

**REPORT ON PROCEEDINGS BEFORE**

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

**CORRECTED**

**At Preston Stanley Room, Parliament House, Sydney, on Monday 27 November 2023**

**The Committee met at 11:00.**

**PRESENT**

Ms Cate Faehrmann (Chair)

The Hon. Mark Buttigieg

The Hon. Susan Carter

The Hon. Wes Fang (Deputy Chair)

The Hon. Stephen Lawrence

The Hon. Rod Roberts

The Hon. Emily Suvaal

\* Please note:

[inaudible] is used when audio words cannot be deciphered.

[audio malfunction] is used when words are lost due to a technical malfunction.

[disorder] is used when members or witnesses speak over one another.



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

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

**Mr LES BRAND**, Managing Director, Amplitude Consultants, affirmed and examined

**The CHAIR:** I welcome our first witness, Mr Brand. Thank you for making the time to give evidence. Would you like to begin by making an opening statement?

**LES BRAND:** I would, thank you. Madam Chair and Committee members, good morning and thank you for the opportunity for me to share my knowledge and experience, and answer questions on HVDC and underground cables. My name is Les Brand, and I have more than 30 years' experience in the industry, including 24 years on HVDC long-distance underground and subsea cables. Some examples of my experience include project engineer and operations manager for Directlink, Australia's first HVDC and 56-kilometre-long underground cable in northern New South Wales; project manager and operations for Murraylink, a HVDC system between Victoria and South Australia which is 180 kilometres of underground cable; key roles on major long-distance HVDC subsea and underground cable projects, Basslink and the Trans Bay Cable project in California, USA; and various roles for HVDC projects proposed and under development in Australia and overseas.

I am internationally recognised as a leader of CIGRE and IEC working groups and committees on various topics, including the installation, commissioning, operations and maintenance of HVDC systems. I would like to add to the opening remarks that I delivered during my testimony on 26 July 2023 in Tumut, New South Wales. I would like to start by acknowledging that the transition to renewables in Australia will necessarily require a significant unprecedented level of construction of high voltage transmission to be completed to connect the often-remote renewable energy sources to major load and demand centres. My experience and that of my company includes both AC and HVDC projects using overhead lines and underground or subsea cables.

In some cases, the use of AC or HVDC overhead lines will be more appropriate, especially in cases where the benefits of spending the extra cost for undergrounding cannot be justified. I am of the view, however, that there will be cases where the additional capital costs of using underground cables can be justified, considering the benefits that could be realised at that particular location or for that particular project. There may also be technical and economic reasons to prefer long distance HVDC over AC, particularly where the distances between the renewable energy source and the load and demand are so far apart that a HVDC and/or underground solution may become the lower capital cost with the lower electrical losses. The technical assessment of AC versus HVDC and overhead versus underground must be undertaken in a balanced, fair and structured way by professionals with knowledge and experience in these areas early in the process.

It is true that HVDC underground cables have a longer design, manufacturing and construction program than an AC overhead line equivalent. However, around the globe it is accepted that gaining easements and permitting for overhead transmission lines in some locations can result in lengthy delays, meaning that in the end HVDC underground projects can be built quicker. If HVDC underground is decided when a project is first proposed, I have no doubt the project would be commissioned sooner than the AC overhead line equivalent. This was the rationale behind the Murraylink project and the stated rationale for many long-distance underground HVDC projects currently underway connecting renewable energy sources in other countries. The reality is every project is unique. The concept design, capital and operating cost, construction time, easement width, requirements for connections all need to be determined for the various options—AC, HVDC, overhead or underground, or a combination of these—on a project-by-project basis.

I accepted the invitation to appear here today because many points raised during the previous inquiry hearings and presented in recent submissions do not align with what I know and understand from my 24-plus years of experience in HVDC projects, my recent activities undertaking AC versus HVDC studies and my significant work in CIGRE and the IEC. I believe many of these statements derive from facts about AC cables rather than HVDC cables, or about submarine cables rather than land cables. Many of the negatives presented for underground cables may apply to AC cables but not to HVDC transmission. In many cases, the case for the HVDC alternative is not stated.

Topics include land cable fault-finding, the time to repair a cable fault, the amount of spoil that needs to be removed from the trenches—the ground above underground cables does not need to be sterilised and there is no requirement for a 50-metre-wide trench. The requirements to tap in and out of HVDC projects—the reality is that HVDC links are rated for maximum power in and maximum power out, perfect for transmitting large-scale renewables to the location of the load. In such cases there is no capacity left to want to tap in. In terms of costing, firstly, an underground HVDC option will be more expensive than an AC overhead option. That is a fact. The question is, could the additional cost be justified through other technical and non-technical benefits?

I have heard a lot about the cost of HVDC projects—what it includes and what it doesn't, and that the presented costs that we've come up with previously do not take into account recent increases in costs. This is not

correct. Our estimates take into account an approximate 30 to 35 per cent increase in the cost of HVDC and underground cables over the past 24 months. Even using the most conservative construction and terrain assumptions, we can produce HVDC underground options for as low as 1.5 times the current published cost of the HumeLink AC overhead option. Finally, I have seen various comments about underground HVDC cables being worse for the environment than the AC overhead transmission lines. I would like to remind the Committee that the Murraylink HVDC cable between Victoria and South Australia, which is 180 kilometres long, was constructed within a four-metre-wide construction corridor and won a Case Earth environmental award for environmental innovation. Thank you again for the opportunity to appear here today.

**The Hon. WES FANG:** Mr Brand, it's good to see you again and thank you for again making time to provide evidence to the Committee. Since the time when the Committee previously reported, there has been a report released, as you have indicated in your opening statement somewhat. Can you provide a breakdown as to how that report has provided more clarity and more detailed analysis in relation to the costings? What is it that was different to reports that the Committee had previously viewed, such as the GHD report, that allowed a further refining of the cost profile that was provided as evidence?

**LES BRAND:** In that report we were asked to produce two alternative HVDC underground alternatives. One of them was based on one of the technical options presented in the GHD report. I would like to point out that the technical solutions that were presented in that report we agree with, and the costing of the HVDC converters we agree with. We produced an alternative. The alternative takes into account—it was stated in the GHD report that they were advised, presumably by AEMO, I think by AEMO, that the HumeLink could accept a 700-megawatt loss in the event of a single credible contingency outage.

Previous versions in the report were either  $n$  minus one or  $n$  minus a half. What we did was we applied the 700-megawatt allowable loss, and we produced a slightly smaller converter station with cables. We used our software to determine how big those cables should be, and then we actually developed our costing based on how we cost HVDC projects over the many years that we've done that. In the end, it all comes down to the cable construction cost. We don't agree with it; we never did. In my previous testimony I advised that we felt that the cost per kilometre in that report was significantly high, so what we've done is we've taken our approach that we apply and we've come up with an alternative number. That's how we get the lower number.

**The Hon. WES FANG:** In relation to the profile of costings, how have you managed the civil works for that project as you've costed? Is there an analysis of different ways that you might underground, whether it be a cut-and-fill solution or whether it be with the use of tunnelling machines? Have you looked at other options around how the cables are laid in the ground? Has that provided you an opportunity to see the difference in costings and whether a mix of solutions could be put into the project?

**LES BRAND:** The short answer is no. We assume cut-and-lay the whole way. That is a slower method, so what we tried to do was create, to some degree, a worst-case construction scenario. Our method is to actually calculate the width of the trench and then, based on cubic metres, construct excavation rates and remediation rates to come up with a bottom-up civil cost. The reality is a project of this length will have some horizontal directional drills along the way. But at this preliminary costing kind of level—concept design costing—we assume that gets balanced out with the fact that a long-distance project like this will necessarily require innovative ways of trenching and innovative ways of laying the cable.

**The Hon. WES FANG:** Is it fair to say, then, that the costings that you've provided for the civil works would be what you consider a worst-case scenario?

**LES BRAND:** It's in the higher end, correct. We assumed some pretty harsh terrain conditions and also—I wouldn't say rock all the way, but we had some pretty high assumptions regarding things like the hardness of the soil.

**The Hon. WES FANG:** So there is perhaps an opportunity for further technological advances in civil works, such as horizontal drilling, to provide a speed and cost efficiency saving in relation to what you've proposed here.

**LES BRAND:** Correct. In my previous testimony I'm pretty sure I mentioned that every long-distance underground cable project will necessarily, at the start, require establishment of an innovative, efficient way to trench and install based on the limitations of the project. Again, the Murraylink is a good example. We had a four-metre-wide corridor, and at that time we engaged an experienced gas pipeline cable laying company to come up with a method to stay within that corridor.

**The Hon. WES FANG:** Mr Brand, I'm pretty sure you were familiar with the previous inquiry, and you would have been following its progress as we had hearings et cetera. You would have heard that there's concern

that perhaps the undergrounding of a project like HumeLink might create a delay in the approval and also in the actual physical work. I imagine you've had some experience in discussions with landowners and the like. Can you provide some insight as to the views of landholders around undergrounding versus the disruption of their farm operations with overhead, as proposed for HumeLink?

**LES BRAND:** The people that I've spoken to, without exception, have been fully supportive of undergrounding. I believe they're aware of the construction corridor that is required, but I believe there's an understanding that that construction corridor is a very short-term issue. You've got to remember that the construction moves as somewhat of a front; we call it a construction front. It'll be in one particular location for a matter of weeks before it then moves on to the next. My feeling is there's an acceptance of, I guess, short-term pain for long-term gain.

**The Hon. WES FANG:** In the dealings that you've had with landholders looking at this project, is it fair to say that you've explained those impacts to them and also explained issues such as the width of easements and the projects that can occur above the corridor once the project has been laid—that is, can they continue to farm and have pasture above it? We heard differing evidence during the last inquiry as to what can be done above where the cables are run. Has there been feedback to you on those issues as well?

**LES BRAND:** Yes, there have been various comments made about what can grow above the cable and what cannot. I can speak to my experience. Remember—and I think a lot of people forget this—Australia still has what was once the longest underground cable in the world, at 180 kilometres. Only recently was that record knocked off its perch. But I can say that there are areas along there where we've put the cable in a firebreak but, in the areas where it is not, you need a machine—a detector—to actually go and find where the cable is. You can't see it with your eyes, and that's because the grasses and the natural shrubs will just grow over it. So this idea of sterilising above the cable I do not support for these long-distance HVDC cables.

**The Hon. WES FANG:** I appreciate I'm flying through a lot of these issues. I'm trying to cover off all of the negatives that we've heard previously that have been rolled out as excuses as to why undergrounding can't occur, and I think we've covered off a lot of those now. I want to drill down on the capacity of the line that you, with your experience, costed, and look at some of the other issues that came up during the previous inquiry, where we heard that the overhead AC systems allow for further tapping in and out, because an AC to AC system does not require those converter stations, whereas, where you have a DC line, each end of the DC line requires a converter station.

If you were to tap into a DC line for another project, you require another converter station. Part of the argument that was made in previous hearings was that the ability to tap in and out of HumeLink will provide opportunities further down the track. But can you provide some clarity on how it might work, if a converter station is required to tap into a DC system, for whatever reason, in the future? What cost impact would it have if that requirement was on the table in the future?

**LES BRAND:** If you want to tap into an HVDC system, you are going to need to build another converter—usually a smaller one but, still, it will be a high cost. We haven't had a project in the world where one has been retroactively added, but it is possible, but with technical challenges. We call them multi-terminal HVDC links. The multi-terminal HVDC links that do exist were designed to be so at the start. For example, there is one in Scotland—Caithness Moray HVDC system. But the general misunderstanding is, when you try to use HVDC as a one-to-one replacement for AC, HVDC is a solution to get bulk power from point A to a load area at point B, and, if you've got two gigawatts coming in at point A and you've built a two-gigawatt HVDC system, there is no more capacity, anyway, to want to tap in.

That's a very different situation to how all of us in the power industry have grown up with AC transmission, where we have smaller loads and smaller generators connecting at various locations. In a situation where you already have two or three gigawatts of power in one location, you would size your HVDC links to those two or three gigawatts and you'd transmit it all the way. The analogy I use is the highway bypass. This is the concept that is being applied by other countries who are faced with the same problem—how to get all of this power from one location a long distance to another location.

**The Hon. WES FANG:** I think you have pretty much answered the next question that I was going to ask, which I was hoping we would get to. Is part of the support for an overhead AC system due to the fact that it allows the additional capacity to tap in and out that DC does not? Because you effectively size the cables and the system with converter stations for the designed load that you will have. For example, if you have a REZ that you are connecting to a major load, which would be a metropolitan area, you cannot then create another REZ further down the track and tap it directly in, because the system will not have the capacity to accept the extra power. Is the flexibility that AC might provide more important to the grid system than the transmission of the power from one

location to another? Do you think there is a business case built into HumeLink to have an AC overhead system that will allow further tapping in and out of it into the future?

**LES BRAND:** I can't really answer that. I think that the reason why an AC overhead line is supported is because it will pass the current regulatory processes. It is the cheapest solution, and that is pretty much what the current processes are set up for. What we have to remember is—and we will eventually be using HVDC in this manner—when this happens, by shunting the power from point A to point B you are offering capacity in the AC network that is parallel to it. So the argument for the flexibility—it's a different way of thinking. It's a different way of planning the network. It's shunting power from point A to point B to free up the adjacent AC network and then, if you want to connect a 100-megawatt solar farm or something like that, you connect it in the freed-up network. Whether they use the flexibility of being able to tap in as part of the justification, I don't know the answer to that.

**The CHAIR:** Mr Brand, could you talk us through some of the workings of the report with a bit more detail into the costings. My first question is about the loss. You are saying that is a significant component, in terms of the costings differential. Could you explain, in laypersons' terms, how loss is factored in financially in terms of the cost of operation and maintenance going forward? Could you break down why that is an actual cost? The question is about 700 megawatts of loss. What is the cost? I am trying to work that out. It is a non-engineer's question.

**LES BRAND:** Any transmission line, AC or DC, will experience electrical loss. Whatever you inject in one end of the transmission line, the megawatts on the other end will be lower. If you had an interconnector, for example, and you were buying power in one region—you were buying 100 megawatts, you would only be selling 95 megawatts. In that example, that is actually a real cost. I'm not an expert in the machinations of the NEM but, if you were to buy power from one generator and then sell it into another location or transmit it to another location, there will be some megawatts that you paid for that you won't be delivering to a customer.

**The CHAIR:** Thank you. That is actually very clear and simple. In the undergrounding report that you have prepared, on page 5 you state:

It is disappointing that the 2A-1 option was not considered, i.e., a fully underground HVDC option which allows for a loss of 700 MW (as apparently advised by AEMO to Transgrid/GHD as being acceptable during the study).

Would you care to explain to the Committee what that means in terms AEMO saying to Transgrid that that was acceptable during the study?

**LES BRAND:** Yes. We've taken that from part of the GHD report. It looks like they looked at an A option, which is an N-1. They looked at a B option, which is an N-½, which means you lose one pole of a converter—you lose 50 per cent. That's called N-½. But then there are some options where they have produced a C option, and the C option takes into account this loss of 700 megawatts. The disappointment was that for the option 2s—which is fully underground HVDC—they did not produce a C option. So we've had a go at not only designing a C option using the same principles as the GHD report but then costing it up using our method.

**The CHAIR:** Again talking about losses, Amplitude's own loss estimates of HVDC versus the AC option show the HVDC losses to always be lower and, in some cases, up to 24 per cent lower than the AC option. This is a really important point for Committee members to get their heads around. You highlight operating costs in general. Do you want to expand upon that to the Committee in terms of why that is so important and why it might have skewed GHD's costings?

**LES BRAND:** No worries. For the losses, the GHD report just provides dollar values, not megawatts, so there's no way we can try to figure out how they calculated those losses. But the results are that the loss costs are more for HVDC than they are for AC. This goes against the generally accepted principle that losses in an HVDC system are lower than in an AC system. But because there was no megawatt number for us to drill down into, we couldn't really—we have our own calculator for calculating HVDC losses.

The second part about operating costs is quite important. In my background, I've developed the O&M budgets for Directlink, Murraylink and the Trans Bay Cable in the US, and I'm currently heading up the international working group on the operation and maintenance of HVDC. The numbers that are in here are extraordinarily high compared to any of those projects and anything that I am familiar with. In here, we've tried to break out what we think. We took the published costs for Murraylink and Directlink and tried to say, "If you take those into account and then multiply by three, because there are three times as many converters, then you should be looking at numbers like this." If I recall, they were significantly below the numbers that were put in there. If you've overestimated your annual costs and then you compare projects in terms of life cycle costs, it will skew it towards the AC overhead option rather than the HVDC underground.

**The CHAIR:** Thank you. Mr Brand, you're a joint recipient of the 2020 national professional electrical engineer of the year award from Engineers Australia, aren't you?

**LES BRAND:** Correct.

**The CHAIR:** How many members of Engineers Australia are there?

**LES BRAND:** I don't know. I can't answer that, but pretty much every engineer I know is a member.

**The CHAIR:** I know that some people will say that because there has never been a 500 kV line buried underground for this long—for example, in terms of HumeLink—then we shouldn't do it. That's reason enough not to do it. What's your view on that?

**LES BRAND:** If we're talking 500 kV AC, the numbers are pretty high. A lot of the negative comments that you see towards—

**The CHAIR:** Do you mean the costings when you say the numbers?

**LES BRAND:** The capital cost numbers. Undergrounding 500kV at long distance is very expensive, and it will lead to the kind of construction corridors that you've heard other people talking about. Every 30 or 40 kilometres, you're going to need to build a separate yard with a lot of equipment in it. I wouldn't necessarily say the reason would be that it has never been done before. I think the reason is more that for AC 500 kV for that kind of distance, it wouldn't make sense. You'd go to HVDC at that point.

