

REPORT ON PROCEEDINGS BEFORE

STANDING COMMITTEE ON STATE DEVELOPMENT

**FEASIBILITY OF UNDERGROUNDING THE TRANSMISSION
INFRASTRUCTURE FOR RENEWABLE ENERGY PROJECTS**

CORRECTED

At Macquarie Room, Parliament House, Sydney, on Tuesday 18 July 2023

The Committee met at 10:00.

PRESENT

The Hon. Emily Suvaal (Chair)

Ms Cate Faehrmann

The Hon. Wes Fang

The Hon. Emma Hurst

The Hon. Stephen Lawrence

The Hon. Taylor Martin

PRESENT VIA VIDEOCONFERENCE

The Hon. Anthony D'Adam

The Hon. Bob Nanva

The CHAIR: Welcome to the first hearing of the Standing Committee on State Development'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 my respects to Elders past and present, 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 and Torres Strait Islander people joining us here today. Today we will hear from a number of stakeholders with various perspectives on the issue before the inquiry. I thank everyone for making the time to give evidence to this important inquiry.

Before we commence, I make some brief comments about the procedures for today's hearing. Today's hearing is being broadcast live via the Parliament's website. A transcript of today's hearing will be placed on the Committee's website when it becomes available. In accordance with the broadcasting guidelines, the House has authorised the filming, broadcasting and photography of Committee proceedings by representatives of media organisations from any position in the room, and by any member of the public from any position in the audience. Any person filming or photographing proceedings must take responsibility for the proper use of that material. This is detailed in the broadcasting resolution, a copy of which is available from the secretariat.

While parliamentary privilege applies to witnesses giving evidence today, it does not apply to what witnesses say outside of their evidence at the hearing. Therefore, I urge witnesses to be careful about comments they may make to the media or to others after they complete their evidence. Committee hearings are not intended to provide a forum for people to make adverse reflections about others under the protection of parliamentary privilege. In that regard, it is important that witnesses focus on the issues raised by the inquiry terms of reference and avoid naming individuals unnecessarily.

All witnesses have a right to procedural fairness according to the procedural fairness resolution adopted by the House in 2018. If witnesses are unable to answer a question today and want more time to respond, they can take a question on notice and provide a written answer. If witnesses wish to hand up documents, they should do so through the Committee staff. In terms of the audibility of the hearing today, I remind both Committee members and witnesses to speak into the microphone. Finally, would everyone please turn their mobile phones to silent for the duration of the hearing.

Mr MICHAEL KATZ, Member, HumeLink Alliance and Stop! Rethink HumeLink, affirmed and examined

Ms ANDREA STRONG, Vice-President, HumeLink Alliance, sworn and examined

The CHAIR: I now welcome our witnesses. Would either of you like to start by making a short statement? I ask that you please keep it to no more than a couple of minutes.

MICHAEL KATZ: Sure. Many thanks for the opportunity to address this Committee. I am a member of the Stop! Rethink HumeLink group. We have been battling for some three years to have HumeLink 1 built as an underground line. We want the people of New South Wales to have the same outcomes as Victorians and people in California, Germany and other places for safe, secure, low-emission delivery of low-emission power. Underground transmission with DC cables is safe. It's efficient, it's reliable and it's secure. It's best practice around the world. It's cheaper in the long run and it's the default standard by law in most countries, in particular Germany. This is in sharp contrast to overhead cables. Given these points, why are we here? Transgrid is attempting to build overhead cables despite the compelling analysis that it is much worse environmentally, economically and socially than undergrounding. This Committee can play a key role in stopping this environmental disaster before it happens.

We need to deliver low-emission power through low-emission transmission to the people of New South Wales. Transgrid is pushing for overhead because the regulations allow and, indeed, encourage or force it to do so, and because they believe it is faster. These regulations were developed 30 years ago at a time when we were not contemplating low-emissions electricity supply systems. They are no longer fit for purpose. By relying on these outdated regulations, all that is being considered in the project costs are capital, operating and compliance costs. There is no mention of the external costs, such as bushfires, nor the cost impact on communities, on the mental health of the nearby residents, or on native birds and animals losing vast areas of habitat. The issue of carbon emissions from massive bushfires is not even addressed.

We accept that up-front costs for undergrounding will be more than overhead, but not 25 times higher, as Transgrid has misleadingly claimed. Experts suggest that the real number is approximately two times. Operating costs should be much cheaper for underground because underground power is not damaged by storms, lightning, fires and so on. Compliance costs will also be cheaper because the size of the corridor that is required for underground drops from 70 metres to 15 metres, so it's substantially smaller.

The big problem is we don't account for external costs such as bushfires. And who wears these external costs when they happen? This is a key aspect. We don't believe that in the event of a major bushfire caused by an overhead transmission line, or by the transmission line stopping the proper management of a bushfire, Transgrid has the capacity to cover even a fraction of the massive costs of bushfires. If Transgrid is not going to pay, who will? It will be the taxpayers of New South Wales. HumeLink's primary purpose is to connect Snowy 2.0 to the grid. It is now established that Snowy 2.0 will be delayed until 2030 at the very earliest. There is no rush to build HumeLink 1.

We can and must "Stop! Rethink HumeLink". We should build properly, and that means underground, just like the Victorians are doing with Federal help for the 90 kilometres of the Marinus Link, which is going into Victoria right now. Let's not allow New South Wales to be a second-class State with second-class, dangerous and inefficient overhead powerlines that carry significant unfunded external risks and costs. Let's "Stop! Rethink HumeLink".

The Hon. WES FANG: I welcome you to this inquiry today, the first of the inquiry hearings that we will be holding. Thank you very much for your excellent opening submission. Before I go to the details around HumeLink and the impact, I want to take you back a little bit and talk to you about the initial aspects of the project itself and the consultation that has happened with people who live along the corridors that have been proposed by Transgrid. What feedback has been provided to Transgrid, and what information have they given you in relation to the impacts and what the project will mean for residents affected?

ANDREA STRONG: Thank you for the question. There has been consultation. The Stowe inquiry looked at some of the flaws with the consultation and brought out a report in, I think, late 2021. As a consequence of that, some community consultative groups were set up. But, despite this, I feel that the consultation has, rather than informing, been to manage community opposition. There seems to be this position of let's not tell them what we are doing and hope that they don't catch on until it is too late.

For instance, in the first CCG, Transgrid made reference to contacting people that were neighbouring the line. Now the way the process works is only those people that are directly impacted by the easement get compensation and are informed about the project. For people neighbouring it, their properties could be devalued by 30 per cent—and overseas studies have indicated up to 91 per cent for frontline homes—so they are not told

about the project. This was discussed in October 2021, that people neighbouring the easement should be informed. Well, they are just going out now. At the last CCG in May 2023, they are just going out now and telling these people neighbouring that they are being impacted. There are 4,322 of those and, with roughly three people per house, that is another 13,000 that could potentially not have any idea.

The Hon. WES FANG: We only get about 12 minutes per side for questions with you, so I am going to fly through my questions, if that is okay. I will ask for some succinct answers because there is a lot I want to cover in this time. In relation to the consultation, when Transgrid were consulting with affected landholders, was the issue of undergrounding the lines raised during that consultation? What was the response?

MICHAEL KATZ: Well, it was raised by ourselves. The response was "too expensive".

The Hon. WES FANG: In relation to the cost, have they provided modelling to you around what they perceived to be that cost and how it differs from overhead lines?

MICHAEL KATZ: When undergrounding first came up, we at the HumeLink Alliance raised a significant amount of money to get an undergrounding study written which would be independent. As soon as that became apparent, it seems to me that Transgrid decided to undertake their own undergrounding study. They went ahead and commissioned that and used Andrea and others to sit on the steering committee. The problem was the terms of reference were agreed by Transgrid. They were not really consulted—none of the other parties were consulted, as far as I could see, and so the results came out. Andrea, why don't you just run through those results very quickly?

ANDREA STRONG: Yes, I was on the steering committee for the undergrounding study. We had 52 outstanding issues with that study, and we didn't endorse the study. We thought it was flawed and unbalanced. Initially, they released the study in June 2022 for an HVDC option. They had \$18.7 billion, and we didn't agree with those costs. The consultant that was helping us said they will never retract it—they did. Two months later they came out with a cost of \$11.5 billion that we still think is significantly overstated. When the problem with the first study that came out was brought to the committee, we decided to go to an independent expert to get a third opinion. They thought about half, or a bit more than half, of what was included in the study as the cost—the per kilometre.

The Hon. WES FANG: Because of the limited time I didn't want to interrupt you. There were a lot of acronyms that you've used, and no doubt Hansard will come back to you later. I won't interrupt you. We will use the acronyms for the moment and then we might have to provide them later to Hansard. In relation to the study that Transgrid conducted, which wasn't endorsed and has had multiple iterations, versus what Stop! Rethink HumeLink had via their study, can you talk about what the differences were and how those amount to dollars in relation to the cost of the project?

ANDREA STRONG: We are currently in the process of getting the undergrounding study reviewed. When we get that, we will know what the costs will be. There are two costs with undergrounding as an HVDC option: There is the cost of the converter stations and there is a cost dollars per kilometre. We thought that the dollars million per kilometre was roughly about double what it should be. In addition, they compared the costs that were estimated for undergrounding in 2022 with the costs that were estimated for overhead in 2020. A repeated comment was that there has been this dramatic and sudden rise in electrical manufacturing costs in that period. I have got a—can I?

MICHAEL KATZ: No.

ANDREA STRONG: No, I can't hold this up.

The Hon. WES FANG: We can have it tabled later.

ANDREA STRONG: Okay.

The Hon. WES FANG: Obviously, if we've got some time later, I will come back to you in order to do that. You spoke in the opening statement about there being the direct costs of undergrounding. But there are also those indirect costs, which are, in effect, the effects on community, the effects on environment and the effects on unforeseen issues, such as bushfires. In fact, you almost stole my thunder when you were covering those points because I was going to ask you about those things. Can you expand a little bit and talk about the costs of something like a bushfire and how that adds to the cost to the community, not necessarily the cost to the actual line itself, in the construction phase?

MICHAEL KATZ: There is not a direct impact from a bushfire during the construction phase, for the most part. Obviously, there could be a bushfire while the whole thing is being built and then it's pretty hard to figure out what's going to happen. But in the normal course what we're really talking about is that an overhead

line is built, there's a storm and it arcs, meaning that the wires get close enough that the power can jump. That causes a spark and that triggers a bushfire. That's a known fact; it's reported in many, many studies of fires.

The Hon. WES FANG: We've seen that in Australia, haven't we?

MICHAEL KATZ: Yes.

The Hon. WES FANG: In Victoria, the Black Saturday bushfires were in relation to overhead wires that, in fact, were damaged during a storm and then that created a fire.

MICHAEL KATZ: Exactly.

The Hon. WES FANG: And the cost of that is, in effect, borne by the landholders, by the communities which the fire has affected. That isn't factored into the costing of undergrounding, is it?

MICHAEL KATZ: Well, it doesn't have to be because that can't happen with an underground wire. They are amazingly, beautifully safe. That's the whole point. That's what we're saying. We're in a bushfire-prone land and we're putting up this massive infrastructure which is prone to causing bushfires. It's nonsense.

The Hon. WES FANG: Has a risk assessment been done on the difference between having overhead powerlines built for HumeLink and undergrounding in relation to things like bushfire, like any other environmental damage aspects that aren't foreseen in the construction phase but are likely to exist potentially after a construction?

MICHAEL KATZ: I don't think there's been a comprehensive study as yet. It would be very sensible to have one done. It's a major effort, but it wouldn't be that hard actually to do it very well.

The Hon. WES FANG: One of the biggest arguments that I've heard in relation to undergrounding of powerlines is the fact that the cost of transmission makes up part of a bill, for example, to the end user—so residential, commercial. That is impacted by the cost of the infrastructure and, therefore, by going underground there is a greater cost to the end user—residential user, commercial user et cetera. Could you explain how it differs where the cost is borne by the affected landholders and the community by having these powerlines going through their communities as opposed to being undergrounded and the cost then being borne by the end user? Does the landholder have to pay an inordinate amount in order have those powerlines going through their property and does the community also suffer?

MICHAEL KATZ: If the line is built overhead and the bushfire happens, the cost to the community at large is billions and billions of dollars. Pick a number. And that number has to be sheeted home somewhere. What we have seen in natural disasters across Australia and, in particular, in New South Wales—with everything from Lismore to the fires—is that, at the end of the day, it gets sheeted home to the taxpayers because the individuals who suffer the harm look around for someone to claim against. Unfortunately, in the case of the powerlines, because of the history, in part, there is very little natural justice available for people who take an action against Transgrid. In the past, when we had the New South Wales State Electricity Commission, it was set up and it was given legislative protection from just that sort of action and, in the 1950s, there were no underground options. We didn't know how to do it. So that history is very important. It was set up by this Parliament to make Transgrid somewhat immune.

The Hon. EMMA HURST: Thank you both for coming today. We really appreciate your time. I think you briefly mentioned something in your opening statement about wildlife. There are a number of submissions to this inquiry that refer to the impacts of the towers and the overhead powerlines to the local wildlife. Can you expand a little bit more on the risk there?

MICHAEL KATZ: In the first instance, the issue is that the corridor goes from 15 metres for underground to 70 metres. So, across 360 kilometres, that is huge. It's a massive area of land that's clear-felled. Once it's clear-felled, the next thing—that it's maintained—is quite interesting and hasn't been covered very widely. The maintenance of these corridors is done largely by spraying with herbicides, and those herbicides are quite noxious. In fact, in another life I'm quite interested in some medical conditions, and those herbicides are highly associated with clusters of things like Alzheimer's and Parkinson's. So this is bad news stuff and very bad for the animals, plants and birds. There is also lots of evidence of bird strikes—who try and sit on the wires and turn into toast pretty quickly.

The Hon. EMMA HURST: Are there any risks posed to wildlife by undergrounding transmission?

MICHAEL KATZ: Nothing in any way comparable. I mean, they might fall into the trench in the three weeks that it's open but, apart from that, it just looks like normal pasture and bushland after it's filled.

ANDREA STRONG: It should be noted that this project is impacting matters of national environmental significance. The action area is 48,733 roughly, or 48,323, hectares. There are 5,000 hectares cleared, 1,862 hectares of critically endangered grassy woodland directly impacted and 82 threatened species. This is massive impact of this project on the environment.

The Hon. EMMA HURST: One more follow-up question based on something my colleague was asking about before around the risk around fire. I read in some of the submissions that there is also another problem with the overhead powerlines actually obstructing access to certain areas by both aerial and ground-based firefighters. Can you expand on that a little bit?

MICHAEL KATZ: That's actually probably the biggest issue. These overhead lines constitute something of a wall. It's 80 metres high; it's a Trumpian wall. What it means is that if you've got a fire on your left and the wall on your right, and if you're unlucky enough to be in the middle, you have no way out. So the risk of loss of life goes up dramatically. The other part that you are alluding to is that nowadays the first weapon of choice for managing bushfires is, of course, aerial. You can't fly planes near these 80-metre tall lines. We lost one big tank a couple of years ago in New South Wales. That is a horrific thought. The only way to manage that is to keep all aircraft away. The NSW Rural Fire Service has no authority to go near those lines in a smoky environment because the particles of smoke act as conductors. If you drive an RFS truck under a high voltage line which is energised and if there is a lot of smoke in the environment, the chances are you will turn to ash.

ANDREA STRONG: You might be interested that in July 2021 California announced that they were going to bury 10,000 miles of powerlines. When asked about the cost of undergrounding, that was going to be \$15 to \$30 billion. They said that it was too expensive not to do it; lives were on the line.

