

**REPORT ON PROCEEDINGS BEFORE**

**STANDING COMMITTEE ON STATE DEVELOPMENT**

**BENEFICIAL AND PRODUCTIVE POST-MINING LAND USE**

**CORRECTED**

**At Jubilee Room, Parliament House, Sydney, on Monday 12 August 2024**

**The Committee met at 8:45.**

**PRESENT**

The Hon. Emily Suvaal (Chair)

Ms Abigail Boyd

The Hon. Mark Buttigieg

The Hon. Wes Fang (Deputy Chair)

The Hon. Scott Farlow

Ms Sue Higginson



**The CHAIR:** Welcome to the second hearing of the Committee's inquiry into beneficial and productive post-mining land use. I acknowledge the Gadigal people of the Eora nation, the traditional custodians of the lands on which we are meeting today. I pay my respects to Elders past and present, and celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of New South Wales. I also acknowledge and pay my respect to any Aboriginal or Torres Strait Islander people joining us today. My name is Emily Suvaal. I'm the Chair of the Committee.

I ask everyone in the room to 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 the hearing. I urge witnesses to be careful about making comments to the media or to others after completing their evidence. In addition, the Legislative Council has adopted rules to provide procedural fairness to inquiry participants. I encourage Committee members and witnesses to be mindful of these procedures.

**Ms GEORGINA BEATTIE**, Deputy Secretary, NSW Resources, Department of Primary Industries and Regional Development, affirmed and examined

**Mr PETER DAY**, Executive Director, Resources Regulator, NSW Resources, Department of Primary Industries and Regional Development, affirmed and examined

**Mr DAVID GAINSFORD**, Deputy Secretary, Development Assessment and Sustainability, NSW Department of Planning, Housing and Infrastructure, affirmed and examined

**Mr TONY CHAPPEL**, Chief Executive Officer, NSW Environment Protection Authority, sworn and examined

**The CHAIR:** Welcome and thank you for making time to give evidence today. Would you any of you like to start by making a short opening statement?

**GEORGINA BEATTIE:** Thank you for the invitation to appear today. New South Wales has a strong regulatory framework to support mine closure and facilitate appropriate post-mining land use. This is mainly overseen by the three key agencies that are represented here today. The Department of Planning, Housing and Infrastructure undertakes a merit assessment of mining projects under the Environmental Planning and Assessment Act, with the Independent Planning Commission imposing consent conditions regarding the closure and rehabilitation of mine sites to specific landforms to facilitate future agricultural, biodiversity conservation or industrial land use. NSW Resources in the Department of Primary Industries and Regional Development administers exploration and mining titles under the Mining Act, and the Resources Regulator enforces compliance to ensure that land disturbed by mining is progressively rehabilitated to a safe and stable state.

The NSW Environment Protection Authority requires environment protection licences under the Protection of the Environment Operations Act and regulates the management and remediation of contaminated land under the Contaminated Land Management Act. The New South Wales Government has also committed to establish Future Jobs and Investment Authorities, which will provide a leading role in planning for the future of coal regions. The process for mine closure involves progressive rehabilitation throughout the life of a mine to return land to its approved final land use. This final land use is set when a mine receives its development consent, which can be decades before a mine is scheduled to close. The planning framework can accommodate changes to the approved final land use if this is initiated by the mining company.

Rehabilitation can take many years after a mine closes, and the Resources Regulator will only sign off rehabilitation when it is confident the long-term risks can be managed. A mining title can be partially approved for relinquishment while rehabilitation and monitoring continue in other parts of the mining title. The Department of Planning, Housing and Infrastructure also undertakes a strategic approach to planning for future uses post-mining. For example, in the Hunter region, the Hunter Regional Plan 2041 has identified 19 sites across Muswellbrook and Singleton local government areas for potential productive land use opportunities. The New South Wales Government recognises that we need to change the way we think about mine sites in New South Wales. Rather than return mines to their former state, opportunities to repurpose parts of those sites to create new jobs should be considered.

Some mine sites will be suitable for new economic uses, while others will be best suited for biodiversity conservation. Post-mining land use is a complex issue, requiring strong collaboration between local and State governments, owners of former mine sites, proponents on active mine sites, investors as well as local councils and communities. A common theme in Australia and internationally is that planning for post-mining land use takes time. Regulatory frameworks should always be reviewed to ensure they are fit for purpose and meet the expectations of government and the community. Any reforms to the regulatory framework in New South Wales must ensure that long-term environmental risks can be managed. Opportunities for the future use of mining land will be one of the areas of interest for the Future Jobs and Investment Authorities. I'll now pass over to Mr Chappel.

**TONY CHAPPEL:** I also acknowledge the traditional custodians of the lands we meet on here today, the Gadigal people of the Eora nation, and extend my respect to their ancestors and Elders past and present. I also acknowledge that wherever mining occurs in New South Wales, Aboriginal people have cared for that country since deep time and have many useful lessons to impart. In terms of mining, the EPA, as my colleague mentioned, is responsible for implementing two specific legislative regimes: the Protection of the Environment Operations Act and the Contaminated Land Management Act. Under the POEO Act, mining activities require environment protection licences, which the EPA issues and regulates against. These are reviewed at least every five years to ensure that they continue to meet community and environmental standards. They can include post-closure conditions.

Under the Contaminated Land Management Act, in any specific post-mining context, the EPA may have a role in regulating that land, ensuring that contamination onsite is appropriately managed. Section 9 of that Act

requires the EPA to have regard to ecologically sustainable development principles when exercising these functions. There are currently a number of mines in the Hunter region at the beginning of their rehabilitation process. With these principles in mind, EPA is focused on ensuring that dam as well as surface and ground water is protected from contamination as the clean-up occurs. To conclude, EPA seeks to work collaboratively with other government agencies as well as international experts in finding the best approaches to ensure we restore mining land and protect the environment and in doing so support the best outcomes for the community.

**Ms ABIGAIL BOYD:** Good morning to all of you. I couldn't help but notice that you put case study 4 and 5, which relate to power station sites, in the Government submission. The Government's discussion paper about the Future Jobs and Investment Authorities doesn't touch on that; it only refers to mining sites rather than coal-fired power station sites. Do you think that's an oversight? Do you think it should be included?

**GEORGINA BEATTIE:** The issues paper on the Future Jobs and Investment Authorities does include power stations. It talks about employment. I think there's probably a greater focus on the employment from the coal mines because it's so much greater than the employment from the mine sites but, absolutely, what we're talking about is the future of the whole regions, and the power stations as well as the mines are important. The case studies and some of the opportunities for the future growth and potential of those regions picks up on those power stations as well.

**Ms ABIGAIL BOYD:** I'm very glad to hear that. In which case, can we talk about the contaminated state of those sites? As I'm sure you'll be aware, in 2019 we conducted an inquiry into the contamination, namely the coal ash repositories, at each of those sites. There was a bunch of recommendations made in relation to not only rehabilitating and ensuring that there was a future for that land, but also in terms of assessing in great detail what the environmental and health impacts were. I understand most of those recommendations haven't been implemented yet. Could you give me an update on where we're actually at with identifying the extent of the damage and what is required to clean it up?

**TONY CHAPPEL:** I understand, actually, that most of them have been implemented. There are three or four—I will just get the latest for you, and perhaps we can come back to it in this session before we finish. The integrated environmental and health study around Lake Macquarie is well underway. There has been a lot of work done in terms of the water, the sediments and other things. The human health assessment, I understand, is progressing, but let me get you some detail on the outstanding items.

**Ms ABIGAIL BOYD:** That one is Lake Macquarie, and I understand that was slated beforehand. That's been part of a separate discussion. In terms of the environmental impacts around all of these sites—including those old sites like Tallawarra, where we know there is a huge amount of toxins leaching into groundwater—what has been done to assess the damage there?

**TONY CHAPPEL:** Specifically on the parliamentary inquiry's recommendations, I understand that almost all of those have been completed. I think there are a handful that are still in progress. I've just asked for the latest there and will happily share it in the session, or straight after if I don't have it by the end of the session.

**Ms ABIGAIL BOYD:** I know there was quite a delay in some of those sites being added to the contaminated land register. Are all of them on there now?

**TONY CHAPPEL:** Let me take that one on notice to make sure that I am fully accurate.

**Ms ABIGAIL BOYD:** I think the community has a lot of concerns that, in the very valid drive to create new jobs and turn these sites into other viable sites for industry, we might cover up what's happened underneath and not actually do the rehabilitation work that is required to take that coal ash out and put it into lined pits. Has consideration been given to that aspect?

**TONY CHAPPEL:** Certainly. A number of these legacy ash repositories, as you know, are not only not lined but they've also received other contaminated material over time in decades past. We do need to be careful about not creating any additional contamination as we seek to re-use and recycle that. There is quite significant work underway on using more contemporary coal ash now in low-carbon applications. There are a number of programs there working with the landholders for these sites, but some of the older sites are more challenging. Perhaps I will take that on notice as well and give a comprehensive answer on notice.

**Ms ABIGAIL BOYD:** That would be very useful, thank you. One of the more optimistic parts of that inquiry was a recommendation that the Government works with industry, community, unions and local councils—which sounds like a kind of transition authority—to grow that coal ash recycle and reuse industry. I understand that not much has been done on that either. Can you give us an update?

**TONY CHAPPEL:** Yes, and I will give you a full update on notice. The EPA has overseen two programs under our carbon abatement partnership program. One is with the coal ash recycling association and the

other is, I think, with a part of the cement or concrete sector specifically. There's been some significant work done with the current operators of the power stations producing ash today as well. Let me get you a summary of that, if I may.

**Ms ABIGAIL BOYD:** Perhaps it's not quite at the scale of the recommendation, which was a New South Wales wide taskforce that would actually shepherd that industry into existence and ensure that there were good jobs for people on those sites. It's such a compelling industry switch when you can have these recycling plants onsite to reduce the burden of that coal ash as well as creating a new industry that's got lower-emission concrete and other types of construction products.

**TONY CHAPPEL:** I'm very happy to take the further particulars on notice as well. I'm sorry, I hadn't anticipated questions on coal ash from the power stations.

**Ms ABIGAIL BOYD:** That's all right. Whenever I'm in any inquiry I will ask about coal ash.

**Ms SUE HIGGINSON:** I'm curious about what your framework around residual risk will look like, how it's communicated, what are the objectives and how are you working with the sector on that. That question is for anyone.

**PETER DAY:** I'll start with a response. I'll talk generally around our current regulatory framework for rehabilitation. That's very much a hurdle approach around how the requirements are in place to ensure that effective and satisfactory rehabilitation occurs, and ultimately with the overall objective that the land is returned to a safe and stable form. Good rehab takes a long time. That is informed by a lot of studies, a lot of work, alignment with the final approved land use that goes through the planning process and also a lot of inspections and assessments by ourselves. The regulator does a lot of assessment programs looking at what we would see to be the critical risks that, ultimately, are some of the things that could lead to residual risks, such as groundwater studies and revegetation studies.

There are two projects we've got going this year on large mine sites. We're assessing how the companies are incorporating those provisions into their programs. Our view would be that the more work we do, the better job we do with rehab overall over that time, and make sure that the proper studies are done, the time is taken to ensure that the rehab that has been done is sustainable and long-standing, lessens the risk of residual risk substantially. The stronger our framework and the more robust our testing and assessments are should lessen the risk of residual risk itself going forward.

