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**From:** Ted Woodley  
**Sent:** Wednesday, 9 August 2023 12:31 PM  
**To:** State Development;  
**Subject:** RE: Inquiry into the feasibility of undergrounding the transmission infrastructure for renewable energy projects – Post-hearing responses – Tuesday 18 July  
**Attachments:** Ted Woodley Further issues for NSW Legislative Council Inquiry Paper 3.docx

Good afternoon Stephen

A third submission from me following the hearing on 7 August. There is much in the comments by TransGrid and the AER that needs to be challenged.

Also, why hasn't EnergyCo appeared before the Inquiry, especially as it has responsibility for transmission to most of the REZs.

Happy to discuss anytime.  
Ted

**NSW Legislative Council Inquiry**  
**Feasibility of undergrounding transmission for renewable energy projects**

**Questions following the Hearing on 7 August 2023**

Ted Woodley – 9 August 2023

## **QUESTIONS FOR TRANSGRID**

### **1 Focus on cost to consumers**

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*Transgrid is working with the Australian Energy Market Operator on the delivery of nation-critical energy projects identified in the 2022 Integrated System Plan, which is a whole-of-system plan that provides an integrated road map for the efficient development of the national electricity market over the next 20 years and beyond. Its primary objective is to optimise value to end customers by designing the lowest-cost secure and reliable energy system capable of meeting any emission targets determined by policymakers at an acceptable level of risk.*

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*Our role is to provide the Australian Energy Regulator with the most viable option for its assessment that includes the least cost to eight million consumers in New South Wales.*

Question:

1. In its submission and at the Hearings TransGrid has emphasised the primary objective being to provide the lowest cost service to electricity consumers. How are the costs and benefits to other stakeholders, such as local communities, landowners and neighbours, and the environment, taken into consideration?
2. If these other costs were properly included, wouldn't this significantly narrow the gap between the capital costs of overhead and underground?

### **2 2026 timing**

Page 2

*HumeLink is an actionable project in the ISP to be delivered by 2026. Any delay to this delivery could put the security and reliability of the electricity network at risk, and that supplies millions of Australians.*

Page 2

*We would expect a delay of approximately five years [to underground HumeLink]. The quicker we transition to renewable energy, the quicker all consumers in the cities and in the regions will have energy security and access to lower cost energy.*

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*To go to the underground scenario, as Marie mentioned before, the delay to five years means the consumer will incur higher costs for an additional five years—limiting the access of more renewables to come into the network as well as increasing the risk to reliability for the network.*

3. Can the cost of a five year delay be quantified, noting that Snowy 2.0 is unlikely to be completed during that period?

*JEREMY ROBERTS: So we've confirmed with the market operator, AEMO, that with the Snowy delays HumeLink is more critical to increase the resilience of the network. Without the Snowy coming on as soon as it was, that resilience requirement for the network is even more critical—especially that connection from Wagga through to Bannaby. To improve that, it allows the Project EnergyConnect to come through and bring that power through from South Australia, as well as relieve constraints in that south-west region of the network that currently exist, therefore increasing the ability for renewables to come onto the network which allows for a more competitive market with more renewables being able to access the market.*

*The Hon. WES FANG: So, in effect, this is really about the fact that because we're losing a number of the coal-fired power stations out of the Hunter region, you will have to bring power from somewhere else. That's why HumeLink is required now—so that you can move that power up because we're not going to have enough power in New South Wales. Is that, in effect, what you're saying?*

*JEREMY ROBERTS: Mr Fang, I'm saying that the network strength improves. As coal-fired generation across the whole grid is retiring as we transition to a greener, renewable future, more transmission lines are required to strengthen the network and reshape where our generation sources are coming from.*

4. If Snowy 2.0 had been on schedule wouldn't HumeLink be more critical in 2026 than if Snowy 2.0 is delayed, as is the case?
5. In fact, if HumeLink weren't built wouldn't Snowy 2.0 be precluded from pumping or generating any more than a couple of hundred megawatts?
6. Can the correspondence with AEMO be provided confirming that "with the Snowy delays HumeLink is more critical" and the July 2026 target completion date?

