

**REPORT ON PROCEEDINGS BEFORE**

**SELECT COMMITTEE ON THE FEASIBILITY OF  
UNDERGROUNDING THE TRANSMISSION  
INFRASTRUCTURE FOR RENEWABLE ENERGY  
PROJECTS**

**CORRECTED**

**At Macquarie Room, Parliament House, Sydney on Friday 16 February 2024**

**The Committee met at 9:00 am**

**PRESENT**

Ms Cate Faehrmann (Chair)

The Hon. Mark Buttigieg

The Hon. Susan Carter

The Hon. Wes Fang (Deputy Chair)

The Hon. Stephen Lawrence

The Hon. Emily Suvaal



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**The CHAIR:** Welcome to the second hearing of the Select Committee's inquiry into the feasibility of undergrounding the transmission infrastructure for renewable energy projects. I acknowledge the Gadigal people of the Eora nation, the traditional custodians of the lands on which we are meeting today. I pay respects to Elders past and present, and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters in New South Wales. I also acknowledge and pay my respects to any Aboriginal or Torres Strait Islander people joining us today.

My name is Cate Faehrmann, and I am the Chair of the Committee. I ask everyone in the room to please turn their mobile phones to silent. Parliamentary privilege applies to witnesses in relation to the evidence they give today. However, it does not apply to what witnesses say outside of the hearing. I urge witnesses to be careful about making comments to the media or others after completing their evidence. In addition, the Legislative Council has adopted rules to provide procedural fairness for inquiry participants. I encourage Committee members and witnesses to be mindful of these procedures.

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**Mr JIM COX**, Deputy Chair, Australian Energy Regulator, sworn and examined

**The CHAIR:** Welcome, Mr Cox, and thank you for making the time to give evidence. Would you like to make a short opening statement?

**JIM COX:** I'd like to make a very brief opening statement just to clarify our role in these activities, as it may be of use to Committee members. Thank you very much, Chair, and thank you for the opportunity to make an opening statement. I'm Deputy Chair of the Australian Energy Regulator, which is commonly known as the AER. We work alongside two other market bodies: the Australian Energy Market Commission and the Australian Energy Market Operator, known as AEMC and AEMO respectively. The AER appeared twice as a witness for the undergrounding inquiry established in June last year. For the benefit of anyone who was not part of that inquiry, I thought I'd just say a few words about our role.

For the purposes of this inquiry, much of our work needs to be explained by reference to AEMO's integrated system plan or ISP. The ISP is a comprehensive road map for the development of the National Electricity Market. It identifies major transmission projects that must be progressed to meet power system needs, called actionable projects. HumeLink is one of these. AEMO conducts rigorous cost-benefit analyses into developing the ISP, guided by the AER's cost-benefit analysis guidelines. The AER conducts transparency reviews to ensure that AEMO's processes are robust, credible and transparent. We published our most recent transparency review in early January on AEMO's draft 2024 ISP, noting that, while most important assumptions were adequately explained, a few areas could be explained better. AEMO is currently undertaking this task.

Once the ISP has been finalised, actionable projects should ideally begin to be progressed as soon as possible by transmission businesses. Under the national framework, a transmission business must identify all credible options for a project and then, of those, assess which option maximises the net economic benefit to the market. This process is known as the regulatory investment test for transmission, or RIT-T. The RIT-T supports long-term investment efficiency by promoting a predictable network development framework around which competitive investments in the market can be made. While cost is a consideration in the RIT-T, the goal is not to identify the least-cost option but to identify the option that results in the highest benefit-cost ratio. This goal is set by the National Electricity Rules.

The AER's role is to develop guidelines setting out how businesses should apply the test and to ensure that businesses comply with these guidelines. For actionable projects, transmission businesses can make applications to the AER to recover the costs of major network infrastructure assets from consumers. These applications are called contingent project applications. A network business can make a contingent project application once it has fulfilled all of its RIT-T obligations and once AEMO has confirmed via the feedback loop that the preferred option identified in the RIT-T aligns with the most recent ISP. In assessing contingent project applications, the AER reviews the costs of the project to ensure that they are prudent and efficient, and the consumers will pay no more than necessary for delivery of the project. We are currently assessing a contingent project application for HumeLink.

Now I'll touch briefly on renewable energy zones. Renewable energy zones are areas identified as having high development potential for clusters of renewable energy projects. In New South Wales the enabling piece of legislation is the Electricity Infrastructure Investment Act, which also appoints the AER as regulator for renewable energy zones in New South Wales. The AER's role here is relatively narrow in scope because once a renewable energy zone project comes to us for assessment, it has already been approved for development by the Minister or the Consumer Trustee. The AER's primary role is to determine the efficient cost of the project and to make annual contribution determinations, which set the amount that will be passed through to energy consumers in New South Wales each year.

I hope this overview has been helpful in outlining the AER's role in relation to transmission infrastructure and renewable energy zones. I'd like to keep my opening remarks brief in the interests of time, but just wanted to finish by noting the AER acknowledges the transition is happening at pace. We've seen this across all of our recent work and are doing what we can within the existing regulatory framework to meet the needs of an evolving energy landscape. Thanks for the opportunity to make this brief statement. I'm happy to turn to questions now, if you wish.

**The CHAIR:** Thank you very much, Mr Cox. That actually was a very helpful opening statement for the Committee. We'll go to questions from the Opposition to start with.

**The Hon. WES FANG:** Thank you very much for appearing today. In your opening statement you spoke about—I think it was that you're assessing a contingent application for HumeLink, was it?

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**JIM COX:** We have received an application from HumeLink. We are in the process of assessing it for whether it complies with all the relevant requirements. Once we have done that, we will then have satisfied ourselves that it does meet the requirements. We will then consult on that proposal.

**The Hon. WES FANG:** So it differs, does it, from the original proposal that HumeLink put forward in 2021?

**JIM COX:** I don't want to comment on that because I haven't personally reviewed the application, so I'm not sure of the extent to which it is different or similar. But I imagine it will be a proposal not involving undergrounding.

**The Hon. WES FANG:** In relation to this new proposal, the contingent proposal that's put forward, I assume that's by Transgrid and that it would be acknowledging the fact that there's been an increase in costs to the project from when it was first proposed.

**JIM COX:** Once again, I haven't reviewed the project myself and I haven't been briefed on it. I would imagine it recognises that costs have increased.

**The Hon. WES FANG:** What other changes do you expect would result in a contingent application being put forward?

**JIM COX:** Right. Just to explain, we make determinations for a five-year period. In the case of Transgrid, that was made some years ago. Things are happening apace, as we've discussed. New projects are being undertaken. Something like HumeLink is on the actionable list of the integrated system plan, so it's something that needs to be pursued as quickly as possible. Therefore, in effect, what we do is we update our determination to incorporate the contingent project. That means that the capital expenditure that has been incurred we've rolled into the asset base, and the amount of revenue that Transgrid can recover from consumers will be adjusted to take account of the project. I mean, that is a process that we go through. We obviously go through it with some care. We have just recently received Transgrid's application and the first question is whether it complies, and we are assessing that now.

**The Hon. WES FANG:** I'm just, I guess, trying to drill down on some of the details in relation to this project, given that it has previously been assessed, or the previous proposal has been assessed. The previous costings have been used for the calculation of cost-benefit analysis, I would assume. There is now an acknowledgement that the cost of the project has increased dramatically—almost 50 per cent—from when it was first proposed. In circumstances where that has occurred, is there a requirement that the figures are put to your organisation to reassess, or does it trigger a whole reassessment of the project—that is, consultation processes and route analysis? Is it limited in its scope of the assessment, or does it mean that Transgrid has to go out again and re-consult with the community?

**JIM COX:** Yes, there are two triggers there. The first one is that the project, with increased costs, remains on AEMO's integrated system plan—their optimal development path. That is something that is assessed not by us but by AEMO, but AEMO will need to certify that. The second thing is the RIT-T itself. There the responsibility is on Transgrid. As you pointed out, I think rightly, costs have increased. Transgrid have to then assess whether the change constitutes material change in circumstances such that they have to re-run the RIT-T. That is something that Transgrid has to assess, not us. We have received their proposal and we are currently considering whether it meets the requirements.

**The Hon. WES FANG:** I appreciate the way that you are answering the questions, but obviously it's not providing much insight, shall I say, to the Committee. I appreciate the difficulties you would have by not trying to let too much information out as to what's contained in that proposal. Are you able to provide that proposal to us?

**JIM COX:** I think not at this stage. I think we have to first do our own job, which is to ensure it meets the requirements of the National Electricity Rules. Once we have done that, we will be very happy to provide you with the proposal.

**The Hon. WES FANG:** What's the time frame on that?

**JIM COX:** I'm not sure I can say that, to be honest.

**The Hon. WES FANG:** How long is a piece of string?

**JIM COX:** We would want to do it as soon as we reasonably can, but there are some quite complex issues involved that we have to assess.

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**The Hon. WES FANG:** Obviously there have been some very prominent issues in recent times. In Victoria we have seen the failure of a number of overhead powerlines through weather events. Where in this assessment process, if at all, are you able to look at the interruption to service, the risk of bushfire, and calculate that cost into the assessment?

**JIM COX:** Yes, that obviously is an issue. In developing projects, they may have different implications for the risk of interruptions. Not being interrupted clearly is a benefit, and that's something that will be taken into account in the cost-benefit analysis and the RIT-T process.

**The Hon. WES FANG:** What weight does it carry?

**JIM COX:** At the same time, obviously, different options have different costs and the costs as well as the benefits need to be taken into account.

**The Hon. WES FANG:** But in this circumstance, where I'll assume that—I think you've basically said it without saying it—the HumeLink proposal that is currently being assessed by you is effectively what has previously been put forward, without any analysis or assessment of undergrounding, how are you able to draw a comparison between the cost of interruption to supply from bushfires et cetera if you don't have those costings and a comparison between an overhead proposal and an underground proposal on the table?

**JIM COX:** The responsibility there is ultimately one that lies with Transgrid. They need to assess benefits and costs. Obviously in the case of HumeLink, a long process of assessment has already taken place. It is not as though—

**The Hon. WES FANG:** Some questionable assessment perhaps, but those are questions for Transgrid. I know my time is about to run out, so I will just squeeze one more question in. Where there's a clear risk that's involved with something like an overhead powerline and the issues around weather events and bushfires et cetera interrupting supply or, conversely, a failure of the overhead powerlines leading to something like a bushfire, isn't it incumbent upon your organisation to look at not only the proposal that's put in front of you but alternate proposals to determine which is the best outcome for the community?

Ultimately, if you're leaving it to the construction entity, which is Transgrid—and we know that Transgrid has already got equipment on order, they've got plans in place—it's less likely that they're going to assess alternate plans, given how much they've already invested into what's proposed already. Isn't it your job as the regulator to assess not only what's put before you by Transgrid but also to look at other options to determine what's the best outcome? Because I would suggest that an underground system that doesn't have a risk of loss of supply, like we've seen in Victoria, that doesn't have a bushfire—

**The CHAIR:** Wes, ask the question.

**The Hon. WES FANG:** —is just as important.

**The CHAIR:** That was a long question at the end of the time.

**JIM COX:** Yes. The answer to that is, in many ways, the responsibility to put forward the project is that of Transgrid, under the rules we have. They have to apply the material change in circumstances test. We are in the process of assessing how they have done that and whether we think it complies with the requirements of the rules or not. So that's happening at the moment. We as a board have not discussed the results of that assessment, so I'm not in a position to say what we think about it.

**The CHAIR:** Mr Cox, I was hoping you could explain for the Committee, and I think we mentioned it in the last inquiry—there's a new rule around enhancing community engagement in transmission building. AEMC, I think, has published it. Is it a draft new rule or is it a new rule? Then potentially the difference that would make—are you aware of that?

**JIM COX:** I'm aware of the rule, yes.

**The CHAIR:** What do you as the regulator think is going to be the change between what may have happened in the initial approvals process and consultation process, whatever that looked like, with the first HumeLink compared to new projects? Will it make any substantial difference, in your mind?

**JIM COX:** Yes, I think it will. The most important requirement, I think, is to consult with a wider range of stakeholders, including local communities. I think there will be more extensive consultation than has been the case in the past.

**The CHAIR:** I'm curious, because there are lots of guidelines and best practice around community consultation—and engagement, actually. If you speak with the community, they're very dubious about that. The

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consultation is actually not up to scratch. What does a rule mean—if you like, within the regulatory environment, for a new rule to be imposed, how much does that hold the energy companies, transmission companies, to do the engagement? What does the new rule mean for us?

**JIM COX:** It means the transmission companies are required to comply with the rule. We obviously have an enforcement compliance function—I haven't spoken about that—so it is our responsibility to ensure compliance with the rule. If we thought the transmission company was not complying with the rule then we'd be in a position to take action.

**The CHAIR:** This is about community engagement, so there's something around taking the community's views on board as well. Is that correct or is it just engaging with the community? Is there a requirement to weigh up and balance the views of the community more in the consideration of options? Is that part of it?

**JIM COX:** Just to clarify, the final word change was made in November 2023. It requires businesses to engage with stakeholders as part of the preparatory activities who are reasonably expected to be affected by the development of the integrated system plan project, future ISP project or project within a renewable energy zone—this includes local land owners, local council, local community members, local environmental groups and traditional owners—clarifies these local stakeholders as interested parties for the RIT-T and that businesses consult with them during the RIT-T; and it makes community engagement expectations that businesses must make reasonable endeavours to satisfy when engaging with these local stakeholders. That's what the rule says. In terms of good practice, I think we would like businesses to demonstrate what regard they've had to the views expressed by stakeholders, which doesn't mean they have to agree with them but it does mean that they should not ignore them.

**The CHAIR:** Does that rule change allow more flexibility? I would be appreciative of your views and expertise on this. Does it allow more flexibility to consider costs during the RIT-T process to the community other than financial? Does it impact that process at all, having a rule change like this, or are they two separate things?

**JIM COX:** I would think, yes, the costs imposed on the community are relevant issues to consider during a project. We are obviously keen to encourage businesses to adopt good practice in consultation and we've set out some guidelines saying what we think that should be. I think behind all of this is a concern that if good community engagement does not take place, projects which are important for the energy transmission will at the very least be delayed substantially. So I think there is a concern there.

**The CHAIR:** You kind of think social when you think community concerns, but I assume the community concerned about biodiversity impacts and other things as well get more weighting. In trying to provide a little more hope here compared to what has happened in the past, do you think that as a result of this rule more consideration could be given to different impacts and costs? Undergrounding somewhere sometimes may be a bit more attractive; you could see that possibility if those costs were weighed up. I'm not saying you have to say, "Yes, undergrounding is going to happen," but it just makes it a bit more feasible or possible in some areas for some communities. What do you think?

**JIM COX:** Yes. Just to clarify, we're not saying "no undergrounding". What we're saying is that the benefits and costs have to be weighed. I think the benefits—the sorts of things you are talking about; the views of the community—are relevant to be taken into account in such an assessment. And, yes, we would obviously like businesses to engage better with the host communities to understand what the community wants and needs. Maybe there are opportunities for ways to advance a project while at the same time assisting the community to get what it wants and needs. I think there are opportunities there that may be available in the future.

**The Hon. EMILY SUVAAL:** Thanks, Mr Cox, for appearing again for this inquiry. I might start by asking if you could explain for us again, or in detail, how transmission projects are planned, approved and the cost recovered?

**JIM COX:** Let me go through that because it's a complex story. The first stage is AEMO's integrated system plan. What that does—it's a high-level plan—is identify the optimal development path and the projects that really need to happen. That's stage one; that's done by AEMO. Projects on the optimal development plan are what are called "actionable" which means they have to be pursued as quickly as possible. The next stage is the thing we've been talking about which is the RIT-T process, which is a cost-benefit analysis undertaken by the proponent. In practice, that does look at a wide range of issues. We discuss the issue of social licence a bit. We think that investments that may mean the projects can be undertaken without extensive delays are ones that can be considered within the framework of the National Electricity Rules and hence the RIT-T process. That's stage two, which is a RIT-T.

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Stage three is having to recover the money from consumers of electricity, and to do that AEMO must have completed the ISP. There's a thing called the feedback loop, which means that, if costs have increased, AEMO has to certify that the project remains on their ISP. Then the RIT-T also has to be completed—all stages of that. Once all that's done, the businesses come to us as the regulator and say, "Can you please adjust your determination to take account of these additional costs?" What we then do is to take the project. We ask ourselves and we consult on whether it's being done prudently and efficiently, and we determine if they're prudent and efficient costs, and we allow those to be recovered from energy consumers. Obviously, these are long lived projects, so it may take some time for the costs to be recovered. It may be 40, 50, 60 years, but they are recovered over time.

**The Hon. EMILY SUVAAL:** What is the test that you apply in deciding whether to allow a project to proceed?

**JIM COX:** We're not the planning authority. Our authority is to allow revenue to be recovered from consumers. That's what we do. There are all these other processes that are gone through that are required under the National Electricity Law, but those are done by AEMO and the proponent itself, the RIT-T. Our job in those processes is to ensure that they have been done satisfactorily, and then when we come to decide are we going to allow revenue to be recovered from consumers, we then have to check whether it's been done satisfactorily.

**The Hon. EMILY SUVAAL:** Why is the regulatory system that we have in place the way that it is? Can you explain to us what is the logic behind having consumers paying for transmission, as it would be?

**JIM COX:** I think the argument would be that consumers are the ones that benefit from transmission because, after all, electricity is an essential service and revenue should be recovered from consumers. I don't think that means that only consumers should pay. I think it's arguable that they are broader environmental and social benefits that governments may wish to pay for, and that's certainly their right if they wish to contribute towards the cost of transmission projects. That is certainly within government's right to do so, in which case the revenue doesn't have to be recovered from consumers. Arguably, there is a shared responsibility there, but certainly there are benefits to consumers in having a reliable power system and it's reasonable that they should contribute to the costs.

**The Hon. EMILY SUVAAL:** It's fair to say that we have to build a lot of new infrastructure to enable the energy transition and electricity consumers will bear these costs over time. Can you outline the role of the AER in seeking to protect consumers from inappropriate cost increases?

**JIM COX:** Yes, you're right to say that a lot of transmission is required to be built for the energy transition to occur. That's certainly true. Our concern is that consumers should pay no more than they need to. Our roles, as we were explaining, are to supervise the ISP and RIT processes to ensure that they are open, transparent and based on good information. We have a responsibility in passing costs on to consumers to ensure they don't pay any more than is necessary. We obviously do take a lot of effort and trouble to ensure that no more than is necessary is passed on to consumers. I agree: That is our responsibility and we take it seriously.

**The Hon. EMILY SUVAAL:** Yes. Well, within a cost-of-living crisis like we're in—

**JIM COX:** We are very much aware of cost-of-living pressures.

**The Hon. EMILY SUVAAL:** Absolutely.

**JIM COX:** There are two things: an environment in which we are moving rapidly to an energy transition, which requires investment. On the other hand, we're also in a cost-of-living concern. So those are all things that we do have to pay attention to when making decisions.

**The Hon. MARK BUTTIGIEG:** On this line of questioning, the crux of all this is based on what I'll refer to as modelling. This cost-benefit analysis essentially is a model. The more sophisticated the model, the more accurate a picture you will get of whether it's worth undergrounding. Could you just walk me through the process, because I'm not clear. Who comes up with that modelling in terms of inputs to the model? I'm talking about cost of undergrounding reliability versus cost of overhead reliability, environment degradation—all those things you would want to see in a model. Who is actually responsible for putting that model together?

**JIM COX:** The project proponent is responsible, but it's worth saying that we run a transparency process. The inputs and assumptions are consulted on and it is open to people to dispute them, and that does happen.

**The Hon. MARK BUTTIGIEG:** Who would be a typical person or entity who would dispute it? Who vets it?

**JIM COX:** Probably increasing numbers of people, but typically some sort of energy consultancy or an engineer that has expertise in the area. Firstly, there are the inputs and assumptions, then there is also a procedure



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for disputes about the RIT-T. We are the dispute resolution body and there have been a number of disputes, including on HumeLink, that we've had to resolve. That's also another avenue where people can query the costs, should they wish to.

**The CHAIR:** We're out of time, Mark, so just one more.

**The Hon. MARK BUTTIGIEG:** Just one really quick question: Based on that and given the previous evidence we've heard in other hearings and hitherto, would it be fair to say that, on balance, that modelling suggests that overhead is more effective than undergrounding in terms of that cost-benefit analysis, given all those inputs? Because that's essentially what we're here for.

**JIM COX:** I wouldn't say undergrounding is never justified.

**The Hon. MARK BUTTIGIEG:** No, that's not what I asked.

**JIM COX:** I can imagine there are circumstances where it is.

**The Hon. MARK BUTTIGIEG:** Yes.

**JIM COX:** I suppose the other point to make is that obviously you've heard a lot of evidence about costs of undergrounding. I think those costs, honestly, are very uncertain. The large, long undergrounding link has not been constructed in Australia, so I think there's a lot of uncertainty about the costs.

**The Hon. EMILY SUVAAL:** And who bears the costs.

**The CHAIR:** Okay, I think we've had the "who bears the costs" discussion, and we will have to draw a line under this, I'm afraid. Thank you for appearing at this second inquiry into undergrounding transmission, Mr Cox. The secretariat will get in touch if we have any questions on notice.

**(The witness withdrew.)**

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**Mr FRANK DE WILD**, Business Director and Senior Principal Consultant, DNV, before the Committee via videoconference, affirmed and examined

**The CHAIR:** You're tuning in from the Netherlands. You have a backdrop that looks like it's very sunny and bright there, but I'm sure it's not. I'm sure it's late at night there, if that's correct.

**FRANK DE WILD:** Correct.

**The CHAIR:** Thank you, we really appreciate you making time for us. Do you have a short opening statement to make for the Committee?

**FRANK DE WILD:** Yes, I do. Good morning, everyone. Thank you for having me in this hearing. I am representing the company DNV Netherlands in this hearing. I have just over 25 years of experience as an expert in power cables. I and my power cable expert teams work worldwide as an adviser and as an independent third party. My role in DNV is business director and senior principal consultant in power cables. You have requested me to make a submission to your inquiry about the feasibility of undergrounding the transmission infrastructure for renewable energy projects. I have answered this submission by sending a letter, which I'm sure you have received.

When it comes to deciding whether to transmit energy via overhead lines or underground cables, many different topics are of importance. These topics range between technical, environmental, financial, societal and more. Connecting a renewable energy source to the grid effectively means one has to make decisions on what topics are more important than other topics and how, within a topic, the overhead and underground transmission solutions compare. This can either result in a decision for an overhead line or for an underground power cable, which both exist and are applied in the world as mature options for energy transmission. Making the right decision requires insight into the topics at play and all the associated advantages and disadvantages.

A study could be made to clarify all these advantages and disadvantages for overhead lines and underground cables, and to understand any disadvantages that could be mitigated. Such a study could support decision-making in individual projects or could lead to a predefined decision-making process when similar decisions are required in a variety of projects. I made the proposal to utilise DNV as an independent expert in the matter to execute such a study. I hope my submission has been useful and that our proposal has been appropriate. It has been my aim to support the decision-making process to ensure that renewable energy sources are indeed connected to the grid with the best possible transmission option for New South Wales. Thank you for your attention.

**The CHAIR:** We will go straight to questions from the Opposition.

**The Hon. WES FANG:** Thank you very much for making yourself available at this hour over there, and also for providing what I believe is a very balanced submission. For those that haven't had the opportunity to read the submission, on page 6 you effectively say that you're not drawing a conclusion as to what's better but that, in effect, what we need to do is have a detailed and proper study of both solutions in order to determine what's the best outcome. I'm paraphrasing that, but do you agree that that's effectively what the conclusion is of your submission?

