



Stop, Rethink HumeLink Undergrounding Transmission: The Best Option

■ By the Stop, Rethink HumeLink Campaign

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stophumelink.com.au

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Executive Summary

Exaggerated costs for undergrounding proven wrong

A new expert report into the cost of undergrounding HumeLink has found more than \$4 billion (bn) worth of savings and uncovered significant shortcomings in Transgrid's previous cost estimates.

Based on these new numbers by Australian engineering consultancy, Amplitude Consultants, undergrounding the 360-kilometre (km) HumeLink transmission line in the Snowy to Southern region of NSW could be done, on a like-for-like basis, for \$7.3bn. This means Transgrid's costing for undergrounding in its report is overstated by 58%.

The new report [Humelink Undergrounding - Review of Transgrid Report and Costing for HVDC Alternatives](#) states that the multiple for undergrounding – using the revised costing – is 1.5 times the cost of the proponents preferred overhead line option.

An even cheaper solution

While the figures above are compelling, *Humelink Undergrounding - Review of Transgrid Report and Costing for HVDC Alternatives* identified an even cheaper underground option, which Transgrid itself had previously advised the Australian Energy Regulator (AER) was "credible". This could be delivered for \$5.5bn - which would mean almost no additional cost to consumers compared to overhead, but with long-term environmental and OpEx cost benefits.

A faster and cheaper option that meets the brief

Humelink Undergrounding - Review of Transgrid Report and Costing for HVDC Alternatives debunks Transgrid's concerns that undergrounding would cause significant delays, suggesting an underground HumeLink can be completed by August 2029, aligning with the timing needed to connect Snowy 2.0 to the grid and in line with the optimal timing identified by AEMO. The report highlights discrepancies in the schedule estimates provided by Transgrid and GHD.

When adding OpEx, underground is cheaper

The outdated nature of overhead transmission and its inefficiencies become clear when operational expenditure (OpEx), which includes maintenance costs and energy leakage, is considered.

Drawing on *Humelink Undergrounding - Review of Transgrid Report and Costing for HVDC Alternatives* OpEx figure of circa \$15 million (m) per annum and extrapolating publicly available information of OpEx costs for transmission, a simple calculation suggests undergrounding the 360km HumeLink line is evidently a cheaper solution.

Applying Transgrids average ratio of OpEx at 3.4% of CapEx over 50 years, and using a simple calculation, undergrounding could well be the cheapest overall option, before taking into account reduced losses and the significant and enduring environmental and community benefits.

A more resilient power system

Governments have a responsibility to deliver a power system which is resilient.

However, overhead power lines inherently lack resilience, as they are more susceptible to disruptions caused by storms and fires. The failures during these events could potentially lead to a widespread blackouts throughout the country, including our major capital cities.

Given the current climate emergency, the looming bushfire season and increase in natural disasters, it is imperative that the inherent risks associated with overhead transmission lines are properly considered.

The regulatory regime

The Australian Energy Regulator's regulatory framework mandates that proponents of transmission projects propose the most efficient option. Despite this, the regulatory process ignores important environmental and community impacts that must be taken into account to determine the project option that's best (least cost) overall for the people of NSW and Australia.

Even though it is stated that undergrounding "would be unlikely to receive regulatory approval," concrete evidence supporting this claim is lacking, with the precedent set by its approval of undergrounding in Victoria for Marinus Link suggesting differently.

The hidden costs of overhead

The financial cost debate of transmission infrastructure also fails to consider that the overhead proposal rips through habitats of endangered species, increases bushfire risks and jeopardises lives and local industries. Unfortunately, many critical environmental, operational and community costs are considered "externalities" by the industry and regulators, and are disregarded in assessing large infrastructure projects like HumeLink that have a lifespan of several generations, over 50 – 80 years.

These costs include:

- The destruction of habitat for more than 90 threatened and endangered species.
- Increased risk of bushfires.
- Life-threatening danger to firefighters from arcing during fires.
- Impossibility of effectively managing and controlling fires in the vicinity of overhead lines and infrastructure due to obstruction.
- Severe impacts on local industries, including agricultural, tourism and plantation forestry.
- Mental health and wellbeing impacts on local communities; and
- The continuing existence and value of natural regional landscapes for current and future generations.