**The CHAIR:** When you say that you'd have to go to HVDC at that point, what's the difference between what you've just talked about in terms of the AC and the HVDC?

**LES BRAND:** HVDC does not require any compensation along the length. I'm sure you would have seen in the media that people are talking about 4,000-kilometre-long HVDC cables without any compensation along the length. There are technical reasons why that's the case.

**The CHAIR:** In what capacity are you saying compensation?

**LES BRAND:** Large reactors in a fenced yard, so quite significant. This is why in many cases if it's a subsea cable where the practicality of having these along the route—you have to build a platform. That's why for subsea cables HVDC is almost always selected, particularly if it's over 30 or 40 kilometres.

**The CHAIR:** What about capacity? One of the things we're hearing about is the expertise in this country, the availability of what is needed to lay HVDC and the time. The Minister keeps saying that if we went with undergrounding HumeLink, for example, it would take four to five years longer. What's your view on that?

**LES BRAND:** If you started the project right now, if you decided to go underground with HumeLink right now, it will be a four- to five-year process because you are pretty much starting again. The underground option has been investigated now for, as I understand, about two years. Prior to that, there was a lot of development in the overhead AC option. One of the points that I raised in my submission is that if you wait three or four years and then decide to go HVDC underground then, yes, there will be a delay to the project. But if you assess underground HVDC fairly at the start of the project, without these one-off statements from reports and Google and things like that that I'm seeing in the industry—if you assess it fairly and decide to go HVDC underground, then HVDC underground will be built before the AC overhead line. I'm confident of that.

**The Hon. ROD ROBERTS:** Thanks, Mr Brand, for both your submission and your time here today. Murraylink, at the time, was the largest capacity, longest distance underground power-moving cable in Australia, correct?

**LES BRAND:** Yes.

**The Hon. ROD ROBERTS:** We've heard from proponents of overhead power at the moment providing resistance towards HumeLink being underground, simply because it has never been done before. We've never had anything of that capacity. We've never gone that distance before. Was there similar reluctance to Murraylink at the time?

**LES BRAND:** I'd say no because we built it as a private company. I was the project manager of that project and the decision for us to go underground HVDC was one that we knew we could build, at the time, in two to three years. We knew if we tried to build an overhead transmission line, we would not get the permitting and consents. I recall that at the time we were looking at six to seven years, so schedule was a big part of the project. Technical risk—we were an experienced company. We managed the technical risk associated with it being the highest voltage, at the time, and the longest distance.



**The Hon. ROD ROBERTS:** Right. You've just answered my next question, and that was: Why was undergrounding chosen for Murraylink? You've answered that. We hear from opponents of underground that if there are faults underground it will take forever to find them and locate them. With Murraylink, have there been any issues or faults—and/or locating those faults—that have taken it offline for any extensive period of time?

**LES BRAND:** There have been cable faults on Murraylink. I believe that's a matter of public record. However, I have seen some submissions that have used CIGRE failure statistics—back calculated them to get seemingly ridiculous numbers. Murraylink is 360 kilometres of cable. I believe it has failed twice post trial period. If you work out those formulas, you will get a much lower failure rate to what I have seen in the submissions. I also want to point out, while we're talking about that, that the submission is referring to Directlink and using public record on Directlink failure rates. I have seen those in there and I'm familiar with them. But we have to remember that Directlink was the very first polymer HVDC cable in the world. There were a lot of learnings from Directlink. I was the project engineer and the operations manager for that one as well. That is not an appropriate reference, in my view, if you're going to work out failure rates for the technology that has developed over the last two decades.

**The Hon. ROD ROBERTS:** We've come a long way, haven't we?

**LES BRAND:** Yes, we have.

**The Hon. ROD ROBERTS:** To your submission on page two—I wasn't on the first inquiry, but we heard evidence at the inquiry on 18 July saying there'd be a requirement for a 50-metre wide trench, or words similar to "an Olympic pool-sized trench" et cetera. Where could they have possibly got that assessment from?

**LES BRAND:** I believe what was meant was a 50-metre-wide construction corridor, only because even the GHD report published on Transgrid's website doesn't refer to those kind of trench widths. However, it was said that a 50-metre-wide trench—and with HVDC, you are probably looking at a couple of metres per circuit. With AC, that will probably go out to three or four metres per circuit.

**The Hon. ROD ROBERTS:** That is certainly nowhere near 50 metres.

**LES BRAND:** Not 50-metre-wide trenches, no.

**The Hon. ROD ROBERTS:** I have one last question. Evidence heard on 18 July was that the undergrounding option could be up to 10 times more expensive. Do you know where they got the evidence to actually make that sort of statement?

**LES BRAND:** I think the genesis of the 10 times, which is quite often repeated and replicated, is in the case where you are trying to underground with AC cables, because you need multiple cables for the same amount of power, and, as I mentioned before, the higher the voltage, you are going to need these reactive compensation stations. So whether it is 10 times or eight times or 12 times, those numbers probably will align if you choose AC underground. This is where the concept of HVDC underground needs to be considered because you can get those numbers down to, as our report shows, as low as 1.5 times. If you throw a whole lot of other things in there, maybe two times, but, yes, it is not 10 times.

**The Hon. ROD ROBERTS:** What we are talking about here is taking power from its generation source down in the Snowy Mountains and taking it up to Bannaby to the substation there.

**LES BRAND:** Correct.

**The Hon. ROD ROBERTS:** Really, we are just moving it from one spot to another?

**LES BRAND:** Yes.

**The Hon. ROD ROBERTS:** Hence your recommendation or your proposal, perhaps, that HVDC is the way to go on this particular project.

**LES BRAND:** And projects like it, where—again, I use the highway bypass analogy. You just shunt as much power as you can push into one end, and you push it out the other—no need to take it out halfway along; no need to add to it halfway along.

**The CHAIR:** I will just jump in with one last question. In terms of withstanding bushfires and underground cabling, I have read that they can still suffer due to the heat during bushfires. Has there been any experience of cabling and how it has survived bushfires in Australia that you are aware of and could you speak to that—or not survived, I should say?

**LES BRAND:** I don't have any experience in that. But, as someone who works in the industry, I have never heard of a HVDC cable being impacted by a bushfire above ground.

**The CHAIR:** Okay. Overhead, of course—as we saw, there is a Transgrid report. Are you aware of that report, that the impact of the Black Summer bushfires on Transgrid's network was quite extensive?

**LES BRAND:** Yes, but it's not something I have delved into.

**The Hon. EMILY SUVAAL:** Thanks so much for appearing again today, Mr Brand. How many underground transmission projects have you worked on in Australia?

**LES BRAND:** Two.

**The Hon. EMILY SUVAAL:** And what were those projects?

**LES BRAND:** Directlink and Murraylink.

**The Hon. EMILY SUVAAL:** Have you worked on any underground 500-kilovolt transmission lines in Australia?

**LES BRAND:** AC?

**The Hon. EMILY SUVAAL:** Underground 500-kilovolt transmission lines in Australia.

**LES BRAND:** No.

**The Hon. EMILY SUVAAL:** What were the distances of the transmission lines that you refer to that you've worked on that were the underground ones?

**LES BRAND:** One is 56 kilometres, and the other is 180 kilometres.

**The Hon. EMILY SUVAAL:** What kilovolt size?

**LES BRAND:** kV?

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

**LES BRAND:** 80 kV for the first one—built, commissioned in 2000; and 150 kV, commissioned in 2003.

**The Hon. EMILY SUVAAL:** What expertise is there in Australia in building 500-kilovolt underground transmission lines, would you say?

**LES BRAND:** I'd say none. Probably not in the world either.

**The Hon. EMILY SUVAAL:** If this has never been done before in Australia and, indeed, there's limited evidence in the world, what is your evidence based on?

**LES BRAND:** Which part of the evidence?

**The Hon. EMILY SUVAAL:** The evidence—your report that you've commissioned.

**LES BRAND:** Global experience with HVDC and the fact that every HVDC project is necessarily a higher voltage. When we built Directlink, no-one had built an 80 kV before. When we built Murraylink, no-one had built a 150 kV before. When I was over in Trans Bay Cable in California, no-one had built a 200 kV before. Every project is necessarily going to be bigger. They're currently talking about 525-kV projects that are being developed in Australia and 320-kV projects that are being developed in Australia, and we're working on those projects.

**The Hon. EMILY SUVAAL:** How wide would the trenches need to be for 500-kilovolt underground transmission lines?

**LES BRAND:** HVDC?

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

**LES BRAND:** Approximately 1.5 metres.

**The Hon. EMILY SUVAAL:** How wide would the land easements need to be?

**LES BRAND:** Well, it depends how wide apart, how far apart you want to put these cables. In terms of the mutual heating effect of cables—to kind of answer your question about the 500 kV, there is acceptable software that we use in the industry to actually calculate the heat in the cable. When you go up in voltage, you go down in current. When you go down in current, you can actually put more power through, which is the concept between

going from 320 to 525. There is a mutual heating effect that you do need to take into account. Our view is that's a couple of metres. But, practically, you may want to space the cables further apart so you can actually get access to them during construction, where you excavate them, find the fault, dig it up and put it back in.

**The Hon. EMILY SUVAAL:** So the easement may in fact be more?

**LES BRAND:** Yes, I think we said something of the order of 20 metres in our report.

**The Hon. EMILY SUVAAL:** What material do you use to line these trenches?

**LES BRAND:** The answer is it depends. Directlink and Murraylink, we didn't use any other material. In fact, in Murraylink, we used screens to screen the material to get the soft bedding soil, using the natural spoil around the cable. So, effectively, the material that you put around the cable depends on the thermal resistivity characteristics of where you're putting it in.

**The Hon. EMILY SUVAAL:** If it was a 500-kV cable, for example, what material would you use?

**LES BRAND:** The principles are the same, whether it is 500 or 320 or whatever. In your calculation, in your modelling, you would put a thermal resistivity value in there. We use 1.5 as a value. Now, when you go out and you actually measure it, you may find there are areas where 1.5 is not—where you're actually measuring higher, in which case you may put in known thermal resistivity backfill. I have seen parts of the report where they say you replace the whole trench with that backfill. I don't support that. You can actually replace an area around the cable.

**The Hon. EMILY SUVAAL:** Sure. If you undergrounded a 500-kilovolt transmission project, what infrastructure would you need above-ground to connect renewal projects along the route?

**LES BRAND:** HVDC? You would need converter stations at each end.

**The Hon. EMILY SUVAAL:** How long would it take to build a 360-kilometre-long 500-kilovolt transmission line?

**LES BRAND:** Overhead line?

**The Hon. EMILY SUVAAL:** In general.

**LES BRAND:** I believe I said five to six years—four to five years, sorry.

**The Hon. EMILY SUVAAL:** This is for undergrounding?

**LES BRAND:** Yes.

**The Hon. EMILY SUVAAL:** The maintenance of underground transmission lines—does it cost more when you compare it to overhead and how long does it take compared to overhead?

**LES BRAND:** No. But if you're using AC—in my opening remarks, I commented how there are a lot of statements that are made about AC. AC, you need access to the joints, and you need to go and inspect them and take measurements. You don't need to do that for DC cables. In fact, on Murraylink, all the joint bays are actually buried completely. There are no pits that you have to go and visit.

**The Hon. EMILY SUVAAL:** But, specifically, does it cost more?

**LES BRAND:** No.

**The Hon. EMILY SUVAAL:** How long does it take?

**LES BRAND:** For a HVDC cable, I would go and drive the route. I'd check for anyone excavating in the area, or I'd check to make sure no-one has taken any of our cable markers and signs.

**The Hon. EMILY SUVAAL:** Would you say it's a shorter or a longer period of time, as opposed to overhead AC?

**LES BRAND:** Shorter.

**The Hon. EMILY SUVAAL:** Your submission says that apart from deep-rooted trees, farming and cropping can occur above underground transmission lines. Are you aware of Aurecon's recent study that showed you cannot have deep-rooted crops within easement areas for underground lines?

**LES BRAND:** Yes. The term "deep-rooted" is being used a lot. I'm not a farmer, so I don't know what "deep-rooted crops" actually means. For us, we have always used "deep-rooted" to refer to trees. Maybe they're talking about orchards. I have read that report.

**The Hon. EMILY SUVAAL:** Do you acknowledge that grazing and cropping are typically permitted below overhead transmission lines?

**LES BRAND:** Possibly, if you have the right clearances.

**The Hon. EMILY SUVAAL:** There is a lot of dispute about the cost of undergrounding. Do you accept you are one of the few to say the cost is only marginally more, and that a seeming majority of experts have shown that the costs of undergrounding are significantly higher?

**LES BRAND:** I accept that my costs are in line with those that are building projects elsewhere, and I can't comment on how others come up with their costing.

**The Hon. STEPHEN LAWRENCE:** Mr Brand, you said earlier that if the underground proposal had been advanced from the beginning, it could have been completed within a certain time frame. I'm wondering whether that time frame included what would need to have been done by way of amendment to the National Electricity Law under which the regulatory framework sits?

**LES BRAND:** No, it would not.

**The Hon. STEPHEN LAWRENCE:** Are you able to tell us what sort of processes are involved in amending the National Electricity Law and the regulatory framework that sits under it?

**LES BRAND:** I'm not an expert in the National Electricity Law, but I am familiar with the RIT-T process. The RIT-T process requires that the higher net market benefits get selected, which usually means the lowest cost option.

**The Hon. STEPHEN LAWRENCE:** Did you get a chance to look at the Transgrid evidence from the last occasion and particularly the evidence they gave about the risks to the network if HumeLink wasn't completed on schedule?

**LES BRAND:** No, I did not.

**The Hon. STEPHEN LAWRENCE:** You'd have much more understanding than me of what they said if you looked at it but, broadly speaking, they said that there were serious risks to the stability of the network and electricity provision if HumeLink wasn't completed on time. As a broad proposition, do you agree with that?

**LES BRAND:** As I said in my opening, there is a need to build transmission, and we understand that a lot of transmission needs to be built in a period of time. We look at AC overhead transmission versus HVDC underground transmission. We're not looking at things like the timing of Snowy, where the power is coming from at the other end. That is presumably being addressed by others. When I get involved in things like this, my role is to try and get the facts out there about HVDC and about undergrounding. I feel a need to appear at an inquiry like this because of some of the things that I see being said in the public domain, but it's not my role to determine when Snowy is going to be completed and what is the required timing for HumeLink.

**The Hon. STEPHEN LAWRENCE:** You accept, don't you, that because undergrounding was not advanced from the beginning, there would be considerable delay if that method of construction was adopted?

**LES BRAND:** Do we have the latest delivery date for the AC overhead option?

**The Hon. STEPHEN LAWRENCE:** I don't have it at hand.

**LES BRAND:** My estimate would be, if we all decided today to go HVDC underground, you would probably be looking at 2029-30.

**The Hon. STEPHEN LAWRENCE:** Accepting that, at least on the previous estimate when we were here last time, that was considerable delay in terms of the construction time. You're not able to comment on what that would mean in terms of the risk factors that have been pointed to by Transgrid, are you, because that's not within your remit?

**LES BRAND:** No.

**The Hon. STEPHEN LAWRENCE:** The thing I'm struggling with, to be frank, is how could we recommend the undergrounding proposal in circumstances where it wouldn't, on the current regulatory framework, be approved. Are you able to assist us on that?

**LES BRAND:** No. That's not my area either.

**The Hon. STEPHEN LAWRENCE:** It's not your remit?

**LES BRAND:** No. I think there are two issues at play here. There's the immediate issue of HumeLink and then there's the issue of what we do about the next one. I feel that if it is too late for HumeLink to go underground—and it's not my position to say whether it is or isn't—certainly when you start looking at the next transmission lines, we need to make sure that we are assessing AC versus DC, and underground versus overhead, early in the process, because one of the reasons why many projects around the world in the private sector are going to HVDC right up-front is because everyone believes, and I believe, that it will be built quicker than an AC overhead transmission option.

**The Hon. STEPHEN LAWRENCE:** Presumably, on the basis of the opinions you've expressed, you would at least now be against the decisions of the previous Government that advanced the above-ground proposal?

**LES BRAND:** Sorry, I don't understand the question.

**The Hon. WES FANG:** He's trying to stitch us up.

**The Hon. STEPHEN LAWRENCE:** For example, I'm talking about things like the previous Government approving overgrounding through Kosciuszko National Park and other steps such as not financially contributing to an undergrounding proposal in order that the regulator could have approved the project. If you could go back in time, your opinion would be against those decisions?

**LES BRAND:** I guess, yes.

**The Hon. STEPHEN LAWRENCE:** Those decisions having been taken as they were, you're not able to speak to the risk to electricity provision if we were now to change tack?

**LES BRAND:** No. Do you mind if I add to that?

**The Hon. STEPHEN LAWRENCE:** Sure. Please.

**LES BRAND:** The issue that's on the table here, and my understanding is that one of the reasons for the inquiry, is we need to look at what needs to change so that we can start looking, fairly, at HVDC underground or overhead—remember, you can do HVDC overhead as well—early in the process and justify potentially any additional costs, but the current processes don't allow for that. HVDC technology does provide quite a number of technical benefits to the network that currently are not being taken into account in the current processes.

**The Hon. STEPHEN LAWRENCE:** On the basis of the decisions that have been made to date, including the lack of financial contribution to undergrounding, and accepting the regulatory framework and accepting that the risks are not within your expertise, do you accept that it may well just be too late to progress the undergrounding proposal in respect of HumeLink?

**LES BRAND:** I'd say that is not mine to say. I can only tell you when I think we would be able to have a HVDC underground option, and then it's up to other parties that are looking at the timing of renewables and REZs and Snowy to determine whether that will be too late.

