

National Parks Association of NSW
Analysis of Snowy 2.0 Transmission Connection Reports
31 March 2022

Introduction

The **Snowy 2.0 Transmission Connection** proposal is classified as Critical State Significant Infrastructure. The Environmental Impact Statement (EIS) for the project was exhibited between February and April 2021. The proponent's Response to Submissions and Preferred Infrastructure Report (RTS/PIR) was released on the DPE Major Project website in March 2022. The next step will be for DPE to finalise their review of the application, draft potential conditions of approval and submit to the Minister for Planning and Housing for approval or refusal.

The RTS/PIR recommends the retention of the preferred option from the EIS, namely the construction of four 330 kV overhead circuits on two sets of towers over the nine kilometres between Lobs Hole and the proposed Maragle Substation in Bago State Forest, just outside Kosciuszko National Park (KNP).

This Paper reviews the RTS/PIR¹ and supporting documents. The full list of documents referred to in this Paper is provided in the footnote below. It demonstrates many serious deficiencies, inaccuracies and flawed conclusions in the RTS/PIR. The reports comprehensively fail to demonstrate that overhead transmission is the best option for connecting the Snowy 2.0 station to the grid, especially in light of the KNP Plan of Management's prohibition on the construction of any additional overhead lines in the Park.

Despite the EIS's patently absurd claims that underground cables would have a greater environmental impact than overhead towers, access roads and permanent clearance of the transmission easement, the RTS/PIR acknowledges that it is the relative costs of the different connection options were the real reason for selecting overhead transmission. NPA rejects the

¹ **Snowy 2.0 Transmission Connection Planning Portal**

<https://www.planningportal.nsw.gov.au/major-projects/projects/snowy-20-transmission-connection>

Response to Submissions

- (i) Submissions Report
<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=EXH-14643274%2120220310T030205.189%20GMT>
- (ii) Appendix D Transmission Connections Options Report
<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=EXH-14643274%2120220310T030206.968%20GMT>
- (iii) Appendix E Supplementary Landscape and Visual Impact Assessment
<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=EXH-14643274%2120220310T030208.599%20GMT>

Amendments

- (iv) Amendment Report
<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-9717%2120220314T050529.154%20GMT>
- (v) Appendix C Revised Biodiversity Development Assessment Report (BDAR)
<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-9717%2120220314T050532.275%20GMT>
- (vi) Appendix D Addendum Non-Aboriginal and Aboriginal Cultural Heritage Assessment Report
<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-9717%2120220314T050533.473%20GMT>
- (vii) Appendix E Water Quality Monitoring Program
<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-9717%2120220314T050534.735%20GMT>

proposition that the commercial interests of Snowy Hydro, the entity that will bear the costs of the transmission connection, should be elevated above the statutory status of the National Park and the biodiversity, landscape and cultural values it protects. Snowy Hydro and TransGrid were both fully aware of the long-standing prohibition on new overhead transmission in KNP. Any higher costs associated with underground connection simply reflect the fact that the operating environment of Snowy 2.0, and indeed the Snowy Mountain Scheme, is a protected area of national and international significance. As a consequence, the only acceptable options are those which minimise or avoid adverse impacts on the National Park.

Further, it is simply ludicrous to suggest that, in the context of a Snowy 2.0 project with expenditures exceeding \$10 billion, that the additional costs associated with an underground transmission connections would jeopardise the Snowy 2.0.

The RTS/PIR do not provide any basis for concluding that overhead transmission is the best option for connecting the Snowy 2.0 power station to the grid. Approval should be denied and a fresh set of SEARS issued for an underground connection.

Executive Summary

- Additional overhead transmission lines are prohibited in KNP, under the 2006 Plan of Management (POM) – *“any additional transmission is to be located underground”*.
- Snowy Hydro and TransGrid were fully aware of this long-standing requirement.
- TransGrid acknowledges this in both the EIS and RTS, but states it was advised that the NSW Government will exempt Snowy 2.0. The Government is currently proposing an amendment to the POM that would permit overhead lines. NPA has advised Government that we have legal advice indicating that any such amendment is challengeable due to lack of adherence to legislated processes and apprehended bias by the Minister.
- Overhead transmission lines have not been built in a NSW national park for 50 years. Underground cables are commonplace in areas of environmental value and natural beauty throughout the world.
- There are no technical impediments for underground cables in KNP. In fact, underground cables have many operational advantages, being invulnerable to bushfire, severe weather and other physical impacts and having less outages.
- Undergrounding will be more expensive, but that should not be a consideration for the government when assessing the EIS. Cost is not included in the SEARS. Snowy Hydro should not be treated any differently or more favourably than any other developer by the Government amending legislative requirements to minimise the cost of the project, especially for such a massive industrial project in a national park.
- All costs of the transmission connection will be paid for by Snowy Hydro, and will have no impact on the people of NSW as mistakenly stated in the RTS.
- TransGrid has eliminated undergrounding on the basis of extra cost, alone:
“After consultation with DPIE and NPWS, it was resolved that Options 5, 6, 8 and 9 [i.e. the underground options] would not proceed to a detailed assessment as, primarily, they did not meet the evaluation criteria relating to economic factors, specifically they significantly increased the Project’s economic risk”.

TransGrid has adopted the cheapest option and then claimed it has avoided/minimised its environmental impacts (but doing so for overhead lines is not possible):

“Transgrid have landed on a solution based on the three main evaluation criteria which balances cost and avoids and minimises impacts as far as is reasonably practicable”.

- The underground cost estimates seem inordinately high. They should be tested with a call for Expressions of Interest to major international cable installers.
- Connecting Snowy 2.0 to the existing Lower Tumut Switching Station (LTSS), rather than the proposed Maragle Substation, has significant benefits to the National Electricity Market (NEM) and the people of NSW. TransGrid has again rejected this alternative for spurious and incorrect reasons.
- If overhead lines to Maragle are to be considered, only two circuits on one set of (slightly taller) towers are necessary, halving the environmental impact.
- The RTS/PIR fails to address the substantive issues in [NPA's EIS submission, 2 Apr 2021](#), the [Open Letter to Ministers Stokes and Kean, 18 Jan 2021](#) and the Victorian Energy Policy Centre [Review of the HumeLink Project Assessment Conclusions Report, Sep 2021](#).
- The RTS/PIR should be rejected and TransGrid required to resubmit a proposal for underground cables, preferably to LTSS.