**Ms SUE HIGGINSON:** What I'm trying to understand is with the pressures right now about beneficial reuse and the fact that rehab takes a long time—but there is a very obvious pressure—what will the threshold look like around residual risk in the planning system? In terms of beneficial use, what will be the residual risk threshold of signing off?

**PETER DAY:** In some cases, if the risk can be mitigated and there are minor issues, we can look at, as part of the sign-off process, that someone would retain responsibility for managing that going forward. They could be very minor elements. It's about how much risk when you get down to that end point prior to the rehab sign-off. That's informed by the metrics and also the completion criteria that the company submits to us at the end of the process. If there is an interested party or another project that is there, we can then look at that in terms of that a management plan can be put in place. We can use covenants and a whole range of things that could allocate some responsibility for that if there is a residual risk going forward in that project itself.

**Ms SUE HIGGINSON:** Do you currently have a bucket of identified residual risks that are allocated to each particular site? Do you have a lines eye on that at this point in time?

**PETER DAY:** It's case by case for each site. Obviously, our aim is always to ensure that any residual risk is minimised to the point of not being there. Any risk that we know about would be dealt with as part of that rehabilitation process before we have sign-off.

**Ms SUE HIGGINSON:** Sorry to interrupt—and perhaps this is a question for Mr Gainsford; I'm not sure at this point—but how are we reconciling? For example, our colleagues at the Minerals Council are suggesting that we could be missing opportunities. We need a planning framework that navigates this in-between space in the long rehabilitation process that many minds will have to undertake over 20 or 30 years minimum, based on the literature that we have—or 40 years, more likely—and this pressure that we as a committee are being asked to contemplate in terms of we should have a specific set of planning instruments and planning rules. I'm trying to understand, given the complexity and the time that we all know rehabilitation sincerely, in terms of managing risks—not just community health, environment health, long-term et cetera. What would benefit this Committee in understanding what the Government is currently doing in looking at that framework space?

**DAVID GAINSFORD:** I'm happy to attempt to answer that. From a planning system perspective, I agree with Mr Day. Obviously we are assessing these projects on a case-by-case basis. If a change in land use is being proposed as part of a new application for a mining site, obviously we need to consider those risks as part of that assessment, whether it's through a modification or whether it's through a new application. I do take the point, though, and I think it's well made in some of the submissions to the inquiry, around the appropriateness of some of the strategic planning work associated with that future of mining, that post-mining land use. Certainly, that is something in the regional plan that has been identified as requiring some further investigation. I think, through some of the mechanisms that are now being set up with the Future Jobs and Investment Authorities, there is an opportunity to bring those sorts of discussions in—and, obviously, this inquiry. We're looking forward to recommendations out of this process as well.

**Ms SUE HIGGINSON:** Just on that, is the planning department—or the NSW Resources Regulator—seeing mining companies in discussions with potential future land use entities? Are they coming to you and are you having those discussions at this point, where we're talking about passing on liabilities or periods of shared liabilities for changing of land use?

**DAVID GAINSFORD:** I'm happy to attempt to answer that. First, I know that there are ongoing discussions that are happening with some mining companies that have started contemplating what those future land uses might be and entering into arrangements with some other companies. We have referred to a few case studies and a few examples of where that's happening. I haven't personally been talking specifically about some of those residual risk issues, but no doubt they're coming up in some of those discussions. I would say that it's fairly formative at the moment. There are a few case studies, as we've referred to there, but not lots of examples that are coming forward at the moment.

**GEORGINA BEATTIE:** If I may add to that, the residual risk really goes to the heart of this issue about looking at how we can find opportunities for alternative uses. It is really about finding that balance, as you point out, between how we could streamline to perhaps make earlier opportunities for investment without leaving any residual risks, and the costs of that to the State and the community. There are some opportunities to do that now. In the case of a recent example, as Mr Day explained, where it's really minor, there can be a decision that the risk is manageable and some of that risk can be taken on by a new developer. But at this point, that has only ever been done for very minor cases.

If it was to be something more significant, to see a much earlier opportunity found at those sites would require much more consideration and, probably, regulatory reform to allow a new way to approach the issue that ensured, as I said in the opening statement, that government can be left with confidence that those long-term environmental risks can be managed. That assurance needs to be provided and there would still need to be financial assurance, because at the moment it is held in a security bond by the mining company. Mr Day explained that the relinquishment of rehabilitation is not signed off until they are completely satisfied that the land is safe and stable. To bring that forward and to allow someone else to take on that responsibility, the Government would still need to have the financial assurance in place to make sure that those risks could be managed in future.

**Ms SUE HIGGINSON:** I have two more questions—I have a thousand, but I'm limiting them. What are some of the considerations around beneficial reuse for final voids, other than pumped hydro? There is mention of that in the Government's submission. I am curious about what other potential final void reuses may have been given to you.

**PETER DAY:** In terms of voids, one of the core issues that you're looking at as part of this process is that, ultimately, it does feed into the final approved land use. I think there are some good examples around the world of what can be done with voids. We have had no discussions with companies to date.

**Ms SUE HIGGINSON:** Would you mind elaborating on the ones around the world?

**PETER DAY:** I'm aware that in Germany they've created a lake system out of voids. A lot of money was put in as part of the reunification project, a long time ago, around that process. Theoretically, there is a lot of opportunity for voids in terms of agriculture, tourism and ecological uses as well. I guess we go back to that, at the moment, in terms of the regulator, we look at the void in terms of what has been approved for the final land use. Our job, as part of the rehab program, is to make sure that those voids are rendered safe and stable in terms of the slope design, the forming process and making sure that they won't erode or that there won't be environmental issues some way into the future.

**Ms SUE HIGGINSON:** I keep racking my brain about what we are going to do with all the big holes, other than lakes. I'm sure we'll do something. My other question is: What are the ag land agreed condition classes and where are they? Are they readily ascertainable? Is there a base threshold for what that is?

**DAVID GAINSFORD:** Ms Higginson, each consent, as you'd probably be familiar with, does have requirements for rehabilitation. Often it's returning the land to its previous state, be that agriculture or a watered area or what have you. Those consents often specify what the requirements are around what the agriculture land is to be returned to. Lots of mining companies are, obviously, through their progressive rehabilitation, stockpiling topsoil and various things to help that process of returning the land back to those types of land uses.

**Ms SUE HIGGINSON:** So it will just be a case-by-case assessment for any final rehab sign-off. I read that cows get fatter on post-mining land, apparently. There you go. It will be case by case. My final question is about biodiversity considerations. If a mining company is going to seek to not rehabilitate along the lines of native vegetation and biodiversity return, or regeneration, where will that fit in the overall matrix of the biodiversity debt and deficit that we now hold in terms of the harm done to biodiversity from mining projects?

**DAVID GAINSFORD:** Certainly, again on a case-by-case basis, we would be needing to look at those potential impacts to biodiversity. Obviously the answer to this question depends on the type of rehabilitation and whether that rehabilitation is including biodiversity offsets that are required as part of the consents. To date, my understanding is that we haven't had proposals that have come forward to us, albeit that we've only had limited proposals that have come forward to us, that have looked to reduce those offset requirements. But obviously we'd need to take that into account if those issues came up.

**The CHAIR:** I have some questions around the Hunter Regional Plan 2041, which you mentioned in your opening statement, Ms Beattie. This may be a question for Planning, Mr Gainsford. Action 1.1 under the plan states:

The department will investigate the feasibility of expedited planning options to permit the change of one employment use to another employment use ...

Has this happened? If it has, could you provide the Committee with an update?

**DAVID GAINSFORD:** Yes, the Hunter Regional Plan, as you say, has identified that as an action and it has talked about expedited planning options around land use. Certainly, there has been some work—again, I would say probably more on a case-by-case basis rather than at a landscape scale—looking at the various opportunities. A lot of that work now is being wrapped into the work that Regional NSW is helping to lead. It's largely being done on a case-by-case basis at the moment. But I think there is an acknowledgment from the department that some of the underlying zonings and land uses associated with these areas are probably not fit for purpose. There does need to be some consideration of whether a change in zoning or other requirements to help facilitate opportunities is needed. The Government submission points out a case study of the Liddell and Bayswater power stations, where there has been a bit of work done, looking at that sort of—

**The CHAIR:** Indeed that is a power station, also—not a mine site.

**DAVID GAINSFORD:** That's correct. But certainly there is a need on the sites, within the Hunter in particular, to look at the opportunities and the constraints in each area. We are open to doing that.

**The CHAIR:** I should have declared at the outset that I am a proud local resident of the Hunter Valley, and care deeply about the social, economic and environmental implications in the area. Has the department undertaken to identify and map the infrastructure mentioned in action 1.1—so existing infrastructure, like hardstand areas, workshops, stores, treatment plants and rail loops?

**DAVID GAINSFORD:** My understanding, Chair, is that we haven't done that full audit at this point in time. But I'm happy to take that on notice and provide some more details.

**The CHAIR:** In terms of the place strategy, then, for post-mining and power station sites, which is also mentioned in the Hunter Regional Plan, it talks about the Department of Regional NSW and the Department of Planning and Environment, as leading that work. How many place strategies have been done or identified? And where is that work up to?

**DAVID GAINSFORD:** I'd need to take that on notice, Chair.

**The CHAIR:** Thank you, if you could. If you could also take on notice with regards to the place strategies, the involvement of local councils in those areas, that would be great. In terms now for the Government submission, you mention the number of case studies that were included in there that Ms Boyd spoke to. I'm interested in case study 3, which is the Black Rock Motor Park. You mention just under, "Strategic planning provides an opportunity to identify and prioritise existing mine sites for post-mining land uses." What strategic planning has been done regarding existing mine boundaries and assets?

**DAVID GAINSFORD:** Sorry, Chair, I may need to take that one on notice as well.



**The CHAIR:** Sure, not a problem at all. In terms of the closure process now, and management of risk, which my colleague Ms Sue Higginson was asking questions about earlier, it talks about streamlining the process to provide clarity on risk ownership. I'm just interested to understand more how you envisage this occurring—how we bring mining companies along with us in that process, if you like?

**PETER DAY:** Black Rock is a really good example, and it's probably the first case we had under the current framework that we are looking at in terms of really innovative post-mining land use for a site. The history of that site—it had a long history in terms of risk issues, with underground fires and so on.

**Ms SUE HIGGINSON:** Was it 38 years, really, that it burned?

**PETER DAY:** There was about a 30-year fire underground there, yes, with the gases and so on. So we temper that, in terms of that going into our assessment, all the processes there. The company did a good job in terms of rehabilitating the site. There was some subsidence identified in 2015 which then delayed the sign-off, unfortunately. I need to acknowledge first up that everything we do from a rehab framework point of view, we also do a continual review from the ground up of trying to improve our processes. There are things there we could do better, learning from that episode. Engaging with councils and so on, earlier in the process, is certainly one of them. But in terms of that project the sign-off has occurred and I think it will be a good example of an innovative use for old mine sites going forward.