**The Hon. STEPHEN LAWRENCE:** Your expertise is on the construction aspect of HumeLink rather than how HumeLink fits into the bigger picture?

**LES BRAND:** Correct.

**The Hon. STEPHEN LAWRENCE:** The risks obviously lie in that area particularly?

**LES BRAND:** I would say my expertise sits in long-distance underground power transmission. As I've said, the reason why I've agreed to appear here is to make sure that the facts about HVDC and the facts about underground transmission are presented.

**The Hon. STEPHEN LAWRENCE:** It may well be, upon our assessment of those other factors—such as risk and the related factor of timing—that we have no choice but to recommend against the undergrounding proposal. You certainly can't exclude that, can you?

**LES BRAND:** That's a possible outcome.

**The CHAIR:** Thank you very much, Mr Brand, for coming again. I recognise it's your second appearance before not this Committee but on this issue to an upper House inquiry in a number of months. We appreciate your evidence.

**(The witness withdrew.)**

**Mr GRANT PIPER**, Deputy Chair, CWO REZist Inc, before the Committee via videoconference, affirmed and examined

**The CHAIR:** Welcome, Mr Piper. Do you have a short opening statement to make?

**GRANT PIPER:** I am the chair of Uarbry Tongy Lane Alliance and the National Rational Energy Network. I have some prepared documents here, so I'll start with that. Thanks for commencing the new inquiry into undergrounding. I noted the dissenting reports from the previous inquiry, and thank you for that. I noted the main report focused largely on the HumeLink transmission line, while the many other systems of the State to be imminently affected by transmission lines, such as us in the CWO REZ, got little mention. We've got compulsory acquisition commencing this week, drilling machines and bulldozers are moving, and all prior to the project EIS being reviewed or approved. There is no procedural fairness in this, and we fear the CWO REZ will be forced through before any sensible review of policy occurs, which will then wind back construction in other REZs. In short, I think we will be built over for no other reason but to save face and to give time to redirect the narrative as the reality of the situation the State is in starts to bite.

Re-undergrounding transmission using high voltage DC would alleviate many key problems, such as direct routing, visual amenity, property devaluation, large easements, EMF and firefighting. Most landowners would welcome this change. There has been no substantive change to the situation given in my previous submission to the inquiry. I simply recommend that they are reviewed. My new submission to this inquiry repeats what I submitted to the EnergyCo CWO REZ EIS, as this is fundamental to our problem, I think. Undergrounding does not address these key flaws of the whole scheme, which I'd like to read from the submission to the EnergyCo EIS, which I submitted to this inquiry. It states:

2. Industrial wind, solar, pumped hydro and the enabling powerline infrastructure will forever spoil productive farmland and decrease food production, and thus food security. People need clean food, cradle to grave, before they need—

supposedly—

clean (sic) power.

3. The energy consumed in the mining, transport, manufacture and installation of industrial wind, solar, batteries, micro pumped hydro and powerlines is provided by oil, gas, nuclear and predominantly coal. Consumption of these limited resources will increase, not decrease, because of the installation of these inefficient generators.
4. The building of more wind/solar/powerlines to provide energy to build more wind/solar/powerlines is a daisy chain of delusion due to their inefficiency and energy loss at every step – please refer to the 2nd Law of Thermodynamics.
5. With wind turbines only delivering ~29% of their installed capacity (AEMO 2022 data) they are a grossly inefficient way to produce bulk power. The embedded energy and materials in them and the infrastructure needed to connect them to the grid make them expensive environmentally and expensive per kw produced, such that they are counterproductive to the stated aim of reducing emissions. That is, they cause more harm than good to the planet, and power prices will not fall ... Added to this is the massive local and direct environmental damage caused.

The same statement can be made for solar. It only delivers 20 per cent of its installed capacity based on AEMO data and so it's actually worse. The submission further states:

6. The relatively short life of industrial wind and solar, and especially batteries, is acknowledged as less than 25 years. This means they must be replaced ... which incurs a whole new cycle, or continuous cycle, of energy and materials/resource consumption with the attendant emissions ...
7. Battery storage is listed for the Merotherie sub-station—

in the Central West REZ—

and internal to many of the proposed wind and solar projects in the REZ. Batteries do not produce any power at all and consume huge amounts of energy and resources to produce, so the economic and environmental cost to Australia and the world of using them is greater than even for wind and solar. Once again, their use yields a net result that is counterproductive to the stated aim.

I note that the energy operator also lists the latest subsidies from both State and Federal governments. There's a frequency control ancillary services market, which isn't talked about much. Basically, it's throwing money at generators that can provide immediate and short-term backup to the grid in a synchronous manner. They've recognised the problem, they're going to throw money at it, and that will result in gas turbine and diesel generators being plugged into the grid and being paid by high, supposedly, market rates to support the renewables. I'll go on from the submission:

8. Micro pumped hydro sites have been identified all over the State, some in the CWOREZ. Pumped hydro suffers many of the same problems as wind and solar. All the 'low hanging fruit' of hydro in Australia has been built. Australia is mostly flat, we do not have large mountains or reliable rainfall or snow. The cost of small pumped hydro is exorbitant for the limited storage and power delivery capacity, and incurs large local environmental cost ...

9. Hydrogen production is also floated as an energy storage solution. Converting water to hydrogen via electrolysis takes a lot of energy and requires access to a lot of water.

It's about 80 per cent efficient; you need about 50 kilowatts of electricity to get one kilogram of hydrogen. The submission continues:

Water is often in short supply in inland Australia, and food production will suffer if water is taken from it to make hydrogen. Over-building wind and solar to provide capacity to produce 'green' hydrogen is being spruiked ...

You can see that in the Central West REZ, where we've gone from three gigawatts an ounce initially and they are now talking about 20 gigawatts of installed capacity for us.

10. The CSIRO GENCOST report omits all powerline infrastructure and associated expenses prior to 2030 - this is not useful for decision making and is misleading. The true cost to Australian citizens of building the AEMO ISP is unaffordable and the stated goals of providing cheap and reliable electricity can never be realised in this way. Much expert commentary and analysis has taken place on this topic—

over the last year. The submission continues:

11. All wind and solar generation needs baseload backup to achieve the 99.8+% reliability goal - the historically accepted standard for first-world mains power. Forcing baseload thermal power to operate off its design-point to cater for variable wind and solar leads to less efficient operation, more fuel consumption and instability in the grid. Baseload cannot be eliminated due to the variability of the wind and the sun setting.

I refer to the FCAS market that I mentioned earlier. The submission continues:

12. In the 21st century I cannot believe we have an energy crisis of our own making. With ample coal, gas, uranium, and wind and solar for remote areas, we should have many options to produce the cheapest power in the world with minimal emissions if intelligently used. Our grandparents who engineered and built a reliable and efficient power system would be appalled at the wasteful and incoherent plans being implemented today.
13. I urge you to diligently consider the engineering reality of electricity production before you set us irrevocably on a path to unreliable and expensive power, which we and our children will be paying for all of our lives. This, along with decreased food production and a poisoned industrial landscape, is not a legacy to be proud of.

Supporting documents with that have been submitted.

**The Hon. WES FANG:** Thank you, Mr Piper, for making yourself available today. I noted in your opening statement you said that compulsory acquisitions are about to start, that there is effectively work about to commence on a number of projects. I'm assuming that obviously the EIS has been fully approved and that it's effectively a last resort by EnergyCo to do this, and that they have done the proper and appropriate consultation over many, many sessions. Would that be a fair assumption?

**GRANT PIPER:** The EIS isn't approved. The public submission period and exhibition period had closed a couple of weeks ago, so that is with DPIE, I assume, before it goes to the secretary and then to the Minister for approval. So, no, the Central-West Orana REZ EIS is not approved and, yes, the compulsory acquisition process or the negotiation period has been running in parallel. The six-month negotiation period finishes this Wednesday and then we'll go into the peer period after that. Consultation? No, you would have heard elsewhere. I don't think the consultation has been appropriate simply because the project isn't approved. It's all jumping the gun. And the breakdown in consultation, you could go back years to when the electricity infrastructure bill was passed in both Houses of your Parliament in November 2020 in 17 days. In November 2020 there was no public consultation worth mentioning about the REZ or the establishment of the REZs, so the consultation breakdown began with an Act of Parliament that was rammed through in November 2020 at the height of the COVID era and it's been similar from then on, really. We're being told. We're not being consulted.

**The Hon. WES FANG:** In relation to the negotiation and compulsory acquisition process, can you provide some insights as to what steps have been taken in relation to consultation and negotiation by EnergyCo in relation to the project? What steps have they taken to negotiate in good faith with landholders who are looking to have impacted land either taken or compulsorily acquired versus what's been offered by way of compensation or purchase?

**GRANT PIPER:** Yes. Sorry, I'm just interpreting your question. Initial contact was made with most landowners via a letter and then public meetings in the local area with staff and maps from EnergyCo. A lot of these maps are very ill-defined and some of them were just plainly wrong, and so initially the problem was ascertaining exactly where the powerlines were going to go. I think most of that negotiation or that information happened directly between landowners—we're all freehold landowners—and EnergyCo acquisition managers, which are people employed or contracted to EnergyCo to talk directly to landowners. Then they came out with a mud map and describe where it's going to go.

We've only had one meeting with an acquisition manager because we just said—well, one meeting we discussed it, and we went away and thought about it, and we didn't want a part of it. All our correspondence since then we try to put through a solicitor and in writing. We have seen the acquisition manager at meetings at since, and we've agreed to disagree. We also had Chris Swann and Michael Young come out to a couple of meetings and we've discussed directly with them our concerns and were told to basically put up or shut up. I think that was pretty close to what happened there. We haven't had any further direct communication at that level.

There are obviously landowners everywhere along the route that wonder why it's on their property, or why it's on a section of their property, when there might be a better location not too far away and the route is quite tortuous. The compensation offered is, I guess, per the 1991 compensation Act. We've all got our valuations and the EnergyCo valuations. I haven't seen anyone else's, clearly. But, really, it's hard to negotiate when you've got a gun to your head like compulsory acquisition. I mean, you're not in a strong bargaining position. I don't think the compensation, as EnergyCo has done it, is adequate, given the diminution or loss in value to the land—and not the immediate damage as well, but the future damage. Because once these powerlines are built and these easements are taken, it's just inviting more proponents, more solar, more wind, either on neighbours' property or nearby. So it's only the thin end of the wedge. This is the problem with looking at this in isolation. You need to say, "Well, they're projecting our CWO REZ to expand to 20 gigawatts installed." So all the projects that are planned now are just the beginning. We're going to be surrounded by them eventually. I'm not sure if that answered the question but that's the background.

**The Hon. WES FANG:** It does, in part, Mr Piper. This is the last question I'll ask before I pass to my colleague the Hon. Susan Carter. If there was an option to have the transmission lines component of the REZ undergrounded, do you believe that that would make a difference to the approach of the community in relation to the transmission component—not so much the actual energy generation projects but the actual transmission? Do you believe that people would be more accepting if they were undergrounded?

**GRANT PIPER:** I do, yes. Obviously, like I said, I think it would remove a lot of the direct routing. You wouldn't have such a tortuous route where it twists and turns through different people's portions of land, so you'd save direction. Visual amenity would obviously be immediately improved. Property devaluation would be immediately removed as a factor, really. The large easements would be immediately reduced. EMF and firefighting concerns would be immediately removed. Most landowners would welcome this change. High voltage DC was designed to get large loads across large distances.

If the scheme was redesigned into more of a hub-and-spoke arrangement where distant projects fed into a hub and then a trunk DC went to the load, such as the cities or industry, I think that would make more sense from a technical point of view. It still doesn't remove the environmental cost of manufacturing all this stuff. It doesn't work very well. But as a solution to the immediate problem of getting powerlines through land and connecting up misnamed renewable projects, something like that would make more sense. But it doesn't remove the environmental cost and the emissions produced in producing all this stuff that doesn't work very well.

**The Hon. SUSAN CARTER:** Mr Piper, I just want to go back to a question my colleague asked and in relation to the effect on agricultural land of the current proposals for the overhead powerlines. It seemed to me in your answer that you had a concern that this was a first proposition and that there were plans for further impacts on agricultural land with further REZs down the road. Have I understood you? If I have, could you comment on your concerns about future plans?

**GRANT PIPER:** The way it started was the Central-West Orana REZ was initially declared at a three-gigawatt capacity. Three or four months ago, EnergyCo put in a request to have it expanded to 4.5, and then six, gigawatts. I'm not sure what status that is. In further New South Wales planning documents, it is now written that they want eight gigawatts of dispatchable power and 20 gigawatts of installed power. There is a further 500 kilovolt electronic line, a major line, extending from Elong Elong substation to the north-west of the REZ area towards Mendooran and Gilgandra. That area at the moment is relatively undeveloped. I'm not aware immediately of what projects are planned for out there, but clearly they intend to saturate that area with projects as well.

Then to the east of the REZ, which is technically outside of the REZ, there are two large solar projects on the Merriwa Plateau adjoining the Goulburn River National Park. They're outside the REZ, but they're in proximity to the existing powerline. Once the powerlines are built, it's going to attract the projects because they can connect into the powerline. If we're to expand from three gigawatts to 20 gigawatts, that's a massive expansion. We've already got some 47 projects pencilled in for the REZ. You're going to have 150 or 200 projects. To get 850 megawatts from a solar farm is about 25 square kilometres. You can do the math yourself. We're just going to be swamped and covered with this stuff in five, 10 or 15 years. In the EnergyCo EIS, they say themselves that



the landscape will change from predominantly rural to industrial in nature, and they boast that we'll be part of a modern-day power station. I haven't built my business, raised a family and built my house for the last 30 years here to be in an industrial landscape or to be in a power station.

**The Hon. SUSAN CARTER:** What impact does that have on agricultural land?

**GRANT PIPER:** There's the mechanical aspect of moving, not so much where it goes over our property but over farming areas, and the clearance under the lines and the arcing from the lines. The restrictions within the easement affect the big farmers more than us, who predominantly graze. There are EMF concerns for proximity to magnetic fields or electrical fields for extended periods, whether that be people or animals. The wind turbines themselves, they've got 2,000 tonnes of concrete in the base, which stays there forever. They catch fire. They inhibit aerial firefighting because they're 850 feet high. They're 250-metre turbines. The blades erode, so they shed bisphenol A, or BPA, which is an endocrine-disrupting chemical with limits on exposure to humans. That's going to be blown over the countryside and into the waterways. What effect does that have on human and animal health and reproduction in the long to medium term? The chemicals in solar panels, in the construction of them, with the aluminium and steel bleaching into the soil, there's studies about that. Then there's the decommissioning of all this stuff, which has a short life span, and the maintenance requirements of leaking oil and stuff.

**The Hon. ROD ROBERTS:** Mr Piper, thank you for giving your evidence today. In your earlier statement you said that the EIS is not completed yet. I think we all agree with that. I want to clarify that you said bulldozers and constructions were already underway. Is that what you said?

**GRANT PIPER:** Construction isn't underway, but I got a call from a neighbour and he said that EnergyCo is really twisting his arm to give access to a drilling rig to start mechanical work on his property. He hasn't yet signed an agreement, as in they haven't acquired the easement, but they want to get access. So the machinery is starting to move.

**The Hon. ROD ROBERTS:** What does that say to you and fellow landholders in your area?

**GRANT PIPER:** It's the desperation. They're on a time line and they seem like they want to force it through before proper review and the proper process is even complete.

**The Hon. ROD ROBERTS:** I have anecdotal evidence, but I'm not giving the evidence, so let me ask you this: You want to increase the capacity of a farm, so you want to buy additional land. You come to me, the local real estate agent, and I show you two different blocks of land, both very similar in topography and soil content, both for exactly the same dollar-per-acre asking price, but one of them has a high voltage overhead line running through it and the other one doesn't. Which one would you choose?

**GRANT PIPER:** I might have to choose the one without a powerline. The evidence of the market shows that.

**The Hon. ROD ROBERTS:** Certainly. I then ask you this: What's the particular impact on your farm and/or surrounding farms from the construction of high voltage overhead lines? For example, what's your loss of production? Can you spray crops using a crop duster in that area? Can you get headers and other high machinery under them, bearing in mind the easement? What does it do to the values of properties? What does it do to the amenity of your life? Can you talk to us a little bit about that, please?

**GRANT PIPER:** I am not a big farmer, as in I am not a broadacre farmer. The property that is affected is predominantly a grazing property. It's mainly the livestock activities that will be affected. Further west and around me are people that farm, and getting machinery under the powerlines has been documented before. I think there is a 4.3 metre limitation, and many spray rigs and harvesters are already above that. The powerline, in our case, is a 330-kilovolt dual-circuit line that cuts across the back corner of one property, so it affects less than four or five hectares directly, so we're relatively minor in the scheme of things. But the neighbours have seven or eight kilometres of powerline on their property, and others are in the same situation where the powerlines cross prime river-farming country that they have to traverse repeatedly with machinery all the time. For us, it's a relatively minor impact; I admit that.

**The Hon. ROD ROBERTS:** But your surrounding bigger, broadacre landholders would have a more significant impact on them and their production capacity, wouldn't they?

**GRANT PIPER:** It will affect them. And then there's the disruption during construction as well, because they want you to remove livestock. They don't want to open and shut gates, so they want to cut the fences. And they want to use the powerline routes as an internal road system to run workers and machinery. Wherever they traverse your property, you're going to have to exclude those areas with fencing or some other way so as not to have stock escape, and you won't be able to work on that land for three and a half to four years of construction.

For those people affected like that, I think they may do some calculation in the compensation for that loss of productivity. But for many things, where people have been going near the house, their silos, their yards and, in one case, his water tank for his house, there's no compensation for having to move or being unable to use their own infrastructure on their own property while construction is going ahead.