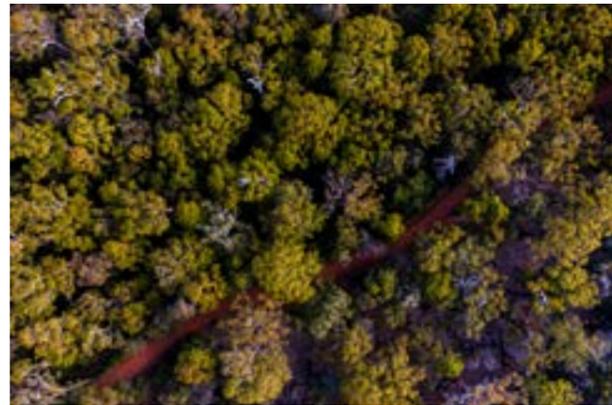
Taking into account all the costs including capital, operating, the environment and the community, it is clear undergrounding is by far the cheapest option.

Capital Costs of Undergrounding

New expert study slashes cost of an underground HumeLink by \$4.2 billion

- Transgrid's undergrounding costing report overstated by \$4.2bn.
- Transgrid's report claims are 57.5% higher than the new expert study.
- The new capital cost calculation is just 1.5x the cost of overhead, not the 10x multiple often claimed by Transgrid and repeated by a number of Ministers.
- Undergrounding reduces energy losses by 13.5%. This is important when transmitted energy is valued at a high level in peak periods.
- Undergrounding would result in minimal additional cost to electricity bills.

The independent costing report by highly respected Australian engineering consultancy, Amplitude Consultants, has shown that undergrounding the HumeLink project can be delivered for \$4.2bn less than that claimed in Transgrid's undergrounding report. This figure is exclusive of other significant benefits associated with undergrounding, such as ongoing OpEx requirements, eliminated bushfire risks, environmental and community costs.



The costings report, [HumeLink Undergrounding: Review of Transgrid Report and Costing of HVDC Alternatives](#), was authored by a team of three highly experienced Australian industry experts, including Mr. Les Brand who boasts over three decades of experience as an electrical engineer in the transmission and distribution sector in Australia and overseas. Throughout his career, he has held senior technical positions in various high voltage direct current (HVDC) interconnection projects, including Directlink (Australia), Murraylink (Australia), Basslink (Australia), and Trans Bay Cable (California, USA).

by GHD in 2022 and developed a high-level technical solution and cost estimate for Transgrid's preferred option (2A-1) at a much lower cost and in 2023 market terms. The most significant savings identified in the new report come from HVDC underground installed cable costings.

The report states: *"Comparing the cost per kilometre presented ... with our own estimates and other benchmarks such as the Australian Energy Market Operator (AEMO) TCD (Transmission Cost Database), it is clear*

The capital cost comparison

For *HumeLink Undergrounding: Review of Transgrid Report and Costing of HVDC Alternatives*, Amplitude conducted a thorough assessment of the undergrounding report commissioned by Transgrid and written

Project Variant	GHD 2A-1 Cost Estimate	Amplitude Modified 2A-1 Cost Estimate	Difference (\$AUD)	Difference %
CapEx Total	\$11,490,000,000	\$7,319,242,000	\$4,170,758,000	36.3%
Transmission Line CapEx	\$7,717,000,000	\$4,242,535,000	\$3,474,465,000	45.0%
Transmission Line CapEx/Km	\$11,349,000	\$6,239,000	\$5,110,000	45.0%

HumeLink Undergrounding - Review of Transgrid Report and Costing of HVDC Alternatives, Amplitude Consulting 2023

that even within the range of accuracy and considering current market cost pressures, the cost per kilometre used ... is excessive."

The \$7.3bn cost to deliver the current preferred route for HumeLink, connecting Maragle, Wagga and Bannaby as an underground HVDC solution, stacks up favourably compared to Transgrid's preferred overhead high voltage alternating current (HVAC) transmission lines, which they recently admitted had blown out to \$4.9bn.

These capital costs of both options do not include the costs of externalities for overhead nor the savings that will be achieved from undergrounding, such as:

- Benefits to threatened and endangered species of flora and fauna by reducing the HumeLink corridor from a 70-130metre (m) wide easement to one which will be close to a mere 15m;
- No risk of bushfires being ignited by overhead transmission lines;
- No obstruction risk in managing bushfires due to assets being safely located underground;

- No costs incurred from high voltage assets being damaged in fire and severe weather events; and and
- Improved mental health and wellbeing for landowners.