Key issues

1. The primary reason stated for the transmission connection project is that it is Critical State Significant Infrastructure for Snowy 2.0, which is *“the largest committed renewable energy project in Australia”*. However, Snowy 2.0 is not a renewable energy project. It is simply a big battery and hence is not renewable, as are conventional hydro generators that rely on catchment rainfall inflows. And it will be the least efficient battery on the NEM, losing 25% of energy cycled from pumping to generation.
2. The transmission connection project constitutes just the first nine kilometres of three hundred and sixty kilometres of double-circuit transmission lines (HumeLink) needed to connect Snowy 2.0 to the grid.
3. Of the 40 Environmental Impact Statement (EIS) submissions, 65% opposed the project, 35% provided advice/comments and none provided support.
4. The National Parks & Wildlife Service (NPWS) has not opposed the project and only offered a few minor suggestions in its EIS submission. Whilst NPWS is responsible for protecting and enhancing the values and condition of Kosciuszko National Park (KNP), it has stood by meekly whilst vast areas are being destroyed across 35 kilometres of the Park. This is even more reprehensible because the Park’s Plan of Management (POM) explicitly *“requires any additional transmission to be located underground”*. There is no evidence that NPWS defended the POM – in fact it has done the opposite by issuing a draft amendment to the POM to exempt Snowy 2.0 from having to locate the transmission connection underground.
5. It is repeatedly stated in the RTS reports that the Department of Planning & Environment (DPE) and NPWS never questioned the use of overhead lines and have in fact facilitated the proposal: *“the scoping report submitted to DPE was based on an overhead connection and, subsequently, SEARs were issued on that basis. At that time, DPE did not question this design approach”*.
This and other references throughout the reports again confirm that the Government/Minister supported overhead lines from the outset and did not abide by the POM requirement.
6. The reports repeat the acknowledgement in the EIS that the project is inconsistent with the POM:
“the KNP PoM expressly requires any additional transmission lines in KNP to be located underground and for existing overhead lines to be rationalised wherever possible. Consequently, the project is currently not consistent with the KNP PoM and an amendment to the KNP PoM will be required to enable Snowy 2.0 to connect to the grid via an overhead transmission connection”.
7. Twelve options are provided² but were quickly narrowed down to two, both overhead lines, one

² Page 27 of Submissions Report:

Overhead to Maragle

- Option 1 – Overhead to Line 2
- Option 2 – Overhead to Line 1
- Option 3 – Overhead to UTSS
- Option 4 – Overhead to Line 64 (This is the ‘project’ proposed in the EIS/RTS)

Underground to Maragle

- Option 5 – Deep cable tunnel to Line 64 (This option is presented as Alternative A (with tunnel construction) in NPA’s submission)
- Option 6 – Trench to Line 64 (This option is similar to Alternative B in NPA’s submission)
- Option 7 – Horizontal directional drilling (HDD) to Line 64 (This option is presented as Alternative A (with HDD) in NPA’s submission)

to the proposed Maragle Substation (the preferred Option 4) and the other to the existing Upper Tumut Switching Station (UTSS). The latter option was requested by DPE, but is clearly no more than a straw-man option, being one of the least attractive of all twelve options.

8. Some of the underground options to Maragle are deemed to be unviable due to the steep terrain. However, underground cables are being installed in other parts of Snowy 2.0 with far steeper and more challenging terrain.
9. All underground options were dismissed after *“it was resolved with DPIE and NPWS that they did not meet the evaluation criteria relating to economic factors”*. The cost of the project to Snowy Hydro has nothing to do with DPE and NPWS, especially as the SEARS makes no mention of project costs nor that cost is a determining factor.
10. Whilst the report ‘examines’ five project objectives - Network & Connectivity, Constructability & Design, Economic factors, Community & Environment and Best practice safety requirements – environment is well down the list (and lumped in with community).
11. The RTS attempts to downplay the influence of cost, but concludes that *“Transgrid have landed on a solution based on the three main evaluation criteria which balances cost and avoids and minimises impacts as far as is reasonably practicable”*. Clearly cost is the predominant criteria and environmental impacts are only minimised where reasonably practical (which turns out to be very little).
12. It is estimated that overhead lines to Maragle will cost \$290m, versus a hybrid trench/deep cable tunnel at \$1,087m, or a deep cable tunnel at \$1,393m. These costs seem high, especially for a connection of only nine kilometres plus part of a substation.
 - By comparison, the cost of HumeLink, which will have a much higher capacity, covers 360 km and includes two new and one augmented substation, is (just) \$3,315m.
 - Also, the cost of the tunnelling options seem high compared to the Snowy 2.0 Main Works contract of \$5,100m, encompassing 27 km of 11 m diameter water tunnels, a further 10 km of other tunnels, two enormous underground caverns and electro-mechanical equipment for the pumping/generating station, plus other ancillary works.
That \$5,100m cost includes three km of underground cables from the station to Lobs Hole Switchyard (one-third the distance from Lobs Hole to Maragle) and the switchyard itself.
13. A simple and quick way to test the underground cost is to issue to the market a request for expressions of interest with an indicative estimate.
14. Even if the estimates are correct and an underground connection is about \$800m more expensive than overhead lines, this extra amount equates to less than 10% of the \$10+bn all-up cost of Snowy 2.0 and its connection to the grid. The Snowy 2.0 Main Works are costing \$billions extra to be built underground – there is no reason not to build the entire project underground.
15. The RTS clearly demonstrates that underground options have superior environmental outcomes.

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- Option 8 – Hybrid trench/deep cable tunnel to Line 64 (This option is a combination of Alternative A and B in NPA’s submission)

Connection to LTSS rather than Maragle

- Option 9 – Hybrid trench/submarine cable to LTSS (This option is presented as Alternative C in NPA’s submission. This option is also similar to Alternative E2 in NPA’s submission)
- Option 10 – Trench to LTSS
- Option 11 – Overhead to LTSS
- Option 12 – Deep cable tunnel to LTSS (This option is similar to Alternative D in NPA’s submission).

16. The options for connecting to Lower Tumut Switching Station (LTSS) are dismissed for the same spurious and incorrect reason given in the EIS, that they *“do not ensure the resilience and reliability of the NEM in the context of dramatically increased intermittent generation from renewable sources”*.
 - The RTS proposal to locate HumeLink adjacent to the existing transmission circuits just to the north of LTSS exacerbates the claimed problem. NPA’s EIS Submission and the VEPC Paper on HumeLink effectively discount this ‘reason’, and observe that HumeLink can be routed away from existing lines if this was thought to be a concern.
 - Paradoxically, TransGrid proposes to position HumeLink adjacent to existing 330 kV lines on the route near Tumut. This poses similar bushfire outage risks to those claimed for nearer to LTSS.
17. No recognition is given to the SEAR’s requirement to assess cumulative impacts of the project on top of the existing Snowy Scheme and transmission lines through KNP. No doubt this cumulative impact is the very reason that the POM prohibits additional overhead transmission.
18. The reports argue (unconvincingly) for the need for four, rather than two, 330 kV circuits and against higher towers with less easement clearing.
 - Two high-capacity 330 kV circuits will provide sufficient capacity. The risk of bushfires continues to be overstated – if it were the problem claimed then undergrounding will solve it.
 - Slightly higher towers will almost eliminate the need for any easement clearing.
19. TransGrid disputes the visual impact of the project will be greater than that of existing transmission lines throughout KNP, even though the towers will be more than twice the size. The Submissions Report states that the average tower height is 56.43 metres, with no towers of 75 metres. However, the Options Report states that the transmission lines will be suspended by approximately 42 steel lattice towers (21 pairs), with the towers being approximately 75 metres high.
20. It is mentioned that naturally occurring asbestos (NOA) is present along the route of the line, but no method to address the issue is provided – *“If NOA is determined to be present, it would be managed and disposed of at a suitable licenced facility or a dedicated Snowy 2.0 approved NOA emplacement area and in accordance with a dedicated NOA management plan.*
21. The RTS repeatedly states that measures have been taken to mitigate the environmental impact of overhead lines, but few are outlined. Realistically there are none of any significance, other than undergrounding.
22. Offset payments of \$11.4m in KNP and \$21.95m outside KNP have been calculated, purportedly *“resulting in a positive benefit for the biodiversity values of the KNP over the long-term”*. It seems odd that the offset payments for outside KNP are twice those within the Park.
23. TransGrid lauds its public consultation, but it has not initiated any consultations with NPA or its energy experts.