**FRANK DE WILD:** I agree.

**The Hon. WES FANG:** We've had Transgrid, which is the constructor of the project for HumeLink, effectively say to us that they've only ever built overhead powerlines; there's no real experience in this country with building DC underground powerlines; the cost of DC underground powerlines is more on a per kilometre basis; and we've got a regulator that's effectively rewarding the lower cost solution when just looking at dollar terms without, in effect, considering the other aspects, such as bushfire risk and failure of towers. You may be aware that we had a number of towers fail in Victoria, which is the State below us, earlier this week. Where those factors are the predominant ones but the other factors aren't taken into consideration, would a study such as the one you're proposing take into account all factors?

**FRANK DE WILD:** The study we will be proposing would take into account all of those factors. The different topics need to be compared to each other, but it's also quite important to really understand the advantages and disadvantages of overhead lines and underground cable solutions within each of those topics. Without an integral picture of the total, it's very difficult to come to a conclusion. I can understand why there may be more or less experience with certain solutions, but if we look to the entire world, there are solutions for undergrounding

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very large transmission systems in Australia.<sup>1</sup> There are also many examples for overhead solutions for them. The solutions that are existing, have different drawbacks and advantages and we need to compare all of those. As long as we don't have that picture complete, it's very difficult to come to a conclusion I think.

**The Hon. WES FANG:** Where you have a regulator that effectively prioritises, say, cost over the other factors, in your experience do you know of other jurisdictions that operate in that way, or do other jurisdictions in the world have a more holistic view when they assess these sorts of projects?

**FRANK DE WILD:** It depends on what cost are we talking about. It can be the capital expenditure, but we could also be looking to the societal cost and they are more than just the capital expenditure. How do you define cost and which cost are you taking into account and which cost do you leave out of that equation? That is quite different from country to country in the world.

**The Hon. WES FANG:** In your experience—and I imagine you've done work in a number of jurisdictions for a number of governments in relation to transmission line assessments—where one proposal has been put forward by an entity, such as we have for HumeLink and Transgrid putting forward only an overhead proposal, do governments in other jurisdictions look at other solutions, or do they just rely on the proposal that's put forward by the entity that's constructing it?

**FRANK DE WILD:** I guess that is depending on the country and the jurisdiction we are in. That could be very different between countries.

**The Hon. WES FANG:** Let me rephrase it so it is a bit more targeted. With governments that you've worked with, what would you consider to be gold standard in the way that they assess projects? Only assessing the project that's put forward by the entity that will construct it, or looking at the projects and alternatives so that they can draw a more holistic picture of an outcome?

**FRANK DE WILD:** In my experience there are quite many of those comparisons between overhead lines and underground solutions to figure out what is the best choice in a certain situation. That means that different jurisdictions really look into those alternatives to make the best choice.

**The Hon. WES FANG:** Because what we have in relation to this project, HumeLink for example, it is the constructing entity that's responsible for putting a project to the regulator for assessment. The regulator isn't forcing a consideration of other means, that is undergrounding, because the entity, Transgrid, is only putting forward an overhead powerline. The community would prefer it undergrounded, it was accepted that the cost would be more, but it was dismissed by the constructor as being extremely expensive, whereas I believe some of the evidence is not there. When you have a situation like that, would it normally be a government in your experience that would step in and say, "Hang on. We need to reassess this," or would it be your experience that the government would accept whatever proposal is put forward and just work with it? Because that is effectively what we're seeing here.

**FRANK DE WILD:** What complicates the matter is that you are speaking of HumeLink—a very specific project. Ideally, I would say there is already a decision-making process in place that defines which kind of options to choose when an important link, such as HumeLink, is being developed.<sup>2</sup> What is the framework for this decision-making? I learned from your inquiry that this is about connecting many renewable energy sources, not only one. You should evaluate all of these projects with the same measures, with the same benchmarks, to understand in which case you choose an overhead line and in which case you choose an underground cable. If correct, there should already be something there, I would assume. If that is not the case, I would propose to make a study out of this, because there are so many aspects which play a role and which could partly be mitigated or fully be mitigated. We can have overhead lines of all different sorts and types that have more or less impact et cetera. The same goes for underground cables, so it quickly becomes very unclear if you don't have such a decision framework.

**The Hon. WES FANG:** In your experience, where a project like HumeLink is proposed, what time frame would you imagine an assessment of an underground and overhead solution to take?

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<sup>1</sup> In [correspondence](#) to the committee dated 2 March 2024, Mr Frank de Wild, Business Director and Senior Principal Consultant, DNV, clarified their evidence.

<sup>2</sup> In [correspondence](#) to the committee dated 2 March 2024, Mr Frank de Wild, Business Director and Senior Principal Consultant, DNV, clarified their evidence.

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**FRANK DE WILD:** Of a specific project or of a project in general, for all kinds of renewable energy sources?

**The Hon. WES FANG:** I'll go with this as a specific project first, noting that the renewable energy zones in New South Wales extend across the State, and there's a number of transmission projects that will be put forward. There is Central-West Orana, there is HumeLink and there is one in the Northern Tablelands. All of these powerlines will be crisscrossing the country. The most recent one that is most likely to start sooner is probably HumeLink, so that's the one that is on the table. A holistic view would be interesting, but I'm focusing now on an assessment of that particular project. Because that route's mapped, there's probably a better ability to target it first. How long would that take?

**FRANK DE WILD:** I would estimate right now in a few months that should be possible.

**The Hon. WES FANG:** What would the cost of an assessment like that be in broad terms? We're talking about \$5 billion expenditure on this project, so I'm trying to determine in percentage terms what a definitive study would be in relation to a project such as HumeLink?

**FRANK DE WILD:** I think that the study costs are really small compared to the number you are mentioning. We are talking about months of work for a number of engineers to understand all of the advantages and disadvantages in this case, so we are talking about a few hundred thousand dollars, probably.

**The Hon. WES FANG:** Which is probably what Transgrid—

**FRANK DE WILD:** That is in a completely different ballpark than \$5 billion.

**The Hon. WES FANG:** In relation to the solutions themselves, even though Transgrid doesn't have—they say—the experience in building underground powerlines, do you believe that we would have any problem bringing that expertise into the country and potentially providing Australian engineers, Australian companies, with the experience so that they can deploy it elsewhere?

**FRANK DE WILD:** I think that should be possible. If we look to history, there has been a time that also in Europe there were many countries which did not have underground cable expertise; now they do have. Why? Because they stepped over and started to collect experience with undergrounding power cables—also for the very high voltage levels. So that has been happening. It has very positive effects in these countries, and there are no dramatic issues in countries with power cables, I would say. So it is perfectly possible to learn from the experience which is elsewhere in the world and apply that learning in Australia. Of course, it will take an effort. But it's something that is doable.

**The CHAIR:** Mr de Wild, do you have a view as to how Australia is going compared to other countries when it comes to adopting underground transmission, recognising what you've said—that it depends on the situation and undergrounding isn't suitable in all circumstances? But is there a view within this global energy infrastructure community as to how Australia is going? Do you have a view?

**FRANK DE WILD:** Not really. I don't really have a view on how Australia is going with underground cables. I know there are some closer to the cities. I know you have vast lands, right, and huge areas where not so many people are living, so I know some of the basics of Australia. But I don't have a very clear view of those ins and outs and maybe that is also better.

**The CHAIR:** That's fine. I'll move on to some of the technical questions to get your view on some of the evidence that we've received before this inquiry. Firstly, turning to the expense. The Energy Market Operator here very recently produced another report into this which is saying that, depending on terrain and a lot of other things, undergrounding could cost four to 20 times more than overhead. What is your view on that? Also, it would be interesting as you're answering that, what other factors should be taken into consideration when we're thinking of the cost, for example, of the cabling? So firstly, the four to 20 times statistic, and then the other factors.

**FRANK DE WILD:** Very often you see that people quote that power cables are much and much more expensive than overhead lines. I think that in such comparisons we are primarily looking to capital expenditure and not to the rest. I think what we should have—also, here, kind of a holistic picture. What about operational expenditure? What about the losses? What about the cost for society on all kinds of other aspects?<sup>3</sup> Like we have land use changes which have impacts on somebody's cost-benefit analysis but not to one who is paying for the

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<sup>3</sup> In [correspondence](#) to the committee dated 2 March 2024, Mr Frank de Wild, Business Director and Senior Principal Consultant, DNV, clarified their evidence.

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capital expenditure. So are we considering all cost factors? And what is then the overall cost and benefit picture for society?<sup>4</sup> That, I think, is the thing which matters and is quite difficult to establish, actually.

**The CHAIR:** Moving on to the operating expenditure, then, because we have received a bit evidence around here and I'm interested in your views on this. One of the witnesses appearing later today, EnergyCo, which is a government agency, says:

... the comparative difficulty of repair and maintenance activities means that operating costs for underground cables are typically the same or greater than those for overhead lines.

But they're saying that repair time can be significantly longer—one to three months—and it takes a long time to locate and repair a fault in underground cabling. Again, just your views on that?

**FRANK DE WILD:** Underground power cables, because they are underground, well, it'll take a bit longer to repair it; that is true. I think for land-based power cables we are not speaking of one to three months. It's maybe one or two weeks or so and then you should be in the position to make a repair.<sup>5</sup> You can also prepare—so make sure that you are prepared for making such a repair such that you know where to go, what to find, to have the consent in place et cetera to make sure that you can actually repair as quickly as possible. One to three months of time frames is more applicable to submarine power cables, where you have to go with a vessel and dig up the power cable and arrange a ship, have a crew et cetera. There, you are speaking of months, but not on land.

**The CHAIR:** In terms of the global supply of various infrastructure, obviously it is impacting everybody. I think it is impacting us a lot as well because we're this big island; we've got to bring everything in. Again, it appears in EnergyCo's submission. I just wanted to check. Is there an issue with the global supply of cabling? Could you talk to what the global industry is doing in terms of ramping up the production, if it is?

**FRANK DE WILD:** Absolutely. There is development there. Many countries around the world are connecting renewable energy sources to their grids, meaning that there is a huge demand for power cables. There is also a huge demand for transformers and for switchgear et cetera. So this whole industry is at the start of a tremendous growth. We need to double or triple the transmission networks in the world between now and 2050. That, of course, causes some stress on the supply chain and also on the power cable suppliers. But that is not unique to power cables. It's also for other components. It may also lead to having some cable factories in Australia, which could happen; I don't know.

**The CHAIR:** Yes, that would be a very good thing to do. In your submission you list various factors, considerations—topics, you call them—that need to be considered. One of them, which I wanted to explore a bit further with you, is security and protection, where you talk about extreme weather, earthquakes, fires, everything. Of course, we're seeing an increase in that. We know why. Australia, in 20 or 30 years, is going to be a very volatile place, I think, in terms of extreme weather events. We have, again, different evidence about what—undergrounding can also be impacted by various extreme weather events. What are your thoughts on undergrounding versus overhead with the various weather events that we get here: extreme flooding, extreme wind, which we saw just recently in another State, as well as bushfires.

**FRANK DE WILD:** Underground power cables are underground—about one to two metres of soil coverage on top of them if you make a standard power cable trench. You could also further protect them with pipes or other means. That does protect them quite nicely from weather extremes like winds or bushfires or heavy rains et cetera. That could be an interesting protection. I struggle a bit with understanding the effects of landslides or for example, earthquakes—I don't know if you have that also in Australia.

**The CHAIR:** Probably not so much here. Not as much—although, landslides.

**FRANK DE WILD:** I know from an earthquake in New Zealand—which of course also damaged underground power cables because the earth was moving so significantly. But, typically, the earth offers a pretty good protection for the infrastructure. Later on, we will have to rely on those connections with renewable energy

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<sup>5</sup> In [correspondence](#) to the committee dated 2 March 2024, Mr Frank de Wild, Business Director and Senior Principal Consultant, DNV, clarified their evidence.

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sources, especially if the amount of renewable energy sources which we are connecting to the grid is rising.<sup>6</sup> Protection is becoming an increasingly important topic to consider, I would say.

**The CHAIR:** I will now go to the issue of trenches and cabling. We've had different evidence about this as well. You spoke about the cabling in the case of the extreme weather events, if it was encased in a pipe. So a 500 kV transmission line, underground cabling part of the way—for example, a couple of hundred kilometres, whatever it would be. What would the trench look like? Say it's over farmland—let's just stick with that—a couple of rolling hills and through probably a national park or State forest. What do you think the cabling would look like, and the trench, from your experience? Then on the whole issue of the sterilisation of land above, we've just received evidence just one way and the other way. I'm interested in your considered views on this.

**FRANK DE WILD:** There are many, let's say, possibilities to make a link. It depends very much on the transmission capacity, on the voltage and on the length. So there are many different variants. But to give you some flavour, we could make a connection which, let's say, can transport about one gigawatt of power within about two metres of trench width, where we have the power cables arranged in open trefoil, which is buried. This actually was a solution for a specific case, which was quite ideal in that situation.<sup>7</sup> We could also have the power cables in pipes, let's say, about 1.8 metres in depth, and then in flat formation, a little bit wider, because if there is no width limitation why make it very narrow? In this case we make it a little bit wider and a little bit deeper and then we simply use agriculture on top of it without any limitation.<sup>8</sup> So there are different possibilities to realise that.<sup>9</sup> But it doesn't have to be very wide, very big or very deep. I hope that makes sense.

**The CHAIR:** Yes, it did. Thank you. So that's in terms of the land usage. What about the types of cabling and the speed with which underground cabling—the digging for the trenches and all of that happens? There is a company in Australia that has got these big machines now that just push through—tunnelling—and it was showing us just how quickly and cleanly they can do that. From your experience in terms of what's happening now and where things are moving to, is it the case that it is getting faster to do that? Is another argument against undergrounding that it takes a lot longer?

**FRANK DE WILD:** I think it does. For example, there are those machines that dig a trench, put in the power cable and close the trench again in one single work process—there exists a machine that move through the countryside, and put power cable in place in such a single process, and there are quite interesting examples of that, I know, in Denmark and in France and in other countries around the world.<sup>10</sup> There are also some publications on that. That shows that if you are in a rural environment you could actually really speed up. In an urban environment—so in the middle of a city—it's more complex, of course, but what has been experienced is that if you use pipes which you lay beforehand and you pull a power cable through, you can also actually increase the speed, quite interestingly. Still, the overhead line is quicker. That is just one of the aspects that you need to compare. The point is that topics that seem to appear a disadvantage on first sight can also be mitigated to an extent that goes for almost all of the topics to be considered.<sup>11</sup>

**The Hon. EMILY SUVAAL:** Thanks, Mr de Wild, for being here today. I appreciate you taking time out of your schedule. Firstly, I wanted to ask if you have any experience with transmission lines in Australia?

**FRANK DE WILD:** Transmission lines in Australia? No—or very limited.

**The Hon. EMILY SUVAAL:** How many transmission projects have you been involved with in Australia?

**FRANK DE WILD:** I have only been involved in the Basslink arbitration case but that was not a line—if you mean an overhead line—that was a submarine link.

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<sup>6</sup> In [correspondence](#) to the committee dated 2 March 2024, Mr Frank de Wild, Business Director and Senior Principal Consultant, DNV, clarified their evidence.

<sup>7</sup> In [correspondence](#) to the committee dated 2 March 2024, Mr Frank de Wild, Business Director and Senior Principal Consultant, DNV, clarified their evidence.

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**The Hon. EMILY SUVAAL:** So moving out now, how many underground 500 kV transmission projects have you been involved with in Australia or overseas?

**FRANK DE WILD:** I don't know by heart. Quite a lot. Multiple—let's say tens. Something like 30, 40, 50 maybe.

**The Hon. WES FANG:** That seems like quite a lot to me.

**The Hon. EMILY SUVAAL:** Fifteen, sorry?

**The Hon. WES FANG:** Fifty, I think.

**FRANK DE WILD:** Quite a lot of them.

**The Hon. EMILY SUVAAL:** So 500 kV ones?

**The CHAIR:** Sorry, members. We won't interject with somebody that is dialling in via videoconference from the Netherlands. Because of the delay, it makes it very difficult. Mr de Wild, continue, hopefully without any further interjections from the Opposition.

**The Hon. EMILY SUVAAL:** Sorry, Mr de Wild. Just for clarity, the number of 500 kV transmission projects you've been involved in in the world—500 kV underground, I should say. My understanding is that there's only 13 in the whole world.

**FRANK DE WILD:** There have been quite a lot of studies and projects. Not every study leads to a project and leads to a realisation. We have been involved in for sure, let's say, more than 10, 15 of those projects.

**The Hon. EMILY SUVAAL:** Wonderful. Thank you. Do you agree there's a difference between the cables used to connect renewable energy projects to the transmission system, and the transmission system itself?

**FRANK DE WILD:** Yes, I agree. There is a difference.

**The Hon. EMILY SUVAAL:** Can you explain this difference for the Committee? Why would some or all of the cables used to connect a renewable energy project to the grid be underground while transmission lines are then above the ground?

**FRANK DE WILD:** I don't think that is the difference. I think the difference is in the reliability. Your backbone, you don't want to have it failing under no circumstance so the reliability of your backbone should be of a different magnitude or of a different order than a power plant which you are connecting, regardless of what kind of power plant it is. You could lose a power plant without jeopardising the stability of the grid but you cannot lose too much of your transmission backbone.<sup>12</sup> So there is a difference in the reliability of a transmission grid and something that connects to it.

**The Hon. EMILY SUVAAL:** When we were discussing earlier around the modelling that was being used you talked about different societal factors. How would you quantify all those different societal factors?

**FRANK DE WILD:** How would I qualify them or quantify?

**The Hon. EMILY SUVAAL:** Quantify, sorry.

**FRANK DE WILD:** What we could do is to identify those different societal factors and to try to establish what are the advantages and the disadvantages of them. Understanding how they compare to each other, or how those kind of societal factors compare to, for example, environmental factors or costs or whatever, we cannot do that. I think that has to be decided by politicians.

**The Hon. EMILY SUVAAL:** In terms of the time it takes to do repairs, which we were discussing earlier, I wondered if you have any experience on repairs for Australian high voltage lines.

**FRANK DE WILD:** I have not.

**The Hon. EMILY SUVAAL:** Do you agree that there are a range of factors to consider when deciding to underground transmission lines?

**FRANK DE WILD:** To underground existing transmission lines?

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<sup>12</sup>In [correspondence](#) to the committee dated 2 March 2024, Mr Frank de Wild, Business Director and Senior Principal Consultant, DNV, clarified their evidence

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**The Hon. EMILY SUVAAL:** Just to underground transmission lines generally.

**FRANK DE WILD:** Of course.

**The Hon. EMILY SUVAAL:** There is a range of factors to consider.

**FRANK DE WILD:** Yes, there is a range of factors.

**The Hon. EMILY SUVAAL:** What are these factors? Could you describe them?

**FRANK DE WILD:** In my letter I tried to identify a number of those topics—as I named them—which are different between overhead lines and underground power cables. There may be even more topics than the ones I have mentioned, but those topics all play a role in how an overhead line and an underground power cable compare to each other. So they should be evaluated—things like scalability, footprint, route length, transmission capacity which you can have, security, protection, safety and health. There are many of them.

**The Hon. EMILY SUVAAL:** When is it most appropriate for transmission lines to be placed underground?

**FRANK DE WILD:** That can also be for a variety of reasons. It depends on how those different aspects compare to each other. Sometimes underground power cables are used in more urbanised areas to remove some societal effects or to remove simply the visual presence of transmission infrastructure, but sometimes you go underground because you want to preserve a nature reserve or you want to preserve a countryside view. There are multiple different reasons why, in the end, an underground cable solution was favoured. It is not a single reason.

**The Hon. EMILY SUVAAL:** What voltage is most appropriate for placing underground?

**FRANK DE WILD:** That can be anything. That depends on what you connect. A renewable energy source can be small scale; it can also be of a very large scale. It depends. The size of the renewable energy source leads to requiring a certain transmission capacity for your transmission line.<sup>13</sup> It could be as low as 20kV to 50kV or as high as 500kV, or maybe even higher.

**The Hon. EMILY SUVAAL:** So it's fair to say it's really a case-by-case basis when you decide to go underground. Is it usually more appropriate in built-up areas and for short distances?

**FRANK DE WILD:** It's a case-by-case situation, absolutely. In one case it can lead to an overhead line; in another case it can lead to an underground cable. That's why I propose that it's good to have a decision framework behind that, to understand when you will decide on an overhead line and in which case you would decide on an underground cable.

**The Hon. MARK BUTTIGIEG:** Mr de Wild, can I ask you—I'm sorry, you hadn't finished. I interrupted you, I'm sorry.

**FRANK DE WILD:** No, go ahead.

**The Hon. MARK BUTTIGIEG:** I was just curious. Have you had a chance to analyse the methodology used by our local regulators, which could potentially come to the same conclusion which you are suggesting. In other words, we heard on evidence from Mr Cox before that there is already a process in place where these analyses get done. Have you had a chance to look at the veracity of those models or analysis and make a judgement on whether or not you think a more sophisticated model would be better?

**FRANK DE WILD:** No, I have not received any information on that.

**The Hon. MARK BUTTIGIEG:** In your experience from your previous projects—I know this is perhaps a little bit unfair because we've just finished saying it's horses for courses, so to speak—

**The CHAIR:** Like he's going to know what horses for courses means.

**The Hon. MARK BUTTIGIEG:** But, generally speaking, when you do your cost-benefit analysis and your modelling, is it usually the case that the cost-benefit analysis comes out better for undergrounding or overhead?

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<sup>13</sup>In [correspondence](#) to the committee dated 2 March 2024, Mr Frank de Wild, Business Director and Senior Principal Consultant, DNV, clarified their evidence



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**FRANK DE WILD:** As I said, undergrounding has the name of typically being more expensive when you look only at capital expenditure, but when you look to the entire societal cost, the picture can be different.

**The Hon. MARK BUTTIGIEG:** Are you aware that in New South Wales, and in Australia generally, we are perhaps racing against the clock more than some other countries which you may have been used to in terms of addressing climate change and that, in order to address that time frame, there is a view that the undergrounding would just take too long? We are talking about interim targets within a decade and then a final target by 2050. That's not a lot of time to get the infrastructure in.

**FRANK DE WILD:** No.

**The Hon. MARK BUTTIGIEG:** Given that overarching context, have you got a view about how that would influence this assessment, this cost-benefit?

**FRANK DE WILD:** Well, to me, it makes that topic of time lines—how quickly can you build or realise it—a very important one, maybe even more important than cost. So it has to be factored into the decision-making process. But I am not here to advocate for underground cables.

**The Hon. MARK BUTTIGIEG:** No.

**FRANK DE WILD:** I am also not here to advocate for overhead solutions. I am here to advocate for the best solution, and that leads to understanding those different topics and weighing them in comparison and then making your decision but fully knowing what you are designing for in each case, because you also don't want to have a precedent which determines the next 25 other decisions.

**The Hon. MARK BUTTIGIEG:** No. Your evidence is essentially that you need a sophisticated model which takes everything into account. There are companies out there who do this. But, obviously, from our perspective, without us being availed of the modelling that our people are already using, you can't really see whether it's sufficient or not. Would that be fair enough to say?

**FRANK DE WILD:** Correct.

**The CHAIR:** That's the end of our time for this session. Again, we really appreciate you making the time that you have to speak with this Committee, Mr De Wild. You also experienced a little bit of Aussie lingo there, "horses for courses", which you probably—

**The Hon. MARK BUTTIGIEG:** I think he got it. He's smart enough to work it out.

**The CHAIR:** Google it if you're not sure what that meant. Thanks again, Mr de Wild, for your expertise. If the Committee has any further questions, the secretariat will be in touch with you about those.