Further savings through credible option

HumeLink Undergrounding: Review of Transgrid Report and Costing of HVDC Alternatives also demonstrated the cost of delivering HumeLink underground could be further reduced by confining the project to a direct line from Maragle to Bannaby, which Transgrid itself defined in a report to the AER as a "credible option" that would meet the need of the project.

Amplitude's high-level cost estimate for the alternate Maragle to Bannaby underground option could be built for \$5.5bn while still fulfilling HumeLink's primary purpose of transmitting energy from Snowy 2.0 to Sydney's outskirts. This option has an even greater reduction in energy loss of 21% and OpEx, with only two converter stations.

The impact on power bills

Despite Transgrid perpetuating the myth that undergrounding will significantly impact consumers' power bills, it has not been able to qualify this in any way. Given the absence of any transparency regarding the impacts, we can make an estimate by extrapolating the information in Transgrid's own 2023-2028 Revenue Proposal - which indicates an annual cost of \$4.25 to be passed through to NSW Residents for HumeLink. When factoring in the cost multiple provided by Amplitude for the revised undergrounding capital costs, it suggests undergrounding costings could result in a modest annual increase of around \$2.50 compared to overhead. Hardly the "gigantic" increases Transgrid claims.



Source: Transgrid 2023 Revised Revenue Proposal, NSW Residential Bills

Delivering to Schedule

Undergrounding is viable from a cost perspective and is better for the environment and social fabric.

The *HumeLink Undergrounding: Review of Transgrid Report and Costing of HVDC Alternatives* report highlights it is also a solution that can be delivered on time to effectively support the national transition to renewables by connecting Snowy 2.0 to the grid, with immediate social license to construct and operate.

The Snowy Hydro 2.0 project – initially estimated at \$2bn, revised to \$5.9bn, and now with a staggering \$12bn price tag – has been significantly delayed.

Claims that undergrounding HumeLink would result in a delay of up to five years are simply not true. As highlighted by the Amplitude report, even GHD's report found that, at most, a HVDC option would only take an additional 1.75 to 2.75 years to build compared to overhead lines.

HumeLink Undergrounding: Review of Transgrid Report and Costing of HVDC Alternatives suggests that the GHD schedule for delivery is exaggerated based on comparisons with other projects. For example:

- While the GHD report assumed a traditional procurement process of 1.5 years, it contends that proven strategies can compress the duration to less than 1 year.
- The installation rate used by GHD to calculate the time to build was slow and “likely in line with construction of underground

cables in heavily populated areas” as opposed to the Murraylink project, which was much quicker.

- The one week allocated to installation of joints was more than double the time required for the Murraylink project.
- The commissioning time of more than 8 months, which GHD accounted for in its delivery estimates, is “significantly too long – Murraylink was commissioned in just one month” at a time when the technology was in its infancy. Amplitude believes commissioning for HumeLink could be done in less than “three months and even that is being conservative.”

Amplitude concludes that “Based on a decision now, this would mean completion by August 2029” – before it will be needed for connecting Snowy 2.0 and not too far off AEMO's modelling showing the optimal timing of HumeLink was 2028-29 in its Step Change scenario and 2033-24 Progressive Change scenario.

Significant schedule benefits are also expected by the community working with Transgrid to deliver an underground option on time, rather than fighting against the overhead option.

In the media on 8 September, it was reported that the project to construct a DC link to Singapore will include the construction of a factory to produce underground DC cable. This would be in sharp contrast to the overhead project which is sourcing everything except the masses of concrete internationally.



A Long-Term Cost Win

To date the cost discussion has focused on the capital costs alone - lifetime costs must be known and considered

- An underground HumeLink's ongoing operational cost will be significantly less than overhead transmission lines, when extrapolating available information and the application of simple math.
- According to *HumeLink Undergrounding: Review of Transgrid Report and Costing of HVDC Alternatives*, Amplitude suggests an OpEx of ~\$15m per annum for an undergrounded HumeLink based on the preferred route moting projects such as Murraylink and Directlink as benchmarks.
- Overhead OpEx could be significantly more when applying:
 - the AEMO assumed OpEx of 1% of the CapEx, which makes the annual cost \$35m.
 - Transgrid's average OpEx of 3.4% of CapEx, which makes the annual operation and maintenance cost \$120m.