Ms CATE FAEHRMANN: Thank you for appearing today. I can see that one of the arguments against underground transmission is going to be the time. Transgrid's submission to this inquiry clearly states that—well, I am not sure it is clearly—overhead powerlines will be in place sooner. Interestingly, you talk about the fact that undergrounding HumeLink will give social licence and potentially reduce delays as a result of community opposition. Could you both give a sense to the Committee about that community opposition, how strong it is, why it's there and, if overhead powerlines do go ahead, is there going to be a delay because of that community opposition?

ANDREA STRONG: Yes. If they go underground, the community will work with government and the proponent to get this project delivered. Farmers in Tumut have said, "If you go underground, you can start tomorrow and we'll even dig the trench for you." If you persist in going overhead, there will be delays. There will be opposition. Communities will be fighting this. But, in addition, there is time to get this underground. Snowy 2.0 has been delayed, Michael said, until 2030. The official completion date is December 2029. So we have time to get this right. The modelling itself says 2028-29 in the integrated system plan. It is important to deliver this transmission when it is needed. There are politicians saying that you want to bring these delivery dates forward. There is an optimal time to deliver these projects. There is a model in the integrated system plan that is a progressive change option or scenario, and it actually says it's not needed until 2033-34. HumeLink isn't needed until 2023-24. We have time to get this right. We did look at an option from Maragle to Bannaby, which was 94 kilometres shorter. They could build that.

Ms CATE FAEHRMANN: That is right. That has come through in some of the submissions as well. You can potentially get a much more direct link in following a different path that is a much more direct path, if you go underground. I will quickly move to another question because I know time is limited. Does it sound to you, from your experience working with Transgrid over the past couple of years and trying to convince them about the worth and benefit of underground transmission, that there is ideological opposition within Transgrid to underground transmission?

MICHAEL KATZ: I don't think it's ideological per se. I think it's regulatory in the first instance in that the structure of the whole rules and regulations around the Australian energy market make it extremely difficult for Transgrid to have a financially sound position if they spend more than the amount established by the RIT-T or regulatory investment test for transmission. I think that, for me, is the critical issue.

Ms CATE FAEHRMANN: It did sound, though, that with GHD the assessments or analysis of that report—the community engaged their own independent consultant to assess the GHD report that Transgrid commissioned and that that report undertaken by the so-called independent consultant may have been written to justify overhead powerlines, as opposed to weighing up the costs and benefits of both systems. That is what you seem to be implying with that report?

MICHAEL KATZ: Yes.

ANDREA STRONG: Yes.

Ms CATE FAEHRMANN: Cost is another issue too, isn't it, because the cost of transmission, shockingly, still rests with the consumer. I understand that Snowy 2.0 doesn't need to contribute to the renewable energy owners and developers, or the Government doesn't need to contribute. Again, you are talking about regulatory barriers—it all comes down to the consumer. That is a problem here, would you agree, if we need to look at best practice, putting in place infrastructure for the next 50 to 60 years, climate proofing, if you like, the regions and infrastructure? Could you talk to that as well, just to get some of that on the record, if that's the view?

ANDREA STRONG: I think that it is a problem. The main problem is that the regulatory investment test for transmission doesn't include the environmental externalities—all the external costs—and the Australian Energy Infrastructure Commissioner has said that the rules of the market are not fit for purpose. So there's a real problem. The New South Wales Government requires environmental externalities—the environmental and community costs—to be taken into account for projects that cost more than \$10 million. These transmission companies are building projects that are worth billions of dollars and aren't taking into account the environmental and community costs.

On the question of prices, your objective should be efficient electricity prices, and that requires you including all the costs of transmission: the costs to landscapes of great natural beauty for the next 80 to 100 years, the costs to regional development, the costs to agricultural productivity, bushfires, and the big costs of losses in biodiversity. All those costs should be incorporated in the cost of electricity. So if they incorporated all those costs in the cost of electricity for the overhead option, undergrounding would be the cheapest option. It's wanting environmentally responsible transmission as well as generation.

MICHAEL KATZ: I think, quickly, that a lot of this is historical. When the National Electricity Market was established, the big issue was that the existing State-owned corporations commissions had gold plated the investments that they did, and the desire was to avoid that. So the rules and regulations were structured to avoid gold plating. We are over that phase now. It's not that we need gold plating. What we need is environmentally sensible and advantageous both transmission and generation.

The Hon. STEPHEN LAWRENCE: Thanks for your submission, it is much appreciated, and thanks for your time. I want to put to you a couple of issues that have been put to us in submissions and get your response to them. I'm not necessarily expressing agreement with the propositions, I'm just curious about your response. It's been put to us that bushfire risk isn't so much posed by these high voltage transmission lines but rather by different ones. I was just curious about your response to that—if your research or knowledge extends to the particular risk from different types of powerlines.

ANDREA STRONG: Yes, it's true that, although the number of bushfires started by powerlines—there aren't a lot of bushfires started by powerlines. But in times of extreme fire danger, the incidence of powerlines starting bushfires rises significantly. And it's not just the fact of powerlines starting bushfires; it also impedes your ability to control them. You can't fight under them and you can't use your first line of defence, which is aerial. And these are massive costs. The costs of the Black Summer bushfires have been put at \$230 billion. In addition, almost three billion animals were killed and displaced—massive costs. So if it increases the risks of bushfires, there's a compelling argument to put this transmission line underground.

The Hon. STEPHEN LAWRENCE: Another issue in a broad sense that has been put to us is that the HumeLink is too long to put underground. I am putting that very crudely, but I was interested about whether your research might extend to comparable examples from other places, maybe overseas, where a line of similar length has been fully undergrounded or substantially undergrounded.

MICHAEL KATZ: The SuedLink in Germany is approximately 800 kilometres. There's another one that goes from, I think, Denmark to Sweden, which is the same technology and it's about the same. This is no longer a big issue—the length. What's critical is that, if you do it with a direct current, or DC, line, it becomes quite manageable.

ANDREA STRONG: The issue is that there are two ways that you can transmit power. You can transmit it AC underground, and that has a length limit of 40 to 50 kilometres for the higher transfer capacity. But for HVDC you can transmit very long distance, and in fact it's what they're doing overseas to bring renewables into big cities. Michael mentioned SuedLink, but there's also Champlain Hudson Power Express that's taking hydropower from Canada into New York—challenging terrain, 546 kilometres and it's going submarine through the lakes and underground. This is world best practice. To bring renewables into big cities, undergrounding is the best practice. It's very concerning that you're being told that it's not feasible for long distances.

The CHAIR: I take you back to comments at the start about the consultations. Do you have suggestions for how the community could be better consulted for projects like this?

ANDREA STRONG: Well, the issue isn't consultation; the issue is actually planning. The consultation is just telling communities, "This is the way it's going to be."

The CHAIR: So there hasn't been consultation as such?

ANDREA STRONG: Well, they're trying to deliver this project. If they consult en route, that just shifts the problem. Undergrounding gets rid of the problem. So the issue really is with the planning that they need to take into account. Like New Wales South government does for cost-benefit analysis, they need to take into account all the environmental and community costs. Then, by doing that, they would come up with the best solution. It might be that we need less transmission and we need more rooftop solar. We might need renewables off the coast of New South Wales close to the load centres so there's not so much transmission. But it is a planning problem rather than a consultation problem.

The CHAIR: You mentioned a couple of times the comparable environmental costs, particularly related to undergrounding. I was just interested to get your thoughts on what those environmental costs would be, given there is a significant amount of wildlife that does live underground. My understanding is that with the digging of trenches, multiple trenches are required to be built to underground infrastructure and the easement is actually larger than overhead transmission lines.

ANDREA STRONG: Am I able to show you a diagram of—

The CHAIR: Do you have copies?

ANDREA STRONG: No, but it's in—

The CHAIR: We can make copies. Is it in your submission?

MICHAEL KATZ: Not in mine—not this one.

ANDREA STRONG: One of the options that was considered in the GHD Transgrid undergrounding study involved two trenches. The trenches were 1.3 metres wide and 1.25 metres deep. The easement for that option was a bit over 15 metres. So instead of a 70-metre easement, you're considering a 15-metre easement. It's a quarter of the impact, and also you don't have those high voltage transmission lines that can kill climbing or flying birds and animals.

MICHAEL KATZ: Obviously there are underground animals who will be affected by the trench, but in the scheme of things it's a very, very modest trench and it's not open for a very long time because we've got to get it done. They build them pretty quickly now with modern equipment.

The CHAIR: It can't be backfilled with the existing soil is my other understanding—

MICHAEL KATZ: I think that's not always—

The CHAIR: So perhaps there are some concerns around biosecurity that may be apparent.

ANDREA STRONG: What was—

The CHAIR: It can't be backfilled with the existing soil.

ANDREA STRONG: It can't be?

The CHAIR: There are requirements around what goes back into the trench around the line.

The Hon. WES FANG: It's dirt.

ANDREA STRONG: There's an issue of the thermal resistivity of the soil, but that can be managed in local areas. For the majority of the route, they strip off the topsoil, they take out the subsoil, they put in the cables, they reinstate the existing subsoil and put the topsoil back. In terms of biosecurity, because it's a small easement it is not nearly the biosecurity risk. With the 70 metres, that's much more of a biosecurity risk. The weeds and the diseases are going to be in the vegetation on the surface, not in the soil. So the biosecurity issues are much greater with the overhead. In addition, they have to keep clearing that line. There is much less maintenance of the line with the underground option. Every time they come through with a process to maintain the line is a biosecurity risk.

MICHAEL KATZ: Can I just point out also, on my property the plan is to bring it through next to an existing line. We've got a 60-metre easement already—70 metres for HumeLink 1. If you look at the forward plan, there's HumeLink 2 in the plan. That's another 70 metres, so a 200-metre-wide corridor altogether. This is a serious corridor, right? Two hundred metres is not going to go down lightly.

The CHAIR: The other questions I had relate to the difference between the AC and the DC lines, because my understanding is, obviously, that there are advantages of both. In terms of having the AC lines, you can step it up and step it down, but DC needs to be converted. Do you have any comments on the impact of, or plans for, the converter stations that would need to be built if it was to be an HVDC line?

MICHAEL KATZ: No. I would just say this is a planning question, as Andrea has indicated, and it's quite technical, really. But when I look at the SuedLink in Germany, what they're planning is a monster spine of high voltage DC current right up the middle of the country. That seems to be terribly, terribly sensible, and we should be thinking about the same thing from Melbourne to Sydney and up to Brisbane. That would be the way one should think about it. That's not being thought about. The question is why.

The CHAIR: SuedLink is still in the planning phase. Or is it being built? Has it been built?

ANDREA STRONG: SuedLink is in the process of being built, yes. I think '25 or '26 it's going to be delivered. But, yes, there is an issue with AC and HVDC. There's a tee-in and tap-off constraint. You can't tee in and tap off with an HVDC. You need a converter station to do it. But, in fact, this project is ideal for this technology to shunt a big volume of power from Snowy 2.0 to the load centre of Sydney. Because it's paralleling existing lines, they provide the opportunity to tee in and tap off. So it's not the constraint that might be argued elsewhere. And, once you go to that HVDC option, if we had that HVDC backbone in the grid that industry experts argue for, it's not a big leap to then put it underground. You can be saving these landscapes of great natural beauty and taking it a more direct route.

MICHAEL KATZ: There's one other thing we would like to table if we could, which is this marvellous diagram, which pretty much shows the position that we're looking at. The existing towers, which are typical of what's across New South Wales at the moment, are the smaller ones—

The CHAIR: The 330 kV?

MICHAEL KATZ: Yes. The big one is the one that is being contemplated, and the individual is me. And I don't feel so small.

The Hon. WES FANG: Chair, do you mind if I ask that one question I didn't get a chance to ask before?

The CHAIR: Thank you both for attending this hearing. Committee members may have additional questions for you after the hearing. The secretariat will contact you in relation to those questions.

(The witnesses withdrew.)

(Short adjournment)

Ms JACQUI MUMFORD, Chief Executive Officer, Nature Conservation Council of NSW, affirmed and examined

Mr TED WOODLEY, Executive Member, National Parks Association of NSW, sworn and examined

Mr GARY DUNNETT, Chief Executive Officer, National Parks Association of NSW, affirmed and examined

The CHAIR: I would now like to welcome our next set of witnesses. Would you like to start by making a short statement? Please keep it to no more than a couple of minutes.

JACQUI MUMFORD: The Nature Conservation Council's primary interest is protecting nature across New South Wales. This includes direct impacts of development and doing what we can to mitigate the worst impacts of climate change. We support the move towards renewable energy happening as fast and as fairly as possible, without unnecessary impacts on nature. In most cases, action on climate change supports biodiversity goals. As we transition the energy system and roll out more transmission, there is the rising challenge of climate and biodiversity goals coming into competition.

Renewable energy zones are seeing large areas of land cleared for clean energy. We need an approach to ensure energy projects are developed in areas of the lowest biodiversity values along with a hierarchy for decision-making, focusing on avoidance of high-value sites on public and private land. With appropriate policy and regulatory controls, we can continue to pursue the crucial climate intervention of transitioning our energy systems and protect areas that are rich in biodiversity. Undergrounding transmission presents a solution where transmission can have the least possible impact on nature.

In our submission we've outlined a number of ways that undergrounding is beneficial for nature, fire management and for protecting cultural heritage. Undergrounding transmission lines is international best practice and our recommendation is that New South Wales should move to international best practice and use underground connections whenever passing through areas of high environmental, social or cultural significance.

GARY DUNNETT: Thank you. I'd just like to begin by acknowledging that we're meeting on Aboriginal land and pay my respects to Elders past, present and emerging. The National Parks Association of NSW has been involved in a campaign in relation to the Snowy 2.0 transmission connection through Kosciuszko National Park for some three years, and our submission draws the Committee's attention to what we see are some of the really critical challenges facing you in terms of determining where and how the initial decisions around whether to propose overhead or underground transmission are taken. In the case of Snowy 2.0, way back in 2006 there was an amendment to the plan of management which expressly prohibited any further overhead transmission connections through Kosciuszko National Park. The reason it did that was a judgement that the park had been so sliced and diced by previous transmission connections that it was starting to lose its essential ecological integrity.

Unfortunately, the first time that prohibition was tested was the Snowy 2.0 transmission connection. Transgrid, rather than recognise that prohibition, went to the department of planning with a proposal to put overhead transmission in. We're currently undertaking judicial review proceedings in the Land and Environment Court on this issue, but they did that on the understanding that National Parks would amend their plan of management. There was a very high benchmark set and we faltered at the very first step.

What we then had was a planning process which was entirely structured around the proposition that there would be overhead transmission. We talked to Planning officials who told us that they were under no obligation to require an assessment of alternatives and that it was entirely up to the proponent—in this case, Transgrid. We were subsequently very pleased when under budget estimates the then Minister agreed to have his department undertake an assessment of alternatives. That then ended up being Transgrid who did it as part of what's called the preferred activity statement for that development. Nonetheless, the whole overhead process was approved despite what we regarded as overwhelming evidence that the balance between environmental, social and economic factors was overwhelmingly being driven by Transgrid and, ultimately, Snowy Hydro's interest.

I guess what that experience showed us was that if we rely on the part of the planning system that proceeds after an EIS is commenced to make a rational, informed, well-balanced decision about the respective merits of undergrounding and overhead, we've already lost the opportunity to make a sound decision because these developments will inevitably be classified as critical State-significant infrastructure. The premise in the entire planning system is of approval—generally with conditions, but approval. Despite all of our efforts—and as I say, we've now had to resort to court action—the reality is that these developments will go ahead.

In our mind, what this tells us is three things. The first is that the statutory protections that we expect to apply to areas of high environmental significance such as national parks just aren't up to the job. The second thing is that Transgrid is working on the premise that last century's technology, which is overhead transmission, is the

only option, and therefore they will be seeking environmental approvals that are structured around that presumption that it has to be overhead. The third thing is that there is no clear space within that planning framework to make the informed decisions around what is the most appropriate option in each individual situation. It's certainly not going to be Transgrid, who are driven by their economic imperatives.