**The CHAIR:** In terms of the submission that talks about the decarbonised economy and renewable technology, given our net zero targets, which we have legislated, how feasible is it to use mine sites under the current planning framework that you mentioned?

**DAVID GAINSFORD:** I can talk to that question. The feasibility would be on a case-by-case basis for the applicants. But we have had some applications that have come to us and some inquiries made to us. Stratford is one that comes to mind in the Gloucester region, for a pumped hydro project. There are, in the Government submissions, examples of renewable energy projects, be they solar farms or pumped hydro projects, that have either gone through the system or are in the process of going through the system. By evidence of some of the applications that have come to us, there does seem to be some feasibility and appetite for those projects.

**The CHAIR:** Is there work that we need to do, or recommendations the Committee could make, regarding that process given that—it's my understanding—it's easier to put a solar farm on farmland than rehabilitated mine land? Are there things we need to consider as a Committee to assist particularly the local communities up there in the Hunter as they transition?

**GEORGINA BEATTIE:** I think there are some great opportunities to use renewable energy at mine sites, because of some of the infrastructure that already exists there. As Mr Gainsford said, the Stratford site, the Muswellbrook coal site. There are a few looking at that—Mount Arthur as well. There are also current mine sites that are looking at having solar farms on their surrounding land as well. I think the emerging sector is bringing out all these opportunities on current sites, and the potential for future sites.

In terms of when mining has ended, using those sites for renewable energy, it really comes back to the final approved landform and final land use. If there is an opportunity to accelerate or make it easier to change that final land use that could incentivise companies, both investors and the mining industry, to look at some of those alternatives—at the moment mining companies are miners, and some of them are interested in doing something different and have taken the initiative. Others, understandably, want to focus on their core business. The process to change that final land use currently requires a change to the development consent. Any change that would allow that needs to balance the need to ensure that rehabilitation is undertaken appropriately.

**Ms SUE HIGGINSON:** How are you currently contemplating an application that is currently rehab, native vegetation, regeneration or restore biodiversity? I come along and I say, "Well, actually, I would really like to put a big solar farm right here, right where these current rehab requirements are." There is an excellent public interest in doing that. But then I get partway down the path, we make all the adjustments, and then I go bust and I can't develop that solar farm and in fact someone else is doing it somewhere else. Where does that evaporate to? How does it come back? Is that something we are contemplating? Because the idea that we are all sitting here talking about beneficial re-use—it is about achieving our net zero. We're dealing with miners who are miners. So how would we contemplate that, at this point in time?

**GEORGINA BEATTIE:** At the moment, the mining titleholder is responsible for the rehabilitation. If the mining company wants to move to renewable energy, then that's much more straightforward. If there is an investor, they would need to work together. To change that would require some changes to the regulatory framework to allow, probably, title changes under the Mining Act and consent condition changes. It would be something that would need a fair bit of consideration around how to provide alternative pathways that would encourage new investment for those uses. But, as you say, somebody would need to be responsible for that

rehabilitation at the end of the day, and the Government would need to have that financial assurance that if the project didn't proceed, that rehabilitation would occur to a safe and stable site.

**DAVID GAINSFORD:** I think I would add, Ms Higginson, that some of your question there is getting to finding the right balance, and I'd note that a number of submissions that came to this inquiry talk about concerns that there are too many impediments at the moment around enabling change to be able to occur readily. Perhaps that is why we are not seeing as many proposals that are coming to the table. But Ms Beattie is right: Certainly, in any consideration of any application that we would receive, we would obviously need to take those things into consideration in terms of offset obligations and various other requirements in the existing consent.

**PETER DAY:** I might just add maybe a point of caution of why we are now where we are at with the current rehab framework as well, because of previous examples of failures in systems. I'm sure that there is always a way through this, but our current process is very much based on both the company's and all of our requirements being very clear on what we are working towards, noting the time it takes to get good rehab. Where the friction lies within the system is where suddenly another different final land use appears and, in some cases—not all the cases—that can dramatically change the criteria that we would all be working to, both as a regulator and also as the company. I guess I am just adding in there the need to balance, as David outlined, the premise of where we are and why we are where we are with the rehab framework currently, and why it is so robust and strong.

**Ms ABIGAIL BOYD:** Can I ask a question coming from that?

**The CHAIR:** I will continue with my last question and we will come back, because we are going down a rabbit hole here. In terms of that rehabilitation process now, which we are already talking about, how are government agencies or departments considering bringing post-mining land use into the centre of that rehabilitation process?

**GEORGINA BEATTIE:** I will have a go at answering that one. The rehabilitation process is dependent on the final end land use, which is approved at the beginning of a mine. It can be decades before a mine closes and then the rehabilitation can also take a significant number of years. I think, at the moment, a change to that final end land use is dependent on the proponent—the titleholder—initiating that change.

**DAVID GAINSFORD:** Just to add to that, again, as Ms Beattie has said there, it would be up to the applicant to decide if there were changes. We're obviously aware that in a number of cases some of the consents talk about rehabilitation whilst they're progressive and that final landform decades in the future, so it is that obligation. We do, from time to time, get applicants who come to us and say, "We are looking to make changes", and there are modifications then made to consent processes to take that into consideration.

**GEORGINA BEATTIE:** I would just add, the Future Jobs and Investment Authorities—the commitment to establish those—would play a leading role about the future of these regions. I think a lot of it comes back to strategic planning: Looking at a region as a whole, what are the opportunities given these emerging industries and where does it make sense? As I said in the opening statement, some sites are going to make really great opportunities and other sites not so great, depending on their location and their proximity to other infrastructure, transport lines and communities. So a strategic view about a region, I think, is where we need to go.

**The Hon. WES FANG:** Thank you all for appearing today. In relation to the use of former mining sites, has the Government done any preparatory work in relation to future uses in relation to nuclear? The polling today shows that the Federal Labor Government is on the nose. The Coalition has said that it will look to introduce nuclear. Has this Government done any preparatory work into perhaps using some of those old mining sites for future nuclear?

**GEORGINA BEATTIE:** We haven't, no.

**The Hon. WES FANG:** The Minister hasn't done any preparedness work in relation to that?

**GEORGINA BEATTIE:** No.

**The Hon. WES FANG:** Well, that is disappointing.

**The Hon. MARK BUTTIGIEG:** I'll get on to him, Wes!

**Ms SUE HIGGINSON:** I think all the Ministers have been pretty clear, Wes.

**The CHAIR:** Is that the extent of your questions, Mr Fang?

**The Hon. WES FANG:** New South Wales can be left behind here.

**The Hon. SCOTT FARLOW:** With respect, Ms Beattie, you pointed out the challenge you face when you have got approvals made potentially 30 or 40 years ago that try to determine what the post-mining land use will be in 30, 40 or 50 years and the friction we have in the system in terms of changing that, as we see an iterative process. There were suggestions in the last inquiry that we needed to do an audit of all of the sites to work through some of these suitability issues. Is that something that has been contemplated?

**DAVID GAINSFORD:** Certainly, Mr Farlow, again referring back to the Hunter Regional Plan, it does talk to needing to look at, effectively, an audit of each one of the sites and looking at those sorts of opportunities and constraints. I think that is something that is one of the recommendations that came out of that regional plan and, certainly, the work that we know that this Future Jobs and Investment Authorities will be looking at.

**The Hon. SCOTT FARLOW:** With respect to that as well, to date, it has been very much a proponent-led movement and it all falls to the proponent if they want to change that land use or the like? We have heard the example of the Idemitsu site, where it was more of a proponent but also a community process. Is there any view of that becoming part of the system, so to speak?

**DAVID GAINSFORD:** Certainly, I think those case studies are good examples of the sort of work that I think could be identified as good practice. Again, the Government's submissions refers to a few examples. One that I'm somewhat familiar with is some of the work that is happening at Mount Arthur at the moment. You might be aware that the department has a modification currently under consideration, and whilst I appreciate that there's some work outside of that modification that is related to the future land uses on that site, there are certainly conversations that are happening with local councils, with the department and with the applicant around those examples. But, yes, you're correct in characterising that a lot of those are applicant-led at the moment.

**The Hon. SCOTT FARLOW:** The other challenge put to us in the last session was with respect to the zoning, and I think you mentioned that, Mr Gainsford, in terms of that zoning process. It was put to us that there were challenges with the Liddell site—I note it is not a mining site and I think its zoning was at SP2—and the change of its zoning and people effectively walking away from the project. Is there anything that the department is contemplating in terms of simplifying some of those processes for rezonings in those sites.

**DAVID GAINSFORD:** Yes. Certainly, Mr Farlow, I think you're correct in identifying—if we look at a number of the mining sites, the underlying zoning is often a rural zoning, and whilst that rural zoning allows for rehabilitation, often back to an agricultural state or things that are permitted under that zoning, it often isn't fit for purpose with regard to other types of land use. Similarly, SP2 zoning, such as I understand for Liddell and Bayswater, allows certain types of activities but not others. So, yes, the department is looking at those types of things. Again, at the moment, it's likely being done on a case-by-case basis, but we acknowledge that there needs to be further work there.

**Ms ABIGAIL BOYD:** We were talking before about rehabilitation of mining sites, and I'll come back again to coal-fired power stations. The remediation of pre-existing contamination at the time of privatisation is of course the responsibility of the Government. Because we have that joint responsibility for those sites once they come to decommissioning, what has been done so far by the Government in terms of planning for the required remediation works?

**TONY CHAPPEL:** We may need to take that one on notice. I'm very happy to do that. I think there is work under way at a number of the sites, but I couldn't give you the specifics off the top of my head. Unless—

**DAVID GAINSFORD:** No, I don't have anything else to add.

**Ms ABIGAIL BOYD:** I will be very interested in that answer.

**The CHAIR:** In terms of the community perspective, what are the biggest barriers preventing the full realisation of the social and economic benefits from rehabilitated mine sites? How does the Government propose we address those?

**GEORGINA BEATTIE:** I think the Future Jobs and Investment Authorities will oversee that in future, and the establishment of those authorities—they're going to have a really important role in looking at economic and social implications of such large-scale shift when coalmines close in the future.

**The CHAIR:** In terms of the site infrastructure of a mine, what are the current requirements for decommissioning and removing all of that that surface infrastructure—for example, admin buildings, rail loops, warehouses, powerlines and sewerage? How are mine operators held accountable for the fulfilment of that removal?

**PETER DAY:** That forms part of the rehab process and is very much tied into the final approved land use in terms of what was agreed to. If there is infrastructure there and the site was identified for native vegetation,

then a lot of the infrastructure has to be removed over time as part of that process. That's part of the plan that we can look at going forward. We are very much aware of the concerns with unnecessarily reducing infrastructure as part of projects, but we are locked into that final land use at the moment.

**The CHAIR:** In terms of the final land use for these mines, are there any that have anything but "sticks and grass", as they call it in the industry?

**PETER DAY:** The vast bulk are assigned to native vegetation and grazing land. That's very much dependent upon the time frame—20 or 30 years ago—of when they were approved.

**The CHAIR:** In terms of creating and submitting a rehabilitation plan that perhaps entertains something contrary to that—particularly in the case where we're looking at setting up renewable energy infrastructure and we need powerlines—you think of Lake Macquarie, where there is buffer land that is really close to massive residential growth. There is sewerage there. If there was a plan to perhaps entertain an alternative, how would a mine operator, and indeed, the regulator, determine what could remain on-site and how would that happen?