When the ongoing costs for transmission line maintenance, ongoing operations, vegetation management, right-of-way management and savings from energy losses are considered, undergrounding using HVDC will have a significantly lower whole of life cost than Transgrid's preferred overhead solution.

As highlighted in the *HumeLink Undergrounding: Review of Transgrid Report and Costing of HVDC Alternatives* report, the OpEx costs contained in Transgrid's underground costing report are deemed “excessive” when compared to other comparable projects and reasonable forecast models.

Less energy loss from undergrounding

Amplitude raises concerns regarding the energy leakage, or energy loss, and operating cost assumptions presented in Transgrid's report. Of particular concern is the assertion that the “cost of losses for the HVDC options are similar or close to that of the AC options,” a claim that is in direct contrast to the experiences of other HVDC projects.

Further, the report states that the energy losses at maximum power from an underground HumeLink would be 13.5% lower than the equivalent Transgrid proposed overhead AC option. Even greater reductions in losses of 21.3% are expected with the direct Maragle-Bannaby option considered.

Saving 13.5% to 21.3% of the energy delivered by Snowy 2.0 will be critical to the evaluation of that project and the government's renewable energy transition plan.

The OpEx for an underground HumeLink

In its report, Amplitude contends that the annual OpEx attributed to underground the preferred HumeLink route is many “multiples more” than what is currently reported for operating standalone HVDC systems



in Australia. It says: “The forecast operating expenditure for Murraylink (180km) is circa \$5 million per year, which includes the O&M of both converters and the underground cables in between. Directlink (56km) is reporting at circa \$4.7 million per year for the same.”

Amplitude's experience with both local and international projects shows that the OpEx for underground HVDC transmission is not significantly tied to route length, and instead suggests the OpEx for an underground HumeLink would be circa \$15m. This is based on the fact that HumeLink has three times (3x) the number of converters than Murraylink. This \$15m OpEx requirement starkly contrasts the circa \$92m claimed in the Transgrid underground costing report.



The overhead OpEx comparison

The overall OpEx for HumeLink needs to be considered by the regulator and governments in determining the feasibility of transmission solutions.

Based on the OpEx costs of undergrounding being placed at \$15m by Amplitudes *HumeLink Undergrounding: Review of Transgrid Report and Costing of HVDC Alternatives* report and the publicly available information of OpEx for transmission, the ongoing costs will be less costly by going underground.

Transgrid uses a simple factor of 0.5% of CapEx to calculate OpEx in its PACR RIT-T modelling. This raises questions, especially considering that AEMO's OpEx assumptions and Transgrid's own average OpEx ratio are significantly higher.

Using the AEMO assumption of OpEx being at 1% of the total CapEx per annum, the operating costs for an overhead HumeLink would be circa \$35m per annum, more than two times the costs required to manage and maintain an underground solution.

However, when applying Transgrid's average OpEx spend of 3.4% of CapEx - as revealed in its recent Pricing Proposal to the AER - the ongoing costs of overhead would be circa \$120m per annum, or more than eight times of that required for an underground line.

The real costs of HumeLink

Extrapolating this out, undergrounding is clearly a viable option considering the long-term direct costs of both CapEx and 50 years of OpEx, particularly when applying Transgrid's actual average OpEx spend.

Simplified OpEx comparison

	CapEx	Annual OpEx*	OpEx - 50 Yrs*	TOTAL**
UNDERGROUND				
Amplitude Costings	\$7,319,242,000	\$15,000,000	\$750,000,000	\$8,069,242,000
OVERHEAD				
1% (AEMO Assumption)	\$4,890,000,000	\$35,000,000 [#]	\$1,750,000,000	\$6,640,000,000
3.4% (Transgrid Average)	\$4,890,000,000	\$120,000,000 [#]	\$6,000,000,000	\$10,890,000,000

* - Excludes Rate of Change and average capital refresh every 15 years. This does not attempt to undertake present value analysis, which would impact the total.

- Excludes biodiversity offsets from capital cost.

