Submission No 106

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

Organisation: HumeLink Alliance Incorporated

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HumeLink Alliance Inc.

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The Hon Emily Suvaal, Committee Chair,
Inquiry - Feasibility of undergrounding the
transmission infrastructure for renewable energy projects
Standing Committee on State Development
Parliament House
6 Macquarie Street
SYDNEY NSW 2000

14 July 2023

Dear Committee Members,

Undergrounding – the least cost option: ***the benefits of removing the negative impacts of overhead transmission lines***

Thank you for the opportunity to present to the committee the real facts of undergrounding transmission infrastructure, to assist it in determining the cost and benefits of undergrounding, the impacts to delivery timeframes and learnings from domestic and international undergrounding projects, as set out in the Terms of Reference.

For three and a half years, our communities have been told many reasons why HumeLink must cut an ugly scar through 360 kilometres of beautiful landscapes with:

- 80-metre-high towers replacing trees;
- important habitats for endangered species being clear felled; and
- productive agricultural land being ripped apart.

We've heard that going underground was not technically possible, and then arguments including that it's less reliable and impossible to repair faults, or that it would prevent other renewables connecting in the future. All of these have proven to be nothing but wrong, when fact checked by independent underground cable experts.

As the momentum for undergrounding gained traction, we then heard it was deemed too expensive, would have a significant impact on household's electricity bills and that it would delay the transition to renewables.

We argue that undergrounding is the least-cost option for NSW, that for efficient outcomes in the electricity market the price of electricity must include all costs, and an underground option will be delivered on time.

As the representative for HumeLink Alliance Inc., I welcome this inquiry as it will ensure the feasibility of undergrounding transmission infrastructure is a decision made by the government for

the people - not a decision made by a foreign owned Transmission Network Service Provider for the benefit of its shareholders.

Executive Summary

Undergrounding HumeLink is the least cost option when the environmental and community costs of overhead lines are taken into account.

Governments overseas that are undergrounding transmission are doing so because it is the least-cost long term solution.

All environmental and community impacts of transmission lines need to be factored into the cost of projects for efficient outcomes in the national electricity market (NEM). The currently Rules of the NEM mean the cost-benefit analysis of projects aren't taking into account all the environment and community costs. This is inconsistent with NSW government cost-benefit analysis policy and is leading to the wrong project decisions.

Transgrid has demonstrated that their statements about costings cannot be relied upon:

- Initially Transgrid said the cost of undergrounding would be 10 times the cost.
- In June 2022, in a report published online, Transgrid reported the undergrounding cost at $18.7 billion for a HVDC option.
- Transgrid revised the report, and released it two months later, reducing the cost by some $7.2 billion to $11.5 billion.
- The GHD/Transgrid undergrounding costs were estimated in 2022, and were compared with the overhead costs estimated in 2020, which significantly overstates the cost difference of the underground option. There has been a sudden and dramatic rise in electrical manufacturing costs since 2020 which needs to be factored into the cost of the overhead option.
- Even after releasing its revised report showing the cost differential of 2.9 times, Transgrid continued to provide highly inflated costings, with a letter to the CCGSC quoting the "costs of underground cables are approximately four to 25 times higher than overhead lines."
- Two independent experts, who reviewed the costs in the GHD/Transgrid HumeLink undergrounding report before it was released, believed the costs reported to be significantly overstated.
- The cost estimates for the underground cable components used in Transgrid's revised costing were significantly higher than values reported in the AEMO Transmission Cost Database (which was developed by GHD, the same consultant that did the undergrounding study).
- In response to the Community Consultative Groups representatives on the HumeLink Undergrounding Steering Committee (CCGSC) questioning the costs, GHD stated that "publicly available info on non-Australian UG cable projects such as SuedLink in Germany was reviewed and …. costs indicated potentially 50% less than our study estimates".
- Conversely the $m/km costs in the GHD undergrounding study are 100% above the Suedlink Germany project, and significantly greater than other international undergrounding projects.
- The community is in the process of getting the GHD/Transgrid HumeLink undergrounding report expertly reviewed.

Further, claims of undergrounding threatening the transition to renewables are also at odds with reality.

- Snowy 2.0 has been seriously delayed. The planning of HumeLink assumed that Snowy 2.0 would be available from 1 July 2025. Now Snowy 2.0 won't be completed until December 2029, four and a half years later.
- Undergrounding HumeLink will give social licence and will mean that communities will be working with Transgrid and AEMO to deliver HumeLink on time.
- In California, PG&E expect it will have undergrounded more than 600 miles (965km) of distribution and transmission lines by the end of this year, having only started the process in mid-2021.
- The Integrated System Plan (ISP) says the optimal timing for HumeLink is 2028-29 in the Step Change scenario and 2033-34 in the Progressive Change scenario.
- The Step Change scenario which assumes rapidly falling costs of energy productions, is inconsistent with what's happening in the real world, making the Progressive Change 2033-34 timing of HumeLink more likely to be optimal.
- HumeLink can be delivered as an underground option, without delaying the transition to net zero emissions.
- Significant delays to HumeLink as an overhead line will likely occur because of community opposition to the overhead line option.