### **3 Future connection points**

*Transmission projects, including HumeLink, which forms part of the National Electricity Market superhighway, require a high-voltage alternating current transmission line that will allow connection points for generators as well as new loads.*

7. Where, and when, are connection points for new generators and loads envisaged for HumeLink?
8. Can you give instances where a connection point has been added to a 500 kV line in NSW?
9. Wouldn't connection points be on the 330 kV and 132 kV networks?

### **4 Reliability of DC converter stations**

*Converter stations globally have a reliability of about 98 per cent. This is much lower than our current reliability expectation in New South Wales of 99.998 per cent.*

10. Isn't this a case of comparing apples with oranges – the 99.998% refers to the overall system-wide reliability, whereas the 98% refers to a single component?
11. Can TransGrid refer to any electricity system component (e.g. transformers, lines, switchgear etc) that has a reliability of 99.998%?

### **5 TransGrid legacy**

*We are also committed to leaving a positive legacy in the communities where we have our transmission projects*

12. Does TransGrid believe that HumeLink will have a 'positive legacy' for communities and future generations?
13. Would not the legacy be more positive, or less negative, if HumeLink was undergrounded?

## 6 The increase in HumeLink cost to \$4.89 bn

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*Our latest figure for the HumeLink project is \$4.89 billion in real dollars as of FY 2023, and that was published last Friday by AEMO.*

When TransGrid appeared at the first hearing on 18 July no mention was made of a \$4.89 billion official estimate, though Mr Redman conceded the official number of \$3.3 billion is three or four years' old and the costs have increased about 30%, agreeing with a revised figure suggested by The Hon Les Fang of about \$5 billion.

*BRETT REDMAN: The current official number is about \$3.3 billion to build HumeLink.*

*The Hon. WES FANG: We know from the Commonwealth Games that probably there's a figure and then there is an actual figure. Are we still expecting around \$3.3 billion or are we expecting somewhere closer to five or six?*

*BRETT REDMAN: So that number is now a bit out of date. That was the last time it was loaded up with the market operator. It's about three or four years old. Since then inflation and cost of construction have gone up. I would use it as a marker. I expect broadly the cost of infrastructure and transmission has gone up about 30 per cent. We're going to see that when we finish the costing in the next few months.*

*The Hon. WES FANG: So \$3.3 billion, 30 per cent, about \$5 billion—and you say that \$11½ billion was generated last year by the thing?*

*BRETT REDMAN: Yes.*

AEMO published its 2023 Transmission Expansion Options Report, with the latest \$4.982bn estimate, on 28 July 2023, ten days after the hearing. No doubt TransGrid would have provided the updated 'official' estimate to AEMO well before the date of the hearing, yet it wasn't revealed.

14. Why didn't Mr Redman advise the Inquiry that the latest 'official number' is \$4.892 billion, not 'about \$3.3 billion'?
15. When did TransGrid advise AEMO of the updated estimate?
16. Isn't the increase 48% rather than 30%, as stated by Mr Redman?
17. Hasn't this increase occurred over a two year period, rather than 'about three or four years', as stated by Mr Redman?
18. What are the reasons for such a large increase in just two years?
19. Why have HumeLink's cost estimates been so wildly underestimated, with effectively a five-fold increase in three and a half years:
  - PADR (Jan 2020) - \$1.350bn (for more expensive single-circuit lines)
  - PACR (July 2021) - \$3.317bn
  - July 2023 update - \$4.892bn
20. Don't the revelations since the HumeLink PACR signify a 'material change':
  - 48% increase in cost to \$4.892bn, at the upper limit of the PACR range of \$3.3bn - 30%/+50%
  - the latest estimate having an even wider range of -50%/+50%, \$2.5bn to 7.5bn
  - a 14% reduction in capacity from 2570 MW in the PACR to 2200 MW
  - delays in Snowy 2.0 reducing the benefits
  - assumptions made in the PACR that bolstered the benefits, now being confirmed

otherwise:

- the certainty of Kurri Kurri and Tallawarra B gas stations being built
- Snowy 2.0's capacity factor being overstated
- Opex of 0.5%, when the standard is 1% for lines and 2% for substations

21. Will TransGrid be formally advising the AER of this material change in circumstance and reviewing the RIT-T?

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*JEREMY ROBERTS: So 3.3 was the last assessed cost that was published prior.*

*Ms CATE FAEHRMANN: The last one. That's what you gave this Committee three weeks ago.*