We don't believe that it's a role for AEMO. It's not within the scope of their considerations to consider environmental issues. I guess the best fit that we can see is that it's in the departments that are responsible for Energy and Environment to do that initial planning around route selection and most appropriate technique. But it has to happen outside of the planning system because we can't have this just dealt with as a fait accompli. We need to make sure that we get the best route selection that delivers the lowest environmental impact and not simply the best commercial outcome for Transgrid and other corporations such as Snowy Hydro Corporation. Thank you.

The Hon. TAYLOR MARTIN: Thank you for coming today, giving your evidence and making time. I just want to ask of the National Parks Association. In your submission there seems to be no mention of any costings or estimates or anything of the sort, but there is a mention about the new underground power connection to Mount Selwyn ski resort replacing the overhead lines burnt out by bushfires, and that it will be an example of the move to undergrounding. Do you have any more information as to how much that particular project will cost, whether it's in total or per kilometre?

TED WOODLEY: I don't have any information about the cost of the Mount Selwyn connection. The decision was made after that overhead line was burnt down with the 2019-20 bushfires that overhead lines were just not appropriate in Kosciuszko National Park, so the decision was made to underground most of that line to Selwyn. In terms of the transmission connection we're talking about for connecting Snowy 2.0, the cost for the overhead line in the EIS was just over \$300 million. Transgrid costed undergrounding as somewhere between \$1 billion and \$1.4 billion. We think that's wildly overstated because at \$1.4 billion, the cost of the transmission connection is about a quarter of the cost of the whole Snowy project, with 27 kilometres of tunnels and underground power stations. It already includes three kilometres of underground cable to get from the underground power station up to the surface. So it will definitely be more expensive, but not three to four times more expensive.

The Hon. TAYLOR MARTIN: That's a very good point.

The Hon. WES FANG: I just have a few questions. I'll start with Ms Mumford. Thank you for your opening statement. Just looking at some of the issues you addressed in it, in effect, these large transmission connectors between large metropolitan areas are needed in order to move the renewable energy both to and from sites like 2.0. That's correct, isn't it?

JACQUI MUMFORD: That transmission is required?

The Hon. WES FANG: Yes.

JACQUI MUMFORD: Yes.

The Hon. WES FANG: You addressed in part of your opening statement that, in effect, where the power is produced plays an important role as to those connectors. If the power was produced locally, then you wouldn't need these big interconnectors. Is that what you were addressing?

JACQUI MUMFORD: Yes. I think we're moving to a different energy mix of distributed—different types of energy. If we were to see a much greater uptake in electric vehicles, rooftop solar and energy production of different size and scale, then we can look at decentralising our energy system, in a way. I think that's what the renewable energy zones also seek to do to an extent, while also ensuring that we still have those really large areas that are producing the scale of energy that's required.

The Hon. WES FANG: One way to move that power around is through these large interconnectors, which we're having discussions about as to whether we go above ground or underground. But another way to resolve the issue would be to have more localised power generation—like you've said, rooftop solar. Can you talk about any other ways in which we can generate power at a local level that isn't requiring these large interconnectors?

JACQUI MUMFORD: I'm not the expert on that, but we do know that there are community-scale projects that we can have that seek to decentralise and distribute the energy in that way. I can certainly dig out some examples and get those to you.

The Hon. WES FANG: But these interconnectors do pose risks, don't they, to flora and fauna, in the construction and also in the operation phase?

JACQUI MUMFORD: I'm not sure, to be honest. I'd have to look that up.

The Hon. WES FANG: There's a risk during the construction phase to the flora and fauna. That's why you've made a submission. Is that correct?

JACQUI MUMFORD: Yes.

The Hon. WES FANG: Can you talk about those risks?

JACQUI MUMFORD: During the production stage?

The Hon. WES FANG: Yes.

JACQUI MUMFORD: We're really concerned about clearing of land, destruction of habitat and any sort of environmental impacts that will come about from infrastructure that's associated with clean energy and transmission. So that's why we've pushed for undergrounding—so that we can really try to reduce and mitigate as much as possible the impacts of that infrastructure.

The Hon. WES FANG: It's not just things like Snowy 2.0 that are creating these interconnector issues. It's things like large-scale solar, wind and all these projects that are outside metropolitan areas. We need to get that power from the regional areas into metropolitan areas, and that requires these connectors. Is that right?

JACQUI MUMFORD: Yes, that's my understanding.

The Hon. WES FANG: So would it be sensible to say that something like small modular nuclear reactors, which could be placed closer to metropolitan areas in order to have less of that transmission, could in some ways reduce the need for these large transmission lines cutting their way through the countryside and impacting the flora, fauna and residents that live underneath them?

JACQUI MUMFORD: No, I don't agree that nuclear energy presents a solution. I think with the renewable energy technology that we have and the transmission that is required, even taking those different aspects of infrastructure that we have just discussed into account, we can definitely find a balance when transitioning to renewable energy in a way where we can sort of plan for and manage any impacts on the environment that absolutely does not require any form of nuclear technology. I think nuclear is far more expensive and far more dangerous from an environmental and human health perspective.

TED WOODLEY: Can I just add, I mean your proposition is correct that you try and put your generators as close as you possibly can to the loads. At present, the generators are in the Hunter Valley, Lithgow and so they are reasonably close to the load. The new renewable energy zones are hundreds of kilometres away from the main load centre, as is Snowy 2.0.

The Hon. WES FANG: In relation to those power generation modules, whether they be nuclear or any other form, getting them closer to the site where the power is needed—i.e. the metropolitan areas—is partly the key in order to reduce the transmission loads across the—

TED WOODLEY: Exactly.

JACQUI MUMFORD: And undergrounding transmission lines.

The Hon. WES FANG: And it's not just nuclear that is possible in order to have these smaller, more localised power generation units. There are other technologies available. Instead of having these large renewable generation types in rural and regional areas that are impacting the local communities, you can have other technologies that are closer so that you don't have to have these interconnectors?

TED WOODLEY: I think the main renewable technologies, frankly, are just wind and solar. You would concentrate on putting your renewable energy zones as close as you possibly can to Sydney, Newcastle and Wollongong. That means that the Hunter zone, for example, might be a higher priority than the zones out west of Balranald. And, in the same sense as said at the previous session, offshore wind.

The Hon. WES FANG: That is one option in order to reduce the necessity of putting these lines in. The other one would be to find other power generation sources at the existing sites. For example, anywhere that there is a coal-fired power station, we've already got the existing transmission lines in place. If we can generate power through another means at that site, we don't have to then be cutting in new transmission interconnectors. Is that another feasible option?

TED WOODLEY: Yes, definitely. Those sites are limited in terms of areas, but that is why some of the big batteries are being located on the power station sites, right next to the existing substation.

The Hon. WES FANG: In relation to, for example, HumeLink—and we have heard a lot about that from the Stop! Rethink HumeLink group—in order to link a renewable energy production source, which is Snowy 2.0, into the grid, which is having a detrimental impact on the communities along that path, there are other

ways that we could potentially be doing this and not creating those impacts to start with at all. Would you see that is probably a more equitable and desirable solution than having to cut up large parts of a national park and prime agricultural farming land in order to see these transmission lines connect up something like 2.0 into the metropolitan areas that don't want to share the cost burden of undergrounding and, therefore, we're seeing it produced by an overhead powerline?

JACQUI MUMFORD: It would depend on what the energy generation form is. You have mentioned nuclear and coal-fired power. Unfortunately, those forms of energy are not suitable for the coming decades, centuries. Coal-fired power is, as we know, driving climate change in extremely unsafe levels, and it's critical that we get off coal-fired power as soon as possible. Nuclear technology is, again, incredibly unsafe for humans and for the environment, not to mention incredibly expensive. So what we're talking about here is a system that ensures that we are generating energy in a way that is not driving climate change, that is safe for communities and that is safe for the environment. I don't think it's a matter of pitting overhead powerlines against having to use nuclear generation closer to where the population is. What Gary has outlined is a really sensible solution in terms of undergrounding transmission lines.

Ms CATE FAEHRMANN: My first question is to Mr Woodley. We've heard from previous witnesses, and in a range of submissions, about what other countries are doing in terms of underground transmission—that this is world's best practice and this is where many jurisdictions are going. Why isn't Australia doing this? Why hasn't Australia adopted this technology too?

TED WOODLEY: It is a good question. The current transmission system in New South Wales was built, largely, 40 or more years ago. In the last 40 years there have been very few additional transmission lines built. And 40 years ago overhead transmission was the only technology available. But times have moved on. Underground technology, particularly DC technology, is now well established. Overseas countries, as reported earlier today and in many of the submissions, have adopted undergrounding and DC as the default. In New South Wales at present the default is still overhead, but overseas the default is underground. We have that technology available.

The advantages of undergrounding have already been outlined in discussions this morning. The advantages of DC have probably not been outlined to the same extent, but DC underground cabling is a very viable alternative to overhead and should be seriously looked at by this Committee. Why it hasn't been done to date—I think it's just intransigence, familiarity with the previous technology and an unwillingness to consider alternatives, and also an unwillingness to consider anything other than the difference in capital cost for the construction. As pointed out today, there are lots of other externality costs that are not being considered when deciding the technology to apply.

Ms CATE FAEHRMANN: That is a great segue to my next question, which is about environmental impacts. To the last witnesses, the Government was suggesting that perhaps the environmental cost of digging trenches for underground cabling seems to potentially be more than the overhead transmissions, in terms of clearing and the impact on biodiversity—wildlife and what have you. There are two questions with that. Firstly, is it? Which one has the greater environmental impact? Secondly, the width of the vegetation cleared, the fact that we have to keep that vegetation cleared to manage bushfire risk and everything else—if you could speak to the scale of that environmental impact compared to underground transmission. Who wants to take that? Mr Woodley?

TED WOODLEY: I was going to give my voice a rest. There's absolutely no question that undergrounding has less environmental impact. There's still an environmental impact. You've still got to dig up a trench. You've still got to replace the soil. In some cases you have to bring in new soil. The end result is an easement no more than 15 metres wide versus an easement of 70-odd metres for the 500 kV lines that we're talking about. This gives me an opportunity to show you a diagram that's in our submission that shows that the situation in Kosciuszko is even worse than the situation for HumeLink. These are the 330 kV lines that everybody is quite familiar with. They're squat lines. It's just a single circuit, so the conductors are placed horizontal. They're about 35 metres to 40 metres high, and they're still significant structures. You can see them snaking across all of New South Wales. The Snowy 2.0 connection though is four 330 kV circuits on two sets of side-by-side towers, and these towers end up being 75 metres high, which is almost as tall as the 500 kV lines that we're talking about.

Ms CATE FAEHRMANN: And the width is?

TED WOODLEY: And the width of the easement in Snowy 2.0 is 120 to 140 metres—up to 200 metres in some circumstances. So you've got a width at least double. You've got a height double. The actual impact is three times the impact for the existing overhead transmission lines. Also, as I think Michael said—that's Michael down the bottom of the diagram. That's a bushwalker. So these are the height of 40 people on top of each other. They're ginormous towers. Easement for trenching, as an alternative, is 15 to 20 metres—nothing above ground.

Ms CATE FAEHRMANN: Can I jump in with another question? In relation to the biodiversity that's cleared, it's incredible country, obviously, in terms of Snowy. Biodiversity offsets, what is the situation there? Has that been factored into the cost of those transmission lines?

GARY DUNNETT: It's factored in in terms of there's a calculation in the EIS specifically for the Snowy case. It's really easy to forget, with these linear developments, the net hectareage which is lost through construction and, equally importantly, the ongoing clearance of the land under the easement to mitigate the risk of future bushfires which, of course, isn't a risk with the undergrounding options at all. So, in the case of the Snowy transmission connection which, by the time we get to Bargo State Forest, is about 10 kilometres by more than 100 metres wide, we're into 100 hectares. When we think about the irreplaceability factors that apply particularly to the alpine zone, the chance of an organisation like Transgrid being able to actually acquire offsets at the scale that is required—it's just not going to happen. We have seen that again and again with major developments in national parks. They are irreplaceable, so they can't get those offsets, which means that we are potentially into billions of dollars in offset liabilities. So there is a bigger equation here.

There are all sorts of problems with our current offsetting schemes in New South Wales, but least they give us some sort of benchmark to the scale of impact that we're talking about, in purely financial terms. If I could just emphasise that the issue of initial impact isn't just the construction of the towers. It's all of the infrastructure, particularly roading and trails that are needed to access those trails, and then it's the fact that in most circumstances they're required to clear the easements on an ongoing basis. They are not just a passing phase in the life of this infrastructure. They are a permanent impact on those landscapes.

Ms CATE FAEHRMANN: I have been given leeway to ask one more question. In relation to the potential billions of dollars of offsets, are they in the cost of what Transgrid has come out and said building the overhead powerlines would cost compared to the underground lines? Have they factored in the potential couple of billion dollars in offsets in that?

GARY DUNNETT: They have for the broader—well not, in that case, for billions—

Ms CATE FAEHRMANN: But that's HumeLink.

GARY DUNNETT: —for the broader HumeLink, but I'm not aware.

TED WOODLEY: HumeLink, it's nearly \$1 billion of offsets. For Snowy 2.0, it's about \$15 million. It's a pittance compared to the damage that is being caused to the park.

The Hon. EMMA HURST: Thank you all for coming today. Mr Dunnett, in your opening statement you gave a pretty distressing example of some real barriers that you have come across in regard to undergrounding. Could you go into a little bit more detail about those barriers and what needs to change to ensure that undergrounding can be done?

GARY DUNNETT: I guess the really critical one is that there is nowhere apparent in the planning system at the moment that allows an objective assessment of alternatives. There is a cursory assessment of alternatives that is supposed to be built into each and every environmental impact statement. But the reality is, if an EIS was to conclude that there was a better alternative, what the proponent knows is that that actually throws them back to the start of the process and they're commencing an entirely new EIS. And, with these things being inevitably declared as critical State-significant infrastructure, that's just not going to happen.

What we need is a way of making good proposals before we then test them in terms of their environmental impact. We're all relying on the EIS system to do that and on the way that the Department of Planning reviews those proposals. It's just not going to work for something which is fundamentally an equation at a statewide level about where and how we select routes that are going to inflict the lowest community, social, economic and environmental damage.

And then, once we've actually got those routes, how are we going to make the decision about where it's warranted to go to the additional expense of going underground versus where an overhead solution might be appropriate? As I tried to allude to, we've got zero confidence that the Department of Planning is in any situation to make that broader judgment. I think one of the greatest challenges for this inquiry, in truth, is to actually construct a means of making sure that we have good, sound, well-considered proposals before they are even tested through the planning system.

The Hon. EMMA HURST: Correct me if I'm wrong but it sounded as though, despite the court case running, you felt that that overhead was still going to be pushed through. If that's the case, what long-term effects into Kosciuszko are we potentially looking at?

GARY DUNNETT: There's a broader issue with Kosciuszko, which was that it was subject to multiple assaults under the previous Government, from the wild horse heritage legislation through to proposals to intensify resorts through Kosciuszko, through to allowance of commercial activities in wilderness zones and then of course the Snowy 2.0 project. Kosciuszko is a park that is under incredible duress and, essentially, the worst sort of—all of those proposals that are still on the books degrade the overall ecological integrity of that park. It is an alpine landscape, and its values are fundamentally around its capacity to act as a unique set of ecosystems.