1. Introduction

The proposal to build HumeLink as an overhead transmission line has so many issues associated with it – from increasing the risk of bushfires in fire prone regions, to threatening endangered species, and destroying regional communities, the productive efficiency of agricultural and tourism industries.

Whenever these very real and important issues are raised, the proponents that are recommending scarring 360km x 70 metres of beautiful landscapes and replacing trees with 80+ metre high old technology towers simply claim, that taking the transmission underground is too expensive.

The reality is that these claims are wrong.

There are two problems with the assessment of the underground option as follows:

1. Cost of the underground option has been significantly overstated; and
2. All the non-market costs of overhead transmission for the next 80 – 100 years are not assessed in the regulatory investment test for transmission (RIT-T).

Experts and global experiences highlight that the claimed cost of undergrounding HumeLink – a key argument being used to dismiss going with the globally recognised best practice of undergrounding electricity transmission infrastructure – is greatly exaggerated, and should not be relied on in determining how HumeLink and many other planned transmission projects are delivered.

Governments overseas and private companies in Australia have come to the conclusion that when you take into account all the non-market costs of overhead transmission lines (bushfires, biodiversity, visual amenity, regional development, tourism, and agricultural productivity) for the next 80-100 years, undergrounding is the preferred option.

2. A track record of exaggeration

2.1. Cost of undergrounding

Initially, NSW's transmission network service provider, Transgrid, was claiming taking HumeLink underground would be "in the order of ten times higher in magnitude than overhead lines", (Transgrid, *Transgrid response to Kyeamba Concerned Landowners Group Manifesto*, October 2021).

Fast forward to June 2022, in a report that Transgrid published online prior to consultation with the Steering Committee, and subsequently retracted based on questions by the Steering Committee, reported the undergrounding cost being at around $18.7 billion for a HVDC option.

Its revised report released just two months later saw the cost reduced by some $7.2 billion to $11.5 billion (see Table 1 below that provides the $m/km cable costs behind these project costs).

Table 1: Transgrid's declining $m/km cost estimates for underground cables, 2022

	Single circuit costing	Double circuit costing
Transgrid's Initial costing June 2022	$21.35m/km	$42.7m/km
Transgrid's Revised costing August 2022	$11.35m/km	$22.7m/km

Two independent experts, who reviewed the costs in the GHD/Transgrid HumeLink undergrounding report before it was released, believed the costs reported to be significantly overstated.

Even though the 2022 GHD/Transgrid HumeLink undergrounding study showed the cost to be 2.9 to 3.5 times the cost of overhead, Transgrid has persisted with quoting wildly exaggerated multiples. In the respond to the community representatives on the HumeLink undergrounding steering committee, Transgrid refers to four to 25 times the cost.

While their calculated costings on undergrounding kept sliding down, the reality is the costing is still exaggerated, based on independent experts and global experiences, and cannot be relied on – for making the best decision for now and for future generations.

Transgrid's track record with costs has been wrong before – as demonstrated in its submission to the revised revenue proposal, when it found a $1.6 billion savings in cost on that provided in the initial revenue proposal after questions asked (Transgrid, 2023-28 Revised Revenue Proposal, December 2022, p3).

2.2 The relative cost of underground cables and overhead lines

The GHD/Transgrid undergrounding costs that were estimated in 2022, were compared with the overhead costs estimated in 2020, reported in the Project Assessment Conclusions Report (PACR). This significantly overstates the cost difference of the underground option.

The PACR 2020 cost estimate of HumeLink as an overhead line is $3.3 billion[1]. However since 2020, when the overhead cost was estimated, there has been a sudden and dramatic rise in electrical manufacturing costs.

Figure 1 below shows that since June 2020 electrical equipment manufacturing has increased by 35%. A 35% increase in the cost of HumeLink as an overhead option would have the cost now at around $4.4 billion, meaning that the cost difference for undergrounding, quoted by Transgrid, is greatly exaggerated.

Figure 1: Producer Price Index Electrical Manufacturing

2.3 The real cost of undergrounding transmission

The pricing in the undergrounding report is significantly higher than local advice and that being experienced by undergrounding projects internationally.