Detailed Comments on the Submissions Report

Pge	TransGrid	Comments
1	To connect Snowy 2.0 to the NEM, a new transmission connection is required.	Avoids mentioning the 360km of HumeLink to complete the connection.
1	Option A minimises disturbance within a mapped high risk naturally occurring asbestos (NOA) zone.	First mention of NOA.
2	The project would also provide a connection point into Transgrid's southern network reinforcement project (HumeLink), which when completed would strengthen the southern network, including reducing constraints on Line 64, and would allow the export of the full capacity of Snowy 2.0 across the broader transmission system. HumeLink is not the subject of this EIS or application.	A rather disingenuous description of HumeLink as being an ancillary project to "reduce capacity constraints on Line 64". HumeLink is just as essential to connecting Snowy 2.0 to the grid as is the project.
8	Of the 40 submissions, 65% opposed the project, 35% provided advice/comments and no submissions (0%) provided support for the project	<i>"no submissions (0%) provided support for the project"</i> .
15	NPWS/BCS submission Consideration of all options to reduce impacts, and compensate for any remaining unavoidable impacts (e.g. visual amenity) in addition to biodiversity impacts	NPA finds it inconceivable that NPWS would consider the environmental impacts associated with this project to be consistent with their statutory obligations to protect KNP
16	NPA Submission	A reasonable summary, except for no mention of the overhead line mitigations.
20	Transgrid has engaged further with stakeholders since exhibition of the EIS, building on previous extensive engagement with the community and key stakeholders (including government agencies and organisations) regarding the project since 2018.	No consultation with NPA or its experts, despite numerous references to the NPA EIS submission in the RTS.
22	Preparation of the Options Report was carried out in consultation with DPE and NPWS encompassing several progress update meetings and separate information request deliverables.	NPWS and DPE have been intimately involved in the project.
24	To integrate the Snowy 2.0 HumeLink connection point with the existing Upper Tumut Switching Station (UTSS) or Lower Tumut Switching Station (LTSS), or southern NSW 330 kV lines (eg Line 2) would reduce the system resilience gained through geographical diversity which is achieved by locating the Snowy 2.0 connection point at Maragle.	A spurious and incorrect 'reason' for dismissing LTSS, when there are so many benefits – see NPA submission and VEPC paper.
25	Project objectives – provide a connection for renewable energy generated by Snowy 2.0	Snowy 2.0 does not generate renewable energy – it is simply a battery (and with much lower round-trip efficiency than alternatives).
26	Project objectives <ul style="list-style-type: none"> • Network & connectivity • Constructability & design • Economic factors • Community & Environment • Best practice safety requirements 	Of the five objectives, environment is grouped with community and listed second. 'Community & Environment' is listed fourth, which indicates the priority for the RTS.
28	Option screening <ul style="list-style-type: none"> • Do not ensure the resilience and reliability of the NEM in the context of dramatically increased intermittent generation 	The LTSS options are dismissed on a spurious ground.

Pge	TransGrid	Comments
	from renewable sources (Option 10, Option 11 and Option 12).	LTSS actually improves the NEM resilience far more than Maragle.
29	A second meeting was held on 10 August 2021 with DPE and NPWS to further discuss the options assessment. In consultation with DPE and NPWS, it was resolved that Options 5, 6, 8 and 9 would not proceed to a detailed assessment as, primarily, they did not meet the evaluation criteria relating to economic factors; specifically they significantly increased the project's economic risk. Timeframes, spoil management activities and disturbance areas were also key considerations. It was resolved that options 3 and 4 would proceed to the detailed assessment stage for selection of a preferred option for the project.	<p>DPE and NPWS agreed to dismiss underground options as “they did not meet the evaluation criteria relating to economic factors” NPA does not consider cost factors relevant to the regulatory role of NPWS or DPE and questions the probity of such negotiations.</p> <p>Only two options were considered in detail - overhead lines to UTSS (Option 3) or to Line 64 (Option 4). How could Option 3 (UTSS) possibly be one of the top two options, especially when it decreases network resilience and results in an even longer Humelink? A comparison between Option 3 (UTSS) and 4 (Maragle) will clearly favour Option 4. It really is a superfluous comparison.</p>
30	Summary table	Undergrounding is clearly superior for environmental considerations, according to the table.
33	Overhead to Maragle, \$290m, versus hybrid trench/deep cable tunnel, \$1,087m, or deep cable tunnel, \$1,393m	Underground is \$800m more than overhead. Is this a sound estimate?
35	Another benefit is that Option 4 is able to provide the required capacity for Snowy 2.0 generation delivery into the NEM, without the need for Humelink infrastructure to be brought into KNP.	Supercilious comment. Option 4 infrastructure is in KNP already.
35	Overall, this option [i.e. Option 4] has no significant network and connectivity constraints.	But it does nothing to connect Snowy 2.0 to the rest of the Snowy Scheme.
36	The cost of Option 4 is approximately \$290 million. This is \$160 million less than the cost of Option 3.	All of the comparisons are with the overhead line to UTSS, which is irrelevant as this option is clearly unviable.
44	This led to the scoping report being submitted to DPE based on an overhead connection and subsequently, SEARs were issued on that basis. At that time, DPE did not question this design approach. The outcomes of the early options assessment work were captured in the EIS and sufficiently satisfied the SEARs in relation to this matter.	DPE and NPWS never questioned overhead lines or insisted on the POM's requirement for additional transmission lines to be located underground.
45	The steep terrain between the Snowy 2.0 cable yard and Line 64 poses challenges to implementing underground transmission	The terrain is less steep than for the electrical circuits from Lobs