Slashing through new overhead transmission lines is about the worst thing we can possibly do in that situation. We have campaigned so hard on the question of the undergrounding for Kosciuszko precisely because it is the one part of that difficult mix of considerations in Snowy 2.0 where there was actually an opportunity to significantly reduce the overall environmental impact of the Snowy 2.0 project on Kosciuszko. Yet what we saw was purely a commercial outcome rather than an outcome that actually treated the park as something which was precious in its own right.

The Hon. EMMA HURST: Ms Mumford, you also talked about the conservation of nature. There were quite a few submissions that spoke about local wildlife and the effects of undergrounding versus overhead. I just wanted to get a bit more understanding from you about some of the effects on native animals or threatened animals and the difference there between above or undergrounding.

JACQUI MUMFORD: Yes, certainly. A key threatening process for the decline of a lot of our native species is deforestation and land clearing. You could see in the diagram that Mr Woodley held up the difference in terms of the footprint between above ground and undergrounding. Clearing for above-ground transmission lines means the destruction of a lot of that habitat compared to a footprint for undergrounding, which would be clearing a much smaller area. What we are talking about really is threats to habitat, which we know is one of the key threatening processes for the decline of many species.

The Hon. STEPHEN LAWRENCE: Thank you for your submissions and your time. I wanted to ask a question firstly about the environmental impacts of undergrounding. It's a question to both organisations. I think you have both talked about the obvious impact of excavating the trench and then burying the cable. Are there any other ongoing environmental impacts from undergrounding in terms of maintenance and associated infrastructure?

GARY DUNNETT: I might start on that. I think one of the problems that we have is that when we talk about undergrounding, in many cases, people are assuming that that's a reference to trenching. It's really important to remember that there are, in fact, multiple different options for undergrounding and they all have a different impact profile. Trenching is the most impactful in that you have to literally dig a trench. But there is also directional drilling, where, in fact, it's—at the moment, the technology is able to go about a kilometre between pads where you actually insert the directional drill, so that you have a small area at kilometre intervals that are being impacted. But in the case of Kosciuszko, the most appropriate option is actually just to tunnel. That's just using exactly the same technology that's already being used across that project.

Yes, it is the most expensive of those options, but in some circumstances it's the most appropriate way of dealing with those sorts of challenging situations, and in that case the environmental impacts are really restricted to the exit and the entry holes and then how you choose to dispose of the spoil. In the case of Kosciuszko, it's going into the lakes, bizarrely, and also some sort of landscape regeneration. But the spoil is a big issue there. So you've got three different sorts of profiles of environmental impact. But overall, because it is buried infrastructure, it's in a relatively narrow easement, it's far lower than the requirements to not only service the individual towers but also to maintain the cleared easement underneath.

TED WOODLEY: I can't add any more. Thank you.

The Hon. STEPHEN LAWRENCE: Ms Mumford, would you like to respond to that? It's up to you.

JACQUI MUMFORD: I think Gary has just about covered it.

The Hon. STEPHEN LAWRENCE: The other question I have is just to bring together some things that have been put to us in submissions, I think accurately. I'm curious what you would say to the suggestion that because of the urgent need to address climate change and because of the related need to bring the renewable energy sources online and ensure that the grid is catered for, there is too much delay in undergrounding, essentially? I know that brings in a whole broad range of issues, but I am just interested in a global response to that.

JACQUI MUMFORD: I might just jump in first there, Gary, and then hand to you. I think what we've really tried to outline in our submission is it's not one or the other. We've been campaigning for a long time for the energy transition precisely as you said, to address climate change, and we've been really heartened to see the rollout of the renewable energy zones. It doesn't have to come at a cost to nature. I think if we have the right

laws—environmental laws and planning laws—in place it can happen in a way with the least possible impact on nature. In terms of your question around time frames, even if there were a slight delay in rolling out transmission because of undergrounding, I think we really have to get that right and ensure that we're not transitioning to renewable energy at the expense of the environment.

The Hon. STEPHEN LAWRENCE: So, in your view, is there a special case for undergrounding in the national park as opposed to other areas of the State that might be affected by above-grounding?

JACQUI MUMFORD: Absolutely, yes. I think any area of environmental or cultural significance absolutely should be given special consideration in terms of how we manage those areas.

GARY DUNNETT: I will add on the haste issue. Again, sorry to bring it back to the prism of Snowy 2.0, but it's worth remembering that that was a really urgent project when it was announced in 2017 and it was going to be completed in four years. We now know that Snowy 2.0 is unlikely to be completed this decade. There is a rolling end date which gets extended every six months to every year, depending on the Senate estimates process, but that project proceeded as though there was never going to be a requirement to actually connect it to the grid. That was treated as a separate process that Transgrid was given responsibility for. It's a fairly bizarre idea. There is no way that there hasn't been more than ample opportunity to recognise the environmental sensitivity and actually plan for what might be a slightly longer construction period but is certainly in no way comparable to the inevitable delays that happened with these really big, complex energy generation projects. The transmission issue should not be the lag that drives us.

TED WOODLEY: Can I just add, because I'm sure this afternoon you're going to be told that we're in a great rush here and we have to get moving and Transgrid is up and ready for the job—but at this stage in New South Wales alone there are five projects costing \$12 billion that are scheduled to be completed by 2027. You've got Central-West Orana, EnergyConnect, HumeLink, New England REZ and the Sydney Ring. Now, frankly, that's just practically impossible. In fact, if they build one of those lines by 2027, they'll be going well. So the time frames that people are putting and trying to achieve are just not viable. In fact, the frenzy is just upping prices. We don't have the capacity in New South Wales or Australia to build all of these lines that are proposed to be built.

The other thing I should mention too is that these costs just keep on escalating. HumeLink was originally estimated to cost \$1.1 billion. That was in 2018. A year ago it was \$3.3 billion and now it's well above \$3.3 billion. So you're talking about 200 per cent increases. Not only is the time frame moving out because of the impracticality of building it within this time frame but the costs are increasing. Many of us have been saying that we just need to look at this issue far more rationally, not get spooked by the need to build all of these thousands of kilometres of transmission lines, because they were needed yesterday—but to do it in a way that is practical and achievable, and achieves the best results. We're building something that's going to last for a hundred years so we need to get it right. The fact it might take a year or two longer to build today will be irrelevant in 20, 30, 40 years.

The CHAIR: To what extent do currently planned transmission lines impact on the national parks in New South Wales?

TED WOODLEY: Well, at this stage Kosciuszko, of course. But some of the other lines do skirt, or are proposed to go through, the edges of the national parks. Because the route of these lines has not yet finally been determined, we don't know exactly where they're going to go. But it's almost impossible in some cases to build a line from A to B without going through either a national park or an area of great environmental significance.

The CHAIR: Do you have any suggestions on how transmission infrastructure could be better planned to minimise any environmental impacts?

TED WOODLEY: I think to date these projects have been looked at project by project. We haven't seen evidence of there being an overall plan, particularly an overall plan to use the latest technology. The plan is "We're building a renewable energy zone in Orana. We need to connect it so we'll just build an overhead transmission line, and 500 kV double circuit seems to be the standard so that's what we'll do." I have yet to see an overall plan of the best way of, and the priorities for, building the new energy environment that we're talking about.

JACQUI MUMFORD: If I could just jump in there, there are many problems with how environment is currently being managed in New South Wales. We know that because of the uplisting of species like koalas, greater gliders and gang-gang cockatoos under the threatened species Act. We know we're not getting it right at the moment. Obviously there's a whole lot of Federal reform going on at the moment around how we manage environment in this country. When we're talking about transitioning our energy system, which is obviously presenting a significant challenge from a planning perspective and from an environmental perspective, I think it

is an opportunity to revisit how we manage for those impacts of all development, not just for transmission lines, because there's something not right when you have such iconic species on the decline.

I think one of the things that's been proposed at the Federal level is having no-go zones. These are areas that are just too precious that can't be replaced, can't be offset. They're such small areas of critical ecological communities left that just shouldn't be touched. Having areas that are just simply no-go zones as a starting place—and then, where there are developments or, you know, transmission that are required, we look at ways that we can do that with the most minimal impact on the environment, and obviously undergrounding is one way of doing that.

GARY DUNNETT: If I could just add, I think if you were to ask what the greatest current weakness of our planning framework in New South Wales is at the moment, it's our inability to deal with cumulative impacts. We've got a system that's entirely focused on the individual development footprints. If there was ever a situation where we need to think in a genuinely strategic way and do a genuine strategic plan, surely it is actually in terms of the routing of these transmission lines because their cumulative impacts are going to be immense. If we let it default to the individual projects, we're going to get a really bad outcome. We need to have that strategic plan up-front that actually puts the vision and makes some of those assessments about how you provide the lightest possible footprint across the landscape right from the get-go and then let the normal planning system deal with it. But if we just rely on EISs to do this, we will fail.

The CHAIR: Thank you all very much for attending this hearing today. Committee members may have additional questions for you after the hearing, and the secretariat will contact you in relation to these questions. Thank you.

(The witnesses withdrew.)

(Luncheon adjournment)

Professor ANDREW DYER, Australian Energy Infrastructure Commissioner, affirmed and examined

Mr JIM COX, Acting Chair, Board of Directors, Australian Energy Regulator, sworn and examined

The CHAIR: Would you like to start by making a short statement of no more than a couple of minutes?

ANDREW DYER: I did make a submission yesterday. Would the members have received that?

The CHAIR: Yes.

ANDREW DYER: That probably lays out our role and our views on certain things. So I'm happy to take that as read in the interests of time.

JIM COX: Thank you very much for the opportunity to make an opening statement and to present to you today. I'd like to begin by giving you a brief overview of the AER's roles and functions with a focus on our role in regulating network businesses. The AER's purpose is to ensure that energy consumers are better off now and in the future. Our functions relate mostly to energy markets in eastern and southern Australia, where we regulate wholesale and retail electricity and gas markets and energy networks under national energy legislation and rules. The AER regulates 30 gas and electricity network businesses, with a combined asset base of over \$150 billion, with network electricity costs contributing about 40 per cent to 50 per cent to a consumer's bill from that retailer.

Our primary role in this respect is setting the maximum amount of revenue that network businesses can earn and the price that they can charge for regulated services. This is to ensure that consumers pay no more than necessary for their energy. The AER reviews revenue proposals submitted by electricity and gas network businesses every five years, and this process is known as the reset process. This is one stage at which businesses can provide the proposal to us, which may include undergrounding works. However, often this is not the case because the cost of undergrounding works makes it difficult to meet our prudence and efficiency requirements. Where undergrounding has met prudent and efficient costs, the AER has previously considered and approved undergrounding works. Overall, we make our decision after considering multiple factors, such as the extent and level to which a network business engages with community consultation, weighing up prudent and efficient costs, network reliability and taking into account the necessary safety standards.

Beyond the five-year revenue setting process, businesses can also apply to the AER for approval of the costs associated with major capital projects, such as transmission projects. These were called contingent projects and are dealt with separately because whether they will proceed is not sufficiently well known at the time we make our five-yearly determination. Under the national framework, transmission and distribution network service providers must apply a cost-benefit test referred to as the regulatory investment test—or RIT-T to its friends—before building major electricity network infrastructure such as transmission lines or interconnectors. The purpose of this test is to assess a range of credible options that could address a need in the electricity network and then identify options to maximise the net economic benefits for the market. These options may include undergrounding.

The AER has a number of specific roles in relation to major transmission capital projects. First, the AER is responsible for establishing and amending the cost-benefit analysis guidelines on the application of AEMO's integrated system plan and regulatory investment tertiary transmission guidelines. The cost-benefit guidelines are used to determine the optimal development of the National Electricity Market through the lowest system costs associated with generation, storage and transmission investment, and the RIT-T is a cost-benefit analysis that network businesses must perform and consult on before making major investments in their networks.

A key function of the ISP is to identify actionable ISP projects in the optimal development path for the National Electricity Market. Where a project is identified as actionable, the RIT proponent must complete the RIT-T. On completion of a RIT-T for an actionable ISP project, the RIT-T proponent must seek confirmation that the preferred option in the RIT-T aligns with the optimal development plan in the most recent integrated system plan. If a preferred option does not align with the most recent ISP, AEMO must update the ISP. When undertaking RITs, network businesses must give due consideration to what options are available before identifying the best way to address a need on their network. The AER regularly reviews aspects of these guidelines to ensure they remain fit for purpose.

Secondly, the AER monitors and enforces compliance with the ISP and RIT-T requirements in the National Electricity Rules, as well as any disputes regarding the application of the ISP and the RIT-T, to ensure stakeholder confidence in the process. We also require to publish ISP review reports on the transparency of AEMO's explanation of the key inputs and assumptions and on the outputs of the draft ISP to ensure key aspects of the ISP are adequately explained to stakeholders. Lastly, for projects where the ISP has been completed and for an actionable ISP project AEMO has confirmed the preferred option aligns with the most recent ISP, the AER

also considers a contingent project application for network businesses to enable them to recover their revenue for significant projects. Our role includes reviewing the cost of the project guided by the National Electricity Rules to ensure the costs are prudent and efficient, and consumers will pay no more than necessary to deliver the project.

Our role is not to assess whether an investment should be made or what design it should have, including whether a particular route should be taken. We recognise additional investment will be required to replace ageing infrastructure, including rural renewables, additional flexible and dispatchable generation capacity and new transmission. We also understand that market reform will be fundamental to ensure that transmission is delivered at least cost and in an orderly manner. The introduction of renewable energy zones across Australia is an example of one such change.

Here in New South Wales the AER has been appointed the regulator under the Electricity Infrastructure Roadmap, making revenue determinations on monopoly of network infrastructure and annual contribution determinations. Our revenue determination role includes overseeing the robustness of any contestable processes used to procure transmission projects to support a renewable energy supply. Our role is to ensure that consumers pay no more than necessary as the sector transitions. That completes my statement. Thank you for your attention. I think this is quite complicated stuff so I thought it was useful to explain it all at the outset, but happy to answer any questions.

The Hon. WES FANG: Thank you very much for making yourselves available today, and for submissions and also opening statements where applicable. I will ask a question of you both. I will start with Professor Dyer and then you, Mr Cox, in turn. In relation to consultation, what do you consider to be adequate consultation for a project?

ANDREW DYER: Are you talking about a transmission project, a new build, long-distance—

The Hon. WES FANG: For something like HumeLink—perhaps that might help.

ANDREW DYER: Just a few comments—and, again, our annual report is quite verbose on this. You can't build a powerline without the landholder's consent. I mean, you could force it through legislation, but you do need to get the landholders to be onboard. Because we haven't built projects of this scale in transmission for a long time, we're really having to rebuild the industry from scratch. Just about any artefact that you might think you would need, whether it's a landholder guide or an option for easement agreement or a land access agreement – I see we are getting photographed here—all of that needed to be built. The sort of issues that came up, say, with HumeLink were fundamental things. The landholders wanted to know what am I going to get paid, how is that calculated, when do I get paid—and so on and so forth—what happens during construction, what happens at end of life and what happens if the route changes. Landholders have raised with me and others genuine concerns and questions that I would certainly have as a landholder if a powerline was coming my way.

JIM COX: We haven't looked at community consultation in relation to transmission projects specifically, but we do look at it very much in our research process and we have turned our minds towards what is adequate consultation in the process of a reset. Incidentally, we've published a document called the Better Resets Handbook that sets out in some detail what we do expect. We can certainly make that available to the Committee, were that to be useful. But just to summarise some of that, probably the most important thing, in my view, is that the consultation must be entered into genuinely with a willingness to learn.

There are various consultation techniques and all of them can be used, I think, to generate the result you want. I think it's the intention that this is going into the consultation being willing to listen and, if necessary, adopt their proposal in response to what has been said. We also look as to whether the consultation has been done over a broad enough range of issues and whether it's been done in sufficient depth to ensure that consumers have an opportunity to talk about what they want to talk about, which may not be what the business would like them to talk about. Those are the sorts of things we'd look at, but we have a lot of material which we can draw the Committee's attention to, were that to be useful.