**The CHAIR:** I've got a couple of questions, Mr Piper. Firstly, I'm wanting to be clear around what particular options were provided in relation to putting some of the infrastructure transmission lines underground?

**GRANT PIPER:** Options to us?

**The CHAIR:** Yes.

**GRANT PIPER:** That option was never put to us or any other landowner, as I understand it, in this REZ.

**The CHAIR:** You've basically got overhead transmission lines and that's it? There are no other options?

**GRANT PIPER:** Yes. Undergrounding has never been mentioned. We wrote to EnergyCo when the first undergrounding inquiry was stood up and requested an extension to the period until that inquiry reported. They said that it would not affect their operations and, depending on the report from that inquiry, they would adjust if they needed to.

**The CHAIR:** I wanted to also get your view, or the community's views—it does sound like the frustration is with the renewable energy zone, or the REZ, more broadly, from your evidence here today. How much of a difference would it make if part of the transmission lines were put underground, or all of them? Would it make a difference to those members of the community who are in opposition to the REZ?

**GRANT PIPER:** The percentage of the community that are in opposition that are affected by powerlines, and that is if they see that as their main and only problem, I think they would accept probably undergrounding before they accept the standard overhead lines, and it may get them over the line. For the broader community projected to be looking out their front window at a solar plantation or you're three or four kilometres or less from wind turbines, I don't think it's going to change their view of the REZ or the whole scheme, no. That's where I'm at too. It's a bigger problem. We shouldn't just be looking in silos, as they say, about, "Oh, let's talk about undergrounding or overgrounding." The due diligence of doing the whole thing has to be examined technically. That's what I wish would happen, that a proper technical look at it would happen and we come up with a proper engineering solution rather than something that's so terribly inefficient to carry out.

**The CHAIR:** What work has been done with the renewable energy proponents as part of this REZ to work with the community to ensure that there are community benefits, if you like? I know this is a big area of work that renewable energy companies and the Government to some extent are undertaking to try to build support within regional communities. From your perspective, what's happened or hasn't happened in that regard?

**GRANT PIPER:** The council, I believe, has negotiated or agreed a 1.5 per cent of capital payment to them from the proponents—so from the Tilts and the ACENs, not EnergyCo. I'm just talking immediately around Coolah, which are the two wind projects around here. That's what I know. Those companies have also made community donations to the Lions club and to the Men's Shed, to the craft shop, but we're talking \$2,000, \$3,000—I don't know, maybe. All of that stuff is small in the grand scheme of things. I believe the access charge that EnergyCo is planning to charge the generators to access the grid also goes back into—is meant to pay for the construction of the line and also the community payments. I can't remember the details and the numbers on that but, by the time you take out a lot of the expenses that they put in the community payments, there isn't a real lot that's left for the community. Then I don't think it's the place of private generators or private companies to be picking up the tab for infrastructure or services that really are in the Government's domain and should remain in the Government's domain. I don't think they should be taken over or paid for by private companies.

**The CHAIR:** We can probably agree on that point. You named two companies then. Could you just say their names again and also the council that you're referring to?

**GRANT PIPER:** I'm in the Warrumbungle Shire Council and the windfarm—they call it the Liverpool Range Wind Farm—is owned at the moment by Tilt. It's had two owners since it was commenced already. The one to the west or south of Coolah is the Valley of the Winds, which is owned by ACEN, which is a Filipino-owned company.

**The CHAIR:** That's very useful. We are out of questions for you, Mr Piper. Thank you so much for appearing today. Your evidence was very valuable and the Committee will now break for lunch.

**(The witness withdrew.)**

**(Luncheon adjournment)**

**Mr SIMON CORBELL**, CEO and Chairperson, Clean Energy Investor Group, before the Committee via videoconference, affirmed and examined

**Ms AMY KEAN**, Director, Stride Renewables, before the Committee via videoconference, affirmed and examined

**The CHAIR:** Welcome. I assume you both have short opening statements to make. We will start with you, Mr Corbell.

**SIMON CORBELL:** Thank you to the select Committee for the opportunity to give evidence before you today. I am the CEO of Clean Energy Investor Group. Clean Energy Investor Group is an industry association that represents investors in the clean energy sector in Australia. Collectively, our members hold about 50 per cent of all operational clean energy assets in the National Electricity Market currently. We're very pleased to provide the submission that members have obviously received in relation to this select Committee inquiry. There are just a couple of points I wish to highlight. The first is that the speed and urgency of the energy transition is critical. Right now, there is a shortage in the total volume of new committed projects required to meet the operational demand of the New South Wales region of the National Electricity Market, particularly as we anticipate the closure of thermal generation plants over the next decade.

Therefore, we need to get as much new clean energy generation operational in the NEM as quickly as possible. That's only feasible if there is equally a timely delivery of new transmission infrastructure. The quickest way and the most effective way to deliver new transmission infrastructure is through overhead transmission cabling. It's cheaper. It's more cost effective and that means consumers pay less when it comes to their electricity bills. We would highlight that undergrounding of high-voltage transmission infrastructure is more expensive. Recent estimates from the Australian Energy Market Operator in consideration of similar transmission projects in Victoria indicate that the cost of undergrounding high-voltage transmission lines is up to double the cost associated with overhead transmission infrastructure. Therefore, we would say to the Committee that it is critical that proper consideration be given to the cost not just to governments but also to energy consumers, who will be asked to recover the costs of those transmission infrastructure investments.

Finally, I wanted to highlight the importance of ensuring and building social licence in host communities. It is recognised that the establishment of any new infrastructure can raise significant concerns in communities where that infrastructure is being proposed. Transmission infrastructure is no different. Therefore, it is absolutely critically important that transmission companies and governments focus very strongly on ensuring that strong social licence is built and maintained. That is particularly the case in the context of benefit sharing outcomes for regional communities that are enduring and long-lasting and recognise the significant role that those communities play in hosting transmission infrastructure for the long term. We believe there's more work that needs to be done by governments in this regard and by the transmission sector more broadly and we continue to advocate to governments the steps needed to ensure that that social licence is built and maintained. Madam Chair, I will conclude my comments there and thank you for the opportunity to make the opening statement.

**AMY KEAN:** I echo many of Simon's comment and very much believe that transmission is the biggest constraint to meeting net zero targets in New South Wales. We have plenty of market interest in renewables. Our calculation is we currently have more than 30 gigawatts of renewable projects in the New South Wales planning system. We need about 4.6, according to AEMO, so lack of market interest is not the problem. It's curtailment by the network that is stopping these projects being built and slowing down the energy transition, as well as putting challenges on our net zero targets.

Transmission projects that are essential to unlock this clean energy have been subject to lengthy delays and cost increases, which is then creating uncertainty to invest in this generation. I do believe we need to think very carefully about the impacts of transmission lines on communities and consider how we can share the benefits in a more fair and equitable manner. We also need to think about the impact of transmission on near neighbours, not just the landowners, and the fact that regional communities are disproportionately impacted. I think we need to really consider innovative ideas to build out Australia's transmission lines, and obviously New South Wales, and gain social licence to do that. One particular area that has been done overseas is the use of mono-poles. That's changing the design structure for transmission lines that are less visually impactful, moving away from traditional lattice designs that have much more impact on the vegetation and surrounding environment, and you can effectively see straight through them, compared to the current structures.

I also think that often the concern, which I assume is leading to your inquiry about going underground, is often associated with the wider energy infrastructure and not just the transmission. We need to consider how it can be bundled together and how we can do the benefit sharing with the communities so that they can then reap

the reward and there's a whole lot of things that can be done to do that. We do need a lot of transmission. We need it quickly. Time is absolutely of the essence because postponing it and creating more uncertainty about more options that are potentially costly without a pathway to fund them is actually causing more stress for communities. We need to crack on with the job. We need to gain social licence through meaningful community engagement and also bespoke benefit sharing schemes. Thank you very much.

**The Hon. WES FANG:** Thank you very much for appearing today. I direct my first set of questions to Mr Corbell. Can I ask initially, are you based in Melbourne? Is that correct? I think you were referencing Victorian studies in your opening statement. Is that correct?

**SIMON CORBELL:** No, that's only partially correct. Clean Energy Investor Group is a national industry body. We represent businesses across the national electricity market, so in all jurisdictions except Western Australia and the Northern Territory. Personally, I am based in Canberra, but our organisation has personnel in Melbourne, in Brisbane, as well as in Canberra.

**The Hon. WES FANG:** But you are personally based in Canberra?

**SIMON CORBELL:** That's right.

**The Hon. WES FANG:** Have you had the opportunity to head out to around the Tumut, Snowy Valleys area where a lot of the impacted HumeLink communities are? Have you had the opportunity to go out there and sit down and meet with people who are impacted by the transmission lines as they are proposed?

**SIMON CORBELL:** I'm familiar with that area. I haven't visited it recently, but I have had in the past extensive experience in engaging with regional communities around transmission infrastructure development. In a previous role I worked for the Victorian Government and as part of that had responsibility for talking with and meeting with regional communities about transmission and distribution infrastructure development associated with clean energy projects. So I'm familiar with the types of issues that are raised by regional communities in that context.

**The Hon. WES FANG:** Understood. Then you'd be aware that almost universally every single stakeholder that we've had present to us, either in this Committee as it's formed at the moment or the previous committee under State development, has been universally opposed to the HumeLink project overhead transmission lines, or the overheading of additional transmission lines in general. You would be aware of that sort of feedback, right?

**SIMON CORBELL:** I am aware of that, yes.

**The Hon. WES FANG:** I note the comments in your submission that talk about the need for these projects to be constructed so that we can build on our clean energy future. Do you have a view as to what is the more important, whether delivery of clean energy is a more important goal than something like sustainable agriculture and the ability to feed and clothe ourselves?

**SIMON CORBELL:** Our view would be that both are compatible exercises. Overhead transmission infrastructure allows for land to continue to be utilised for a broad range of uses and results in overall less alienation of land use capability than undergrounding does. As we highlighted in our submission to the Committee, undergrounding of high voltage transmission, in particular, results in a very high level of alienation of that land. It is difficult to use that land for any other productive purpose, cropping, anything that involves land disturbance is effectively—is not possible with high voltage, underground transmission infrastructure. So we would say that those are the sorts of issues that we would encourage the Committee to take into account.

**The Hon. WES FANG:** Whilst I accept that that's your view, I would say that the evidence that this Committee has heard, both today and the previous committee under State development, you've completely ignored a number of the issues that stakeholders have provided in evidence to us around the land use and the impact of overhead transmission lines. I'm seeking to understand how your organisation, and you in particular, are able to make those statements, under what evidentiary basis?

**SIMON CORBELL:** These factors are well understood, from the experience of undergrounding of high voltage transmission lines globally.

**The CHAIR:** Can I ask a question of clarification here. When you are talking high voltage underground lines, are you referring to AC or DC?

**SIMON CORBELL:** It can be either, depends on the total carrying capacity of the line. But what I would highlight is that the experience globally and in Australia of undergrounding—and I have to say the experience in Australia is very limited, but more broadly globally, the undergrounding of high voltage transmission lines does

result in a much higher level of alienation of land than overhead lines. Overhead lines—if I can answer your question?

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

**SIMON CORBELL:** In terms of the evidentiary base for that, our submission highlights, with references, a range of examples of where that infrastructure has been built and the relatively limited application of it overseas, because of cost and other challenges, including the alienation of land. So we would highlight to you that these assertions are not made in a vacuum, they are referenced carefully in our submission to you. It's an important consideration when you think about cost and when you think about impacts on land use when it comes to the development of this very large and very expensive type of infrastructure.

**The Hon. WES FANG:** You've actually segued very nicely into where I was hoping to take this, Mr Corbell. For example, part of the evidence you've referenced is the Transgrid submission to the underground of HumeLink and you've referenced the Standing Committee on State Development, which is the committee we were on previously that looked at this issue. A lot of the evidence that you've cited here is, at best, disputed or, I would guess, doesn't actually reference the evidence that we've heard elsewhere. For example, in numerical number five, you've stated:

In contrast, underground lines come with significant land disturbance issues during initial trenching works, and maintenance access is more invasive, often requiring digging up soil and crops to address faults.

That has come out of the Transgrid report of September 2022, "Undergrounding HumeLink would triple costs". Mr Corbell, I would say that while you've referenced evidence, that evidence is disputed, and certainly the reason that we are holding these inquiries is because the evidence was questionable when we looked at it last time. I will ask again: On what evidence and basis are you making these claims that undergrounding is more disturbing and more impacting on local communities than what overhead lines would be? Aren't you simply just a front for energy investors that are wanting to get these energy projects connected quicker, which is why they're advocating for overhead?

**SIMON CORBELL:** I think it is in all of our interests to get clean energy generation connected more quickly. It's in our interests from a climate perspective. It's in our interests from an economic perspective. It's in our interests from an energy system stability perspective. I don't think there's any difficulty with asserting that these projects need to be connected more quickly.

**The Hon. WES FANG:** But, Mr Corbell, you haven't met with these communities.

**The Hon. STEPHEN LAWRENCE:** Point of order—

**SIMON CORBELL:** If I could answer the question.

**The CHAIR:** Order! A point of order has been taken, which I know will be to allow the witness to finish and just treat witnesses with respect as well. Mr Corbell, if you could continue with your response.

**SIMON CORBELL:** Thank you, Chair. In terms of the evidence, as the member has quite rightly identified, we've drawn on the evidence of an experienced transmission development business that, with all of the cost estimation and technical assessment capabilities, a business such as that would have. I haven't seen any evidence to suggest that the assertions made by that business, which is an expert business in the delivery of transmission infrastructure, are incorrect. I'm not familiar with any claim to the contrary but what I would say is that when you look at life expectancy of overhead transmission versus underground transmission, the order of magnitude is about 100 per cent higher—between 80 and 100 years life expectancy for overhead transmission; approximately 40 years for underground transmission. The cost, based on the HumeLink proposal, is: overhead was \$4.89 billion; underground was somewhere between \$11.5 billion for HVDC or \$17.1 billion for HVAC. Repair time is much higher: overhead transmission generally between one to two days; underground transmission between three to six months. For all of these reasons—

**The Hon. WES FANG:** Mr Corbell, I do appreciate the evidence. I'm well aware of the evidence. What I'm trying to drill down on is it would appear to me that you've effectively recycled a number of the submissions that were made to the previous inquiry and trying to re-prosecute a lot of those arguments, a lot of the arguments that we discounted or have questions around. Could I drill down—

**The Hon. STEPHEN LAWRENCE:** Point of order—

**The Hon. WES FANG:** Don't waste my time.

**The CHAIR:** There is a point of order that has been taken.

**The Hon. STEPHEN LAWRENCE:** It has been suggested that we have discounted those arguments. I think that's quite a misleading thing to suggest to the witness because the majority report was quite to the contrary and the witness shouldn't be misled.

**The CHAIR:** Thank you, Mr Lawrence. There's no point of order. Continue, Mr Fang.

**The Hon. WES FANG:** Could I drill down on to how your organisation is formed. Who are the stakeholders that form it? How is membership determined? Is there a membership fee? In effect, how is your energy group formed?

**SIMON CORBELL:** We're formed like any other industry association. Companies join the association as members. They pay a membership fee and collectively our organisation determines our positions on policy and regulatory matters based on the consensus view wherever possible—

**The Hon. WES FANG:** How many members do you have, Mr Corbell?

**The CHAIR:** Order!

**SIMON CORBELL:** —across the membership.

**The Hon. WES FANG:** How many members do you have?

**SIMON CORBELL:** It's outlined in our submission. We have approximately 20 companies as members.

**The Hon. WES FANG:** Do you have any members that are in favour of undergrounding?

**SIMON CORBELL:** No.

**The Hon. WES FANG:** Have you taken into account any views that are different—i.e. the community groups, the impacted communities, the landholders, the stakeholders that have all made submissions around the impacts that overhead powerlines will have on their lives, their livelihoods and their farming practices?

**SIMON CORBELL:** Yes, we do seek to take account of broader community views when it comes to determining our position on policy and regulatory matters. This issue is no different. So, for example—

**The Hon. WES FANG:** Because I don't see within your submission—

**SIMON CORBELL:** Well, again—

**The Hon. STEPHEN LAWRENCE:** Point of order—

**The Hon. WES FANG:** —any position that supports or takes into account those views.

**SIMON CORBELL:** I'm very happy to answer the member's question if he gives me an opportunity.

**The Hon. STEPHEN LAWRENCE:** He is being treated with extreme discourtesy, Chair. It started with—

**The Hon. WES FANG:** I'd say that this submission is extremely discourteous.

**The CHAIR:** Order!

**The Hon. STEPHEN LAWRENCE:** It is not that difficult for Mr Fang to control himself I would suggest, and the progress of this hearing will benefit if that occurs.

**The CHAIR:** That's the end of that time. Mr Fang is done. We now go to crossbench members. I'll kick off with a few questions to begin with. I might go to you first, Ms Kean. I'm as supportive as you both are and many people are in ensuring that renewable energy projects are fast-tracked as quickly as possible and that we get things moving as quickly as possible. However one of the issues that I'm struggling with is that, firstly, there does seem to be almost an ideological opposition to undergrounding, if you like, as though undergrounding can't even be considered at all ever. I'm aware that part of it is due to the regulatory environment in which the transmission network has to be built to the lowest cost to consumer and that costs have been a part of that for some time. Costs, we're hearing, are reducing and reducing. Is that the key reason why a group like Stride Renewables is against undergrounding transmission? Is it because of the cost factor first and foremost?

**AMY KEAN:** To be perfectly clear, we didn't say we were opposed to it. I think if it is cost effective and can be done in a timely manner, that's great. I'm not an expert on undergrounding, nor have I professed to be, but I think cost is always an issue for any infrastructure and, of course, it's the physical nature of it as well. But there is no philosophical opposition to it.