**PETER DAY:** Through the planning process they need to go back and seek a modification in terms of that final approved land use. There are examples where that's occurred. It goes back to what David was saying before. Our examples of where it works well is where both the proponent and the company are aligned in terms of where they want to go in terms of development. We've got some really good examples, previously: Catherine Hill Bay is a residential development from a mine site, Maitland hospital is on an old quarry site, and we've mentioned Black Rock before. I guess now the opportunity is for these renewable projects as well. Where the company and the proponent are aligned works well in terms of them taking the time and effort to seek the modification. We also engage early with the process. We have a number of meetings with both those companies, if that is the case, and we outline from our point of view what's involved and try to work as a group towards a shared outcome.

**The CHAIR:** Are there any projects that have been completed and examples of post-mining land use, specifically for mines? There were a couple of quarries that were listed.

**PETER DAY:** We've got four mine sites that were signed off—my iPad's just died on me. There were four sites that have been signed off in full, but we've had about 20 applications since 2022 for partial sign-off. That's probably more the common approach as companies hive off parcels of land, and that's one of the benefits of the current framework as well.

**The CHAIR:** In terms of strategic planning integration the Hunter Regional Plan is a great example of a regional plan and framework that currently exists. How well integrated and aligned with post-mining land use goals are these regional plans? What improvements can be made to better integrate them?

**DAVID GAINSFORD:** Chair, I agree with you that the Hunter Regional Plan and the strategic plans do provide a good basis for identifying the types of potential future activities around these mines. Working now with those plans and with some of the applications that are coming to us and then with the Future Jobs and Investment Authorities' work going forward is the way to take some of those plans forward. The regional plan, as you identified before, does identify some of those areas of interest where there are opportunities that may be the obvious areas where land use change can occur. So I think that provides a good starting point.

**Ms SUE HIGGINSON:** I'm not going to cavil with the description of sticks and grass but, in terms of the important biodiversity rehabilitation outcomes that are currently posited in the system, is there work that you are undertaking in terms of natural capital and the nature-positive frameworks that can assist companies to look at their future liabilities to turn them into something of broad public interest for the State? Rather than just a "this is what was there before; therefore you must return", are we developing accounting systems and frameworks? Along with looking at how we can further potentially exploit and develop, are we also looking at how beneficial re-use is calculated into the broader economy of New South Wales?

**DAVID GAINSFORD:** Certainly, Ms Higginson, you're probably familiar—the Government's response to the Ken Henry review, released recently, talks to some of these opportunities for future accounting and valuing of those sorts of assets. They're probably questions better for my colleagues at Climate Change, Energy, the Environment and Water. However, the department is working closely with our colleagues there. Again, reflecting on the regional plan, which identifies areas that have been identified for biodiversity offset and rehabilitation—at that broad landscape scale, but then looking at the specific consent requirements for offsetting, certainly our obligation is to ensure that those consent requirements are being met. But, yes, to your point about valuation and accounting, certainly the Government is looking at those sorts of opportunities. They've flagged that in their recent response to the Ken Henry review.

**Ms SUE HIGGINSON:** In terms of the EPA's climate policies and moving to emissions reduction and those hard-to-abate industries, on the one hand we have submissions from the sector and industry saying, "No, we're going to keep mining for years and years, mainly for export." Obviously those emissions are exported too, in terms of scope 3. Are we contemplating what that could look like in terms of the biodiversity—the marriage between biodiversity improvement on these particular sites that have had the benefit of that nature deficit for so long, in terms of the global effort of reducing greenhouse gas emissions and whether there's any contemplation about benefit to the industry in that?

**TONY CHAPPEL:** Certainly we're very mindful of the potential synergies, in particular, approaches that can produce better biodiversity and carbon outcomes. One thing we've had some early consideration of is the opportunity for more sophisticated frameworks to capture and quantify meaningful abatement, where it occurs, through air capture and various mechanical treatments or other opportunities on tailings dams, but I'm not sure those would have biodiversity benefits explicitly. Anything else to add?

**DAVID GAINSFORD:** No.

**The CHAIR:** That's all we have time for this morning. Many thanks to you all again for making time to be here. For questions that were taken on notice, and any supplementary questions, the Committee secretariat will be in touch with you.

**(The witnesses withdrew.)**

**Ms CLAIRE DOHERTY**, Policy Director, NSW Minerals Council, affirmed and examined

**Mr STEPHEN GALILEE**, Chief Executive Officer, NSW Minerals Council, sworn and examined

**The CHAIR:** Welcome. Thank you so much for making time to give evidence to the inquiry today. Would either of you like to start by making an opening statement?

**STEPHEN GALILEE:** The NSW Minerals Council appreciates the opportunity to appear at these hearings today to assist the Committee in its inquiry into beneficial and productive post-mining land use. We've been talking to government about this issue for years and, while there's been plenty of head nodding, high-level statements of intent and in-principle agreement on the issues raised, it's a policy area that seems to have been placed in the too-hard basket when it comes to the detail of what actually might be needed to get some real progress. We just heard this morning about the Hunter Regional Plan and the some of the recommendations of that plan which haven't been completed, so maybe a good place to start might be a recommendation from the Committee that some of those things actually get done.

We've also had a former planning Minister in the previous Government just before they left Parliament highlight this as one of the areas of activity that needed to be addressed in the future, despite the fact that he'd been planning Minister twice, so there is a level of frustration from industry about the lack of progress on these policy issues and the detail that is needed to actually deliver some changes that could help. We very much welcome this Committee's deliberations and the work you'll be doing on these issues, and we hope that it is a concrete step towards some actual policy outcomes.

We've been proactively investigating a range of post-mining land use opportunities and challenges, including through the Upper Hunter Mining Dialogue, established in 2010. Through that process, we brought together community, industry and government stakeholders to build an understanding of some of the opportunities, barriers and potential regulatory solutions. We've commissioned studies on the suitability of final voids for various uses and, looking at international examples, we've conducted cattle grazing trials on post-mining land. We've heard from local community leaders and businesses of their interest in a range of potential economic opportunities that could be pursued.

As we've heard, traditionally the focus of mine site rehabilitation outcomes has been to restore land to its pre-mining state. Most mining development consents require a mix of pasture and ecological rehabilitation reflective of pre-mining landscapes. Over the last decade, we've seen a shift in relation to these outcomes, particularly from local mining communities in the Hunter. Increasingly, local community leaders and businesses have expressed interest in the potential economic uses of post-mining land. This has become even more so as several operations are approaching, or have come to the end of, their operating lives, and also through the slated closure of the large Mount Arthur operation by 2030, pending planning approval.

There's also been an increased focus on potential renewable energy use. For example, recently we've seen the New South Wales Government grant critical State significant infrastructure status to two proposed pumped hydro projects on post-mining land in the Hunter. Many of these potential post-mining land uses, such as renewable energy, were not anticipated at the time of approval of most current operational mines. Emergence of these new potential land uses, where post-mining land offers significant advantages, and greater focus on post-mining transition in some regions, makes it vital that the New South Wales Government actually considers how the regulatory framework can facilitate these opportunities in an effective and timely manner. Several of our mining company members are in the process of attempting to develop more innovative post-mining land uses by painstakingly grinding through the current regulatory framework, and I know that some of them will be appearing before the Committee.

The lack of a fit-for-purpose framework that acknowledges emerging land uses more beneficial than those anticipated at the beginning of a mining project acts as a disincentive for mining companies and proponents of new developments to explore new post-mining land uses. Many of the barriers to developing new and innovative post-mining land uses are the result of the need to obtain multiple approvals under the EP&A Act and the Mining Act, as well as mining lease relinquishment requirements. In the absence of change, companies will likely revert to their existing post-mining rehabilitation obligations, which will make pursuing alternative economic opportunities and renewable energy projects even more difficult.

Maximising these opportunities also has the potential to make an important contribution to an orderly economic transition over time in relation to coal. The best transition for coalmining families and communities will be one that is orderly, occurs over an extended period and is driven by demand factors over time, not by seeking to rapidly constrain our ability to supply global markets while demand for our coal does continue. New South Wales produces just 2 per cent of the world's coal and, while this is minuscule in global terms, our industry plays

an important economic role here. Demand for our coal remains very strong. Our high-quality coal is top of the list in most of our key export markets. We've had a record year in relation to coal production jobs in New South Wales, at over 25,000 again. Reflecting this, there are nearly 40 coalmines currently operating across New South Wales, including 17 in the Hunter region, with most involved in export coal markets. Fifteen Upper Hunter mines either have approvals in place or are seeking approvals to continue mining to 2035 or beyond, with several seeking extensions to operate beyond 2040.

Beyond the Upper Hunter, another 15 New South Wales coalmines either have approvals in place or are seeking approvals to continue mining into the 2030s, with six either approved or seeking approval to operate until 2040 and several seeking extensions to operate well beyond 2040. An orderly transition over time will provide the best possible opportunities to minimise employment shocks and related economic impacts on local communities and the New South Wales economy. Existing operations wishing to continue should be supported for as long as possible as others choose to close. This will mitigate the overall impact and soften the transition for families and communities in coalmining regions. Nevertheless, with some mines already in or approaching their post-mining phase, it is critical this Committee makes meaningful reform recommendations that help facilitate future economic opportunities throughout the transition.

**The Hon. WES FANG:** Thank you for attending, Mr Galilee. I want to address something that was brought up in the last session. I note you were in the audience, so you would have heard the question. We talk about scope 3 emissions often, particularly with the exporting of coal overseas to other countries where they will then produce electricity from those locally. If we were to turn off the taps, shall we say, and turn off our high-quality New South Wales coal to those countries, is it likely that they will burn an inferior, lower quality product to still produce electricity? If so, will that increase emissions?

**STEPHEN GALILEE:** There are a couple of points that I will make briefly in relation to that. We produce 2 per cent of the world's coal. Last year, 8.7 billion tonnes of coal was produced and roughly the same amount consumed. Half of that was produced and consumed by China, about 15 per cent or 16 per cent by India and the rest by other countries around the world. We are a very small producer of coal, so if we stopped our coalmining now, that 2 per cent gap would be filled very quickly by some of our global competitors. It would be, in most cases, a lower quality coal, which would result in a higher global emissions outcome. The idea that if we make an example by shutting all our coalmines in New South Wales prematurely that's going to mean less coal-fired power stations around the world is not correct.

There are about 2,500 coal-fired power stations around the world. Again, about half of them are in China. China is building about 80 to 100 new ones a year, and there are another 70 or 80 being built across south-east Asia. The rate of deployment of coal-fired power stations around the world is slowing, but some of those countries are in the final stages of building a few new ones. Japan, for example, has 90. They are not going to turn off those power stations if they can't get coal from us; they are just going to get coal from elsewhere, and those coal-fired power stations are going to continue to operate.

**The Hon. WES FANG:** So, ultimately, trying to adopt an ideological position of banning coal exports from New South Wales would lead to two impacts really: devastation in the Hunter communities because of the loss of jobs and, more likely, higher global emissions from burning a lower quality coal.