The Hon. WES FANG: For example, in the instance where consultation is started on a project and that project is defined by, for example, overhead transmission from a site—let's say, we'll use Snowy 2.0—and it's cutting through areas in the Snowy Valleys Council, effectively like HumeLink, is it satisfactory that that consultation goes out and talks to landholders about that project? Or is it perhaps a more critical issue that when that consultation is occurring the landholders are saying, "Instead of overhead powerlines, we would prefer it to be underground"? Mr Cox, I know that in your opening statement you said that you don't specify the project itself, as in you're not making judgment calls about the project itself. But where that consultation is directly asking for something else to achieve the outcome, what weight does that have? I will start with you, Professor Dyer, and then I will ask you again, Mr Cox.

ANDREW DYER: It's a very good question. It comes down to why you are building the line in the first place. If you're building it from A to B and that is a long distance, and if you're told you've got to put it underground or else, then you have no choice but to use DC technology for long lengths. Anything longer than 50 kilometres really needs to be DC. If your other requirement is to, in fact, add projects along the line, such as wind farms or solar farms, it is very expensive, if not impossible, to connect and plug into an underground DC line. The fundamental requirement needs to be specified clearly up-front in terms of what you're trying to achieve. Then you need to look at other considerations as well. You talked about the Snowy Mountains. If you go to the west Blowering Dam, you'll see an incredible example of how an overhead powerline can cascade down the hill. If you were to drill that and put that underground, that would be a remarkable piece of engineering. But firstly you've got to decide why are we building the line and do we intend to tap into it and tap out of it. That then frames the solution you need to then consult on and do it well.

JIM COX: What we'd say is that what's required is the cost-benefit analysis. It's important to look at both benefits and costs. We would be looking to see that those things have been adequately defined in our role in supervising the RIT-T process. But I think it's necessary to look at both benefits and costs. Obviously one of the problems with undergrounding, as I think I said, is that it can be very expensive, and those costs have to be weighed against the advantages that undergrounding might give. It's fair, that to be done, I think.

The Hon. WES FANG: We're now looking at two different solutions to the problem. Obviously, there is a DC underground system or an AC above-ground system that you can, in effect, tap into. Where does the community's view around their requirements, their amenity and the risk that perhaps overhead powerlines pose versus undergrounding—where does that weigh in relation to things like cost? I know that Mr Cox, in your opening statement, you talked about making sure that consumers weren't burdened with extra cost. How do we manage those two competing factors, and then the other factors in being able to tap in and out? Where do we find the balance?

ANDREW DYER: I'm batting first?

The Hon. WES FANG: You were always going to bat first, Mr Dyer.

ANDREW DYER: Done. Again, if the requirement is to tap in and add projects along the way, you're limited, sensibly to do above ground. Even if undergrounding was half the cost of above ground, you would still need to do that (above ground) and do it properly. The interesting part is the undergrounding impact on neighbours and community is much less. There would be construction impacts, of course, but the impact on the host landholder can be quite significant and severe. I was conciliating a matter the other week with a landholder who is a candidate for undergrounding on their property. It's a very high-end horticultural property, and the damage that would be done to that property to construct would be long lasting and quite traumatic, I would think, for the landholder, whereas if you went overhead, you'd put one tower there. But when you do put a tower, you have neighbours to consider. They have visual impacts. You have the broader community issues. So you need a planning scheme and a financial model that takes those matters into account and resolves them where you can.

JIM COX: It's good going second, by the way, so thank you for the opportunity.

The Hon. WES FANG: That's right. It's because I have more faith in Mr Dyer. No, I'm joking.

ANDREW DYER: He's Geoff Boycott.

JIM COX: I think you're right. There are desirable objectives possibly competing with one another and that's not uncommon in the world of energy. So that's something we're used to. What we would expect is that proponents would understand the views of the community, understand the benefits the community sees and attempt to quantify them where possible, but then set them against the cost in determining what might be the optimal route, because bear in mind, at the end of the day, all these things have to be paid for by energy consumers. We know that affordability is a matter of great concern to all of us, and we have a concern that we do not needlessly worsen the affordability pressures that are so strong. So that's certainly a major thing that's part of our thinking as well.

The Hon. WES FANG: We've talked about the way that consultation occurs with the community. We've talked about how there are different outcomes, depending on which solution is selected. And we've talked about the impacts on the community's landholders, but also the cost impacts and how we have to weigh those up. In relation to something like HumeLink, which we've heard a lot about today, is there a requirement that we have to provide the opportunity to tap in with further projects into the future, or is it effectively a means of distributing renewable power to and from Snowy 2.0 so that we can discharge and recharge an effectively huge battery and have that power distributed to larger metropolitan centres like Adelaide, Melbourne, Sydney et cetera, or are we looking at creating this link that will allow further renewable projects to be tapped into it? Because it seems that that is the critical question—about what we are hoping to achieve with this project that will then provide some

view as to whether undergrounding and relieving some of the communities with the burden of having these overhead powerlines is the nub of it. Who is specifying that we have to be able to tap into and increase the number of renewable projects along this route?

ANDREW DYER: I may defer to my second batsman, but usually it comes down to the business case. If the business case for the project includes the benefit and the ability to attach wind farms and solar farms and batteries to the powerline along the route, then that drives the requirement. There will be cases where it's a point-to-point solution. There is an underground DC line that runs between Red Cliffs, south of Mildura, across to Renmark and that stacked up and that works perfectly—a much smaller voltage than what we're talking about with HumeLink. It should reflect the business case.

The Hon. WES FANG: Before I serve up my speed ball down the line, I want to ask—because I can tell you that my community, and I live in Wagga, is already concerned about the number of renewable projects that are using prime agricultural land in areas like the Riverina. So the idea that HumeLink is, by going overhead, going to provide even greater opportunity for more renewable projects which are going to then have impacts on prime agricultural land is going to be of great concern to the people that live along the routes that will see these overhead powerlines going in.

ANDREW DYER: Yes. Well, no good deed goes unpunished, but if you create that environment then that creates that opportunity. But my view, which is in our report, section 8, appendix A, says that you need proper top-down planning and you should have an approach that appropriately lays out where those projects are going so that you don't have cumulative effects and unnecessary impacts on agriculture.

The Hon. EMMA HURST: This is a broad question for either or both of you. We heard this morning that there's potential human health impacts from overhead transmissions compared to underground transmissions. One of the submissions also said that it can result in adverse electromagnetic exposure. Are there human health issues that we should actually consider in these projects?

JIM COX: Not, I think, to our knowledge. Put it that way. We are not the experts on the health implications. That possibly is a question best addressed to the project proponent, which I think is Transgrid. But we are not aware of any issues.

The Hon. EMMA HURST: One submission we also received explained that, while Australia generally uses HVAC technology, there are more efficient technologies available that better transmit renewable energies. I don't know if you are able to expand on that to give us a bit more information, if you have any knowledge in that space.

ANDREW DYER: I would be curious to know what the technologies were. Today it really is AC or DC, which can be both above ground or below ground, with the limitations we have discussed. If there is a better mouse trap out there, we would be keen to know, but that is where it sits today. What I should say is that the higher rating of the line gives you more capacity for what you might connect. So in very rough numbers, a 220-kilovolt powerline might allow you to connect 500 megawatts of generation capacity. A 500-kilovolt line is more like 2,200 megawatts. It is not quite an exponential curve but it's not a straight line. Hence the HumeLink and Project EnergyConnect and VNI West, which will be rated at 500 kV, does maximise the amount you can connect to that asset.

JIM COX: If I could just add something now. It is worth thinking about if the transmission links don't go ahead, what's the alternative. That probably is things like batteries or more gas-fired generation to firm the network. There will be cost implication for that as well. That's also worth thinking about. Probably building the transmission links, I think is our understanding, is the cheapest way to get additional renewable generation to the load centres where it's needed.

The Hon. EMMA HURST: Does the type of renewable energy affect the kind of infrastructure that's needed? I know you touched on that already, but will that change the best way, depending on how that renewable energy is sourced?

ANDREW DYER: It shouldn't. There are certain things you need to do as a result of generating renewable energy in terms of synchronous and asynchronous and rotating stuff with the current. It gets very technical and I won't delve into that. The other key to it—picking up on Mr Cox's point—is that you really build new transmissions for one of two things. One is to either unlock capacity—you might have lots of solar farms and wind farms connected to the existing grid but they can't get their power away at all times because there are too many assets competing for the capacity of the cable, or you're unlocking geography—you're opening up geography where there is no or limited generation capacity because of the lack of grid. They're the two principles, and a business case should articulate those things well and properly that would go to Mr Cox's shop for assessment.

JIM COX: I suppose the most important thing is location; it is where the renewable energy is located. It tends to be remote from the load centres, so it requires transmission to link the two.

The Hon. EMMA HURST: Can you explain that a bit more? Because they're remote—

JIM COX: Because they're remote—they tend to be areas like south-west New South Wales, New England or Central-West Orana, which are distant from the load centres—you would need additional links. That is probably the most important factor determining why we need to build this additional transmission.

Ms CATE FAEHRMANN: In relation to HumeLink, who ultimately pays for that? Who is paying for the construction, ultimately?

JIM COX: Ultimately, it's consumers in New South Wales who will pay through their electricity bills. HumeLink is going to be constructed by Translink, so ultimately it will find its way into an AER network determination at some stage. But on the way through there's this contingent project process that we explained in our opening remarks.

Ms CATE FAEHRMANN: So the owner, the developer, Snowy 2.0—they don't pay for the connection because of the regulatory environment, correct?

JIM COX: The regulatory environment doesn't require them to pay, no.

Ms CATE FAEHRMANN: It doesn't require them to pay; it requires consumers to pay, and only consumers?

JIM COX: Only consumers, yes, is the way that things are at the moment. I suppose the other thing that's around and important is the Government has got ideas about concessional financing of these transmission links. Were that to go ahead, that would reduce the amount that consumers have to pay. So that's another possibility that's being considered at the moment.

Ms CATE FAEHRMANN: I suppose it's a result of history that we have this regulatory environment that dictates that the consumer, and only the consumer, pays for this transmission infrastructure. Shouldn't we consider regulatory change to potentially split that between, say, the proponent, the developer, the Government and, yes, potentially the consumer?

JIM COX: Let's see. The idea that generators should contribute is one that's around, and I think there are respectable arguments in that direction. I certainly wouldn't want to rule that out.

Ms CATE FAEHRMANN: Transgrid does pay their CEOs and executives quite a bit of money, yet the consumer is expected to pay. It does seem last-century kind of thinking, Mr Cox.

JIM COX: In the sense of Transgrid, they get a regulated rate of return, which they tell us is fairly low. That determines how much profit they can get. I think they are worthwhile arguments to say that perhaps generators should be required to make a contribution to some of the costs of these links that may be of particular benefit to them, so that certainly is an idea in good standing. But it's not the way the system works at the moment, and it obviously requires some change. I think government contributions are being considered through the concessional financing route that I mentioned earlier.

Ms CATE FAEHRMANN: And another way to do that, of course, would be regulatory change.

JIM COX: Yes. That's another possibility, but the way the system works, for the moment, puts the responsibility on consumers, unless something else happens.

Ms CATE FAEHRMANN: That impacts the requirement for transmission infrastructure to be assessed as lowest cost, doesn't it?

JIM COX: No, I don't—

Ms CATE FAEHRMANN: Is there any link, though, in terms of needing to provide the lowest cost to the consumer or not?

JIM COX: Let's see. There's the cost-benefit test, which means that the link that's provided is the one that provides the greatest net benefits. So you have to look at what are the benefits of the link and the benefits for essentially allowing low-cost energy to flow through to consumers. So that's the benefit of the link. And then you have to look at the cost of the link and balance the two of those. I think the system tries to find the one that provides the greatest net benefit, rather than necessarily the lowest cost.

Ms CATE FAEHRMANN: I wanted to explore that a little bit further, actually. The benefits and costs—where do environmental externalities, for example, come into this analysis that's undertaken?

JIM COX: Yes. They come in a number of ways. Firstly, obviously, as Mr Dyer was talking about, there are costs of meeting the requirements of landholders and the community regarding areas of particular environmental value. We looked at the South Australia and New South Wales interconnect, and there we did make allowance for the costs of biodiversity offsets and quite a substantial amount. Also, very importantly, as you may know, the Government is changing the national electricity objective to specifically take into account emissions reduction. Once that legislation goes through—I think, in the South Australian Parliament later this year—then we will be required to look at environmental benefits and emissions reduction benefits in undertaking this work, including the work on the RIT-T that I was discussing earlier. So that will affect our decision-making.

Ms CATE FAEHRMANN: Have you looked into, say, in terms of this whole assessment process, the impacts of future extreme weather events, the scale of fires that we're seeing now, which are really megafires—I don't think we can call them bushfires anymore—and extreme storms? Just a couple of weeks ago, Selwyn Snow Resort wasn't in operation because of the failure of powerlines, and that will only get worse in terms of extreme weather. How is that taken into consideration when weighing up costs and benefits if, indeed, it is?

JIM COX: Yes. We're looking at the revenue redetermination processes for the three New South Wales businesses, and they've all proposed expenditure to deal with resilience issues. I think, particularly, Essential, that went through the floods in the northern part of New South Wales; it's very close to their minds. They have made proposals to us for increased expenditure to improve community resilience that they have run through their community engagement program and, interestingly, there's strong support for that.

Ms CATE FAEHRMANN: Can I just check with that? I'm sorry, Professor Dyer, that I haven't gone to you yet.

ANDREW DYER: I'm waiting.

Ms CATE FAEHRMANN: Can I just check with that resilience? Does that mean, if they're asking for additional funding, are they coming back and suggesting that some of that additional funding is for things like, because of the extreme flooding that we're seeing in certain places, we should be looking at more underground transmission? Is the agency actively dealing with requests for that?

JIM COX: I don't know whether they're proposing undergrounding. My colleagues might be able to help me.

Ms CATE FAEHRMANN: Sounds very radical.

JIM COX: But they're certainly proposing additional expenditure to improve the resilience of the system and also to improve the way in which the community can respond when one of these adverse events takes place. There are a lot of proposals there along those lines and we are in the process of considering those. We make, I think, a draft decision in September. We are thinking about how we should respond to that. That's certainly something that is very much on our minds at the moment. The other thing—sorry.

ANDREW DYER: Largely, what you are talking about is the distribution network. That is, the high volume of—

Ms CATE FAEHRMANN: In places like Lismore.

ANDREW DYER: Yes.

Ms CATE FAEHRMANN: But making that point as well.

ANDREW DYER: Yes. Now Mr Cox's operation looks after that as well. But the fire risk and the flood risk and the outage risk is usually from the distribution network, not from the high voltage transmission network.

The Hon. STEPHEN LAWRENCE: Thank you for your submissions and your time this afternoon. I might start on that question of bushfire risk or fire risk. We were talking about high voltage transmission versus lower voltage in the distribution network. Could you expand a bit on the bushfire risks of each of those modes of transmission?

ANDREW DYER: If you define high voltage transmission as being, say, 220 kV and higher, the risk of that igniting a fire is virtually zero. You may wish to read a document we contributed heavily to that was put out by Energy Safe Victoria earlier this year that describes the rationale and the facts behind that. That was prepared by ESV, the Country Fire Authority and my office. Your risk is more, again, the distribution network, with pole-top fires and fuses that jump to the ground that are red hot and so on and so forth.

The Hon. STEPHEN LAWRENCE: What's the reason why the higher voltage network poses such a dramatically lower risk in terms of bushfires? Is it because of the strength of the structures or that they are higher or is it something more about the electricity? Excuse my gross ignorance of these things.

