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October 10, 2023

Dear Sir/Madam,

SUBMISSION IN RESPONSE TO THE ENVIRONMENTAL IMPACT STATEMENT OF THE HUMELINK PROJECT – APPLICATION NO SSI-36656827

We hereby submit this response to the HumeLink Environmental Impact Statement (EIS) report.

We object to the HumeLink proposal on a number of grounds, as follows:

1. Flawed economic assessment of the State benefit of HumeLink;
2. Feasible underground option for HumeLink has not properly been considered;
3. Failure to correctly undertake visual and landscape character assessment;
4. Failure of consultation;
5. Agricultural impacts;
6. Bushfire impacts;
7. Biodiversity impacts;
8. Tourism impacts;
9. Regional development impacts;
10. Social impacts;
11. Noise impacts; and
12. System security of infrastructure of national significance.

These grounds are discussed in more detail below.

1. Flawed economic assessment of the State benefit of HumeLink

The method used to assess the economic benefit of the HumeLink project is entirely unsound, as it uses a method described by NSW Treasury as **not a tool to assess State benefit of projects**.

The key economic issue in the Planning Secretary's Environmental Assessment Requirements (SEARs) is to assess 'the benefits of the [HumeLink] project for the region and the State as a whole.'

The HumeLink Scoping Report Reference: 507179-160522-REP-NN-001 (the Scoping Report) says '*[t]he methodology for the economic impact assessment will be guided by the TPP17-03 NSW Government Guide to Cost-Benefit Analysis.*'

Instead of using cost-benefit analysis as required under NSW Government Guide CBA, the EIS uses input-output analysis (I-O):

> '*HillPDA used input-output (I-O) modelling, to estimate the economic impacts at the regional, State and national level.'*

As such the economic analysis undertaken in the EIS is inconsistent with the TPP17-03 NSW Government Guide to Cost-Benefit Analysis (NSW Government Guide CBA) and needs to be redone.

NSW Government Guide CBA says in relation to I-O modelling:

> I-O analysis is *'of limited usefulness in assessing the net social benefit of proposals.'*
>
> And
>
> *'I-O analysis is subject to* ***significant limitations****, and* ***extreme care should be taken in its interpretation****. I-O analysis is concerned with simply measuring economic activity.* ***It is not a tool to measure welfare in the appraisal of projects or programs, nor does it take account of the alternative uses (opportunity costs) of resources. I-O analysis does not necessarily measure net benefits****.*
>
> *Multipliers are often inappropriate for assessing impacts associated with additional (marginal) investment. Published multipliers measure the overall linkages between an industry and the remainder of the economy, and therefore represent average rather than marginal impacts.*
>
> *Other limitations include:*
> *♣ Often poor quality of the data on which regional input-output models are based.*
> *♣ Potential double counting of impacts – Value added, income and employment impacts are alternative measures of the level of activity, and should not be added together.*
> *♣ Lack of supply-side constraints – Multipliers assume that extra output can be produced in one area of activity without reducing resources for other activities. This would not apply, for instance, where resources are fully employed.*
> *♣ The assumption that prices are fixed and that relative price changes have no impact on the allocation of scarce resources between activities, which may not always be true.*
> *♣ The assumption of fixed production technology, which can lead to erroneous conclusions, particularly when technology is changing rapidly.*

♣ *Absence of budget constraints – As a result changes in consumption occur without reducing demand elsewhere. When in reality most consumption expenditure by households and government are budget constrained.*
♣ *Multiplier impacts are based on a theoretical relationship. They cannot be considered as literal or precise, and any flow-on impacts (i.e. impacts beyond the first round effects) cannot be directly observed, measured or verified after the fact'* (some emphasis added), p65-66.

Therefore I-O is wholly the wrong method for assessing the benefits of the HumeLink project for the region and the State as a whole.

1.1. RIT-T cost- benefit modelling

A net benefit to **electricity consumers** of the HumeLink project was established in the regulatory investment test for transmission (RIT-T) cost benefit analysis.

The EIS states: *'HumeLink is expected to deliver $491 million in net benefits to electricity customers'* (EIS Summary, p35) which is the net benefit (including competition benefits) determined for HumeLink in the RIT-T, and reported in the Project Assessment Conclusions Report (PACR July 2021).

However, this net benefit amount includes competition benefits. AEMO consulted with stakeholders on the inclusion of competition benefits in the Integrated System Plan (ISP) cost benefit analysis in October 2021, and, as a result, has NOT included competition benefits in the Draft 2022 ISP saying, *'AEMO has not included competition benefits in the assessment… due to the significant uncertainty surrounding key assumptions*', (AEMO, Draft 2022 ISP, p83).

Excluding the competition benefits, consistent with AEMO policy, the HumeLink project in the RIT-T has a net benefit of $39 million, before environmental and community costs.

1.1.1. Material changes in circumstances and related factors

Since determining the $39 million net benefit of HumeLink in the RIT-T, there have been four fundamental changes to the material circumstances of HumeLink, and two closely related factors, which means the RIT-T economic modelling cannot be relied upon for assessing the net benefit of the HumeLink project for electricity consumers, and needs to be reapplied.

The material changes in circumstance are:

I. **Cost blowout**. As of August 2023, HumeLink is projected to cost $4.892 billion (2023 Transmission Expansion Options Report (TEOR)). This is an increase of 389% from the around $1 billion 500kV double circuit adjusted cost in the January 2020 Project Assessment Draft Report (PADR)[1], and 48% from the $3.3 billion cited in the July 2021 Project Assessment Conclusions Report (PACR);

[1] The $1.35 billion cost cited in the PADR is for 630km of single-circuit 500 kV, which is equivalent to about $1 billion for 360 km of double-circuit 500kV.

II. **Further Snowy 2.0 delays**. Snowy 2.0 was included in the PACR from 1 July 2025, but is now not scheduled to be on-line for a further three-and-a-half years, not coming on-line until December 2028 at the earliest;

III. **Reduction in capacity**. Humelink's transfer capacity has been reduced from 2,570 MW (PACR) to 2,200 MW (TEOR), a 14% reduction; and

IV. **Change in assumption about other generators**. At the time of the July 2021 PACR, the Kurri Kurri and Tallawarra B gas fired power stations were not committed. Now they are.

The related factors are:

I. **Underestimation of Opex**. Opex is underestimated at 0.5% of Capex in the July 2021 PACR. AEMO assumes Opex is 1% of Capex, VNI West assumes Opex is 1%, and Transgrid's current operating performance is 3.4%. We assume that this "refinement" of the Opex estimate in the PACR is a change to ensure the project has a net benefit (excluding competition benefits) because Opex at 1% of Capex would add a $103 million net present value cost to the project, and mean instead of a $39 million net benefit, the project has a $64 million net cost ($39m - $103m = -$64m); and

II. **Lack of clarity about capital refresh.** The July 2021 PACR did not include a capital refresh cost, as a percentage of Capex, after 15 to 20 years.

The community asked Transgrid to model the impact on the net benefit of HumeLink with Snowy 2.0 delayed 3, 5 and 10 years. Transgrid responded saying that the net benefit of HumeLink without Snowy 2.0 was modelled as the Slow Change scenario in the Project Assessment Draft Report (PADR January 2020). Including the biodiversity offsets costs that were omitted in the PADR, it appears HumeLink, Option 3C, has a **net cost of around $555 million, without Snowy 2.0** (when the project cost was $1.35 billion rather than $4.892 billion). Therefore, delivering HumeLink before Snowy 2.0 is ready, is expected to come with enormous costs to the State.

These material changes in circumstance and related factors are expected to mean that HumeLink now has a significant net cost before environmental and community costs.

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

> *'The project would generally have a beneficial economic outcome. According to the 2022 Integrated System Plan, the project is estimated to contribute about $1.3 billion in net market benefits'* (HumeLink EIS Summary, p25).

This $1.3 billion net benefited is disputed for a number of reasons:

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

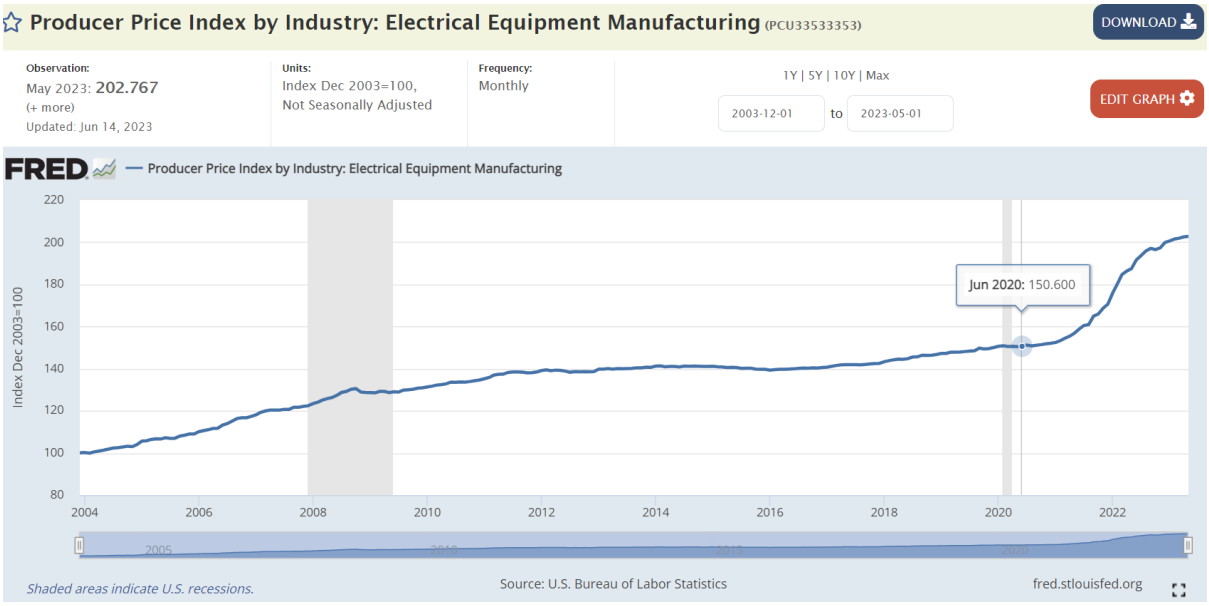
The modelling by AEMO, to determine the market benefits of projects in the ISP, involves a sequential modelling process. Initially an oversimplified model for the transmission network, with exaggerated transmission limits on the interstate transmission network, is assumed. When the outputs of this modelling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

ii. Further this $1.3 billion net benefit of HumeLink is based on the Step Change scenario that AEMO, at the time, defined as the most likely. The Step Change 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*** fundamental to the Step Change scenario is contrary to what's happening in the real word (see Figure 1 below).

Figure 1: Producer Price Index Electrical Manufacturing



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;

iii. The $1.3 billion net benefit was based on a project cost of $3.3 billion. HumeLink is now costing $1.6 billion more, with a cost of $4.892 billion. In the Draft 2022 ISP, when the cost of HumeLink was $3.3 billion, AEMO said '*To ensure the benefits are robust, the project costs cannot materially increase from the current estimate of $3.3 billion. Further work to drive down costs should be undertaken urgently'* (p65). Rather than costs being 'driven down', the cost of HumeLink has blown out, meaning the net benefits of HumeLink are likely substantially negative.

iv. The $1.3 billion doesn't take into account externalities. One important externality is bushfire risk. HumeLink as an overhead line increases the risk of starting bushfires and the risk of bushfires being uncontrollable. Firefighters on the ground say overhead transmission lines prevented the control of the Dunns' Road fire. The fire went on to burn for two weeks with 147 homes lost and 386,000 ha burnt, including 50,000 ha of pine plantation and 20,000 ha of hardwood forest, with a value for the timber alone estimated at more than $5 billion.

1.1.2. HumeLink is not 'critical'

The HumeLink EIS states '*The project is considered a critical component in delivering long term benefits to the National Electricity Market*.'

If HumeLink was as critical, as the EIS argues, it would be in AEMO's top ranked 2022 ISP candidate development path (CDP) and it would have a much larger net benefit than $39m (before environmental and community costs). In fact, according to the 2022 ISP the national electricity market (NEM) is $3 million better off without HumeLink.

HumeLink isn't in the top ranked candidate development path (CDP-10) in the Draft 2022 ISP. CDP-10 includes projects New England REZ transmission Link, Sydney Ring, Marinus Link and VNI West but NOT HumeLink (see tables 9 and 10 below). HumeLink 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).

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.

Further if less weighting is given to the now less likely Step Change and more weighting is given to the now more likely Progressive Change scenario, HumeLink is even less critical. The top ranked CDP with Progressive Change is CDP-01, which doesn't include HumeLink. Under this scenario, the NEM is $520 million better off if HumeLink is not actionable.

1.1.3. Timing of HumeLink

The EIS states:

'*Construction of the project is targeted to commence in 2024, …..and become operational by the end of 2026.*'

This timing is inconsistent with the optimal timing of the project identified by AEMO in the 2022 ISP (see Table 8 below).

Table 8 Optimal timing of major network projects in each scenario, assuming perfect foresight

Project	Earliest Commissioning Date	*Slow Change*	*Progressive Change*	*Step Change*	*Hydrogen Superpower*
Sydney Ring	2027-28	2039-40	2027-28	2027-28	2027-28
New England REZ Transmission Link	2027-28	2027-28	2027-28	2027-28	2027-28
HumeLink	2026-27	2037-38	2035-36	2028-29	2027-28
Marinus Link (Cable 1)	2029-30	2034-35	2030-31	2029-30	2029-30
Marinus Link (Cable 2)	2031-32	2037-38	2032-33	2031-32	2031-32
VNI West	2030-31	2040-41	2038-39	2031-32	2030-31
Gladstone Grid Reinforcement	2027-28	Not needed	2035-36	2030-31	2028-29
CQ – SQ Stage 1	2025-26	2040-41	2030-31	2028-29	2028-29
QNI Connect	2028-29	2035-36	2036-37	2032-33	2029-30
New England REZ Extension	2031-32	2045-46	2038-39	2035-36	2031-32

Source: AEMO, 2022 ISP, p80.

In the 2022 ISP, the optimal timing of HumeLink is 2028-29 with Step Change, and 2035-36 with Progressive Change. This modelling assumed Snowy 2.0 would be delivered 2025-26 when it's now delayed until 2028-29. The delay in Snowy 2.0 can be expected to further pushout the optimal timing of HumeLink.

1.2. Failure of RIT-T cost- benefit modelling in assessing State benefit

While the RIT-T is described as a cost-benefit analysis, it is in fact a simple financial analysis and doesn't determine the benefit of the project to the State. It ignores critical environmental externalities.

See below an excerpt from AER's *Application guidelines Regulatory investment test for transmission* that illustrates the problem for communities and the environment in the case of **a new generator** – power station, wind farm, solar farm, etc.

Example 20: Externalities

Negative externality

Assume a credible option is a local gas-fired peaking generator, planned for development in close proximity to an existing hotel. The RIT–T proponent expects the development of the generator will reduce the nearby hotel's annual earnings (due to a loss of visual amenity). The present value of this loss is $15 million.

In this example, the $15 million cost borne by the hotel's proprietor is a negative externality. While the development of the gas-fired peaking generator drives this cost, the generator's developer will not incur the cost. It is therefore not part of the credible option's costs.