**The CHAIR:** Mr Corbell, you were asked before by Mr Wes Fang about whether any of your members supported or were in favour of underground transmission and you very quickly said no. One of the things that I've been grappling with as a Greens member on these committees who strongly supports renewable energy and fast-tracking renewable energy, is what appears to be, by the regulators, by some of the companies, almost an ideological opposition to undergrounding. I absolutely understand that we can't have every single new transmission line in New South Wales undergrounded, but surely it's not so black and white, is it, that you could just come out very quickly and say, "All 20 of your companies don't support undergrounding of transmission lines"?

**SIMON CORBELL:** Chair, for exactly the same reasons that Ms Kean has just outlined, we don't support it at this point in time because it can't be delivered in a cost-effective way that minimises price impacts on consumers or avoids what would be a lengthy delay in the build-out of transmission infrastructure. The climate crisis requires a rapid response to the challenges associated with greenhouse gas emissions, and building infrastructure that will take longer to deliver, that will be less long-lived and will be more expensive just doesn't make sense in the context of the situation we're facing in terms of the energy transmission and the broader climate crisis. To be clear, our submission did state very clearly that future consideration should be given to undergrounding transmission lines, but we do not currently consider it a feasible option for the reasons that I just outlined and which Ms Kean outlined before me.

**The CHAIR:** You said that the underground option won't last as long. I think that was your language. It was in your submission as well in terms of the duration. You've got life expectancy of underground transmission of approximately 40 years and the life expectancy of overhead of 80 to 100, as well as the costs, the estimated completion date and repair time. Where have you got all those statistics from?

**SIMON CORBELL:** If you're referring to table two in our submission that draws largely on the evidence provided to AEMO in relation to the HumeLink project.

**The CHAIR:** So the evidence was provided. I can see that most of it is evidence that was presented to the State development committee inquiry earlier.

**SIMON CORBELL:** Yes, that's correct.

**The CHAIR:** Regarding the recommendations around the regulatory process in terms of improvements, do either of you have any concerns about, for example, the fact that the RIT-T does not take into account social and environmental impacts? Is that of concern to you, Ms Kean? Should that change? Should the Committee be trying to recommend things like this, for example? There is an existing regulatory framework that, in some ways, is creating this issue of having to build transmission infrastructure at the least cost to consumers. If there are any recommendations for the inquiry to make things a bit better going forward, we would love to hear them from you.

**AMY KEAN:** I think the RIT-T process has some fundamental challenges associated with it. It is very much focused on the least cost, which you raised before, and doesn't consider the environmental or social impacts. So, yes, I think there should be consideration as to how that can be more fit for purpose, and I understand the AER is doing a review of that at the moment. But, obviously, in New South Wales, a lot of the transmission lines that have been proposed are not under that framework. That is why the renewable energy zones don't consider the importance of social licence. I commend the policy to have benefit-sharing programs as part of that, but, yes, there is absolutely room for reform of the current RIT-T process.

**SIMON CORBELL:** If I may add, Chair, we also support changes to the RIT-T process to have stronger regard to community impacts and broader non-economic considerations when it comes to that regulatory investment test framework. As Ms Kean has outlined, the Australian Energy Regulator is currently considering such changes. As an industry organisation, we have made a submission to the AER supporting the inclusion of those types of criteria. So it is quite wrong to suggest that, as an investor body, we don't have regard to those matters. We do. We support the development of stronger social licence and benefit-sharing frameworks to inform investment in the energy sector overall, including in relation to transmission. Because at the end of the day this infrastructure has to be delivered in a way that builds, maintains and delivers benefits to communities, including those communities that host that transmission infrastructure. But we must also balance that against the fact that the energy transition is expensive and in the Australian regulatory environment those costs are largely passed through to consumers, particularly when it comes to infrastructure such as transmission and, therefore, the broader costs borne by consumers—big and small, households and businesses—must be properly taken into account.

**The Hon. ROD ROBERTS:** Mr Corbell, we've already determined you don't live in a rural community. Do you own any rural land that's likely to be impacted by overhead high voltage lines at all?

**SIMON CORBELL:** No, I do not.



**The Hon. ROD ROBERTS:** Do you have an electrical engineering or civil construction background at all?

**SIMON CORBELL:** I do not personally, but many of our members, of course, are experts in energy infrastructure, in particular electricity generation infrastructure. They have many people who are qualified either as electrical engineers or a range of other trades and professions.

**The Hon. ROD ROBERTS:** Would it be a fair statement to say that your membership base and investors will only realise a profit once connected to the grid, so speed and timeliness is paramount from your client base perspective?

**SIMON CORBELL:** Of course. You can't get a return on your investment unless you can get your product to market. It's the same with electricity and electricity infrastructure.

**The Hon. ROD ROBERTS:** Ms Kean, is it a fair statement to say that Stride is a lobbyist and advocate group on behalf of your clients in the renewable energy sector?

**AMY KEAN:** No, that's not fair. We are not lobbyists; we are technical experts. I know the industry very well. I've got a policy background, I've worked in the sector for 20 years and I provide modelling and other technical services.

**The Hon. ROD ROBERTS:** Well, then, to take that further, do you have a fiduciary and moral obligation to your clients?

**AMY KEAN:** Of course.

**The Hon. ROD ROBERTS:** Then it would, I am assuming, be highly improper for you to advance a proposition that's not favourable to your clients at all?

**AMY KEAN:** I have a wide diversity of clients who have different interests, so I don't have a single position that represents all my clients.

**The Hon. ROD ROBERTS:** In relation to this, since you're giving evidence?

**AMY KEAN:** I'm representing this as an individual of interest in a market. I wrote this as myself, who has an interest in accelerating the energy transition to ensure we reduce our carbon emissions, and the best way to do that is to address the network constraints that are currently in the energy market and that are preventing clean energy being provided to homes and consumers in New South Wales.

**The Hon. ROD ROBERTS:** I've got one question that begs to be asked, and that will be my final question. Are you related to Matt Kean at all, who developed the New South Wales renewable energy roadmap?

**AMY KEAN:** That's not relevant to this conversation today. That was not part of my [inaudible] submission.

**The Hon. ROD ROBERTS:** It's a question that I've asked, Chair. You're here and you've taken the oath I understand—or affirmation, it was—to tell the truth here.

**AMY KEAN:** I am not an immediate relative of his.

**The Hon. ROD ROBERTS:** Cousin, is that right?

**AMY KEAN:** Correct.

**The Hon. ROD ROBERTS:** That's all I have, Chair.

**The Hon. STEPHEN LAWRENCE:** I will start for the Government with some questions of Mr Corbell. Mr Corbell, as you will be aware, our terms of reference are pretty broad in relation to transmission infrastructure, but the inquiry in this iteration and the previous one has had a particular focus on HumeLink, so I want to ask you some questions firstly about HumeLink. There's been evidence on both sides of the debate, if I can put it that way, that an undergrounding option for HumeLink would not have been approved by the regulator, the AER. Firstly, do you agree with that—that the AER would not have approved on undergrounding option for HumeLink if it had been put to them?

**SIMON CORBELL:** I'm not privy to how the AER would have considered that if it had been put to them, but I can make the general observation that the AER is obliged to consider the most cost-effective solution, the least cost impact on consumers, when it decides whether or not to approve the development of a piece of infrastructure which is regulated under the National Electricity Law.

**The Hon. STEPHEN LAWRENCE:** I was wondering if you could explain for Committee members some details about the regulatory test, and particularly how it is that it has its focus on the impact on consumer price.

**SIMON CORBELL:** Yes. In general, the way that this regulatory environment operates is that, first of all, it is a recognition that transmission is a natural monopoly and, therefore, the owner of those assets is able to seek costs for the development of that infrastructure from all of the consumers who benefit from it. As a result, the Australian Energy Regulator has to have regard to minimising cost impacts for consumers, because this is a monopoly asset with a regulated asset base, and that transmission owner, the monopoly operator, can only seek to recover its costs from consumers where it is the most cost-efficient piece of infrastructure to recover costs from. Basically, transmission infrastructure operators are not allowed to build expensive pieces of kit that are not the cheapest, most suitable solution and then ask consumers to pay for it through their electricity bills. That's why it is a very important parameter in protecting the interests of consumers big and small, and allows for the efficient operation of the economy more broadly.

**The Hon. STEPHEN LAWRENCE:** One thing I'm struggling with, in the context of terms of reference that I think require us to look at the different options for a project like HumeLink, is how it is as a committee of a State Parliament that we could, for example, hypothetically recommend an undergrounding option for something like HumeLink if the shared evidence on both sides, if I can put it that way, is that it wouldn't be approved by the regulator. In that context, could you tell us how it is that the National Electricity Law and the regulatory framework that sits as part of it actually can be amended? What is the governmental process there?

**The Hon. SUSAN CARTER:** Point of order: The honourable member seems to be questioning the basic fundamental terms on which the inquiry is conducted and asking a witness to comment in relation to whether or not there are valid terms of reference for this inquiry.

**The Hon. STEPHEN LAWRENCE:** To the point of order: I am certainly not doing that. I am asking how it is that the National Electricity Law can be amended, which I think is an important matter when the terms of reference have us looking at the options.

**The Hon. SUSAN CARTER:** To the point of order: That question is predicated on an assumption that the regulator would not allow the undergrounding and that presumption goes to the fundamental terms of reference of this Committee and suggesting it is an inappropriate matter for the State Parliament to inquire into.

**The Hon. STEPHEN LAWRENCE:** My friend might have the disadvantage of not having been on the previous inquiry where that was indeed the evidence—that it would not be approved. It might well be relevant, for example, that we make a recommendation for the amendment of the National Electricity Law. It would be strange if we couldn't ask questions relevant to it.

**The Hon. WES FANG:** I am prepared to allow the question to be put. I would remind the member, though, that the Committee is the will of the House, as a select committee, and therefore questioning the terms of reference as selected by the House is perhaps not appropriate at this time. But I will allow you to continue to put the question.

**The Hon. STEPHEN LAWRENCE:** Thanks, Deputy Chair. I assure the Committee I wasn't challenging the terms of reference; I am asking a question relevant to it. Mr Corbell, can you enlighten Committee members on how it is, from a governmental point of view, that the National Electricity Law can be amended?

**SIMON CORBELL:** Yes, certainly. The National Electricity Law is a cross-government agreement across all jurisdictions at a State level, Territory level and the Commonwealth. It provides for a common, uniform law which is enacted in all jurisdictions with the agreement of all Ministers. Any change to that law has to also be agreed by all relevant jurisdictions through the relevant ministerial council. I should highlight it is possible for jurisdictions to derogate from the National Electricity Law and to create their own State-specific regulatory environments, and that's certainly been the case in relation to a number of jurisdictions recently. Indeed, the Electricity Infrastructure Roadmap itself in New South Wales does rely on some level of derogation already. We have seen derogation also in other jurisdictions, particularly in Victoria. But those are the exception rather than the norm, and they do require, in those instances, specific decisions of the relevant State Parliament for derogation to occur.

**The Hon. STEPHEN LAWRENCE:** We heard some evidence this morning about there being a delay or that there would be a delay if a project like HumeLink was now approached on the basis of undergrounding when the preparatory processes have been focused on above-grounding. I was wondering if you could give us your analysis of the risks to the provision of electricity if there were substantial delays to implementation of the transmission infrastructure.

**SIMON CORBELL:** I think the key risk is the more delay you see in terms of delivery of transmission infrastructure, the more delay you see in the development, construction and operation of new electricity generation infrastructure. New electricity generation infrastructure is heavily reliant on new transmission infrastructure being built. We're already seeing in New South Wales a situation where, because of a shortfall in new electricity generation being built in a timely way, questions arising about whether or not existing increasingly unreliable electricity generation infrastructure, such as Eraring Power Station, need to be kept open for longer. That situation of an ongoing reliance on a piece of ageing, increasingly unreliable electricity generation presents real risks to security of supply, and it is clearly an issue that is of significant concern to the New South Wales Government at the moment.

The key factors that drive that are essentially access to grid for new wind and solar generation. For that reason, we think it is critically important that you cannot disentangle issues of visual impact, broader social licence in communities and reliability and security of supply, as well as affordability of supply. All of these factors intersect. They all must be taken into account. They need to be balanced in terms of achieving the optimal pathway that allows more low-cost wind and solar to be built as quickly as possible to meet the needs of an energy system that is increasingly relying on ageing and increasingly unreliable pieces of generation infrastructure.

**The Hon. STEPHEN LAWRENCE:** There has been evidence in respect of HumeLink that it's been started on the basis of above-grounding and that there would be delay if there was a change of course in that respect. Are you able to give some evidence on the question—putting aside changes halfway through a process, is it generally the case that above-grounding is quicker than undergrounding as a mode of installing this type of infrastructure?

**SIMON CORBELL:** Yes. It is generally the case that the construction of above-ground transmission is quicker than underground. I have to caveat that by saying that these are relative assessments. Building any large piece of infrastructure takes time, and above-ground transmission, in and of itself, takes time to build and operate. But our submission highlights that the time frames associated with undergrounding are longer. The complexities, particularly of tunnelling or boring, are higher and, therefore, the risks are higher, and we've seen that, obviously, in relation to attempts to underground other pieces of infrastructure in the energy market lately. It's quite clear that the complexities with trying to go underground brings a whole new level of risk in terms of infrastructure delivery, and those are risks that ultimately are of themselves borne by taxpayers if the cost is higher than anticipated. So I think, whilst we talk about the relative cost of overhead versus underground, we also have to remember that, if the risks are higher in terms of delivery, the risks of an increased cost burden on consumers are also higher, and that is a factor that the Committee should take into account in considering the relative benefits of different types of infrastructure.

**The Hon. STEPHEN LAWRENCE:** If above-grounding is quicker and cheaper generally, in what circumstances would one utilise undergrounding for transmission infrastructure, in your opinion?

**SIMON CORBELL:** Generally speaking, the experience internationally has been that undergrounding has been utilised where there is no above-ground easement available for that piece of infrastructure. In the Australian context, undergrounding has been utilised in relation to heavily built-up urban areas where there is no above-ground corridor available. In those circumstances, it's been for relatively short lengths—lengths of maybe several kilometres at a maximum. But we're certainly not in the order of hundreds and hundreds of kilometres or even tens of kilometres. That's because of costs. The absence of an above-ground corridor would generally be the reason why undergrounding would have to be considered as the only viable option available.

**The CHAIR:** Thank you very much, Mr Corbell and Ms Kean. That is the end of this session. Thank you both for appearing and for your evidence today.

**(The witnesses withdrew.)**

**Mr ANDREW BRAY**, National Director, RE-Alliance, before the Committee via videoconference, affirmed and examined

**Ms ELIANOR GERRARD**, Engagement Coordinator, Community Power Agency, affirmed and examined

**Mr LEIGH HEANEY**, Manager, Government Relations, Smart Energy Council, affirmed and examined

**Mr CONNOR WOULFE**, Policy, Legal and Research Adviser, Smart Energy Council, affirmed and examined

**Ms HEIDI McELNEA**, Engagement Coordinator, Community Power Agency, before the Committee via videoconference, affirmed and examined

**The CHAIR:** Welcome to our next witnesses. We're starting with the Community Power Agency in terms of short opening statements. Do one of you have a short opening statement to make?

**ELIANOR GERRARD:** I'm a community engagement coordinator at Community Power Agency. We collaborate with and build capacity in communities with government and industry to create renewable energy policies and projects that result in a fairer and faster energy transition. One aspect of our work is working on the ground in renewable energy zones. For the past year, I've been working alongside community stakeholders in Gippsland, and my colleague Heidi, joining here today, works in the New England. We wrote a submission to this original inquiry because we are dedicated to making sure that energy infrastructure is developed in ways that engage and deliver meaningful benefits to host communities. Communities need to experience procedural and distributional justice in this process. Our position is that the shift to renewables should be done in ways that have minimal impact to biodiversity and nature, allow us to achieve Australia's renewable energy targets within time frames to meet Paris Agreement goals and to create lasting benefits for host regions.

Our research finds that global experience with underground transmission can be a useful solution where lines pass close to densely populated areas or in some sections of a project where visual amenity or ecological or other factors are considered. However, it is worth noting that underground cabling does not necessarily provide fewer ecological impacts. Furthermore, decisions around above- or below-ground cabling should incorporate a range of considerations, such as First Nations' self-determination, fair pay for landowners and holding infrastructure, shared community benefits, and improved community engagement practices. Transmission should be delivered in ways that keep costs down for energy consumers.

While there are many factors to consider in rolling out above- or below-ground transmission, I'd like to bring the panel's attention to a few ways in which transmission is being delivered in innovative ways in other regions. In the north-west of Tasmania, TasNetworks ran an extensive community engagement process and co-designed a community benefit-sharing program, which, I think, is quite emergent in transmission. A key part of this was a youth panel made up of 18- to 25-year-olds from across north-west Tasmania. Given young people would have to live with the infrastructure the longest, the community supported them to have a lead role in this, and the benefit scheme will provide \$10 million for initiatives providing benefits to communities in six local government areas affected by the project. In Canada, First Nations co-own several large transmission line projects, facilitating ongoing economic development for First Nations communities across the country. Transmission infrastructure is the linchpin in a renewable energy system that delivers on Australia's net zero emission targets. It can also be re-imagined as a pathway for greater community agency and regional economic development, and this is what we would like to see.

**ANDREW BRAY:** Thank you very much, Chair and secretariat, for inviting me to take part in the hearing of this inquiry today. RE-Alliance is an independent not-for-profit advocacy organisation. Our mandate includes all forms of energy, along with transmission and energy storage. We recognise that a holistic and collaborative approach to regional development is needed. We take a practical approach to leveraging the renewable energy boom to deliver the best possible outcomes for regional farmers, landholders and communities. We advocate extensively with government to elevate the voice of most communities and we work with renewable energy developers to deliver best practice community engagement, community funds and to earn the acceptance of the communities they work in.