Pge	TransGrid	Comments
	options (Option 5, Option 6 and Option 7). Option 7 was assessed not to be technically viable because it is unsuitable for steep terrain, has a high probability of tunnel drift during drilling and also requires the transition to overhead transmission over Talbingo Reservoir.	Hole to Marica, which are to be underground. Option 7 (HDD) is exactly the same method to be applied to seven HDD holes for the cables from Lobs Hole to Marica.
45	Consideration of whether the project should be underground Option 5, Option 6 Option 8 and Option 9 did not proceed to a detailed assessment as, primarily, they did not meet the evaluation criteria relating to economic factors (and Option 9 was not technically viable). Specifically, these options significantly increased the project's economic risk as the costs are up to five times higher than the base case (Option 4). Impacts to timeframes and size of disturbance areas were also a key consideration. Therefore, no underground or hybrid options were considered in the detailed assessment of alternative options as summarised in Section 3.2.7.	All very high level. Again, options were dismissed as "they did not meet the evaluation criteria relating to economic factors".
45	The options assessment and analysis documented in the Options Report clearly demonstrates that Option 4, which is an overhead connection to a new substation, located adjacent to Line 64, is the preferred option as it is the optimal solution which balances technical feasibility, cost and environmental impacts.	Option 4 is the cheapest, but there is no attempt to determine the optimal solution on a technical, cost and environmental basis.
46	The scale of the project Given the criticality of the power generation from Snowy 2.0 to the stability and energy security and reliability for the NEM, a key design objective is to minimise the risk of losing the ability to transmit this power to consumers.	Snowy 2.0 will hardly ever be critical to the stability and reliability of the NEM. Connection by underground cables is more reliable and connection to LTSS will be more reliable than connection to Maragle.
46	The full generation of 2,000 MW from Snowy 2.0 results in a total power transfer requirement of 2,550 Megavolt amperes (MVA). Using the largest conductor size for 330 kV cables in use in the Australian market, this equates to a minimum of four circuits, with each circuit rated at 850 MVA,	AEMO has assigned Line 64 a summer daytime rating of 857 MVA, a winter night-time rating of 1223 MVA (and an annual average rating of 1028 MVA). https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/data-nem/network-data/transmission-equipment-ratings . Line 64 uses two-conductor bundles. A 330 kV line with four-conductor bundles should have a thermal rating of over 1,500 MVA.
46	An alternative, as suggested in a submission, is that a single set of double circuit lines with high-capacity conductors could be used to transmit Snowy 2.0 energy generation to the market. In that case, a multiple contingency event (both circuits) on this section would result in an instantaneous loss of up to 2,000 MW Snowy 2.0 generation or pumping at that point of time. This is because the connection is in the radial configuration (meaning there is only one source of power transmission) and there is no other flow path for Snowy 2.0 generation during the outage.	Snowy 2.0 only needs two 330 kV circuits, not four, taking into account the very high reliability of lines and the rarity of Snowy 2.0 generating more than 1,500 MVA. HumeLink is one double-circuit 500 kV line.

Pge	TransGrid	Comments
	<p>Under this single set of double circuit lines scenario, this generation loss will be larger than the current largest generator in the NEM and could lead to widespread loss of supply and load including the possibility of cascading tripping and system blackout. In addition, in the event of forced or planned outage of one circuit, Snowy 2.0 generation is required to manage large generator trip events to be limited to about 750 MW and the pumping load to manage large load trip events would be limited to about 400 MW.</p> <p>For these reasons, a single set of double circuit lines with high capacity conductors is an inferior solution to that proposed by the project.</p>	<p>The loss of its two circuits would have a far greater impact on the NEM than the loss of the Snowy 2.0 circuits.</p> <p>See NPA EIS submission for further information.</p> <p>TransGrid has unintentionally presented an argument for why LTSS would be a better Humelink termination point than Maragle.</p> <p>Note also that six underground cables have far higher reliability than two or four overhead lines.</p>
47	<p>Over canopy design</p> <p>The EIS considered but rejected an over canopy transmission connection design which would use taller structures with the transmission lines strung high above the canopy with minimal easement clearing (refer to Section 3.2.4 of the EIS). However, this was assessed to not be feasible due to the unacceptable level of bushfire risk imposed by the large quantity of underlying fuel load in close proximity to the overhead transmission lines.</p>	<p>Bushfires occur no more than every 20 years (see EIS and NPA submission).</p> <p>If a bushfire threatened the lines the transmission could be reduced to a safe level or cut off altogether. This is hardly an issue on such an infrequent basis and does not warrant dismissing higher towers, with minimal easement clearing.</p>
47	<p>A connection point at LTSS imposes network stability risks associated with the high concentration of existing assets in that area of the network</p>	<p>This is addressed in the NPA Submission and is not the insurmountable problem posited by TransGrid.</p> <p>Also see comment on p46.</p>
48	<p>The options assessment and analysis as documented in the Options Report considered five options (Option 4, Option 5, Option 6, Option 7 and Option 8) that connect into Line 64. As summarised in Section 3.2, of the five options that connect into Line 64, only Option 4 was progressed to the detailed assessment.</p> <p>The other options did not meet the objectives or they exceeded threshold issues relating to the assessment criteria. As such, these options were eliminated in the screening process.</p>	<p>What exactly is the 'threshold issue' referred to?</p>
48	<p>It is noted that Option 3, which is an overhead to UTSS was considered in the detailed assessment (refer to Section 3.2.7), at the request of DPE. That assessment concluded that Option 4 was the optimal solution, and therefore the preferred solution.</p>	<p>Why would DPE request analysis of connection to UTSS, when clearly it is inferior to all other options.</p>
48	<p>Compared to the steel lattice structure design, an overhead transmission connection with monopole supporting structures is expected to have a larger impact area. This is due to the size of the pole segments, requirement for deeper footings and loading requirements as explained below.</p>	<p>Not a valid reason to dismiss monopole structures.</p>
62	<p>If NOA is determined to be present, it would be managed and disposed of at a suitable licenced facility or a dedicated Snowy 2.0 approved NOA emplacement area and in accordance with a dedicated NOA management plan.</p>	<p>What exactly does this mean? Where is a 'suitably licenced facility'?</p>
66	<p>Transgrid is the proponent for the project and was supported by a team of qualified professionals to provide a balanced</p>	<p>No mention of the assessment involving economic criteria.</p>