Source: AER, Application guidelines Regulatory investment test for transmission December 2018

If this was **a transmission line,** the example would be:

> *Assume the **preferred option for a transmission line** is planned for development in close proximity to an existing hotel. The RIT–T proponent expects the development of the transmission line will reduce the nearby hotel's annual earnings (due to a loss of visual amenity). The present value of this loss is $15 million.*
>
> *In this example, the $15 million cost borne by the hotel's proprietor is a negative externality. While the development of the transmission line drives this cost, the transmission line's developer will not incur the cost. It is therefore not part of the credible option's costs.*

Therefore, it is only necessary to have a couple of businesses impacted in this way from visual and noise pollution, along the 360km length of the HumeLink route, for the project to have a net cost, even before adding in the other indirect costs from:

- increased risk of bushfires;
- lost biodiversity;
- lost productive efficiency of agriculture;
- lost tourism;
- undermined regional development;
- increased risk of childhood cancer from electro-magnetic fields (EMF);
- lost liveability, workability and beauty for the 260 private landowners directly impacted;
- lost liveability, workability and beauty for 4,322 indirectly impacted neighbours; and
- lost landscapes of great natural beauty for current and future generations in NSW, Australia and around the world, who value the existence of these landscapes.

Given the financial net benefit of HumeLink is only $39 million (before the $1.6 billion increase in project cost), and the project has extensive and enduring environmental and community costs, an economic assessment (a triple bottom line assessment) can be expected to show that the HumeLink project has a significant net cost to the State.

1.3. NSW Government Cost-Benefit Analysis is required to determine State benefit

The NSW Government Guide CBA states:

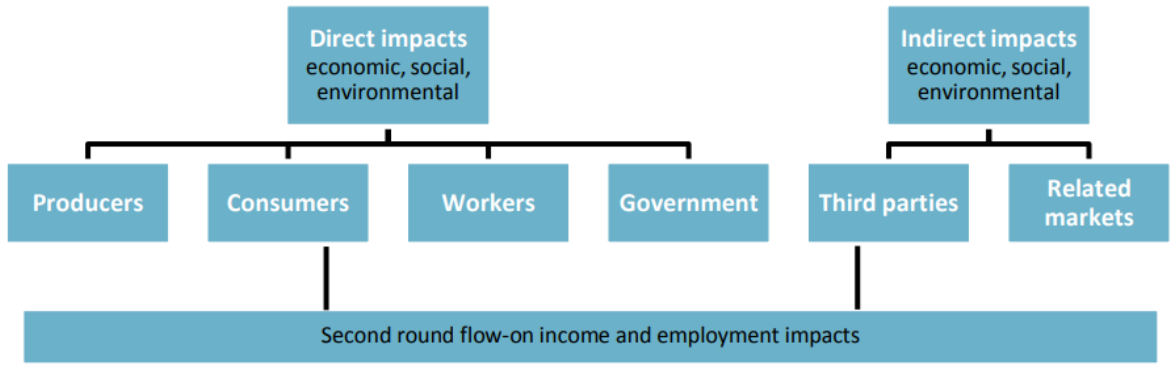
> *'Agencies should use this NSW Government Guide to Cost-Benefit Analysis (Guide) when assessing all significant government projects, programs, policies and regulations.*
>
> *Cost-benefit analysis (CBA) is an evidence based method for systematically organising and presenting information to help government understand* ***all the impacts of*** *policies and* ***projects, including economic, social and environmental impacts'****.*
>
> Also
>
> *'The government should act only if there is a net improvement to social welfare. In this Guide, social welfare refers to the wellbeing of the entire society or community (in this case the people of New South Wales)'.*

A 'net improvement to social welfare' means a net benefit to all in society – a net benefit to the State. To ensure a net benefit to the people of NSW, from a program or project, the NSW Government Guide CBA requires all first round direct and indirect costs of projects to be factored in to the cost-benefit analysis:

> *'The general valuation principle is that all first round impacts should be valued as changes relative to the base case regardless of whether the impacts are direct or indirect. The secondround flow-on or multiplier effects are generally not included in CBA'* (p12).

See below the definition of direct and indirect impacts – economic, social and environmental (a triple bottom line assessment).

Figure 2.3: Possible costs and benefits – classifying impacts



In NSW these impacts are required for projects costing $10 million.

Generally, this Guide recommends that a CBA should be completed and submitted to Treasury for any new programs or changes to existing programs that meet the following value thresholds:
♣ For capital expenditure: Estimated total capital cost of $10 million or more, (p3).

As a $4.892 billion project, with significant, widespread and enduring negative environmental impacts, it is critical that the benefit of HumeLink for the State as a whole is determined with NSW Government Guide CBA.

The NSW Government Guide CBA states:

'A CBA is an essential part of both a preliminary business case and a final business case' (p6).

Transgrid have failed to undertake this ***essential*** part of the preliminary and final business case for the HumeLink project.

The I-O analysis undertaken to assess State benefit, completely ignores the indirect non-market costs of overhead transmission lines that reduces liveability, workability and beauty of regions (see indirect costs listed in section 1.2 above).

Only when a net benefit to the State as a whole has been established, taking into account all first round market and non-market costs, might an I-O be considered for the HumeLink project, but this would need to be applied to all options – overhead and underground. I-O can only be undertaken with a full understanding of its flaws and limitations. And as stated in the NSW Government Guide CBA, I-O is ***'not a tool to measure welfare in the appraisal of projects or programs'.***

Further I-O analyses:

♣ Lack of supply-side constraints – Multipliers assume that extra output can be produced in one area of activity without reducing resources for other activities. This would not apply, for instance, where resources are fully employed.

As such, in the current macroeconomic environment, with unemployment currently at record low levels, it can be expected that instead of increasing employment, the HumeLink project will increase inflation and so interest rates.

1.4. Commitment to NSW Government Guide CBA in HumeLink scoping report

The community has been repeatedly told by Transgrid that environmental and community costs would be assessed in the EIS. Transgrid, in the HumeLink - Scoping Report, reinforced this understanding, saying:

The economic impact assessment will:

*'• Identify and **quantify** the potential significant impacts (costs and benefits)….*

The methodology for the economic impact assessment will be guided by the TPP17-03 NSW Government Guide to Cost-Benefit Analysis' (Transgrid, HumeLink - Scoping Report, p91).

Methods to quantify environmental and community impacts are discussed in Appendix 3A: Valuation principles and methods of NSW Government Guide CBA. This Appendix discusses Non-market valuation methods such as "stated preference methods" including "contingent valuation" which is described as '*widely used mainly to value environmental programs'.* These methods could have been used to quantify the visual amenity costs of HumeLink as an overhead line.

Why hasn't quantifying environmental and community impacts been done?

Until this is done, it cannot be determined that there is a benefit to the State with the HumeLink project.

2. Feasible underground option for HumeLink has not properly been considered

2.1. Expert review of the GHD/Transgrid HumeLink undergrounding study

A community commissioned expert review of the GHD/Transgrid HumeLink undergrounding study, has found that undergrounding HumeLink is a feasible option and could be delivered from between $5.5 to 7.3 billion, with the higher capital cost offset by lower ongoing operating costs and environmental benefits (Amplitude Consultants, *HumeLink Undergrounding Review of Transgrid Report and Costing of HVDC Alternatives*, October 2023 – see attached).

This review confirms that the GHD/Transgrid HumeLink undergrounding study significantly overstated the costs of undergrounding HumeLink.

2.2. Transgrid has an obligation to mitigate and avoid environmental impacts with a feasible option

Transgrid has an obligation in the legislation to mitigate and avoid impacts on the environment (see attached).

Transgrid said in its response to the Manifesto of Kyeamba Valley Concerned Landowners that:

> *'The Department of Planning, Industry and Environment (DPIE) requires projects to avoid, minimise or offset environmental impacts and Transgrid is required to demonstrate that no other feasible options with lesser impact are available as part of the environmental planning approvals'.*

This follows from the Environmental Planning and Assessment Regulation 2000 under the Environmental Planning and Assessment Act 1979 which states (emphasis added):

'3 Analysis of alternatives

An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including the consequences of not carrying out the development or activity.

(See Appendix A for the direct references to the regulatory criteria below).

International and local case studies show undergrounding:

- is a "practicable" means *to avoid…. serious or irreversible damage to the environment;*
- preserves ***inter-generational*** *equity* by ensuring *that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations;*
- is consistent with the precautionary principal; *and*
- conserves ***biological diversity and ecological integrity.***

This is because high-voltage direct current (HVDC) undergrounding:

- eliminates the visual pollution of landscapes of great natural beauty by transmission towers, up to 80m high, every 300-400m for 360km;
- reduces the risk with bushfires and associated catastrophic impacts on biodiversity, communities and local businesses;
- significantly reduces electro-magnetic fields (EMF)[2]; and
- has an easement a quarter of the size of overhead lines, plus the ability to horizontal directional drill[3] sections, with commensurate reductions in biodiversity impacts.
- Eliminates the risk of overhead transmission lines starting fires, as well as allows aerial and ground operations to control bushfire, reducing the risk of bushfires impacting the environment.

A study by the International Council on Large Electrical Systems, or CIGRÉ, shows the environmental impacts of concern from overhead transmission lines and underground cables (see Figure 2 below).

[2] Amplitude Consultants, Western Victorian Transmission Network Project High-Level HVDC Alternative Scoping Report, July 2021, p16.

[3] **Directional boring**, also referred to as **horizontal directional drilling** (**HDD**), is a minimal impact trenchless method of installing underground utilities such as pipe, conduit, or cables in a relatively shallow arc or radius along a prescribed underground path using a surface-launched drilling rig. Directional boring offers significant environmental advantages over traditional cut and cover pipeline/utility installations. The technique is routinely used when conventional trenching or excavating is not practical or when minimal surface disturbance is required https://en.wikipedia.org/wiki/Directional_boring

Figure 2: Impacts of concern from overhead transmission lines and underground cables

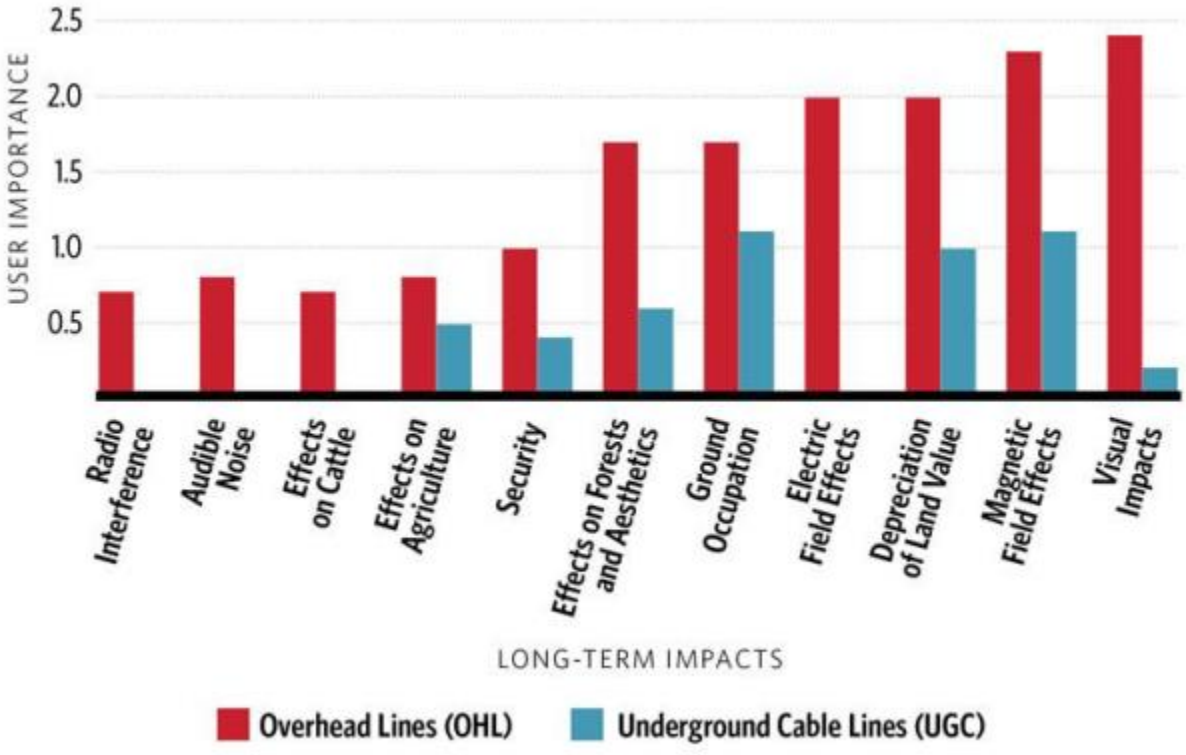


Figure 2: Source - CIGRÉ as referenced by HDR https://www.hdrinc.com/insights/top-5-reasons-use-underground-transmission-lines

In all cases overhead lines have greater negative impacts than underground cables. One factor not assessed for 'user importance', in the study above, is "bushfire risk", which is a major concern in regional areas of Australia. Underground cables provide an important benefit of eliminating the risk of starting and controlling bushfires.

In July 2021 California announced it will bury 10,000 miles of overhead power lines to reduce the risk of wildfires, at a cost of between $15 to $30 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 .

In relation to EMF and undergrounding transmission to reduce EMF exposure, the National Institute for Public Health and the Environment, *National precautionary policies on magnetic fields from power lines in Belgium, France, Germany, the Netherlands and the United Kingdom,* RIVM Report 2017-0118, states:

> *Scientific research points to a possibly increased risk of childhood leukaemia in children who live near overhead power lines. Because of statistical uncertainties and the fact that the disease mechanism is not known, it is not clear whether the magnetic fields of the power lines are the cause. Out of precaution, the Netherlands and several other European countries*

have developed policies several years ago that aim to reduce the exposure to magnetic fields from new power lines. Different countries deal in different ways with the uncertainties in the available knowledge and strike a different balance between scientific evidence and social, economic and political arguments, (p3).

A number of countries overseas are undergrounding transmission close to dwellings because of a precautionary principle and the association between exposure to electro-magnetic fields from high-voltage transmission lines and childhood cancer.

The environmental benefits of undergrounding are supported by environmental awards for undergrounding projects. Murraylink for instance, which runs between Berri in South Australia and Red Cliff in Victoria, was the longest HVDC line in the world for some years, at 180km, and won an environmental award. https://new.abb.com/news/detail/13669/abb-power-transmission-project-wins-national-environmental-award-in-australia .

Also the GHD/Transgrid HumeLink underground study, that compared impacts of overhead lines and underground cables, reported only positive environmental impacts for the underground option post construction.