**STEPHEN GALILEE:** Yes. There are 10,000 coalmining workers in a workforce of 25,000 in New South Wales now who work in mining projects and who want to extend their operations for longer into the future, while others would choose to close over time. We should be working from a starting point in relation to this transition that it's going to be a long-term transition and it needs to be done in an orderly, staged manner. The starting point should be trying to keep as many of those jobs in place for as long as possible. For as long as demand for the coal is there globally, we should be ready to supply it. I think my colleague from the MEU Grahame Kelly said something similar about that as well. He is obviously looking at it from a workforce interest perspective too.

**The Hon. SCOTT FARLOW:** Wes's new best friend.

**The Hon. WES FANG:** Yes, we get along famously. It was fabulous.

**STEPHEN GALILEE:** I did read the transcript. I assume he is in your DMs now.

**The Hon. WES FANG:** I am sure that you and I could potentially get along just as well. I am still judging, but we will get there.

**STEPHEN GALILEE:** Let's wait and see. We have only just met, as Grahame said the other day.

**The Hon. WES FANG:** That's right, yes.

**STEPHEN GALILEE:** But we should be supporting those project applications and the jobs of those 10,000 coalmining workers in New South Wales for as long as possible because, ultimately, the fate of our coalmining sector is going to be driven by global demand factors. I've been in this job now for 13 years and pretty much every year I have heard people say that the industry is on a downward trajectory and it's all over. There was a big global downturn in the middle of the last decade, and we lost about 5,500 coalmining workers out of a workforce of 25,000. Some people thought that was a great thing. There wasn't anybody talking about transition assistance back then for those people. Now we are back to 25,000, and we need to make sure that we keep those people in those jobs for as long as possible. It gives the transition the best chance of success.

**The Hon. WES FANG:** Mr Galilee, I note in your opening statement you talked about how those mines that are looking at closure soon have been trying to wade their way through the vast regulatory burden that is attached to post-mining land use and the way that it can be rehabilitated. Do you think, in relation to that work, maybe what we really should do is use this inquiry as the catalyst to scrap all the different regulatory burdens from different Acts and the like and form a new clean sheet for and a more modern view about the way that we can approach post-mining land use?

**STEPHEN GALILEE:** That's going to be up to the Committee, but there does need to be some blue-sky thinking in relation to the regulatory processes around how this is all managed. There needs to be some political will because, as we have heard this morning from the good folk in two departments and the agencies, it's not fair to ask them the questions about what the Government has been doing if the Government is not itself, from the Minister down, driving that process. This is a difficult area of reform and there is obviously a lot of interest in it. It's not without political risk and there needs to be some political will driving the process to some good outcomes, because departments and agencies aren't going to take risks unless they are directed to do so by their political masters. That means political will from governments and Ministers to actually want to achieve an outcome and drive a process, and not just put out a glossy Hunter Regional Plan and then find out three or four years later that no-one has looked at the recommendations since they were put out—but there was a press release, a media announcement and everyone pat themselves on the back—and nothing actually happened.

The last thing we need is more reports, more studies and more consultancies on what the future of the Hunter looks like post-mining. You could fill a library this big with all those studies that have been done so far. Everybody knows what needs to be done. We are now seeing, I think, through the Future Jobs and Investment Authorities, some good progress on some long-term planning and thinking that can be done, but that should not be an excuse to kick this issue down the road and say, "This is now an issue for them to look at." This Committee needs to drive some outcomes here and provide some options to the Government for it to be able to consider, and the Government needs to have the political will to consider them.

**Ms ABIGAIL BOYD:** Good morning to you. In your opening statement and in your submission I didn't see much about workers and the transition for workers within closing coalmines. I note that you did mention, Mr Galilee, some comments about jobs when it came to questions from Mr Fang about keeping coal going longer. But in the context of the Government's current policy settings at both Federal and State levels, where we are looking to gradually close down coalmines—and we want to do that as fairly as possible—what is the Minerals Council's policy when it comes to helping workers transition out of closing coalmines?

**STEPHEN GALILEE:** Let's unpack the transition and what that might look like from a practical sense. You mentioned the Government's intention to shut down coalmines; it's actually the Government's policy intention to shut down coal-fired power stations, not coalmines. They have their approvals in place and they are free to seek consent to continue. Under the Safeguard Mechanism at a Commonwealth level, many of them will be able to do that and comply with the Commonwealth framework. On domestic government policy in relation to the transition, the biggest impact that is going to have is in relation to coal-fired power station closures. So if you look at—

**Ms ABIGAIL BOYD:** Can we look, though, at—sorry, because my question was around—

**STEPHEN GALILEE:** Yes, I'll get there.

**The Hon. WES FANG:** Don't interrupt him. He's very good.

**STEPHEN GALILEE:** If you look at the roughly 25,000 coalmining workers in the workforce right now, you should add to that at the top of the list those working in those coal-fired power stations.

**Ms ABIGAIL BOYD:** I'm very concerned about them, and I have been working with them.

**STEPHEN GALILEE:** And they're not all going to get jobs in fly ash.

**Ms ABIGAIL BOYD:** Sorry, let me ask the question. Even if we are not looking at government policy, there is no doubt that we have coalmines closing. What is your organisation's policy in relation to helping workers transition out of those jobs where the mines are closing?



**STEPHEN GALILEE:** We have seen examples where the mines have been closing in some cases. Those workers in those cases can be redeployed to other mining operations but, if you're opposing all of those and lodging legal—

**Ms ABIGAIL BOYD:** No, I'm asking what the industry is doing.

**STEPHEN GALILEE:** I'm trying to tell you what's going to happen to these people in the workforce over time in the transition.

**The Hon. WES FANG:** Point of order.

**The CHAIR:** Apologies, a point of order has been taken. We will have to hear the point of order, Mr Galilee.

**The Hon. WES FANG:** Ms Abigail Boyd keeps rudely interrupting Mr Galilee. He is trying to provide some focused answers to the questions asked. I ask that Ms Abigail Boyd allow him to continue.

**Ms ABIGAIL BOYD:** To the point of order: It is standard practice and quite normal that, when a witness is not answering the question that was asked, a member is able to redirect them towards the actual question.

**The Hon. SCOTT FARLOW:** To the point of order: The witness was directly answering the question, Ms Abigail Boyd.

**Ms ABIGAIL BOYD:** He wasn't.

**STEPHEN GALILEE:** I haven't had a chance to finish yet.

**The CHAIR:** I remind all Committee members to consider the procedural fairness resolution adopted by the House as it relates to inquiry participants. Mr Galilee, please proceed.

**STEPHEN GALILEE:** In terms of the hierarchy of the way the workforce will be treated in relation to the transition over time and what that transition might look like, to your question about retraining, I would make a couple of points in relation to that.

**Ms ABIGAIL BOYD:** Or any other support.

**STEPHEN GALILEE:** Firstly, there are obviously the power station workers at the top of the list. That's outside my area, but they are at the top of the list in relation to the impact. Then there are the coalmining workforce that are involved directly in the domestic supply of coal to those coal-fired power stations who are next likely to be affected by, as you say, Government policy in relation to coal-fired power station closures. In some cases, they were able to be redeployed to other coalmining operations owned by the same companies where they can pivot to export.

**Ms ABIGAIL BOYD:** Is that left to the market though or is that your policy? Is there a policy?

**STEPHEN GALILEE:** These are the individual policies of individual companies and, funny enough, the approach of the global coal market that will have an impact.

**Ms ABIGAIL BOYD:** I see we have your policy director here. Is there a policy from the Minerals Council around how to transition workers? For example, we've heard about workers getting qualifications in mines that aren't recognised outside of that particular company. Is there a policy to try and certify those qualifications? Is there any consideration being given to the ongoing health impacts on workers who have been working in coalmines who then go outside of the industry? Is there a policy of the industry in how to look after those workers? Those are the sorts of things I am looking for.

**The Hon. WES FANG:** That's a question in 20 parts.

**Ms ABIGAIL BOYD:** I'm trying to help the witness.

**STEPHEN GALILEE:** I'm not sure I follow the logic of the question. These are issues that are dealt with by regulatory authorities and companies operating in compliance regimes.

**Ms ABIGAIL BOYD:** So there is no policy from the Minerals Council in relation to helping workers.

**STEPHEN GALILEE:** No, there is. Our policy is to keep people in coalmining jobs as long as possible and, where that is not possible, to support opportunities for them to redeploy to other coalmining jobs elsewhere through the ongoing extension and modifying the lives of existing coal-fired power stations, and not closing them before they need to and putting people out of jobs unnecessarily.

**Ms ABIGAIL BOYD:** That's not the question. We are talking about when they close—

**STEPHEN GALILEE:** And also examining some post-mining land use opportunities so that there will be jobs in those areas for those people when those mines eventually close, through some meaningful reforms from this Committee. What's the point in training people for jobs that aren't going to be there because it's too hard to develop the opportunities?

**Ms ABIGAIL BOYD:** Thankfully, I think that some of the companies who are running these coalmines do have these policies. I look forward to asking them. It's a shame that the Minerals Council doesn't have that overarching policy.

**The Hon. WES FANG:** Point of order—

**The Hon. SCOTT FARLOW:** They don't employ anyone.

**CLAIRE DOHERTY:** We don't tell our members how to do this. We let them make the decisions.

**Ms ABIGAIL BOYD:** No, but other peak bodies might come together and shepherd whole industry—Ms Doherty, you are shaking your head. No? Okay.

**Ms SUE HIGGINSON:** You were here and heard all of the government witnesses and you have seen their submissions. There is a very strong, clear and, I would say, rightful commitment to the rehabilitation and the post-mining plans being implemented to the fullest. That's what every mining corporation signed up to when they got their development consent. In what you're proposing, in terms of what this inquiry should be looking at—to change systems to facilitate post-mining land use—where do you see the rehabilitation components go in that mix? I was trying to get it with the government witnesses. Are there threshold places within the system that you have a vision over in terms of how we do this and what we do within the planning system?

**CLAIRE DOHERTY:** I'm not sure I really understand the question. Are you asking is there some sort of review of where there might be beneficial post-mining land uses and alternative land uses?

**Ms SUE HIGGINSON:** Yes. The status quo is that every mining corporation has significant ongoing responsibilities to post-mine rehabilitation. Where do you say that pivots? You're asking for a framework that changes, essentially—from what I can gather, and in your submission—the mine rehabilitation obligations that each mining corporation has. How do you see that happening? Do we pause rehabilitation? Is that what you're essentially asking for, or just for some corporations?

**CLAIRE DOHERTY:** I think it's complex. It depends upon the individual site. What we're saying is that there are opportunities to streamline that process. You would have seen that our submission—

**Ms SUE HIGGINSON:** Sorry, what process?

**CLAIRE DOHERTY:** The whole process.

**Ms SUE HIGGINSON:** I think that's what I'm not understanding. What process? At the moment, mining corporations have made a commitment to every single person in New South Wales and the country that they will fulfil the law, which is written in their development consent and their mine rehabilitation plans. Are you now suggesting there needs to be a whole process that says that's no longer a requirement?

