to provide the necessary information to the community on the need for new transmission infrastructure so that they are adequately and accurately informed of how much transmission is needed, when it is needed, the cost differences between the various options and impacts on energy bills. Iberdrola believes that informed landholders will make the appropriate decisions for their community and decisions that are in the best interest of the State of NSW.

Thank you for the opportunity to comment on the feasibility of undergrounding transmission lines.

If you would like to discuss any of the issues raised in this submission, please contact Maheshini (Mesh) Weerackoon via email at

Yours sincerely,

Ricardo Da Silva
Network Business Development Manager