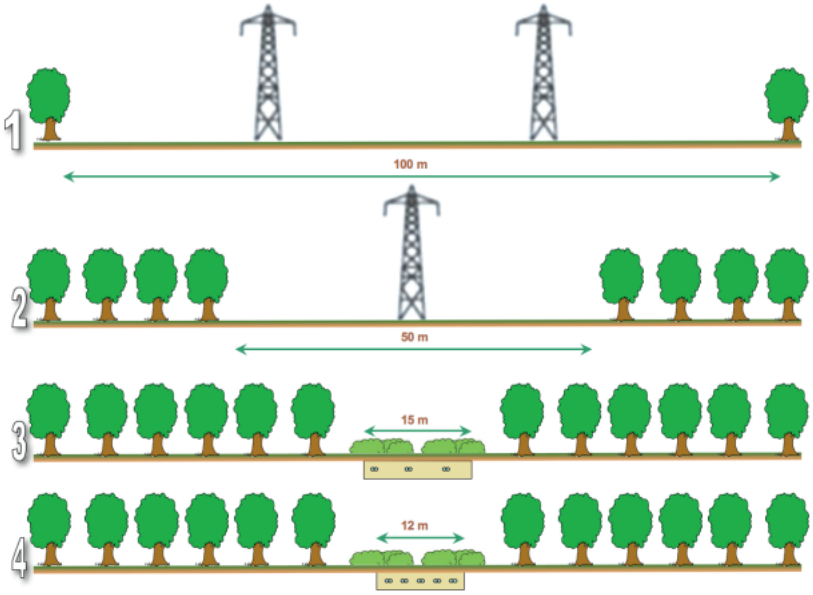
Further studies internationally suggest that there are almost no declines in crop yield above underground cables.

europacable

Use of land

- The only restriction on the use of land over an undergrounded section is that no deeply rooted trees may be planted within the corridor width plus a margin of about 2 meters to prevent root encroachment into the cable trench. Apart from that there are no limitations to cultivation, including agricultural farming.(see picture above)
- The laying depth of the cable systems has to be sufficient to avoid any damage to the cable trench and cables themselves by agricultural activities above the cables. The corridor must be kept free from any buildings.

3) Possible layouts to fulfill HVDC 5 GW power transmission requirements

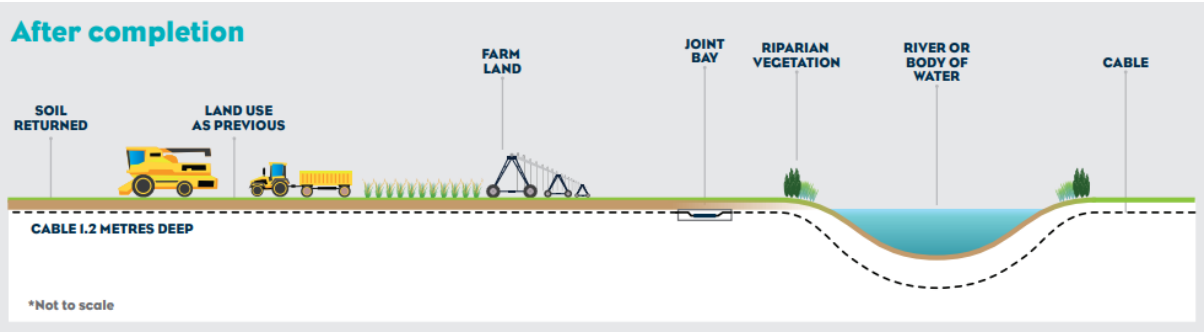


1) Overhead line at 600 kV - HVDC
2) Overhead line at 800 kV - HVDC
3) Mass impregnated cables and LCC technology: 3 bipoles at 500 kV - HVDC
4) Extruded cables and VSC technology: 5 bipoles at 320 kV - HVDC

The excerpts above are from Europacable, *An Introduction to High Voltage Direct Current (HVDC) Underground Cables,* Brussels, 10 October 2011, and indicate the only restriction of land use above undergound cables is deep rooted tree.

This is consistent with the GHD/Transgrid HumeLink undergrounding study that provided a link to land use impacts of underground cables [Victorian-land-access-and-easement-acquisition-Marinus-Link-web.pdf (marinuslink.com.au)]

Figure 3: Land use impacts of undergrounding post laying underground cables



As shown in Figure 3 above, agriculture can be carried out as usual above underground cables.

Figure 4 below shows a comparison of overhead and underground cables in the landscape showing the significant visual and landscape character benefits of underground cables.

Figure 4: Comparison of the visual impact of overhead and underground cables

2.3. GHD/Transgrid HumeLink Undergrounding Study

2.3.1. Incorrect EIS statement

The HumeLink EIS states:
'In response to community feedback, an independent investigation was also carried out in consultation with an Undergrounding Feasibility Steering Committee to assess the viability of building HumeLink as an underground cable instead of overhead transmission lines. Based on the findings, Transgrid confirmed undergrounding HumeLink would not be consistent with the regulatory rules that require Transgrid to propose the ***most efficient option*** *for consumers based on the capital cost of the solution, the ongoing operational costs, the market benefits, the expected reliability,* ***and the costs associated with the impact on landowners, the community, and the environment****,'* (HumeLink EIS Summary, p13).

However this statement is completely untrue. The RIT-T doesn't require Transgrid to provide the most efficient option based on capital costs, operating costs and impacts on landowners, **community and the environment**. The RIT-T specifically excludes indirect costs of projects on community and the environment – see section 1.2 Failure of RIT-T cost- benefit modelling in assessing State benefit, above.

The failure to fairly assess the market and non-market costs and benefits of undergrounding, a feasible option, is a major failure of the HumeLink project evaluation process – the consultation, the RIT-T and now the EIS.

The Amplitude Consultants expert review of the GHD/Transgrid HumeLink undergrounding study shows the decision to reject undergrounding HumeLink on the basis of capital cost was based on incorrect exaggerated costs.

Further, Transgrid made no attempt to quantify the community and environmental costs of the overhead lines (or conversely the community and environmental benefits of undergrounding), despite this being part of the GHD/Transgrid HumeLink undergrounding study. Countries overseas have come to the conclusion that undergrounding is the cheapest (most efficient) option if you take into account all the environmental costs of overhead lines for the next 80 to 100 years. If the 'regulatory rules' required all the costs be taken into account, HumeLink would be planned and constructed as an underground project.

2.3.2. GHD/Transgrid HumeLink undergrounding study flawed, unbalanced and not endorsed

The Community Consultation Group Representatives on the HumeLink Undergrounding Study Steering Committee (CCGSC) believed that the GHD/Transgrid HumeLink undergrounding study was flawed and unbalanced, and misrepresented the costs of the undergrounding option. The CCGSC had 52 outstanding issues and were unable to endorse the report. As such, they were of the view that the study shouldn't be relied upon for making decisions about undergrounding HumeLink.

Two independent expert engineers also believed the undergrounding costs in the study to be significantly exaggerated. (This has now been confirmed by the Amplitude Consultants review).

Further, as stated above, part of the scope of the study was to quantify the non-benefits of underground transmission, so these could be valued and fully taken into account in making decisions on undergrounding HumeLink. This important part of the study, was omitted.

Transgrid took nearly 6 months to respond to the CCGSC position on HumeLink Undergrounding Study Report, which presented as deliberate delaying tactics, particularly as the Office of Environment and Climate Change said they were waiting for Transgrid to respond, before committing to review the study.

Two letters, sent to the independent chair at the conclusion of the study, are contained in Appendix B, as follows:

i. A response to the Transgrid decision to dismiss undergrounding HumeLink on the basis of the unendorsed report, with a Table of the non-market benefits to be quantified, attached; and
ii. Comments relating to our reasons for not endorsing the report.

3. Failure to correctly undertake visual and landscape character assessment

The visual and landscape character assessment in the EIS appears to significantly understate the impacts on visual amenity and landscape character of the HumeLink project.

Overseas studies have found that transmission lines have a major negative impact on the aesthetic quality of the landscape, and have established a link between the quality of landscapes and the wellbeing of the population (Berto, 2005; Hartig, Evans, Jamner, Davis & Garling, 2003; Mu˜noz,

2009; Ulrich, 1984; Ulrich et al., 1991; Velarde, Fry, & Tveit, 2007; Wells, 2000, Arriaza, Ca˜nas-Ortega, Ca˜nas-Madue˜no, & Ruiz-Aviles, 2004; Devine-Wright, 2012; Kaplan, TaskIn, & Önenc, 2006; Soini, Pouta, Salmiovirta, Uusitalo, & Kivinen, 2011; Tempesta, 2006; Tempesta & Thiene, 2007).

The HumeLink EIS visual and landscape assessment is inconsistent with this extensive literature.

Understating the visual and landscape impacts of transmission lines, when they are closely associated with a decline in wellbeing of communities, is doing considerable harm to the regions.

3.1. Lack of visual and landscape character impact assessment in route planning

The National Parks Association (NPA) states:

'500 kV lines are the tallest, bulkiest, and most imposing of all transmission lines in Australia, completely dominating the landscape for tens of kilometres…….

Although the HumeLink project travels through visually sensitive rural landscapes with considerable topographic change for hundreds of kilometres, no landscape or architectural consideration is applied to the project in the route assessment. This is in conspicuous contrast to other major infrastructure projects such as expressways, bridges and rail corridors, which carefully consider visual impacts on the landscape. This is major failure of transmission project planning, particularly when it is understood that the visual impact of transmission lines is the biggest impact of concern for communities (see Figure 2: Impacts of concern from overhead transmission lines and underground cables, above)

The problems with the lack of assessment of visual impacts in the HumeLink project are obvious with route refinement decisions by TransGrid, supported by fact sheet – HumeLink Route Options Assessment - Final Report. The fact sheet says for the route assessment, independent consultants GHD, completed a multi-criteria analysis (MCA), 'using GHD's GIS-based methodology known as the 'InDeGO' method (Infrastructure Development – Geospatial Options) to quantitatively assess the preferred route subject to the least constraints. InDeGO assigns a score to each route based on the length of the route that overlays relevant constraints and the rating of the constraint. The higher the score, the higher the enviro-social impact'. (HumeLink Route Options Assessment - Final Report, GHD, March 2022, p3).

This InDeGO method purports to assess the 'enviro-social impact' and yet it omits visual impacts, the most important impact of concern for communities, as identified by the CIGRE overseas study. As a consequence of this InDeGO analysis, the now preferred route will have HumeLink running along a ridge above the township of Tumut, with the locals saying instead of Snowy Valleys, the region will now be known as Ugly Valleys.

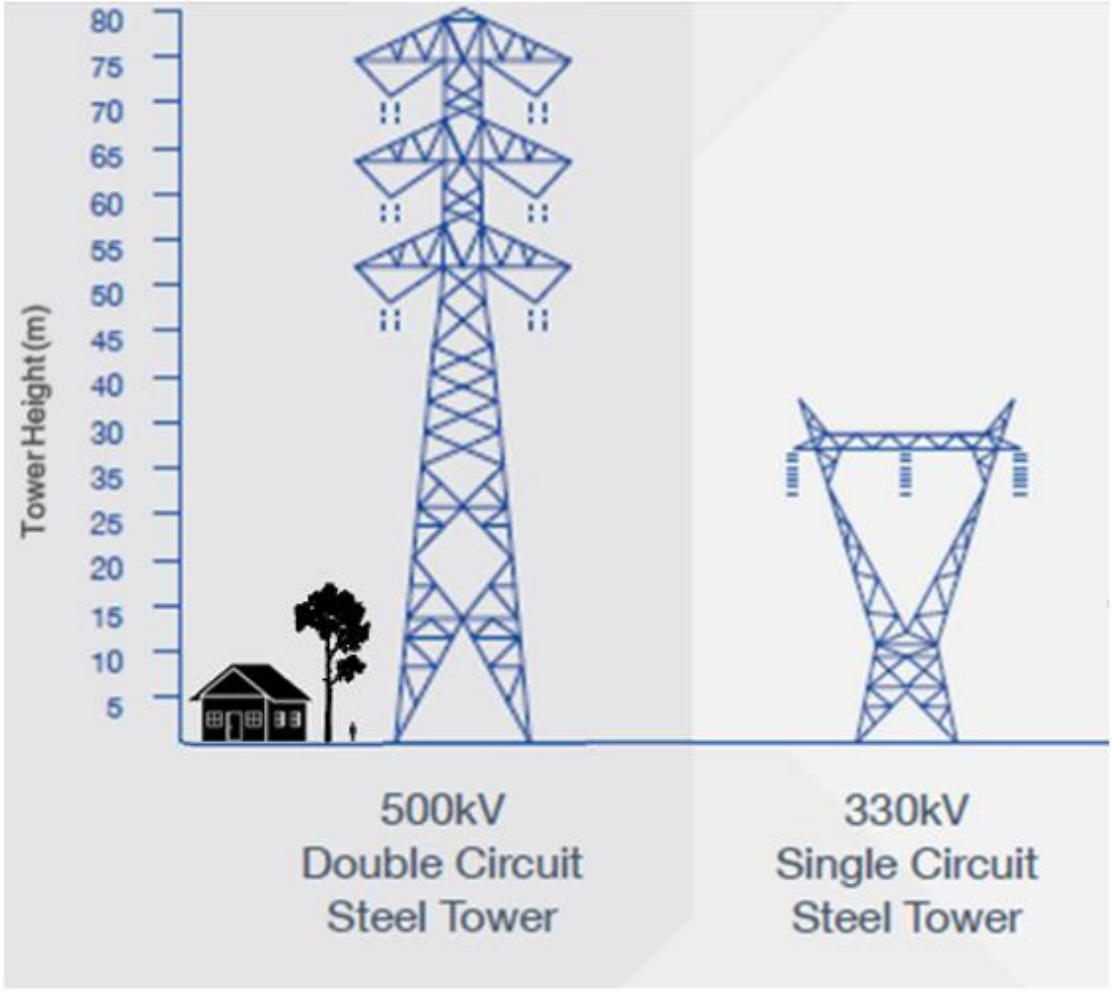
3.2. Height of the towers

The EIS says:

'The 500 kV transmission lines would be supported on a series of free-standing steel lattice structures that would range between around 50 m up to a maximum of 76 m in height', (TR 8, Part 1, p7).

However Transgrid in consultation with the community said towers would be up to 80m tall and wouldn't rule out them being taller in certain topography.

Figure 5: Proposed 500kV tower relative to existing towers, house, tree and person



To give an idea of the scale of the proposed towers, Figure 5 shows the height of a HumeLink 500kV double circuit tower relative to the existing 330kV towers, a house with an 8m roofline and a 6'6" person.

The problem with 500kV lines is the height of the towers relative to the trees in the landscape. The trees in most regions are 15-20m tall, while the 500kV towers are up to 80m tall - four times the height of the trees, with devastating impacts on the rural landscape character.

3.3. Community assessment of the visual and landscape character assessment

The community has considered the visual and landscape character impacts of the HumeLink project on the regions, as discussed in this section. Many of the visual and landscape character impacts of the project, identified by the community, are not considered in the HumeLink EIS.

3.3.1. Description of an existing 300kV single circuit tower

Figure 6: 330kV tower in the Bannister area

The existing 330kV single circuit tower is in the order of 35m high and carries six transmission lines in bundles of two, at one level, at an approximate height of 27m above ground level (see Figure 6). The tower comprises a visually porous, light and minimalist structure. This results in the towers quickly becoming visually recessive as they travel across the landscape.

3.3.2. Description of a 500kV double circuit tower

Figure 7: 500kV tower at Bannaby

The HumeLink proposed 500kV double circuit tower is in the order of 65m to 80m high (see Figure 7). It carries 24 transmission lines, in bundles of four, at three different levels, approximately 37m, 47m, and 57m above ground level. The tower can be characterised as a visually dense, tall and narrow structure, with three large crossbars protruding either side of the tower, in strong visual contrast to the vertical form of the tower.