Not only did two independent experts consulted in the undergrounding study state that the undergrounding study costs were too high, but they were close to double the AEMO indicative underground cable costs.

- AEMO publishes a **price book of indicative costs**. The consultant that estimated the **indicative underground cable costs** for AEMO was GHD, the **same** consultant that did the HumeLink undergrounding study. When challenged on the fact that the costs in the HumeLink undergrounding study are well above the AEMO price book, GHD said something like the 'prices in the AEMO price book weren't reliable'.
- Technical experts, assisting the community on the Steering Committee, didn't agree saying, the underground cable costs in the price book had been review by industry/stakeholders before being published.

[1] The 2020 cost of Humelink as an overhead option in the PACR was $3.266 billion and was escalated by the CPI of 1.57% to derive a 2021 cost of $3.317 billion.

As previously stated, governments throughout the world are choosing undergrounding based on analysis of all costs, including environmental and social costs and conclude that undergrounding transmission is the cheapest long-term solution. The construction costing of undergrounding is also significantly less than that being reported by Transgrid for HumeLink.

- Media reports on California's PG&E undergrounding project of both transmission and generation, puts the costs of undergrounding at of $3.75 per mile and that this is expected to be further reduced to $2.5m per mile by 2026.
- A report by the California Public Utilities Commission states undergrounding can range from $1.85 million to $6.072 million per mile.
- GHD stated, in their final comments to the Steering Committee, that "Publicly available info on non Austrailan UG cable projects such as SuedLink in Germany was reviewed and … costs indicated potentially 50% less than our study estimates". Conversely the costs in the GHD undergrounding study are 100% above the Suedlink Germany project.
- Even with building in a buffer – to cover inexperience in labour – coming close to Transgrid's costs can't be reached based on independent costings nor reported costings of other projects.

2.4 Errors in the RIT-T cost-benefit analysis of HumeLink as an overhead line

There have also been serious questions raised about the accuracy of the costs in RIT-T cost-benefit analysis of the overhead option.

In the PACR, HumeLink was assessed as having a net benefit of $39m (excluding competition benefits[2]). This is a tiny net benefit for a $3.3 billion project, before environmental and community costs. Further this net benefit was estimated assuming:

- Snowy 2.0 would be operating from July 2025, when it's now delayed until at least December 2029;
- Snowy 2.0 was a sunk cost, and so without cost;
- an overly optimistic capacity factor for Snowy 2.0; and
- a wrong per annum Opex assumption of 0.5% of Capex, when AEMO assumes 1% in the ISP and Transgrid's five year average is 3.5%.

Correcting for these modelling errors, means HumeLink has a net cost, even before the environmental and community costs are added.

The reported $39m net benefit (excluding competition benefits, and environmental and community costs), speaks to the fact that HumeLink is not critical to the transition to net zero emissions. The modelling is saying that compared to the base case, where there is no HumeLink, electricity consumers are better off by only $39m with HumeLink. If HumeLink was critical, it would have a

[2] The Australian Energy Market Operator (AEMO) consulted with stakeholders on the inclusion of competition benefits in the Integrated System Plan (ISP) and has excluded competition benefits '*due to the significant uncertainty surrounding key assumptions*', (Draft 2022 Integrated System Plan, AEMO, December 2021, p83).

much bigger net benefit. $39m is merely the value of two or three average houses in the suburb of Mosman, Sydney.

The $39m net benefit of HumeLink is predominantly due to avoided fuel, storage and generation costs. It begs the question whether NSW would be better with Tesla batteries near the load centre of Sydney, rather than a big water battery remote from where the energy is needed, requiring a massively environmentally destructive transmission line.

See attached the HumeLink Alliance Inc. submission to the HumeLink Contingent Project application with more detail on issues with the RIT-T cost-benefit analysis of HumeLink as an overhead line.

2.5 Net benefit of HumeLink in the 2022 ISP

While Transgrid reports a net benefit of HumeLink of $39 million, AEMO in the 2022 ISP reports a net benefit (excluding competition benefits, and environmental and community costs) for HumeLink of $1.3 billion.

Industry experts say the RIT-T modelling is more robust than the ISP modelling and the $1.3 billion figure can't be relied upon.

The modelling by AEMO, to determine the market benefits of projects in the ISP, involves a sequential modelling process. Initially an oversimplified model for the transmission network, with exaggerated transmission limits on the interstate transmission network, is assumed. When the outputs of this modelling are fed into the more detailed, hour by hour simulation modelling, it leads to overstated benefits of State interconnectors.

