

Submission  
No 26

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

**Organisation:** Ausgrid

**Date Received:** 10 November 2023

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Ms Cate Faehrmann, MLC  
Chair  
Select Committee on the Feasibility of Undergrounding the Transmission  
Infrastructure for Renewable Energy Projects  
Submitted via online portal.

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Dear Ms Faehrmann, MLC and Select Committee Members

**Ausgrid submission to the NSW Parliamentary Inquiry into Feasibility of Undergrounding the Transmission Infrastructure for Renewable Energy Projects**

Ausgrid welcomes the opportunity to respond to the NSW Parliamentary Inquiry into Feasibility of Undergrounding the Transmission Infrastructure for Renewable Energy (**the Inquiry**).

Ausgrid operates a shared electricity network that powers the homes and businesses of more than 4 million Australians living and working in an area that covers over 22,000 square kilometres from the Sydney CBD to the Upper Hunter. We are a key economic enabler for metropolitan and regional NSW.

Our submission responds to the Inquiry's Terms of Reference as follows:

**(a) The costs, benefits and risks of underground versus overhead transmission lines, particularly with regard to bushfire and other weather-related events, ongoing environmental impacts, and community mental health and welfare**

Ausgrid's network includes a combination of overhead and underground transmission / sub-transmission lines, dependent on geography. Sydney CBD's is undergrounded due the high density buildings. In urban areas there is often a combination of overhead and underground construction depending on density, access and when the network was established. In more rural parts of the network, the lines are predominately overhead construction.

In Ausgrid's experience, underground construction is on average 5-6 times higher in cost than overhead construction, however as shown in **Appendix A** the cost can vary significantly from project to project. Underground construction is also generally more disruptive to the community due to excavation requirements to install, augment, repair and eventually replace cables. These costs can be further increased due to technical constraints, including soil conditions, rating and fault current management and access issues such as waterway crossings. Higher voltage underground transmission lines are also limited in the distance which they can cover due to cable capacitance issues, and are generally only suitable for shorter distances such as those found in denser, more urbanised areas.

There are material constraints on land use above and in the vicinity of underground lines, as there are for overhead lines. Overhead construction is exposed to weather conditions, including storms and bushfires and can require the management of vegetation. However, overhead lines are cheaper and faster to install, maintain and repair, and have the benefit of being able to span over sensitive areas such as wetlands, endangered vegetation, and Aboriginal areas, materially reducing the environmental impacts of construction. Due to their greater height and larger construction, high voltage overhead lines generally carry lower risk from weather-related events than lower voltage lines.

**Attachment A** demonstrates that while overhead lines for higher voltages are generally the preferred option in rural areas, each project is subject to its own detailed feasibility study which includes stakeholder and customer engagement along with consideration of the factors described here.

**(b) Existing case studies and current projects regarding similar undergrounding of transmission lines in both domestic and international contexts**

Ausgrid undertakes a number of transmission / sub-transmission infrastructure projects each year that includes the need to build new, augment or replace overhead and underground lines up to 132kV. There are many factors that are considered in the decision to build overhead or underground, including: location, route, rating/capacity, timeframe, construction impact, amenity and cost.

**Attachment A** provides a cross section of recent projects, demonstrating the variability of costs between overhead and underground lines.

**(c) Any impact on delivery timeframes of undergrounding with broad community consensus versus overhead transmission with large scale opposition**

Ausgrid's experience is that communities equally oppose underground and overhead lines.

Within the project development timelines, Ausgrid has been able to navigate consultation with private land holders to obtain easements as required. Ausgrid implements its 'Good Neighbour' principles and follows our Community Engagement Handbook for projects in development. We have had a Community Engagement Policy since 2014. These have been developed in line with our experiences in carrying out projects in the community as noted above.<sup>1</sup>

**Attachment A** also provides community views on recent overhead and underground transmission / sub-transmission line projects.

For further information about this submission, please contact Naomi Wynn, Regulatory Policy Manager at Ausgrid at

Regards

Junayd Hollis  
Group Executive, Customer, Assets and Digital

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<sup>1</sup> An overview of our processes can be found here: <https://www.aer.gov.au/system/files/Ausgrid%20-%202.07%20-%20Ausgrid%20Community%20engagement%20system%20overview%20-%20January%202015.pdf>