*MARIE JORDAN: Then when we look at the cost adjusted and then to today's cost, it's a 26 per cent, 27 per cent increase.*

22. Doesn't the jump from \$3.3bn to \$4.892bn constitute an increase of 48%, not 26% or 27%?

## **7 Cost of undergrounding not understated**

Page 6

*On a general point, too, when I was listening to the Tumut inquiry the comment was made that that was what they felt was a bit under for the cost of cabling. They were very specific that the HVDC converter stations were not included in that number. We would need three and they're half a billion dollars each, and the substations we have planned and the substation equipment that's planned would also be installed. So it would have to come up and convert and go into a substation and collect in additional energy from lines at those locations. So you end up with the redundancy of both the converter station and the substation, and those were not factored in based on the comments made in that inquiry.*

23. It would appear that the estimates in the GHD study commissioned by TransGrid include all underground costs, including converter stations, contrary to Ms Jordan's understanding?

## **8 Multiple underground to overhead on a line**

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*I have not seen multiple underground to overhead on a single line. That is something I haven't seen. I don't think it's feasible.*

24. Are there not many instances where transmission lines are both overhead and underground?

25. Didn't the GHD underground study include options for part overhead and part underground?

## **9 Capacity limitations for multiple uses for HumeLink**

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Sure. I think that prior to HumeLink was Project EnergyConnect, which is under construction now. It brings connections from South Australia to Wagga and picks up that real rich renewable energy source of the south-west, which is also the proposed future REZ location of south-west New South Wales. The requirements for HumeLink are to bring the south-west renewables across from Wagga and up to Sydney and Bannaby, as well as bringing that renewable across to the Snowy so that it can pump back up and then discharge when the renewables aren't going—to use it as a battery—and bring that up to Sydney, as well as strengthen down south into Victoria as part of the integrated network. There's multiple needs for it.

26. How can HumeLink do all this when it has a capacity of only 2,200 MW?

27. Won't Snowy 2.0 alone take up most of HumeLink when pumping or generating at 2,000

MW?

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*Ms CATE FAEHRMANN: If Snowy 2.0 does get built—I am just trying to understand capacity here—what will be the capacity requirements of Snowy 2.0? Are you aware of that, or am I asking you detail that is—*

*MARIE JORDAN: Sorry, the detailed information like that on specific megawatt hours, I do not have with me.*

28. The question was what is the capacity of HumeLink compared to the capacity of Snowy 2.0, nothing to do with megawatt hours?

## 10 EIS process

Page 11

*Ms CATE FAEHRMANN: When is the EIS coming out?*

*JEREMY ROBERTS: For public exhibition? It is currently planned by 30 August to go on public exhibition in September.*

*Ms CATE FAEHRMANN: How long will that be? What's the usual—*

*JEREMY ROBERTS: As a State significant infrastructure project, I believe it's planned for four weeks.*

29. Is a four week EIS exhibition period for a \$5bn project covering 360 km that has been many years in the making considered sufficient?
30. Will the EIS include a comprehensive analysis of underground options?

## 11 Compulsory acquisition

Page 12

*Ms CATE FAEHRMANN: What's factored in? What is that factored in by? What month? After the public exhibition at the end of this year, you'll continue working with landholders, but what have you factored in in terms of when you pull trying to get agreement and you start going on to compulsorily acquire? What time frame have you given that? Three months? Six months?*

*JEREMY ROBERTS: Ideally, we're aiming to have all land available for access for construction by mid to late next year, or late next year. I'll come back with some actual dates of the land acquisition process.*

31. What is the process to be taken with property owners who refuse to allow TransGrid on their land or refuse to agree to an easement – in detail please with timeframes?
32. Can TransGrid meet its 2026 target if compulsory acquisition is needed for a significant proportion of landholders?
33. What budget has TransGrid set for legal actions against property owners?
34. How will such actions impact the 2026 target?