Pge	TransGrid	Comments
	<p>assessment of environmental impacts in accordance with legislative requirements, as well as subject matter experts and specialists in their field.</p> <p>Following lodgement of this Submissions Report and the Amendment Report, the Secretary of DPE will prepare an Environmental Assessment Report on the project to be provided to the NSW Minister for Planning and Public Spaces for the purposes of the Minister’s consideration of the application for approval to carry out the project. The Minister for Planning and Public Spaces then decides whether or not to approve the project, considering the Secretary’s report, any advice from the Minister for Energy and Environment, and any findings or recommendations of the Independent Planning Commission if there any in respect of the project.</p> <p>Approval, if given, is made under Division 5.2 of the EP&A Act, with modification or conditions to the project as required.</p>	
67	<p>As a result, the scoping report submitted to DPE was based on an overhead connection and, subsequently, SEARs were issued on that basis. At that time, DPE did not question this design approach. The process and outcomes of the early options assessment work were captured in Chapter 3 of the EIS and sufficiently satisfied the SEARs in relation to this matter.</p>	Apprehended bias.
67	<p>Since the exhibition of the EIS, and because a number of submissions queried the analysis of options in the EIS, a further options assessment has been carried out for several different connection options as described in Options Report and summarised in Section 3.2 and Section 4.1.1. The findings of the Options Report reinforced the options assessment presented in the EIS, after considering and assessing the further options put forward in the submissions received, and confirmed the project remains the optimal and preferred option.</p>	A rigorous assessment of options was a requirement of the EIS and should have been incorporated at that stage.
68	<p>Transgrid recognises the pristine environment in which the project and Snowy 2.0 are located within KNP and acknowledges that KNP contains unique sub-alpine values and declared wilderness areas and is listed on the Australian National Heritage List. Since the inception of the project, the aim of the design has been to avoid and minimise environmental impacts as much as possible. The primary driver of many of the design amendments has been to continually reduce the project’s footprint.</p>	<p>The aim of the design is purportedly to minimise environmental impacts by continually reducing the project’s footprint.</p> <p>Undergrounding will do that.</p>
70	<p>Consistency with the KNP PoM</p> <p>The KNP PoM expressly requires any additional transmission lines in KNP to be located underground and for existing overhead lines to be rationalised wherever possible. Consequently, the project is currently not consistent with the KNP PoM and an amendment to the KNP PoM will be required to enable Snowy 2.0 to connect to the grid via an overhead transmission connection.</p> <p>Transgrid is aware of the prohibition of overhead lines in the KNP PoM, however, Transgrid’s preferred and the most viable solution for the project is to use overhead transmission lines (see the EIS and Section 3.2).</p> <p>The Minister for Planning and Public Spaces will make a determination to approve the proposal or not, and potentially to do so subject to the KNP PoM being successfully amended.</p>	<p>This section needs to be read in its entirety.</p> <p>It does not repeat the comment in the EIS stating that NPWS agreed to amend the POM to permit overhead lines.</p> <p>Why did not TransGrid simply comply with the POM?</p> <p>If the Minister decides to amend the POM this will be legally challengeable, on very strong grounds.</p>

Pge	TransGrid	Comments
70	<p>As part of the initial application for SEARs, a scoping report was submitted to DPE, who then provided it to relevant government agencies for review and comment. While some comments by government agencies were received on the project and possible alternatives, no major issues were raised regarding the overhead connection at that stage. At that time, DPE did not question this design approach. Subsequently, the project based on an overhead connection was not rejected by DPE during the early phase of the project application and SEARs were issued.</p>	<p>It is clear that government did not object to overhead lines and has facilitated their approval.</p>
70	<p>The amendment of the KNP PoM is required to ensure that the project and Snowy 2.0 construction and operations authorised under the EP&A Act can be carried out in accordance with the KNP PoM. This amendment includes lifting the statutory prohibition on new overhead transmission lines to reflect the requirement to connect Snowy 2.0 to the grid via an overhead transmission connection as stated below:</p> <p><i>“Require all additional telecommunication and transmission lines to be located underground, except those constructed as part of the Snowy 2.0 project.”</i></p> <p>If the draft KNP PoM currently being exhibited is accepted and approved, then the project would be consistent with the updated KNP PoM.</p>	<p>This effectively expects that the POM be brought into line with what TransGrid/Snowy Hydro wish to do.</p>
71	<p>Cumulative impacts</p> <p>The application and assessment process for the project has followed the well-established procedures for CSSI projects under the EP&A Act every step of the way.</p> <p>In accordance with the SEARS, the EIS included the strategic context of the project having regard to any other existing, approved or proposed projects that could result in cumulative impacts of the project (see Section 7.13 of the EIS). The major projects considered were:</p> <ul style="list-style-type: none"> • Snowy 2.0 • HumeLink • Line 64 upgrade. 	<p>No assessment of cumulative impacts with the original Snowy Scheme and existing overhead transmission lines.</p>
72	<p>Mitigation measures</p> <p>The full list of mitigation measures including all revised environmental mitigation measures is provided in Appendix B of the Amendment Report.</p> <p>Additional mitigation measures that have been suggested in some of the submissions included shorter structures, possibly of a pole design, no cleared easement, no access tracks, and construction/maintenance by helicopters and drones. These suggestions regarding shorter structures, possibly of a pole design, no cleared easement, no access tracks, were considered as part of the project analysis to select the preferred option, refer to Section 3.2. As such, these suggestions have not been included as mitigation measures.</p> <p>In regard to construction/maintenance by helicopters and drones, the EIS did consider using drones to string the transmission lines and that helicopters may be used to transport personnel, materials and equipment to the higher elevations (eg sheep station ridge). However, it was determined following the exhibition of the EIS that this would not be required, and road access would be preferred.</p>	<p>TransGrid has made no serious attempt to examine mitigation measures.</p> <p>There is no need for access tracks - drones and helicopters can do the job of construction and maintenance, as proven elsewhere in Australia and overseas.</p>