Responsibility for Resilience

Governments have a responsibility to deliver a power system which is resilient.

While HumeLink and other infrastructure projects under Rewiring the Nation are urgent and vital, it is critical that they must also be resilient.

However, it is well acknowledged that overhead power lines inherently lack resilience, as they are susceptible to disruptions caused by storms and fires.

The failure during such natural disasters could potentially lead to widespread blackouts throughout the country, including our major capital cities.

Given the current climate emergency, the increasing incidence of natural disasters globally such as storms and fires, and the concerns over a bushfire season that has begun a season early, it is imperative

for governments to carefully assess the inherent risks associated with overhead transmission lines.

In extreme conditions governments will be faced with a stark choice of shutting down capital cities or exposing regional communities to extreme danger, death and destruction.

Furthermore, constructing HumeLink as an overhead option runs counter to the principles of sound engineering design endorsed by the Australian Energy Market Operator (AEMO).

Undergrounding eliminates the risk of power transmission interruptions during severe weather events, thereby enhancing transmission security and resilience as mandated by the Security Legislation Amendment (Critical Infrastructure Protection) Act 2022 (SLACIP Act).

Regulatory Regime need not be a Barrier

While the regulatory regime around energy has been pointed to as a barrier for undergrounding, given the exaggerated costs perpetuated by Transgrid, such belief is highly questionable.

The rules, overseen by the AER, require proponents of transmission projects to propose the most efficient option.

Despite the NSW Parliamentary committee report finding that undergrounding "would be unlikely to receive regulatory approval," there is no concrete evidence to back that up.

The AER's stance on whether undergrounding HumeLink would be feasible has been intentionally ambiguous. During the Inquiry hearings, the AER didn't categorically rule out the undergrounding option for HumeLink.

While there may have been hesitancy to provide definitive guidance, the AER did not outright dismiss the possibility of undergrounding and instead, their position was largely contingent on the alleged high construction and operational costs, rather than any assessment of costs to the environment and communities. When asked about prospects of approval on undergrounding, the AER's Deputy Chair, Jim Cox, said "Where undergrounding has met prudent and efficient costs, the AER has previously considered and approved undergrounding works. Overall, we make our decision after considering multiple factors, such

as the extent and level to which a network business engages with community consultation, weighing up prudent and efficient costs, network reliability and taking into account the necessary safety standards."

Another underground transmission project approved by AER

Already there is precedence for underground transmission projects receiving the regulators approval, with the AER's approval of the Marinus Link project, which incorporates some 90km of underground cables in Victoria. This demonstrates that undergrounding is not an insurmountable regulatory hurdle, as it has been depicted. The divergence in regulatory treatment between Marinus and HumeLink raises questions regarding the assumptions made about HumeLink's feasibility and the regulatory landscape itself.

While the regulatory landscape presents challenges and considerations, it does not categorically disqualify undergrounding as an option. Any assessment of the regulatory feasibility of undergrounding HumeLink should be comprehensive, account for all relevant factors and be founded on the facts – not the now debunked figures provided by Transgrid in their undergrounding report.

Externalities

In considering the most feasible solution for transmission in terms of financial, social and environmental factors, it is important that externalities are fully factored in. Yet, to date, externalities have been disregarded.

Undergrounding - Substantial savings for the environment

An overhead HumeLink will:

- Have devastating environmental impact, on 48,322 ha of land (483.22 square km).
- Require the clearfelling of large tracts of land including removal of 670.21 ha of native vegetation.
- Invade and destruct habitats for 91 threatened or endangered species of flora and fauna.
- Increase greenhouse gas emissions through land clearing, the carbon-intensive materials and heightened risk of bushfires.

The national environmental impact to construct an overhead HumeLink is immense. According to Transgrid, 48,322 hectares (ha) or 483.22 square km of land – the equivalent of 67,678 football fields – will be impacted to construct HumeLink’s overhead transmission lines.

HumeLink is expected to have a significant impact on Matters of National Environmental Significance. According to its own Environmental Impact Statement (EIS), this will include the destruction of around 670.21ha of native vegetation during construction and would impact 90 Aboriginal heritage sites and potential archaeological deposits within the project footprint.