ANDREW DYER: No, you are doing well. Exactly. It's the easement, which you need to maintain properly. There are rules around that and legislation about how that's maintained. And there's, as you say, the sheer height of the cables above the ground and that they are steel structures, not wooden posts.

The Hon. STEPHEN LAWRENCE: I now address a question to you both. I wanted to put to you something that is in a submission from Transgrid to us. It says that Transgrid formed or brought about a feasibility study scope of works on undergrounding the HumeLink. It found that undergrounding would increase the cost and delay completion by up to five years. They said in that study scope of works that that would pose a risk to the energy transmission network because it was essential that the infrastructure is completed by 2026. I am curious to know whether you're aware of that study scope of works and whether you agree with it in essence.

ANDREW DYER: Again, if I go back to my earlier discussion, it's about getting the requirement right and then you look at the cost. But if you're not meeting the requirement in the most sensible way, then the comparison becomes irrelevant. I'm assuming that the HumeLink requires not only to get power from Wagga and PEC up to Sydney and out to Bannaby but also power from the Snowy scheme. But its intention also is to have the ability to build power stations along the route to diversify and increase the State's capacity for power generation.

The Hon. STEPHEN LAWRENCE: Do you have any thoughts on that, Mr Cox?

JIM COX: I'm not personally aware of the study you're referring to. I think the requirement is for these transmission lines to go through a cost-benefit assessment. The concern about undergrounding would be that it increases the cost substantially, making these lines harder to build and thus, given the emphasis on building new transmission links in our electricity strategy, perhaps delaying or putting that strategy at risk. That would be our concern.

The Hon. STEPHEN LAWRENCE: It was put this morning in broad terms that the preference for above-ground transmission networks demonstrates a focus on minimising short-term costs at the expense of the consideration of more medium- and long-term costs. I'm just wondering what your response would be to that suggestion or criticism that's been made. I'm talking about the HumeLink, I should say.

JIM COX: I don't think we'd agree with the criticism. We undertake, or we require the proponent to undertake, a cost-benefit analysis that weighs benefits against the costs. Any additional costs of undergrounding versus non-undergrounding in the long term will be taken into account in that assessment, so it's certainly a long-term assessment. Yes, it's important that the benefits of alternative options are considered carefully, and that's required. Obviously, if we thought that wasn't being done adequately, we would draw that to people's attention.

The Hon. STEPHEN LAWRENCE: What are your thoughts on that, Professor? I'm talking about this idea that the preference for above-grounding is demonstrating a focus on minimising short-term costs but not considering long-term costs.

ANDREW DYER: Yes, I would be keen to understand what the long-term costs are and were and how they were derived, that are creating the economics to change.

The Hon. STEPHEN LAWRENCE: It has been suggested that undergrounding, overall, is more cost effective when you take a proper view of it. I take it that you wouldn't agree with that?

ANDREW DYER: It depends. I cited before the Murraylink line between Red Cliffs and Renmark. That was cost justified. Another example is we had a situation in Victoria where we had three wind farms trying to connect to the same terminal substation at Terang and the last player there, Mortlake South Wind Farm, by Acciona, took the decision to go underground because the cumulative effect down the road of all these wires would've been just completely unacceptable. Now, that was at quite a premium cost, to do that, as opposed to above ground, but it was the right thing to do and it solved what could've been some very difficult community reactions.

The Hon. STEPHEN LAWRENCE: Do you have a specific view about the HumeLink project in that regard—about whether undergrounding that would be best value for money in the long term, taking into account all factors?

ANDREW DYER: Well, again, if the requirement is the ability to tap into it up and down the route, then that's not going to change. In fact, once you've built these things, you can't then put—once you've built the wind farms and the solar farms along the route, you can't just sort of flip it down into underground mode. So it's fit-for-purpose design, and then you go from there.

JIM COX: I wouldn't want to give the impression we are against undergrounding per se.

ANDREW DYER: No.

JIM COX: I mean, there are cases where it is justified. But you have to weigh up the benefits and the costs. For a long project, such as HumeLink, the additional costs would be substantial.

The Hon. STEPHEN LAWRENCE: That was certainly made clear in your submission, Professor Dyer, wasn't it? It's horses for courses, if I can put it that way.

ANDREW DYER: Yes, you need to look at the topography. You're going up and down mountains and hills. You can only trench on flat ground or near flat ground, so if you've got lots of hills you need to drill or tunnel. You're getting into some very serious engineering there and you've also got the impacts on agriculture. So you need to look at the current land use, the topography, the business requirement, and all those things may have an impact on cost but aren't about costs alone.

The CHAIR: This question is to the Energy Infrastructure Commissioner. Will you elaborate on why this new transmission infrastructure is required in New South Wales?

ANDREW DYER: We're moving from a highly centralised power generation grid system—which we have in Victoria, where I'm from, and certainly in New South Wales around the Hunter—to a very distributed generation approach, which is the nature of the beast with renewables. You need a diversity of geography to position the generating plant where the resource is best. You will tend to find solar farms tend to go better west of the Great Divide, and you tend to put wind farms where it's windy—and, of course, we haven't talked about offshore wind and the implications there.

So you need to diversify in geography to capture the best resource, and you also need to diversify the type of generation, which is predominantly wind and solar, because they have different attributes, balancing the security of supply. For example, if you've got a place that's windy during the day and—or, actually, you want it to be windy at night and sunny during the day. It gives you that sort of balance there. So you're seeking out a whole range of diverse properties. That redefines how the grid needs to be built and run.

The CHAIR: Are there any ongoing impacts on landowners or other land uses of undergrounding? You sort of inferred that earlier.

ANDREW DYER: We just got the blue screen.

The CHAIR: We will continue.

ANDREW DYER: So the question was what can you use the ground for—

The CHAIR: What are the ongoing impacts on landowners or other land uses of undergrounding?

ANDREW DYER: You should seek professional expertise on this because it's not my expertise. But my understanding is that the area that is above the cables and the trenches is not—

The Hon. ANTHONY D'ADAM: I appear to have lost the connection.

The CHAIR: We can hear you, Anthony. We've lost the webcast, I understand. We are fine to proceed, Mr Dyer, sorry.

ANDREW DYER: We're talking about undergrounding and effects on agriculture. If you're doing a high voltage DC underground configuration, you have typically two trenches, which might have two or three very large cables in each. The construction easement is typically double the actual final easement. The final easement, as I understand, has limitations on what you can grow. You can't sort of deep rip or do things that you might normally need to do in the horticultural-type ag production.

The CHAIR: So double the final easement?

ANDREW DYER: Yes. Because you need to dig your two trenches and then you've got trucks and cranes and whatever running up and down the side of it to put the cables into the ground.

The CHAIR: And that needs to be established on an ongoing basis to allow—

ANDREW DYER: Once it's done, you fill the trenches in and you do away with the construction easement, but you need to allow for that when you're looking at the amount of land which you need to give up and make available to the proponent.

The CHAIR: Mr Cox, how would the AER consider proposals from transmission providers to underground transmission infrastructure?

JIM COX: It comes in a number of phases. The first phase is our cost-benefit analysis. There, we would expect the proponent to do the analysis, not us. But we would expect them to consult with their communities, understand what the benefits of undergrounding were, quantify the benefits to the extent possible, weigh them against the costs and then come up with the proposal that best maximises net benefits to people in the market. That's stage one. Stage two—they come to us for an application to increase the amount of money that can be recovered through customers through a contingent project application. There we would expect them to have gone through the cost-benefit process. Very importantly, if we find, as often is the case, that costs are increasing through time, we'd expect them to go and re-confirm with AEMO, the Australian Energy Market Operator, that the proposal was still on their optimal development plan. So that's required. Then we would look at the prudent efficient costs of undertaking the project and allow only those costs to be recovered from consumers.

The CHAIR: Thank you. That concludes our session for this hearing. Thank you both for your time and for attending this hearing. Committee members may have additional questions for you after the hearing and the secretariat will contact you in relation to those questions.

(The witnesses withdrew.)

(Short adjournment)

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

Mr BRETT REDMAN, Chief Executive Officer, Transgrid, sworn and examined

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

The CHAIR: I now welcome our next set of witnesses. Would any of you like to start by making a short statement? If you could please keep it short to no more than a couple of minutes.

BRETT REDMAN: Thank you for the opportunity to speak to this inquiry. I know that there are community members who will be speaking to the Committee about the impacts that transmission lines will have on their property. I want to acknowledge that this is a difficult time for change. We are committed to helping property owners and the broader community to mitigate the impacts of our projects, but we are acutely aware that it remains a process that can have significant impacts on people's wellbeing. Transgrid is the operator and manager of Australia's most important electricity transmission network. We operate a 13,000-kilometre high voltage transmission network in New South Wales and the ACT. Our network provides electricity to more than three million homes and businesses and enables energy trading between Australia's three largest States.

We support the Australian and New South Wales governments' climate strategy to cut domestic carbon emissions to net zero by 2050. The transition will not only deliver a clean energy future; it is essential to easing the growing cost-of-living pressures on Australians by reducing customer power bills with cheaper energy from renewables. There will be no transition without transmission. Transgrid's projects like EnergyConnect, HumeLink and VNI West form nation-critical infrastructure at the heart of the Australian Energy Market Operator's, or AEMO's, 2022 integrated system plan. Without an urgent acceleration in building transmission infrastructure, New South Wales will not be able to connect the renewable energy zones to the grid to move clean energy from where it's generated to where it is needed. Every dollar spent on transmission is projected to return more than twice this in benefits to customers.

The route design and cost of delivering transmission projects are subject to significant review and engagement with stakeholders including the Australian Energy Regulator. The AER must be satisfied that the total investment is both prudent and efficient in terms of the cost to deliver the project because it has a direct impact on customer bills. The AER would not accept the cost of undergrounding HumeLink because it would result in an unacceptable increase in the project cost of three to 10 times. Undergrounding would also delay delivery of HumeLink by three to five years, posing an unacceptable risk to consumers in terms of energy reliability and network security, and slowing down the integration of cleaner and cheaper renewable energy into the grid.

If HumeLink is not delivered on time in 2026, it will jeopardise network reliability. It is also not technically feasible for the type of transmission line required for this project. As I mentioned at the start, Transgrid is working hard to reduce the impacts and deliver genuine and lasting benefits for local communities making our energy transition possible. We will continue to maximise the economic and social benefits to local communities, with our major projects creating jobs, developing skills, providing educational opportunities, supporting local businesses and boosting essential community facilities and services.

The Hon. WES FANG: Thank you for appearing today and making a submission and giving up your time to appear before us. Mr Redman, in relation to the insistence that the transmission lines are overhead, is this in relation to cost or is it in relation to the fact that you will then be able to tap in and have more renewable projects accessing the feed line that is HumeLink in the Riverina? What's the priority here?

BRETT REDMAN: I guess the biggest driver of undergrounding versus the overhead cables is cost. If you spend enough money, anything is technically possible but practically not. Some of the discussion that often comes up is the difference between AC and DC—this is one of the big debates, if you like—and, very simplistically, the way energy is transported. I'm not an electrical engineer so I'll give you the layman's view; I have a couple of engineers who can give the technical view if you want to get into it. There are two ways to transport electricity: AC and DC. Globally, it's worked out that AC is the primary form of moving energy around, and a lot of it has to do with the cost of connecting. DC has benefits—it has lower line losses; it creates less heat—but the cost to connect into it is prohibitive. Senator, hopefully I'm addressing your question.

If you look globally, you typically would never think about a DC line connection for under about 300 or 400 kilometres because the cost of connection is very expensive. The German SuedLink is a good example of a DC connection. It runs about 700 kilometres; it's there to connect the wind in the North Sea down to Munich. But the big part of it, the big thing to watch for in it is it doesn't stop anywhere along the way. It's like one big superhighway where no-one gets on or off. From a dollars point of view, the difference between connecting into an AC line versus a DC line is orders of magnitude. It's about \$100 million to \$150 million to create a connection

point for renewables into an AC line. It's about \$400 million or \$500 million to create the same kind of connection point for a DC line.

If we come back to the prime purpose of why are we building HumeLink, there are a couple of reasons, including energy security, creating an energy superhighway to move energy up and down the coast. But one of the big reasons is to connect renewable energy. At \$400 million or \$500 million a connection point, those renewable energy projects aren't economically viable. So, if we're going to do it for the purpose of connecting renewable energy, we have to do it with a type of transmission line that allows people to economically connect. That gets you to the point where you go, "Okay. I've got to connect to AC and not DC." Then the second thing you've got to look at is then "Can you underground AC?" AC is very difficult to underground because it does generate a lot of heat.

Marie can talk to a lot more detail, and Jeremy can give you a lot more detail. But a couple of things to focus on are, one, we've scoured the globe, and the longest transmission AC project that we can find in the globe is about 40 kilometres. Again, that goes to the prohibitive cost that's there. In answer to your question, technically, if you spend enough money, you can do kind of anything. But, in a world where there's immense pressure on customer bills, to head down that DC route, the transmission line alone, in an AC sense—that three to 10 times is prohibitive. You put the DC in, you wipe out the economics of renewable projects.

The Hon. WES FANG: I think that's something that has become quite apparent, not only during this hearing but also in discussions around these projects in general, where there's impact on landholders, impact on community. It's consistently a battle between cost versus impact and how we measure those things up. But, in this instance, we have a community that I've heard a lot from. I live in Wagga. I, obviously, am aware, from those stakeholders that are going to be impacted by HumeLink, that these transmission lines overhead are going to have a massive impact on the amenity, the land use—the impact on the communities. Obviously, there's the risk as well, around fire and the like.

Where you say that this cost is between, say, 3 and 10 per cent higher for undergrounding, as opposed to overhead—obviously, there are connection issues with DC versus AC—how are you balancing the want of the community to have this thing undergrounded against bills of the wider population? It seems to me that you're asking this community to bear the brunt of this overhead monstrosity so that people in metropolitan areas can have cheaper power bills. I have a big problem with that. But I also have a problem with the fact that—if it's around cost alone, that's one thing. If it's around putting more renewable projects in prime agricultural land, which is what we have along that corridor where you're going to put HumeLink in my area—we already have concerns about those renewable projects. I think the community needs to know that as well.

BRETT REDMAN: Senator, your points are valid. I've spent quite a lot of time in Wagga. I've spent a lot of time walking properties. I've listened to landowners. I've had them show me where the lines are going to go. I'll come back to bushfires. I've had them talk to me about the horrible impact of bushfire and the emotional scar that that's left behind. It is really difficult. One of the hardest parts about our job is going out to property owners and to local communities and talking about building big linear infrastructure. Some of the challenges that we have, just to give you a simple example—we're trying to work out, look at a route. Should it go a bit to the left or should it go a bit to the right? Left will impact 12 homes. Right will impact 10 homes. I've sat in those sorts of discussions. You end up having to go, "Okay. We're going to have to go the 10-home route because that is marginally less impact." The people on the 10-home route will look at you and go, "Why have you come here? I can't see the difference to the other side of the valley."

There is no doubt that these big linear projects have significant impact on landowners who have lived and worked on their properties, in some cases, for many, many generations. I can't shy away from that. Money alone will not compensate for it. We can talk about compensation that's there. You can argue that in an economic sense there is compensation being made to offset the economic effects, but you can't take away from the emotional impact for somebody who cares about their property.

The Hon. WES FANG: Probably if I was going to distil it down to a couple of questions, the first one I would ask is if you were to underground HumeLink, what will the cost per year be to a consumer power bill once it is finished?

BRETT REDMAN: I'll have to come back to you with some proper math because I don't have it at hand. But from memory, per household, rather than per person—you've got about four million households in New South Wales. Some of it would be borne by industry, but let's just stick with households. If you add \$10 billion-plus in cost to one line—I think the Committee's considering all transmission projects, not just HumeLink, but this is just for HumeLink. If we added \$10 billion across four million homes, you start to do that math and, however you smear it out over a number of years, it's a material impact on people's bills that starts to come through. That's the trade-off that we're having to balance.