2.6 HumeLink is not in the top ranked candidate development path

HumeLink isn't in the top ranked candidate development path (CDP) in the 2022 ISP. It is in the second ranked CDP, but not again in a CDP, until the ninth ranked CDP. AEMO has defined the second ranked CDP as the optimal development path (ODP). If HumeLink was as critical, as AEMO argues, it would be in all of the top ranked CDPs.

Table 9 The candidate development paths (unchanged from the Draft ISP)

In these CDPs …		… these projects would be actionable					
		New England REZ Transmission Link	Sydney Ring	Marinus Link	VNI West	HumeLink	Gladstone Grid Reinforcement
Least-cost CDPs in each scenario							
1	Progressive Change least-cost	✓	✓				
2	Step Change least-cost	✓	✓	✓	✓		
3	Hydrogen Superpower least-cost	✓	✓	✓	✓	✓	✓
4	Slow Change least-cost	✓					
Testing variations to test timing of project delivery and/or event-driven scenarios							
5	CDP1, adding Marinus Link	✓	✓	✓			
6	CDP1, adding VNI West	✓	✓		✓		
7	CDP1, without New England		✓				
8	CDP2, adding HumeLink	✓	✓	✓	✓	✓	
9	No actionable projects						
Testing the staging projects with early works							
10	CDP5, with VNI West staged	✓	✓	✓	✓ Staged		
11	CDP8, with VNI West staged	✓	✓	✓	✓ Staged	✓	
12 (ODP)	CDP10, with HumeLink staged	✓	✓	✓	✓ Staged	✓ Staged	
13	CDP12, removing Marinus Link	✓	✓	✗ Never available	✓ Staged	✓ Staged	

Table 10 Weighted net market benefits of CDPs across scenarios for the Draft ISP ($ billion)

CDP	Description	*Slow Change*	*Progressive Change*	*Step Change*	*Hydrogen Superpower*	Weighted Net Market Benefits	Rank
	Scenario weighting	**4%**	**29%**	**50%**	**17%**		
10	CDP5, with VNI West staged*	3.52	16.35	25.59	70.01	29.58	1
12 (ODP)	CDP10, with HumeLink staged	3.35	16.20	25.59	70.20	29.56	2
2	Step Change least-cost	3.25	16.26	25.59	70.01	29.54	3
5	CDP1, adding Marinus Link	3.71	16.51	25.51	69.60	29.52	4
6	CDP1, adding VNI West	3.62	16.47	25.59	69.37	29.51	5
1	Progressive Change least-cost	4.17	16.72	25.50	68.95	29.49	6
7	CDP1, without New England	3.94	16.67	25.49	68.45	29.37	7
4	*Slow Change* least-cost	4.34	16.50	25.41	68.73	29.35	8

Source: AEMO, 2022 ISP, p81, 82.

Comparing Table 9 and 10 above, not only is HumeLink not in CDP 10, the top ranked CDP, it also isn't in CDPs ranked 3 to 8, that is CDPs 2, 5, 6, 1, 7 and 4.

Again, if HumeLink was critical for the transition to net zero, it would be expected to be in the top ranked CDPs.

2.7 Unrealistic assumptions in the cost-benefit analysis of transmission

Highly questionable assumptions are being made when modelling the cost and benefits of transmission projects. For instance, even though electrical manufacturing costs have increased significantly in the last years (see Figure 1, above), the Step Change scenario, that AEMO describes as the most likely scenario, has the following assumptions:

Step Change – rapid consumer-led transformation of the energy sector and co-ordinated economy-wide action. Step Change moves much faster initially to fulfilling Australia's net zero policy commitments that would further help to limit global temperature rise to below 2°C compared to pre-industrial levels. Rather than building momentum as Progressive Change does, Step Change sees a consistently fast-paced transition from fossil fuel to renewable energy in the NEM. On top of the Progressive Change assumptions, there is also a step change in global policy commitments, ***supported by rapidly falling costs of energy production****, including consumer devices. Increased digitalisation helps both demand management and grid flexibility, and energy efficiency is as important as electrification. By 2050, most consumers rely on electricity for heating and transport, and the global manufacture of internal-combustion vehicles has all but ceased. Some domestic hydrogen production supports the transport sector and as a blended pipeline gas, with some industrial applications after 2040, (2022 ISP, AEMO, p31).*

The assumption of rapidly falling costs of energy production is contrary to what's happening in the real world.

The Step Change scenario, with the rapidly falling costs of energy production assumption, is associated with large net benefits of transmission projects, and is being used to push for a rapid build of transmission lines. Looking at what's actually happening on the ground, the more likely scenario is one that doesn't assume rapidly falling costs of energy production – possibly the Progressive Change scenario.

3. Operational benefits of underground cables

There are also operational benefits of underground cables which offset any additional underground construction cost.