Dozens of towns and communities will be impacted, including Wagga Wagga, Tumut, Adelong, Adjungbilly, Batlow, Bookham, Yass, Gunning and Bannaby, as well as national parks, state forests and prime farming land.

In contrast, undergrounding will significantly reduce negative environmental impacts due to a smaller easement and fewer ongoing clearing requirements. According to Amplitude’s report, the trench profile is two 1.5m wide trenches, separated by 1 metre, and dug to a depth of 1.25m. Based on this and allowing for an access track, the easement required would be close to 15m. This starkly contrasts the clear-felled easement needed for overhead lines, which spans between 70m to 130m. In addition, the construction process is likely to be less damaging to the environment without the need for huge crane pads to allow the erection of the approximately 900 towers currently planned by Transgrid.

Wildlife and biodiversity

The current proposal will invade and devastate a significant section of Southern NSW’s landscape, including national parks, conservation areas, nature reserves and state forests.

According to Transgrid’s EIS, this proposed path is home to 91 threatened or endangered species of flora and fauna. Climbing and flying threatened animals and protected species are particularly

vulnerable to overhead transmission lines as they disturb the flight of birds and the movement of climbing animals. Given the wide easements required for the transmission lines, there is also a risk of confining threatened species to small habitats that are unviable for long-term survival.

Also at risk are critically endangered flora, a tract of the endangered ecological community, remnant native vegetation areas, a nationally important wetland, and land that has been rehabilitated through Landcare government-funded projects.

The *State of the Environment* report highlights that the number of threatened plant and animal species has risen, and further extinction of Australian species is expected; therefore, it is critical that all large, high-impact infrastructure projects in NSW minimise destructive environmental impact as a priority.

Deforestation in the name of renewable energy

In addition to vegetation clearing along the proposed project path, it is expected around 400ha of prime timber plantations will also be cleared to allow for the proposed transmission route. These impacts go far beyond the destruction of the environment, with implications also to the local industry, economy and community (see page 13).

Greenhouse gas emissions

This clear felling of land directly contradicts scientific research demonstrating that vegetation clearance directly contributes to a warming and changing climate. As does the manufacture of construction materials like carbon-intensive concrete and steel.

But by far, the greatest risk of increased and unnecessary greenhouse gas emissions is due to the tremendous bushfire risk presented by the transmission towers. Assessments of the 2019-20 summer bushfires suggest that more than a year’s worth of Australia’s greenhouse gas emissions were released during the devastating event. This cannot be ignored – it is of global significance and concern (see page 11).

The cost of overhead causing fires & impeding their control

- Powerline-related faults cause 2-4% of all rural fires in Australia, rising to 50% when weather conditions elevate fire risk.
- Overhead lines obstruct firefighting efforts and are a safety concern for firefighters.
- The cost of the 2019-20 Australian bush fire season, ‘Black Summer’, has been estimated at \$230bn and it’s suggested this single event contributed more than a year’s worth of Australia’s greenhouse gas emissions.
- The risk of transmission lines sparking fire is real and evidenced with Transgrid:
 - Requesting funding approval from the AER to address issues on a transmission line to avoid the risk of a failed component sparking a fire.
 - Referencing a 2018 fire in California that resulted from failed transmission infrastructure which “destroyed 18,804 structures, resulted in 85 fatalities and billions in damages for the network operator.”

Bushfires have cost hundreds of billions of dollars. The extra cost of undergrounding HumeLink pales into insignificance if even one fire is prevented or controlled because HumeLink is underground.

Transgrid’s overhead proposal impacts many bushfire-prone regions and will increase their susceptibility to devastating bushfires in the future: posing life-threatening risks for firefighting; impeding fire prevention and management; and risking terrible environmental impacts.

The additional fire risk overhead transmission lines create will increase over the project’s lifespan as global warming and climate change intensify. These risks include:

- Serving as ignition sources for fires.
- Jeopardising firefighter safety under and around the towers.

- Restricting firefighting access and ability to use aircraft, water and equipment near overhead lines.
- Exposing people and communities to an even higher level of risk in the event of fire with dangerous overhead transmission arcing and obstructing escape routes.
- Limitations on back burning and hazard reduction activities.
- Compromising power security for users in case of transmission equipment damage or shutdown.