**CLAIRE DOHERTY:** No. Let me answer the question. I think you would have read our submission. We have a few suggestions in there. This is a committee of inquiry. There will be some recommendations but then, potentially, there is a lot of work that has to be done. We've got a few suggestions in there. One is potentially around what can be done, once you've got a potential new project, to streamline the process of dealing with the current consent for the mining project, the mining lease and the new consent for the new project and the rezoning, potentially. What we've suggested is, if there is potentially a process where you could bring together rezoning and the development approval for those projects into a State Government decision-making process, some of these projects will actually have a local government decision-making process.

Rezoning is a local government decision-making process. Potentially, there is an opportunity there to have a process which is more streamlined. That's one suggestion we've made. It needs a lot of investigation and discussion. It needs a lot of work, which we would hope the Government would be able to do, if that's a recommendation of the Committee. The other thing that we've looked at, potentially, is if there is a form of tenure that you could create where you could potentially move the responsibility for rehabilitation to the new owner of the site. At the moment, it's a mining lease. The mining lease couldn't be taken on by that new owner.

Is there a form of tenure that could be created which effectively provides protection of the mining lease, including financial assurance? I note that the Government talked about financial assurance for new projects. Is there potentially a form of tenure that could be created that would allow that to happen so that there is that smoother process of a new owner taking on those responsibilities? Those are two things that we've come up with

and we've suggested. Yes, they need a lot of unpacking and they need a lot of investigation. But, essentially, they would allow that process, which is now very clunky, to be streamlined.

**Ms SUE HIGGINSON:** How do you envisage your suggestions being navigated? You don't think the regulator and the department have that system now? They seem to suggest that they're ready for those discussions.

**The Hon. WES FANG:** Point of order: That was more of a statement. I don't understand the question.

**Ms SUE HIGGINSON:** I think Ms Doherty does.

**The CHAIR:** There is no point of order. Ms Doherty, please answer the question.

**CLAIRE DOHERTY:** I think the Government departments who gave evidence did indicate that this is something currently that needs to be gone through and that there are some challenges. I think the councils who made submissions have all pointed to a more strategic process. Mr Gainsford and Ms Beattie both spoke about potential for a more strategic process. Potentially, can we bring that up so that some of these decisions are being made at the State Government level and there is more streamlining of that process? That is one thing to think about. The other thing that we have suggested is, where there are modifications necessary, can we make that process more streamlined, if it's just a modification that deals with rehabilitation and final land use? There is definitely some potential here to take some of the pain out of the process.

At the moment, if you've got an alternate use, you're just really grinding through a system that's not well designed to deal with that. Obviously, we've got sites that go back decades. They have very old commitments around rehab and mine closure. The sorts of things that we're anticipating now—solar farms and pumped hydro—weren't even in contemplation. There's no sense of getting out of your rehab obligation. At the end of the day, it's probably easier just to do the rehab you're committed to, especially in coalmining, because the rehab is well progressed in many cases. Most mine operators won't want to change their commitment. They're already well progressed in terms of doing pasture and in terms of doing woodland. For them, it's a complicated process with a lot of risk to it and there aren't many benefits. The reason to do it is to leave behind a legacy and to look to alternate land uses that have a higher and better use than simply pasture and woodland.

**Ms SUE HIGGINSON:** I've got one last question.

**The CHAIR:** If we've got time at the end. We've only got 15 minutes further with these witnesses. I've got questions.

**Ms SUE HIGGINSON:** It's literally on just one point.

**The CHAIR:** If we've got time at the end, sorry. In your opening statement, Mr Galilee, you made some observations on how post-mining land use and issues relate to economic transition—or transformation, as I like to call it—in coal regions. How do you see this playing out? What can be done to help those that are impacted?

**STEPHEN GALILEE:** I tried to allude to a bit of this earlier in one of my attempted answers. If you break this transition discussion down into its component parts and you put aside the people who work in the mining supply businesses and focus on the workforce that is going to be impacted over an extended period, as I said earlier, the domestic energy market policy issues are going to cause the immediate impact in relation to the power station workers. There might be 1,000 or so of those. There might be a couple of thousand coalminers working in New South Wales that are working on a dedicated basis to the supply of coal to those power stations. They are directly involved. The other 20,000 or so working in coal production jobs in New South Wales are working in export-oriented mining operations where demand is expected to continue for some time to come.

As I said in my opening statement, there are mines that have already got their approvals to run for the next 15 or 20 years. Some are seeking to extend, and over time the number of coalmines will gradually decline. The 20,000 working in those mining operations that are export-oriented, those jobs should be supported for as long as possible. While, overall, the expectations are that the industry will globally decline over time, it's happening at a much slower rate than a lot of people expect. The impact on our export sector is going to be a lot slower over a longer period of time than some people might want or expect because of the nature of the product we offer and because of the issues that a lot of our export partners are encountering, like we are, in relation to their own energy transition and the use of other energy sources. Of those 20,000 workers working in that export sector, half of those are working in projects now that are seeking to extend those operations and keep those jobs running for longer.

We start on the basis that the easiest way to manage a successful transition is to keep as many people as possible in the jobs they're in now for as long as possible, rather than force a sudden employment and economic shock by prematurely closing operations that can continue to operate because demand globally is still going to be there, and to not make a decision that we want to cut off supply in coal. We can run our coal industry as long as

there is demand for the coal. In the export market, that is going to continue. Managing this transition over time in an orderly and successful way is very possible if we don't make it harder. Ultimately, when we talk about what's going to be there over time, there are a couple of other points to make. There's obviously the possibility for those working in domestic coal supply mining operations to pivot to export, and there's at least a couple of mines that could potentially do that that already supply into domestic coal-fired power stations but could pivot into the export markets.

There's the opportunity, as I said, for some of those export operations to continue for longer to ease the impact of the transition and extend it over time. Even as the industry will be impacted, you can minimise the impact, manage the opportunities and manage the risks. There's talk about the possibility of transitioning some mining workers into other parts of the mining sector, like the metals sector and the critical minerals sector, which is great. Again, there is no point thinking about that when you can't get metals mines approved in New South Wales either. We have got two that were approved in New South Wales in April last year that are still waiting on their final approvals out of the Commonwealth—two new metals mines that could provide opportunities for jobs for hundreds and hundreds of mining workers. There are going to be others in the planning system that could form an important part of that workforce transition.

**The Hon. WES FANG:** Butters, can't you get Albo to pull his finger out, mate?

**The Hon. MARK BUTTIGIEG:** Definitely. I'll call him now. Can I just ask a follow-up?

**STEPHEN GALILEE:** The last point I would make in relation to those post-mining land use opportunities that we're talking about here is that we need to come up with a process that's going to facilitate them and allow people to do some of these things. We've heard about all of these opportunities. We've got head nods and in-principle agreements for years, and it's still so bloody hard to make any of it happen. There's a lot of suspicion that the industry is trying to get out of its obligations and all that sort of stuff. As Claire said, if we just keep doing what we're doing under our current system, we'll meet our obligations. That's fine. But the communities are going to miss out on the opportunities, and the opportunities that could be there for a transition to be managed properly won't be there in the places that they are needed.

It's a hard policy area. There are no simple answers here. It's not going to happen if we're just talking about it in another five or six years time and still saying, "Yes, it's a great idea. Something should happen. Look at all of these opportunities that could be done." There are jobs on offer. Jobs in those areas aren't going to come from just restoring the land to ecological outcomes. They're not going to come from the renewable projects, as big as they are, because those jobs, as you heard last week, there are not as many of them and they are not as well paid.

**The Hon. MARK BUTTIGIEG:** It was interesting when you gave those figures earlier. I think it was that 2 per cent of our market contributes to global coal consumption.

**The Hon. WES FANG:** Production.

**The Hon. MARK BUTTIGIEG:** It was in the context of if we get ahead of the game and proactively shut down, it's not going to make that much difference because the gap will be filled. If it was a hands-off approach and we didn't accelerate that shut down, presumably at some point in the future the market would dictate it because China and India are going to. Has the Minerals Council done any modelling on that trajectory and the time line?

**STEPHEN GALILEE:** We have all of the publicly available information from the department of planning on when the existing 40 coalmining operations in New South Wales have their approvals to, what year they can operate to and where they have publicly said they are going to seek to extend. We can provide this to the Committee.

**The Hon. MARK BUTTIGIEG:** That would be good.

**STEPHEN GALILEE:** It may have been in our submission; I'm not sure. But it's something that we show people all the time to get a trajectory on, in the absence of any further planning approvals, which mining operations will close and when. Some have entered that process. Some smaller operations, for geological reasons or economic reasons, bring their operations to a close earlier than expected. We saw one a few weeks ago—a small one—bring it forward by a few months. You can get visibility very easily on the time frames. I know that Ms Beattie's department has done some work on this as well in the context of Future Jobs and Investment Authorities.

You can map this out and anticipate it, and then you can see where there are opportunities to keep some of those operations running for longer and those people in jobs for longer while others nearby might be closing, to mitigate the impact of those employment shocks in those local areas. We've also done the work on the metals mines—when they are coming through, when they might be approved and where there might be prospective new

employment opportunities in other parts of the State for those who might not want to be retrained into another industry. They have already got skills in mining, and they're readily transferrable to other mining operations.

**The Hon. MARK BUTTIGIEG:** That's pretty much the baseline architecture that you should be modelling off in terms of transition, because anything beyond that is a matter for government. If you just let it go, that's probably where it's going to end up. You guys have got a fairly good handle on that, have you?

**STEPHEN GALILEE:** We do, and we update it all the time.

**The Hon. MARK BUTTIGIEG:** Have we got that?

**The CHAIR:** The Government provided consent expiry dates in their submission. I might ask now about the work that the Upper Hunter Mining Dialogue is doing regarding some of these issues, particularly as it relates to the industry up there.

**CLAIRE DOHERTY:** We've been doing work around this issue for a long time. We've done a lot of work with the community. The Upper Hunter Mining Dialogue is a collaboration between industry and communities to look at the impacts of mining in the Hunter. It started in 2010. It's been around for a long time. It pursues projects of interest to the community stakeholders. You will have seen in our submission that we talked about some studies that we did around grazing trials. That was in response to the community saying, "We're not confident about this land. Will it be productive? Will it be able to support profitable grazing?" We did a project with stakeholders that was run by the Department of Primary Industries. We looked at how the cattle on those grazing trial sites performed. They performed really well; they performed better than the control sites. We've done some of that research into confidence around the types of rehab that we're actually going to be providing.

Ms Higginson has talked a little bit about voids. We had a project around what the beneficial uses of voids are. The idea was to start to understand what things might practically be able to be done in the Hunter. We did a literature review and looked at all of the different uses of voids that have been undertaken globally. We did that in 2014, I think, so it's now 10 years old. It unpacked a number of different international examples like the lake district in Germany. There's a similar lake district plan in Canada. It looked at those examples and worked with the community to identify which ones might be appropriate for the Hunter. We also did some baseline sampling of a few voids and developed a guideline around how you might sample voids to understand what your water quality might be. We did that quite large project nearly 10 years ago, but what's interesting about that is it didn't identify pumped hydro.