## 12 Need for HumeLink 2

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*Ms CATE FAEHRMANN: Do you think there will be additional transmission lines required to increase the capacity of HumeLink within the next decade or so, for example, in five years or 10 years? Will that be required, based on what AEMO has released? Will there be additional transmission lines required close by?*

*MARIE JORDAN: I can't answer that based on that report, but we will know more when the 2022 draft ISP comes out. Then we will have more specific information.*

*Ms CATE FAEHRMANN: Is it a possibility, though, that more transmission lines—*

*MARIE JORDAN: I couldn't comment, and it would be truly just my opinion. My planning team is much closer to it, but I would be uncomfortable making any kind of assertion there.*

35. Doesn't the AEMO Report include additional HumeLink options, contrary to Ms Jordan's lack of knowledge?
36. Weren't these additional options provided to AEMO by TransGrid?
37. Given the (reduced) capacity of HumeLink of 2200 MW and the capacity of Snowy 2.0 (2000 MW) and the proposed REZ and interstate transmission, when will HumeLink be operating at capacity and further augmentations be necessary?
38. Isn't the HumeLink augmentation option for HVDC of comparable cost to HVAC, and wasn't it provided by TransGrid?

### **13 HumeLink contractors engaged**

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*Ms CATE FAEHRMANN: Has Transgrid already signed up any contractors to build HumeLink?*

*JEREMY ROBERTS: We are very close to commencing early design works with our contracting parties, but we have not signed them up yet.*

*Ms CATE FAEHRMANN: You have contracting parties that are ready to do design work but you haven't signed anything with them?*

*JEREMY ROBERTS: Not with those parties yet.*

39. Can you confirm that contractors have not been engaged to build TransGrid, as press reports suggest otherwise?

### **14 Length of underground line before it becomes economic**

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*MARIE JORDAN: I don't know if a comprehensive study has been done, but there are some global studies that are very interesting about length of the line and when HVDC actually makes sense.*

*There's a cost benefit and you can see it; it's somewhere between 800 and 1,000 kilometres for a single line when it really makes sense.*

40. If the distance has to be more than 800 km for a HVDC line to be economic, why are there many examples of installed and proposed HVDC lines of considerably shorter length?
41. Doesn't real world experience demonstrate a much shorter distance for HVDC to be economic?

### **15 Difference between Victoria and NSW**

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*MARIE JORDAN: Could you be referring to the multi-criteria analysis that's used in Victoria, where there are other inputs into the process that are considered? Because those do not apply, if that's what you're referencing. They don't apply in New South Wales today.*

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*The Hon. STEPHEN LAWRENCE: Does that mean that Victoria departs in some way from the national model law?*

*MARIE JORDAN: Yes, it does.*

42. Can the differences between NSW and Victoria be explained?
43. How does Victoria depart from the national law?

## 16 Blackouts in California

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*The CHAIR: Further to that, Ms Jordan, with comments you made previously about Snowy's delay making HumeLink more critical, I wonder if you would comment about how it would put our country at risk, given other comments that you've made about HumeLink in the ISP being critical in terms of network security and reliability. What are the consequences of that?*

*MARIE JORDAN: The consequences of that would likely be insufficient resources. In June 2022 we spent a lot of time in lack of reserves. They have it categorised from one to three. I would see us in those lack of reserves. If you couldn't get the generation, the next option is rotating blackouts that are managed through the distribution network operators. We do have plans; we came very close to executing them in June 2022. We were fortunate that we had a few things occur that stopped that but, having lived through the energy crisis in California, it's real. When the resources aren't there, you go into rolling blackouts. Even in the recent couple of years, with having to turn down transmission lines in California, there was a significant number of rotating blackouts that occurred in my area. I spent quite a few afternoons in the dark in Napa, California, because we turned down some of the transmission lines. That ability to move energy across the regions is critical.*

44. What relevance are blackouts in California to NSW?



# QUESTIONS FOR AER

## 1 Consideration of factors other than lowest cost option

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*Beyond that, obviously it's not the only thing. Obviously I think issues of cost do matter—cost to the general community. There's an element of balancing all those things, but I don't think it's right to say that we're required to take the lowest cost option or that other factors aren't capable of being taken into consideration.*

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*That wouldn't necessarily have been the cheapest project but the undergrounding project would have to show that it produced greater benefits than an alternative which might have been an overhead project.*

1. Can the AER be specific as to what costs and benefits, other than those to the consumer, were taken into consideration when reviewing the HumeLink PACR?
2. Has the AER ever approved a project proposal that wasn't the cheapest for consumers or the one with the highest net benefit for consumers?