At 65m to 80m, the towers are exceptionally tall within the context of the landscape, visually dominant from long distances, and anathema to the rural character through which they travel. For example, where travelling through 20m high forest, the towers would project up to three times that height again.

3.3.3. Visual effects of adjacent 330kV and 500kV transmission lines

Figure 8: Expected appearance of a 500kV double circuit line paralleling a 330kV single circuit line. The height of the 330kV single circuit tower is 35m above ground level, while the first cross arm on the 500kV tower is 42m above ground level.

Given that the impact of greatest concern with overhead transmission lines is the visual impact, it's a major failure of community consultation that TransGrid failed to provide an image of what's proposed in many regions – a 500kV double circuit paralleling a 330kV single circuit line, until August 2022, 28 months after consultation began, despite numerous requests.

In the absence of an image in situ, Figure 8 was put together to shows a 500kV double circuit line paralleling a 330kV single circuit line. The image of the 330kV tower should be viewed assuming it is positioned side by side the closest 500kV tower. The lowest lines on the 500kV tower are estimated at 37m above ground level, while the top of the 330kV towers is estimated as 35m above ground level, so 2m below the lowest lines on the 500kV tower.

The 330kV and 500kV towers are in stark visual contrast to each other, with the 500kV towers being more than double the height of the 330kV towers, and of entirely different form.

The 330kV towers have three bundles of two lines while the 500kV has six bundles of four lines, making the line bundles on the 500kV towers doubly thick. The line bundles are a visually prominent element of a transmission line. Doubling the size of the bundles (from two to four lines in a bundle) and doubling the number of bundles (from three to six bundles) will significantly increase the visual prominence of the lines, with associated visual impacts.

The visual impact is further amplified by the height difference of the line bundles on the two types of towers. The three crossbars at the top of the 500kV tower will carry the line bundles well above the height of the 330kV line bundles. Rather than seeing lines at a single level as with 330kV towers, there will be lines at three higher levels on the 500kV towers, resulting in four line-levels being seen within the rural landscape.

To illustrate this impact, Figure 9 shows the 330kV line crossing through the view. The visual intrusion of the wind turbines is evident. As seen in the Figure 9, the 330kV line sits just below the forested horizon. In this case it would be expected that at least two, and possibly all three of the thicker 500kV line bundles would be seen against the open sky, resulting in very high visual prominence.

One can imagine what that view looked like before the transmission line in particular ran through, but also the wind turbines. The proposed 500kV towers with line bundles at three different heights above that of the 330kV line, will result in significant further interruption of the view.

Figure 9: Single line bundle level with 330kV line

Moreover, the easement width will expand from 60m wide to at least 130m wide. To give a visual indication of what a 130m wide transmission line easement would look like…….*it would equate to the length of a football field (100m), plus close to both dead ball areas (20m).*

The problems with doubling the width of the easement can be seen in Figure 10 below. Already the landscape is extensively cleared. There are few ecologically valuable remnant stands of vegetation remaining. The width of the existing transmission easement (as seen most clearly on the horizon), will more than double, to host towers more than twice of the height of those existing. Not only will this create a further linear edged cutting through the forest, but it will further reduce the character of the landscape through reduction in the patchwork of forested 'islands' that define its specific rural landscape character type. HumeLink, as yet another large infrastructure project, will further whittle away the special landscape character of the region.

Figure 10: 330kV line in the regions

The two different tower types are expected to be in close proximity to each other. The tower 'stepping' distance between the proposed 500kV line and the 330kV line will be constantly changing, rather than for instance, placing the towers side by side. This will result in an increased visual sense of disorder and/or sprawl across the landscape, instead of an ordered change to the view.

Looking again at Figure 9, while the 330kV towers are outside the frame of view in the photo, they are unlikely to be too far out of frame. Given the continuous variable distancing of the two tower types, a HumeLink 500kV tower could readily be located in the middle of this view.

As a result of more than doubling of the transmission line easement width, the different tower forms, the many more line bundles at multiple levels, and the expected uncoordinated stepping of the two contrasting tower types, the proposed 500kV line will have visually grave impacts on the quality of views and landscape character.

3.3.4. Cumulative negative impacts of transmission and renewable energy infrastructure on the liveability of the regions

The cumulative negative impact of HumeLink in combination with existing transmission and renewable energy infrastructure on the regions will be excessive. As such HumeLink will have serious negative impacts on the liveability of the regions.

What is occurring is the rapid industrialisation of the rural landscapes. Many properties in the regions already have views interrupted by wind farms. HumeLink will further diminish the quality of these views, and the integrity of the region's landscape character.

Figure 11: View of wind farm in the regions

Figure 12: Substation at Bannister

Figure 13: Transmission infrastructure and wind farms in the regions

Figure 14: Transmission infrastructure and wind farms in the regions

Figure 15: 330kV transmission line in the regions

The HumeLink 500kV double circuit line will significantly increase the industrialisation of the already impacted landscape. As such an assessment of undergrounding HumeLink is urgently needed.

3.4. Methodology problems with EIS visual and landscape character impact assessment

3.4.1. Definition of the project

It is not clear whether the visual and landscape character impact assessment has taken into account the whole structure of the project, both the lines and tower structures, or just the tower structures in assessing impacts.

'This visibility analysis uses a digital terrain model and points on the top of each transmission line structure along the indicative transmission line route, to identify the areas from which views to the project may be seen' (TR 8, p27).

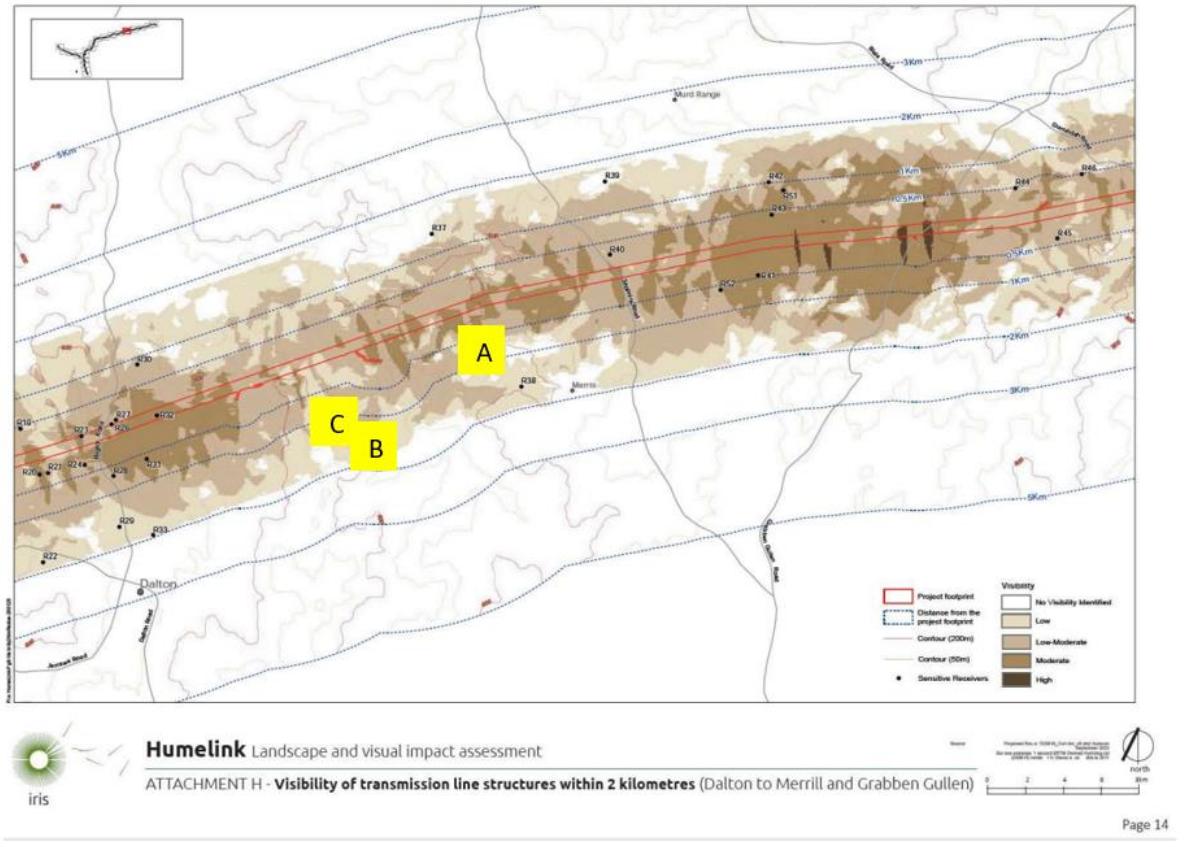
If the assessment has only considered the tower structures, the visual and landscape character impact have been considerably understated. Tower occur every 300 to 400m. The lines span every inch of the 360km route.

3.4.2. Visual impact assessment omits significant numbers of impacted dwellings

Large numbers of dwelling appear to be missing from the visual and landscape character impact assessment. By not identifying the dwellings, the assessment significantly understates the impacts on regions.

Just in our area alone 3 dwellings are missing as shown below (Figure 16).

Figure 16: Omitted dwellings from the visibility of transmission line structures within 2 kilometres mapping



Some of the dwellings not shown on the *visibility of transmission line structures within 2 kilometres* mapping in the Merrill region:
A – "Rockpools"
B – Z Ferkh
C – G & D Fitzpatrick

Neither Z Ferkh nor G & D Fitzpatrick have been contacted about the project and they consider they will experience significant negative visual and landscape character impacts.

3.4.3. Insufficient landscape character zones and viewpoints

The "viewpoints" that have selected for assessing the visual and landscape character, aren't representative of the landscape character zones.

Many more "viewpoints" along the route are needed to assess the visual and landscape character impacts of the HumeLink project – particularly near towns but also farming properties.

Further there are only eight broad landscape character zones. This is insufficient. There is no landscape character zone for the Gunning/Merrill landscape, and there needs to be, given the area's unique characteristics.

3.4.4. Errors in visual and landscape character impact assessment

3.4.4.1. Incorrectly dismissing cumulative impacts

The EIS states:

'Some cumulative impacts….would occur in landscapes where there is existing electricity infrastructure. As such, impacts associated with additional transmission lines and new energy generation infrastructure would be minimal', (p25-6 | HumeLink | Environmental Impact Statement)***.***

In the Green Hills and Red Hill and Bungongo landscape character areas, the magnitude of change would be low, due to the presence of transmission infrastructure, resulting in a low landscape impact during construction [should read operation] in these areas. (TR 8 – Part 1, p70).

Saying '[s]***ome cumulative impacts'*** would occur and then conclude that the impacts associated with '***with additional transmission lines and new energy generation infrastructure would be minimal'*** is completely inconsistent with cumulative negative impacts concept.

Also while stating that the '*magnitude of change is low'* might be correct, concluding that HumeLink will result in a '*low landscape impact'* when operating, completely ignores the fact that the cumulative impacts may be excessive.

'Cumulative effects to the environment are the result of multiple activities whose individual direct impacts may be relatively minor but in combination with others result are significant environmental effects' https://en.wikipedia.org/wiki/Cumulative_effects_(environment) . It cannot be concluded that there will be a low impact on landscape because there is already transmission infrastructure present. In fact, the opposite is likely true. The impacts will likely be excessive.

3.4.4.2. Error in assessment of structural form

*The **transmission line structures would be of a similar form to those which currently exist** in this landscape, although about double to triple the height. They would be seen in the context of existing large scale electricity infrastructure, including multiple wind turbines and substations. Overall, there would be a low magnitude of change to this landscape and a low landscape impact during operation,* (TR 8 – Part 1, p77).

FIGURE 6-6 UPLAND FOREST LANDSCAPE, CHARACTER IMAGES shows images of 330kV lines which have a completely different form than the 500kV towers. This assessment is wrong.

3.4.4.3. Visibility of transmission line structures limited to within 2 km

Restricting the assessment of Visibility of transmission line structures limited to within 2 km of dwellings understates the impacts. 500kV lines are visible for tens of kilometres. Impacts need to be assessed over a greater distance.

3.4.4.4. Structures will be larger than Bannaby - Mt Piper line towers

'Landscape impact during operation: The project would increase the presence of electricity infrastructure in this landscape, including a new additional transmission line easement, largely cleared of vegetation, which would further detract from the character of this rural landscape. The existing 500 kV substation at Bannaby would also be expanded. ***The transmission line structures would be of a larger in scale than and form to the Mount Piper to Bannaby 500 kV transmission lines*** *and would be seen in the context of existing large scale electricity infrastructure, including existing transmission easements and a substation. Overall, there would be a moderate magnitude of change to this landscape and a moderate-low landscape impact during operation (TR 8 – Part 1, p79)'*

In consultation, Transgrid has told community that HumeLink towers will be no bigger than *Mount Piper to Bannaby 500 kV transmission line* towers. In fact, land access officers have recommended travelling to Bannaby to view the tower to understand the scale of HumeLink.

3.4.4.5. Failure to assess impacts on bicentennial trail

The impact of the HumeLink project on the **Bicentennial National Trail** hasn't been considered in the EIS. The **Bicentennial National Trail** runs alongside the entire western and part of the northern boundary of 'Spring Hill' a property at Bannister. The Trail comprises Australia's premier long distance, multi-use recreational trekking route, stretching an extraordinary 5,330 kilometres from Cooktown in tropical far north Queensland to Healesville in Victoria. In 1988 the NSW government recognised the significance of The Trail https://www.bicentennialnationaltrail.com.au/about/history

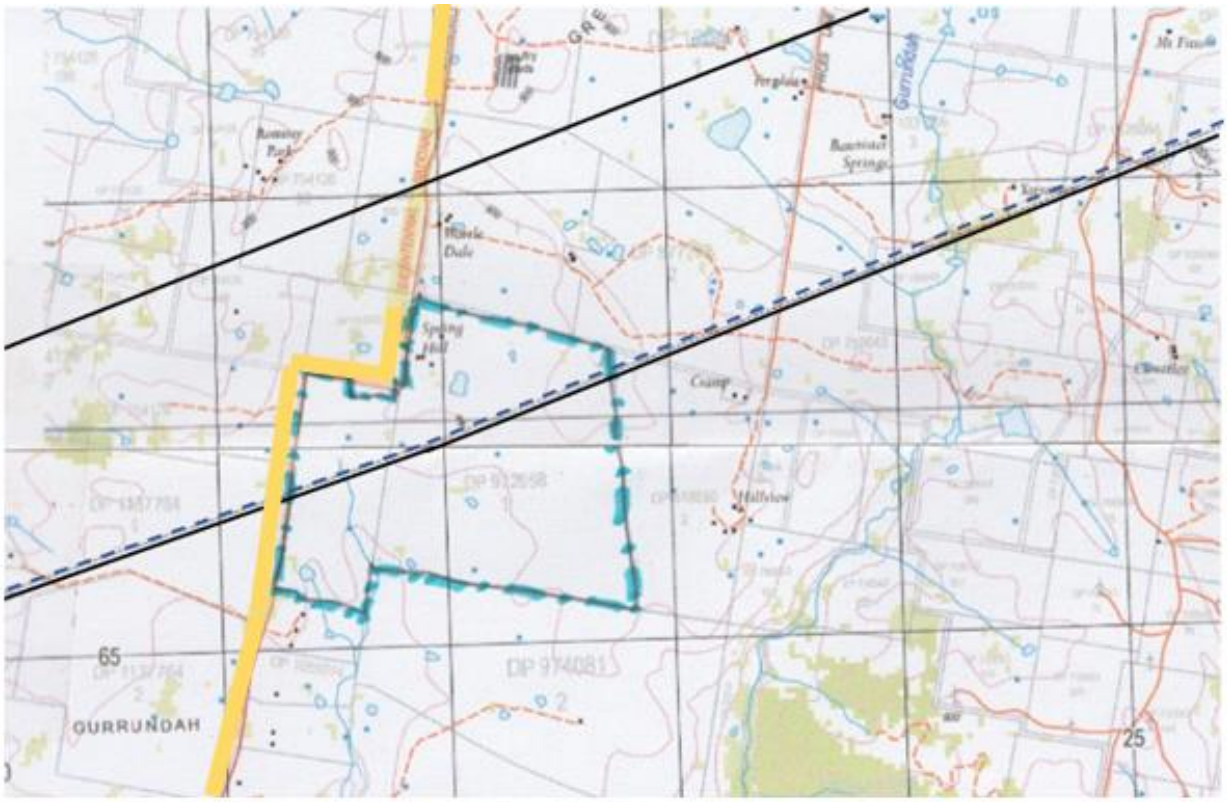


Figure 12: 'Spring Hill' ; existing 330kV line ; HumeLink study corridor
Bicentennial National Trail

> *'As it winds along Australia's eastern seaboard the National Trail reveals some of the most spectacular scenery in the country. The Trail provides access through some of Australia's wildest, most inaccessible country and provides endless fascination for those interested in our unique fauna and flora'* https://nationaltrail.com.au/about/ .