- Lower energy losses;
- Greater system security;
- Improved reliability; and
- Less ongoing maintenance.

These are discussed in turn below.

3.1 Energy losses

Studies indicate that HVDC underground cables have less transmission losses than AC overhead lines and so will have offsetting operational benefits over the life of the project. A paper by Amplitude Consultants determined that at maximum power output, the losses of a HVDC system are expected to be approximately 2.49%, while the losses of an AC overhead option are expected to be 7.5%, (Amplitude Consultants, *Western Victorian Transmission Network Project High-Level HVDC Alternative Scoping Report*, June 2021).

Losses are a considerable ongoing cost of transmission. Reducing losses by three times is a substantial benefit of HVDC underground cables.

3.2 System security

Undergrounding transmission eliminates the risk of interruption to power transmission in severe weather events and/or bushfires and therefore improves transmission security and resilience as required under the SLACIP Act . This is important benefit where 500kV double circuit lines parallel existing 220kV or 330kV lines, as is the case with HumeLink. By diversifying the installation method, undergrounding rather than overhead, system security, as required under the SLACIP Act, is improved.

3.3 Reliability

Underground cables are more reliable than overhead transmission lines. Transgrid has said the lights will go out with underground cables, as if there is a failure as a repair can take months. This is simply not true. While it does take longer to repair underground cables (weeks not months), underground cable systems are designed with 100% redundancy. If one circuit fails, there is a second circuit to take the load.

Whereas if an overhead transmission line tower goes down in severe weather or a bushfire, both circuits will be lost, and then the lights will go out.

A study by Moorabool Shire Council estimated the forced outage of overhead and underground as follows:

- 'Forced outage rate for the 75 km of double circuit overhead line is calculated as 2.25 incident per annum….
- Forced outage rate for the 75 km of double circuit underground cable is calculated as 0.79 incident per annum', (*Moorabool Shire Council Comparison of 500 kV Overhead Lines with 500 kV Underground Cables*, September 2020, p8).

3.4 Ongoing maintenance

Maintenance of underground cables is limited to driving the route, every few weeks at most, whereas overhead lines require tower inspections, earthing checks/measurements, corrosion treatment for towers, cleaning insulators, replacing broken insulators, etc.

4. The real costs of overhead transmission lines

The real problem is that the costing of HumeLink as an overhead line, does not consider all costs:

- Environment;
- Fire risks;
- Agriculture;
- Regional development; and
- Tourism.

These costs, that aren't considered in the assessment of transmission projects, are substantive.

Omitting significant indirect costs when evaluating large scale transmission projects is inconsistent with NSW Government policy and results in projects going ahead that shouldn't, and environmentally sensitive project options, like undergrounding, being ignored. The nation is left with energy projects that are highly damaging to the environment.

The balance between the environment and essential infrastructure is lost. Projects aren't developed in environmentally sensitive ways such as undergrounding the transmission lines.

The incorporation of these costs into the cost of transmission is critical for efficient investment in, and efficient operation and use of electricity services in the electricity market.

4.1 Environment

Overhead transmission lines have significant impacts on biodiversity that can be substantially reduced with undergrounding. The referral to the Environment Protection and Biodiversity Conservation Act (EPBC Act) states HumeLink has an action area of 48,332 ha and will significantly impact Matters of National Environmental Significance including 82 threatened species and six threatened ecological communities. Initial assessments identify that 1862 ha of critically endangered woodland will be directly impacted.

The transmission planning process is failing the requirements under the EPBC Act to avoid and mitigate impacts on protected matters, before using biodiversity offsets. **Biodiversity offsets under the Act are to address unavoidable impacts.** Like all large developments, transmission projects destroy large amounts of native vegetation, killing thousands of native plants and animals in the process.

An obvious means of avoiding and mitigating environmental impacts is to underground transmission. By undergrounding transmission, a much smaller easement is needed with commensurate reductions in loss of biodiversity, some sections can be horizontal directional drilled and bushfire risks are substantially reduced.

More information on the impacts of transmission on the environment is included in the attached HumeLink Alliance Inc. submission to the referral of Humelink to the EPBC Act.

4.2 Fire risks

Also, overhead powerlines increase the risk of bushfires. The 2009 Victorian Bushfires Royal Commission says: *'Although the proportion of fires that are caused by electricity infrastructure is low, on days of extreme fire danger the percentage of fires linked to electrical assets rises dramatically"*.

Having live overhead lines during a bushfire severely restricts bush fire control and the presence of overhead lines can restrict aerial operations during a bush fire which are nowadays one of the most commonly used methods of fire control.