**(The witness withdrew.)**

**(Short adjournment)**

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**Associate Professor ROGER DARGAVILLE**, Monash Energy Institute Interim Director and Senior Lecturer, Civil Engineering, Monash University, before the Committee via videoconference, affirmed and examined

**Professor YOLANDE STRENGERS**, Associate Dean (Equity, Diversity and Inclusion), Faculty of IT, Monash University, before the Committee via videoconference, affirmed and examined

**The CHAIR:** Would one of you, or both of you, care to make an opening statement?

**ROGER DARGAVILLE:** I'll be making an opening statement of behalf of both of us. Thank you for the opportunity to speak at this hearing into the undergrounding of transmission lines. Professor Strengers and I today represent the Monash Energy Institute, which, in turn, represents over 100 energy researchers across Monash University in the social, technical and economic disciplines. Monash Energy Institute supports multidisciplinary research to tackle the most complex problems relating to the transition to low- and zero-carbon energy systems.

Our initial technical assessment demonstrates that the increasing costs of transmission to put them underground will not only increase total system cost but in a least-cost optimised system, will result in a significant change in the location of investment in wind and solar power. In our modelling results more solar photovoltaics are built close to the demand centres, requiring additional storage. This will result in higher energy costs for all energy users and less investment in renewable projects in regional areas.

However, the technical and economic considerations are perhaps secondary to the issue of community engagement. Professor Strengers' initial scoping of community sentiment and understanding of underground transmission lines, including what level of compensation might be acceptable, indicates there is a lack of social research on this issue in the Australian context. This is a significant concern because gaining the trust and support of everyday Australians, especially those in the regions most affected by renewable energy and transmission projects, is essential to ensuring a successful transition.

Most past social research with households indicates they prefer the undergrounding of distribution and transmission lines, but this may change when they understand the costs, disruption impacts and potential risks. Social research is needed to engage people in conversations about the options, opportunities and constraints of undergrounding transmission lines in the context of the broader energy vision and purpose for expanding the transmission network.

Past research conducted by Monash researchers indicates that everyday Australians are looking for guidance on a clear and unified vision for where the energy sector is heading to get on board with the significant changes and infrastructure upgrades required to achieve the transition. In this case, the question they are likely wanting to understand is: "Why do we need new transmission lines and how does placing them underground—or overground—help support the energy transition?"

This requires an open and public conversation before individual landholders and community members are asked to commit to and support particular disruptions and construction projects. Resistance and opposition is more likely when community members feel sidelined from decisions or when they do not understand the context and purpose of infrastructure projects that affect their communities and lives.

**The Hon. WES FANG:** Thank you very much for appearing today but also thank you for your submission. Obviously, the issues that we've heard throughout this hearing have come down to cost but also community acceptance, and it's interesting to view a hybrid model. I use the term hybrid model—obviously you've used that in a later context—but just to have the two issues compared and contrasted side by side. In relation to the community acceptance component, we've heard from the rural and regional communities that are predominantly impacted by the transmission lines themselves, both the landholders and the surrounding communities. What method does the regulator have to quantify and measure those impacts and determine their weight in relation to the other metrics that they use for comparison, which are costs? Do they, and if they don't, should they?

**YOLANDE STRENGERS:** Do you want me to have a go at answering this one, Roger?

**ROGER DARGAVILLE:** Yes, Yolande, this is your domain for sure.

**YOLANDE STRENGERS:** Thanks for that question—

**The Hon. WES FANG:** It's called a handball.

**The CHAIR:** Ignore him.

**YOLANDE STRENGERS:** Obviously I would say that quantifying and trying to measure social sentiments and community acceptance is extremely difficult, if not impossible, and to then weigh it up. This has

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**CORRECTED**

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been the problem with cost-benefit analyses for forever—that it's very, very difficult to accurately and adequately account for the costs and the benefits from a social perspective. That's not an approach I would personally recommend.

But what I could say is if you tried to quantify it—and I guess there are methods out there that you could use to do that—it would be in terms of how much willingness there would be to either accept whatever decision was made by the Government or embark on significant opposition. You could potentially put some figures around what that kind of disruption, if there is opposition, might create for a regulator or for a transmission network business or for anyone else involved in this kind of process in terms of delaying the project, in terms of disrupting the project, in terms of potentially stalling or stopping the project.

That's where I would imagine the most significant costs would come in from a project management perspective. And of course we've seen examples from previous large-scale infrastructure projects where public opposition has significantly disrupted projects and has caused significant costs. I would say, though, that we need to get in before that step and actually build community confidence and support for the project rather than seeking to measure the potential impact if that support is not there.

**The Hon. WES FANG:** Because ultimately what we see is a mandating of consultation with the community, to have these conversations. But I guess in practice the evidence that we've heard is that it's often presented as a *fait accompli*, that this is the decision. The consultation is really more about—well, it's not even really an information session; it's effectively a presentation of what will be imparted on the community. So where a project like HumeLink—and that's the one I'm probably most familiar with because it's in the area that I live in—is strongly opposed by the community, where do you think the weighting for that should be factored in?

Is it the regulator that has the responsibility to recognise that? Is it the commissioner? Is it Transgrid themselves or the Government? We mandate any number of times who's responsible for what, but it seems that nobody is responsible for this part. Do you have a view on that?

**YOLANDE STRENGERS:** I don't think there's an easy answer to that question. I know that this is not a very satisfactory answer but, ultimately, everybody needs to be responsible for understanding the community concerns and their wishes. As you've identified, the critical problem we have at the moment with all of these projects is that the community views and the opportunity for genuine consultation is either not there or comes so late in the project that it really isn't seen as genuine and, as you've said, the decision has been made. From the very beginning of government policies, from regulatory requirements, from transmission projects—and that involves all of the parties you just mentioned—we need to be bringing the community in. I would say that there are probably roles and responsibilities for each of those agencies you've mentioned, to be taking part in genuine community consultation in different ways, depending on what the roles of those agencies are, from the outset of any decision or any process by which these decisions are being made.

**The Hon. WES FANG:** Where you've got almost universal opposition by a community to a project, where do you think the balance lies in acknowledging that and finding a resolution to it? For example, the landholders around the HumeLink around the Tumut area are all advocates for underground. That's almost universal—the community, landholders, everybody. What responsibility do we have to acknowledge and respect that view where a project is being imposed on a community? How do we progress that from here?

**YOLANDE STRENGERS:** That's the crux of the question, isn't it? That's such a difficult thing to do—to balance the wishes of a community with a broader community benefit, potentially, from these kinds of projects. I can't give you an easy answer or an easy way in which that can be done. I certainly think that, as much as possible, we need to be taking the wishes of the communities affected into account and accommodating whatever kind of, I guess, wishes they may have, such as undergrounding. But seeing you said that, some of the conversations that I've observed that are occurring are more, as you say, information sessions about the decisions that have been made, rather than a presentation of the options and of the considerations that have gone into the particular decision.

In our research, we often find that when people fully understand why a particular decision has come about—what the risks or the benefits are of the different options—they may actually come to the same conclusion or a similar conclusion as the regulator or the Government or whoever is doing the project. But because they're not part of those conversations and they're not actually presented with those options and they can't think about those things themselves, they essentially become defensive and resist the project. So we really have to avoid getting to that point by getting in as early as possible and really laying out the options for communities so that they can actually be part of that decision-making process.

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**The Hon. WES FANG:** That's a really interesting analysis of it. I think part of what has struck me about this issue is that that community around the Tumut area that are impacted by the HumeLink project are, I think, probably some of the best-educated people around the issue, understanding the options, understanding the whys of what the project is supposed to do. There's some level of acceptance that the project might go ahead, but what they're asking for is that it be undergrounded as opposed to overhead. Where that circumstance exists, where there's a community that's understanding of the issues, the options, the whys and the hows and the whos, in effect, that are driving this decision-making process, they've almost universally come to the conclusion that they want this undergrounded. Isn't that the model you're proposing, which is communities educated, presented with the facts and then that decision gets built into the solution? That should occur, shouldn't it.

**YOLANDE STRENGERS:** That's right. Yes, I agree. Then in that situation, if it's at all possible, I would be attempting to support the community's wishes.

**The Hon. WES FANG:** Okay. That's where we come to the more technical aspects of the proposal and we talk about the hybrid model. There's obviously the difference in AC, DC and I think it's all spoken about in your submission very well. We know that if we go underground HVDC, converter stations are required at either end of the transmission line, effectively, to convert it from AC to DC and back and so forth. How would a hybrid model work in that circumstance, given that effectively each trunk of HVDC would require a converter station?

**ROGER DARGAVILLE:** I think the issue here is that the expense of converting from AC to DC and back again for relatively short trunks of transmission would be prohibitively expensive. You normally only do DC above ground or below ground for stretches of hundreds of kilometres. The AC-DC converters are very, very expensive. If you were just doing it to do tens of kilometres to maybe divert around a particular community, the economics would not stack up.

**The Hon. WES FANG:** You would propose putting HVAC underground for short periods. Is that in effect what the hybrid model would look like?

**ROGER DARGAVILLE:** Yes. I think if it was to go underground for short sections, AC underground would be the only viable option.

**The Hon. WES FANG:** And the only reason that you would keep the system AC as opposed to having a long stretch DC system is, in effect, as you talked about in your opening statement. Having the system DC effectively reduces the opportunity for new renewable energy projects to be constructed and connected along the line, doesn't it? It in a way futureproofs the ability for those future systems to attach in.

**ROGER DARGAVILLE:** That's right. You can't have what are known as taps along the way on a DC line. If you wanted to supply power to a regional area, or feed in power from a wind or solar plant, DC doesn't allow that to happen. It's really good for connecting long distance renewable energy projects to load centres, but not for gathering up lots of dispersed renewables across a broad area.

**The Hon. WES FANG:** Thank you very much.

**The CHAIR:** Thank you. We will come back to you. Associate Professor Dargaville, thank you for the work that has been put into the submission. I want to dig into it a little. Quite a few submissions mention the AEMO integrator ISP cost projections and the inputs into that. Obviously, doing this work, you satisfied yourself as to what those inputs originally were to come to the fore. I think AEMO goes up to 20 times, potentially, more expensive, not 10 times, in terms of undergrounding. Firstly, those inputs, did you verify them?

**ROGER DARGAVILLE:** The knowledge that I have is that it's four to 10. I think 20 times would be an extreme case. The issue with undergrounding is that you don't know in advance what kinds of challenges you might run up against, not dissimilar to the problems with Snowy 2.0. When they started tunnelling into the ground, they discovered, much to their surprise or even horror, that the underground geotechnical was a disaster. Similar issues can arise with undergrounding powerlines. For particular projects, they could be up to 20 times more expensive but I think, overall, if you're looking at it from a systems point of view, four to 10 is a pretty reasonable expectation for increases in costs.

**The CHAIR:** In the submission, basically in your workings you've compared the standard overhead transmission scenario with a scenario where all new transmission capacity was assumed to be underground, which I think is probably highly unlikely, of course—for all transmission infrastructure to be underground—in terms of the costings that you've provided. I don't think that's going to happen in anybody's reality. Did you also model a hybrid, where 40 per cent or 20 per cent—I don't know how you would model that, but did you consider doing that as well, or did you do that as well?

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**CORRECTED**

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**ROGER DARGAVILLE:** We haven't done that. I certainly accept your point that for all the new transmission lines to be underground would be an extreme case and very unlikely to happen. The reason for doing that was to essentially bookend the range of scenarios. We're trying to show a worst-case scenario, I guess, and we don't really have the resources to run lots and lots of hybrid simulations of mixes above and below ground at this stage. That would be a rather involved study. So, yes, to answer your question, it's an extreme case. It wouldn't happen. In reality, if you are undergrounding some of the lines, you would see less overall system costs. The conclusion we had from the study in general is that undergrounding of long sections of transmission lines is not cost effective compared to the alternative of having renewables, primarily solar, close to the load centres.

What actually happens—in the modelling scenarios, at least—is if you force the model to go underground for the transmission, it doesn't build them. It builds the renewables close to the load centres and builds lots and lots of storage to compensate for the lesser quality of renewables that you access close to the cities. The final result of that is that you don't get renewable projects in the regions, which some people might be happy about but that's where the best quality renewables are. So it comes at the detriment to the quality and cost of the overall system.

**The CHAIR:** Thank you. That's very clear. You've also said in your submission—if you wanted to expand upon that as well, the delay. We've heard from quite a few witnesses. I consider Monash uni and you, as academics, independent. The delay, from your research—again, I would prefer for us not to think of every single thing being undergrounded. What within your research do you think, given lack of social licence and what have you—sorry, forget that last bit, "lack of social licence". That doesn't help the point that I'm trying to make. What's the delay if we did go underground for part, or a good portion, of the network? What do you think would be the delay with that?

**ROGER DARGAVILLE:** The delay or the increased cost? We haven't really thought about the timing of the issue in our submission.

**The CHAIR:** Yes, the delay in terms of the action that we need to take on climate change. Have you put that into your submission as well, in terms of our targets that we need to meet?

**ROGER DARGAVILLE:** In our modelling, we always assume that we're going to meet net zero by 2050, regardless. The costings that we present are for a net-zero system by 2050 with or without undergrounding of transmission lines. The 20 to 30 per cent increase in cost that we've projected if undergrounding was enforced—which doesn't result in underground transmission lines; it results in renewables being built at the load centres rather than in the regions—doesn't change the timing and the emission-reduction pathway.

**The CHAIR:** Could you clarify, in terms of working out those costs, what other costs you factored into this work other than purely financial?

**ROGER DARGAVILLE:** It is just a techno-economic assessment. We don't look at the social licence constraints directly, but one of the strengths of the work that we do is that we are in constant discussions with experts like Professor Strengers to discuss these issues. We would never present the techno-economic assessment without the social licence issues in consideration.

**The CHAIR:** Looking at a cost-benefit analysis, there are also the other costs, such as, potentially, environmental and others. It's more than social licence. We've heard a lot about social licence, which is very important. I know there's the rule change that happened at the Federal level recently to ensure community engagement. That is top of mind for governments, but there's also more to costs. I can't see where any of those other costs are being factored in at the moment. Do you have any comments about that?

**ROGER DARGAVILLE:** This approach can't include non-financial costs. We have a cost function, as we call it—the amount of money that the system costs that we're trying to minimise. If we could place a dollar amount on environmental damage or social licence, then we could add it into the system. But, as Professor Strengers said at the start, you can't quantify in a dollar number what social licence is worth. These are separate considerations, so you really need to take a multi-layered approach. Even if the techno-economic assessment stacks up, if you don't have the social licence or the ability to run a project without significant environmental damage, then it's a nonstarter.

**The CHAIR:** Professor Strengers, I want to get your view. Part of what's happened here within the regions in New South Wales, and I know it's in other parts of the country as well, is the frustration by some communities over what has appeared to be almost—from the community's perspective—ideological opposition to undergrounding and a lack of genuine consideration by the energy companies and government whether it is at all possible anywhere. That's the feedback that we're getting, that it seems to be very dismissive. Are you saying, with part of your work, that it's critical to explain to the community and put more evidence and facts on the table?

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Sometimes communities are treated as though they don't know anything, and they're not given all of the information they need to weigh up and make up their own minds with the right information. Is part of what you're arguing here that, if that happens, that could be useful and beneficial for the companies that are trying to build infrastructure across the State?

**YOLANDE STRENGERS:** Yes, that's correct. That is partly what I'm suggesting. But more broadly than information campaigns, I'm also suggesting that there needs to be a bigger national conversation about the energy transition that involves communities and everyday Australians. We talk about energy all the time, but it's often in the context of a crisis or perhaps bigger climate change concerns or things that have gone wrong. I think the public is aware that we're moving towards net zero and trying to move towards the energy transition with renewables and all of those things, but it certainly isn't across what that means more broadly in terms of the changing nature of transmission.

They probably don't even know, many of them, what transmission is and how it distinguishes from different parts of the system. Obviously, not in all communities—some are very well educated, as you said. But it is more about a bigger conversation about where this country is headed and how communities and households are being expected or will be expected to get involved in that, and really bringing them on board with where the energy transition is going rather than just communicating with them at the point at which we need their so-called social licence.

**The Hon. WES FANG:** I want to go back a little bit to some of the earlier evidence from when I was asking questions. In relation to the difference between HVDC and HVAC that run underground, obviously you said that the HVDC is better equipped for doing longer distances—for one, because of the cost of the converter stations et cetera. But, ultimately, where we are connecting, say, a REZ to the metropolitan area or, with HumeLink, we've got two metropolitan areas and Snowy 2.0 as an intermediary position that is connecting in and distributing that power, is it not reasonable to run it in a HVDC capacity over those long distances? There are landholders that are worried about the actual impact of continual renewable energy projects taking prime agricultural land and what the future means for us to be able to feed ourselves and clothe ourselves. Where we've got a REZ that's, in effect, designed to have these renewable energy projects put in there, connecting that REZ to the metropolitan area should be HVDC all the way without having to reconnect in parts later on. Is that not a reasonable assumption?

**ROGER DARGAVILLE:** As I mentioned before, if you've got nothing over hundreds of kilometres tapping in and out of the line, then DC is perfect. But invariably we've got townships and other renewable energy projects that would ideally, optimally, be able to tap into that transmission asset. You might be right. It's not a scenario that we've really considered in detail. One of the advantages of just doing straight DC is that you could underground it for some segments where you've got sensitivity with community engagement, and you could above-ground it where that issue doesn't arise at much lower cost. It's an interesting question. I don't have a good answer for you, I'm afraid.

**The Hon. WES FANG:** Thank you—but the regulator should have.

**The Hon. EMILY SUVAAL:** Thanks so much for appearing today. Professor Strengers, when it comes to the energy transition in New South Wales, and indeed in Australia, who would you say are the different groups of stakeholders?

**YOLANDE STRENGERS:** That's a very big question. It depends how you break it up, but obviously we have government stakeholders, we have the energy businesses—which you can break up further into distributors or generators or retailers or what have you. We have regulators, we have market operators, we have community members, households, businesses and the commercial sector, all of which have their own stakes in the energy transition and their own perspectives and views on how that will unfold.

**The Hon. EMILY SUVAAL:** So there's quite a large number of stakeholders. What are the reasons that communities may favour underground transmission lines, in your view?

**YOLANDE STRENGERS:** I think there's a widespread sort of general perspective that undergrounding will be less disruptive and more visually appealing, and also potentially less risky in terms of the powerline or transmission lines having damage done to them with extreme weather or bushfires or what have you. I understand that that's not necessarily the case, technically, so I'm just talking about community perceptions. But that is what a lot of people would—when we interview people and they talk about their preferences for things like undergrounding, they're the kinds of issues that come up.

**The Hon. EMILY SUVAAL:** Do you think the community understands the cost implications of undergrounding?

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**YOLANDE STRENGERS:** No, absolutely not, not generally. They may in some communities, where they've got very actively involved, but even there it would be probably a fairly small group of people within that community. But in general, no, absolutely not. When we speak to households about the energy transition, they often confuse all those different stakeholders I mentioned. They don't understand who's responsible for what. They probably can't distinguish between a distribution and a transmission pole. There's very basic understanding, generally, in the community about energy infrastructure and the way the energy system operates.

**The Hon. EMILY SUVAAL:** Do you think, then, that the community understands the impact on the landscape of undergrounding transmission infrastructure and what the construction process involves?

**YOLANDE STRENGERS:** They'd certainly have their own aesthetic expectations or imaginations about what a transmission distribution system might look like. It may not be founded, again, on any reality or technical facts. But I think most people can imagine what transmission infrastructure would look like, and so they would have that kind of understanding in their heads. But I wouldn't say that would necessarily correlate with any kind of technical or economic understanding about what that would mean.

**The Hon. EMILY SUVAAL:** Again, focusing on consumers and impacted communities, how can we best communicate the need for and the benefits of transmission and the energy transition generally?

**YOLANDE STRENGERS:** I think there does need to be a unified voice. This comes back to, actually, one of the earlier questions about who's responsible for having these conversations with communities. This has been an issue for the energy sector for many years now: Because there are so many stakeholders, there's no one central party taking responsibility for that community conversation and engagement. Everybody is sort of doing it in relation to their own projects or their own interests, but that creates a lot of confusion within the community.

I think the number one thing that needs to happen is a central body or a central somebody—perhaps a body that already exists—taking the lead in the national conversation about this issue, and then the other players can follow with those more specific details about what does this transmission project or any project mean for a particular community. But without that overarching conversation about why is this transmission infrastructure even needed, why do we need to put renewable energy projects where they're going, how is that supporting where the country is heading and what are the broader benefits—without that conversation, all those other conversations that are happening with companies on that more isolated and community scale are missing the bigger picture. There's a lot of distrust, as well, because people are hearing different things from different parties within this system. There are many other things, but that is the number one I would like to emphasise—just the need for that central voice.

**The Hon. MARK BUTTIGIEG:** In terms of the modelling, which has been discussed a fair bit today, I want to get a feel for the detail and the comprehensiveness of the modelling you've done and whether you're satisfied with the current regulatory regime. There are a number of moving parts, from what we've heard. You've got Transgrid, AEMO and AER. Are you comfortable with the veracity of the sort of modelling that they do, compared with what you've done in an academic sense, in terms of completeness and thoroughness?

**ROGER DARGAVILLE:** The AEMO modelling and the ISP modelling, in particular, is very thorough, very robust and very carefully planned, with huge amounts of stakeholder engagement and huge amounts of effort to assess what the costs of the different components are. The work that we've done at Monash is at the other end of the scale. It's a relatively simple model that we can run quite quickly and it gives us insights into how the system works, but I certainly wouldn't be using our model results at Monash to specifically plan the next set of transmission lines for the NEM. They're quite different approaches with different goals. Our approach is for academic insights, not for specifically planning the system.

**The Hon. MARK BUTTIGIEG:** I heard you before, Associate Professor Dargaville, mention the fact that the assumption is based on getting to net zero irrespective of the medium, be it underground or overhead. Does that mean that there is an inbuilt assumption that you could—to use your term—force an underground system? You can get there if you want to with underground, but it's just going to cost a bucketload more, right, to get that speed?

**ROGER DARGAVILLE:** Correct.

**The Hon. MARK BUTTIGIEG:** Could you talk us through some of these—I found interesting your take, comment or observation that if you were to go down the underground path, then you would have to shift the profile of where you put the near-load centres—I think that was the phrase you used. Can you talk us through why that is the case and the practicalities of that? I think it is important to get that on the record.

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**ROGER DARGAVILLE:** Absolutely. Thank you for the opportunity. When we run this optimisation—and it's an optimisation—it's looking for the least cost combination of wind, solar, transmission and batteries to meet a given load profile. The model looks for wind and solar locations that complement each other in terms of their variability. You want lots of wind farms that don't produce wind at the same time, for example, because that helps the reliability of the system. But to access lots of different wind regimes requires more transmission, so there is a cost. So there are costs and benefits to all these different aspects. What the model says, when you look at the overground transmission lines, is that the benefits of accessing lots of wind and solar over a broad geographic region offsets the cost of the transmission lines. So you end up with a good, low-cost system.

If you then change the assumptions and say, "The transmission now costs five times as much," it says, "It's not worth accessing that characteristic of the system, and it's better to build your renewables close to where the power gets used, in the cities, and instead of using the geographic distribution to smooth out the variability, you build lots of batteries." So because you have to build batteries and you have to build more renewables of a lesser quality—because they are not out in the sunny, windy locations—that bumps up the cost of the overall system.

**The Hon. MARK BUTTIGIEG:** Yes, that makes sense. So basically, in order to draw on a bigger suite of variable renewable inputs, you need to have cheaper transmission infrastructure to allow you to do that—unless you just want to spend a total bomb, which then, of course, will feed into the electricity bills and all the problems we've been discussing on the Committee.

**ROGER DARGAVILLE:** Exactly right. We could force the model to build the same transmission lines that it proposes above ground, put them underground, and provide a cost, but that would be higher still than the 20 per cent to 30 per cent increase in costs that we realise when we have the renewables close to load centres.