The '*spectacular scenery'* and '*unique fauna and flora'* at Bannister will be damaged by HumeLink project for the next 80 to 100 years.

The sight of HumeLink from The Trail will have a significant adverse impact on views, with the relentless marching of towers, cutting through the broader rural landscape to the horizon.

3.4.4.6. Failure to show worst case visual and landscape character impacts

The images in the EIS appear to underplay and understate the visual impact of the project. See Figure 17 below (section 4, Failure of consultation), an image provided by Transgrid, that more accurately shows the visual and landscape character impacts that can be expected along much of the length of the HumeLink project. The image faintly shows the existing 330kV line and therefore provides some indication of the scale of the HumeLink line relative to the existing line in the landscape.

3.4.5. Mitigation method inadequate

The EIS states that where there are high-moderate visual impacts these will be mitigated with "screening".

'The assessment identified 180 dwellings, either located in the project footprint or generally within 500 metres of the project footprint that may experience visual impacts. Of these, 17 dwellings would have a high visual impact, 27 dwellings would have a high-moderate visual impact and 36 dwellings would have a moderate visual impact. Where there is a potential view to the project from the primary view of a residential dwelling, resulting in a moderate-high or high visual impact, visual screening and any other potential mitigation measures would be considered in consultation with landowners with an aim to reduce the visual impact of the project'.

Screening is an utterly futile measure to mitigate the visual impacts of towers up to 80m, as tall as 27 storey apartment blocks, every 300 to 400m, in a rural landscape. Mature trees in regional landscapes are 15-20m tall, and will be unable to hide industrial 80m transmission towers. Further the visual impact on a farming property is not restricted to the dwelling of the property. The whole farm is the home – where the family works, lives and plays.

4. Failure of consultation

Consultation is a general requirement of the SEARs, and in relation to engagement the SEARs says to Transgrid:

> *'you must consult with…. affected landowners'*

While Transgrid states in their submission to the parliamentary inquiry *into the feasibility of undergrounding the transmission infrastructure for renewable energy projects* (parliamentary inquiry):

> *Transgrid recognises the significance of meaningful community engagement. Transgrid involves local communities in the decision-making process, allowing their concerns to be raised and addressed.*

the Kyeamba Valley Concerned Landowners Manifesto in July 2021, documents the rage and frustration of communities with the HumeLink "consultation" process.

One would expect that consultation would be about informing, listening, responding, and working with the community in meaningful engagement, but rather it seems to be about managing community opposition to a project. It comes across as 'let's not tell them what we're doing, and hope they don't catch on until it's too late'.

In the case of HumeLink, the first brochure that was sent to landowners to let them know about the proposed HumeLink project had not one image of the proposed transmission line. Instead, it had an image of a town at night, nestled in a valley. The next two brochures sent by Transgrid had images of towers, but not the 500kV towers proposed for HumeLink – rather smaller towers, for a smaller line. The community is of the view that by not providing an image and/or providing wrong images of what was proposed, the brochures were deceptive and misleading.

In 2022, the Yass/Bookham landowners became aware that Transgrid was reviewing the HumeLink route in other regions. There was a request that the route in the Yass/Bookham region also be reviewed. Although the landowners had not been told that a review was possible, Transgrid said, after initially agreeing to consider a review, that it was too late to review the route in the Yass/Bookham region. Not informing the Yass/Bookham community about the route review process, and not undertaking the review, is considered a major failure of the consultation.

Transgrid has also delayed informing indirectly impacted landowners, about HumeLink. These landowners will receive no compensation despite their properties being significantly devalued. At the very first Community Consultative Group (CCG) meeting (October 2021), Transgrid stated that it was looking to notify people indirectly impacted by HumeLink. However, it wasn't until the May 2023 CCG meeting that Transgrid said they were finally contacting the 4,322 indirectly impacted households (with potentially an additional 11,000 people impacted[4]).

If Transgrid was genuine in their consultation, all these people would have been contacted at the outset of the project, rather than leaving it until May 2023, when it's too late for them to have input into route refinement. Notifying indirectly impacted landowners in May 2023, more than three years after those directly impacted, is again a major failure of the consultation process.

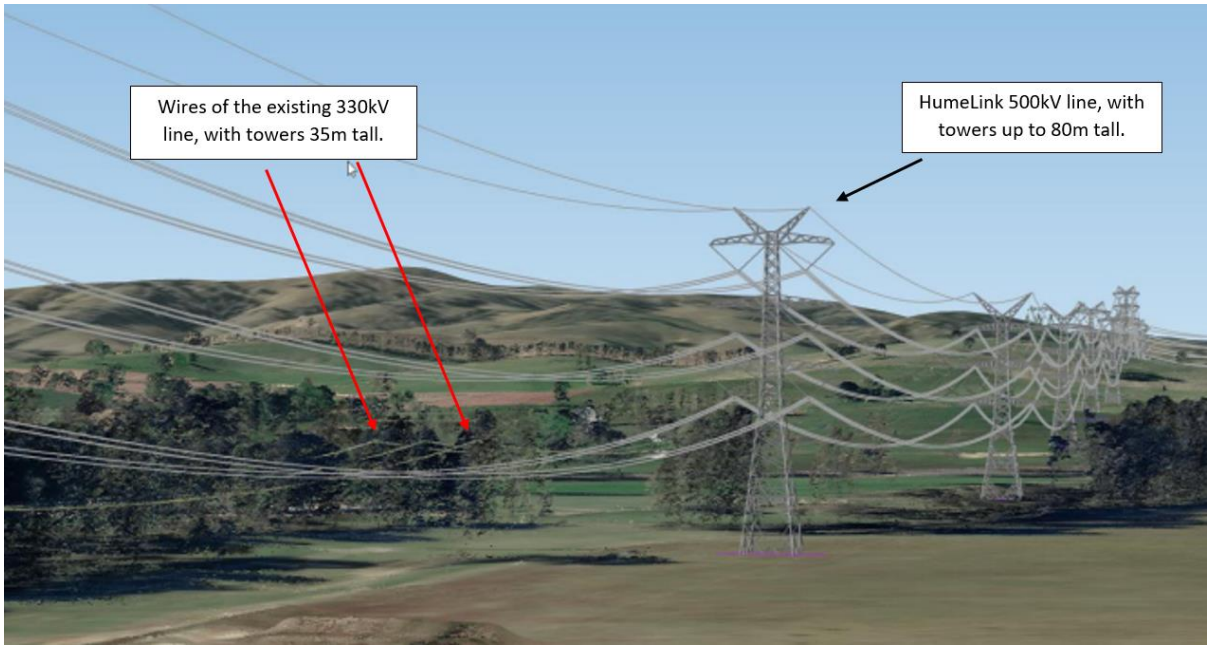
It now appears, speaking with neighbours, that numerous indirectly impacted neighbours have still not been contacted and informed about the HumeLink project by Transgrid. By not doing so prior to releasing the EIS, Transgrid has failed in the requirement to engage with affected landowners.

Transgrid has also withheld important visual and landscape character impact images from communities.

In February 2023 Transgrid provided NEARA 3D visualisation tool images to the CCGs. See image Figure 17 below:

[4] The average number of people in each household in NSW is 2.6 https://www.abs.gov.au/articles/snapshot-nsw-2021#:~:text=Households%20are%20getting%20smaller%20in,of%20households%20were%20family%20households.

Figure 17: NEARA image of HumeLink presented at the CCG meeting, February 2023



At the time, members of the CCG stated that it was critical that these images be provided to communities at the upcoming 'community information sessions' on the 'visual and landscape character impacts' of the project. Transgrid failed to show any of these images at the community information sessions.

Transgrid had pitched the recently acquired NEARA tool as a means of providing landholders and the community with more 'accurate' and 'quick turnaround' images. Previously Transgrid had mocked up photomontages for only a very few landholders.

Soon after the CCGs were shown the images possible with the new NEARA technology, it was taken off the table for use with the community. Rather it was announced that it would now only be used by engineers.

As a result, important information about the visual and landscape character impacts of the HumeLink project have been withheld from communities. As the visual impact of transmission lines is a principal impact of concern, not providing communities with all available images of what the project will look like, means communities have been kept in the dark about the visual and landscape character impact of the project.

We consider this yet another major failure in Transgrid's obligation to consult.

5. Agricultural impacts

We note that the project footprint and agricultural study area are defined as follows:

> • *Project footprint: The area that has been assumed for the purpose of this EIS to be directly affected by the construction and operation of the project. It includes the indicative location of*

project infrastructure, the area that would be directly disturbed during construction and any easement required during operation.

• Agricultural study area: The agricultural study area comprises a 1.5 kilometre buffer around the project footprint.

Table 7-1
Summary of land affected by operation of the project

Element	Indicative total area (ha)	Area within agricultural land uses (ha)	Proportion within agricultural land uses
Transmission line structures	38.61	31.74	82%
Transmission line easement and access tracks	2,521.62	2,116.95	84%
Proposed Gugaa 500 kV substation	23.17	22.23	96%
New area at the modified Bannaby 500 kV substation	6.73	0.15	2%
New area at the modified Wagga 330 kV substation	0.09	0	0%
Telecommunications hut	0.04	0.04	100%
Total	**2,590.26**	**2,171.11**	**84%**

The agricultural study area, as 1.5 km around the project footprint, is therefore estimated to total approximately 90,720 hectares (360km x 1000 x 1.5km x 2 x 1000/10,000 x 84% percentage agriculture).

The EIS states:

The total gross value of agricultural production averaged $590 per hectare in 2020-21 across the five Local Government Areas (LGAs) of Wagga Wagga City, Snowy Valleys, Cootamundra-Gundagai Regional, Yass Valley and Upper Lachlan Shire which include the agricultural study area, (TR 4, piii).

Hence the total gross value of agriculture for the agricultural study area is approximately $54 million p.a. (90,720ha x $590/ha/year).

5.1. Agricultural production losses

A number of impacts on agricultural production are noted including, but not limited to the following:

The width of cropping equipment varies from property to property, but sprayers can exceed 40 metres in width, especially on larger cropping properties near Wagga Wagga and Tarcutta. This may increase the distance that is required from transmission line structures to avoid impacts on existing spraying activities for some properties. However, some sprayers have the capacity to fold and operate at narrower widths, (TR 4, p61).

This comment ignores the fact that spray equipment can't be folded as then it will exceed the very restrictive 4.3m height limit.

Many landowners in the agricultural study area, including those employing CTF, use GPS guidance for their cropping equipment. GPS systems use receivers in the equipment, and sometimes in a fixed base station. Concerns have been expressed that the project's transmission lines would have the potential to interfere with the GPS reception by base stations and cropping equipment, or with signals sent by base stations to equipment, (TR 4, p61)

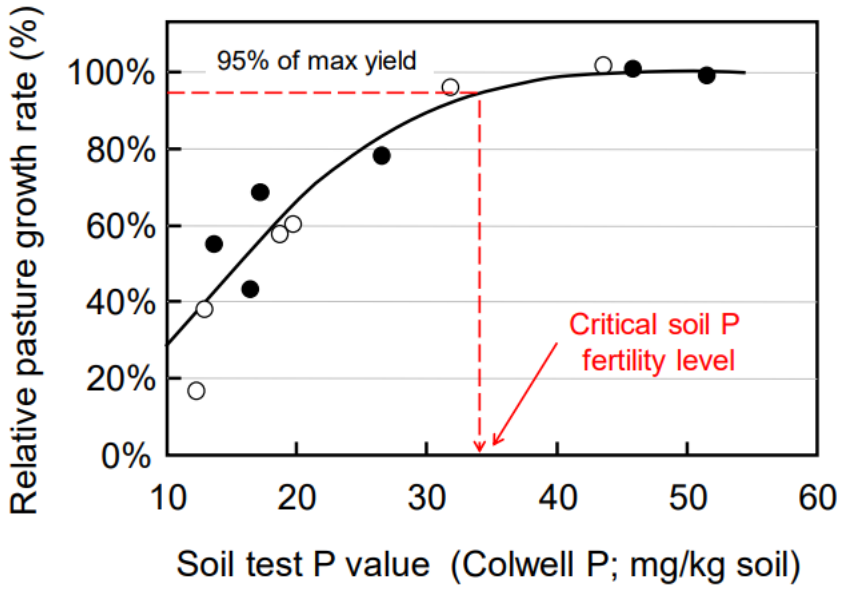
However, ***should interference with GPS guidance occur, this would cause a substantial impact on cropping operations.*** *The HumeLink Audible Noise and Radio Interference Report (Aurecon, 2022) recommends that where the project causes nuisance interference, signal boosting equipment or antenna enhancement would be offered* (TR 4, p62).

GPS guidance is also used for spraying and fertiliser application in grazing operations.

Large, localised impacts on aerial agriculture operations (such as aerial spreading of fertilisers *and aerial spraying with fixed wing aircraft or helicopters) and drones use have the potential to arise from the presence of transmission lines in agricultural areas. The efficiency and effectiveness of aerial agriculture operations can decline as application procedures must be amended to compensate for the presence of infrastructure elements. Transmission line structures and transmission lines are a potential hazard for low level aviation activities, and these must be considered in planning a safe aerial application program*, (TR 4, p62).

Where the overhead transmission lines prevent aerial spreading of super, the impact on agricultural production is shown in Figure 18 below, with more impacts where soils have lower inherent fertility.

Figure 18: Soil P value and pasture growth



Source: CSIRO, NSW Department of Planning, Industry & Environment (Department of Primary Industries), Five Easy Steps - to ensure you are making money from phosphorus fertiliser, 2020.

The EIS says that in the study area:

Most soils have moderately low to moderate inherent fertility with smaller areas of higher or lower fertility, (TR 4, pii).