**The CHAIR:** Mr Bray, can I interrupt? I'm sorry to do this. Could you maybe lean in a little bit closer to your microphone? We're losing every tenth word or so. Maybe start from the previous sentence again. Thank you.

**ANDREW BRAY:** Okay. I'm getting an echo, for some reason, which is possibly connected.

**The CHAIR:** Sorry.

**ANDREW BRAY:** That's alright. We work across the eastern seaboard States, from Queensland down to Tasmania and in New South Wales. Particularly, lately we've been working in the Central West-Orana REZ and the South West REZ. I'm delighted to have this opportunity to appear as I was on leave during the previous inquiry's hearing, but we did make a full submission to that inquiry. It's impossible to overstate the urgency of New South Wales progressing key transmission projects to connect the new generation that will replace our aging and often failing coal-fired fleet. All aspects of critical transmission projects need to be determined in a way that delivers—and here I'm echoing my predecessors—procedural and distributive fairness to local communities. At all times, but especially during a cost-of-living crisis, this needs to be balanced with the needs of energy consumers.

We don't know of anything that's happened since our submission to the previous inquiry that has changed our main argument, which is that there are major equity and environmental challenges to undergrounding of transmission, and that underground lines are significantly more expensive for energy consumers and have environmental and land-use impacts from the extensive digging required for the the building and ongoing access requirements of buried assets. Are you picking any more of this up now? Are you able to hear me okay now?

**The CHAIR:** Yes.

**ANDREW BRAY:** Great, thank you.

**The CHAIR:** You are still going?

**ANDREW BRAY:** Yes. We do, however, see some limited applications for undergrounding solutions that involve lower voltage lines over relatively short lengths. For example, the connection of multiple generation assets to the transmission network through underground lines would involve limited cost uplift and would spare local communities so-called "spaghetti connections". However, undergrounding of high voltage backbone lines<sup>1</sup> across hundreds of kilometres would be a recipe for unacceptably higher costs and unacceptably longer delays than New South Wales is already experiencing with transmission projects. I might just leave my comments there.

**The CHAIR:** Thank you very much. That is great. We will move to the Smart Energy Council for its opening statement. Mr Heaney?

**LEIGH HEANEY:** Thank you very much. I might just give a quick introduction to the Smart Energy Council and hand over to my colleague Connor. The Smart Energy Council is Australia's not-for-profit peak industry body for renewables. We include things like solar, batteries, wind, green hydrogen, finance, large-scale development, manufacturing, and we encompass the whole renewables ecosystem. The council has over 950 members and 65 years' experience in the sector, having been established by the photovoltaic pioneers in the 1950s and sixties who built the world's first solar panels and solar hot water systems.

The Smart Energy Council understands that Australia's transition to a net zero emissions economy will deliver massive benefits to business and the economy as a whole. It will deliver jobs, attract investment, innovate and make our economy more productive and competitive, all while delivering a safer climate. Achieving a strong economy and a safe climate is not just possible; it is critical if we are to confront the challenges of our future. Our 950 members provide us with real-world empirical insights into the problems of the renewables industry and offer solutions, drafting, testing and help us to advocate for those solutions.

**CONNOR WOULFE:** Thank you very much, Mr Heaney. To give a flavour of the work of the Smart Energy Council in relation to transmission and its planning, first of all, the Smart Energy Council is a stakeholder in the Federal work that's going on in terms of planning a new system for accessing transmission. Obviously as we go from predominantly a fossil fuel-powered grid with a small number of generators to one that has 30, 40 generators, the way in which projects access transmission is becoming extremely more complex. That process is going on at a Federal level. The Smart Energy Council works with industry and across broad stakeholders on industry policy for renewable energy projects. Last year the Smart Energy Council worked on the Capacity Investment Scheme with the Clean Energy Investor Group, Climate Action Network Australia, the Battery Council and a number of other stakeholders.

Our work is effectively looking at how we accelerate at the pace required to meet our emission reduction goals as well as our renewable electricity goals at both Federal and State level. The Smart Energy Council is an advocate for an energy transition that is: one, at pace with emissions reduction; and, two, keeps the costs at a

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<sup>1</sup> In [correspondence](#) to the committee dated 11 December 2023, Mr Andrew Bray, National Director, RE-Alliance, clarified their evidence.

reasonably levelised rate compared to where we are now, noting the New South Wales electricity road map, which set out and promised a reduction of energy bills for New South Wales consumers. A just transition also includes a transition that transitions in a way that keeps costs at, or relatively close to, current levels. I will finalise this statement there.

**The CHAIR:** Ms McElnea, you've got your hand up. Is that because you also have a short opening statement to make?

**HEIDI McELNEA:** Yes, I have a couple of examples to fill.

**The CHAIR:** Just very quickly, because we do need to get to Committee member questions. Thank you, go ahead.

**HEIDI McELNEA:** In my research and experience, two of the key concerns communities have in relation to above-ground traditional [inaudible] are aesthetics and impacts to land and environment. I found that local involvement in projects and a level of agency helps to get better project outcomes while reducing these concerns. In the New England Renewable Energy Zone, where I live and work, a number of local conversationists, ecologists, landowners and First Nations knowledge-holders have been concerned about impacts of the transmission on an already fragmented landscape that has been cleared primarily for agriculture. Initially, concern was largely due to the lack of the opportunities to participate in planning. We helped to convene meetings for people who shared these concerns. Together, the group developed recommendations to guide the planning, construction and management of the new transmission lines and trialled new participatory processes to feed local environmental knowledge and data into the planning process.

Another cause for concern is the gap in research. What are the effects on different plant species when canopy cover is removed? How can clearing a 70-metre-wide corridor impact the movement of native animal species and, if negative, how can this be mitigated? Better research and information will minimise environmental impacts and concerns. A challenge moving forward, however, is if there's no agreed standard or accreditation to give people confidence that whichever company wins a tender to construct the infrastructure will have a commitment to environmental protection or mitigation beyond the minimum required. In North America, the Right-of-Way Stewardship Council provides resources and accreditation for utilities. In Europe, the Renewables Grid Initiative does this. Sound environmental practice is needed in transmission here in Australia. How can we bed these practices down, and could the Government play a leadership role? I can leave it there.

**The CHAIR:** Thank you, that is very useful. We will go to questions from the Opposition.

**The Hon. WES FANG:** Thank you all for making yourselves available to appear today. I am going to start with you, Ms Gerrard. I note, having done a little bit of reading online, that you have been working in the space around the community. A "just transition". I think that is the phrasing that is used to describe your work in relation to the energy space. What is your view where there is a project that impacts communities, such as an overhead transmission line, that the community is simply against? How do we find a just transition when they are prepared to accept something like an underground line but they are being told that it has to be overhead?

**ELIANOR GERRARD:** Excellent question, and I posed this just recently to another panel of researchers. I think, fundamentally, what Community Power Agency advocates for is improved transparency in decision-making processes. That's improved community engagement from skilled practitioners that can go and engage with those community members about the infrastructure that is coming, and about the options that are available to them. Making sure that they are informed respectfully about what the options are, not dumbing down with engineers coming across and not being respectful to people's local knowledge, but really ensuring that they have a sense of agency and that they are being brought along on any decision-making process. I think what you're saying is that a just transition also needs to take into account landholders that might not want energy infrastructure—is that the crux of it?

**The Hon. WES FANG:** Effectively, yes. You would be aware that this is the second inquiry on this issue—

**ELIANOR GERRARD:** Yes.

**The Hon. WES FANG:** —and that the first inquiry heard from a lot of stakeholders. In fact, we went to places such as Tumut because of HumeLink. We have been to Deniliquin because of the transmission lines there, and we have been to Armidale to have a look at the work that EnergyCo will be doing up there. We also heard from Central-West Orana as well. Here are a group of stakeholders, as in community members, that know more about overhead and underground transmission lines than I have ever known a group of stakeholders to know. They have agency. They have been taken along for the ride. They have been consulted to death, and they are still

advocating for the undergrounding of these lines. Now, where you have got informed, well-educated, considered stakeholders that are still saying, "We don't want the overhead. We are happy to have it—we understand why you need it—but we want it underground," haven't they met all the requirements that you would advocate for to say that they have made a considered decision, and they still want this? Is it then on us to actually work with them to actually have that undergrounded?

**ELIANOR GERRARD:** I don't think it's as simple as that, because there are obviously lots of stakeholders in this energy transition. There are people that live in urban areas. There are people that live in regional areas. We have to make sure that it is cost effective and it is fair and just for everyone, which means there are so many different things to take into account. But I think the context behind that is that we are entering into this very rapid transition off the back of decades of inaction on climate change, and so the pace of this change is really fast. And therefore the greater storytelling that should have happened—the community engagement prior to this kind of feeling like everything is being rushed—has been a real missed opportunity. I think it is also happening in an environment where there is a lack of trust in government.

**The Hon. WES FANG:** If I am extending that, then you have got metropolitan stakeholders—people that are living in the Sydney CBD, where we all are now—and they live in a concrete jungle. They drive their car. They might use public transport. In order for them to be able to receive renewable energy that is produced in rural and regional parts of New South Wales, we have to first have those renewable energy zones, which are in regional areas, and we then have to build these transmission lines to get that power to here. So that people can save—and I have calculated this—about \$8 per power bill. We are enforcing overhead transmission lines on communities to provide cheaper power for people that live in the city. Isn't that an abrogation of the overall responsibility onto people in rural and regional areas, because they have to carry the renewable energy projects—they have to carry the renewable energy transmission lines—and, in effect, the net benefit is basically going to metropolitan areas? Where is the benefit for those people who have been engaged with and consulted with?

**ELIANOR GERRARD:** Sure. I think that we are also not acknowledging that we need to rapidly act on climate change. What Community Power Agency advocates for is greater benefit sharing in these regional host communities. We want to see local jobs, and we want to see local procurement, and we want to see engagement practices that are early and meaningful and genuine. It might be that you have to have longer tender processes—engagement processes on route and route choice. But, fundamentally, I think that communities need to see benefits. Regional communities need to see benefits from the change.

**The CHAIR:** Mr Bray has his hand up.

**The Hon. WES FANG:** I was going to come to Mr Bray in a second—

**The CHAIR:** Yes, but he has had his hand up for some time.

**The Hon. WES FANG:** I appreciate that, but my questioning is not to Mr Bray. I will come to Mr Bray in a second. I know my time is very limited, but you understand that the genesis of a lot of these problems is that you have a lot of city dwellers telling rural and regional people that, "We are going to consult with you", "We are going to do this", "We are going to do that." You are advocating for doing more of that, but I don't think any more consultation or information or engagement with these communities will have them have overhead powerlines. They want it underground, and it is simply a matter of cost now. Would that be a fair assumption?

**ELIANOR GERRARD:** I'm not an engineer, but I don't think it's also just about cost. I think it's also about the—

**The Hon. WES FANG:** Feasibility?

**ELIANOR GERRARD:** —feasibility of it.

**The Hon. WES FANG:** Understood. I will come now to you, Mr Bray. Does RE-Alliance have any connection with the Clean Energy Investor Group?

**ANDREW BRAY:** No.

**The Hon. WES FANG:** Because we heard from Mr Corbell earlier, and he cited your submission to the previous inquiry numerous times throughout his submission. Did you provide any advice to the Clean Energy Investor Group around your previous submission, and have you done any work with them to provide them any advice, feedback or technical expertise for their submissions?

**ANDREW BRAY:** I don't recall. We do speak with the Clean Energy Investor Group from time to time. I don't recall if we had specific interaction about this report. That was some months ago now. But, you know, I didn't hear what Mr Corbell had to say before because I wasn't logged in.

**The Hon. WES FANG:** It wasn't that interesting.

**ANDREW BRAY:** Sorry, Chair. The reason I had my hand up before is I wanted to respond to the assumption in Mr Fang's first question. It's a framing that you hear quite a lot—that regional people have to put up with all the impacts, and only city people get the benefits. I think that's really a misconstrued version of what's happening. I don't question for a second that the impacts happen definitely in the regional areas, but people who live in regional areas are power consumers as well. Regional businesses, energy and people who live in regional and rural towns use power. If power comes more cheaply because of this large-scale renewable energy infrastructure, it benefits all. While people in this region or that region all want routes undergrounded, I'd question whether the discussions that we've had with them were as power consumers—are you happy with the much higher prices of those solutions that you would spend?

**The CHAIR:** Mr Bray, I'll direct my first question to you. Do you also submit that the assessment process at the moment for transmission infrastructure during the RIT process doesn't take into account social and environmental concerns? There's a reason that it's reflected potentially as cheaper power bills—because it doesn't take into account social and environmental concerns. You also are critical of that. Do you believe that should change?

**ANDREW BRAY:** Yes, we absolutely have been critical of that since we released our *Building Trust for Transmission* report a bit over two years ago. Happily, I can say there's progress being made in those areas already. The Australian Energy Regulator is allowing for extra community engagement costs to be passed through, for instance, so some of that work is starting to now happen. But I would second the comments made by the Community Power Agency reps earlier that these processes need to be delivering procedural fairness and distributive fairness in those communities, and undergrounding needs to be seen as part of that discussion.

**The CHAIR:** I'll turn to questions to the Smart Energy Council. Mr Woulfe, you mentioned something at the beginning about a planning process at the Federal level in relation to transmission. What consideration during those meetings is being given to undergrounding? What else is being discussed and deliberated on in that area?

**CONNOR WOULFE:** Thankfully, for time's sake, the reform in terms of access to transmission is largely agnostic as to whether the transmission is above ground or underground, so it's a different kind of problem that they're solving in that particular working group. But in terms of the broader considerations, the build of transmission isn't about lowering energy bills by \$8. If you factor in the cost of renewable energy projects that get connected, it's a far greater impact. It's a far broader problem that's being solved. That is that if the transmission doesn't come in on time, not only do we have, let's say, maybe more expensive energy; we don't have enough energy to satisfy our demand. It's a security risk; it's an energy reliability risk. That is very significant and one of the more salient factors in designing the transmission access regime at the national level.

Getting this wrong or not doing this quickly enough is a serious reliability issue. We know that as climate change worsens over the coming decade or two decades, and we have more heatwaves and more unpredictable heatwaves, the blackouts and coal-fired power plants shutting down more irregularly and more frequently means that it's a really serious issue. I also just want to highlight that, in New South Wales, the per-megawatt cost that is paid to communities is the highest in the country, as far as I'm aware. I might not have checked the Northern Territory, so I could be wrong on that exact—putting New South Wales at the top.

**The CHAIR:** When you say the per-megawatt cost paid to communities, how?

**CONNOR WOULFE:** In the New South Wales wind guidelines, which is backed up by legislation and regulation, there are a range of community engagement conditions which projects have to go through. In there are a range of per-megawatt contributions that have to be made. It's a very significant portion of the profits, and so the idea that this is some sort of transfer of resources and wealth and benefits from regional to cities simply is misrepresented.

**The CHAIR:** If it directly impacts landholders or broader communities, in terms of councils, exactly how is that payment paid out? Obviously, we can look at the document you referred to to get more detail.

**CONNOR WOULFE:** As far as I'm concerned, it's paid to the councils, and they have a duty to distribute those. Obviously, there are also some payments for transmission on landholders' property. From various stakeholders we've spoken with, there's a real recognition that having diversified revenue streams in an increasingly difficult agricultural environment—with, again, rapidly changing environmental conditions—means that, for many stakeholders, having diversified revenue is actually hugely beneficial. While some stakeholders are not happy with it, I guess at the end of the day we are providing a reasonably basic commodity. If we were looking at something like water and water infrastructure, and providing that at a reasonable price, you wouldn't change



course dramatically based off a very small group opposing the way in which infrastructure is delivered, especially if they want that infrastructure delivered at three to 10 times the current cost.

**LEIGH HEANEY:** If the Chair is looking for some reference points, the new wind farm guidelines that have recently come out have an extensive list of community benefit fund requirements for payments to councils listed in those.

**The Hon. STEPHEN LAWRENCE:** I might start with a couple of questions for Mr Bray. Could you give us a sense of the opposition in regional areas of the State to transmission infrastructure, an example of which is HumeLink? Can you give us your appraisal of the basis for opposition and what sorts of people or groups are expressing that opposition?

**ANDREW BRAY:** The first thing to say about the opposition to HumeLink is that the engagement that was done in the first parts of that project were quite poor, and I think Transgrid have acknowledged that themselves. Once you go out with the wrong information, you don't talk to the right people, you're not clear about what it is you're doing and also you come across as trying to hide things, you get people offside to begin with. I think that's made the whole problem much more difficult than it should have been. Transgrid acknowledged that. They went through the internal review; they got Rod Stowe on board with that. My understanding is that has improved it somewhat. But, nevertheless, that generated a number of opposition groups down there who have been quite vocal, and I think they were quite within their rights to do so. I think they weren't treated well.

**The Hon. STEPHEN LAWRENCE:** Has the opposition come from landholders predominantly, or has it come from broader segments of regional communities, to your understanding?

**ANDREW BRAY:** To my understanding from landholders themselves, they're the ones who will have the lines going through their property. It's a considerable impost, and it will be an impediment to the way they've farmed to date. There's no doubt about the fact that they are going to have to make adaptations to it. For some of them, I think the \$200,000 per kilometre rate was immense after that engagement began. This is the payment for transmission landholders. For some of them, that's going to make a difference, and I understand that it has. But for some, they would prefer that there just wasn't that infrastructure there to begin with.