**The Hon. MARK BUTTIGIEG:** In terms of the consumers and the affected communities, do you have a view on how we can—we have a Committee here that has the time and wherewithal to draw on subject matter experts like yourselves to inform ourselves. Have you got a view on how—Professor Strengers, you touched on this point—we can better communicate what is relatively complex matter for the public to understand? You have this situation essentially, I think, where you have a minority cohort potentially living near the transmission lines who are understandably upset because of the blight on the aesthetics and all the rest of it, and cutting swathes through farming properties or whatever the issue is, versus a whole population, a load centre, which is going to benefit from renewables and a cheaper cost. It is a bit of a thorny issue as to how you communicate that. Have you got a view on that?

**YOLANDE STRENGERS:** There is a whole lot of social research that's been done in Australia not specifically on this issue but more broadly on how to communicate some of the complex issues around the energy transition. Unfortunately, I don't think we've done it particularly well in Australia so far. We've tended to—energy is a very technical subject generally. It is dominated by engineering and economics. Often engineering terms end up in the media and households and people's eyes glaze over.

**The Hon. MARK BUTTIGIEG:** They switch off.

**YOLANDE STRENGERS:** Yes, that's right. The good news is there is actually quite a lot of good work now that has investigated the kinds of terms and good ways of communicating these issues to people. I think there is a lot to learn there and more work to be done, sure, on how to best communicate in this particular issue on this particular topic, but we have to get away from the engineering speak and get into ordinary language. Even the term "distributed energy resources" is not a very people-friendly term. My research team is actually doing some work on an energy glossary, which is about translation of complex energy concepts into ones that people understand. There is not just us; there are lots of researchers in Australia who've done work on this. There are resources out there to help with this.

**The Hon. MARK BUTTIGIEG:** Can I ask, just quickly—

**The CHAIR:** No, we're done. Sorry, you can put questions in on notice to them.

**The Hon. MARK BUTTIGIEG:** All right, will do.

**The CHAIR:** You know how I am with these things. We're a little bit over time and we're trying to stick to time. Thank you very much, Professor and Associate Professor, for making yourselves available. We really value your expertise.

(The witnesses withdrew.)



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**Mr DOMINIC ADAMS**, General Manager – Networks, Energy Networks Australia, affirmed and examined

**Mr RICARDO DA SILVA ALVAREZ**, Network Development Business Manager, Iberdrola Australia, affirmed and examined

**Mr NINO LALIC**, General Manager Public Affairs, Iberdrola Australia, affirmed and examined

**The CHAIR:** Welcome to our next witnesses. Mr Adams, do you have a short opening statement to begin with?

**DOMINIC ADAMS:** I do, thank you. I'll get going. Thanks for the opportunity to be part of the inquiry. A bit about ENA—we represent Australia's electricity transmission and distribution and gas distribution networks. Our members provide more than 16 million electricity and gas connections to pretty much everyone in Australia. As an industry peak body, we don't really get involved on the ground in the business of doing transmission projects. Our staff won't go out into community town halls or be sitting opposite landholders to talk through these issues. What we do is we listen to our member organisations—our transmission businesses—we listen to communities and energy customers, and we try to navigate that path for industry to meet everyone's needs through what we think is pretty much the biggest challenge of our time: the decarbonisation challenge.

Over the last five or so years, community and social licence engagement issues, which have always been a very high priority for our members, have become a high priority for ENA. As a result, we've been involved increasingly in work to improve outcomes for communities and landholders—so engaging through the Energy Charter Better Practice Social Licence Guideline for transmission, engaging on the rule changes, and reviews around community and landholder engagement and social licence that have occurred at that national framework level. That really brings us to the issue of undergrounding. Communities and landholders are legitimately concerned with the impact of new transmission infrastructure. They're big, big projects and they are going to have real impacts on the land. There's disruption during construction. There are ongoing land use impacts and visual amenity—you're aware of all of the various categories and so on.

And it's not just the transmission infrastructure. These impacts are magnified. You've also got renewable developments that follow and go around these transmission infrastructure. So the engagement fatigue being felt in communities is genuine. At the same time, we've got other imperatives. We've got the State and Federal decarbonisation goals. In New South Wales, in particular, we've got coal-fired power stations reaching end of life. They're closing over the next decade; we have to replace them. And the national plan, the AEMO plan, says that that's best done with new renewables connected in, firmed by storage, interconnection and gas generation. At the same time, as well, people are doing it really tough on cost of living. That's a genuine concern. Energy prices form a part of that. They are a direct cost. They're also an indirect cost embedded in everything we buy, in products and services. It's a really difficult context; it's got many competing priorities.

Transmission developers and communities that they work in need to, in that context, sort out whether building above or below ground is the right way to go. The mere fact that we've got tons of transmission out there already—most of it, really, is above ground; some of it is below ground—means that there are going to be use cases where transmission is appropriate for each—above- and below-ground transmission is appropriate. I had transmission go below ground up the other end of my street a few years ago in Transgrid's Powering Sydney's Future Project, which was an underground project to meet the growing needs of Sydney. There are many factors that go into and influence whether above ground or below ground is the right choice for a particular project, for a particular circumstance. I won't go into the particular factors. I think Curtin University and Queensland university included a submission from a piece of work that one of our members helped fund as well. I'll skip over the brief summary of that.

But there are very different competing technical differences—as you've mentioned, as I was listening just before—in alternating current versus direct current technologies. There are cost implications, time-line implications. There are all sorts of different implications for the different technologies. In the mix as well, as you've noted, there are complex energy planning and regulatory assessment processes that work out what's the best project to do and how do we do the best project in the most cost-efficient way, and those are genuinely designed to make sure we're not building too much or paying too much to meet energy customers' needs as well. It's really complex stuff. Coincidentally, whenever we're in such a complex environment, it's rich ground for confusion and miscommunication. We're in the TikTok world where influencers have more cachet than energy companies or governments in communication.

It's a very hard environment to be working in as well. We need to be mindful of that. It's understandable then that when we go and talk to our transmission businesses—and this goes right up the chain to CEO level

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discussions— they're asking us to be more co-ordinated and to engage and to try and solve some of these problems. That's a recognition really that it's complex, there's information and expectation gaps between transmission developers and communities and that the only way we're going to solve that is through genuine collaboration and putting in the hard yards to do that.

Having that put on our agenda by our members, we looked around and sought for the right thorough, independent collaborative processes to try and achieve that outcome and we didn't want to reinvent the wheel. We asked the Energy Charter to take on this issue and they've done that quite quickly. They've got a project underway around evaluating transmission undergrounding and all things going well that will start producing some outcomes in the middle of this year. I think you have some details of that project as well in Energy Charter's submission, so I won't go into any real detail there. The only thing to draw attention to is it is a genuine co-designed project where we try and get the best research done and then get everyone, all the right stakeholders in a room, landholders, farmers groups as well as transmission developers to try and nut out what's the best way to work through this.

**The CHAIR:** Mr Adams, can I see how much you have in terms of a short opening statement, because you are eating into question time.

**DOMINIC ADAMS:** About a minute, less.

**The CHAIR:** Keep going, but I am giving you a time warning.

**DOMINIC ADAMS:** The only other thing to note is that really where we want to get to through that project is to have some defined expectations around when and how everyone will work together, come together and what the rules of the game are for making those decisions around whether a project should go above or below ground, and if we can get there then we've made big progress. I won't pre-empt the outcomes of that project because it's within the collaborative process to look at the research and work out what the best way forward is. I will leave it there<sup>14</sup>.

**NINO LALIC:** I might make a short intro and then my colleague will continue for a little bit. Thank you to the Committee for the opportunity to provide evidence at the public hearing today. Iberdrola Australia has been operating in Australia for more than 20 years and around the country we have about 1½ gigawatts of renewables across the NEM. In particular, energy assets and interests in New South Wales include the 130 megawatt Bodangora Wind Farm east of Wellington; the 145 megawatt Flyers Creek Wind Farm south of Orange; the 48 megawatt Woodlawn Wind Farm east of Lake George near Canberra; the 140 megawatt Capital Wind Farm, also near Lake George; the 245 megawatt Avonlie Solar Farm near Narrandera; the Smithfield Open Cycle Gas Turbine; and the Wallgrove Grid Battery. We are already obviously operating in a lot of regional communities across New South Wales but globally we are part of the Iberdrola group, which has more than 60 gigawatts of generation in operation and 1.3 million kilometres of transmission.

We've been in the process of transitioning our business model for more than two decades with investments in renewable energy generation, transmission and distribution, battery and pump surge hydro and green hydrogen. Our business and our people are aware of both the opportunities and risks regional communities in particular face as part of the energy transition. In response, we believe in putting our stakeholder needs at the centre of our strategy. We are focused on ensuring the benefits created by the energy transition are fairly shared by the communities, business and individuals we work with. As part of our focus on our fair energy transition, we are committed to creating benefits for our communities and the environment, the First Nation communities of Australia and skilled employment in green and sustainable industries in the future.

**RICARDO DA SILVA ALVAREZ:** Thank you, Nino. I also would like to thank the Committee for the opportunity to provide evidence at the public hearing today. As my colleague was saying, we are a global utility recognised in different jurisdictions across Europe, UK, US and South America. I particularly come from the UK where I spent more than six years working for the rail related arm of Iberdrola for transmission and renewables. Currently, globally, Iberdrola operates one of the largest power systems, comprising 1.3 million kilometres of powerlines and more than 4,000 substations. This actually carries electricity to more than 34 million people around the globe. Our investment currently targets 40 per cent of the group organic investment. That is around €27 billion invested in transmission regulated and non-regulated businesses.

That's why I'm here today. Iberdrola Australia, particularly, is currently trying to roll out our TNSP capabilities in Australia to support the energy transition. We definitely agree with the statement on the need of

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<sup>14</sup>In [correspondence](#) to the committee dated 23 February 2024, Mr Dominic Adams, General Manager - Networks, Energy Networks Australia, clarified their evidence

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building transmission infrastructure in New South Wales—not only in New South Wales but across the east coast—as the increase of connectivity and additional generation will be required to replace retiring coal-fired generation. This is something that we see not only for Australia but we have seen in other jurisdictions: the UK, the US and Spain.

As for the NSW Electricity Infrastructure Roadmap, I think it's clear that new transmission and new generation will be required. The technology of this generation could be renewables, could be nuclear, subject to any debate that the industry actually runs. But whatever is rolled out, transmission will be necessary. I don't think this is going to be something that we will be able to avoid in the future. Transmission is necessary not only for Australia, but we see industry bodies in Europe and the United States regularly publishing reports targeting and identifying the need for significant new transmissions. On the Australian landscape, I think it's important to say that we are in a global landscape, sharing and competing not only on workforce but the supply chains, on the skill sets. That's important to consider in these debates.

As we've said, I think in the media I can see short-term alternatives being proposed, like an extension of coal closure and the use of natural gas peaking. But, as we've said, whatever it is that we deploy in the future—renewable generation, nuclear—will require transmission lines, significantly. I will say that it's not only for Australia that we see reports also being published about the importance of deploying and connecting new transmission in a timely manner. Particularly in Australia, we have seen reports—particularly from Nexa Advisory—that have modelled that any delays of two years on transmission rollout will translate to \$600 more on electricity bills over 15 years for customers. This increase to our customer energy bill increases approximately \$1,800 over the same period, with a transmission bill delayed for four years. We believe that the build and investment in transmission, while ensuring impacted communities are genuinely consulted, is the only way to deliver affordable and reliable energy transition for Australia.

**The CHAIR:** Thank you very much. We'll move to questions, starting with questions from the Opposition.

**The Hon. WES FANG:** Mr Adams, I wanted to start with you. Do you represent Transgrid, or Transgrid is a member of your organisation?

**DOMINIC ADAMS:** Yes, Transgrid is a member of our organisation.

**The Hon. WES FANG:** What about EnergyCo?

**DOMINIC ADAMS:** I don't think EnergyCo is a member. They may be an associate member or one of the different levels, but I don't think they're a full member.

**The Hon. WES FANG:** Okay. You've spoken about the work that you as an organisation are doing to improve the initial contact with communities, trying to better achieve outcomes in relation to the consultation process and the planning process and getting all the stakeholders in the room. Obviously, you said there's a study that's going on at the moment. Is that an admission that you believe that there is a failure at this present time in the way that that has occurred previously?

**DOMINIC ADAMS:** I don't think I would say that there has been a particular failure. I think the biggest issue is that we haven't done this in this environment before. The last time we rolled out major transmission investment was a long, long time ago when the rules of the game were very, very different. As I was talking about before, it's a really different environment that you are trying to work within, and it's challenging. Of course, the businesses will all be learning. For them, it's existential. If you have an imperative for these projects to go ahead, and to go ahead in a timely way to meet the needs of customers, you have the ultimate objective to obtain social licence and to do this right.

**The Hon. WES FANG:** Yes. You would be familiar with the HumeLink project, I assume.

**DOMINIC ADAMS:** Yes.

**The Hon. WES FANG:** Almost everyone is. You would be aware that the community's not inclined to support the proposal that Transgrid has brought forward with the overhead powerlines. You'd agree with that assumption?

**DOMINIC ADAMS:** I think that's quite a generalisation.

**The Hon. WES FANG:** It is.

**DOMINIC ADAMS:** I'm sure there are some parts of the community who are supportive; some parts that are not so supportive, but there's—

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**CORRECTED**

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**The Hon. WES FANG:** Let me rephrase: The community where the powerline is due to be installed is generally unhappy with the consultation process and the outcome that is on the table at the moment. Would you agree with that assessment?

**DOMINIC ADAMS:** I think there have been pretty big challenges with the way that—

**The Hon. WES FANG:** You're starting to lose your credibility with me because I think it's pretty clear—

**The Hon. EMILY SUVAAL:** Point of order—

**The CHAIR:** Order! I'm very aware of what the point of order is going to be. The witness said three words. If the member could allow the witness to at least get part of his answer out so we have an indication of where he is going, that would be appreciated.

**The Hon. WES FANG:** Okay.

**The CHAIR:** Mr Adams, if you could continue, please.

**DOMINIC ADAMS:** There are genuine concerns from communities about the scale of the impact of major transmission investment, as there are with any major infrastructure projects. We're in a very difficult operating environment where it's difficult to communicate and to engage within this environment. I think everyone's trying to do their best.

**The Hon. WES FANG:** We're looking at the HumeLink project, the way that the models have been presented to the community, the way that the community feedback has or has not been adopted, and the way that the proposal has changed in relation to that community feedback. Do you believe it has been acceptable to date that the community's views, the impact of landholders and community members for where HumeLink will be installed, have been taken into account when the assessment and reassessment of that project has occurred?

**DOMINIC ADAMS:** I think we're getting towards areas where, as I said in my introduction, we're the peak body so we don't deal with particular projects and we don't know exactly what's going on on the ground and the way the communications individually have been handled, so we're kind of departing from areas where I have expertise to give valuable evidence.

**The Hon. WES FANG:** Okay. In relation to the work that's occurring at the moment around the further assessment on how it can be done better and the project that you have in place to bring people together, what has driven that need? Is it the acknowledgement that these sorts of projects haven't been well accepted previously?

**DOMINIC ADAMS:** I think it's an acknowledgement that there's a gap between expectations and ability to understand and engage in processes—a gap between where the businesses are at and the communities are at, and it's a difficult environment in which to have shared discussions and reach a shared understanding. It's a recognition we need to do things in another way. We need to work together and it's only through that collaborative-type process that you're going to get there.

**The Hon. WES FANG:** As a peak body, once you have a process that this planning work that's currently underway will formulate, will it be a requirement that your member organisations implement that when they're moving forward with projects?

**DOMINIC ADAMS:** I think that's a matter for the Energy Charter itself. The Energy Charter is another organisation that has its own members, who are also our members as well, and I think that's all a matter to be worked through the project. The governance of how that works going forward should form part of the conversation that happens within that sort of collaborative consultation as to what's the right governance for this going forward. Should it be mandatory? Should it be voluntary? What's the oversight?

**The Hon. WES FANG:** Where you've got, say, Transgrid—who you've indicated is part of your organisation—if you were to mandate or implement that program, you've got the Transgrid projects where it may come into play but then EnergyCo isn't a part of it.

**DOMINIC ADAMS:** Let's distinguish between Energy Networks Australia and the Energy Charter, and EnergyCo is not a member of ours. I think they may be a member of the Energy Charter; I'm not 100 per cent sure. So let's clarify that.

**The Hon. WES FANG:** So then it's more that the Energy Charter is the body that will implement any of these assessments that come out of the work. Is that effectively how it's structured?

**DOMINIC ADAMS:** Yes, that's right. It's an Energy Charter project.

**The Hon. WES FANG:** What is the involvement that your organisation has then? Is it just feedback?

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**CORRECTED**

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**DOMINIC ADAMS:** We're a part of the kind of collaborative group. We're also—

**The Hon. WES FANG:** In your opening statement you said that you asked for the work to occur.

**DOMINIC ADAMS:** Yes.

**The Hon. WES FANG:** That you'd tasked—

**DOMINIC ADAMS:** If I said "tasked", that's probably the wrong word. We asked very nicely. No, I think it was a shared understanding from our members that undergrounding is a difficult discussion to have with communities. The Energy Charter were hearing the same thing from communities, from their members, and we reached a shared understanding that we need to do something here, so the Energy Charter decided to undertake a project.

**The Hon. WES FANG:** And the time frame expected is midyear?

**DOMINIC ADAMS:** Midyear this year, yes.

**The Hon. WES FANG:** But these projects that are currently underway will be grandfathered?

**DOMINIC ADAMS:** That's a matter for the project as to how that works out.

**The CHAIR:** Mr Adams, starting with you, why shouldn't energy companies pay for some of the costs of transmission? At the moment it's going to consumers. Do you think energy companies would be open to potentially sharing some of the financial costs?

**DOMINIC ADAMS:** By "energy companies", do you mean generators?<sup>15</sup>

**The CHAIR:** Your members.

**DOMINIC ADAMS:** Our members, the transmission businesses?

**The CHAIR:** Yes.

**DOMINIC ADAMS:** Customers ultimately will always pay for the energy service that's provided. The aim is, over all, to make sure that energy is as affordable as possible. Customers pay for different parts of the supply chain in quite different ways. The network component of the bill, of what customers pay for, is paid by—the businesses invest and then the bill is paid for over many years by customers because they're large, critical infrastructure projects. It flows through the bill through to the retailer, and so all customers pay for all parts of the supply chain.

**The CHAIR:** Yes, they do. I could keep going on that, but in limited time I want to turn to Iberdrola. I note in your submission that you talk about the potential for bushfires and possible extreme weather events to impact energy transmission infrastructure. In other countries, are we seeing more decisions being made that take into consideration the impacts of potential extreme weather events on energy transmission infrastructure? Is that happening in other countries? For example, should we build overhead or underground here, or shift it over here because of the potential impact of something that could happen in 2025, in terms of extreme weather events? Is that happening? Are you aware of that?

**RICARDO DA SILVA ALVAREZ:** I would say there are clear technical specifications and processes when assessing routine and overhead lines on undergrounding. Sometimes those are industry wide or company specific. I can say that, in recent times, the effects of climate change and the impacts of climate change are being considered for changing and, perhaps, improving and futureproofing their specifications. But transmission is a long game. It takes time to implement these new additions to the specifications and best practice. I would say, in our experience, I cannot remind myself of any particular areas in which we have changed the design or the scoping or the routing based on extreme events. We have certain specifications that have been shared for some time. Although they may be incurring assessment, I don't think we have drastically changed all that in the last few years.

**The CHAIR:** Mr Adams, from your experience, do you know whether that's happening as well, or is this outside your knowledge area? Do you know whether the potential—let's call it climate-proofing or futureproofing our infrastructure. Is that happening in the assessment of, for example, what the best options are in terms of this transmission infrastructure? Is it factored in? Because I'm not seeing that it is, and none of the companies that have come to either the previous inquiry or this one are really talking about it, which is extraordinary, considering

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<sup>15</sup>In [correspondence](#) to the committee dated 23 February 2024, Mr Dominic Adams, General Manager - Networks, Energy Networks Australia, clarified their evidence

**CORRECTED**

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that this infrastructure has to be in place in 2045-2050. Heaven help us with what we're going to see with extreme weather events in that time. Is it happening?

**DOMINIC ADAMS:** I think the businesses are really alive to the fact that we are in a really evolving climate. There are more heatwaves, more often. There are stronger winds, and a lot of work is being done around the resilience of the grid at both the high voltage transmission level and the low-voltage distribution level. For specifics, I think you might be able to ask Transgrid who are up later.

**The CHAIR:** Yes, thank you. I do intend to do that. I want to talk about the Energy Charter. You've got the guidelines in place now, and I see that the Energy Charter was first started—was it a couple of years ago? Is it a voluntary guideline?

**DOMINIC ADAMS:** It is voluntary, yes. There's the charter itself and then there's the Better Practice Social Licence Guideline for transmission, which I think came in mid last year.

**The CHAIR:** Do you see there being a substantial change as a result of that Energy Charter, once that was developed, with the behaviour or engagement of your members with the community, for example? Are you seeing tangible benefits as a result of having that in place?

**DOMINIC ADAMS:** I draw you back to my earlier comment that I don't see and witness those discussions that our members have on the ground and the way that they engage on particular projects with communities and landholders. But what I have seen is a real increasing of the maturity of the discussion at that level of coordination between our members and their collaboration with landholder groups and the like.

**The CHAIR:** The Iberdrola witnesses are aware—I'm sure you are—of the recent rule change at the Federal level that will now require community engagement from companies. You're aware of that. How will that change your practice and the practice of other companies in terms of engaging with communities early? Is that a positive sign? Will we see tangible differences?

**RICARDO DA SILVA ALVAREZ:** It is a positive sign and is also consistent with what we see in other jurisdictions. This is an indication of an evolution and maturity of our regulatory framework. Definitely, community engagement and stakeholder consultation need to be brought forward to timely deliver these projects. This needs to happen at the very early stages of any development in order to keep all of the communities and key stakeholders in the loop in their routing assessment, and the sooner the better. Right now, our perception is that this is being brought up at the moment, in which their project should be thinking about their delivery strategy and how this is going to be rolled out. Bringing that forward will allow people to have their say and create this environment of maturity of discussion and arguments, alongside the route assessment. It's not about companies imposing what route. Nobody in this industry wants to impose anything on anybody, but bringing the discussion forward will allow people to bring new options and create a comprehensive outcome.

**The CHAIR:** Can I get both of your views around what seems to be the way that, say, HumeLink, for example, has been undertaken. The community seems to have been told that there's no other option but overhead and we're going to completely dismiss undergrounding anywhere. I think it has frustrated people because it seems that, in some ways, it's an ideological push as opposed to an evidence-based push. That has been my problem. I totally support renewable energy coming on as fast as we can make it. I think a lot of the evidence seems to have been that we need to discredit undergrounding as much as we can and we're going to throw all of the evidence on to this Committee to do that, which raises people's suspicions. Can it be done better? Surely it could be hybrid sometimes, with undergrounding being okay in some areas—for example, high environmental impact or other things. Is there a case to be put that we should be saying to the community, "Yes, we will give more consideration, in some circumstances, to undergrounding because we hear you and, in some cases, it's beneficial"? Do you think we should be doing that? I will go to Iberdrola, and then maybe Mr Adams—

**RICARDO DA SILVA ALVAREZ:** As I said to the previous question, this should be part of the early engagement of any transmission project. These kinds of option assessments should be brought to communities sooner rather than later. I think part of the frustration, as you're saying, is due to the fact that they feel that they are being rushed into taking these decisions. Bringing all of this up-front and creating best practice through industry bodies and consistency not just across New South Wales but also across Australia in the way that we approach communities for this project is necessary. The frustration, from our point of view, is also reflective of the fact that this is new. We have gone decades without building transmission, and companies went from delivery companies to operation and maintenance companies. And now they are going back to delivery and these practices need to be reviewed again. It's understandable. We understand that it creates frustration, but it's part of the transition.

**The CHAIR:** Mr Adams, do you have anything to say to that?

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**CORRECTED**

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**DOMINIC ADAMS:** Not much to add. I'd support Ricardo's statement. But also genuine, early engagement that is collaborative and listens to customer and community concerns is probably the way to go.