Pasture growth rate can be reduced from 95% with fertiliser, to 30% without fertiliser where soils are naturally infertile. Agricultural operations in the study will therefore potentially have their productivity more than halved if they are unable to fertiliser their pastures.

There are also a number of pests, diseases and weeds that are controlled by aerial spraying that cause significant production losses including:

- red legged earthmite can cause losses in dry matter of anywhere from 10-80% and grain yield losses of 20-80%;
- weeds can cause losses of 20-40%, depending on a variety of factors;
- the disease sclerotinia in canola that can decease yields by more than 20%; and
- the disease stripe rust, one of the most significant diseases of wheat, can severely impact grain yield by up to 50% in susceptible varieties.

Losses to agricultural production in the agricultural study area therefore can be large by preventing aerial operations. Assuming, on average, production losses are 25%, this will amount to $13.5 million p.a. ($54 million total gross value of agriculture x 25% = $13.5 million). The present value of an annual agricultural production loss of $13.5 million is approximately $228 million ($13.5m/5.9%[5]). While some of this may be covered in landowner compensation payments (understood to be $90

[5] Assuming the same real, pre-tax discount rate of 5.90 per cent adopted as the central assumption for the NPV analysis presented in the PACR, (Transgrid, PACR, July 2021, p41.

.

million in the PACR), there are impacts on neighbouring properties that are outside RIT-T costs. As such, HumeLink, with a net benefit of only $39 million, can be expected to have a net cost to NSW, on the basis of agricultural losses associated with restrictions on aerial operations alone. Additional losses can be expected from interference with precision agriculture and GPS, the 4.3m height restriction on machinery, restrictions on the use of drones, the inability to spray irrigate and increased biosecurity risks.

5.2. Biosecurity costs

Biosecurity costs in Australia are very high with estimates up to $AUD11 billion p.a. (observed, highly reliable costs only) and $AUD90 billion p.a. (all costs combined) https://neobiota.pensoft.net/article/58834/. Therefore, increasing biosecurity risks to agriculture is an important and significant cost of the HumeLink project.

Undergrounding HumeLink is a means of reducing the biosecurity risk of the project. Biosecurity risk is closely positively correlated with easement width and the operation and maintenance requirements with the easement. As an overhead option has an easement four times the width of an underground option and requires more ongoing clearing, it can be expected that the overhead option will have significantly higher biosecurity costs. This cost hasn't been quantified for the project.

5.3. BSAL

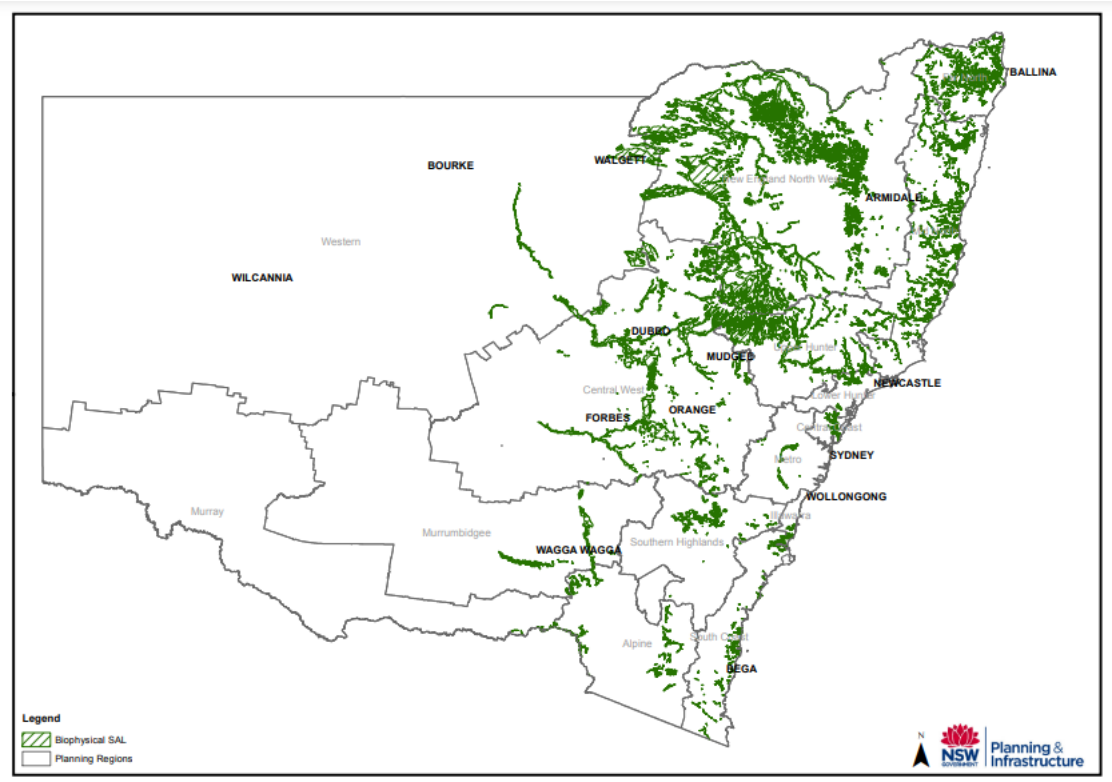
The EIS states:

'The area of biophysical strategic agricultural land (BSAL) within the project footprint would be 447 hectares, while the area of draft State significant agricultural land (SSAL) would be larger at 534 hectares. This is equivalent to 5.2 and 6.2 per cent of the total project footprint, respectively'.

'Biophysical Strategic Agricultural Land (BSAL) is land with high quality soil and water resources capable of sustaining high levels of productivity. BSAL plays a critical role sustaining the State's $12 billion agricultural industry. A polygon dataset that estimates the Biophysical Strategic Agricultural Land (BSAL) within New South Wales. These lands intrinsically have the best quality landforms, soil and water resources which are naturally capable of sustaining high levels of productivity and require minimal management practices to maintain this high quality'.
https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU&runWorkflow=AppendLayerCatalog&CatalogLayer=SEED_Catalog.79.SALBiophysical

In the regions impacted by HumeLink, only 1.55% of land in the 'South East and Tablelands' region and 0.53% of land in the 'Riverina Murray region', is BSAL. This land is rare.

Figure 19: BSAL land in NSW



There is a strong focus in planning on protecting BSAL. Impacting 447 ha of BSAL and 534 ha of SSAL, when this land is very rare, is a significant impact, and all measures to avoid this impact need to be undertaken. Undergrounding HumeLink would significantly reduce the impact on BSAL and SSAL.

6. Bushfires impacts

6.1. Grid resilience

Bushfire risk relates to the risk to the public as well as the risk to the infrastructure and grid resilience. AEMO's 2020 ISP Appendix 8. Resilience and Climate Change states on page 15, *Do no harm – 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.*

The EIS says:

> *'Bushfire prone land (BFPL) is defined by local council as land able to support a bushfire or subject to a bushfire attack. Category 1 BFPL generally support the highest intensity bushfires and are considered the highest risk vegetation…..*

> *Large areas of the project footprint are categorised as Category 1 BFPL, particularly between Wondalga and the future Maragle 500 kV substation, Red Hill and Adjungbilly, and from Roslyn east towards the existing Bannaby 500 kV substation', (*Transgrid, HumeLink EIS Main Report, p19-5,19-6).

Constructing the HumeLink project as an overhead line where *[l]arge areas of the project footprint… support the highest intensity bushfires* means the project fails the grid resilience criterion.

Undergrounding HumeLink would improve grid resilience.

6.2. Starting bushfires

Although electrical assets rarely start fires, on days of extreme the chance of them starting fires rises dramatically. As such, with climate change and increasing incidents of days of extreme fire danger, there is a risk that HumeLink, as an overhead line, will start a fire. This cost needs to be factored into the cost of the project.

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. Increasing the likelihood of these catastrophic costs, needs to be factored into the costs of HumeLink as an overhead transmission line, when comparing options. Conversely, decreasing the likelihood of these catastrophic costs, needs to be factored into the benefits of undergrounding HumeLink, when comparing options.

6.3. Impeding bushfire control

The EIS states:

> *Potential risks from transmission lines to ground-based firefighting can include situations where dense smoke and hot gases from large fires under or near a transmission line cause arcing. As such, ground-based firefighting, backburning or initial attack on spotfires are not possible within a horizontal distance of about 25 metres from the transmission line.*

As this excerpt indicates, the inability to fight fires, aerially or on the ground, where there are overhead transmission lines, means bushfires can get out of control and cause widespread catastrophic damage and loss of life. If HumeLink was underground, it would be possible to keep it operating in a bushfire, and turn off the existing overhead 330kV lines, to fight the fire, without blacking out capital cities. The inability to do this, is a major cost of the overhead option and a major benefit of undergrounding.

Impeding bushfire control has costs for the public and the infrastructure. These costs need to be factored into the cost of the project.

7. Biodiversity impacts

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.**

> *Avoidance and mitigation measures can reduce and, in some cases, remove the need for offsets if the residual impact is not significant.* ***Offsets will not be considered until all reasonable avoidance and mitigation measures are considered****, or acceptable reasons are provided as to why avoidance or mitigation of impacts is not reasonably achievable, (Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy, October 2012,* p7).

Like all large developments, transmission projects destroy large amounts of native vegetation, killing thousands of native plants and animals in the process.

The recent State of the Environment report found that Australia is failing the environment on almost every measure. An important measure is loss of habitat. Humelink will worsen our performance on this measure. 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 identified that 1862 ha of critically endangered woodland would be directly impacted.

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. Also, with undergrounding some sections can be horizontal directional drilled, eliminating impacts on habitat altogether.

8. Tourism impacts

Tourism is 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 in the Snowy Mountains and Tablelands regions, that have been specifically selected as **iconic** location to promote regional Australia. It is damaging to the natural asset (landscapes of great natural beauty) that is the drawcard for visitors to regions. As such HumeLink will harm tourism, an important growth industry for many regions.

9. Regional development impacts

HumeLink as an overhead transmission line 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 NSW Budget 2023-24 included '$1.8 billion in new regional investment to build on the strengths of the regions….and improve….quality of life in our rural and regional communities' https://www.budget.nsw.gov.au/2023-24/budget-papers/regional-nsw#:~:text=This%20budget%20includes%20%241.8%20billion,our%20rural%20and%20regional%20communities.

HumeLink as an overhead line, which is taking liveability, workability and beauty from regions, is directly undermining this investment in regional NSW.

10. Social impacts

A requirement under the NSW Government Guide CBA is an assessment of the distributional equity impacts of the project. This is also part of the Department of Planning and Environment's Social Impact Assessment Guideline (2023) (SIA Guideline).

Despite this, there appears to be no attempt to assess the distributional equity implications of the HumeLink project. The fact that people in the regions are bearing the environmental costs - are the losers, and people in the cities with cheaper electricity are the winners, isn't identified.

The EIS states:

There were a total 71,481 private dwellings and 63,566 households in the social locality[6] at the 2021 Census, with an average household size of 2.5 people, slightly higher than the Rest of NSW, at 2.4 people.

Transgrid said they were contacting 4,322 residences identified as near neighbours (within the EIS project footprint, 2 km radius) in May 2023. The number of landowners the line actually traverses is 260. Therefore, the total number of residences impacted is approximately 4,582, meaning between 6.4 to 7.2% of dwellings/households in the regions, housing 11,455 people, will be impacted by HumeLink. This is likely an underestimation, as the visual impacts on dwellings will extend well beyond a 2 km radius of the project.

As such a significant proportion of residences in the regions will be impacted by HumeLink.

[6] The social locality, or study area, for this Social Impact Assessment (SIA) has been defined to include the Local Government Areas (LGAs) that are most likely to be impacted by the project, including: ▪ Wagga Wagga City ▪ Snowy Valleys ▪ Yass Valley ▪ Cootamundra-Gundagai Regional ▪ Upper Lachlan Shire ▪ Goulburn-Mulwaree ▪ Hilltops.

As noted in section 3 above, a large number of studies have found a link between transmission lines, a reduced quality of the environment and a lower level of wellbeing for communities. As such building overhead transmission lines rather than underground cables is condemning regional communities to a lower level of wellbeing for generations.

This is particularly unacceptable as the regions are already less well-off relative to people in city areas (Regional NSW demographic and economic snapshot, Briefing Paper No 01/2020). Taking something of value from regional communities – their landscapes where they live, work and play, will further eroding their wealth and so increase inequity in NSW. There is an important distributional equity argument for putting transmission lines underground in the regions.

11. Noise impacts

Noise associated with the HumeLink project will have impacts on tourism, regional development and the wellbeing of people in the regions.

The EIS states:

> *The assessment conservatively assumes that the transmission line may be anywhere within the project footprint, with consideration of a 70 metre minimum easement. The distance at which operational transmission line noise impacts are expected varies across the project but is generally around 350 metres.*
>
> *Up to a total of 65 receivers have been identified to potentially have operational transmission line noise impacts based on worst-case conditions. At the edge of the easement, the worst-case noise levels for the majority of potentially impacted receivers is expected to be around 2 dB to 4 dB above night-time trigger levels with the highest exceedance being up to 15 dB above night-time trigger levels.*
>
> *During fair weather conditions transmission line noise emissions are expected to be lower, with up to 11 receivers identified to potentially have operational noise impacts from the project transmission lines. At the edge of the easement noise levels may exceed the night-time trigger level by up to 4 dB. The NPfI indicates that after the application of all reasonable and feasible mitigation, residual noise impacts of this magnitude are considered to be of 'marginal' significance.*

As the noise of HumeLink will exceed noise limits enforced by the NSW Environmental Protection Authority (Noise Policy for Industry (EPA, 2017)), at numerous dwellings, the noise impacts of the project are significant.

To address the excess noise, Transgrid plans to enter into agreements with impacted landowners to 'treat' (we presume sound proof) homes.

> *'Operational transmission line noise impacts would be confirmed as the project progresses. It is likely that individual agreements would be the most feasible and reasonable mitigation strategy where operational noise impacts are identified.* ***These agreements may include***

***property treatments to reduce noise ingress**. Any agreements would be subject to the outcomes of noise monitoring and further discussions with property owners'* (HumeLink EIS).

Noise mitigation strategies are totally unacceptable to landowners. There needs to be a commitment to shut down the line to prevent exceedances or to underground the line. Undergrounding eliminates noise issues.

Further with farming properties, the whole farm is the home. It is insufficient to assess noise exceedances just at dwellings. Noise impacts on the farm work place and recreational areas, also need to be assessed.

12. System security of infrastructure of national significance

The Department of Home affairs says: 'The Security Legislation Amendment (Critical Infrastructure Protection) Act 2022 (SLACIP Act) came into effect on 2 April 2022….. [T]he SLACIP Act seeks to make risk management, preparedness, prevention and resilience, business as usual for the owners and operators of critical infrastructure assets'.

HumeLink, as an *actionable project in the Integrated System Plan – (Marinus, VNI West (via Kerang), and **Humelink**), has been* being declared transmission of national significance.

There are significant security risks for the grid with HumeLink as a 500kV double circuit overhead line, paralleling existing 330kV overhead lines in high-risk bushfire prone areas. Undergrounding HumeLink will eliminate 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

13. Conclusion

Australia is a big country but south-eastern NSW is closely settled. There is a strong case for undergrounding transmission in this region. Also it might not be possible to underground all future transmission, but there is a compelling case for undergrounding 500kV lines - the biggest bulkiest and most imposing of all transmission lines in Australia, completely dominating the landscape for kilometres either side.