Deloitte Access Economics put the tangible and intangible costs of the Victoria Black Saturday bush fires at $7.6 billion. By extrapolation, the cost of the 2019-20 Australian bush fire season, 'Black Summer', has been estimated at $230 billion. This value includes massive biodiversity costs - the loss and displacement of nearly 3 billion animals. Increasing the likelihood of these catastrophic costs, needs to be factored into the costs of overhead transmission lines, when comparing options. Conversely, decreasing the likelihood of these catastrophic costs, needs to be factored into the benefits of undergrounding transmission lines, when comparing options.

4.3 Agriculture

A recent report by the Australian Farm Institute commissioned by the NSW government entitled *Managing farm-related land use conflicts in NSW*, reviewed farmland use conflict and identified failures in planning policy.

The report states: 'Critical agricultural assets need to be identified and protected by all levels of government to secure the future of the industry. There is a lack of strategic identification and protection of critical agricultural assets across NSW at present. Current strategies of industries coexisting with agriculture do not appear to be working and are causing significant economic, personal and social impacts on community members', page 12.

And also 'There appears to be a lack of proactive State-wide strategies which plan significant infrastructure developments that conflict with agriculture……', page 24, https://www.farminstitute.org.au/report-managing-land-use-conflict-in-nsw/ .

Overhead transmission infrastructure is infrastructure development that conflicts with agriculture. Modern farming practices are increasingly relying on technologies like drones and precision agriculture to improve productive efficiency. These technologies can't be utilised and many other activities, like aerial operations and irrigation can't be performed in close proximity to overhead transmission lines. It's important that these losses in productive efficiency of neighbouring agricultural operations are taken into account in planning all new transmission projects.

4.4 Regional development

Overhead transmission infrastructure is destroying areas as desirable places for lifestyle farmers – a growth sector for regional economies located two to three hours from major cities. Lifestyle farmers have invigorated and brought prosperity to many regional and local businesses. By not using environmentally sensitive transmission infrastructure solutions such as undergrounding, this important economic stimulus for rural areas is being lost.

The paper by Resist HumeLink (2021) *Undergrounding HumeLink - Reducing impacts on the Upper Lachlan region*, is attached to this submission and provides more detail on the impacts of HumeLink on regions.

4.5 Tourism

Tourism is also affected by overhead transmission lines. Tourism is a major growth industry for regional NSW, with the number of visitors increasing 41% from 2014 to 2019 and expenditure of $14.3 billion in 2019. The NSW Office of Regional Development says 'More people visit NSW than any other state and territory in Australia. Visitors are drawn to the vibrant city of Sydney and the region's **natural landscapes**, and famous food, wine and beverages (emphasis added)'.

Also 'The Snowy Mountains in the South East and Tablelands region has been selected as an iconic location to promote regional Australia…….' https://www.investregional.nsw.gov.au/sectors/tourism/

HumeLink is impacting landscapes of great natural beauty. It is damaging to the natural asset that is the drawcard for visitors to regions. As such HumeLink will harm tourism, an important growth industry for many regions.

5. Current NEM Rules are leading to inefficient outcomes

For efficient outcomes to be achieved in the NEM, all costs of transmission, including environmental and community costs, need to be included in project assessments.

Inconsistent with this, the ISP and RIT-T don't require that all the environmental and community costs be factored into the costs of projects
https://www.aer.gov.au/system/files/AER%20- %20Final%20RIT-T%20application%20guidelines%20-%2014%20December%202018_0.pdf , page 30/31.

The Australian Energy Infrastructure Commissioner, Andrew Dyer, recognises the problem when he says the current Rules of the NEM are 'not fit for purpose'.

HumeLink Alliance Inc. has submitted a rule change to the Australian Energy Market Commission (AEMC) to require the incorporation of all environmental and community costs in RIT-T and ISP cost-benefit analysis. (See the HumeLink Alliance Inc. Rule change request attached to this submission).

Commonwealth and NSW Government cost-benefit analysis guidelines require 'economic, social, environmental and cultural' impacts be assessed for projects. The NSW Government requires these costs to be considered for projects costing more than $10 million. And yet in the NEM decisions are being made about transmission projects, worth billions of dollars, without including all the environmental and social costs. It would be one thing if these costs were insignificant, confined and short-lived but the impacts are massive, span for kilometres and last for generations – 80 to 100 years.

The establishment of the NEM, a significant microeconomic reform, was to drive efficiency in the energy sector. However, application of the national electricity objective (NEO), is leading to inefficient outcomes.

The wrong kind of transmission infrastructure is being built, overhead instead of underground, it is being built in the wrong place and too much is being built. The net benefits of the candidate development paths in the ISP are grossly overstated, and their ranking is likely wrong, as they do not take into account all the environmental and social costs of the planned transmission. And the RIT-T of actionable ISP projects is reporting the net benefit to electricity consumers, when there is a net cost to the State and the nation.