**The Hon. STEPHEN LAWRENCE:** In terms of that opposition in the context of this debate about undergrounding versus above-grounding, what's your understanding of the main concern that landholders have about above-ground transmission lines? Is it aesthetic? Is that the main concern? Or is it some other issue?

**ANDREW BRAY:** Different things matter to different people. If you have a lifestyle block that you've retired to and you particularly like the environs around there, the aesthetic part of it might be a bigger deal. If you're running a working farm and you've got cropping operations that you would have to change—you might have to do your irrigation differently to get around a powerline—then that's going to be an impediment. It's a range of those different things. Again, you've got to be having this conversation that takes all of those into account, works out where mitigation is impossible and works out where it's not. This is State significant infrastructure, so it's a complicated issue. It needs to incorporate all the views on the ground, but it needs to remember the purpose of what the infrastructure is there for.

**The Hon. STEPHEN LAWRENCE:** I might turn to the Community Power Agency and Ms Gerrard. You were asked earlier by Mr Fang—essentially it was suggested that the opposition to HumeLink, in his view, was informed and strong; therefore, should we just accede to that opposition? Could you tell us whether you think it would be a reasonable approach to the issues that are posed here to simply say, "Well, the opposition is so strong from those directly affected that we should just underground it"?

**ELIANOR GERRARD:** I think that this inquiry is one part of greater transparency in decision-making and greater hearing of different perspectives and different views. But perhaps mechanisms like citizen democracies or other decision-making forums would include a wider variety of stakeholders, because that is just one stakeholder in this very complex energy system that we have. I think that greater stakeholder participation in decision-making processes would be the next step that I would suggest.

**The Hon. STEPHEN LAWRENCE:** That pre-empts my question. I suppose another way to look at it is to say that there are much bigger issues at stake here than that which pertain to any individual landholder. They can't possibly have a veto over such important public infrastructure so, on that basis, it just has to go through. I'm just wondering whether there is a third way, in your view. Is there another way we can build social licence around these sorts of projects and get out of first or second options as a dichotomy?

**ELIANOR GERRARD:** I might let my colleague Heidi answer that because she has been doing some very important work on the ground in the New England REZ and she might be able to bring some examples.

**HEIDI McELNEA:** Thanks, Elianor, and thanks for the question. What's critical to discuss is the reasons behind these preferences of the landowners who've suggested that undergrounding is their preferred option, to ensure that all information is on the table and that these means couldn't be achieved by other mechanisms, and to put their particular preferences—as others have said, to factor them in with environmental, other stakeholders and other requirements to create a balanced outcome. But certainly wherever we find that people have more agency—the ability to contribute and understand how their input factors into decision-making—we get people who are happier all around. If people are just given one or two options but that seems the only way, then it's difficult to find those kinds of compromises that are needed.

**The Hon. STEPHEN LAWRENCE:** Thanks, Heidi. I might lastly go to either of the Smart Energy Council representatives. Where do you see the balance here in terms of the concerns of those most directly affected and the broader public interest that incorporates a whole range of considerations, including speed of delivery and transition?

**CONNOR WOULFE:** I outlined some of the points in relation to that question, and thank you for allowing me to elaborate. First of all, the Australian environment is very unique and special, and our communities regionally are a significant lifeblood of the Australian economy. We do need to do better across renewable energy projects and transmission projects if we want a timely transition and build-out of projects. I think it would be great to understand the values behind why they've opposed the project, noting that they are very well informed. They've spent a lot of time and they're very knowledgeable. But if a particular stakeholder group has the time, money and education to stand up and push back against a project which has a public interest, that doesn't mean that the public interest should be subverted beneath that.

One idea that you could look at is if a community is genuinely against a project and it's not just because they have a "not in my backyard" kind of view and there are other really substantial reasons, including environmental, and that community has so much respect for their own land and their own area that they want to have a huge cost incurred on all energy consumers, you could look for some buy-in from that community. If you say, "Look, if you're going to put on a huge extra cost to the public and you want your land protected, despite the fact that everywhere else in the country these lines have to go above land for the broader public and economic benefit," one way to test potentially genuine protest is to look for some contribution from the communities. I'm not sure how politically or socially feasible that is, but it's a potential third option if you're really looking for one.

**The CHAIR:** Thank you very much. We're out of time. Thanks so much to all of our witnesses for appearing today.

**(The witnesses withdrew.)**

**Mr JAMES HAY**, Chief Executive Officer, Energy Corporation of NSW (EnergyCo), affirmed and examined

**Mr ANDREW KINGSMILL**, Executive Director, Network Planning and Technical Advisory, Energy Corporation of NSW (EnergyCo), affirmed and examined

**The CHAIR:** I welcome our next witnesses. Would either of you have a short opening statement for the Committee?

**JAMES HAY:** Just a little bit about Energy Corporation of NSW for the Committee's benefit. We are a statutory authority. We were originally created under the 1987 Energy Utilities and Administration Act, and our role was to advise the State on the energy resources of the State. Under the Electricity Infrastructure Investment Act 2020, often referred to as the electricity road map, Energy Corporation was added and had a function—Energy Corporation actually didn't do anything for 30 years, but we were re-enlivened under the road map legislation to be the infrastructure planner. The role of the infrastructure planner is to act in the public interest. We are a not-for-profit. We don't—we are a government entity. Ultimately, we won't have a balance sheet; we are not going to operate electricity infrastructure.

Our role is to act in the place of coordinating the investment and transmission generation and storage, principally in the renewable energy zones [REZs] but also what we call priority transmission infrastructure<sup>2</sup> projects, which are transition infrastructure<sup>3</sup> projects that are needed for reliability to keep the lights on. We look at those as a whole. As you know, the transition from the current fleet of coal-fired generators is in progress and happening rapidly. We have an obsolescence issue with that fleet. The existing transmission lines were built to the existing fuel sources, which are the coalfields and the water areas where the coal plants are based. The challenge for New South Wales is to replace over 75 per cent of its base load energy within 10 to 15 years. The CSIRO advice, which is the basis for most policy work in the national electricity market of which New South Wales is a part, is that firmed renewables are the cheapest alternative, particularly in New South Wales. Firmed renewables consist of wind, solar and firming elements such as short- and long-duration batteries, pumped hydro and gas.

Our role is to recommend the network solutions for the renewable energy zones, in particular, and the coordination of those with the generation that is going to come into those areas and the storage that will be in those areas and elsewhere. The renewable energy zones are like the new power stations in that sense—in an electrical sense. One of the things that the Act really recognised—two things: The State no longer has control in the way it did when the transition to coal-fired generation was done 40, 50 years ago. In those days, the State owned generation, transmission, distribution, retail and set the prices, and it also owned the coalfields. Now it doesn't have those interests. The coordination is a much more informed—different way; you don't have the ownership interest, so most of the investment would be private sector investment.

Our role is to recognise the roles of the community, and the objects of the Act stress that obtaining the support and fostering the support of local communities, which is the way that the Act refers to social licence, is a key objective of the Act and the key objective of Energy Corporation in recommending what the right network solutions are to deliver the energy transition. These renewable energy zones are so large that we have to take a view across the whole of the network of New South Wales. Many of you may be familiar with the Network Infrastructure Strategy that we published earlier this year, which looks at the REZs in the context of the network and the wider network in New South Wales and the priority investment projects and how they fit as part of the national electricity market. They are interconnectors with Queensland, with Victoria and with South Australia, in particular.

Just a little bit about myself and Andrew. I have spent most of my career tunnelling or digging holes in grounds in one way, shape or form. I have worked on infrastructure as broadly as hospitals, prisons and tunnels for electricity and for road purposes. I have also been involved in rebuilding major cities and looking at other things like that—in particular, in Christchurch in New Zealand. I have been in the electricity sector for nigh on

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<sup>2</sup> In [correspondence](#) to the committee dated 8 January 2024, Mr Andrew Kingsmill, Executive Director, Network Planning and Technical Advisory, Energy Corporation of NSW (EnergyCo), clarified their evidence.

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30 years in different capacities. Andrew Kingsmill is a very experienced transmission power systems engineer and has worked in both network planning and network operations for most<sup>4</sup> of his career. He leads our technical advisory group at EnergyCo, which assembles the Network Infrastructure Strategy and then informs the scope and scale of the projects that we are tasked with advancing for the people of New South Wales.

Just a couple of other quick things I would make in that opening statement, if I may, Chair. We look at all projects on their merits, and all projects are different. Perhaps one of the things I would like to stress to the Committee: Transmission is not just poles and wires. One of our signature projects at the moment is the Waratah Super Battery project, which is a transmission project and will be for a substantial part of that asset's life. What that project does—and it's based at the old coal-fired power station site at Lake Munmorah. It enables the existing transmission network to be used at a much higher level of utilisation. It avoids the need for build.

In this case, it's actually buying time for the need for some build to allow proper community engagement, which we have just commenced on what we called the Hunter Transmission Project, and proper planning with Transgrid and with AEMO. AEMO is the Australian Energy Market Operator, who sets the overall plan for the network in the national electricity market, which is called the Integrated System Plan. So we look at those things—in and around. The Waratah Super Battery, which by megawatts is one of the largest batteries in the world, will be completed in August 2025, having been commenced as a project in 2022. That enables the existing network to perform at a much higher level than it was currently performing at to keep the lights on whilst other initiatives are planned and other investments occur.

We also look at conventional investments and lines. So the renewable energy zones act like collector systems. They are there to collect generation and aggregate it and bring it to the points where electricity is used on a utility scale. They complement the New South Wales electricity strategy, which is an end-to-end strategy about rooftop solar, energy efficiency and peak demand response schemes. It goes from the very point of production, whether that's on the rooftop or on a utility scale, wind or solar farm or a coal generator, and it looks at the system as a whole.

What we do with other projects like the Hunter Transmission Project—it's about the back haul. It's about the backbone of the network to transport bulk energy. We cover the ambit of that, and we're happy to go through how we look at these projects and the specifics. We look at each community as we find it. We look at the landowners as we find them. We look at the electricity needs and the anticipated demand and use of electricity over time and how it serves affordability, reliability and sustainability for the community over time.

**The Hon. SUSAN CARTER:** Thank you, gentlemen, for being here today. I am just interested what the relationship between Energy Corporation and the Clean Energy Investor Group is.

**JAMES HAY:** The Clean Energy Investor Group is a peak body that works with other entities. We work with everyone in the industry, whether they be market bodies—

**The Hon. SUSAN CARTER:** You are members with them, and you use them as consultants?

**JAMES HAY:** We are not a member. We don't use them as consultants, to my knowledge.

**The Hon. SUSAN CARTER:** And who prepared your submission today?

**JAMES HAY:** We prepared our own submission.

**The Hon. SUSAN CARTER:** You might care to look afterwards at striking similarities between the way you discuss underground transmission in your submission and pages 3 and 4 of the Clean Energy Investor Group's submission. I am wondering what the sources are, because the sources you have disclosed as your footnotes don't appear to give the source for your information about underground transmission in New South Wales.

**JAMES HAY:** We can certainly look into that for the Committee. What I would stress—and one of the other parts I should mention about Energy Corporation—is that we have an advisory committee that consists of members very specialist in both communities and the sector as a whole. Our submission was prepared by my own team of experts, with advice from external parties, our consultants and others, and also with the review our EnergyCo advisory committee, which consists—the key members of that, for this purpose, are Dr Keith Turner,

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<sup>4</sup> In [correspondence](#) to the committee dated 8 January 2024, Mr Andrew Kingsmill, Executive Director, Network Planning and Technical Advisory, Energy Corporation of NSW (EnergyCo), clarified their evidence.

who is an international expert in transmission engineering, and Dr Alex Wonhas, who is AEMO's system planner for many years.

**The Hon. SUSAN CARTER:** So perhaps there is a lot of crossover between your advisers and Clean Energy Investor Group, which is just a matter of interest. Is there any formal connection with the RE-Alliance?

**JAMES HAY:** No.

**The Hon. SUSAN CARTER:** They appear to be very closely linked with Clean Energy Investor Group in terms of using each other's submissions and, by extension, with what we have in front of us to day.

**JAMES HAY:** We work with all bodies, and there's a lot of common material. Our website is the source of many people's information as well. Our job is to put information out there. You'll see quite a lot on our website, so it may well be that others have seen what we've put out there.

**The Hon. SUSAN CARTER:** I notice in your submission, at page 4, you talk about undergrounding and you talk about a bending radius. What's the bending radius of overhead transmission lines?

**JAMES HAY:** That might be a good opportunity for Andrew to come in with the more technical side, and we probably have some exhibits here that might help demonstrate that point, with the permission of the Committee.

**The Hon. SUSAN CARTER:** What's the bending radius of overhead transmission lines?

**ANDREW KINGSMILL:** Overhead transmission lines can actually turn corners quite sharply with the right civil design, so we don't talk about—

**The Hon. SUSAN CARTER:** Is it a bend or is it a corner with an overhead transmission line?

**ANDREW KINGSMILL:** With overhead transmission lines, we don't talk about bending radii, typically.

**The Hon. SUSAN CARTER:** Is that because they can't bend around natural features like trees in the way that underground cables can?

**ANDREW KINGSMILL:** No, they can bend around natural features, absolutely.

**The Hon. SUSAN CARTER:** So the alignment that is proposed bends around natural features to accommodate natural features?

**ANDREW KINGSMILL:** It can. When we—

**The Hon. SUSAN CARTER:** It can, but does it?

**ANDREW KINGSMILL:** That would be specific to each location along the line routes.

**The Hon. SUSAN CARTER:** Your recommendation is that, if it is overhead powerlines, it should be bent to accommodate the natural features so as to have minimal impact on stakeholders?

**ANDREW KINGSMILL:** We consider a range of considerations when we set a route. That includes biodiversity-type impacts. That includes the topology of the land, the constructability, the physical impacts and the impacts on land use. All of those are considerations.

**The Hon. SUSAN CARTER:** Does it include bushfire risk?

**ANDREW KINGSMILL:** Yes, it includes bushfire risk.

**The Hon. SUSAN CARTER:** What's the bushfire risk of overhead transmission lines compared to underground cables?

**ANDREW KINGSMILL:** The bushfire risk—and we're talking here about extra high voltage overhead transmission lines. I would define that as voltages over 330 kilovolts and above—so 330 and 500 kilovolts.

**The Hon. SUSAN CARTER:** And the risk?

**ANDREW KINGSMILL:** A 500 kilovolt line has never started a bushfire in Australia, and I note the evidence provided by—

**The Hon. SUSAN CARTER:** Could I just stop you there? How many 500 kilovolts are currently in Australia?

**ANDREW KINGSMILL:** There are a number in New South Wales. I would have to get the quantity, but off the top of my head it is in the order of seven or eight. And there are a number in Victoria.

**The Hon. SUSAN CARTER:** You wouldn't know the kilovolts of the wires that started the bushfires in Maui, would you?

**ANDREW KINGSMILL:** I don't. I am not familiar with Maui.

**The Hon. SUSAN CARTER:** And the risk for underground cables?

**ANDREW KINGSMILL:** I'll just finish talking to the bushfire risk for overhead lines. We noted in our submission the evidence provided by Andrew Dyer to the previous inquiry where he used the term "virtually zero", and that came from some work he did with Energy Safe Victoria. What I would also note is that where bushfires have started previously—for example, the tragic Black Saturday bushfires in Victoria—they were on far lower voltage assets and, particularly in the case of the Kinglake Fire in Victoria, that was around a particular technology called single-wire earth return. A lot of those issues are less of an issue at higher voltages where the easements are wider, where the lines are higher off the ground and where there isn't as much encroachment from trees on the line—very, very low risk. In terms of underground cables, the bushfire risk, as I understand it, is also virtually zero.

**The Hon. WES FANG:** Thank you very much, gentlemen, for coming today. Looking at some of the projects that have been flagged by EnergyCo recently, and looking at something like Central-West Orana, where you have a REZ and then you have to get power from that Central-West Orana REZ to somewhere like Sydney or other major metropolitan areas, to a major population base, you've said that you are in charge of the network design and, Mr Kingsmill, you're effectively the person that does that design. Have you looked at undergrounding those lines? If you have, what is it that precludes undergrounding for you?

**ANDREW KINGSMILL:** "Precludes" is a very strong word. As Mr Hay said, we take each project on its merits. But, Chair, if I may, now might be a good time to table some samples, and I can talk about some of the physical characteristics of underground and overhead.

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

**ANDREW KINGSMILL:** This is a sample of underground transmission cable at extra high voltage at 330 and 500 kilovolts. It is quite a large asset. It's very specifically manufactured. The interior of the cable is a copper core. It can be an aluminium core, but this one is copper. Outside of that, there's a very specialist cross-linked polyethylene plastic layer, which provides insulation. Then there is an earth and a sheath around that. These cables weigh approximately 40 kilograms per metre, so the installation of them is quite a significant civil undertaking.

They involve excavations, and I recognise that the inquiry has received a number of opinions on how big those excavations are and how wide that corridor is, but I will come to that in a moment. They also have handling requirements so as not to damage the cables, which can be quite expensive to replace. In contrast, an overhead conductor, which this is a sample of, is much smaller. It is much easier to install with a traditional winch-type system. Certainly, the construction of the towers is different between the two, but hopefully this gives a bit of a visual. Committee members are welcome to inspect these if they wish, after the inquiry.

**The Hon. WES FANG:** We might do that a little bit later. I have some more questions I need to get through, and my time has almost expired. Where you have the need to move energy, have you looked at undergrounding from, say, Central-West Orana into the bigger metropolitan areas?

**ANDREW KINGSMILL:** We have, and we've done some calculations on that around the size of the trenches, the number of cables, the distances they would need to run, the volume of spoil that would need to be removed and the cement slurry backfill that would need to be poured in that. They are summarised in our submission, but we can provide more information on that if we need to.