A real concern

Transgrid’s dismissal of fire concerns during the Inquiry contradicts compelling evidence from frontline volunteers. Moreover, it conflicts with its own Revised Revenue Report 2023-28, which recommends a \$61.5m investment to address condition issues on the transmission



line, thereby mitigating the risk of a failed component sparking a fire in this bushfire-prone area. This contradiction is evident in the same revenue report, which references a 2018 incident in California where a failed transmission attachment fitting ignited a fire that led to 18,804 structure destructions and 85 fatalities, incurring billions of dollars in damages.

Investigations into recent destructive bushfires found that powerline-related faults cause 2-4% of all rural fires in Australia. However, this figure rises to 50% when weather conditions elevate fire risk.

The potential of bushfires from overhead is also acknowledged in Transgrid's EIS which states: *“Managing safe clearances from transmission line infrastructure reduces the potential for a fire to start, thereby maintaining public safety, assets, environmental values, and electricity supply.”*

Transgrid's contradictory stance in the Inquiry and its dismissal of overhead line fire risks in public statements are misleading in light of its own reports and documentation. Additionally, undergrounding eliminates the risk of power transmission interruptions during severe weather events or bushfires, thus enhancing transmission security and resilience as mandated by the Security Legislation Amendment (Critical Infrastructure Protection) Act 2022 (SLACIP Act).

The construction of Humelink as an overhead option violates AEMO's principles of good engineering design. One of two criteria for resilience in transmission planning is 'do no harm'. This is stated as *“ensuring that any new infrastructure does not lead to unsustainable deterioration in grid resilience. Building additional transmission lines along a bushfire prone transmission corridor would be an example of resilience deterioration”* (AEMO, 2020 ISP, Appendix 8, p15). As much of Humelink is being constructed in a bushfire prone corridor, undergrounding Humelink is consistent with grid resilience.

Fires start from “arc-ing”

Overhead transmission lines pose the risk of igniting fires through arc-

ing, combustion of metal particles, burning of insulation fluids and vegetation contact with wires. It is noted that the arc distance for a 500kV overhead line hit by lightning is up to 50m from the tower's base. In comparison to other sources, bushfires caused by overhead transmission lines have been shown to burn larger areas of land and exacerbate bushfire events.

As outlined in [Why are we super-charging bushfire risks in a changing climate? The shocking truth about the risks of overhead transmission lines on fire-prone communities](#), several inquiries have linked powerlines to major bushfires. For instance, an NSW Inquiry into the 'Black Summer' bushfires found that the NSW Rural Fire Service (RFS) attributed powerlines as the cause of some of the larger, destructive fires. Similarly, an investigation into four emergency-level fires in Western Australia identified overhead transmission lines as the cause of two fires. The 2009 Victorian Bushfire Royal Commission revealed a history of electricity assets causing bushfires in the state, including five of the eleven major fires during the Black Saturday bushfires— a concerning pattern with deadly consequences.

The financial threat of powerline sparks

The financial ramifications of powerline-caused sparks are substantial. The 'Black Summer' bushfires in Australia impacted over 24 million ha of land, led to the death or displacement of around three billion animals, and directly or indirectly claimed more than 450 lives. In NSW, almost 2,500 homes were destroyed, leaving profound impacts on communities, farmers, businesses, and bushland.

Deloitte Access Economics estimated the tangible and intangible costs of Victoria's Black Saturday bushfires at \$7.6bn. Extrapolation places the cost of the 2019-20 'Black Summer' bushfires at \$230bn. The Fire on the Farm report by the Worldwide Fund for Nature-Australia and the University of Sydney estimates that agriculture alone suffered losses ranging from \$4-5bn.



The impact to regional communities & industry

An overhead Humelink will result in:

- Local business unable to get business insurance.
- 400 ha of sustainable plantation timber lost.
- \$80m worth of timber products and 8,000 tonnes of resources lost.
- Impacts on valuable tourism businesses.
- Productivity of agricultural land reduced or stopped.

Local communities feel intimidated by the current proposal which threatens local industries and jobs.

The project has heightened anxiety in impacted communities, with some people having thoughts of suicide as they fear destruction to their livelihoods, family homes and properties that have been held dearly in their hearts for generations.