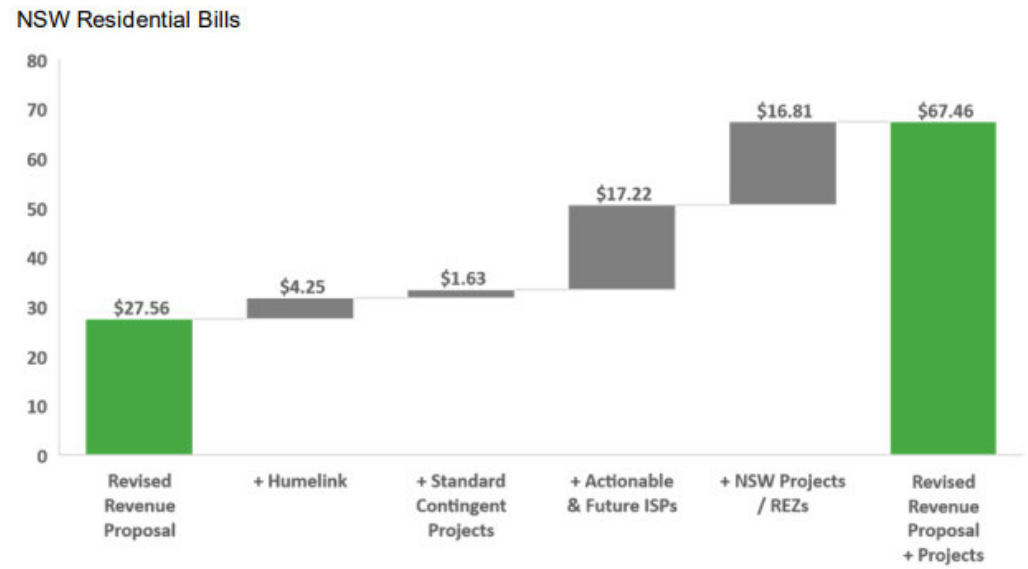
More detail on problems for the efficiency of the NEM, because of excluding environmental and community costs from the ISP and RIT-T transmission planning process, is contained in the paper *A flawed objective means the National Electricity Market is damaging the economy and environment* attached.

6. The impact of undergrounding to electricity bills

For efficient outcomes to occur in the electricity market, electricity consumers must get price signals that reflect all the costs of generation and transmission. Artificially keeping prices low, by not including all the environmental and community costs of transmission, will lead to distortions and the wrong investments in the economy.

Transgrid's 2023-28 Revised revenue proposal shows the pass through to residential bills from an aboveground HumeLink for 2023-28 will be an extra $4.25 per annum of a total $67.46 increase per annum – https://www.aer.gov.au/system/files/Transgrid%20-%202023-28%20Revised%20Revenue%20Proposal%20-%202%20Dec%202022%20-%20PUBLIC.pdf.

Figure E-6 Residential bill impact – 2022-23 to 2027-28 – transmission component ($ / year, Nominal) [29]



- Other additional costs for transmission includes the NSW Rez Projects - $16.81

- With transmission being around 7% of total bill, the actual percentage increase of undergrounding HumeLink will be relatively small.
- Given renewables promise cheaper generation costs, one would expect that any increase in transmission costs will be largely off-set by lower renewable energy generation costs.

7. Overseas examples

Countries overseas are transitioning to net zero emissions by HVDC underground transmission. Two such projects are listed below:

- Canada to NY 339 miles (546 km), Champlain Hudson Power Express https://chpexpress.com/news/hvdc-cables-for-champlain-hudson-power-express-arrive-in-albany/#:~:text=Construction%20of%20CHPE%20is%20underway,energy%20delivery%20expected%20in%202026.&text=CHPE%20involves%20the%20construction%20of,border%20and%20New%20York%20City;
- Off Shore North Sea wind/South solar Germany 750km, Suedlink https://www.jacobs.com/projects/Germany-SuedLink

To bring renewable energy into big cities like New York, HVDC underground, such as the Champlain Hudson Power Express, is world best practice.

Powerlines are also being put underground overseas because of bushfire risk. In July 2021, California announced it will bury 10,000 miles of transmission and distribution lines to reduce the risk of wildfires, at a cost of between $US15 to $US30 billion. When asked about the cost the CEO said "It's too expensive not to do it. Lives are on the line," https://www.npr.org/2021/07/21/1019058925/utility-bury-power-lines-wildfires-california

Further, in Australia, private companies are putting transmission underground. Two current projects Marinus Link and Star of the South, being undertaken by private companies, are putting transmission underground. Marinus Link, the new interconnector between Tasmania and Victoria, and the first investment for Rewiring the Nation, has 90 km underground. Star of the South, Australia's first off shore wind farm, off the coast of Victoria with 2200MW of capacity – more capacity than Snowy 2.0, will have 60-80 km underground. The reasons given by these companies for undergrounding transmission, when it costs more, are the community, the landscape and the environment benefits.