## 2 Triggering of RIT-T reassessment

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*The Hon. WES FANG: Apparently HumeLink had gone from being a \$3.3 billion project to now being a \$4.89 billion project in real terms—that was the testimony from Transgrid. I imagine that the assessment was done on the \$3.3 billion. Now there's been a 30 per cent, 35 per cent, 40 per cent change in the pricing structure of that project. Would that trigger a reassessment?*

*JIM COX: What they'd then have to consider is whether it's going to change which is the most preferred option. If in their opinion it would do that then, yes, they have to redo the RIT process.*

3. Would the RIT-T process have to be redone if the updated cost didn't change the preferred option but it resulted in a negative net benefit?
4. Can the AER be confident that the latest cost hasn't altered the preferred option for HumeLink, especially as the claimed net benefit of Option 1C-new was almost identical with Option 3C (the preferred option)?
5. Don't the recently revealed changes in circumstance since the HumeLink PACR signify a 'material change':
  - 48% increase in cost to \$4.892bn, at the upper limit of the PACR range of \$3.3bn - 30%/+50%
  - the latest estimate having a range of -50%/+50%, \$2.5bn to 7.5bn
  - a 14% reduction in capacity from 2570 MW in the PACR to 2200 MW
  - delays in Snowy 2.0 reducing the benefits
  - assumptions made in the PACR that bolstered the benefits, now being confirmed otherwise:
    - the certainty of Kurri Kurri and Tallawarra B gas stations being built
    - Snowy 2.0's capacity factor being overstated
    - Opex of 0.5%, when the standard is 1% for lines and 2% for substations
6. What action will the AER take to ensure the cost-benefit analysis is redone and the project still has a net benefit?
7. When the AER ultimately approves a capital cost amount for HumeLink to be added to the Regulatory Asset Base, is that figure the PACR estimate, some other figure, or the actual cost of construction?

8. Will the opex allowance for HumeLink be set at 0.5% as assumed in the PACR, or can it be increased to some other amount at TransGrid's request?
9. Would the AER like to see any changes in the current RIT-T process?

### 3 Underestimated costs

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*JIM COX: Yes, I think the increase of cost is of concern to us. I think we are concerned that the initial cost estimates proved to be so far wide of the mark. I don't think that's a good situation. Obviously, as we learn more about how to construct these long transmission links, we would expect cost estimation to improve and we have suggested a number of measures to improve the accuracy of cost estimation. It is something that has received attention for us. We are concerned and we are taking action to improve the accuracy of cost measurement.*

10. What action will the AER take with HumeLink's cost estimates being so wildly underestimated, effectively constituting a five-fold increase in three and a half years:
  - PADR (Jan 2020) - \$1.350bn (for more expensive single-circuit lines)
  - PACR (July 2021) - \$3.317bn (-30%/+50%)
  - July 2023 update - \$4.892bn (-50%/+50%)
11. How does the AER stop proponents from understating costs and overstating benefits to manufacture a net benefit to get a RIT-T approved?

### 4 Sunk amount with Early Works approval

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*Ms CATE FAEHRMANN: There's a lot of pressure. Is it reasonable, then, to spend \$633 million—adding both of those up—before, as we heard earlier, the environmental impact statement has even been exhibited yet? Is that a standard process?*

*JIM COX: We were comforted in thinking about that because the equipment is capable of being resold if necessary. The risk to the consumer was not particularly substantial because of the nature of the equipment that was being purchased. We thought it was a reasonable balance, given the national priority in proceeding with these projects as quickly as possible, that we should apply.*

*Ms CATE FAEHRMANN: In terms of the risk to the consumer, does that mean that if HumeLink doesn't go ahead, what has been bought can be used elsewhere? Is that what you mean?*

*JIM COX: That's what I was trying to say, yes.*

12. How much of the total allocation is for equipment that can be reused, as distinct to sunk cost for design etc?

### 5 Impact on consumer bills

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*The Hon. MARK BUTTIGIEG: What percentage, roughly, is the transmission component?*

*JIM COX: Sorry, I can't say offhand. Perhaps we can get you some accurate figures on that.*

*The Hon. MARK BUTTIGIEG: Sure.*

*JIM COX: Ballpark—probably 10 per cent, but I could be wrong on that.*

13. What is the impact on consumer bills of HumeLink (costing \$5bn)?