Pge	TransGrid	Comments
	In addition, the construction methodology to date does not allow for the use of helicopters for construction due to potential safety issues. As such, the removal of the helipad from the project has assisted in reducing the project disturbance footprint.	
74	<p>4.2.1.6. Consultation/engagement</p> <p>A submission was received which asserted that the necessary consultation with stakeholders has not taken place. Transgrid wholly disagrees with this assertion.</p> <p>Transgrid has been consulting with the community and key stakeholders (including government agencies, councils and organisations) about the project and seeking input for the development of the EIS since 2018.</p>	NPA missed out.
81	<p><i>Offsets for impacts inside of KNP</i></p> <p>For impacts within KNP, Snowy Hydro have committed to the funding of \$82.3 million to the management of KNP across both the Snowy 2.0 Main Works and Exploratory Works. The project would see an additional \$11.4 million of funding provided to NPWS for implementation of management actions to a broader area of KNP, resulting in a positive benefit for the biodiversity values of the KNP over the long-term.</p> <p>Combined, this provides a substantial investment in management of biodiversity values in KNP, resulting in a direct, holistic and long-term benefit to the biodiversity values of KNP, including the species and communities impacted by both Snowy 2.0 and the project.</p>	<p>\$11.4m for offsets.</p> <p>How could this payment possibly result “in a positive benefit for the biodiversity values of the KNP over the long-term”.</p>
81	<p><i>Offsets for impacts outside of KNP</i></p> <p>Transgrid’s offset liability for all impacts occurring outside of KNP could be met by paying \$21.95 million into the BCF. Compared to the relative benefit the local species would receive from such payments, Transgrid views payment into the BCF as the least attractive option and prefers to explore other avenues until all other options are exhausted.</p>	<p>Another \$21.95m of offsets, bringing the total to \$33m.</p> <p>Seems questionable that the offset payment in BCF is twice that within KNP.</p>
93	<p>Visual impact assessment</p> <p>The concern that the visual impact from the project transmission lines (in comparison to existing transmission lines throughout KNP) would be greater than stated in the LCVIA, is not supported by either the technical photomontages prepared for this project nor examples of similar infrastructure in other areas.</p>	<p>How can the visual impact be no more than existing transmission lines when there are two towers, not one, and they are taller?</p>
94	<p>Project visibility and intrusion</p> <p>As shown in Table 4-7, the majority of the structures would be less than 60 metres and the average height is 56.43 metres.</p> <p>The view shed relevant to the assessment of the project is based on the distance at which the project takes up 0.5° (degrees) of the vertical field of view. This was determined to be 7.84 kilometres. This is the ZVI and visual study area which is about 214 square kilometres</p>	<p>Average tower height of 56 metres contradicts the Options Report, which states that the towers will be approximately 75 m high.</p> <p>The line can be visible for up to 8 kilometres over an area of 214 square kilometres.</p>
102	<p>4.4.1.1. Public interest</p> <p>Snowy 2.0 is the largest committed renewable energy project in Australia. It would provide an additional 2,000 megawatts (MW) of dispatchable generating capacity and make approximately 350,000 MWh of large scale storage available to the NEM at any one time.</p> <p>The project therefore benefits the public interest by enhancing overall energy security, and facilitating the transmission of</p>	<p>Snowy 2.0 is not a renewable energy project – it is simply a battery using all forms of power sources for its pumps.</p> <p>It can only provide 350 GWh if the upper reservoir is full, which will be rare.</p>

Pge	TransGrid	Comments
	<p>significant renewable generation that is essential for the transition towards a low carbon future.</p> <p>The long-term benefits of the project, when taken together with Snowy 2.0 Main Works project, are considered to be in the public interest.</p>	<p>Once emptied, it takes some months to refill the upper reservoir.</p>
103	<p>Based on the comprehensive review and further analysis of 12 options, Transgrid have landed on a solution based on the three main evaluation criteria (refer to Figure 3-3) which balances cost and avoids and minimises impacts as far as is reasonably practicable. Refer to the Options Report which is provided in Appendix D and summarised in Section 3.2.</p>	<p>The three main evaluation criteria ‘balances cost and avoids and minimises impacts as far as is reasonably practicable’.</p>
104	<p>Precautionary principle</p> <p>The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.</p> <p>This principle was considered during development of the project which included an options analysis (refer to Chapter 3 of the EIS, Section 3.2, and the Options Report provided in Appendix D).</p>	<p>A completely flawed explanation of the precautionary principle.</p>
104	<p>While Option 4 would result in additional infrastructure and associated environmental impacts within the KNP, this option would keep the Humelink connections outside of KNP.</p>	<p>What is the difference between overhead lines for this project or Humelink traversing KNP?</p>
105	<p>Inter-generational equity</p> <p>The project as an overhead transmission connection not only meets all of the evaluation criteria but is also the most cost-effective connection solution.</p>	<p>This section is highly contentious.</p>
106	<p>4.4.2. Costs</p> <p>Cost is consistently considered in the EIS process as part of the option development and alternative assessment process required under the EP&A Act and listed under the Draft Environmental Impact Assessment Guidance Series, Preparing an Environmental Impact Statement (DPE 2017). It is not an irrelevant consideration.</p> <p>In addition, the ISP and other Commonwealth and NSW strategic policy documents mention price as an important consideration in the design of the future NEM</p> <p>This was done as it is critical that the project is designed, constructed and operated in a manner that is practicable and feasible and balances environmental and social impacts with safety impacts, cost and schedule. Importantly, however, while cost was a consideration in the further options assessments and analysis, it was not the only consideration, nor was it the most highly weighted.</p> <p>The consideration of the key evaluation criteria for each option is summarised in Figure 3-3. As shown in the table, underground options would result in increased volumes of excavated material while also requiring vegetation removal, new cleared easements for options that require trenching (Options 9 and 10) and additional infrastructure within KNP (such as infrastructure entry portal and shafts/adits or access points with associated access tracks) that would result in amenity impacts. They would also involve significant cost.</p>	<p>The price of electricity in the NEM will not be affected by the cost of the project.</p> <p>This statement is clearly incorrect – <i>“while cost was a consideration in the further options assessments and analysis, it was not the only consideration, nor was it the most highly weighted”</i>.</p> <p>The criticism of undergrounding fails to note that the extent of environmental impacts is far less than for overhead lines.</p>

Pge	TransGrid	Comments
	As shown in Table 4-9 , the cost of the underground options (Option 5, Option 6 and Option 8) would be up to five times higher than the base case (Option 4).	
107	4.5.1. Out of scope 4.5.1.1. Other Transgrid Projects/ HumeLink	Surely the connection to HumeLink should be in scope, as without HumeLink the Snowy 2.0 connection is next to useless.
108	5.1. Justification of the project The benefits of connecting Snowy 2.0 to the NEM, are considered to outweigh any identified adverse impacts of the project. While some environmental impacts cannot be avoided, they would be minimised where possible through the implementation of mitigation measures and offsetting. <ul style="list-style-type: none"> • Biophysical considerations: The project, as an overhead transmission connection has been designed to avoid and minimise serious or irreversible damage to the environment where possible. The project design has sought opportunities to avoid and minimise impacts where possible. The amended project would result in direct impacts to about 118.3 hectares of native vegetation which is a reduction of about 17.3 hectares (13%) from the project as assessed in the EIS. 	Minimising environmental impacts is marginal in this project – there is basically no way to do so.
123	If the overhead transmission option remains the preferred option, NPWS will discuss all options to reduce impacts, and compensate for any remaining unavoidable impacts (e.g. visual amenity) in addition to biodiversity impacts.	Bit late.
127	To help reduced the visual impacts of the project, the new structures would undergo accelerated ageing of the zinc galvanised coatings prior to erection.	This is standard practice and should have been included in the EIS.
129	As such, the overhead connection option to Line 64 addresses the economic criteria, but importantly it also satisfies all other evaluation criteria.	How does the proposed option ‘satisfy’ the environmental criteria, when the POM requires underground cables?
129	Cost is a legally relevant consideration. However, while cost was a consideration in the options assessment and analysis, it was not the only consideration, nor was it the most highly weighted.	Where is cost classified as a ‘legally relevant consideration’?