**The Hon. WES FANG:** Is it only a matter of cost that precludes the undergrounding from being an option, or are there other things that preclude your adoption of undergrounding over an overhead system?

**ANDREW KINGSMILL:** There are a number of other factors. For example, particularly in environmentally or culturally sensitive areas, with overhead lines, the towers are spaced 400 to 500 metres apart. So it is possible to route lines around those areas or to minimise impact through those areas, even such that, if the topology is right, it's possible to route them so that there is no need to clear the vegetation under the lines—for example, if they are routed on two sides of the valley. We've considered things like truck movements on local roads with the amount of spoil that would need to be removed.

**JAMES HAY:** It's also important, Andrew, to stress that you can't just replace the soil around this thing. They have to be spaced at a certain minimum. One of these conducts much less electricity than one of these, so

you have to space them further. You have more of them. They have to be deep, and they have to be encased in heat-resistant material, on which nothing will grow.

**ANDREW KINGSMILL:** I realise that time is short but, very briefly, the other consideration we have is that the capacity of an underground cable is less than that of an overhead line at extra high voltages. The transmission lines that we are looking at running overhead in Central-West Orana and New England are good for four gigawatts per line. With an HVAC cable, the highest at 500 kV today is 1.8 gigawatts per line and an HVDC 525 kilovolts is 2.6 gigawatts per line. So you end up with more cables to get the same capacity.

**The Hon. WES FANG:** Unfortunately, my time has run out. I have so many more questions. We may have to ask you to come back at another time because we're not going to get to all the questions today.

**The CHAIR:** Just to check with that cable, what would be an HVAC or HVDC, did you say?

**ANDREW KINGSMILL:** This particular cable is an HVAC. An HVDC is not dissimilar. It is marginally smaller—maybe 10 per cent smaller in terms of diameter—but a lot of the properties are very similar.

**The CHAIR:** Firstly, let me talk about bushfire. Particularly in the State Development Committee inquiry into this issue, we largely covered where the overhead transmission lines can cause fire, and we didn't really talk about the impact on transmission network infrastructure. I think that's an important aspect, given that we will be facing more intense and severe bushfires and fires as the years pass. What has EnergyCo done to futureproof, if you like, potential overhead transmission lines? The Black Summer bushfires absolutely tore through the overhead transmission network, both in Victoria and New South Wales. The impacted transmission infrastructure in lots of parts of the State was down for quite a few days. Are you aware of that? What is EnergyCo doing to ensure that overhead transmission lines can withstand the types of fires that we know we are going to experience again and again?

**ANDREW KINGSMILL:** In the previous fires, there was certainly a small amount of infrastructure that might have been down from that time, pending repairs. But the large backbone, if you like, of the New South Wales electricity system was returned to service and continued in service. I realise there were some repairs to be made after that, but the backbone lines themselves were serviceable. In terms of the measures that EnergyCo takes, we look at easement width, we look at how we route the lines in terms of proximity to bushfires, and we engage contractors to do natural hazard assessment, which actually looks at the bushfire intensity along the line route. That will involve consideration of vegetation, and it involves consideration of topology, and how fires move through the area. That is one of the considerations that we use when we develop our corridor. Where possible, we would try to avoid forested areas, in some respects. In other respects, there are advantages to going through them. But the easement widths, the access and those natural hazard assessments are the measures that we take.

**JAMES HAY:** We can provide further details of just how little interruption there was to the major transmission lines during the fire season. It might be worth the Committee seeing that.

**The CHAIR:** That would be very useful because I don't want to get the sense that the importance of this is being downplayed in any way. It wasn't mentioned by Transgrid at all during the last inquiry, despite numerous questions about bushfires. But there is a whole report that the regulator has done into what happened to the energy transmission network during the Black Summer fires. There is whole report into Transgrid's network and how severely it was impacted at that time. You would be aware of that report, I take it?

**JAMES HAY:** Just confirming you are referring to the Australian Energy Regulator?

**The CHAIR:** Yes.

**JAMES HAY:** We do have a few regulators. We will have a look at that. We will come back with the details.

**The CHAIR:** In terms of bushfires, am I correct in saying that, if we are looking at trying to ensure that the network is able to continue providing electricity for residents during emergencies, there is less risk in undergrounding than there is in overhead transmission, at the height of something like the Black Summer bushfires?

**ANDREW KINGSMILL:** It's probably a question that depends on the definition of "less risk". I wouldn't have said there is materially less risk from undergrounding. The modern power systems are set up with, effectively, as a system, a self-healing type function. If there is a disturbance to a line—and that could be a lightning strike or it could be a fire passing under the line—the system will try to self-heal. If the hazard has passed, then the system would self-heal. I realise that a number of submissions have made the point that overhead

lines are more susceptible to those natural hazards. What I would add to that is that, for most of those natural hazards, they do self-heal.

**The CHAIR:** When you say self-heal, Transgrid's transmission line network within the burnt area—for example, there were 596 wood pole structures. When you are saying self-heal, do they withstand the fire?

**ANDREW KINGSMILL:** If the line is physically intact and capable of conducting electricity, the power system will switch it back on after the hazard has passed. If there's physical damage to infrastructure to the extent that it's no longer capable of conducting electricity, then obviously that would be unsuccessful. What I would like to investigate—and I'm happy to revert to the Committee on this—is the extent to which those statistics were purely about transmission infrastructure or the extent to which they were about sub-transmission or indeed distribution infrastructure because I am aware of much bigger impacts at the distribution level.

**The CHAIR:** It really is around making sure as much as possible that the electricity stays on. During the Black Summer fires there were 12 trips of 500 kV transmission lines. The report states:

This is significant as these are not only part of the main backbone of Transgrid's network but are also the tallest and largest structures on the network. The fact that so many trips occurred on these assets indicates the magnitude of the severity of the fires and the volume of smoke being produced at the time.

Again, that's a positive for underground transmission, is it not, and should be factored in?

**JAMES HAY:** I think there are a couple of things we might tease out here. One is the continuity. We talked a lot about continuity of service, which is different from damage. A line may have impacts that are later needing to be repaired because a fire has passed through it, but did it lose service? For the trips you are talking about, what you would need to look at is the duration of them. They may be momentary. Many of them would be of a relatively short duration. There is quite a nuance to this. I would point out that one of the things with these cables is that they can't follow terrain. Often we are talking here about quite undulating terrain where these kinds of fire risks are pretty high. Much of this, where it's not following the terrain, may be effectively on bridges because these are too heavy to hang on pylons. They will be lower and closer to the height of the fire if they are bridging a gap.

**The CHAIR:** I will go to my colleague now but I can ask you more on notice, if I wish.

**The Hon. ROD ROBERTS:** Thank you, Chair. You and I have obviously been reading from the same document because I, too, have questions in relation to it. Page 15 in the last paragraph of your own submission states:

Underground transmission lines are typically unaffected by aboveground fires – grass and scrub fires move quickly enough that the temperature of the ground surrounding the cable is not raised significantly.

I go to Transgrid's own document—and I'm sure you have probably seen this and are aware of this—which the Chair has quoted from. These are Transgrid's own words:

In total there were 12 trips of the 500 kV transmission line. This is significant ...

The Chair has already alluded to that. These were trips of the system. If it was underground, it's highly unlikely the system would be tripped at any time at all, according to your own submission.

**ANDREW KINGSMILL:** That would be correct.

**JAMES HAY:** Where it's underground, what we are trying to say is sometimes—

**The Hon. ROD ROBERTS:** I heard what you said. I just asked my question, that's all. I don't want you to take that as being rude but I am on the clock and I have to get it finished. Mr Hay, you said a short period ago in your own evidence here today that nothing will grow above underground high voltage lines.

**JAMES HAY:** Very little of any merit.

**The Hon. ROD ROBERTS:** You said nothing before. Now we have something or do we have nothing? You also said that you need special fill.

**JAMES HAY:** Yes.

**The Hon. ROD ROBERTS:** Did you listen to any of the expert witnesses this morning at all?

**JAMES HAY:** No.

**ANDREW KINGSMILL:** I did, and I can take that question, Mr Roberts, if you would like me to.



**The Hon. ROD ROBERTS:** Would you suggest that those witnesses this morning intentionally misled the Committee? Their evidence is directly contradictory to Mr Hay's evidence.

**ANDREW KINGSMILL:** I think it would be worth correcting the record here. It depends on the capacity and the size of the cables and the amount of power to be transferred through them. We are quite aware that with HVDC cables—and particularly traditional HVDC cables that aren't as large as the ones that we would be talking about in the renewable energy zones—it is possible to use engineered fill of local soil and retrench that. Those cables typically operate up to a temperature of 50 degrees Celsius and so that's appropriate to dissipate the heat. For cables of this size and the 525 kV HVDC high capacity, they operate at temperatures of up to 85 degrees Celsius, and so that requires a different thermal treatment. I think what you heard from the experts earlier in the day—and we would agree with this—is that it really is a case-by-case basis, where you need to run the thermal software on the cross-section of the cable. But, certainly, my experience with cables at higher capacity is that you would need thermal fill.

**The Hon. ROD ROBERTS:** I take it that you should read the transcript of their evidence from this morning.

**ANDREW KINGSMILL:** I was watching this morning. I heard the evidence.

**The Hon. ROD ROBERTS:** It's completely contradictory to what you said.

**The Hon. EMILY SUVAAL:** Thanks to you both for appearing today. My first question is to Mr Kingsmill. Could you tell us about your expertise in this area of undergrounding?

**ANDREW KINGSMILL:** My expertise is primarily in power system planning, operation and asset management. My background prior to working at EnergyCo was with the network business Transgrid in those capacities. During that time I managed a range of assets, including some underground cables. While I was at Transgrid we installed underground cables. We faced rating issues with underground cables where the spoil and the fill had deteriorated chemically. We faced end-of-life issues with cables, and we faced issues of movement in cables where they're joined to each other, which we had to remediate. So I've had some experience in cable maintenance.

**The Hon. EMILY SUVAAL:** Can you tell us about the transmission planning landscape in New South Wales? Who are the main players and, importantly, who has expertise when it comes to transmission planning and delivery?

**ANDREW KINGSMILL:** There are three planners for transmission and network infrastructure at extra high voltage in New South Wales. AEMO is the national transmission planner, and we see that most in the Integrated System Plan. Transgrid is the jurisdictional planning body, and we see that in their Transmission Annual Planning Report. EnergyCo is the infrastructure planner for renewable energy zones and priority transmission projects, and we see that in our Network Infrastructure Strategy. We joint plan with AEMO and Transgrid.

**The Hon. EMILY SUVAAL:** Who has the expertise when it comes to that planning into the grid?

**ANDREW KINGSMILL:** I'd say that all three organisations have the expertise in terms of planning. I would add that AEMO doesn't manage assets directly. That would be more network operators that have that expertise.

**The Hon. EMILY SUVAAL:** Is there any expertise about undergrounding transmission lines in Australia?

**ANDREW KINGSMILL:** Look, I think there is. There are a number of Australian engineers that are part of an international consortium called CIGRE, including one of your witnesses this morning and other engineers that work for engineering consultancies.

**The Hon. EMILY SUVAAL:** Some of the evidence to this Committee suggests that you could easily put transmission lines underground. Can you explain to us why things might be different when it comes to 500 kV lines?

**ANDREW KINGSMILL:** Absolutely. The size, weight and physical constructability issues would be the main things that I would cite there. At these sorts of sizes, capacities and voltages, the physical logistics and the sheer size of equipment to be able to trench and to bury and to backfill is significantly larger than the smaller cables that you might perhaps underground down a street or within a wind farm or solar farm. The manufacturing of these is specialist—it needs to be high quality to ensure that there are no impurities in there—but so is the installation of them.

These cables typically come on drums of between 500 metres and a kilometre, probably 500 metres for the higher capacity ones. They're joined at the end of those sections to the next section by joint boxes that are about the size of three of these tables. It's about the width, the height and the size of the side of the room that we are sitting on today. Typically at extra high voltage we don't have the capability in Australia to do that jointing, whether that's for installation or repair. Historically we've sourced that from overseas, typically from the same countries that manufacture the cables: Japan, Korea and the like. There is expertise in Australia at lower voltage and lower capacity cables at sub transmission and distribution voltages.

**The Hon. EMILY SUVAAL:** Thanks. Why is most of the new planned infrastructure in New South Wales proposed to be 500 kV and what are the benefits of this?

**ANDREW KINGSMILL:** There are two main benefits of going to a higher voltage, and 500 kV is the highest that we run. One is that the higher the voltage, the lower the loss for the same power transfer. Less energy is lost from the sending end of the line to the receiving end of the line. The second reason is that the capacity of those lines is higher. I cited earlier four gigawatts for a 500 kV overhead line. Typically it is about one gigawatt for a 330 kV line—perhaps slightly higher or slightly lower, depending on design. One of the things that we're conscious about as EnergyCo is that if we go into a community to do these works, we want to disrupt the community as little as possible. That means making the best use and most efficient use with the highest capacity use of the corridors that we can secure.

**The Hon. EMILY SUVAAL:** Thank you. Can you tell us more about the challenges of operating and maintaining underground lines?

**ANDREW KINGSMILL:** I do agree with the statements made earlier today. It probably varies a bit depending on whether they are HVAC or HVDC. But I alluded earlier to some of the physical characteristics. Cable movement can damage cables. It's possible for external interference. Horizontal direct drilling can actually drill into cables—that has happened before—and needs to be replaced. Some of the maintenance would be around testing. But if there is major damage to a cable, it would take similar construction to how the cable was laid in the first place to remove the section, to replace the section and to rejoin the section into the linear asset.

**The Hon. EMILY SUVAAL:** How long does it take to construct and procure transmission lines? Would undergrounding take longer?

**ANDREW KINGSMILL:** The advice that we have is that undergrounding would take longer, in the order of two to three years, than overhead. The full procurement process for an overhead line—are we talking once we have regulatory and environmental approvals or prior to that? Once we have regulatory and environmental approvals—this is generalising; it depends on the length and the topology and a range of things—there is probably a year to 18 months of design and site investigations and geotechnical work, and then, if I was to give you an average, maybe 18 months to two years of actual construction for overhead.

**The Hon. EMILY SUVAAL:** What are the environmental impacts of undergrounding transmission infrastructure?

**ANDREW KINGSMILL:** They're spelt out a little bit in our submission. Because undergrounding requires a trench and excavation for the full length of the asset, it's not impossible, but it becomes harder to route that around environmentally sensitive areas. Whereas with overhead transmission, where the ground disturbance is at the towers, it's more readily possible, in terms of directional changes of overhead towers, to minimise impacts through sensitive areas by doing that. I don't have a background in agriculture, but it has been reported that in Germany, where they are undergrounding a cable, farmers have raised concerns about the effects of heat from cable on the soil and the effects of heat from cable on their crops.

**The Hon. EMILY SUVAAL:** Interesting. In terms of the restrictions on farming, are there restrictions for underground transmission infrastructure on farming, noting what you've just said?

**ANDREW KINGSMILL:** There would be restrictions. To clarify the statement that was made earlier about what can grow over an underground cable, it would be things that don't have the potential to damage the cable. Anything that has deep root systems—there needs to be access to the cable at all times, in case repairs or maintenance are needed. There's probably a slight bit of latitude on this, but my answer would be that grasses typically would be permitted.

**The Hon. EMILY SUVAAL:** So not a rice paddy or anything like that—something requiring a lot of water?

**ANDREW KINGSMILL:** We would seek to completely avoid irrigated areas unless there was no other option.

**The Hon. EMILY SUVAAL:** Thank you. In terms of the size of the trench, there has been some varying evidence about what the size of a trench would be for a 500 kV line. What is your submission of the size of the trench and the easement?

**ANDREW KINGSMILL:** The easement for the cables would be in the order of 30 to 40 metres. It really depends on the capacity and how many cables. There are some examples in our submission. That doesn't include construction easement. Typically for construction, the advice that we've received is that you would add another 30 metres, roughly. But those estimates vary. Some are slightly less and some are slightly more.

**The Hon. EMILY SUVAAL:** Thank you. What are the cost implications of overhead versus underground transmission infrastructure?

**ANDREW KINGSMILL:** Most of our information on that comes from publicly available reports that we've researched. We would be saying in the order of three to 10 times. I'm aware that there are estimates that have been prepared that have been slightly less than that. What I would say is that those estimates are for lower capacity cables than what we would need to run to renewable energy zones. We've spelt that out in our submission—the difference between some of the lower estimates and some of the capacities that you'd get from the physical infrastructure that would be more commensurate with what we'd run to renewable energy zones.

**The Hon. EMILY SUVAAL:** And what would the impact on consumer bills be of underground transmission infrastructure?

**ANDREW KINGSMILL:** We haven't done a calculation at this point as to the impact on consumer bills, but we could do that and revert, if that was of interest to the panel.

**The Hon. EMILY SUVAAL:** It certainly would be. In terms of the HVAC and HVDC infrastructure, can you briefly explain the difference between these and why you're planning them for the REZ, in terms of the rationale?

**ANDREW KINGSMILL:** I can. I'll try and answer the question, then feel free to follow up. HVAC is how most of the power system operates today, with the exception of three DC interconnectors between States. The reason HVAC is used is typically because rotating machines naturally generate AC. Because our power system has historically been developed around rotating coal-fired generators and hydro generators, that's why HVAC is used. Traditional motors—not so much the modern motors—would typically use HVAC. HVDC is a different technology. Newer generators such as solar panels will generate at HVDC. I can fill that in more later, if you'd like.

**The CHAIR:** Thank you very much to you both for appearing. That's the end of our time today. I'm not sure whether anything was taken on notice. The secretariat will be in touch with you about that, if so, as well as any supplementary questions that members may have. Thank you.

**(The witnesses withdrew.)**

**The Committee adjourned at 15:50.**