In a time when cost of living has never been more on the front page and pressure on bills is enormous and coal is closing—coal closing actually means you've got to do something; not doing something is not an option—then it's that very difficult trade-off where you're looking virtually into the eyes of four million households and saying, "Your bills are going to go up so much," versus the impact that it's going to have on the landowners on the routes that we're dealing with. Some will welcome it and will like the economic benefit. It's not universal but definitely some, and more than some, will feel the pain of it, and the economic offsets that are there won't be enough.

The Hon. WES FANG: If in the future it becomes a requirement that you have to underground HumeLink and, for whatever reason, it becomes mandated—you're told to do it, that's it, end of story, you're going to underground HumeLink—how much of an impact would that have on any business case you may or may not have around attaching further renewable projects and tapping them into that HumeLink, given that it is perhaps a DC from point to point, as you discussed, like the Sued in Germany, where you're not able to tap in? Does that affect your business case in relation to how HumeLink will then later on generate an income?

BRETT REDMAN: I haven't seen it modelled per se, but knowing—

The Hon. WES FANG: Sorry, why not? It is not like this is an overnight issue. This issue since HumeLink has been proposed has been discussed around the undergrounding, the rerouting—any number of issues around that. I would have thought that part of the consultation that Transgrid does in relation to this would have involved modelling any number of scenarios to put to the community so that those communities can have that feedback in consultation. I'll get to consultation in a second if I've got enough time.

BRETT REDMAN: Okay, so I misspoke. Let me clarify. We definitely modelled in the sense of the cost of lots of different options. Right back at the beginning—they call it PISCA as one of the early stages—so years ago, and ever since on regular occasions, we have been modelling the cost of undergrounding. What happens is when it comes up at three, five, seven, whatever—pick your number—but multiple times the cost of the other options, it then gets knocked out quite quickly because it's just such an overwhelming cost difference. If we were talking about a 10 per cent difference, just to make numbers up, that's the kind of thing maybe you could pursue. But where it's that multiple, the regulator won't allow that level of cost.

The Hon. WES FANG: But isn't this the problem, though? You say three, five, seven multiples, even up to 10. We need to know what the multiple is. You can't say it's three times or it's 10 times because at the moment it is such a wide and varied model and number that the community cannot adequately make a decision around the difference in cost to their bills by undergrounding it as opposed to overhead, because you haven't done the work to actually provide the community a proper and fixed figure as to what the difference is in the price. Three times to 10 times is a massive variance. You can't come to this Committee and say it's somewhere between three and 10.

BRETT REDMAN: We worked with the local community groups to find an independent expert about a year or so ago to try and bring to a head, if you like, the discussions. We had lots of expert reports. There are expert reports from all around the world that repeatedly come up with very similar conclusions. We sponsored it; it ultimately concluded, I think, that HumeLink could cost about \$11½ billion to underground. We'd look at that analysis; we actually think it was a little bit selective to reduce the number that's there. But it's such an order of magnitude that it doesn't change the gating decision.

To give a fully accurate cost, as we're doing right now with HumeLink, we were given about 10 per cent of the expected HumeLink cost at the time to do what's called early works. A lot of that goes to proving up the cost. We're currently spending about \$300 million in advance of putting in the full cost submission to get to quite an accurate cost. I don't think it would be a good use of—effectively that money goes back to ratepayers' bills. It wouldn't be a good use of money to prove out whether it is exactly four times or six times when so manifestly it doesn't make that option work. We didn't do more than the high-level studies that give us that indication. But, if you like, the community-sponsored consultative report that we had a year ago, \$11½ billion—that alone gives you that threshold to say why we're landing on economically it's not passing muster.

The Hon. WES FANG: What's the expected time frame that you would see to have that investment recovered? For example, if it is \$11 billion—and how much do you think HumeLink would be for just an overhead line?

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

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

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

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

BRETT REDMAN: Yes.

The Hon. WES FANG: In effect, we're at about double to underground as opposed to—

BRETT REDMAN: Senator, look, I think you can sort of drill towards numbers to get to that math.

The Hon. WES FANG: You say "drilling towards numbers", but in reality this is a project that seems to be driven by numbers. You can't criticise the fact that we're driving towards numbers when the justification for a lot of these decisions seems to be numbers.

BRETT REDMAN: The study that was done with the community-selected consultant that came up to about \$11½ billion—our professional opinion is that it wasn't just—

The Hon. WES FANG: Bottom end?

BRETT REDMAN: —at the low end but it was beneath the low end. You wouldn't find a contractor that will build at that price.

The Hon. WES FANG: Okay.

BRETT REDMAN: But it doesn't change the result, so we stopped there.

The Hon. WES FANG: Let's go with, say, three times. I'm accepting that there are some variables there. But you've got a cost of about \$5 billion in, say, 2023 dollars, and \$11½ billion, plus or minus—we'll call it 15 in 2023 dollars—for undergrounding plus whatever factors in there. If you are forced to underground HumeLink, those costs, over how many years, will be recovered back from the community? How much of a business case has been built around the ability to again tap in more renewable projects along the path so that you can have that feed in and also the distribution along the line?

BRETT REDMAN: I would say roughly over about 30-plus years the regulatory model would recover costs. More than implicit but explicit in the market modelling that AEMO does to generate these decisions—should we build them or not build them—is a presumption that renewables will be connected along the line and also energy will be transported from other areas as well. So the REZs in New South Wales, Marinus Link and what's happening with offshore wind in Victoria, and what is going on up in Queensland all form parts of that integrated superhighway that will move energy up and down, as well as Snowy. But Snowy is just part of the economic case. Built in there is the presumption that we will build a lot of renewables.

The Hon. WES FANG: It's such a shame my time has expired.

The Hon. EMMA HURST: Thank you for coming here today. We've heard a lot today and we've read a lot in the submissions as well about the negative impact of overhead on wildlife. My understanding from some of the submissions is there are 82 threatened species that would be impacted. Can you go into a little bit of detail about how that has been considered within this proposal and if any measures have been put in place to try to reduce the impacts on wildlife?

BRETT REDMAN: I'll get Jeremy, as our project director, to talk to it, but let me frame it as follows: A huge amount of effort goes into the environmental studies. It goes through that proper process, which is to avoid impact, minimise impact and, if we clearly can't avoid any impact, then offset the impact. And that's implicit in what we're doing. Jeremy, do you want to talk to it?

JEREMY ROBERTS: Yes. As Brett mentioned, we're in the environmental impact study phase of the project now. So we've done a soft lodgement to the Department of Planning and Environment here in New South Wales. That has multiple chapters on species-typed biodiversity impacts, bushfire and all the different areas that we need to assess as part of the project. Part of that assessment is we walk the line where we have access. We'll have ecological specialists to walk the line with us and Indigenous groups to look for heritage artefacts as well as from the environmental side of it. That is part of all the chapters that we've developed. That now gets submitted to the department for their assessment, which will go on public display in early September for further feedback from the community and different groups on that assessment.

The Hon. EMMA HURST: I don't want to jump ahead. I don't know if this is public information based on the fact that the answer hasn't been publicly released yet, but what were the risks posed to wildlife that were identified?

JEREMY ROBERTS: It's not public yet but it very soon will be. We look at all the different types of habitats. During this phase we assume presence for a lot of areas. We'll do a broad assume and say, "In that area there could be koalas, so we assume that there will be." And when we're into the detailed design construction phase, we'll do a lot more of that close survey monitoring to avoid where we can and then mitigate where we have to move vegetation or change or adjust our transition line, depending on the impacts that we find.

The Hon. EMMA HURST: As part of that assessment, was there any consideration given to undergrounding in comparison to the proposal of overhead in regards to that environmental impact and the impact on wildlife?

JEREMY ROBERTS: Directly?

The Hon. EMMA HURST: Or did it just look at the overhead proposal?

JEREMY ROBERTS: At this stage we are only looking at overhead, and that's all that's in the environmental assessment at this stage because it is progressed along. That is what the project is. We looked at the undergrounding and the cost of that. Beyond that we've had to go through that assessment phase and are now into the overhead option.

BRETT REDMAN: I don't want to sound like everything distils to dollars and cents, but it is there in the sense that biodiversity offsets are a major part of the costing. So to the extent you avoid environmental impacts, you get down that bio cost, but in undergrounding and overgrounding all the options have a bio cost impact. So, effectively, it's being embedded in there—as difficult as it sounds to translate environmental impact into a dollar number—in the modelling and taken into account in different options.

The Hon. EMMA HURST: Just to understand that better—because today we've heard that the difference, both environmentally and for wildlife that are part of the environment, would be much more significant for overhead compared to undergrounding—that was considered or it has not been considered?

BRETT REDMAN: Yes, it is in the sense that it's distilled into "What is the environmental impact that we have and, therefore, what biodiversity offset do we have to create to balance the books, if you like?" So it is there. Even though it's a bit of a crude device to do that, it's there. But, depending on questions, we can talk a little bit to what undergrounding and overgrounding looks like in a practical sense when it's built.

The Hon. EMMA HURST: The other thing we heard a lot about this morning was the fire risk. Particularly, there were major concerns about blocking access for firefighters to be able to actually put out fires both from the ground and through aerial firefighting. What is your response, I suppose, to those concerns? I can understand, obviously, communities would be very concerned about that.

BRETT REDMAN: Marie and Jeremy will be able to give a bit more detail, but we spend a lot of time thinking about bushfire. Up to half of our operational risk management spending is to do with bushfire and vegetation maintenance. To split the question, if you like, between starting bushfires and managing bushfire, starting bushfire almost never happens with transmission lines because of that veg management. In Australia, for example, we can't find any instance of a bushfire started by any transmission line more than 66 kV, so we are talking about a 500 kV line. If you think about it, and it's a part of your line of questioning, that wide corridor that you maintain is one of the reasons why trees don't fall on transmission lines. They don't start bushfires. When a bushfire is underway, and Jeremy can talk to it a bit more, we work hand in glove with the RFS. One of the things to be aware of is that they are in control when there is a bushfire on; they are able to direct the lines to be turned off. So we are working very closely with them and there is a lot of detail around how to manage in a bushfire situation. It is something that concerns us a lot as well.

The Hon. EMMA HURST: There was actually a submission that the Committee received that said their experience with a fire was that Transgrid did not turn the power off. I don't know if you have seen that submission, but I'm wondering if you know that incident.

BRETT REDMAN: No. I apologise I haven't seen that submission, so I can come back and respond directly to the facts of it. But I want to restate that the RFS are in control in a bushfire situation. We are working very closely with them. Up to a point, transmission is still running because you've got to keep cities powered and you've got to keep civil and municipal works going. But if the RFS determine the line needs to be shut down for safety reasons, it is shut down.

The Hon. EMMA HURST: A quote from one other submission said:

Whilst overhead lines are cheaper to build, they are ignoring the fact that these lines will cost much more to maintain in the future and the hazards they provide, particularly with the effects of climate change.

That sort of sentiment has been repeated across multiple submissions. Can you respond to those concerns, particularly around the ongoing costs and the maintenance costs that people are highlighting?

BRETT REDMAN: I might get Marie to talk to this one.

MARIE JORDAN: On the underground lines, first, they have a much shorter life than an overhead conductor. The cable life is between 50 per cent and 60 per cent the life of an overhead conductor, so there is a significant cost in having to change out the conductor early.

The Hon. EMMA HURST: Why has it got a lower—

MARIE JORDAN: The heat, typically. Because when you've got it buried and it is wrapped in a slurry mix the cable does deteriorate, and it has the potential of water intrusion. Typically, they are changed out in 40 to 45 years. An overhead conductor can easily go up into the 60, 70 and even 80 years. So there is a significant cost differential right there. We also have to patrol and inspect the underground lines just as you would an overhead. Where you aren't doing the veg management for the trees clearing in the right of way, you are still having to keep the entire pathway over the top of underground conductors cleared. You cannot have any vegetation on top of those lines. It is important for quite a few different reasons but the integrity of the lines. It is not as if there is no maintenance at all to an underground line. They are significant, and the cost for doing any kind of repair after an outage is much higher than an overhead conductor.

Ms CATE FAEHRMANN: Going back to the issue of the cost-benefit analysis, if you like, was it GHD who undertook that? Transgrid commissioned GHD.

JEREMY ROBERTS: It was GHD and—

BRETT REDMAN: Stantec.

JEREMY ROBERTS: Stantec who did that work, yes.

Ms CATE FAEHRMANN: Did you ask them to do a cost-benefit analysis of either undergrounding or overhead—the comparison between the two?

BRETT REDMAN: Their brief was to do the cost. The benefit is done by AEMO, the market operator, but we asked them to compare the costs of the two options.

Ms CATE FAEHRMANN: Why did you not ask them to undertake a thorough cost-benefit analysis in the true sense of the word?

BRETT REDMAN: That's what the market operator, AEMO, does. We respond to, if you like, their plan that says you need to build a transmission line because they've decided where the cost-benefit falls out. What we're then doing is taking that plan and going, "Okay, we've got to build the transmission line through a certain area to meet the market need that's been identified." Cost is a major part of it, but what is the lowest impact way of doing it.

Ms CATE FAEHRMANN: Did AEMO give you, Transgrid, a cost-benefit analysis of both overhead transmission lines and underground transmission lines for HumeLink?

BRETT REDMAN: They will have done, within reason, a lowest cost approach when they are building their cost-benefit analysis, which means I wouldn't expect them to have in there an undergrounding option because the benefits—

Ms CATE FAEHRMANN: Thank you, Mr Redman. Where did Transgrid get information around anything to do with the cost of the benefits, if you like, in terms of a true cost-benefit analysis? It does appear as though you've just looked at the costs. In terms of environmental externalities, in response to a question earlier you said that's dealt with in the environmental impact statement. I think you called it rather a crude way or something. There wasn't really any thorough cost-benefit analysis undertaken, was there, between underground transmission lines and overhead transmission lines for HumeLink? You have not compared the benefits. Where have you compared the benefits versus the costs if you factor in—just in terms of your responsibility—the benefits as well?

BRETT REDMAN: We may be talking at cross-purposes in the sense of what you're looking for in terms of benefit, I might be calling a lower cost. When I talk about benefits, I'm typically referring to market benefits. For consumers, what will bring down energy costs. Ultimately, what's being translated through the bill. That's what AEMO is modelling. They're solving for a network that will deliver a lowest cost outcome for consumers. Benefits in the sense of what is lowest impact to build—those things are all factored into the different

options. We distil it to a cost, if you like. So it's a benefit where it's a lower cost, but it's distilled into a cost in comparing the different options to meet that market need that's been identified.

Ms CATE FAEHRMANN: In terms of the cost of both options, for example, there was the potential risk of damage to overhead transmission lines as a result of the type of megafires that we saw during the Black Summer fires. Was that factored in as a cost?

BRETT REDMAN: Not in a direct way, in the sense that it's something very difficult to quantify and not something—

Ms CATE FAEHRMANN: Was any future climate—is it? Really? This is being built for 20, 30, 40, 50 years. You are aware of, and I assume believe in, climate science?

BRETT REDMAN: Yes.

Ms CATE FAEHRMANN: So you're probably aware of the last week in terms of the extraordinary heat records we've seen. In fact, people are running through the streets of Athens right now escaping the fire. In 20 years' time, Mr Redman, can you imagine the type of wildfires and megafires that are going to tear through the forests, the national parks and the agricultural land? And Transgrid hasn't in any way assessed what that looks like and factored that into your transmission lines and your cost-benefits analysis.

MARIE JORDAN: Yes, we have.

Ms CATE FAEHRMANN: In this particular situation with HumeLink?