The recently released expert review of the GHD/Transgrid HumeLink undergrounding study, confirms that the cost of undergrounding HumeLink has been significantly exaggerated. It finds undergrounding HumeLink is a feasible option and could be delivered from between $5.5 to $7.3 billion, with the higher capital cost offset by lower ongoing operating costs and environmental benefits. This is consistent with governments overseas coming to the conclusion that when you take into account all the costs of overhead lines, undergrounding is the welfare maximising option.

Since the $39 million net benefit of HumeLink to electricity consumers was estimated in July 2021, there have been material changes in circumstance for the project. As such the RIT-T needs to be reapplied to the HumeLink project, for NSW Planning and Environment to have any ability to

determine if HumeLink still has a net benefit to electricity consumers, before assessing the net benefit of the project to the State as a whole.

To assess the overall benefit of the HumeLink project, Transgrid stated the assessment would follow the TPP17-03 NSW Government Guide to Cost-Benefit Analysis. Inconsistent with this, the EIS uses I-O analysis, that the NSW Government Guide CBA explicitly says should not be used for project evaluation. As a result, there has been no quantifying of the significant and enduring indirect costs of the HumeLink project omitted from the RIT-T cost-benefit analysis. And there has also been no assessment of the distributional equity implications of the project.

A simplified assessment of part of the impacts on agriculture, estimates a cost from impeding aerial agricultural operations at approximately $228m, and indicates that HumeLink has a net cost to the State, on the basis of this alone.

The EIS consistently understates the negative impacts and repeatedly concludes that strategies to mitigate impacts can reduce impacts to acceptable levels. Understating negative impacts and concluding that profound and enduring impacts can be successfully mitigated, when clearly they can't, is causing significant harm to rural communities.

The mitigation strategies are utterly inadequate. Sound proofing homes, where the project exceeds noise limits, and providing screening for transmission towers that are up to 80m tall and occur every 300 to 400m, where visual impacts are high, are not satisfactory mitigation measures.

We request NSW Planning and Environment require:

i. that the RIT-T be reapplied to the HumeLink project to reassess the overhead option given the current $4.892 billion cost and other material changes in circumstances, and to consider the underground option; and
ii. that a full triple bottom line cost-benefit analysis, consistent with the NSW Government Guide CBA, that considers all first round direct and indirect costs, be undertaken to assess the options – overhead and underground.

The omission of community and environmental costs from the planning of transmission in the RIT-T, is a major failure of the NEM. As a consequence, the State is assessing transmission 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.

An economic assessment that fully considers the non-market benefits of undergrounding is critical to ensure we have environmentally responsible transmission as well as generation, as we transition to net zero emissions. We urge that approval for HumeLink as an overhead line is denied and there is a requirement that the project be constructed underground.

Yours sincerely,

Andrea Strong, HumeLink Alliance Incorporated

Appendix A: Excerpt from the Environmental Planning and Assessment Regulation 2000 under the Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Regulation 2000 under the Environmental Planning and Assessment Act 1979 states (some emphasis added):

> ***'3 Analysis of alternatives***
>
> *An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including the consequences of not carrying out the development or activity.*
>
> ***4 Environmental assessment***
>
> *An analysis of the development or activity, including:*
> *…..*
> *(b) a general description of the environment likely to be affected by the development or activity, together with a detailed description of those aspects of the environment that are likely to be significantly affected, and*
> *(c) the likely impact on the environment of the development or activity, and*
> *(d) a full description of the measures proposed to mitigate any adverse effects of the development or activity on the environment, and*
> *…..*
> ***5 Compilation of measures to mitigate adverse effects***
>
> *A compilation (in a single section of the environmental impact statement) of the measures referred to in item 4 (d).*
>
> ***6 Justification of development***
>
> *(1) The reasons justifying the carrying out of the development or activity in the manner proposed, having regard to biophysical, economic and social considerations, including the following principles of ecologically sustainable development:*
> *(a) the **precautionary principle**, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*
>
> *In the application of the precautionary principle, public and private decisions should be guided by:*
> *(i) **careful evaluation to avoid, wherever practicable**, serious or irreversible damage to the environment, and*
> *(ii) an assessment of the risk-weighted consequences of various options,*
>
> *(b) **inter-generational** equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*
> *(c) **conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
> *(d) **improved valuation, pricing and incentive mechanisms**, namely, that environmental factors should be included in the valuation of assets and services…'*

Appendix B: Letters in response to the GHD/Transgrid HumeLink undergrounding study

Letter 1:

Mr Brian Elton
Independent Chair

HumeLink Undergrounding Steering Committee

29 August 2022

Dear Brian,

Being on the HumeLink Undergrounding Steering Committee has been a mixed experience. It was pleasing to see the rigor and consideration that went into defining the options considered, but very frustrating seeing serious issues being ignored concerning: cost estimates; evaluating transmission losses; route assessment; and the lack of balance in the comparison of the non-market benefits of overhead lines and underground cables.

After spending so much of our personal time on the study, to get to the end, and be unable to endorse the report, is very disappointing indeed.

Even more disappointing and frustrating is that Transgrid, without discussion with the Steering Committee, immediately announced its decision not to underground HumeLink based on the unendorsed report, that the community representatives, the community's expert technical advisor, and a second independent expert, dispute.

This is particularly disappointing given, in our response to the Undergrounding Study, we conclude:

> '……this study should not be relied upon for making decisions about whether overhead lines or underground cables are the preferred option for HumeLink.
>
> A full and comprehensive expert review of the HumeLink undergrounding study is urgently needed to address problem areas of the report, so that informed decisions can be made about undergrounding of the HumeLink project going forward'.

And yet before the ink was dry, Transgrid has dismissed undergrounding as an option, ignoring our some 52 unresolved issues with the study.

We are also very concerned that the information about the relative cost of overhead lines and underground cables, released by Transgrid to explain its decision not to underground HumeLink, is misleading for a number of reasons.

1. **Two undergrounding experts think the undergrounding costs in the report are wrong and too high**

   Transgrid is aware that two undergrounding experts consider that the undergrounding costs in the report are excessive. One of those experts is the expert advising the community. The other is **Transgrid's own** cable specialist!

   To report the undergrounding costs to the public without qualifying the costs and acknowledging that two undergrounding cable experts believe the installed cable cost is more than 50% overstated, does not fairly present the facts.

   The retracted undergrounding report in June 2022, significantly exaggerated the undergrounding cost. According to the experts, the current report still has the undergrounding costs substantially overstated.

2. **Comparison of underground costs in 2022 to AC overhead costs in 2020/21**

   It is also misleading to compare the overhead costs that were estimated in 2020/21 to the underground costs estimated in 2022. This is particularly the case given the sudden and dramatic increase in industry costs over the past 12 months.

   To make comparisons and draw conclusions about the relative cost difference for overhead lines and underground cables, when the costs of the two options have been calculated at different points in time, doesn't reliably present the relative costs.

3. **Non-market costs/benefits of overhead/undergrounding not emphasised**

   Furthermore, in advising the community that it is dismissing undergrounding and going with overhead transmission lines, Transgrid makes no mention of the greater environmental costs of overhead lines: costs to the environment of industrialising landscapes of great natural beauty for the next 80+ years; costs to tourism; costs of greater impacts on biodiversity; costs of increased bushfire risk; and costs of reduced productive efficiency of agriculture.

   At the outset of the study, it was understood undergrounding would cost more. The question is, is the extra cost worth it to eliminate the significant environmental costs of overhead lines?

Transgrid's statements dismissing undergrounding

Transgrid says that it is unsustainable to underground HumeLink "as the additional cost will be passed on to commercial, industrial and private electricity consumers, at a time of great concern about escalating electricity prices". But, to a large extent, the reason that electricity prices are increasing, and will increase in the future, is that coal-fired power stations are shutting down. The reason coal-fired power stations are shutting down is to protect the environment. If we are serious about the environment

as a nation, it's not sufficient to address problems with electricity generation, environmentally responsible transmission is also needed. By undergrounding transmission there are significant and enduring benefits to the environment, and the people whose lives, properties and businesses are directly affected.

In transitioning our electricity generation from fossil fuel to renewables to save the planet, we can't at the same time degrade the country with more overhead transmission lines, in this case 500 kV lines that dominate the landscape, when there is a better way, undergrounding.

In any case, HumeLink, as a "connection asset" for Snowy 2.0, should be paid for by Snowy Hydro and the tax payers of Australia, not by electricity consumers through higher electricity prices.

Transgrid also says "……it is very difficult to put in place any large infrastructure project without impacting some landowners". Firstly, this project isn't impacting just "some" landowners. It's impacting "matters of national environmental significance" (referral: Environment Protection and Biodiversity Conservation Act 2021/9121), numerous regional communities, and hundreds of landowners for 360km and tens of kilometres either side, and the proximate environment. And secondly the solution is obvious, put the line underground.

Comprehensive review needed

As members of the HumeLink undergrounding steering committee, we urge Transgrid not to make a decision on undergrounding with this flawed and unbalanced report that we do not endorse. But rather take note of the opinions of the other underground cable experts, and undertake a comprehensive expert review of the HumeLink undergrounding study, to address major problems with the study, so that informed decisions can be made about undergrounding the HumeLink project.

In addition, a further study is needed to quantify the non-market benefits of undergrounding so these can be valued and fully taken into account in making decisions on undergrounding. Quantifying non-market benefits of underground cables was part of the scope of the study that was omitted by the consultant (see attached the list of some of the non-market benefits that we consider need to be quantified).

Yours sincerely,

The Community Consultative Groups representatives on the HumeLink Undergrounding Steering Committee

Rebecca Tobin, Peter Lawson and Andrea Strong

Table 1: Non-market benefits to be quantified

Non-Market Benefits	Underground	Overhead
Environmental Impact	– Less land disruption following construction – Narrower easement for ongoing access for maintenance and repair – Smaller easement width means less fragmentation of wildlife corridors – Post construction lower ongoing vegetation clearance for underground easements	– More vegetation clearing during construction as a wider easement – Greater loss of habitat and biodiversity with wider easement – More interruption to wildlife corridors with wider easement – Greater risk to wildlife safety from accidental contact with energised infrastructure
Productive efficiency of agriculture and communities	– Possible conditional agriculture activity directly above the buried cable circuits – No risk for aerial spraying activity – No risk of tall machinery or equipment impacts to buried cables	– Restrictions on using machinery over 4.3m tall – Inability to use drones – Inability to use precision agriculture – Restrictions on aerial operations (spraying, spreading super phosphate) – Constraints on using irrigation – Post construction greater biosecurity risk with higher ongoing vegetation clearance for overhead easement – More earthing requirements on metal and electric fencing to prevent transfer potentials – Loss of shelter and windbreaks for stock and pastures as more vegetation removed with the wider easement
Electromagnetic fields (EMF) and electromagnetic compatibility (EMC) Impacts	– Lower Magnetic field with distance from the cable and no electric fields	– Higher Magnetic and electric fields
Community benefits (visual amenity, audible noise, etc.)	– Lower visual impact – No operational noise (Corona) – Negligible impact to public and wildlife activity following construction	
Bushfire Risk	– Negligible potential for bushfire ignition – No restricted access for bushfire fighting – Power transmission unlikely to be affected during bushfire – Negligible potential for above ground bushfire to impact and damage undergrounded assets	– Higher bushfire risk
Impacts on the community and environment	– Negligible impact to public and wildlife living in the area following construction and remediation	– Larger building envelope with towers up to 80m tall – Significant loss of visual amenity for the community with the industrialisation of rural landscapes for in excess of 80 years – Less dust and noise during construction – Lower disturbance to roads and land use during construction – More dwellings, farms sheds, stockyards, etc, expected to be removed with wider easement – Greater disruption to community after construction as more maintenance required

Letter 2:

HumeLink Community Consultation Group Representatives (CCG-SC) for:

Snowy Valleys CCG

Wagga Wagga, Cootamundra, Gundagai CCG

Upper Lachlan, Yass Valley CCG

24 August 2022

Mr Brian Elton
Independent Chair
HumeLink Undergrounding Steering Committee

By email: brianelton1952@outlook.com

RE: CCG-SC Position on HumeLink Undergrounding Study Report

Dear Mr Elton,

This letter summarises the position of the Community Consultative Groups representatives on the HumeLink Undergrounding Steering Committee (CCG-SC) following the review of the final GHD report "Concept Design and Cost Estimate HumeLink Project – Underground" Revision 3, dated 22 August 2022.

There are many aspects, outcomes and conclusions presented in this report that the CCG-SC do not agree with and therefore the CCG-SC do not endorse the report.

Since the release of the draft report to the CCG-SC on 27 May 2022, the CCG-SC have submitted a total of 100 comments to be addressed by the consultant. As of the date of release of this final report, only 48 of those original comments have been resolved to the satisfaction of the CCG-SC, with 52 remaining unresolved.

1 Key Topics of Concern

Over 50% of the unresolved comments can be summarised by the following key topics of concern. It should be noted that these topics cover only a subset of the outstanding issues which have been provided to the consultant.

1.1 Report is Unbalanced

It is the CCG-SC view that the report is unbalanced and favours an approach of focusing on the negative aspects of the use of underground cables, while downplaying the positive aspects of selecting underground high voltage cables over AC overhead lines. The lack of balance is further worsened in

the report by the downplaying of significant negative impacts of overhead lines and lacking the same level of detail and explanation of negatives of overhead lines as is given to underground cables.

The CCG-SC were involved in the drafting of the Request for Quotation (RFQ) of this study, and the RFQ was specifically developed to provide a balanced approach to comparing underground and overhead transmission.

There were two main parts to comparing options in the study:

1. Construction and operation costs; and
2. Non-market benefits.

At the outset of the study, it was understood undergrounding would cost more to construct. Therefore, an important part of the study was to assess the non-market benefits of undergrounding relative to overhead lines, so an informed decision could be made about the benefits of the additional undergrounding construction cost.

For this purpose, the scope required that the selected undergrounding options be compared with the current AC overhead line scope against a set of criteria which was carefully selected by the CCG-SC to provide a balanced comparison. In the CCG-SC's view, this part of the scope was of equal importance as the construction cost in the report.

The comparison tables in the body of the report as well as the executive summary are considered by the CCG-SC to be unbalanced and do not cover all of the criteria required by the RFQ.

1.2 Unit Costs for Underground High Voltage Underground Cables too High

While the CCG-SC understand that the cost of high voltage cables and their installation has increased significantly over the past 12 months, the CCG-SC are of the view that the cost estimates for the underground cable components are significantly higher than (in some cases almost double) values expected according to various sources (including the AEMO Transmission Cost Database, which was also developed by GHD) and Australian based high voltage cable experts.

The CCG-SC are concerned that a bottom-up approach to develop these costs has not been undertaken by the consultant and that the methodology applied has resulted in this higher value. The methodology that has been applied is confusing and seems to be based on high level ballpark pricing derived from a small sample size of other projects. We understand that the major point of difference is in the estimated cost of the cable installation and we understand that was determined using the above approach from overseas. It is the CCG-SC's opinion that the cost of installation should have been developed using a bottom-up approach and using rates and indices from Australian sources and cost guides and handbooks.