Detailed Comments on the Options Report

Pge	TransGrid	Comments
ES1	<p>There are significant existing binding transmission constraint points both north and south of the Snowy Scheme even without the addition of Snowy 2.0 capacity. Maragle was chosen as the Snowy 2.0 HumeLink connection point as it is remote from other substations/ switching stations that connect the existing Snowy Scheme generation and Victorian interconnector meaning that risks are reduced due to geographical separation and allows for greater control of power flows. To integrate the Snowy 2.0/HumeLink connection point with the existing Upper Tumut Switching Station (UTSS) or Lower Tumut Switching Station (LTSS), or southern NSW 330 kV lines (ie Line 2) would reduce system resilience gained through geographical diversity achieved by locating the Snowy 2.0 connection point at Maragle, and expose five key energy assets (Snowy 2.0, HumeLink, Southern NSW 330 kV network, Victoria to NSW Interconnector (VNI) and existing Snowy Hydro Scheme) to bushfire and extreme weather events at specific locations.</p>	<p>The proposed project does not reduce the “<i>significant existing binding transmission constraint points both north and south of the Snowy Scheme</i>”.</p> <p>The risk of integrating the Snowy 2.0/ HumeLink connection point at LTSS is completely overstated. Connecting at LTSS is actually a better alternative to Maragle – see NPA Submission and VEPC Paper on HumeLink.</p>
ES7	<p>However, during engagement with DPIE and NPWS post the screening assessment, additional information was requested on Options 3, 5, 6, 8 and 9. As an outcome of these detailed information requests, it was resolved with DPIE and NPWS that Options 5, 6, 8 and 9 would not proceed to a detailed assessment because, primarily, they did not meet the evaluation criteria relating to economic factors. Specifically, they significantly increased the Project’s economic risk. Project timeframes and disturbance areas were also a key consideration. It was therefore resolved that Options 3 and 4 would proceed to the detailed assessment stage for selection of a preferred option for the Project.</p>	<p>What is the DPIE and NPWS “<i>evaluation criteria relating to economic factors</i>”?</p>
ES13	<p>ES6.4 Preferred option - Table ES3 Outcomes of comparative analysis for Option 3 and 4 Deliver positive economic benefits to the people of NSW</p>	<p>The transmission connection is being financed by Snowy Hydro, as a connection asset. Its relative cost has no ‘economic benefits to the people of NSW’.</p>
9	<p>If the transmission lines connecting the Snowy region and the NSW transmission system are constrained during periods of bushfire or high-power demands, this has the potential to impact supply reliability for NSW and ACT customers.</p>	<p>How often might this be? Bushfires are no more than once-every-20 years and might affect transmission capacity for a few hours or days at most.</p>
14	<p>3.3 HumeLink The main aim of the Project is to provide a direct connection between Snowy 2.0 and the southern shared network. HumeLink’s purpose is to reinforce the NSW southern shared network of the NEM to increase transfer capacity to the primary load centre of NSW, Sydney. HumeLink has been identified as an actionable Integrated System Plan (ISP) project by AEMO since 2018. Actionable ISP projects are deemed to be critical to address cost, security and reliability issues.</p>	<p>HumeLink is an actionable project, staged with decision rules.</p>
18	<p>Network resilience requirements</p>	<p>This whole section is overstated and skewed.</p>

Pge	TransGrid	Comments
24	Having electrical separation between the new Maragle substation and the existing LTSS would provide for greater control over the power flow within the transmission grid. This separation enables better utilisation of the 500 kV lines, which is preferred over utilising the lower capacity 330 kV transmission system.	Not sure this is correct. At the extreme, you could 'move' Maragle to LTSS and keep it electrically separate from LTSS.
25	<p>ii Lower Tumut Switching Station</p> <p>Connection of Snowy 2.0 to LTSS, and therefore also bringing HumeLink into LTSS, will add to the existing high asset concentration and power density in this area. The following considerations are important with connection to this location:</p> <ul style="list-style-type: none"> • It is immediately below the Talbingo Dam wall and spillway; • It is exposed to bushfire and weather events; • It has congested transmission exit routes and already forms a critical node in the VNI, refer to Figure 4.1; and • Exposes the power system to even higher disruption in extreme climate events. <p>Figure 4.4 illustrates the concentration of assets that would result in having the HumeLink Snowy 2.0 connection point at LTSS. The existing transmission assets are shown in yellow with the addition of HumeLink connection adjacent in blue.</p>	<p>LTSS has minimal exposure to bushfire and weather events compared to Maragle. Fig 4.4 shows HumeLink running north adjacent to existing 330 kV lines. There is no reason for HumeLink not to run west to avoid proximity with existing lines. Paradoxically, TransGrid proposes to locate HumeLink adjacent to existing 330 kV lines on the route near Tumut. This poses similar bushfire outage risks to those claimed to be unacceptable for nearer to LTSS.</p>
33	The probability of double circuit outage event for HumeLink will be managed by improved design performance and parameters to reduce a double flashover event (eg improving ground resistance, increasing insulation levels, installation of surge arrestors etc). The reduction of power flow under the double circuit outage of HumeLink is significantly lower than the reduction of power flow under double circuit outage of Snowy 2.0 connection lines.	There is no reason not to design the project with the same parameters as HumeLink to reduce the risk of a double flashover event.
33	<p>i Deep cable tunnel</p> <p>Installation of the HV cables requires special consideration in deep vertical shafts</p>	There should be no need for deep vertical shafts. Shafts can be inclined, as they are for the water tunnels.
35	<p>Figure 4.10 Surface trenched cable: typical cross section</p>	The figure shows a 5m wide access road. The road could be located above the underground cables, reducing the easement width to about 10m.
45	<p>4.7.1 Plan of Management</p> <p>The <i>Kosciusko National Park Plan of Management</i> (KNP PoM) is a framework which outlines objectives, principles, and policies to guide the long-term management of KNP. The KNP PoM recognises that HV power lines that transmit electricity produced by the Snowy Scheme traverse KNP. Section 12.6.1 of the KNP PoM outlines that management objectives related to telecommunication and electricity infrastructure services, namely:</p> <p style="padding-left: 40px;">Telecommunication and electricity infrastructure are managed in ways that minimise adverse impacts on the values of the park and other users.</p> <p>The policies and actions of the KNP PoM require that additional telecommunication and transmission lines be located underground.</p>	The project should conform with the POM requirement for any additional transmission lines to be underground.