**The Hon. EMILY SUVAAL:** Thank you all for appearing today. I will start with a question to you, Mr Adams. In your opening remarks I think you said that electricity prices are embedded in everything we buy. I wondered if I could explore that a bit more. We've talked about, and we heard evidence about, the increasing cost of bills associated with delays. I invite you to expand more on that and how a delay could actually impact costs on other things, particularly in the context of the cost-of-living crisis that we are in.

**DOMINIC ADAMS:** I think we saw it flow through with the most recent cost-of-living crisis. It started with what was going on in Ukraine and it started with gas shortages, and that pushed up wholesale prices domestically here with our gas markets that are linked internationally. And that flows through to everything—the cost of steel and the cost of all sorts of goods and services. It's not just your energy bill that goes up; everything goes up.

**The Hon. EMILY SUVAAL:** The groceries would go up; insurance would go up.

**DOMINIC ADAMS:** Energy is one of the core planks of our whole economy. You need efficient access to capital, efficient access to people and skills, and efficient access to energy. It's one of the core planks upon which our whole economy is built, so it's really important to get it right for our competitiveness as a country and as a State.

**The Hon. EMILY SUVAAL:** I might turn now to Iberdrola, if I can. I wanted to ask you a couple of questions based on your experience with renewable energy and transmission projects. What are some of the workforce constraints on undergrounding transmission lines, would you say?

**RICARDO DA SILVA ALVAREZ:** I think we mentioned in our submission the limitations—well, the workforce-specific issues of undergrounding. I wouldn't say only on the construction side of things but also on the design and procurement. For example, the cables that we use for undergrounding are going to be completely different and bespoke. We currently see very constrained supply chains for undergrounding cables. HVDC cables are also used for undergrounding. There are less than a handful of companies out there able to provide these solutions. So when we will engage or try to design this, we really need to be offering a very good framework and project to these companies to get their engagement and be able to commit to the timescales and the costs and design constraints.

For example, when we talk about overhead lines, we always talk about linies and that the pool for linies worldwide is quite limited as well. When we engage contractors, we always ask about where they are getting their linies. Of course, having local linies is massively strategically important. But for undergrounding, it's a completely different set of experience and expertise. In Australia we have a limitation on linies for overhead lines. For undergrounding, it's going to be even more so because of, I would say, the limited experience in the country of rolling out undergrounding. Again, going back to the point, it's not only about workforce and construction workforce but also on procurement and suppliers. It's something to consider when it comes to undergrounding, and HVDC as well.

**The Hon. EMILY SUVAAL:** So, again, more variables that could factor into delays and costs and all of those things.

**RICARDO DA SILVA ALVAREZ:** Yes, exactly.

**The Hon. EMILY SUVAAL:** What are the health and safety risks associated with the building of trenches and placing transmission lines underground?

**RICARDO DA SILVA ALVAREZ:** It's important to say that when you underground cables the cables produce a lot of heat. Therefore, actually, the transfer capacity of those cables will vary depending on the length and the layout of the cables. So when you underground the cables, you need to provide any specific set of materials on top of the cables to allow the heat to disperse. Therefore, it's not that when you are underground you can just put that terrain to use again once you've finished the building. No, you need to protect that area to the extent of perhaps sometimes even making it sterile for any other activities—for farming, even grazing. So that needs to be protected to ensure that that area is not exposed to changes in the environment, it's not exposed to stress of different activities on top of it.

Perhaps they're not directly related to health and safety but it's a consideration for how these projects get immersed into communities in those particular areas. In regard to health and safety, I think even for some of the cases of undergrounding, we need to provide fencing around the undergrounding routes to ensure that nobody is exposed to not only the heat but also the electromagnetic fields that these lines could produce. So it's pretty

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**CORRECTED**

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dependent and it's subject to the design and subject to the cost but there are specific conditions that are completely different to overhead lines in regard to health and safety.

**The Hon. EMILY SUVAAL:** And the environmental impacts of the undergrounding of lines?

**RICARDO DA SILVA ALVAREZ:** The environmental impacts, yes, definitely. When you start digging up trenches, you need to produce a completely different set-up of reports and understanding of your technical conditions and the environment on the area. Soil is important, so it's not that any area can be a host for undergrounding cables and routes. Again, it's a completely different set of approaches. In fact, the routing, when we do routing, because of the regulatory framework we operate, we always start with the principle of, it's going to be an overhead line and then when it's constrained, we consider undergrounding but undergrounding is a last resort based on costs. When we do that undergrounding assessment, it's likely that the route will change because of the soil conditions and the environmental conditions, so it's not like for like, and that also will impact the overall project itself.

**The Hon. MARK BUTTIGIEG:** Can I just ask you to clarify that evidence? The default position is overhead.

**RICARDO DA SILVA ALVAREZ:** We have routing specifics for the UK that we use which is based on the regulatory framework for the UK, and of course that is based on less cost for consumer. The default position for designing our routing is always overhead.

**The Hon. MARK BUTTIGIEG:** And that is because, over your experience of putting these transmission networks in—I've forgotten how many kilometres you said you did—inevitably, overhead turns out to be the best cost-benefit but there may be situations where you have a bespoke solution for underground.

**RICARDO DA SILVA ALVAREZ:** That's correct, yes.

**The Hon. EMILY SUVAAL:** Mr Adams, your submission notes that undergrounding can cost between four and 20 times more than overhead. That's a big range. Do you have any comments to make about the reasons for that?

**DOMINIC ADAMS:** I'm not an expert on the costs. It's just really a reflection of the literature. I'd point to the Curtin University and University of Queensland study that showed basically that range, and there is a whole bunch of local factors that go into that, whether that is topography, geology—it's really project-specific as to why that range is so broad. That's the best of my understanding.

**The CHAIR:** Thank you so much for appearing today, providing your submissions and giving evidence. The secretariat will be in touch if we have any questions for you.

**(The witnesses withdrew.)**

**(Luncheon adjournment)**



**CORRECTED**

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**Mr JAMES HAY**, Chief Executive Officer, Energy Corporation of NSW (EnergyCo), on former affirmation

**Mr ANDREW KINGSMILL**, Executive Director, Network Planning and Technical Advisory, Energy Corporation of NSW (EnergyCo), on former affirmation

**The CHAIR:** Welcome to this session. We'll proceed either straight to questions or you may have an opening statement?

**JAMES HAY:** We don't really have an opening statement. We thought you'd would want to ask questions.

**The Hon. WES FANG:** Good, I've got plenty of questions. Mr Hay, can you tell me about how the acquisition in Central-West Orana is going?

**JAMES HAY:** The land acquisitions?

**The Hon. WES FANG:** Yes.

**JAMES HAY:** We're progressing that. It's always a difficult process and so we are progressing that. At this stage, we're on target.

**The Hon. WES FANG:** Are you aware that the Treasurer and the Minister for Energy were in Dunedoo on Tuesday?

**JAMES HAY:** Yes.

**The Hon. WES FANG:** So you've spoken to both of them?

**JAMES HAY:** No.

**The Hon. WES FANG:** Have they communicated anything to you at all about that meeting?

**JAMES HAY:** I haven't had a debrief from either of them about that. I've talked with their office a little.

**The Hon. WES FANG:** Has the office provided you any insights into their meeting? What have you heard about the meeting other than that they were there?

**JAMES HAY:** The feedback is similar to what we're hearing.

**The Hon. WES FANG:** Which is?

**JAMES HAY:** It's a process that is difficult for everyone involved.

**The Hon. WES FANG:** Right. You're part of the Treasury cluster. Is that correct?

**JAMES HAY:** Not any longer. As of 1 January we're part of the Department of Climate Change, Energy, the Environment and Water.

**The Hon. WES FANG:** So you've switched recently between the two clusters?

**JAMES HAY:** Yes.

**The Hon. WES FANG:** But you were previously under the Treasurer's effective, I guess, cluster?

**JAMES HAY:** We reported to the Minister of Energy but we were part of the Treasury cluster.

**The Hon. WES FANG:** Right. How many DPIE staff do you have seconded to your organisation?

**JAMES HAY:** DPIE ceased to exist two years ago so we have no DPIE staff seconded to us.

**The Hon. WES FANG:** But they are still using those emails?

**JAMES HAY:** We have to use those emails, unfortunately.

**The Hon. WES FANG:** There are a number of former DPIE staff that are still using DPIE emails that are working for—

**JAMES HAY:** Including myself.

**The Hon. WES FANG:** Yes. Do you know how many people transitioned across or seconded within the organisation that were—

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**CORRECTED**

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**JAMES HAY:** If the question is about who is using DPIE emails, at this stage it's a domain of convenience that the IT department uses. Any new starter at EnergyCo is allocated a DPIE email, notwithstanding that department ceased to exist two years ago. So to answer your question would be very, very hard.

**The Hon. WES FANG:** I'm trying to establish where the legacy is and where the existing is now, because I have been following some of the things—

**The Hon. MARK BUTTIGIEG:** Clearly not.

**The CHAIR:** Order!

**The Hon. WES FANG:** But the DPIE email addresses are all still there, as opposed to anything that is linked to EnergyCo.

**JAMES HAY:** The only EnergyCo emails we've got are the ones that are used on our website. We have people still on Planning emails; we have people still on Environment emails. That's just a matter for the IT part of government. You are rapidly getting to the end of my level of knowledge on that.

**The Hon. WES FANG:** That's fine. I appreciate the feedback. It helps and clarifies a little bit for me. In relation to the land negotiations that are occurring, did the Treasurer, when you were under the Treasury cluster, or now the energy Minister that you are now part of the—

**JAMES HAY:** The DCCEEW?

**The Hon. WES FANG:** Yes, whatever—it's a very, very long name with a lot of Es. Have they said anything to you around the negotiations about how they wish that you would approach it?

**JAMES HAY:** The Treasurer has not discussed the land acquisition program with us.

**The Hon. WES FANG:** Has not at all?

**JAMES HAY:** No, not to my knowledge. Just for the record, I should just correct the name of the department: It's the Department of Climate Change, Energy, the Environment and Water.

**The Hon. WES FANG:** Thank you. Are you aware that when the Treasurer was in Dunedoo on Tuesday he indicated that he believed that the just terms Act was not fit for purpose and that he and the energy Minister would like to get rid of it?

**JAMES HAY:** I don't know. I'm not aware of that.

**The Hon. WES FANG:** So they haven't indicated to you that that Act is not fit for purpose in relation to, in their belief, Central-West Orana land acquisitions and that, if they could, they would get rid of it? They didn't indicate that to you at all?

**JAMES HAY:** No.

**The Hon. WES FANG:** Because that's the position they put to the people of Dunedoo on Tuesday.

**JAMES HAY:** I have no idea.

**The Hon. WES FANG:** You have said the negotiations are ongoing and, I think, difficult or that circumstances were difficult. Would that be a fair paraphrasing of your earlier evidence?

**JAMES HAY:** Look, we try to be very, very respectful. Part of that respect is acknowledging that these are difficult conversations.

**The Hon. WES FANG:** Would you consider that "negotiating with respect" would mean that you would negotiate in good faith?

**JAMES HAY:** Negotiate in good faith, did you say?

**The Hon. WES FANG:** Yes.

**JAMES HAY:** Yes.

**The Hon. WES FANG:** Have you outsourced the negotiation process?

**JAMES HAY:** We use a number of parties to help us with that process. Over time, as resources become available, I have recruited a full-time property manager, but we do have a number of people who are engaged to help on the ground.

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**The Hon. WES FANG:** What sort of organisations do you have engaged?

**JAMES HAY:** There's a number, but I didn't really come prepared for these conversations. I thought we were talking about undergrounding.

**The Hon. WES FANG:** No, I'm sure you weren't. Is AVC one of those companies?

**The Hon. EMILY SUVAAL:** Point of order: Chair, the line of questioning is outside the terms of reference for this inquiry. I would ask you to direct the member to come back to the terms of reference for the inquiry and to use questions along that line. It's not budget estimates yet.

**The CHAIR:** Yes. There is "any other related matters" within our terms of reference and you are being generally relevant. I'm sure we'll get to the reasons why you're asking those questions. I will allow the member to continue.

**The Hon. WES FANG:** Thank you. Is AVC engaged to negotiate on your behalf?

**JAMES HAY:** AVC is one of our contractors, yes.

**The Hon. WES FANG:** Have you authorised any of those third parties that are assisting with the negotiation process of land acquisition for the transmission lines in Central West Orana to effectively hold over landholders' heads the threat of compulsory acquisition? Do you believe that that's negotiating in good faith?

**JAMES HAY:** We don't authorise threats at all. The reality is the process is underpinned by the terms of the just terms Act, so we are not allowed, or we're not free to negotiate amounts that would not otherwise be payable under that Act because that is the backstop.

**The Hon. WES FANG:** You're saying, in effect, that you can negotiate up to what the just terms Act would require you to pay under a compulsory acquisition, and that's it?

**JAMES HAY:** That's it.

**The Hon. WES FANG:** I believe my colleague might have a different view of that. Ms Carter?

**The CHAIR:** With respect, if Mrs Carter is going to ask a question, please go ahead, but you're not asking a question of the member.

**The Hon. SUSAN CARTER:** Do you have a view about whether the terms of the just terms Act are still fit for purpose, given the financial obligations that accrue from the compensation packages which are being discussed?

**JAMES HAY:** It's really, as an official, not my job to comment on the efficacy of that statute. That would be a government policy question.

**The Hon. SUSAN CARTER:** Are you in a position, as an official, to advise government if they need to consider reworking that legislation?

**JAMES HAY:** Yes. That is something an official might do, but my advice to government is not the subject of this Committee.

**The Hon. WES FANG:** I am going to table now a document. I ask if the secretariat can take this. There's a copy for everybody. I've made 10 copies, so one for the secretariat and other staff. Mr Stuart Hackney has provided to me this document, which I will table under parliamentary privilege in this inquiry. It sets out the ways in which the negotiation for his property is occurring from EnergyCo. Are you aware of his circumstances, Mr Hay?

**JAMES HAY:** I don't think it's appropriate for me to comment on individual circumstances in this Committee, especially when it's not part of what I was asked to come here to be answered.

**The Hon. WES FANG:** Certainly, his property is under threat of compulsory acquisition for transmission lines, so I would say that it's definitely within the terms of the—

**JAMES HAY:** But commenting on individual cases, I would not want to do that without a caveat. That might be something that needs to go in camera, or whatever needs to be done, but I'm not sure that's appropriate.

**The CHAIR:** At this point in time I remind witnesses that you are able to take questions on notice. It's a procedural fairness, if you aren't able to answer questions. You are not compelled to answer the question and you are able to take questions on notice, if you need to, and get back to us.

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**JAMES HAY:** Thank you, Chair. I think the bigger point I was making was that I just don't think questions about individual cases—we have to respect confidentiality. Landowners can say what they like to who they like, but we have obligations to not disclose their information unless we have their permission, which I don't have at this point.

**The Hon. WES FANG:** I'm happy if you want to get that permission and perhaps you can provide some more clarity on notice, but certainly my understanding is that in a meeting that was had yesterday with Aaron Davies from AVC, it was effectively held over Mr Hackney's head that unless he signs up to what's on the table, his land is going to be compulsorily acquired. Do you believe that that is negotiating in good faith with these landholders?

**JAMES HAY:** I'm afraid, Mr Fang, I can't comment on that. I wasn't part of that meeting and I don't think that's a question that's able to be answered at this point. I can take on notice details of that meeting.

**The Hon. WES FANG:** Would you support any of the third parties that you've engaged with to negotiate on landholders' behalf to act in that way when negotiating settlements in relation to land acquisition for these projects?

**JAMES HAY:** We maintain that we act respectfully and fairly. We do explain the consequences of the law under which we operate and the basis that we operate and the basis upon which we're allowed to offer compensation. Many landowners do seek over and above that amount. In that case, our practice is to record what they ask, to explain that that's not part of what we're allowed to respond to, but that is recorded so we make sure we're very clear and understand that, and that is part of the respectful process.

**The Hon. WES FANG:** The Treasurer and the energy Minister, when they were in Dunedoo on Tuesday, indicated that they do not believe that the just terms land acquisition Act is fit for purpose in relation to this. They indicated they would get rid of it if they could. We've done a little bit of searching, and we believe that that could happen quite quickly. Is that going to be the recommendation that you would put to the Treasurer and the energy Minister in order to have appropriate and adequate compensation paid to these landholders whose land you are effectively going to take?

**JAMES HAY:** Again, I can't comment on what may or may not be Government policy.

**The Hon. WES FANG:** You are, though, able to make recommendations to the Government in relation to the matters of which you have carriage, and one of those is the acquisition of land in Central-West Orana. Is that correct?

**JAMES HAY:** Mr Fang, if I were to make those recommendations or be asked by government to make those recommendation, they would be Cabinet in confidence. Again, I can't comment.

**The Hon. WES FANG:** The commitment, though, from the Treasurer and the energy Minister to the people of Dunedoo, in particular, was that they didn't believe that it was fit for purpose. Has that been communicated to you?

**JAMES HAY:** I've already answered that question.

**The Hon. WES FANG:** In circumstances where you're not providing adequate compensation for the loss of productive land and the loss of production on land during the time of construction, do you believe you have a social licence to continue with the acquisition, if you're not going to provide adequate compensation?

**JAMES HAY:** We operate within the terms of the just terms Act, Mr Fang. That's all I can say. We do our best to interpret that in a way that is as favourable as possible to landowners.

**The Hon. WES FANG:** Do you believe it is favourable to landholders?

**JAMES HAY:** I can't give you an opinion on that. I apply the law. We work with it and we continue to work with it.

**The Hon. WES FANG:** The Treasurer and the energy Minister are saying something completely different to what you are now. They'll go back to Dunedoo and tell the people there one thing, but you'll operate on a different level.

**JAMES HAY:** I'm not saying anything different to the Treasurer and the Minister. I'm just saying my agreement is to work within the law as Parliament creates it.

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**The CHAIR:** Thank you, Mr Hay. I want to turn to the new rule at the Federal level. This came in around our first hearing date. Are you aware of the new rule by the AEMC around enhancing community engagement in transmission building?

**JAMES HAY:** Sorry, I was just trying to follow the question.

**The CHAIR:** The AEMC had a draft rule. I think they've come back and it's now a rule for organisations like yours. It's called *Enhancing community engagement in transmission building*. Are you aware of that—that's a new rule in place?

**ANDREW KINGSMILL:** I'm aware of it, yes. I should add that EnergyCo operates under the Electricity Infrastructure Investment Act of New South Wales, not under the National Electricity Rules. But we would be seeking to align with the principles behind that rule, yes.

**The CHAIR:** So you're aware of what the principles of that rule are?

**ANDREW KINGSMILL:** Yes.

**The CHAIR:** What are they? This isn't a test but, broadly, what does that rule require? Now I'm curious to know about the potential changes around the need to engage earlier, and more thoroughly and deeply, potentially, in terms of community engagement. Have you looked at that in detail?

**ANDREW KINGSMILL:** The rules would be fairly high level, but the principles behind the rule would be aligned with the principles in the Electricity Infrastructure Investment Act around community acceptance. So principles such as early and transparent engagement and principles such as genuine consultation would be part of that.

**JAMES HAY:** We're happy, Chair, to come back on notice to reconcile how we apply them, but I'm confident there would be no gaps.

**The CHAIR:** The reassurance I'm really searching for here is to get a sense as to whether there's this gradual improvement, if you like, in terms of lessons learnt and the way in which companies are engaging with the community. That was clearly the need last year. The Federal Minister requested that this be looked at by the AEMC, then by November a rule was in place. I am wanting reassurance. That's at the Federal level, but how are you changing your processes to ensure that communities are more engaged and they feel more listened to? Is that something that EnergyCo is actively working on?

**JAMES HAY:** We do work very closely with the Federal commissioner, the infrastructure commissioner, Andrew Dyer, who I think this Committee has heard from.

**The CHAIR:** Yes, the previous—

**JAMES HAY:** The previous iteration. I would talk to Andrew very regularly and we'd compare best practice across jurisdictions in what we're doing. We don't wait for rule changes to try and get the lessons learned.

**The CHAIR:** You don't wait for rule changes, but it's clear that there is a lot of community resistance with this. Do you accept that communities want to hear that all options are genuinely being considered—for example, that undergrounding isn't dismissed out of hand, which is what the sentiment seems to be? Demonstrating that you're genuinely considering whether in some circumstances for some parts of the network in regional New South Wales undergrounding could be called for in terms of the overall cost, maybe in terms of the impacts, whether it's going through sensitive environmental areas—in your view, could it be justified? Possibly you need to be demonstrating slightly more willingness to the community that it could be considered? This is part of the big pushback, what seems to be this ideological opposition and just ruling it out, out of hand.

**JAMES HAY:** We don't have an ideological opposition to it.

**The CHAIR:** There's a perception.

**JAMES HAY:** I would stress that we don't. One of the things we made sure we did as part of setting up EnergyCo was to produce the Network Infrastructure Strategy that Mr Kingsmill has talked to you about and was the principal author of. The objective was to put on the table what do these projects look like. One of the hardest parts of community engagement on infrastructure projects, whatever type of infrastructure it is, is in any given audience you'll have a group of people who think you've waited too long to talk to them, another group of people who think you're talking to them before you've made decisions and all they want to know is what you're going to do, and sometimes a group in the middle who are interested but puzzled as to why you want them there.

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Once you engage, and when you do engage early, by definition you don't have the answers to every question because you are wanting that engagement to help inform those answers. We do have this kind of paradox where some parties think that at that point we should have the answers to every question. But if we did we wouldn't have engaged and we would not have been open to those things. That's the philosophical point and I've found that in every form of infrastructure I've ever been involved in.

What we look at is that engagement. We look at the solutions. Also, everything we recommend and every bit of infrastructure we recommend is paid for by electricity consumers. It has to go through the test under the Electricity Infrastructure Investment Act, the Consumer Trustee first of all, which is totally independent from the New South Wales Government, an agency that has to decide whether the cost of what we are proposing is justifiable to consumers. Then it goes through the Australian Energy Regulator, which is a Federal regulator, to actually agree the amount that consumers will be charged for that infrastructure.

Everything we do, because it's all paid for by electricity consumers, has to be run through that reference. The Electricity Infrastructure Investment Act in its objectives specifically added in the words about fostering local community support, because it recognises that consumer licence—which is those who are paying for the infrastructure—isn't the same as local community support. EnergyCo is very, very focused on that local community support, and that's one of our objectives that we have to meet. The Act was a big step forward from the National Electricity Market in requiring us to focus on those factors. Are we learning as we go? Absolutely. Are we trying to constantly improve? Absolutely.

**The CHAIR:** Is EnergyCo a member of the Energy Networks Australia?

**ANDREW KINGSMILL:** No, we're not.

**The CHAIR:** They were speaking to us today about their best practice guidelines, the Energy Charter. Is EnergyCo part of any other peak body of organisations?

**ANDREW KINGSMILL:** We're not a member of the energy networks association or the Energy Charter. We do talk to both organisations regularly. I sit on a committee chaired by AEMO called the Executive Joint Planning Committee, where these issues and others in relation to forward planning of the power system are discussed. We're certainly in the relevant conversations on the topic, despite not holding memberships.

**JAMES HAY:** As a matter of course, we're not generally members of peak bodies, so to speak.

**The CHAIR:** Energy Charter—this evaluating of transmission undergrounding and wanting to give more consideration and communication to communities around undergrounding—is reporting back, I understand, in May 2024. I believe it's good that that's happening. Is there anything of any similarity that EnergyCo is undertaking or a part of? Again, if you're not a part of the Energy Charter, is there anything that you're doing that you can refer to?

**ANDREW KINGSMILL:** My last conversation with the CEO of the Energy Charter was last week on this topic. I think probably the best way to describe it is that we would aim to align. As Mr Hay said, we aim to continuously improve and be in line with good industry practice, despite not holding a membership formally.