At evidence to the Inquiry, a third-generation resident and small tourism operator who lost her home and farm stay business in the Dunns Road mega fire of 2019-20, Anne Hallard, said: *“Transgrid's proposal to aboveground 78-metre-high transmission towers and wires, is the next wave of devastation for our region, even before we've had the chance to fully recover mentally, environmentally, financially and socially from three and a half years ago.”*

Business insurance: The fire risks associated with overhead transmission lines are well-recognised by insurers. It is understood they are considering refusing to insure farms directly affected by the overhead lines or significantly increasing the premiums to landowners in the project's path. Without insurance, these businesses may not have access to bank finance, threatening the viability of their operations into the future.

Tourism: While the Snowy Mountains and Tablelands have been selected as iconic locations to promote regional Australia, their tourism status was not treated as a serious consideration in Transgrid's Humelink proposal. Tourism is a major growth industry for regional NSW with revenue \$14.3bn in 2019 alone, and visitors increasing by 41% from 2014 to 2019. Many farmers in The Snowy Valleys are pivoting to Agri-Tourism ventures, and Humelink threatens this local growth industry. After the 2019-20 fires, there has been significant government investment in these communities for growth in tourism and resilience.

Agriculture: Humelink will impact the region's productive farmlands, which significantly contribute to local employment and the State's food production and economy. Transgrid's EIS confirms that in addition to the removal and clearing of land, there will be disruptions to aerial agricultural operations, cultivation, crop establishment and husbandry, as well as biosecurity risks through the spread of pests, weeds and diseases from vehicles and workers. These impacts will affect agriculture long-term as property use and access are restricted or removed entirely due to the new transmission line easements. Where deep history has played a part in growth and success, such as stud stock cattle/sheep with historic breed lines, and vineyards with their ageing and long-producing grapevine varieties, this cannot simply 'be replaced' if lost.

Plantation forestry: According to the Softwoods Working Group, the total plantation area lost under the current overhead proposal is almost 400ha, with even more exposed to increased bushfire threat from the transmission lines as they inhibit firefighting. The plantations directly impacted are some of the best plantation areas in the region. One full crop represents a loss of 240,000 tonnes of wood (100kt pulp/140kt sawlog), equating to around \$80m worth of timber products. On an annual basis, approximately 8,000 tonnes of resource would be lost to the softwood processing industry, which is a foundational driver of the regional economy of this area. In 2019, this industry was assessed as supporting (directly and indirectly) over 50% of the employed workforce of Snowy Valleys Shire (Schirmer et al., 2020). The bushfires of 2020 destroyed 40% of the resources on which this industry is based, and significant efforts have been made over the past three years (including financial support from the NSW and Australian Governments) to maintain the industry. Any further resource loss could result in closures and social and economic loss for the regional community.

Supporting emerging renewable projects with freed up transmission

Chair of Electricity Transmission at the University of Queensland, Professor Simon Barlett, explained recently, *“It's like building a major freeway. You have ramps for getting on and off at long distances apart. You don't keep stopping and weaving through towns because you congest the interconnection, and you congest the local network”.*

Amplitude consultant Les Brand agreed, explaining that his company was involved in an international project that had adopted the same principle - using the existing AC network to increase flexibility and efficiency of transmission from a new Hydro project.



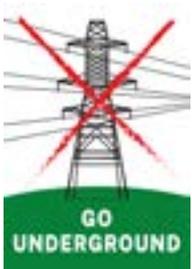


Maintaining land use

The visual impact of high voltage overhead vs underground is stark as demonstrated by the above images. Despite claims of undergrounding “sterilising” land, up-to-date independent expert advice is clear that the impact of the modern undergrounding technology is minimal. Independent expert Les Brand of Amplitude Consultants states HVDC underground cable trenches are less than 2m wide. For the delivery of Humelink, the total easement required will be 15 metres – or 4.5 times less than the minimum of 70 metres for an easement for overhead solutions. However, it’s also important to note that in the Humelink EIS it states that easements for the overhead solution could be up to 130 metres along parts of the route.

Unlike overhead, the easements for undergrounding do not sterilise the land, with the only restriction on the easement being that no deep-rooted trees can be planted within the corridor width plus 2 metres. Apart from that there are no limitations for cultivation, including agricultural. Studies have shown that underground cabling has no impact on crop yields.

Climate change is real and we need real solutions that last



Stop! Rethink Humelink
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