So it's really interesting that 10 years ago we couldn't have anticipated that now we'd have Muswellbrook Coal come forward with a really viable proposal around pumped hydro. It's just recently got critical State significant infrastructure status. We just didn't anticipate that would come forward. So it just shows you how quickly things can change and we need to be able to respond to that. At the moment—you would have seen the example in the case study in our submission—they've been grinding and grinding through this process. They'll get there, similar to Black Rock, which I'm sure representatives from Idemitsu will talk a little bit about. They've gone through a process. They've just ground through it over a number of years. There have been a lot of personalities involved there that have made sure that has happened. Within the company, within Black Rock, they've been very persistent, more so than other third-party investors or more so than you could expect. I think it shows that the processes probably need some improvement. We did that work. Now we know that there's that example of Muswellbrook.

There's a gold mine in Queensland, the Mount Rawdon gold mine. It has a pumped hydro project. It's a coordinated general project in Queensland so it's expected to get a decision by the end of the year. There's the Kidston project in North Queensland, another pumped hydro project. All of these projects have come along in the last 10 years and are looking quite viable. We also have a project, the Premier Coal Lake Kepwari project, which is a recreational lake out of a coal pit lake in Western Australia. It opened a couple of years ago. There is now swimming and waterskiing and fishing on that recreational lake. There are a number of projects that are coming, and have come, to fruition over the last 10 years. It is a positive story. It's great to see the community start to think about some of these beneficial uses. It's not going to be every void. It won't be every pit lake, but there are certainly some opportunities. It was good to start that conversation through the Upper Hunter Mining Dialogue.

**The Hon. SCOTT FARLOW:** Ms Doherty, this is the problem though, isn't it? As you've outlined, it's the grinding through the process. For each one of these, you've got to be very dedicated and committed to seeing it through to the end, otherwise there's an easier route, which is effectively just complying with your original obligation. Do you think that perhaps some of the success of these projects will potentially make it easier and potentially take away some of what I think Mr Galilee talked about before, which is the scepticism of mining companies trying to get out of their obligations—seeing something that is a win-win for the community and a win

in terms of transitioning the workforce, but also transitioning to a better productive use for these communities as well?

**CLAIRE DOHERTY:** Without a doubt. The other thing is that, even within the system that we have, it allows there to be a bit of a road map as to how to do that. It gives government agencies the experience, that they have gone through that process and then they can potentially apply that process on a new project. It gives the community that confidence that it can be done, that there's a new project up and running and they can see through the whole way of the process.

**Ms SUE HIGGINSON:** Can I just ask one question?

**The CHAIR:** We are out of time. It's a very quick question and answer.

**Ms SUE HIGGINSON:** In terms of this, are you suggesting some kind of concierge or special person in planning that talks? Just remind the Committee, if you are a mining company and you're looking for a beneficial re-use of your land, your primary interest is developing that up to then sell it with that future development opportunity because, as you said, you're miners, not necessarily the operator or the proponent or the entity of the next beneficial re-use. The primary motivation is being able to pass on an opportunity at a cost. Are you asking for somebody within government to help your members do that?

**STEPHEN GALILEE:** That's going to vary. The approach is going to vary from company to company. Some of our member companies are multi-commodity global operators that are also very significant players, and increasingly so, in renewable energy projects. It might be consistent with their core business to develop a pumped hydro project as part of their portfolio. Others are going to want to work with proponents of new opportunities onsite to see what's possible. But, in the end, the companies will just meet their existing rehabilitation obligations—

**Ms SUE HIGGINSON:** At a big cost.

**STEPHEN GALILEE:** —and close it off, because they're progressively already on their way to doing that, as Claire said. The rehab is undertaken progressively. It doesn't just all happen at the end. It's happening the entire time. To some extent, pursuing some of these opportunities means that they've spent money that they might not necessarily have had to on rehabilitation, that might not have necessarily needed to be done depending on what the opportunity is at these sites. In most cases that I'm aware of, it's people approaching the companies. It's not the companies dreaming up some new post-mining land use that someone might be interested in; it's people coming to the companies and saying, "Hey, we know you've got a big manufacturing facility out there. Maybe we could look at what we might be able to locate there."

Or it might be Mr Buckingham's friends from the medicinal cannabis and hemp industries looking to do industrial-scale production of hemp. Some of these facilities are perfectly suited for these sorts of things and it just doesn't make sense to most people that the company is going to be forced to incur an expense to rip those facilities out and restore it to a pre-mining state so that someone else can't take advantage of those opportunities in the future. It's a simple concept, but it's a difficult area of policy and I commend the Committee's efforts in trying to get some political will out of this—to look properly at it so that, next time the department of planning appears, they can say, "We've looked at all these recommendations in the Hunter Regional Plan. We've done the work and we know what's possible." I'm not speaking ill of Mr Gainsford, he's got a lot on his plate, but he's not going to add extra work to his workload if the Minister's not asking for it.

**CLAIRE DOHERTY:** I think what we're saying is let's try and take out some of the unattractiveness to third parties. Let's try and make these sites attractive to them by taking out some of that grind through the system if we possibly can, because there are obviously really significant benefits. With pumped hydro, you've already got a hole in the ground, and that's an expensive—that's a massive asset to a project. If we start detracting from it by the process, then it becomes unattractive to them, and they walk away because there is something else down the road. That's our point of view: Let's try and make it more attractive to those third parties.

**The CHAIR:** Thank you so much to you both for making the time to give evidence to the inquiry today. The Committee secretariat will be in touch with you with the details of the questions taken on notice.

**(The witnesses withdrew.)**

**(Short adjournment)**

**Ms LIZ WATTS**, Vice-President, NSW Energy Coal, BHP, sworn and examined

**Ms AMANDA WALKER**, Manager, Corporate Affairs, BHP, affirmed and examined

**The CHAIR:** I welcome our next inquiry participants. Thank you for taking time to give evidence. Would either of you like to start by making an opening statement?

**LIZ WATTS:** Yes, thank you. BHP appreciates the opportunity to assist the Standing Committee on State Development in its inquiry into beneficial and productive post-mining land use. We are here today because the work of this Committee is important for New South Wales. Through this inquiry, New South Wales has an opportunity to deliver a legacy of beneficial and sustainable post-mining landforms and land uses, recognising the potential that exists to diversify existing mine land to realise social, environmental and economic outcomes. Coal mining is almost as old as the State of New South Wales itself. Coal was first mined at the mouth of the Hunter River as early as the 1790s, and coal was Australia's first export commodity, with a shipload departing Newcastle for India in 1799.

For our part, BHP has been operating in the Hunter Valley since the early 1900s. We are extremely proud of the positive contributions we have made to the community and to New South Wales ever since. Today, BHP operates the Mount Arthur Coal facility—an open-cut thermal coalmine located five kilometres south of Muswellbrook in the Hunter Valley, on the traditional lands of the Wanaruah people. Mount Arthur Coal employs around 2,200 people, who predominantly live in the region, and produces high-quality energy coal for domestic and international customers. As the Committee would be aware, in June 2022, following a review of all available options, BHP made the decision to make an application to extend current approvals and cease mining at Mount Arthur Coal in 2030 as part of a responsible pathway to closure for the operation.

As we move toward 2030, we are working closely with our workforce and our community to do all we can to set them up for success into the future. This is why we are adamant that there is a better way forward than the current requirements for closure. As the Committee would know, under current requirements, BHP is required in closure to return the land to agricultural pasture and woodland—an outcome that requires the demolition and removal of all high-quality existing infrastructure, including high-quality office and administrative facilities, industrial workshops, high-capacity electrical infrastructure, maintenance facilities and rail lines.

As we have laid out in our submission, we believe in a balanced approach to adaptively reusing mining land and existing infrastructure to achieve not only the highest possible environmental outcomes but, importantly, the long-term social and economic benefits which our community deserve and have told us that they want. I'm confident that through the capabilities of our communities and the work of this Committee, we can deliver a model of post-mining use which delivers a lasting and positive legacy for the Hunter and for New South Wales. Thank you, and I look forward to your questions.

**The Hon. WES FANG:** Thank you very much for appearing today, for your submission and for offering to answer the questions that we've got. I want to start with the community. The community will be anxious given that there is a telegraphing of closure within the next decade. Has the community said to you what it is that they're hoping BHP will look to do with the site?

**LIZ WATTS:** That's a really good question. We've had a number of conversations with the community over the last year or so, since the announcement of closure. There's one thing I will tell you about what the community aspirations are: There are so many great ideas out there about what the future uses of the site could be. It's a range of uses. In fact, we've taken a lot of the suggestions that have come forward from the community, as part of what we've called our land capability assessment of the site. We've started to group those into potential options for what the future might be for the site of Mount Arthur specifically, given that a lot of the other mines will continue well into the future.

**The Hon. WES FANG:** I think you said in your opening statement that there is a lot of high-quality infrastructure that is already on the site. You mentioned the industrial work sheds, rail lines and the offices that are onsite. I imagine that the workers at BHP will see all this infrastructure and know that the post-mining land use requirement is for you to return it back to sticks and grass, whereas they're seeing this magnificent infrastructure which could actually have a second life. Is that part of what they're telling you?

**LIZ WATTS:** Definitely. A lot of people see that infrastructure. The quality of the infrastructure at Mount Arthur is world-class; it's tens of millions of dollars. There are massive workshop facilities, massive laydown areas—it's significant infrastructure that was built to stand the test of time. When people look at that they can see that there is future economic benefit that sits within that infrastructure that could be repurposed and reused in the future. That resonates with a lot of people, when you talk about repurposing and reusing that infrastructure for some future use—100 per cent.

**The Hon. WES FANG:** In relation to future approval, you've talked about the application to extend the life of the mine to 2030. There are requirements as you come to the end of the current approval. If there is no future approval, what is the likely strategy? What will the job losses be if you don't have that ability to manage the exit from that site? When would you start the rehabilitation process?

**LIZ WATTS:** As you're saying, we have a current approval that runs through until June 2026, and we have sought for a modification on that existing approval out to 2030. If the modification is not forthcoming, as you would know, then there is no consented approval to continue to mine and so we would need to close the operation. We have at the moment working on the mine around 2,200 people employed. That's across employees, we have a service contractor on the site, and we have other more specialist contractors that also work on the site. Why we've sought that timing in terms of the 2030 time frame is to provide time to investigate other alternatives in terms of land use outcomes and other opportunities in the future, knowing that does take time, but also to give time to our workforce and also the community to transition. That's what we've been working on, first and foremost, with our people.

**The Hon. WES FANG:** We have talked about some of the uses of the voids around the State. Is your site one of the ones that can handle pumped hydro? Is that a possibility?

**LIZ WATTS:** We have been looking at a number of different land use options across our site since we announced closure. One of the areas that we've been investigating quite intently is the reuse opportunities that sit with the void, and the investigation around pumped hydro. We have been undertaking some technical studies to understand what the feasibility of that would be. Is it actually viable? Are there any fatal flaws to that as an approach? To date we haven't identified any fatal flaws and we've identified that it could potentially be quite a significant energy source in the future.

**The Hon. WES FANG:** I think a fatal flaw is going to be connecting it to the grid, unless you already have the infrastructure that is required to move that amount of electricity from the site to the grid. Is that within the area of the mine site?

**LIZ WATTS:** One of the positive things from a Mount Arthur perspective, in terms of where the site is located, is that it's actually transacted by the significant transmission grids that you're talking about, that could be connected to, to enable the transmission. If the pumped hydro opportunity was something that was able to be progressed, it could easily tap into existing infrastructure that exists to move electricity around the State of New South Wales.