**The CHAIR:** Do you think the way in which you've communicated to the community around overhead and undergrounding and the benefits and costs of each could be improved?

**ANDREW KINGSMILL:** I'd actually take the community's guidance on that. I think probably from some of the discussion here, the community feels that it could, in which case we take that on notice and seek to improve that. We certainly have communicated on the topic, but if there's room to improve then we will.

**The CHAIR:** Do you see any reality that in the next few years—what's happened maybe in terms of some decisions that have already been made? I want to look forward at this point. Can you see any feasibility in the next few years of having one of the larger transmission infrastructure projects roll out being a hybrid version, for example, having some underground in some highly sensitive, or in whatever, way to gain that community access or that social licence? My sense from talking to communities about this is that is kind of what needs to be demonstrated. And if it's not, the resistance is going to keep being strong. I'm keen to hear your views on that, whether there's any sentiment within the industry that that could be a good idea.

**ANDREW KINGSMILL:** I think it would need to be assessed on a case-by-case basis.

**The CHAIR:** Sure.

**ANDREW KINGSMILL:** I think the panel is well across all of the different factors that would need to be considered in that decision. We're certainly happy to do that. I think this morning's witnesses provided some

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comments on some of the challenges of balancing those trade-offs and the relative importance of those trade-offs. As Mr Hay has indicated, one of things that we're very much conscious of in consulting with landowners is that different things are important to different landowners. We're certainly open to having those conversations. It then comes down to how you balance those factors and the differences in preferences between stakeholders along the corridor.

**JAMES HAY:** I think there is also a conversation to be had with our regulators about that, because they tend to associate the community licence with the consumer licence, and they are overlapping but not the same concept. In my experience—and I've done a lot of underground work on different infrastructure—I think the debate around undergrounding high voltage transmission lines still hasn't really looked, particularly from a biodiversity and environmental point, at the nature of the impacts. They are at least as significant as overgrounding. The kind of disturbance and the impact on landowners is much greater. So you've got all these factors. Think about the impact on landowners. The impact on landowners of the undergrounding construction process is enormous, and then the access for maintenance is significant.

You've got these joining stations about every kilometre, or maybe every 800 metres, over those lands, and those are not insignificant surface structures on their land that need to be accessed, and you need to not have certain activity on top of those cables. In our submission we talked about the trench being well over 40 metres. The construction of that will be another 40 metres outside that, and every inch above the ground has got to be affected. The biodiversity and environmental impacts of that I don't think have been fully appreciated or understood.

**The CHAIR:** I will jump in with one last question. How are the impacts of severe weather events on transmission infrastructure—not just now but in 20 or 30 years—factored into your decision-making now? How does that happen?

**JAMES HAY:** I will let Andrew expand on that but, absolutely, we have an advisory committee. One of the things they charged us with in doing our evaluation was to think not just about today but more and more extreme weather events and the effect of that on our infrastructure.

**ANDREW KINGSMILL:** We've looked at it largely in terms of the build standards that we specify for, in our case, transmission lines and substations. After the event in South Australia in 2016, where towers came down, and the event a few years ago in Victoria, but obviously not yet the most recent one this week we looked at, as did the whole industry, the nature of the winds, the nature of the downbursts, the microbursts, that caused those events.<sup>16</sup> We have adopted build standards that would withstand those events going forward. There is always a balance in terms of cost versus resilience. I know that in Queensland, when they design their transmission lines, they design them to cyclonic wind ratings where they are in that part of the State. I think design standards are fairly key there, but I can assure the panel that we have taken that into account in our design standards.

**The Hon. EMILY SUVAAL:** Thank you both, again, for appearing today. I wonder if you could clarify for the Committee what EnergyCo's role is and how this is different to a company like Transgrid or Ausgrid?

**JAMES HAY:** What was missing from when the last set of transmission lines were built, which Mr Buttigieg is very well aware of, is the common ownership through the State. EnergyCo was seeing there that when you are building generation transmission and now storage, you need coordination. So our role is—we are not a profit-based organisation—to look at the practical, on-the-ground coordination of investment in those three things, which is essential for this energy transition. Section 63 of the Electricity Infrastructure Investment Act sets it out, along with the objectives of the Act. These things don't happen unless they are coordinated. If you build transmission lines and don't have the generation coming on at the same time, you get the upward pressure on costs for consumers without the offsetting downward pressure of the new generation. That coordination is vital.

That's the essence of what we saw. The National Electricity Market had for many years had a reform called COGATI, which stands for the coordination of generation and transmission investment, but it was very economically driven. We've tried to bring that on the ground and with the objective that I have referred to before in the Act of working with the local communities and recognising that they are not the same as the consumer interest.

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<sup>16</sup>In [correspondence](#) to the committee dated 6 March 2024, Mr Andrew Kingsmill, Executive Director, Network Planning and Technical Advisory, Energy Corporation of New South Wales (EnergyCo), clarified their evidence

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**The Hon. EMILY SUVAAL:** On that, has the current Government sought to provide more resources to EnergyCo to enhance that community engagement piece?

**JAMES HAY:** Yes, but more resources across the board so that we have a longer, deeper engagement. We can employ more employees. That takes time to bring in those people, to find the right people, and to compete for the right people, I'd also add. It is a process that we're absolutely making great progress on, we're committed to so that we have the right people in the right place. We now have senior executives in place in the regions. We advertised for those roles pre-COVID. We didn't get any great response. It was partly understanding what our role was from the employment market. We're making great progress in that regard now.

**The Hon. EMILY SUVAAL:** I wonder if I can turn to ask you to elaborate further on some of your previous comments around the environmental impacts. Mr Kingsmill, you mentioned joining structures and other aspects of trenching that were not insignificant. There seemed to be a belief, or at least an idea, from some of the previous evidence and hearings that you might be able to crop, farm or graze animals on some of these underground transmission lines. Could you provide the Committee with a clearer explanation of what we are actually looking at?

**ANDREW KINGSMILL:** Absolutely. There are a few angles to look at that. I might start with an environmental angle, which is the biodiversity. At the last hearing we spoke about—for an overhead structure the main ground disturbance is at the steel towers or pylons, and for an underground structure you'd actually need to clear and trench and have construction zones along the whole route of the cable without a break. In terms of biodiversity impacts, of land area affected, our very high-level calculation is that for an overhead structure—and this is a best case; I stress that this isn't a representative case, but it is sort of one end of the spectrum, a best case—it would be about a third of the clearing and the interruption at ground level as for an underground cable. In practice, it would be somewhere between the two because it won't be possible or feasible at every span to avoid clearing.

In terms of the trenches and the construction, that is one that we've still looked at. I know earlier in the day the panel talked about clearing machines and so forth. As Mr Hay mentioned before, even if that is feasible for the size and the weight of the higher capacity cables that we're talking about for renewable energy zones, there is still a matter of jointing every 500 metres to a kilometre, which are large structures. I used the example at the last hearing about the width, height and depth of these tables at this end of the room. That would still be my view there. In terms of reliability, I know there has been a diversity of views on repair times for cables. There is a range. Certainly, for smaller cables I have no doubt that they would have a shorter repair time. Existing distribution companies in New South Wales, I have no doubt, depending on the fault, may be able to repair cables within a week.

As I mentioned last time, in Australia we are relying at the higher voltage levels—the higher capacity cables that we would be dealing with—on international labour, largely from the countries that manufacture the cables. There is probably a month's lead time simply to get a slot in their programs and then the time that it takes. A couple of examples—in 2019 the Basslink cable had a fault. That particular one wasn't under the sea; it was actually on land on a low voltage cable on the metallic return. That took a month to return to service. We've seen similar with other cables such as Directlink. A little over 10 years ago Directlink had a fire in one of its converter stations that took three years to address. While the actual repair activities may be able to be done in a matter of weeks once the resources are there and on the ground and the work area is set up, I think the practicalities of mobilising and certainly what we've experienced in practice—I have an overseas example as well of that—would be such that, practically, the repair times would be longer than just physically cutting and splicing the cable.

**The Hon. EMILY SUVAAL:** What would the impact be? You're using an example of the Basslink. What would be the implications if we had a similar situation but on a really high voltage transmission line that is getting a lot of power from A to B, for example?

**ANDREW KINGSMILL:** It depends a bit on where that cable is. In the case of Basslink in 2019, Tasmania and the mainland had sufficient energy supply reserves, so there wasn't an impact on the reliability of the grid. There may have been a small economic impact in terms of not being able to dispatch the lowest cost electricity at some times; I don't know. But that particular one wasn't a reliability impact. I think, in general, if it's connecting one or a small number of users, such as generators, the impact would probably be minor, assuming there's sufficient supply elsewhere. If it's on the backbone of the network, the impact would be a lot more major. Again, if we start to talk about worst case, it could mean what is called "rotational load shedding" in the industry, which is really code for rolling blackouts. I don't say that to try to create fear but simply that if there's not enough supply that can get to the demand then the market operator and the network service providers have no choice but to share the available electricity equally.



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**The Hon. MARK BUTTIGIEG:** Can I ask something about some evidence that was given this morning? I think it was from the academics from Monash. They made an assumption that whether it was underground or overhead we could get there, and then they did their analysis on that. They were saying that if you went down the underground path to drive the speed to reach our net zero interim and final targets the cost would be north of 30 per cent extra for underground. Do you have a view about whether or not it's actually possible to underground in that time, given the legislation we've just passed and the interim and final targets we have to meet?

**ANDREW KINGSMILL:** The best advice I have today is that I don't think it would be possible. In terms of the interim targets, I don't think it would be possible—certainly, if you're talking about a 2030 or early 2030s time frame. In terms of the forward targets, whether that's 2035, 2040 or 2050, it may be possible at the additional cost. But the reason why I say that is the increase in construction time. I've described some of the activities that drive the increase, such as the jointing every 500 metres to one kilometre—simply the movement of the large cables and being able to put them in place in the ground—bearing in mind that a cable will generally transmit less than an overhead line. We're talking about multiple cables and the scale of that.

But, also, at the moment, the demand for all high voltage power equipment, including underground cables, is quite high worldwide. For cables, it's driven largely by demand at the moment for undersea cables for offshore wind, particularly in Europe and some countries in Asia. So there would be a lead time for the suppliers to be able to increase that capacity. It means building new factories, new facilities et cetera. That would be where the delays are—the new capacity and the extra construction activity.

**The Hon. MARK BUTTIGIEG:** Notwithstanding those limitations, and assuming we could get there and wanted to get there, what sort of dialogue has there been with the community on the cost implications of that flowing through to electricity bills?

**ANDREW KINGSMILL:** Very little has been done in relating it to the cost of electricity bills. One of the questions on notice that we took last time was to provide an estimate of that cost, and that's in our response to the questions on notice, which you would have seen. For an average New South Wales household, that can range from in the hundreds of dollars extra per year to up to around \$500 extra per year. That's looking just at the EnergyCo projects, and that's assuming that we undergrounded all of the transmission infrastructure—so it's the Central-West Orana Renewable Energy Zone, the New England Renewable Energy Zone and the Hunter Transmission Project.

**The Hon. MARK BUTTIGIEG:** But there has been no socialisation of that as part of the consultation or the education with the community?

**ANDREW KINGSMILL:** No. That's correct.

**The Hon. EMILY SUVAAL:** I wonder if you could now tell us what the bushfire risk associated with underground transmission lines is.

**ANDREW KINGSMILL:** The bushfire risk associated, whether it's underground or overhead, at transmission backbone voltages is very small. Our advice is that the risk of damage to an underground cable from a bushfire is pretty close to zero. Similarly, the risk of damage to an overhead 500 kV transmission line from a bushfire is close to zero. I think the other way to look at that is the potential for electricity lines to start bushfires. Again, as we noted in our original submission, we've never had a 500 kV line start a bushfire in Australia. And the work that Energy Safe Victoria did with Andrew Dyer showed that it was very low and close to zero.

**The Hon. EMILY SUVAAL:** Tell us, what's the impact from the construction of undergrounding lines, particularly on local roads and communities when you are looking at transporting?

**ANDREW KINGSMILL:** It probably depends on a few factors. There would definitely be more truck movements and that would be truck movements in terms of—and I think last time I described and showed the size of the cable that we're talking about. There would be more cable drums coming in because you fit shorter lengths on a cable. There would need to be construction facilities near each joint bay where the cable would be pulled from. That means at every 500 metres to a kilometre there would need to be a clear pad where a truck with the cable drum on it could be parked and then essentially the drum could be rolled off that. With overhead lines, you can fit sort of in the order of five kilometres or more of conductor, because it's so much smaller—it's about three to four centimetres diameter—onto a drum. There would be pads around each tower. But in terms of cable-pulling pads, where a truck with a drum of cable would be parked on, that would be more in the several kilometre-type basis. So definitely more truck movements and removal of some of the spoil from the excavation than with the overhead.

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**The Hon. EMILY SUVAAL:** Are there any other impacts on local agriculture or proximate land uses from underground transmission lines?

**JAMES HAY:** During construction, the landowner is going to be excluded from the entire alignment over their property because of the nature. You've got many, many moving parts going on, and the construction itself takes longer. There's lots of movement of spoil because what you dig out of a hole, it generally multiplies by a factor of two. Even if you can re-use it, it doesn't all go back in. But you will have to bring in other materials—insulating-type materials. So, again, the truck movements are there. You've got to find places to put the spoil, and that in itself has environmental impacts.

**The CHAIR:** Thank you for coming today. I really appreciate it. That's the end of our session with you.

**The Hon. MARK BUTTIGIEG:** See you again next week.

**The CHAIR:** Yes. You're very familiar with the corridors of this building at the moment. If we have any questions for you, the Committee secretariat will be in touch in relation to questions taken on notice. Thank you.

(The witnesses withdrew.)

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**Mr JUNAYD HOLLIS**, Group Executive, Customer, Assets and Digital, Ausgrid, affirmed and examined

**The CHAIR:** We will get straight into it. Do you have a short opening statement for the Committee you would like to give?

**JUNAYD HOLLIS:** If I may, yes. Thank you for the opportunity to attend today. I would like to acknowledge the Gadigal lands of the Eora nation that we are meeting on today. I pay my respects to Elders past, present and emerging, and celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of New South Wales. I also acknowledge and pay my respects to any Aboriginal or Torres Strait Islander people joining us today. I have been at Ausgrid for the last seven years, and for the 15 years before that I have been working with utilities across the globe on issues spanning customer service, asset management planning and economic regulation. My qualifications include a Bachelor of Engineering from the University of Sydney.

For what it's worth, I grew up near the Snowy Hydro scheme in southern New South Wales. The associated overhead electricity infrastructure was literally and figuratively in my backyard. I understand the day-to-day realities of living with overhead transmission lines. At Ausgrid we operate the largest electricity distribution network on Australia's east coast. We provide power to four million people across Greater Sydney, the Central Coast and the Hunter Valley. Our network comprises almost 50,000 kilometres of overhead and underground lines, spanning all voltages from 132 kilovolts down to the 230-volt lines that connect the typical residential home. Importantly, this network includes almost 4,000 kilometres of transmission lines. This includes 1,000 kilometres of underground transmission lines. This makes Ausgrid the biggest owner and operator of underground transmission assets in Australia. In fact, Ausgrid's roughly 500-kilometre-long 132kV network of underground transmission network assets represents approximately 43 per cent of all of the underground transmission in Australia.

Over the last 15 years, Ausgrid has constructed approximately 250 kilometres of transmission and subtransmission lines—150 kilometres of which were underground and another remaining 100 overhead. This is across 83 different projects. We take our responsibility to provide safe, affordable and reliable electricity supply very seriously, and we place a very high priority on community engagement, particularly around these construction projects. We work in good faith to communicate openly and clearly to ensure people are informed about our activities and our decisions and, wherever possible, involve the community in the decisions that affect them. Our experience in delivering the transmission projects has helped us to develop a close understanding of the most common issues likely to be of interest or concern to the community. But we are also aware that every project is unique and has aspects that need to be considered and addressed on a case-by-case basis.

The decision on whether a transmission project should be built underground or overhead will depend, as I'm sure you have heard, on a range of factors, including but certainly not limited to its technical feasibility, community impact, community feedback, environmental consideration and costs. Our firsthand experience is that communities voice concerns about both underground and overhead construction, which means that even when there are genuine options to build a particular line overhead or underground, once the full range of factors are understood by the community, there may not always be a clear community consensus on the approach that should be taken. As we shared in our submission, our recent experience shows underground construction is, on average—and I stress "average"—five to six times higher in cost than overhead construction. Even when factoring in whole-of-life costs, such as ongoing maintenance and vegetation management and the like, this cost differential between the two technology types does not materially shift.

Costs aside, underground construction is generally more disruptive to the community and the environment. This is due to the extensive excavations required to install, augment, repair and eventually replace cables. But, once in operation, underground cables do benefit from somewhat narrower easements, lower exposure to climate events and improved aesthetics. Overhead lines, on the other hand, are more exposed to climate risks, require wider easements—though these are typically less restrictive for agricultural purposes—but are significantly faster and easier to build, maintain and repair. Overhead designs also have the distinct benefit of being able to span over or otherwise avoid challenging or sensitive areas such as valleys, wetlands or areas protected for their Aboriginal heritage or biodiversity status. This is something that underground solutions typically cannot do. The Ausgrid submission provides a cross-section of recent projects, demonstrating the variability of costs between overhead and underground lines and some of the consideration involved, which I would be happy to discuss in further detail.

**The CHAIR:** Thank you so much. We will go to questions from the Opposition.

**The Hon. WES FANG:** Thank you very much for coming in today to provide some evidence. Just in relation to your opening statement, you obviously talked about the experience that you have had or your

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organisation has had in relation to the underground powerlines. You said it was somewhere between five and six times the cost of overhead. Would that be fair? You found that is consistent across the cost of the life of the project.

**JUNAYD HOLLIS:** It's a fair representation across an average of our recent historical projects. Across the life of the project—do you mean across the whole life of the asset over, say, 50 years?

**The Hon. WES FANG:** Yes. I think you said it was five to six times the cost to build, but then also, when you factor in the maintenance and also the positives plus the negatives, it was still around five or six times.

**JUNAYD HOLLIS:** Correct. To put that in context, the whole-of-life maintenance cost for an overhead line, which is slightly higher than the whole-of-life costs for underground, is in the region of 25 per cent of the overall cost, including the up-front build. It would take the five or six to a four to five at best.

**The Hon. WES FANG:** Is that for HVAC or HVDC?

**JUNAYD HOLLIS:** Ausgrid doesn't operate any HVDC assets, so it would be similar, but I can't confirm.

**The Hon. WES FANG:** The cables that are used in underground HVAC are significantly larger. Is that correct?

**JUNAYD HOLLIS:** Than the overhead equivalent?

**The Hon. WES FANG:** Yes.

**JUNAYD HOLLIS:** Yes.

**The Hon. WES FANG:** That's for heat dissipation, isn't it?

**JUNAYD HOLLIS:** For a number of factors, one of which is heat. The stats that I provided, the five to six—we typically build underground transmission at a lower capacity than overhead because higher capacity is much more difficult to achieve underground. You've probably heard other evidence on that front.

**The Hon. WES FANG:** Is that the case, though, for HVDC?

**JUNAYD HOLLIS:** HVDC does get easier to get higher capacity underground, that is true.

**The Hon. WES FANG:** The costings that you've provided are in relation to HVAC undergrounding as opposed to HVDC, which is historically—from overseas experience, anyway—a lot less costly when you're looking at large distances. Would that be a reasonable assumption?

**JUNAYD HOLLIS:** The numbers we provided have been AC versus AC, just for clarity. Yes, my understanding is HVDC does get more economically beneficial relative to AC as the distances get higher, typically. Underground construction will probably encounter much more variable cost drivers over wherever it's built. If it's built in a very accommodating, flat, soily ground, that will be a very different picture to if it was built over rocky, mountainous ground, for instance.

**The Hon. WES FANG:** I put a question to the people from Monash University earlier that was effectively along these lines. If you're going from point A to point B and it's a long distance, where it's required to be an underground cable, that can be achieved with HVDC. But the reason we don't switch from HVDC to HVAC is because of, obviously, the converter stations and the cost of converting from AC to DC. I think it's around half a billion dollars for each station, give or take. If we're looking at connecting a project like a REZ to a major metropolitan area and we've got a large distance to span—and given the cost and difficulty of undergrounding—why can't we have HVDC run from location A to location B without the ability to connect in, and then underground where required and where it's feasible, but then for places where it's not feasible we can go overhead with the HVDC? That seems to me to be a hybrid solution that's the best of both worlds. The only thing it doesn't do is allow us to tap in without the construction of a converter station. Is that a feasible option, in your experience? Do you think that we would have the expertise in this country to do that?

**JUNAYD HOLLIS:** It's a very interesting proposition, and I will preface this by saying I am not an expert in HVDC solutions.

**The Hon. WES FANG:** None of us are either, but we're getting much better at it the longer this goes on.

**JUNAYD HOLLIS:** I will share my opinion on the question. It's plausible it could be feasible. One of the constraints you get with HVDC solutions, as you described, traditionally, is they need to have very stable and secure grids on either side. They tend to be quite disruptive in terms of the harmonic distortions that they can put into the grids that they're connected to on either end. That's why you've traditionally tended to see them installed

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between, say, States or zones as they are—as you'd see in Basslink, Murraylink et cetera and, where they exist overseas, typically between big grids. Modern HVDC technology is slowly starting to overcome some of those barriers. So your VCC converter technology, which has been available for the last 10 years or so does give you somewhat more ability to plug into grids that aren't quite as—

**The Hon. WES FANG:** Stable.

**JUNAYD HOLLIS:** Robust, let's say. Are they at a technology point yet that would enable the scenario that you described of connecting a REZ to a major load centre? I do not know. It is worth investigating. It's not completely out of the question. The second part of your question was about skills in this country. I would suggest that, no, we—if you're going into those very cutting-edge HVDC technologies required to get the sort of scenario you described, the skills available in this country would be incredibly limited.

**The Hon. WES FANG:** Have we ever let that stop us before?

**JUNAYD HOLLIS:** We've certainly let it slow us down.

**The Hon. WES FANG:** In relation to keeping the line as an AC line, part of the logic in that is that, obviously with overhead it adapts into the system easily and it moves the power around where we need it to be, but you can also more easily tap in and tap out along that route. What we've seen in rural and regional areas—I'm from Wagga so I'm quite familiar with HumeLink but also quite familiar with a number of pop-up renewable energy projects that are proposed in and around those areas where a transmission line exists and they can easily tap into it, which are outside of a REZ.

There's obviously also concern around prime agricultural land being overtaken by renewable energy projects and the loss of the ability to feed and clothe ourselves. If we were to put a HVDC line in, which makes it much harder to have these pop-up renewable energy zones along the route, what would you see as the negatives in relation to the actual transmission of that power? Is it going to be the case that the DC line feeding into the metropolitan area is going to be stable with the generation that's coming out of the REZ? Is it going to be the case that we're going to have to move more power around if we can't tap in and out? From a network perspective, what would that mean?

**JUNAYD HOLLIS:** The scenario you're describing is not something I'm very close to so it's probably best that I don't attempt to answer that. From a market perspective, I imagine it would limit your access to the most economically viable generation sites, somewhat. From a power systems engineering perspective, it's difficult for me to comment. It might be a good question for Transgrid.

**The Hon. WES FANG:** I'm just trying to drill down. Does it remove the option of feeding in and out at later dates or is it feasible to consider construction of, say, a converter station where a pop-up or another line is required later? From a networking perspective, does that create issues that you can see?

**JUNAYD HOLLIS:** I'm not sure about DC but even just comparing AC overhead to AC underground, that would create much greater difficulties trying to cut in at a later date and augment additional connections along the way. Overhead is very adaptable and very cheap to cut in, as it's described. The on-ground substation infrastructure required to do that later cut in is relatively simple to build. The underground equivalent is always significantly more complicated, first from a power systems, engineering point of view and just a physical, equipment, cost point view. DC would have converter issues again, so that adds almost an order of magnitude cost difference there.