Pge	TransGrid	Comments
	<p>As described in the EIS for the Project (Jacobs 2021), transitional measures ahead of amendments to the KNP POM are in place, clause 7 of Schedule 4 to the NSW <i>Snowy Hydro Corporatisation Act 1997</i> (SHC Act) provides that for a period of three years from the first Snowy 2.0 approval (7 February 2019 for Exploratory Works for Snowy 2.0), section 81(4) does not operate to prohibit operations being undertaken in relation to Snowy 2.0 (which includes transmission) that are not in accordance with the KNP PoM. Nevertheless, it is understood that amendments to the KNP PoM will be made by NPWS to reflect the requirement to connect Snowy 2.0 to the grid.</p>	
54	<p>6.6 Option 5 – Deep cable tunnel to Line 64 Option 5 involves the construction of a 9 km tunnel between the Lobs Hole cable yard and the proposed Maragle substation and Line 64. The tunnel would have an internal diameter of approximately 5 m. The launch chamber at Lobs Hole would be at the bottom of a 30 m deep shaft. Based on an industry standard design gradient of 4.5%, the retrieval chamber at Maragle would be at the bottom of a 530 m deep shaft.</p>	<p>Note the tunnel diameter of 5m is considerably smaller than the 11m diameter water tunnels. As stated in the NPA EIS submission, why not avoid the 530m vertical shaft with an inclined tunnel (as is the case with the water intake tunnel to the power station). Later references indicate a vertical shaft of 300m (p.123).</p>
56	<p>6.8 Option 7 – Horizontal directional drilling to Line 64 Option 7 involves HDD over a distance of approximately 9 km from the Lobs Hole Cable yard to the proposed Maragle substation and Line 64. It generally follows the same route as Option 5. Option 7 was evaluated as not being technically viable due to:</p> <ul style="list-style-type: none"> • its unsuitability for steep terrain; and • the high probability of cable drift. 	<p>HDD cabling is to be installed between Lobs Hole and Marica in very steep terrain, possible even steeper than Lobs Hole to Maragle.</p>
57	<p>During operations, cables located in tunnels have a failure incidence rate of approximately once every 32 years. The relative risk of damage to cables because of events like fires is rare. However, the average time to repair a fault is very high at between four to 16 weeks.</p>	<p>Cables are very reliable, though take longer to repair (on average once every 32 years – hardly a major issue).</p>
59	<p>6.13 Option 12 – Deep cable tunnel to Lower Tumut Switching Station Option 12 involves the construction of a 26 km tunnel between the Lobs Hole cable yard and LTSS. Option 12 was evaluated as not being technically viable due to a range of reasons. Accordingly, technical calculations such as the area of vegetation clearance, spoil volumes, construction schedule and construction costs were not undertaken. Notwithstanding this, initial estimates indicate that this option would generate more than 1,000,000 m³ of spoil and take more than 7 years to construct.</p>	<p>The shorter and better option is a tunnel between the underground power station and LTSS. The reasons for dismissing this option are unstated.</p>
83	<p>7.6.3 Economic factors The construction cost of Options 5 may be prohibitively high due to the need to deep tunnel through rock for approximately 9 km. Similarly, any damage to underground cables is likely to result in failure of transmission with high economic risk outcomes due to probable time and cost needed to recommence transmission of Snowy 2.0 generation.</p>	<p>As noted above, cables in tunnels are very reliable, failing on average every 32 years. If one cable fails there would still be five other cables to transmit most of the power required for Snowy 2.0 for pumping and generation.</p>

Pge	TransGrid	Comments
104	<p>7.13 Option 12 – Tunnel to Lower Tumut Switching Station A new substation is required in KNP along with five sets of cables within the tunnel. Based on Project development commencement date of 2017, this option has a very high risk of achieving connection for first power generation of Snowy 2.0 given risk profile for tunnel excavation, even though two TBMs are proposed. Option 12 will decrease the resilience and reliability of electricity within the NEM as it leads to an overconcentration of generation capacity in a single location (LTSS). Overall, this option is not viable in terms of network and connectivity constraints.</p>	<p>No new substation is required in KNP. In fact Lobs Hole Switchyard is not required at all. Snowy 2.0 is already running more than six months behind schedule. Option 12 will increase the resilience and reliability of the NEM – see NPA Submission.</p>
109	<p>8.2.1 Number of circuits Building Option 3 with only three circuits does not work due to stability limits. The actual thermal capacity of the line/s is not the limiting factor. The stability limit is estimated to be between 700 and 1,000 MW with detailed network modelling normally required to determine stability limits for configurations. The loss of the double circuit line when pumping or generating (up to 2,000 MW) would mean that up to 1,300 MW of load or generation would be lost and is well above the estimated stability limit. This size of loss of generation or load is significant to the security of the NEM and will be larger than the existing biggest generation in the network and can lead to widespread loss of supply and load. In contrast, the configuration with four circuits would only lose about 700 MW and is within the current operating parameters of the NEM.</p>	<p>The loss of the HumeLink double-circuit line would be far more serious than the loss of the connection between Lobs Hole and Maragle.</p>
127	<p>a Ampacity ratings The total power requirement is 2,550 MVA at an n-1 security of supply standard. A preliminary cable study identified that to maintain practical cable trench and tunnel sizes and ensure that the maximum conductor sizes are not exceeded due to overheating, five circuits (rated at 638 MVA each) are needed.</p>	<p>As stated in NPA’s EIS submission, the logical arrangement is to extend the six cables from the station to Maragle (3km), thereby avoiding the need for Lobs Hole switchyard.</p>
140	<p>8.7.3 Cost breakdown</p>	<p>The cost breakdown does not include the different costs of Lobs Hole Switching Yard, which is higher for overhead than underground circuits.</p>
149	<p>The transmission line will be suspended by approximately 42 steel lattice towers (21 pairs) approximately every 400–500 m along the route. The towers will be approximately 75 m high.</p>	<p>This contradicts the Submissions Report, which states that no towers will be 75m high, with the average being 56.43m.</p>
157	<p>After consultation with DPIE and NPWS, it was resolved that Options 5, 6, 8 and 9 would not proceed to a detailed assessment as, primarily, they did not meet the evaluation criteria relating to economic factors, specifically they significantly increased the Project’s economic risk. Timeframes and disturbance areas were also a key consideration.</p>	<p>The underground options were eliminated as they were too costly.</p>
158	<p>Option 4 is the preferred option for the Project as it would be more cost efficient, thereby delivering positive economic benefits to the people of NSW and reducing project economic risk.</p>	<p>The transmission connection is being financed by Snowy Hydro, as a connection asset.</p>

Pge	TransGrid	Comments
		Its relative cost has no 'economic benefits to the people of NSW'.
A3	<p data-bbox="288 353 480 383">Evaluation matrix</p> <p data-bbox="288 387 1002 479">Options for connection to LTSS do not provide required connectivity to increase the resilience and reliability of electricity within the NEM.</p> <p data-bbox="288 483 1002 575">Leads to a concentration of 5 circuits within one corridor creating bushfire exposure risk that could cause damage to multiple circuits.</p> <p data-bbox="288 580 1002 636">Connection concentrates generation capacity up to 6,800 MVA at any one point in the network.</p>	<p data-bbox="1046 353 1385 479">As stated earlier, five circuits need not be located within one corridor and bushfire risks are rare.</p> <p data-bbox="1046 483 1385 636">Elsewhere on the route to Bannaby, HumeLink is proposed to be located adjacent to two existing 330 kV lines.</p>