The report also assumes no cost reduction when installing two trenches and two sets of bipole cables (three cables) side by side. The unit cost per kilometre for the three cables installed in a single trench has been doubled, with no allowance for economies of scale that should be expected when installing two trenches and six cables instead of one trench and three cables. As a minimum, there should be cost efficiencies in aspects such as mobilisation, demobilisation, overheads, use of labour and procurement of longer lengths of cable. The CCG-SC are of the view that failure to apply such cost efficiencies has contributed to a higher than expected underground cable cost component.

1.3 Cost Benchmarks for HVDC Cables not Appropriate

Related to the CCG-SC's concerns described in section 1.2, the report states that the underground cable cost estimates were "*based on reference to recent bids received by Stantec for EuroAsia and Harmony link HVDC projects as well as information received from equipment suppliers*".

We note that the EuroAsia and Harmony HVDC links are projects where the proportion of land cable components are relatively short (public references indicate 26km and 40km respectively) compared to the more expensive subsea cable components. The consultant to the CCG-SC, Amplitude Consultants, has advised that the unit cost of underground cables, both in terms of the cost of the cable and the installation costs, would be expected to reduce as the total amount of cable purchased and total length of cable installed increases. In the case of the HumeLink project, there will be 679 km of total circuit length and over 2,000 km of underground cables procured and installed. The costing benchmarks selected by the consultant will not have accounted for economies from the procurement and installation of these significantly longer lengths.

It is the CCG-SC's view that the consultant should have benchmarked their unit costs against other projects under construction of similar scope to the HumeLink undergrounding options, such as SuedLink (Germany, 2GW, double symmetric monopole, 750km), SuedOstLink (Germany, 2GW, double symmetric monopole, 275km) and SOO Green (USA, 2GW, symmetric monopole, 563km).

1.4 No Information on Scaling of Costs to 2022

The report states that the cost estimates developed are in 2022 costs, and often refers to recent and dramatic increases in cost for HVDC equipment and high voltage underground cables. Section 4.1.1 refers to "Factors that may affect the cost estimates" which include commodity price fluctuations, suppliers' manufacturing plant loading and labour rates along with others.

Given the methodology applied to develop the cost estimates, particularly for the underground cables, the CCG-SC have repeatedly asked the consultant to advise how these factors have been applied in the development of the cost estimates. The responses the CCG-SC have received include statements such as *"our engineering judgement based on our experience and understanding of the HVDC market to prepare the cost estimates"*, *"the present market conditions were considered in the development of the estimate"* and *"the estimate is based on today's market conditions"*. Given that actual values have been produced, there has been no satisfactory response from the consultant to this request.

The CCG-SC are aware of certain indices that are available for high voltage equipment, cables and conductor manufacture, both in Europe and Australia that do show an increase in costs in these areas particularly over the past 6 to 12 months. However, the fact that the consultant cannot state specifically how they have adjusted historical values to account for these market changes raises concern over the accuracy of the estimates provided.

1.5 Comparison of Underground Costs in 2022 to AC Overhead Costs in 2020/21

The "Options" section of the executive summary of the report provides a summary comparison of the AC overhead option against the various underground options. On the first page of the table, there are CAPEX and OPEX cost comparisons where the cost estimates for the underground options, stated

within the report to be to present market conditions and therefore considered to be mid-2022 cost values, and compared with the 2020/21 CAPEX and OPEX costs of the AC overhead option.[7]

The report goes to great lengths to describe the cost impacts that have affected pricing under current market conditions (see section 4.1.1 of the report). It is the CCG-SC's view that a number of the factors listed in the report, including commodity price fluctuations, suppliers' manufacturing plant loading and labour rates and in addition the supply chain issues being experienced from countries where overhead towers and conductors are typically sourced, such as China and India, are likely to also affect the estimate of CAPEX and OPEX of the AC overhead option.

It is the CCG-SC's view that report unfairly compares costs based on current market conditions for the underground cable options against previously developed 2020/21 estimates for the AC overhead option, especially given the sudden and dramatic increase in costs over the past 12 months. In our view, the AC overhead option cost should be reassessed to present market conditions (i.e. 2022), and applying the same basis, methodology, and other applicable input assumptions as the underground cable estimates to allow a fair and reasonable comparison of CAPEX and OPEX costs.

1.6 Comparison of Losses in OPEX Costs

In the executive summary, the report provides a comparison of operating costs against a value reported for the AC overhead option. It is stated that the AC overhead option value includes losses, which are also included in the OPEX estimates for the underground options.

However, the CCG-SC have requested from the consultant to provide the actual MW and MWh values used to derive the cost of losses in the report. By virtue of the technologies being compared and the distances involved, the total electrical losses of the underground HVDC options should be less than (and in some cases, significantly less than) the AC overhead loss values – this is one of the major reasons why HVDC underground transmission is selected over AC overhead transmission at these distances. The costs presented and compared indicate that the consultant has determined equal losses for the underground options as the AC overhead line option, and the CCG-SC have not had the opportunity to check these values and how they have been derived.

The CCG-SC are of the view that the OPEX costs presented in the executive summary should not be compared between the underground options and the AC overhead options until the calculation of losses used to determine the OPEX costs for both the underground and AC overhead options have been presented and checked.

1.7 Route Assessment

The report presents various route options, primarily for the purpose of determining circuit lengths and cost assumptions. The CCG-SC have raised a number of concerns regarding this route assessment.

Firstly, the RFQ required that the consultant "*For all Options, develop and provide, based on a desktop assessment, an expected route for all underground cable sections. These routes shall consider the "best available" route for the underground cables. The selected routes will not necessarily be inside or follow the study corridor presently being considered for the overhead transmission line route i.e. more direct routes or routes following road reserves or other features and minimising disturbance to private*

[7] The CCGs note that the costs have been updated to indicate that the costs are 2021 costs however, from the overhead line modelling included with the PACR it is understood that 2020 HumeLink costs have been escalated simply using a CPI of 1.57% and not using an index more relevant to the plant, materials, equipment, and delivery of AC overhead transmission projects.

landholders would likely be preferable considering differences in overhead and underground construction."

In our view, this was not done. The consultant has produced only one underground specific route (the Hume Highway route), which was only applied to one set of options. This was not done for "all options" as required in the RFQ which was jointly developed in consultation with the CCG-SC. Furthermore, the Hume Highway route was more than 70 km longer than the Option 2C route from the Project Assessment Conclusions Report (PACR) that followed the same topography, Maragle – Gugaa – Bannaby. Reducing the route length of the options assessed with the Hume Highway route, by 70+ km can be certainly expected to reduce the cost of these options.

Secondly, the consultant ranked the routes considered using a multi-criteria assessment tool "InDeGO". InDeGO purports to evaluate enviro-social constraints, with the route with the lowest InDeGO score being regarded as the route with the least environmental and social impact – the preferred route subject to the least constraints.

In the CCG-SC's view, it is questionable whether all the factors listed in the report are constraints for an undergrounding route. The consultant argues that during the short construction phase (relative to the overall asset life), these factors are constraints. The assertion that an inconvenience for a short period during construction, should dictate the location of an infrastructure project that will operate for decades, is not compelling.

The CCG-SC are of the view that dwellings within a kilometre of the easement, unlicenced airstrips and bushfire prone land shouldn't be regarded as constraints for an underground route.

Further it became evident during the course of the study that the InDeGO database is missing significant numbers of "constraints", with numerous dwellings not identified in the mapping and bushfire prone land not consistent with RFS mapping (see Section 1.8 of this letter Identification of Bushfire Prone Areas). The CCG-SC therefore believe that the majority of the routes identified for the underground options were done so using previous study information that was used for exploration of overhead routes using public and private land. The CCG-SC are of the view that different input information is relevant for overhead and underground solutions such that underground solutions could be developed more directly, and could present differently to what would otherwise be used for development of an overhead solution based on the input information. Even if the methodology was considered robust, the problems with the database and input information makes the scores reported unreliable.

Based on the above, the CCG-SC are of the view that the ranking of routes using this method cannot be relied upon for the decision about the location of the HumeLink transmission project, for both the AC overhead and underground options.

1.8 Identification of Bushfire Prone Areas

The CCG-SC have identified major inconsistencies with what the NSW Rural Fire Service (RFS) defines as bushfire prone, and what Transgrid defines as bushfire prone. Some properties in the area have not been designated as bushfire prone by Transgrid but are shown as bushfire prone according to the RFS maps[8].

The consultant maintains that the RFS has certified the Bushfire Prone Land Maps that have been used to map HumeLink, in the GHD *HumeLink Route Options Assessment (March 2022)*, and this

[8] https://www.rfs.nsw.gov.au/plan-and-prepare/building-in-a-bush-fire-area/planning-for-bush-fire-protection/bush-fire-prone-land/check-bfpl

undergrounding study. The question is then why are the RFS online maps of bushfire prone land and the consultant's maps of bushfire prone land so vastly different? The maps used by Transgrid and the consultant have established bushfire prone land as heavy vegetation/forested areas, yet the RFS maps available to the public show bushfire prone land to be more widespread and encompassing large areas of agricultural land.

1.9 Technical Accuracy of Various Aspects of AC and HVDC Underground Cable Installation and Operation

The CCG-SC have flagged a number of concerns of technical accuracy presented in the reported. Some of these concerns are related to the issue of highlighting negative aspects as described in Section 1.1 of this letter.

One example is how the topic of energisation of the AC cables has been presented in section 3.3.2 of the report. Under the heading of "installation considerations", the report states "*the energisation of the AC cables will require a significant amount of time, estimated to be 48 to 72 hours per 20 to 40 km segment of cable. This introduces operability issues for configurations with AC cables. By reducing the length of AC cables, the operability of the system is improved*".

This statement is misleading. The 48 to 72 hours is only required as a "soak test" of the cables on completion of installation and segments can be soak tested simultaneously, which is common for such long-distance AC underground cables.

Another example of highlighting the negative, under the same topic, is in section 3.1.2 of the report under "Installation conditions" where the report correctly refers to the "soak test" but then goes on to state *"Initial cable commissioning tests will require setup of specialised equipment."*. It is the view of the CCG-SC's consultant that for such long distance cables, it is likely that only a "soak test" would be applied and that the paragraph presented here unnecessarily paints a negative picture of AC underground cables.

It is also clear in the report that the design and installation assumptions applied to these long-distance AC and HVDC cables are based on the Transgrid EHV Cable Design and Installation Manual (section 3.1.2 of the report) and that the consultant has applied techniques for installation of relatively shorter distances of AC underground cables in built-up areas, to the installation of long distance AC and HVDC cables in rural and non-built up areas. This includes the inclusion of thermally stabilised backfill (TSB) in their design assumptions. The CCG-SC are aware that TSB was not used in the two long distance HVDC underground cable projects built in Australia (Directlink and Murraylink) and that in both cases, more time and cost-efficient methods of installation were applied to improve the efficiency of the installation process. TSB can be very expensive and at the lengths considered in this project, it is highly likely that a choice to space the cables a little wider or to select a slightly larger cable may prove more cost effective than assuming TSB. It is noted that in section 4.1.1 it is stated that *"TSB has not been included in the cost estimate"* however in our view applying these types of assumptions for shorter AC underground cable systems to long-distance cable systems would contribute to the higher unit cost of cable installation as discussed in Section 1.2 of this letter.

1.10 Project Schedule

The CCG-SC continue to have concerns over the project schedules presented in the report, particularly for the HVDC options. In the comparison of options, and in the light of current concerns over power supply and transmission, a comparison of the project schedules is likely to be a focus when comparing underground and overhead options.

Section 5 of the report shows the various HVDC options requiring between just over 6 years and just under 7 years.

The CCG-SC's consultant agrees that current worldwide demand for HVDC and underground cables are likely to result in longer project delivery times (which in itself speaks to the popularity of HVDC underground transmission over other alternatives) but have flagged a concern that the schedule assumes 8+ months for commissioning that has not been addressed by the consultant. Representatives of the CCG-SC's consultant headed up the development of the CIGRE technical brochure TB697 "Testing and Commissioning of VSC HVDC Systems" and has held the roles of commissioning manager or commissioning engineer for two out of three HVDC systems currently in service in Australia and one in the USA. The CCG-SC's consultant is of the view that the commissioning schedule in the report is excessive and should be no more than two-to-three months maximum – which will bring the schedule for some options below 6 years and therefore closer to that of the AC overhead line.

2 Conclusions that can be Drawn from the Report

Even though the CCG-SC cannot endorse the report as presented, the CCG-SC can draw the following conclusions from the study.

2.1 Technical Underground Solutions Presented are Reasonable

It is the view of the CCG-SC that the technical solutions and options presented for the AC underground, HVDC underground and various hybrid combinations are technically feasible and reasonable. The consultant has done a good job in identifying the scope of the various options and in determining the technical parameters and requirements for these options. In developing such technical options, this provides a useful reference for the development and consideration of underground options both further for the HumeLink project, and as alternatives for other proposed transmission projects in Australia.

2.2 Undergrounding is not "10 Times" the Cost of Overhead Transmission

The comments presented in Section 1 of this letter highlight a number of concerns with the cost estimates presented. Overall, these comments show that it is the CCG-SC's view that the cost of undergrounding will be lower than those presented in report (in 2022 values) and that the comparison to the AC overhead line in 2022 values should be higher than the $3.3 billion presented in the report.

Notwithstanding the above, even with the disputed values presented in the report, there are a number of underground options or hybrid underground / overhead options with N-1 reliability that are between 2.9 and 3.5 times the estimated cost of the current AC overhead option. Of course, based on our comments in Section 1 of this letter, we expect this ratio to be substantially smaller, but even so hopefully the outcomes of this report will debunk the often-repeated myth that undergrounding is "ten times the cost".

3 CCG-SC Conclusion

As discussed above, we, the CCG-SC, do not have confidence that the undergrounding study fairly compares overhead and underground options for the following reasons:

1. The unbalanced assessment of the non-market benefits;
2. The non-market benefits not being quantified;
3. The unit cost for underground high voltage underground cables is too high;
4. The cost benchmarks for HVDC cables not being appropriate;
5. No information on scaling of costs to 2022 dollars;

6. The comparison of underground costs in 2022 to AC overhead costs in 2020/21;
7. Comparison of losses in OPEX costs is not substantiated;
8. Validity of inputs into the route assessment process;
9. Failure to accurately identify bushfire prone areas;
10. Technical accuracy of various aspects of AC and HVDC underground cable installation and operation; and
11. Excessive project schedule for undergrounding.

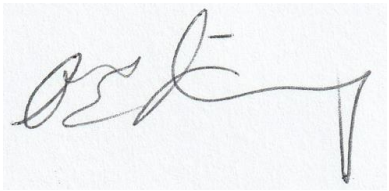
We therefore believe that this study has not met the intent or objectives of the original scope of the study and should be read with the knowledge that there are many unaddressed questions and comments, and disputed costs in the report, and that it is considered that the analysis of the non-market benefits of underground cables and overhead lines is presented in a biased manner.

As such, this study should not be relied upon for making decisions about whether overhead lines or underground cables are the preferred option for HumeLink.

A full and comprehensive expert review of the HumeLink undergrounding study is urgently needed to address problem areas of the report, so that informed decisions can be made about undergrounding of the HumeLink project going forward.

Yours sincerely,

On behalf of the HumeLink Community Consultation Groups:



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