**The Hon. WES FANG:** My final question is: You spoke about growing up around the Snowy Hydro project. Obviously, the overhead powerlines that were installed as part of that project, as you said, are quite prominent and crisscross the landscape. Is it the case, though, that technology really hasn't advanced that much in the time from when Snowy Hydro was built until now? We're effectively using the same transmission infrastructure, the same transmission projects, and we're still scarring the countryside with these towers. Have we not been able to improve the technology at all in the 50-, 60-odd years or more since those lines went in?

**JUNAYD HOLLIS:** They do still look fairly similar on face value and the fundamental technology for AC transmission has not really stepped forward. There is obviously a lot of evolution that's gone on under the covers. If you look at an airliner from the 1970s and one built today, they look pretty much the same on the outside. On the inside they're quite different. It's not too dissimilar in electricity transmission, all the way from the circuit breakers, the protection, the strength, what we know about the resilience of the towers and the different technologies applied within the cables. All of those have evolved quite some way, but it is fair to say that the fundamental technology hasn't changed, with the exception of HVDC showing signs that it may be more adaptable

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than it used to be 20 or 30 years ago. But I stress that that is not well demonstrated at a global scale yet. There is only a handful of places where they're starting to explore some of the applications that we're discussing now.

**The CHAIR:** Mr Hollis, I've asked a few witnesses this today—I don't know if it's the most recent rule change but a recent rule change in terms of National Electricity Rules—about the enhancing community engagement in transmission building, which came into effect I think on 5 December last year. How will that change the way Ausgrid goes about its business in terms of engaging the community? You're aware of the detail, I assume, of that change?

**JUNAYD HOLLIS:** I am aware of the change. I am not closely across the detail, I must apologise. My understanding of it at a high level is that it will be broadly consistent with our existing community engagement protocols. We publish our community engagement protocols. We take a very rigorous approach to that. I have been involved in some of those personally with our climate resilience program on the Central Coast and in Port Stephens. It is something we take great pride in and consider ourselves one of the best in the industry. I do need to acquaint myself better with the detail of that rule change, but I would hope it would not be too far away from what we already do.

**The CHAIR:** In relation to the engagement, therefore, if you do already do it, it would be that you are engaging the community very early—right at the beginning, if not almost before the beginning, of the process—with very clear, accessible information. I wanted to explore what you do in terms of options for consideration for the community. I think that has been part of the reason why there's been such pushback, because it appears as though the community hasn't really been given any say in options. They've been given the option of overhead and that's it, and that has I think got a lot of communities' backs up. How does Ausgrid go about ensuring that they're genuinely engaging with the community on the options and the costs and benefits of overhead verses underground in particular areas?

**JUNAYD HOLLIS:** Perhaps best if I refer to a handful of examples. I think they are all in our submission. One very recent one, which is a current underground line in Belrose, which we have been consulting with the community on for a number of months now, long before any construction started, about that becoming an overhead line—so converting an existing underground line to overhead. The cost difference in that particular instance was a \$5 million job for the overhead versus \$10 million for underground. It's a short strip on the fringe of a Sydney suburb that goes into some bushland.

There was community consultation on that and that ranged from doorknocks, letterbox drops, multiple sessions held with community members, both online and in person. That has now progressed to the point where we think we've got community consensus that the overhead option is appropriate and acceptable. Both overhead and underground had their downsides in that particular instance. That was one where we had a genuine option to do either. From a technical standpoint we could have gone underground or overhead in that instance, and through the consultation we determined that—and also from a cost point of view, the underground option was not completely off the table. Through the consultation process we came to a view with the community that the overhead would be the best balance.

Another example is the project we did in Wamberal some years ago, which I think had two or three years of consultation prior to construction. We proposed initially a very short span of underground with about 15 kilometres of overhead. Through that consultation we adapted our design. There was pushback against the overhead in some portions of that particular build. While there were technical feasibility issues, which blocked us going underground the whole way, as well as cost would have been quite prohibitive, there was a hybrid solution where we could extend the part of that project that was underground and leave the rest overhead. I think it ended up being four kilometres underground, the remainder overhead. That was an example where through that quite prolonged engagement process we changed the design from overhead to underground.

More often than not when we're in a situation where we are proposing longer overhead transmission lines, the underground option, or alternative, is either technically infeasible, economically unachievable or both. Then the consultation is really about how do we pick the path that minimises the impact at a micro, local level. We are talking individual farms and individual properties. I've seen overhead line designs that scoot around individual pools in backyards to make sure that we can maintain safety for those particular individuals. One of the advantages in overhead line design is you can be quite adaptable in your route choice, within reason, and you can, without enormous cost implications, quite often minimise the impact on individual stakeholders along the route. That's more often than not where our consultation takes us for that type of construction.

**The CHAIR:** With the ones that you have here and talked about, have any of them been hugely controversial in terms of having community action groups resisting? Has it got to the point of what we are seeing in certain parts of New South Wales now?

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**JUNAYD HOLLIS:** Probably not to that scale. One of the more controversial ones we had was the Empire Bay 66 kV, within our submission. The controversy in that case was really around EMF, electromagnetic frequency. It ended up with quite a significant petition going to the New South Wales Government. We worked through that process with the community. We have some very highly qualified specialists in that field in Ausgrid. We have very detailed standards and policies around managing electromagnetic frequency issues in the community, and we made some adjustments to our design to make sure that those issues that the community had flagged were appropriately mitigated and that that was appropriately communicated to the community, which is no small challenge. That was probably the worst we've experienced, so not quite to the degree we're probably seeing in the REZ space right now.

**The CHAIR:** It does seem that the way in which Ausgrid goes about its community consultation and talking to people about the pros and cons of overhead and underground isn't the "my way or the highway" approach—which is overhead or nothing—that we potentially have seen from some of the other companies, to be honest. Even here today, there's this mixture of underground and overhead. Yes, it's not hundreds of kilometres in the region. But does it matter, do you think, in terms of getting initial community buy-in, that you're genuinely engaging with them? You're not ruling undergrounding out. The facts are on the table in terms of undergrounding being better in some parts. You acknowledge that, in terms of extreme weather events. That's been hard to get from some companies. They won't even acknowledge that, which I do find extraordinary. So that's a statement, but do you have any comment in regard to why it seems as though you have brought the community with you most of the way? And you do seem as though you're listening to their concerns and responding, as best you can.

**JUNAYD HOLLIS:** As I said, we do take our community engagement responsibilities very seriously. It's very much front and centre. We try everything in our power to be as transparent as we can be, and that's part of our operating procedure and our role in the community. That said, we probably have an advantage relative to some of the other people you'd be talking to here in that we are typically building shorter transmission lines, closer to urban centres. The likelihood of us encountering scenarios where underground versus overhead is a genuine, technically feasible option is probably more prominent for us and the type of area that we operate in than for others. If you were talking about a line that was going to traverse the Great Dividing Range, you would more than likely quite quickly encounter sufficient technical barriers that would make it infeasible. So it's a benefit of geography for us, to some extent.

**The CHAIR:** I could go on. I just want to get this one last question. How do you factor the increasing likelihood of extreme weather events into the decisions that you make, whether it's undergrounding or overhead? In terms of climate risk scenarios, does Ausgrid say, "This is what we're expecting in 2030, 2040 and 2050"?

**JUNAYD HOLLIS:** We do. Last year we commissioned what was I think the industry's first granular climate risk forecast for our network. This was part of and accompanied our regulatory submission for the next five years.

**The CHAIR:** Could I ask that you provide that to the Committee? Are we able to see that?

**JUNAYD HOLLIS:** It's published on the AER's website.

**The CHAIR:** We'll get it from you.

**JUNAYD HOLLIS:** We will send that. That was a very granular study that took into account the climate science or the best of the climate science that you can access, most notably for windstorm risks. In the particular part of the world that we operate in, windstorm risks are probably the biggest part of the risk profile for our network. Other components that were considered were floods, bushfires, heavy precipitation and heatwaves. That was forecast out from 2050 and out to 2090. We really only adapted or used what was forecast out to 2050 as it starts to become fairly uncertain beyond that. And boiling it down, it effectively says that while weather or climate patterns year on year have been and will continue to be quite volatile, the overall trend, both historically and forecast out to 2050, is for it to be deteriorating at a rate of approximately 1 per cent per annum.

**The CHAIR:** What do you mean by "deteriorating"?

**JUNAYD HOLLIS:** The frequency of climate events that are likely, or have the capacity, to damage network infrastructure is increasing at approximately 1 per cent per annum. It doesn't sound like much, but over 20, 30 years, it starts to build up. Our plan that just went in to the AER for our funding for the following five years included a proposed allowance to start adapting to that increasing climate risk, which included a wide range of initiatives, both working with the community to make them more resilient but also looking at the network and how we make the network more resilient.

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**The CHAIR:** This is key to my thinking on this. Does undergrounding factor into that at all anywhere that maybe this part of the network could be more resilient underground?

**JUNAYD HOLLIS:** Absolutely. So undergrounding was a key tool in that toolkit or that proposal. I don't have the exact numbers to hand. It will be in the material we shared, but we are proposing to underground small parts of our 11 kV distribution network as part of that program.

**The Hon. EMILY SUVAAL:** Thank you, Mr Hollis, for making the time to appear today. In your opening remarks you mentioned the 4,000 kilometres, I think it was, of transmission infrastructure that you look after, of which there's 1,000 underground. Have I got that right?

**JUNAYD HOLLIS:** That's right. It's transmission and sub-transmission, so 33 kV up to 132 kV.

**The Hon. EMILY SUVAAL:** Up to 132 kV. The most that you have underground is a 132 kilovolt transmission line?

**JUNAYD HOLLIS:** That's correct.

**The Hon. EMILY SUVAAL:** So that's streets away from what we're looking at here, which is the high voltage 500 kV transmission infrastructure, which is what this inquiry has been focusing on.

**JUNAYD HOLLIS:** Some of. If it's looking at the renewable energy zones, it's completely credible that some of the renewable energy zones could be built at 132 kV.

**The Hon. EMILY SUVAAL:** If I can just continue with this, underground transmission infrastructure is typically located in the CBD and other dense metro areas. Could you explain to the Committee why that is the case?

**JUNAYD HOLLIS:** Sorry, underground transmission?

**The Hon. EMILY SUVAAL:** Yes.

**JUNAYD HOLLIS:** Yes. I guess that roughly 90 per cent of our underground transmission would be in suburban areas or city areas. Probably only 25 per cent of our overhead transmission is in city or suburban environments. Why is that the case? When you are trying to build a transmission line in an existing built-up or high-density building population area like a city, a number of factors come into play that can quite quickly rule out overhead construction. They include, probably not limited to: Can you maintain safe electrical clearances from the lines if you're overhead to buildings or building envelopes or plans, say, the New South Wales Government's plans for housing? Are they going to be compatible with overhead lines? That would be one consideration.

Another one is just physical space. If you don't already have an easement or accessway or free land, you're typically driven onto the verge of the road to build your towers or pylons. These towers or pylons for transmission lines, as you could probably imagine, are quite sizeable, and that is more, as often as not, incompatible with not blocking roads and footpaths and so on. Straightaway you end up with these really physical constraints that take overhead lines off the table. There are a number of other issues: just noise; overhead lines create noise emissions. Can you get them far enough away from residential dwellings in an urban environment? Quite often not. Airspace considerations: City airspaces are more highly contested, congested and controlled. Are you able to put these overhead lines up there? Quite often not. The list goes on.

There's probably half a dozen reasons which quite quickly—not always, I stress that. We have just built a line in Macquarie Park in north-western Sydney, 132 kV overhead line in an urban centre. We found a reasonable route, we could get the easements and the overhead line was going to give us best bang for buck, best capacity, best ability to augment later. That was done in an urban environment. More often than not, though, you end up with those other barriers effectively forcing you underground and into the roadway.

**The Hon. MARK BUTTIGIEG:** Just to follow up on that. The obvious concomitant conclusion is that if you're in a rural area where land's abundant, it's easy to get easements; you don't have all those constraints in the congested city areas, then overhead comes into its own.

**The Hon. WES FANG:** Tell that to the farmers, that land's easy to come by.

**JUNAYD HOLLIS:** That's right. Your ability to navigate all of those sorts of issues, the urban issues that I just mentioned, diminishes rapidly in a rural environment or a regional environment, and you start encountering a new set of issues—wetlands, Aboriginal heritage, acid sulphate soils. There are a number of notable environmental barriers, biodiversity areas and other protected areas, which can quite quickly—if not just increase cost—rule out from a technical feasibility point of view your underground option quite quickly.



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**The Hon. EMILY SUVAAL:** Could I get you to expand more about the environmental impacts of undergrounding lines?

**JUNAYD HOLLIS:** Yes. Two aspects to that: the construction period and then the ongoing period of operation. I imagine you've heard a bit about the construction period and the environmental impacts of that, so I'll do that second. In terms of when it's in operation, if you are building underground lines that are AC, have an equivalent capacity to the overhead line options, you have to build a lot of cables—typically about two to three times the number of cables have to go underground in order to meet the equivalent capacity you can get from one cable overhead. That starts to increase your easement, period.

**The Hon. EMILY SUVAAL:** Yes.

**JUNAYD HOLLIS:** You've probably heard about this. As I think was mentioned in the last discussion, a lot of what goes back in the trench after it's filled is something called TSB, or thermally stabilised—and I can't remember the rest. Anyway, it's effectively just a cement slurry. This allows the thermal issues to be dealt with on the AC cables in particular, which can be quite an issue. That's not very good for agricultural uses afterwards. It tends to screw up the drainage and it also tends to limit any root structures that can go down. Notwithstanding that, any plants with any material root structures aren't allowed to be grown on an easement that has underground cables in them, so trees are ruled out. Anything that resembles a large shrub is quite often ruled out. You're typically restricted to grasses, so grazing is applicable. Very few other agricultural uses are really credible once an underground line is there. From the construction point of view, the environmental impacts are quite significantly worse than overhead.

**The Hon. EMILY SUVAAL:** Significantly worse than overhead?

**JUNAYD HOLLIS:** That's our experience. Just getting rid of the spoil can be very challenging environmentally, particularly if you're encountering things like acid sulphate soils, which you do.

**The Hon. EMILY SUVAAL:** Why is that?

**JUNAYD HOLLIS:** I'll probably have to take that one on notice and we can submit some of the issues around acid sulphate soils. As I think was mentioned in a previous discussion, the interruption on agricultural uses during construction is quite significant and, even post-construction, you can't build any dwellings on an underground easement the same as you can't build dwellings of any significant size under an overhead.

**The Hon. MARK BUTTIGIEG:** Obviously, Ausgrid is predominantly an urban-centred distributor, so you're naturally going to get the majority of your network in those dense areas. In the limited set of circumstances where you do cover rural or semirural areas, because of those factors you outlined before would I be correct in saying that, almost without exception, you'd just put them overhead? On the outskirts of Sydney in new growth areas, for example, you'd go overhead normally, wouldn't you? Because you've got the land and the easements.

**JUNAYD HOLLIS:** Not by default. As I said, over the last 15 years, I think roughly 65 per cent to 70 per cent of our transmission construction has been underground; about the remaining 30 per cent or 35 per cent, overhead.

**The Hon. MARK BUTTIGIEG:** I'm interested in the proportion of how those ratios work out when you just limit your area to the rural areas that Ausgrid covers—which would be fairly limited, I would have thought.

**JUNAYD HOLLIS:** Yes, that's right. It depends what you define as rural but, as I said, we've had examples where we have used underground construction in a rural context.

**The Hon. WES FANG:** He calls Penrith rural, so—

**The CHAIR:** Order!

**JUNAYD HOLLIS:** But you're right; the ratio would be skewed towards overhead. It's almost indefinitely, from our experience, going to provide a more cost-effective solution. More often than not it will provide a technically feasible solution where underground, which can't avoid some of those environmental hotspots along the route, just technically can't be done. So your assertion is correct: Typically, we'd be overhead in a rural or regional context.

**The Hon. EMILY SUVAAL:** What are the impacts on Aboriginal cultural heritage of underground lines?

**JUNAYD HOLLIS:** Difficult to manage. They're considerable and difficult to manage. We have processes in place to manage those impacts. Simply put, when you encounter Aboriginal heritage artefacts in the soil where you're working—whether you're putting a pole or a tower or a cable in the ground—if you are going through land that's going to disturb a midden or something of that nature, you work with the local Aboriginal

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community to make sure that any archaeological artefacts are recovered and appropriately managed there in the way that is suitable to their wants and needs.

The other alternative is, if you identify an area of Aboriginal heritage like that, you can try and avoid it and go around it, in simple terms. It is reasonably easy to achieve that when you are putting in poles and wires or towers and wires, because you have the ability to move by hundreds of metres in any direction where a pole is, more often than not. With a cable, you are generally quite fixed on the course that you take. We've got a proposal for a circa-100-kilometre transmission line at the moment. Over the course of that particular line, I think we're looking at in the region of 100 to 150 different Aboriginal heritage sites that need to be assessed, accommodated, avoided or managed. That's the kind of scale we're talking about. If you're doing that with an underground line, you are invariably going to be going straight through the middle of them. Not unmanageable, but it will certainly slow the process down enormously and drive up cost.

**The CHAIR:** Thank you very much for your evidence; it was extremely valuable. The Committee will get in touch with you regarding anything you've taken on notice and with any supplementary questions, should members have them.

**(The witness withdrew.)**

**(Short adjournment)**

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**Ms MARIE JORDAN**, Executive General Manager - Network, Transgrid, sworn and examined

**Mr JEREMY ROBERTS**, Major Project Delivery Director, Transgrid, sworn and examined

**The CHAIR:** Welcome to what is the last session of the final hearing of this inquiry. Do you have a short opening statement to make?

**MARIE JORDAN:** I do. Thank you for the invitation to appear at the inquiry today. I would like to acknowledge the traditional custodians of the land on which we meet this afternoon, as well as the traditional owners of the land where Transgrid's assets are situated. I pay my respects to their Elders past and present. For the Legislative Council members that were not on the previous inquiry, my name is Marie Jordan, and I am the Executive General Manager - Network at Transgrid, which gives me the responsibility for network operations, reliability and systems security at Transgrid.

I have worked extensively in the energy sector for more than 40 years, primarily in North America. This includes executive roles at Pacific Gas and Electric Company, National Grid, and I also acted as CEO of Peak Reliability, and also as a transmission consultant to the California Public Utilities Commission. As CEO at Peak Reliability, my remit included operational oversight of the transmission system for 14 western states in the US, as well as British Columbia and Baja California in Mexico.

I'm appearing with Jeremy today, who is the project director of HumeLink. At Transgrid, we support the Australian and New South Wales governments' climate strategy to cut domestic carbon emissions to net zero by 2050 and the Commonwealth's target that 82 per cent of our energy from the grid by 2030 will come from renewable energy sources. This timely transition to renewable energy and exiting from fossil fuels are critical to meet these targets and reduce carbon emissions. A modern transmission network is required for a decarbonised future. We need increased capacity, increased generation and increased interconnection between the States to be able to share energy.

The Australian Energy Market Operator's 2024 draft integrated system plan, released in December 2023, confirms the urgent investment that is needed in renewable energy generation, transmission and storage to continue to deliver secure, reliable energy. It is forecasted that households' and businesses' electricity consumption from the grid will nearly double by 2050. As you are all aware, coal is expected to retire faster, with all coal-generating stations in New South Wales, except for Mount Piper, to be retired by 2033, because they are at the end of their useful lives. We need to ensure transmission lines are built to connect renewable energy projects to the grid to get cheap, clean electricity from generation sources where it is most needed, as these power plants leave the energy system.

We do acknowledge that regional communities are being impacted by this energy transition. At Transgrid, we are committed to providing real benefits to the community in which we are building this infrastructure. We want to ensure these regional areas benefit by creating tangible opportunities such as jobs and training. We will be upskilling our workforce and strengthening local economies, including providing supplier and development opportunities to local and Indigenous businesses. We're also committed to continuing to work with local councils and community groups to leave long-term community benefits to these areas.

**The CHAIR:** Thank you very much. We will move straight to questions from the Opposition.

**The Hon. WES FANG:** Thank you, both, for appearing again at this inquiry. We heard from the regulator this morning that the HumeLink project has been resubmitted for assessment. Can you provide the Committee with some insights as to what has changed in relation to the project? Is it just costings? Is it other related matters? Can you provide some insights there, please?

**JEREMY ROBERTS:** I'm happy to provide an update there. It hasn't been resubmitted. It's part of the submission process that we do a CPA-1 process, which is for funding to allow us to develop the project. And we are now at the stage of what is called CPA-2—so the contingent project application for the full funding of the project. That occurred in December to request the full funding approval.

**The Hon. WES FANG:** Other than the costing, which has increased from \$3.3-odd billion to around \$5 billion, has any other detail changed?

**JEREMY ROBERTS:** There has been refinement. That is what we do in that development phase, in CPA-1. The intent of that is to develop the project, refine the estimates, commence the concept design and engage delivery partners to refine for that final submission. And that's why we've got a two-stage process—so that we can get the estimation improved, look at the risks to the project and continue land and environmental approval so

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that we can refine the project. That has route-refinement changes, understanding of the environmental impacts, the delivery partner design and how it will be constructed.

**The Hon. WES FANG:** I asked this morning who is responsible, in effect, for looking at the project, not simply from the proposal that the constructor puts forward—that is, Transgrid, in relation to HumeLink, which is to be an overhead line—but who evaluates the other proposals, if there are any? For example, who is responsible for determining whether an underground solution might be feasible, suitable and more appropriate? Effectively, that seems to fall to Transgrid. Would that be fair?

**JEREMY ROBERTS:** I would say, following the RIT-T process, we assess options and we put forward those options to the regulator. Through that RIT-T process, where we look at different options, different pricings and the different times it takes, the option that is the most prudent and efficient is put forward. Those options are publicly available—what options are assessed through those phases. That determines, through that iterative process between ourselves and the regulator following the RIT-T process, which option is chosen.

**The Hon. WES FANG:** In relation to the costings that you use when you're looking at those options, are you just looking at the construction costs or are you looking at the whole-of-life costs and the less tangible matters, such as the issues around social licence, community concerns, community engagement and the community's opinion?

**JEREMY ROBERTS:** The process follows a set of constraints that we have to apply to—that is, the construction cost; the maintenance cost over the life of the project is assessed; the environmental impact, which are the biodiversity impacts of the project; the land and the land compensation, following the just terms Act; and the social licence. We're working very closely with the AER to improve that social licence funding that is available to us so that we can improve the local engagement and the community benefits that occur through that process, but it is quite strict on what you can assess it on currently.

**The Hon. WES FANG:** You'd be aware that proponents of undergrounding have released a number of reports. One, which I'll term the Amplitude report, has been released. Have you had a chance to review that report and assess its contents?

**JEREMY ROBERTS:** Yes.

**The Hon. WES FANG:** Can you provide to me whether you believe that report is credible and where you believe that the report doesn't accurately indicate the costings for HumeLink to be undergrounded?

**JEREMY ROBERTS:** Sure. As per our submission that we provided to provide more information around that, I won't talk to the credibility of that on a like-for-like basis of what it was assessing. I'm not talking to whether it's credible or not. Where I would like to draw the attention to is the apples-with-apples comparisons of the transfer capability of the option that was assessed by Amplitude. We have a requirement with AEMO to ensure that the megawatts that we can transfer power through the option must be sufficient. When we compare that to the Amplitude report compared to our GHD report that we worked on, it is 33 per cent less power transfer as opposed to what we would need to meet our needs and ensure that we have the adequate redundancy under electricity rules. By having 33 per cent less power transfer, that is a 25 per cent smaller cable. Obviously, that is reduced costs. That is a smaller trench. All those parameters factor into the price. I'm not talking to the credibility of the report itself.