**Attachment A: Cross section of recent Ausgrid transmission projects**

Project	Completion Date	High level description	Cost	Rationale for construction type	Community engagement and views
<p><b>Nelson Bay 132kV Overhead Line</b></p>	<p>2005</p>	<p>34km of dual concrete pole overhead line construction</p>	<p>\$40M at \$1.2M / km</p>	<p>This project involved construction in sensitive wetlands and sand dunes, issues that would have been equally, if not more, challenging if underground construction was pursued.</p>	<p>Ausgrid undertook three years of community consultation and environmental assessment as part of the project determination. The project required two years of community consultation specifically to determine an acceptable feeder route. This included engaging an independent Environmental Management Representative to assist with identification and management of environmental impacts. Ausgrid implemented a four year \$200,000 biodiversity project in conjunction with Port Stephens Council and the National Parks and Wildlife Service.</p>
<p><b>Empire Bay 66kV Overhead Line</b></p>	<p>2013</p>	<p>6.6km of underground 66kV to Woy Woy Zone Substation and 8.6km of overhead to Avoca Zone Substation</p>	<p>\$32.8M</p>	<p>Existing 11kV overhead was able to be rebuilt at 66kV to supply the new substation from Avoca.</p>	<p>There was general opposition to the new substation and supplying overhead lines. The community's main concern was related to potential increased electro magnetic fields (EMF) in residential areas and specifically Melville St Kincumber. Residents argued for the lines to be installed underground or diverted away from their street and delivered a 500 signature petition to NSW Parliament. The community feedback was considered and low cost options (such as phasing and bundling of low voltage) were implemented to reduce the EMF where available. The resulting overhead line was designed to operate well within health authority guideline limits.</p>

Project	Completion Date	High level description	Cost	Rationale for construction type	Community engagement and views
<b>Wameral 132kV Overhead Line</b>	2011	12.2km of overhead and 4km of underground 132kV to Ourimbah Switching Station	\$37.9M	Initially a mostly overhead route was proposed, however ultimately some additional undergrounding was undertaken due to community, environmental and technical considerations.	Three years of community opposition to 132kV overhead lines led to changing some parts of the route from overhead to underground. In response to community feedback, Ausgrid implemented an additional 1km of undergrounding at a further cost of \$2.6 million.
<b>Lindfield to Willoughby 132kV Underground Replacement Cable</b>	2016	Replacing 8.5km of aged fluid filled 132kV underground lines with new underground lines	\$37.7M at \$4.4M/km	A like-for-like underground replacement in this high density urban environment was the only feasible solution.	Ausgrid undertook community consultation as part of the project determination. Irrespective of the proposed underground solution, there was strong negative community feedback with conflicting views on the best route. Some members of the community requested that the lines to be installed through bushland and others requested them to go through streets.
<b>Carlingford 132kV Steel Tower Relocation</b>	2017	Part of a large scale apartment development in Carlingford (approximately 1000 apartments). The approved development application required the developer (Dyldam) to underground 5 spans (1km) of dual circuit 132kV overhead power lines on steel lattice towers (capacity of 550MW).	\$18.3M to underground 1km of overhead lines	The regulatory framework requires the proponent and the beneficiary of the works (in this case the developer) to pay directly for the undergrounding costs of the powerlines at an equivalent capacity. The undergrounding of the line enabled the release of associated easements which increased the available land for the development and improved the amenity.	The developer undertook community engagement and the developer engaged with local property owners directly to offset impact of the proposed undergrounding works. The developer also owned a high proportion of impacted properties.

Project	Completion Date	High level description	Cost	Rationale for construction type	Community engagement and views
<b>Macquarie Park 132kV Connection</b>	2021	Increased rating of an existing underground circuit by the installation of an additional 1km overhead circuit.	\$3.3M/km	Location and existing underground services along Waterloo Rd with opportunities to coordinate with M2 and other stakeholders led to the decision to install the line overhead	Community consultation was undertaken as part of the project determination with limited feedback from the community.
<b>Surry Hills-Kingsford 132kV Underground Cable Replacements</b>	2024 (est)	Replacement of existing aged fluid filled 132kV underground lines with new underground lines	\$29.3M for Surry Hills at \$8.1M/km and \$26.6M for Kingsford at \$5.2M/km	Based on the high density urban environment a like for like underground replacement was the only feasible solution.	Community consultation was undertaken as part of the project determination with limited feedback from the community. General concerns have related to impacts from construction activities.
<b>Belrose 132kV Underground Cable Replacement</b>	2025 (est)	Ausgrid is currently reviewing options to replace 1km of existing aged fluid filled underground 132kV feeders in Belrose with new 132kV overhead powerlines	\$5.7M if overhead; \$10M if a like-for-like underground option occurs	Ausgrid is pursuing replacement of end-of life underground cables with overhead construction to yield significant capital savings for customers. The existing line is already largely an overhead construction (over 80%).	Initial community feedback is that there is a preference for replacing the existing underground cables with new underground cables. Issues such as bush fire risk, visual amenity and impact to native bushland including removal of trees are the main reasons for this preference. The community have acknowledged the amenity benefit an overhead solution provides with the demolition of a large brick enclosure that houses the existing overhead to underground transition arrangement.