MARIE JORDAN: Across all of our assets we look at the resiliency. When you look at the resiliency from floods and fires, underground conductor does not provide a significant advantage. My background in this is I was in California during the wildfire events. We don't underground transmission lines, but the undergrounded distribution lines have the same impact from the fire. When you're looking at a steel tower, quite often you don't have any impact to the actual structures of a fire going through. So we do look across our entire asset portfolio, and we've actually just completed our first resilience looking at some of the climate change issues of today. We have and we do look at the different types of assets, and that is a consideration.

Ms CATE FAEHRMANN: So GHD, for example, and the work that they did, did they have access to whatever Transgrid has before it in terms of determining the climate risk to your assets? Did they have that when they were working out the so-called costs of both options?

MARIE JORDAN: They were looking at a cost analysis of the two options. They were looking at how much would it cost to build an overhead line versus how much it would cost to build an underground line.

Ms CATE FAEHRMANN: I understand that.

MARIE JORDAN: It did not take into account resiliency, because that's more of a cost-benefit or something like that. It was strictly a cost analysis.

Ms CATE FAEHRMANN: So, for you, it's what it will cost Transgrid to build as opposed to the future potential costs of maintaining the network in the case of extreme weather events. Is that correct?

BRETT REDMAN: No, I think it does take into account costs of maintenance and, as Maria was talking about, we do spend quite a bit of time looking at network resiliency and spending a lot. Climate change is part of that long-term planning—thinking about what more flooding could mean and what more bushfires could mean. But pulling back to a transmission line, the con of a veg maintenance of transmission is a big, wide corridor. The pro is it's a bushfire break. You don't find bushfire has anything like the significant impact on a transmission line. You come back to then thinking about do you start fires. I've addressed that transmission lines almost never start the fire. How do you manage in a fire situation? That's with RFS led—there's lot of circuit breakers. There's lots of protocol around how you manage to protect people and to protect their property.

Ms CATE FAEHRMANN: I'll come back to that if I have time, but I just wanted to cover the issue with costs. In terms of who ultimately is going to pay for the transmission network, it's consumers. Is that correct?

BRETT REDMAN: Yes.

Ms CATE FAEHRMANN: So the regulatory framework, I understand, essentially says that even though, for example, the connection through to Snowy 2.0, which Snowy 2.0 needs and requires—they're not required to contribute to the construction of that transmission network. Is that correct?

BRETT REDMAN: HumeLink is part of the wider system. It has many other uses beyond Snowy 2.0. Like any other part of network, both distribution and transmission, an individual customer doesn't pay for a piece of the transmission. They pay to get to the transmission, and that's what Snowy is paying for.

The Hon. STEPHEN LAWRENCE: Thanks for your time. In terms of fire or bushfire as a threat to ongoing transmission—so not so much as a cause of fire but as a threat to the operation of the network—is there any significant differences between above ground and below ground in that respect?

MARIE JORDAN: From the actual starting of the fire?

The Hon. STEPHEN LAWRENCE: No, in terms of the threat that a fire might pose to the operation of the network.

BRETT REDMAN: Network security.

MARIE JORDAN: Network security. I do not believe that you would have some of the same challenges on fighting the fire but, again, we'd de-energise the line.

BRETT REDMAN: It might be worth pointing out during the recent terrible bushfires of a few years ago there was never a loss of service on the transmission lines. Again, they're managed to be highly resilient.

The Hon. STEPHEN LAWRENCE: What are the challenges to fighting fires that above-ground transmission lines pose?

JEREMY ROBERTS: As we've pointed out, we work hand in glove with the RFS through that process in there, and our corridor does form a natural firebreak. As well as that, we have a lot of access roads in and out and around. We need to access our towers during construction and during maintenance and operations as well as when we're doing vegetation, so access roads is another big effect. We work closely with RFS on managing access tracks and where access and egress is available. The difficulty is if the fire is directly under the ground and very close, then it is a higher risk environment to be in. We work with the RFS to ensure that people do not work or walk underneath the line if the fire is right there or extremely smoky at that point.

The Hon. STEPHEN LAWRENCE: I want to ask a couple of questions about the GHD and Stantec report. The report found that above-grounding HumeLink would lead to probably a five-year delay and pointed to it being essential that the infrastructure is completed by 2026 to secure the network before aging power stations are decommissioned. In a hypothetical world where there was that five-year delay and it was put above ground, what would that actually mean in terms of impacts on the community?

BRETT REDMAN: Sorry, are you talking about above-grounding or undergrounding?

The Hon. STEPHEN LAWRENCE: Above-grounding.

JEREMY ROBERTS: Undergrounding.

BRETT REDMAN: Sorry, yes, if we underground, it will be a five-year delay. What does that mean to the market?

The Hon. STEPHEN LAWRENCE: Sorry, undergrounding.

MARIE JORDAN: If you look at where we are today and some of the challenges we see every day with the lack of reserve that we have in the different States, having HumeLink offers the opportunity to really move energy from across the States. That would not happen if we didn't have HumeLink in. When you look at HumeLink as it connects up into Sydney Ring and gets up around the area of the Hunter and the CWO REZ, that's going to be a very important super highway, getting the renewables across the whole eastern side of Australia. You think about how renewable generation is impacted by things like cloud cover for solar and changes in wind across the geography. The more interconnected you are, the more capable that you will be to be able to move the renewables and reliance on the hydro from Tasmania through Marinus Link. All these things are part of how we get to a secure energy future that we don't see with retirement of coal energy if we don't get these lines in on time. I think it's truly a critical risk to not get the transmission built and start using those pathways for the renewable portfolio.

The Hon. STEPHEN LAWRENCE: If it wasn't completed by 2026 and it's not operating in forward years like 2027 or 2028, are we talking about more coal being burned or are we talking about the network not operating properly, like blackouts and so forth? What are we talking about practically if that was to occur?

MARIE JORDAN: If we go back to June last year, I had just arrived here a couple of months prior. Look at what happened—the coal-fired fleet is aging. We even saw some real severe dips in the reserves. Quite often we were sitting on the edge of reaching out to the distribution companies to start rotating blackouts. I think that was a real window in. When I have had the experience of coal retirements up in the north-east of the US, we ended up having to extend the life of the coal units. When you extend the life of a coal unit, they typically have been maintained to get to their planned end of life. To be able to get through the type of refurbishment at the end of life when you are contracting them to stay on longer, you will start seeing some of the challenges.

You end up challenging the system throughout the year and outages become more difficult to get because you don't have enough reserve on the system. You don't have the capability to do additional maintenance on plants that are planned to go longer because you aren't getting those shoulder outages. When I talk about shoulder outages, outside winter and outside the peak of summer is when all the coal-fired generation typically does their maintenance work, as well as our line work. All of that gets thinner and thinner if you don't start building and bringing in more renewables to take over for the coal. Extending the coal is a difficult and challenging thing because they haven't planned to go longer.

The Hon. STEPHEN LAWRENCE: There was some evidence this morning that, in summary, was about what I think is called the SuedLink in Germany.

MARIE JORDAN: SuedLink, yes.

The Hon. STEPHEN LAWRENCE: Yes. That's quite lengthy. There was a suggestion that that represents best practice. I'm just wondering if you could give us some evidence about whether that is a valid comparison and whether that somehow makes the argument that undergrounding is the best option in terms of value for money.

BRETT REDMAN: The SuedLink is a really good example of—this is DC versus AC—when DC works. DC works when it's more than, say, 350 kilometres and where all you want to do is get energy from point A to point B. So that's exactly what SuedLink is doing. It's about 700 kilometres, from memory. It goes from the North Sea—you know, offshore wind up there—down to Munich, and all it's intended to do is to get from point A to point B. Projects like HumeLink are intended to have lots of cut-in points. So this is the issue where the cost of a cut-in point, a connection—to oversimplify—changes from an AC line at about, say, \$100 to \$150 million to a DC line, which is about \$400 to \$500 million. DC: really good for mass transit over long distance, no going off or on. AC: where you want to cut in and out. SuedLink is a mass movement of energy over a long distance with no stops along the way. That's why, in a practical sense, it just doesn't work here in Australia for this type of project.

The Hon. STEPHEN LAWRENCE: Were there also some legal constraints that were applicable to SuedLink? I seem to recall something in your submission about that.

BRETT REDMAN: I apologise. I can't remember that bit offhand, but it's an economically driven thing. Around the world, it's why you see some DC lines but they're for that mass transit with no cut-ins. You'd never see an AC undergrounded for more than 40 kilometres. The global experience is bearing out the economic challenge in making the choice.

The Hon. STEPHEN LAWRENCE: There has been some other evidence suggesting, in effect, that above-grounding represents too much focus on short-term capital expense rather than proper consideration of long-term expense or value for money. I'm interested in your response to that.

BRETT REDMAN: So the modelling that we do, we do whole-of-life modelling. It takes into account yearly maintenance. It takes into account life of assets. As Marie picked up on earlier on, an underground line would model at about a 45-year life, an overground line would model at about 80 years, so that alone drives some better value for money. The cost to maintain is not that much less in an underground versus an overground. I think it's important to visualise what underground looks like when you think about maintenance. What's happened is that you've dug a wide trench about the width of an Olympic swimming pool, you've taken away the soil that you pulled out and you've put into it a specialised soil, if you like—"slurry" is the word that's used—and that's designed to do two things: manage the heat of the cable and to keep everything moist so the ground doesn't dry up and doesn't create problems for the cable.

The impact of that is you can put a light dusting of soil on the top, but you can't really grow most things on the top of it. Some specialised grasses will grow. From a farming point of view, you can't crop it, both because things won't grow as well but also because you can't keep driving heavy machinery like ploughs over it. So while overhead has an impact on farming in restricting aerial spraying and some forms of big irrigation, undergrounding has a big impact on farming by saying you can't crop. Overground you can put small fruit trees, you can put vineyards in if you like. You can't put any real crops in or plough crops in an underground. You can maybe graze around it, but I suspect the quality of those grasses won't be particularly good feed for cattle or sheep.

So, from a maintenance point of view, I wanted to dispel the image, if you like, of you do a cut and cover and then put 40-metre-high trees over the top. You've got to protect the cables underneath. That means you do almost as much veg management in keeping that corridor sterilised all the way through. And so, from a maintenance point of view, it's not hugely different, particularly when if you actually have to do something to it, digging up a cable is enormously expensive and difficult versus working on a single tower or a single section, which we do routinely all the time.

The Hon. STEPHEN LAWRENCE: Lastly, in terms of the regulator's role, is it solely a matter for Transgrid what sort of decisions you make in terms of capital expenditure on things like this project?

BRETT REDMAN: Everything we do will go to the AER, the Australian Energy Regulator—heavily scrutinised. Huge amounts of consumer groups and other stakeholders will pull it apart, massive public processes. It is the AER, ultimately, that will determine if we are approved to make the spend. Their rules of engagement, or rules of the road, if you like, are well flagged and a lot of it has got to do with costs of the consumer. We also take into account any State or Federal laws in costing up and planning and thinking about what we're doing. You see that come through in things like route selection, the biodiversity offsets that are there, the way that we build and how we treat things. That all goes into modelling that we're doing. But the final decision, if you like, is driven by the rules that come down to us from the AEMC, the rule-maker, and the AER, the regulator. We're operating within those parameters. It is that parameter that says the difference in undergrounding versus overgrounding is such a material difference, it's just not entertained.

The Hon. STEPHEN LAWRENCE: In terms of a responsible use of your shareholders' money—I think that's the right term—would you have ever thought about sending to the regulator a proposal for undergrounding, for example, of HumeLink?

BRETT REDMAN: You could argue, if the regulator signed it off—so if the conclusion of government in representing the community, in weighing up all the pros and cons, was to spend a lot more money on undergrounding and it could go through the same regulated model, it could get built. If you like, shareholders would have a degree of indifference in that sense because they would be paid. As a citizen, as somebody living in the State, the cost difference and the impact on consumers would be profound. It's why the regulator wouldn't approve it. It's not necessarily—the shareholder, if you like, wants good, sustainable decisions. It thinks about it in the broader sense. Our shareholders think about what makes a business that'll be here for the long haul. They're mainly pension funds. They invest for decades so they think about the long haul.

But the cost-of-living pressure, as translated into the regulated rules, gives us a very clear guide as to what will be acceptable. Typically when we're building these routes, we're doing everything we can to minimise impacts. A simple example is where you do tower placement. You could argue if you were absolutely ruthless you could shave a few dollars off here and there by just being purely economic. You will talk to the landowner and try to work out a way of softening as you go through. There will be some costs in there. The regulator will accept a little bit of costs in there so that we soften the impact on people as we go through. But that order of magnitude difference they just wouldn't entertain.

The Hon. STEPHEN LAWRENCE: So you have no doubt the regulator would not have approved an underground—

BRETT REDMAN: There's no doubt at all in my mind. I see that in the push from government—governments on both sides at State and Federal level—on cost-of-living pressure and I see that translated into their rules and everything that they give us in terms of guidance. We get put through the absolute ringer for every dollar that we spend and it's appropriate to maintain lowest cost possible for consumer. There is no question in my mind that this—we put up lots of proposals that are rejected. This one would absolutely be rejected.

The CHAIR: I go back to a comment made earlier about what undergrounding and overgrounding look like in more of a practical sense. Could you articulate for us the methods of undergrounding transmission infrastructure?

MARIE JORDAN: Yes, it's very different than what people assume. When you think about a trench for undergrounding cable, we'd have to be, for this distance, doing an HVDC, which would be at least 50 metres wide to account for the additional cables because of the amount of capacity reduction you have in underground facilities.

The CHAIR: Sorry, how many metres? Was it 15 or 50?

MARIE JORDAN: Fifty metres wide. So you have a 50-metre-wide trench—minimum two metres deep, typically more. Depending upon the slope of ground you can either open trench cable or you're tunnelling, both of which have significant impacts. When you do the trenching, the cable reels are about 40 tonnes of reel and they're about 50 metres in length. It's a lot of weight coming in and a lot of weight going out because the majority of the native soil is stripped out and hauled out. You put in a slurry mix over the top of the conductors. So the access roads are much more fit for purpose to carry that kind of load and they go the entire length of the undergrounding.

The CHAIR: On either side?

MARIE JORDAN: Depending. Most of the time it's on both sides. One has to be more for the heavy carry. Some of the other side can actually be where they're putting some of the spoils and things like that. So you have two access roads the entire length. When we're doing an overhead line, we can do an access road into a tower. We can do a variety of methods, including taking a drone and flying a guide rope over the top so you aren't disrupting as much of the ground with vehicles, and really managing the biosecurity differently than you would in an underground situation. Truly, when you look—and we included a few pictures in our submission—you really get a different view.

A lot of times I've heard a comparison to PG&E doing the undergrounding of 10,000 miles. They're undergrounding just distribution. They're undergrounding, like, a neighbourhood conductor. The poles don't go away, either, with the PG&E undergrounding. They're digging a one-metre deep trench by a half-metre wide and putting in the conductor underground. All the other service wires of a much lower voltage that are serving the homes and many of the equipment pieces stay in the air on the poles.

To really do the comparison, it's much different than what you see when you hear people talking about the 10,000 miles of transmission that PG&E is doing. This is transmission voltage. There is not a single transmission line that is being undergrounded by PG&E because they don't have those as fire issues. It's really a very invasive process to underground lines, and it stays—as Brett talked about, the thermal soil and the impact. It truly is not like you put the conductor in a small trench and the grass grows back and it is unapparent that there are transmission lines there. It's not distribution. Transmission looks different and feels different in the undergrounding process.

The CHAIR: I thank all witnesses who attended and gave evidence today. That concludes the public hearing for this inquiry.

(The witnesses withdrew.)

The Committee adjourned at 15:45.