**The Hon. WES FANG:** Because part of what we heard last time Transgrid appeared before the Committee is that there isn't a great amount of expertise in HVDC within your organisation. Would that be a fair assessment?

**MARIE JORDAN:** That is correct.

**The Hon. WES FANG:** How were you able to do an accurate assessment of alternative positions like the Amplitude report if you do not have that expertise in house?

**MARIE JORDAN:** When I talk about the expertise, it is more of the engineering and construction capability. We have quite a few people on my engineering team that are globally based, myself included, and have a lot of expertise in HVDC. I've just brought in for my system resilience role a gentleman from EirGrid. He was an executive over at EirGrid in Ireland and was involved in a lot of HVDC. Really, when I'm thinking about implementing the solution, I think Australia as a whole does not have a lot of resources for the construction activity, some of the engineering. Also, when we've talked about the feasibility of HVDC at this time, just the availability of the components is a huge impact on trying to get the construction built in time.

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**The Hon. WES FANG:** Transgrid has already admitted that they've started the ordering process and the design work around a lot of this stuff for overhead. Are you rejecting undergrounding because you've already put money down and this stuff is probably going to arrive slightly quicker?

**MARIE JORDAN:** No, not at all. When we've looked at the solution, we always look across the board at the beginning of the process. While undergrounding is not in the RIT-T, undergrounding is always considered up-front. So HVDC, HVAC, all the different components are looked at. It was not feasible for this. There are a lot of different constraints that occur with a project of this length—the terrain that it crosses, the number of HVDC stations required. There are a lot of things that, right out of the gate, make the opportunity to use HVDC not appropriate.

**The Hon. WES FANG:** I note that, in the response to the Amplitude report you put forward, you indicated that, for example, thermally stable backfill was required for the whole of the transmission and that was missing from that Amplitude report. Do you still believe that that's the case?

**MARIE JORDAN:** I firmly believe, for a 500kV line, thermal backfill is required. The slurry is needed. A good example of a line that is using the capacity and the redundancy is SuedLink in Germany and they absolutely require the slurry backfill into that trench. That trench is 50 metres wide for SuedLink and I think that is a very comparable transmission line to what we have in HumeLink.

**The Hon. WES FANG:** How many long distance HVDC transmission lines does Australia have?

**MARIE JORDAN:** The one that I'm familiar with—and I'll take on notice if I've missed some, but I do know you have Marinus Link, which is an underground cable. And underground cable—you'll see that a lot in HVDC solutions. As a matter of fact, when I was here last time there was discussion about the most recent HVDC line that is headed into New York City. The majority of that is in the Hudson River. It's very common. The other one is Murraylink. Murraylink is not comparable in distance. It used to be one of the longest in the globe for HVDC but it's a much lower voltage and it carries much less megawatts across that line so there's a very different heating factor on that conductor.

**The Hon. WES FANG:** Okay. You believe that that's the reason why they haven't used thermal backfill on those projects?

**MARIE JORDAN:** I do not know what their engineering report required but when I look at HVDC lines that I've either been engaged with or involved with around the globe, they've always been much larger than the Murraylink and they have had thermal backfill soil.

**The Hon. WES FANG:** I guess that's where we're delving into the realms of opinion. It sounds to me as if you're progressing the view that your assessment of other projects overseas of a similar style would have that capacity thermally backfilled, but it's the technical expertise around determining what that is. That's what I'm getting at. Has somebody from Transgrid, with the capability and technical expertise, actually delved down and looked at the proposals and done proper costings so that the Government, the regulator and the community can determine the best outcome that suits everybody's needs?

**MARIE JORDAN:** When we go to companies like GHD—they have global experience and they have engineers that look at this based on good engineering practice. As an engineer all my life, you don't just look in your patch; you look beyond your borders of where you work and make sure that you are aligning good-quality engineering practices in your decisions. My basis for that statement is a lot of experience and a lot of understanding of what people are doing around the globe.

**The Hon. WES FANG:** I often criticise the Hon. Emily Suvaal for asking these sorts of questions but I will ask it of you just so that I'm aware. How many HVDC lines have you been involved in the construction of?

**MARIE JORDAN:** In the construction? None. But understanding and the engineering process in the UK, yes—National Grid; the UK grid. I was the senior executive there. I spent a lot of time in the UK looking at their projects and they do have HVDC. Physically in the construction, no. Going out and watching the construction, yes.

**The Hon. WES FANG:** And doing technical assessments?

**MARIE JORDAN:** No. I was an executive, I have a senior vice-president on the executive leadership team for National Grid and I did not do any physical engineering for National Grid.

**The Hon. WES FANG:** Unfortunately, my time is up.

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**The CHAIR:** I want to turn to the issue of extreme weather events. I'm not sure if I asked this at the last Transgrid inquiry, but how does Transgrid factor in climate risk scenarios? What climate risk scenarios are you using when you're coming to make decisions about infrastructure now? What are you using to withstand weather that we are going to be having in 2030, 2040 or 2050—climate risk scenarios, in other words. What do you use for that?

**MARIE JORDAN:** I'll go ahead and start with a global look at how we do this at Transgrid across all of our assets. Then I'm going to ask Jeremy to walk through HumeLink because I think that's the interest—the 500 kV towers.

**The CHAIR:** Sure, go ahead.

**MARIE JORDAN:** Recently we were asked to put forth our resiliency plan to IPART. It is a very thorough look at weather patterns—very similar to what was discussed with Ausgrid. We are looking at the changing environment. We are looking at heat, flood, wind, frequency of events, and we are looking at our standards for design and making sure that those are fit for purpose. I will hand it to Jeremy to speak.

**The CHAIR:** In relation to the resilience plan you just mentioned that you put into IPART, is it possible at all for the Committee to have a look at any of that work?

**MARIE JORDAN:** They did an audit of our processes. I'll take it on notice and have our asset management organisation provide information on their resiliency plan.

**JEREMY ROBERTS:** To add to Marie's point there, we apply the AS 7000 standard, which is the latest transmission line standard for our design processes, and on top of that we have to assess it. So that's the guideline. You have to then assess what sort of conditions you're going into. For HumeLink we are going into alpine regions in and around the Snowy Mountains, so we have to design to allow for those climatic conditions. We have a suite of towers that are built for alpine conditions as opposed to other conditions that you factor in—the wind loading et cetera. We look at around the 20-year mark to be fairly certain of the accuracy of the climate conditions. We work and take information from the CSIRO and the Bureau of Meteorology to look at those—at least 20 years for a high level of accuracy—and that's showing no indication currently that we need to change or adapt from the Australian standards currently.

**The CHAIR:** A lot of the witnesses who are saying that overhead is better in many circumstances do talk about how long overhead transmission lasts compared to underground, potentially. How long is that? For example, HumeLink—you're telling the community that it will be in place for, or it is supposed to last for, what is it, 80 years, 60 years, 50 years?

**MARIE JORDAN:** Underground conductor has to—

**The CHAIR:** Overhead, sorry.

**MARIE JORDAN:** Overhead is 80 and underground is 45.

**The CHAIR:** So it's 80 years. Is there a reason why you are using 20 years?

**JEREMY ROBERTS:** That's the best standard we have on what the climate is going to be as far as the level of accuracy.

**The CHAIR:** No, it's not. It's what Transgrid has. The CSIRO has modelling. All government departments have access to modelling from the CSIRO, the Bureau of Meteorology—every single international organisation. So you're saying you can't access that?

**JEREMY ROBERTS:** No, we have that. I'm saying the accuracy that we apply is at least the next 20 years worth of data. That's into the 2040s. But we take that same data from the CSIRO and the bureau, and we work with the RFS and other agencies as well, to look at a full range of climate conditions. Based on our information, that is not changing the Australian standards. We must apply the Australian standards and use ALARP—which is "as low as reasonably practical" to design—to ensure that we are not over-designing. We will be heavily scrutinised for over-designing above what the standards are.

**The CHAIR:** When did those standards change? For example, a steel transmission tower—when did those standards last change? Have they been updated in the past few years?

**MARIE JORDAN:** We'll take that on notice for the exact timing, but there are towers that are grandfathered in, and they are not the same standard as they are now, like the ones in VicGrid. I heard quite a bit of conversation regarding VicGrid. Those towers were grandfathered-in towers. The towers we build for our 500 are going to be at a higher standard than those towers.

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**The CHAIR:** What was the impact of the Black Summer fires on Transgrid's network? It was pretty significant, wasn't it?

**MARIE JORDAN:** For damage to the network?

**JEREMY ROBERTS:** I'll take that. As per the royal commission and state development inquiry into those bushfires, Transgrid managed and operated its assets as per the emergency response procedures. There were five significant events: three loss of supply to Transgrid customers, one event affecting the access generation, and one result in the loss of supply and separation to Victoria. The three loss of supply events to customers were restored within 25 minutes. Our records indicate that in relation to the Dunns Road fire, which burned within the Snowy Valley government area from 28 December 2019 to 15 February 2020, Transgrid's control centre received five requests to de-energise our network. These requests were actioned.

**The CHAIR:** That's your evidence? I have the report in front of me; that is the report from Transgrid *Overview of 2019-20 Bushfire Damage to TransGrid's Network* as a result of the Black Summer fire. The executive summary has 2,681 transmission line structures were within the bushfire zone and there were 1,822 steel lattice tower and pole structures within the burn area and 596 wood pole structures. How many of those were damaged, for example?

**MARIE JORDAN:** We can take on notice the exact number, but the steel tower structures fared well. We were able to re-energise. Actually, some of the wood pole structures, I do know, had some fire damage. Many of it could be re-energised, and that's at the 132 level, and they had work done post being re-energised. We took clearances and took care of those. But we can take on notice more exact figures.

**The CHAIR:** It's an important line of inquiry for this Committee. The report states:

... the unprecedented scale and intensity of the 2019/20 bushfires has had a significant impact on TransGrid's transmission network and the condition of the assets.

That's your report. We're here today and I'm asking you about what the impact of those fires was, and it just seems as though the whole impact is not being conveyed to this Committee in a way that this report would suggest. Were you around then at that time, Mr Roberts?

**JEREMY ROBERTS:** Yes, I was in Transgrid at that time.

**The CHAIR:** It had a significant impact on your infrastructure—on the network and the assets.

**JEREMY ROBERTS:** On the wood pole structures, there were some damaged poles. I'll take it on notice as to the exact impacts of how many. But, as I stated before, that's the impact to the customers and the outages that occurred as a result of our network at the time. I can provide the exact numbers of wood poles that were damaged or replaced as a result. But, again, that is the 132 network, not the HV 500 kV tower network.

**The CHAIR:** I've got here central New South Wales, not necessarily saying that the towers themselves were impacted. The report states:

In total there were 12 trips of 500 kV transmission lines. This is significant as these are not only part of the main backbone of TransGrid's network but are also the tallest and largest structures on the network. The fact that so many trips occurred on these assets indicates the magnitude of the severity of the fires and the volume of smoke being produced at the time.

As well as trips to Transgrid's 500 kV network there were also 129 outages caused by bushfires on the 330 kV network.

That's just the Central Coast. I asked you before about the impact of the Black Summer fires and you said something about Dunns Road, but it impacted your network to a significant degree, didn't it? I have the report in front of me and I've read it extensively. I didn't even know about this report until after the last report was tabled, after I asked both of you, I think, about bushfire and the impact of extreme weather events. This report was never given to us by you for an inquiry needing to examine overhead versus underground. You're aware of the report, though, Mr Roberts?

**JEREMY ROBERTS:** I'm aware that there was an inquiry into the bushfires and a royal commission into the bushfires the previous executive from Transgrid did appear at.

**MARIE JORDAN:** And when you look at the impact of the infrastructure, trips and outages are very common. I know that having worked in California for Pacific Gas and Electric we face similar fire events that are here and, once again, when you look at the fire impact, being able to restore after the trips are very—a line tripping, it could be an instantaneous trip, it could be a longer term outage, but you're always trying to do the restoration as quickly as possible.

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**CORRECTED**

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To the point on Pacific Gas and Electric and some of their undergrounding efforts, I know that I did provide evidence on that. There are requests for 10,000 miles of underground of the lines, but once again, these voltages are very similar to distribution lines in neighbourhoods. And just to be clear, when they underground those lines for fire protection, they only underground the primary. They only take the cable that is at 12 kV to 23 kV, put it in a trench. The poles, the equipment, everything else that is on that pole, including the pole, is still there. They are just taking distribution voltage. When you talk about fires, you're talking about the distance to vegetation and the distance to ground. That is why distribution is much more impacted during a fire, and they're onward poles and actually have the potential to start a fire because of their proximity.

**The CHAIR:** We have this report which states significant damage to the network and to the infrastructure and some of it would take some time to repair. What is Transgrid doing now—I asked about extreme weather events—to futureproof your network against a similar fire, which is inevitable if not worse than the Black Summer fires? What lessons have you learned from the Black Summer fires in terms of doing infrastructure—building differently or improving that infrastructure—so it can withstand the fire better?

**JEREMY ROBERTS:** A couple of points. Obviously building more alternative pathways, which is having an integrated system, is paramount in that so that you have alternative supply sources. If one line does trip out you have alternative ways to provide that supply. And a trip doesn't necessarily mean that a blackout occurs after that. We trip and reclose very often on the network when required in all kinds of scenarios. Having more resilience means having more alternative pathways, hence why we're trying to build out the network. As we change our generation source and rely on the coal generators and move to more disbursed renewable generation, we need more alternative pathways for our lines to be connected up together in that grid across States and within New South Wales getting into the red zone. That's one component; having more of a resilient network so that if there is a fire in one area, you have alternative pathways to provide that same power to those areas that need it.

We also, as I stated before, follow the Australian Standard requirements and continuously review that against our bushfire plans, taking on recommendations from those inquiries that happened previously to ensure that our network is kept as reliant as possible, looking at things like the resilience program that Marie talked about previously. We're audited by IPART, and since 2017 we have been fully compliant on our bushfire management requirements for bushfire protection. Over 50 per cent of our maintenance budget each year goes to the prevention of bushfires—either ensuring our vegetation stays below the limits they require or replacing any assets that need replacing. A significant amount of our focus is prevention of bushfires.

**The CHAIR:** I don't think that's going to stop another Black Summer bushfire but good work.

**The Hon. EMILY SUVAAL:** Thank you both for appearing again today. I just want to take you back and clarify some of the evidence that you gave earlier to make sure my understanding is clear. You were talking I think, Ms Jordan, about—is it the VicGrid towers? Were these the towers that were most recently impacted by weather events in Victoria?

**MARIE JORDAN:** In Victoria they were AusNet towers. I'm sorry, I misspoke.

**The Hon. EMILY SUVAAL:** That's fine. What I suppose I'm trying to understand is that you mentioned they were grandfathered. Is it fair to say they are not built as they would be today, so they're not built to the same standards?

**MARIE JORDAN:** Correct.

**The Hon. EMILY SUVAAL:** How is it different, I suppose?

**MARIE JORDAN:** Actually, I'll pass that to Jeremy.

**JEREMY ROBERTS:** The standards that we apply, the AS 7000 standards, specifically say, for the HumeLink example, they are built to at least a minimum of 165 kilometres per hour wind, up to 200 kilometres per hour wind gusts—as opposed to, I'm led to believe, the wind gusts that occurred in Victoria a couple of days ago were 130 kilometres per hour. The standards we build to now are far higher. It also depends. As Andrew Kingsmill alluded to previously with EnergyCo, depending on the terrain—such as Queensland—you'll have cyclonic conditions. You would build to a higher standard there as well. But our standards are what we're required to. For the area of HumeLink, as an example, it's well above and would have prevented what happened in Victoria. But that is part of an ageing infrastructure, hence why building and continuing to build out the network is critical at the moment.

**The Hon. MARK BUTTIGIEG:** When you do your updated modelling for the renewable energy zone's transmission, presumably you factor that updated reliability into that new modelling. So you'd take the Victorian



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experience, for example, and control for the updated technology of the towers and that gives you—is it that sophisticated? Is that what we're doing, or are we kind of just—

**JEREMY ROBERTS:** Similar to our own network, wherever there is an incident or something that happens, we have a very sophisticated asset management process that does cover and check off—is that a type fault? Do we have that same type of equipment elsewhere on the network of the same age? Do we need to do more preventative maintenance on those? We have a thorough—

**The Hon. MARK BUTTIGIEG:** No, I'm saying, in light of the Victorian experience, that would now presumably create a tangible input into the new modelling, because it's happened down there so it could happen up there.

**The Hon. WES FANG:** Don't go off the scripted questions, Mr Buttigieg.

**The CHAIR:** Order!

**The Hon. MARK BUTTIGIEG:** But there's control for the updated technology.

**JEREMY ROBERTS:** We confirm the inputs of that incident—would that affect ours? So, yes, if it was found to affect ours, we would change our design. But we've confirmed that the design that we're designing to now already would prevent that happening.

**MARIE JORDAN:** And I would like to share that it's very common in this industry, with the magnitude of infrastructure you put in, that many transmission companies have grandfathered in assets that if there were something to happen, you'd build it to the new standard. Quite often you'll find in revenue requests and rate cases, as in the US, you will be asking to upgrade those. But it isn't financially—there's too much bill impact to go out and change all your towers when they change a standard, so you use opportunity and you look at the age of towers and you're working through to upgrade them. I don't want to make it sound like it's a bad practice in AusNet. It's actually common practice across all of the industry.

**The Hon. EMILY SUVAAL:** Given the recent events in Victoria that we've talked about, what more are you doing at Transgrid to improve the resilience of the network?

**MARIE JORDAN:** In the resilience area, and looking at the towers, we do look at the maintenance practice you'd have for coastal towers versus interior towers. They end up with higher corrosion. We look at the age of our assets, and we're always looking at that when they come up—going out and doing preventive maintenance. The average age of our towers in the coastal area is about 54 years and, on those towers, our maintenance practice includes looking for any corrosion, doing repainting of the towers and removing all the rust. It's a common action that we're doing all the time. We condition-base review each of those towers on inspection, so it's a regular process. You really have to keep a good eye on your infrastructure in the field, through maintenance, but you're also modelling everything that's occurring on your network. You're trying to find those reliability issues by tracking what type of insulator failed or what type of tower was having problems. You end up with a database that's always giving you predictive analytics so you're better at replacing your assets on time.

**The Hon. EMILY SUVAAL:** Do you think that overhead transmission lines are appropriate in Australia, given the increasing impact of climate change and severe weather?

**MARIE JORDAN:** Absolutely.

**The Hon. EMILY SUVAAL:** Can you explain how Transgrid manages the bushfire risk that is associated with transmission lines?

**MARIE JORDAN:** Yes, happy to. Actually, we've been acknowledged for having, truly, a leading program. Bushfire starts not just with the assets and how you maintain them. You start at that relationship piece, with the Rural Fire Service and the different agencies, and we work very closely with them. Jeremy is very engaged in coordinating with those over the years, and he can probably speak to it better. But from a process that you go out and look prior to bushfire, you do fixed-wing lighter, which is a plane flies over and has very detailed view of those assets and you're looking for any anomalies—that's one of the first pieces—as well as any vegetation encroachment. Then you have your other inspections ongoing, and you have a day. We're looking to have all of our bushfire activity done before they declare bushfire season starting, and this year it started very early. So we were finished with all of our first run bushfire work by September, but that doesn't stop the maintenance activities that go on. Any time in a high-risk bushfire area where you find an impact or a problem on your system, it's rated in a much higher priority and often fixed in a very short period of time.

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**The Hon. EMILY SUVAAL:** I wonder if I can move to talk a bit more about undergrounding and your experience around that. Obviously overhead lines have the visual impact, but could you talk about what are the environmental impacts of placing high voltage transmission lines underground?

**MARIE JORDAN:** Yes, happy to. When you look at the actual disruption that you have, putting in underground transmission lines, it's significant. When you look at the amount of trench work—digging up to two metres, and even deeper in some instances, based on the slope of the land and the width of the trench, and the hauling out of the soil. When you look at a construction site in progress with that, typically, in a situation like what we have—actually, I submitted a picture of SuedLink in the first inquiry. When you look at the access road you're building, all the way along the full length of the line, and you're carrying in a lot heavier equipment, the weight of the reels I think is about 40 tonnes for a 50-metre length of a reel, and then you have these big expansion joint areas where you're even digging beyond that 50 metres to do the cable connections in those bays.

With HVDC, you only have two conductors for each circuit, so you'll have four conductors. But the amount of cement, slurry and all of that that is hauled in—you are reinforcing roads, your access roads look different, and then there's a big impact to the soil, for the thermal soil, being out there for that kind of distance. Then those conductors will typically be between 80 and 85 degrees when it's sitting in that slurry mix in the trench cables or in the trenches, in the slurry mix, and that high heat is an important piece. Then the other challenge you have is that that conductor is only good for 40 to 45 years, so you are going to be out repulling it. You will be pulling it out of the conduits, putting back in new cable, opening up those joint bays, reconnecting that cable in 40 to 45 years.

**The Hon. EMILY SUVAAL:** Tell me, what is the emissions profile like of the slurry and the backfill and all of this sort of stuff that you're then having to put into the ground?

**MARIE JORDAN:** We would look at it in different instances. I don't know currently what it is, because there are different ways of making slurry right now. I don't know how readily available it is. But I'll definitely look to see if we can find a credible source for that information.

**The Hon. EMILY SUVAAL:** Thank you. That will be interesting. Can you tell us about what are the cultural heritage implications, as well, of undergrounding these lines?

**MARIE JORDAN:** I will hand that to Jeremy, who has been in Australia a lot longer than I have.

**JEREMY ROBERTS:** I suppose the difference, when we compare it to overground, is the trenching nature means for that strip, for the full width, that has to be completely dug up for the whole route. Any impact that comes along has to be moved or is basically destroyed from an environmental component, as opposed to your overhead where you can micro-site. We are doing a lot of that work now on HumeLink, as an example, to avoid those high-impact areas.

As some examples on HumeLink, we have been able to adopt partial vegetation in some areas. We've completely avoided an area near the Maragle substation in the Snowy Mountains where there is a high conservation value on an orchard species. We are able to do that by micro-siting moving towers—obviously, not clearing any of those areas—as opposed to if that was a cable and a trench, you have to discontinue going through that path. It's a lot harder to be able to change the route of a cable, as opposed to a transmission line. In comparison, it will really depend on the type of terrain and what sort of impacts you are seeing, but our ability to change that as we go through the process on overhead transmission means that we can avoid and minimise.

**The Hon. EMILY SUVAAL:** Just in the time I have left, clearly the HumeLink project has caused a lot of angst amongst the community. What lessons have you learned from this project and how can community engagement be improved?

**JEREMY ROBERTS:** There are a lot of lessons that we have taken on board. For starters, the community engagement started in the middle of COVID, so not an ideal environment at all to try to be starting to engage with the community. Throughout the process, we did take on external support and reporting to say how we can improve this because it wasn't going well and we acknowledged that. We took on all those recommendations from the Rod Stowe report to improve on that. All of those learnings we've tried to apply now into Hume link—more face to face, building relationships with individual landowners, as well as rolling that forward into our next project in VNI; engaging earlier in the community on their understanding and seeking more feedback as early as possible on the route selections.

That is difficult sometimes, where some landowners or some community members want answers far earlier than we can provide them as well. So it is challenging when we do consult and talk for years. Some people get really frustrated that we are out there talking a lot and not actually doing. They want answers and they want

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certainty. That can be really challenging, as opposed to others that do want to be engaged really early and want input. It is a challenge, but we are out there trying to improve. We are part of the Energy Charter. We do try to feed into that where we can improve social licence and improve community investments. We are petitioning hard on those elements with the Energy Charter to improve that for our local communities.

**The CHAIR:** The time is up for your session and for this inquiry. This was the last hearing. Thanks very much for appearing. The Committee will be in touch with you if there are any additional questions from members.

**(The witnesses withdrew.)**

**The Committee adjourned at 16:20.**