Engineers tell us that there have been major advances in underground cabling technology, it is entirely feasible and the world is looking on in disbelief as Australia builds more overhead transmission lines.

8. Delivery time for undergrounding

We hear Transgrid, AEMO and government ministers saying they will deliver projects ahead of time.

However, there is an optimal delivery time for projects, with higher net benefits delivering on-time, rather than delivering ahead of time.

Undergrounding will grant Transgrid 'social licence'. There will no longer be community opposition as concerns will be resolved with an underground solution. The community will work with the government and Transgrid to assist in any way possible to ensure the delivery timetable is met. Farmers at Tumut have said: '*If HumeLink goes underground, Transgrid can start tomorrow, and we'll even dig the trench for them*'.

The planning for HumeLink was done assuming Snowy 2.0 would be available in July 2025, (Transgrid, PACR, July 2021). Snowy Hydro has now announced that Snowy 2.0 won't be complete until December 2029. This four-and-a-half-year delay means HumeLink can be delivered when needed as an underground solution.

AEMO's own modelling, even before significant delays to the completion of Snowy 2.0 were announced, said the optimal timing of HumeLink was 2028-29 in the Step Change scenario; and 2033-34 in Progressive Change scenario.

> *'In AEMO's view, the project would optimise benefits to consumers if delivery is targeted for 2026-27.* ***The ISP modelling does suggest that net market benefits would be $3 million more if HumeLink were scheduled to be delivered in 2028-29 in Step Change*** *and 2033-34 in Progressive Change: see Section 6',* p68, https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf?la=en

As discussed above the Step Change scenario assumes *rapidly falling costs of energy production* which is contrary to what's happening in the real world. Given this, the Progressive Change scenario, without this assumption, and an optimal delivery date of 2033-34, is likely showing the required delivery date for HumeLink.

We need HumeLink delivered when needed, with vision and with concern for the environment. In transitioning our electricity generation from fossil fuel to renewables to save the planet, we can't at the same time degrade large tracts of the regions with overhead transmission lines, in this case 500kV lines that dominate the landscape, when there is a better way, undergrounding.

Undergrounding transmission will mean that communities will be working with government to rewire the nation.

9. Conclusion

Transgrid, a foreign owned company, should not be the determiner of the future of transmission as we transition to renewables. They are not focussed on the long term costs of this project for the communities and the environment of NSW.

It should be those elected to represent our country to make a call on what is in the public interest. In making these decisions it is critical that the "source of truth" around the costs is not only based on the views of the proponent, but other experts and real-world examples. Further it is critical that the

wider costs be considered fully when looking at the options such as environment, fire impacts and future generations.

As part of the NSW government environmental planning approval process, it must be demonstrated that no other feasible options with lesser impact are available. Clearly undergrounding HumeLink is a **feasible option with a lesser impact,** and should be the recommendation of government.

Late last year, the NSW Government fronted the media at Barangaroo to announce the enforcement of the height limit of 35m on a new residential tower, rather that 73m as proposed, to ensure Sydney was liveable, workable and beautiful for now and future generations.

At the time, it was ironic that this was exactly what the HumeLink project was taking from the regions – our liveable, workable and beautiful environment, with the proposed transmission lines eroding visual amenity, disrupting agricultural production and polluting landscapes.

The Barangaroo tower was one 35m tower in a cityscape. With HumeLink, Transgrid is proposing to build 800 to 900 towers up to 80m tall, through rural landscapes of great natural beauty.

In December 2022, Prime Minister Anthony Albanese, in his Bradfield Oration, said:

> *'The Bridge wasn't built to the standard of 'good enough for now', it was not conceived or delivered as the bare minimum to meet the needs of the day.*
> *It wasn't done on the cheap, even when the Great Depression tightened its grip.*
> *It was built with ambition, with vision'* https://www.pm.gov.au/media/bradfield-oration

This is the vision we need for HumeLink. The construction cost is a one off. These transmission lines will impact our landscapes for the next 80 to 100 years.

We urge the committee to take into account the wide range of issues presented by overhead transmission infrastructure, the long-term cost savings of undergrounding and the benefits it will bring to the community, and to recommend undergrounding HumeLink and future transmission infrastructure.

Yours sincerely,

Andrea Strong
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