**The Hon. WES FANG:** That's refreshing. We won't have EnergyCo coming and taking people's farms and threatening to ruin their livelihoods.

**The Hon. MARK BUTTIGIEG:** Thanks for the commentary, Wes. Move on, delegate.

**Ms ABIGAIL BOYD:** Good morning to both of you. Thank you so much for coming along. I wanted to ask you about the Pathway to 2030 program. Could you give more detail about how that supports workers as they are transitioning?

**LIZ WATTS:** The Pathway to 2030 kicked off last year, and it entailed one-on-one conversations with our workforce. We commenced quite a significant task of engaging with around 1,000 employees in one-on-one dialogue to understand what their aspirations were for the future; take on board what questions they may have had because, you can understand, people do have quite a number of questions; try to allay people's fears; and also to seek feedback from them as to what support they needed, what they wanted from BHP. We have taken all of that feedback and we've coalesced that into a couple of key themes of some initiatives that we are now actively progressing. Some of those include financial advice for employees. As you can imagine, each person's circumstances are different. They're at different stages in their lives, different stages in their careers. We are working to enable that as an outcome for people, and people have been taking that up.

The next piece or the next phase that we're investigating is around allowing people who are looking to transition to do other things outside of mining post-2030, providing them with the information and then also the skills that enable that transition. There is a piece of work underway where we have some career seminars set up in September that people can go along to, if they would like to. This is really to seek to understand what else is out there. What else is happening in our local area? People who have trades and skills, what other slight changes would they need to make to their current skill set to enable them for future jobs? That information, when you are going to work on a day-to-day basis, may not necessarily be forthcoming or front of mind for people. So we are trying to make those opportunities available as a first step, and then enable or allow people to map, "What skills do I need in the future?" Then we ask, "How can BHP help you in obtaining those skills?"



**Ms ABIGAIL BOYD:** That all sounds great. I have two questions on the back of that. We heard in our first inquiry that there were people who worked for a long time in a particular mine, who built up a series of skills and qualifications, but there was no piece of paper to prove that when they go to their next employer. There was talk of perhaps getting some sort of partnership with TAFE, or someone else to come in, to give those people a form of accreditation for that on-the-job learning. Is that something you have looked into at all? Do you have any thoughts around how that could be facilitated?

**LIZ WATTS:** I know there has been a great deal of effort put into mapping skills to the Australian Qualifications Framework and the RII—I can't remember what that stands for, but I can find the information for you—competencies for, in particular, equipment operation to allow for those skills to be transferrable. For trades it's a little bit more straightforward in that those qualifications are recognised qualifications under the Australian Qualifications Framework as it is, and so they are more easily transferrable. The opportunity, I think, for the future is the concept of micro skills. We've had some discussions with some organisations who have reached out already seeking that the Mount Arthur workforce come into their workforce—this opportunity to do micro skill gapping. Then it's just a matter of, not necessarily having to go and do a full qualification, but it's a much more targeted approach to realise the outcome for someone to transfer to a new role or a new career.

**Ms ABIGAIL BOYD:** Obviously BHP is quite large, it has been around for a long time and as a conglomerate entity has had experience in transition—the Newcastle steelworks, for example. Would it be helpful, do you think, for the industry as a whole, particularly for the smaller players, if it came together to work out how best to do that—not just putting workers into other jobs, but also to work out the skill levels of people at other sites and that kind of thing?

**LIZ WATTS:** I understand what you're saying. It's a little bit of an iterative one, I think, from the point of view of you need to know what those future industries are in terms of what is going to be the key employer, if you like, to then allow for people to pivot and to go and seek training and development down that particular pathway, if that makes sense? Because if you went and invested a significant amount of money and personal time and effort into a particular area, and then it wasn't realised as an outcome, you could potentially end up with people who are unemployed not because they are not skilled; it's because they may not have the requisite skills that are required. In terms of a holistic approach, what we are looking at and who we are engaging with is the likes of TAFE, the Future Jobs and Investment Authorities, Newcastle University. We're trying to look for the big trends of what is coming our way in the Hunter and then providing that information to our people to try to make informed decisions on what you should invest your time and effort into in terms of reskilling, particularly people who want to stay local and remain in the local region.

**Ms ABIGAIL BOYD:** The Hunter is quite up the curve on that. It has been for a long time in terms of community and the university coming together and helping with industry to try and chart that transition. What would help from government in terms of that transition then?

**LIZ WATTS:** There are a lot of support programs and training that is available through government at the moment. I think our part to play in that is making that known to our employees, so that there is transparency on that. Having engagements with government and the sharing of best practice is also something that we've found to be quite helpful. We are in the Hunter, but obviously government has a broader perspective and could take best practice or learnings from where things have worked elsewhere and share that. We've had some conversations to date in respect to that, but there are always opportunities to continue to learn and to take on board those kinds of things.

**AMANDA WALKER:** I think the partnership approach—and certainly we've been looking to learn from other regions that have gone through transitions and trying to take those approaches. I think it is very much a context-based situation. We need to look at what is appropriate for our people and for the local area. But definitely learning from other regions on that collaborative approach has been helpful for us.

**The CHAIR:** In terms of your submission, you talk about the opportunity that we are facing also. You're talking about, "With appropriate protections, planning and relinquishment requirements that could be reformed to incentivise mine operators and reduce barriers for external investors adaptively re-using mine land." You talk about re-using some of that high-quality infrastructure that you mentioned earlier. Have you got examples from elsewhere that the Committee could look at, or suggestions around how we could reform some of these current requirements to incentivise mine operators and reduce barriers?

**LIZ WATTS:** I think the best example around the world is obviously what Germany has been able to achieve in terms of its outcomes. You've got two areas there, being the Ruhr and the Lausitz area of Germany that have both gone through significant change and transition—one which has occurred over quite a long period of time, being the Ruhr region, and one that has occurred in a very accelerated way, which is the Lausitz region. Being able to look at where other areas have been through significant change—the way they've gone about it, the

time frame that it's been completed over, how that has been factored in in terms of community engagement and collaboration across multiple stakeholders are key enablers to these pieces for the outcome.

I would also say that having a broader view from the perspective of economic, social and environmental is key to that and being quite mindful that there is a balanced approach in terms of what needs to look like to support those outcomes into the future. There probably isn't a how-to guide sitting out there, although there is plenty of information that is available in best practice guides, such as in the ICMM and the Australian Government themselves have got a closure framework that does talk to these pieces. But in all of those pieces it talks about a balanced approach as opposed to one element over the others, if that's helpful.

**The CHAIR:** You talked about the social and economic factors as well as the environment. That's a consistent theme across a number of the submissions that we've received to the inquiry about the need to better align or calibrate those. Do you have a view around how things are tracking at the moment and how they should, if any changes need to be made?

**LIZ WATTS:** From a New South Wales perspective?

**The CHAIR:** Yes.

**LIZ WATTS:** Under our current arrangement there is a higher focus on the environmental outcomes. I understand where that has arisen from and the future space that mining has a part to play in. But for the future, contemplating environmental risk alongside social and economic risk is key. Just contemplating downside environmental risk, when there is also downside social and economic risk, is probably an element, I think, that I would say would need to be contemplated. Some of the other elements around what we would see as providing for these outcomes that we are seeking is some timeliness, a timeliness factor. We don't want to miss the boat on people who have great ideas and have an aspiration to see things happen in the community in the Hunter. There is a timeliness piece to how things could and would need to progress in terms of outcomes.

Also there is the certainty for investors. We fundamentally need to create new industries and new outcomes which will need to be fostered through investment from outside. There will need to be a degree of confidence that's afforded to enable those outcomes for the future. They would be probably the two pieces I would call out: confidence in terms of the process and the timeliness of that process, but even the fact there would be confidence from a government perspective for investors to pursue alternate re-use outcomes in the mining area in the Hunter Valley. I think that would be really important.

**The CHAIR:** You do talk in your submission, in terms of summary, of having a clear statement of support for alternative mine land re-use. What sort of role does that play when it comes to investors? What would a statement of support look like?

**LIZ WATTS:** A statement of support gives, we think, investors some confidence that there is an appetite within government to take what is existing infrastructure, what is existing mining land, and fostering future economic development outcomes. I think without that, given the current complexity that sits there around the legislative environment that people would need to navigate, and the length of time that it takes to progress something through an approvals process—without some sort of light at the end of the tunnel that you are going to be successful in terms of support to enable that outcome, and that it is actually something that is supported by the Government, that could be a huge barrier for people to get past, to know that there is that support there for some of the investments that we are going to need and will be seeking into the future.

**The CHAIR:** In terms of your submission you also talk about undertaking extensive stakeholder engagement since you announced your intention to cease mining in 2030. I invite you to talk more to us about the feedback you've received from the Muswellbrook community and what their vision is for the future.

**LIZ WATTS:** We have had a number of different mechanisms to engage with the local community since the announcement. Amanda and I have been out on a number of occasions at a number of the local community events, seeking feedback from local community members, seeking their ideas, but also conveying information. We've also had a public invitation out to the Muswellbrook community to come along to seek to understand where we are at with the closure of the mine, what some of the things that we are looking at are and, again, to answer questions that people have and take on board their feedback.

Some of things that we hear—and maybe I'll pass to you, Amanda. She has also been doing a lot of other work in relation to surveys and focus groups with the community more recently. But a lot of people want a future in the Hunter Valley. A lot of people have lived there for their whole lives or have lived there for significant periods of time, and they are concerned about what will happen when the coalmines start to close. They see the opportunity that is on their doorstep with Mount Arthur—we are five kilometres from town—and they see these opportunities for what could be in the future. On top of the repurposing of the existing infrastructure, which is the

multimillion-dollar maintenance facilities and that sort of thing, there is also this opportunity and this real thirst for the social elements that come along with closure.

In Muswellbrook, there is not a lot to do on the weekend, and people will drive in a car for an hour or an hour and a half to Dungog in order to ride their pushbike or go walking. We see that there are significant areas of land that are slated for biodiverse outcomes—woodlands—that could coexist with some of these recreation outcomes that have been put forward by the community, who want to see walking trails, who want to see pushbike parks and who would like to see maybe even somewhere to ride their motorbikes and things like that. We do see that there are opportunities to do—it is not an "or" statement; it is an "and" statement. It is the environmental outcomes, but can we use the land for this as well. That is what we are exploring, and that is what we are seeing. When you start to think through that, there are not a lot of barriers that prevent those outcomes from being realised. I will just pass to Amanda for a bit more on the community engagement piece.

**AMANDA WALKER:** That opportunity to access the land is certainly something that seems to have resonated with community. We have been conducting, since February this year, quite a deliberate series of engagements with stakeholders. As my colleague Ms Watts mentioned, we have been doing some community surveys, some stakeholder interviews and some focus groups to ask community members what they are thinking about the closure and what opportunities they see for Muswellbrook and the region once BHP is no longer operating. We really are seeing a sense of those three pieces of economic, environmental and social outcomes needing to coexist. Very much there is a desire to see strong environmental outcomes delivered on the site but alongside job creation and economic opportunities.

When we start to explain to people, under current requirements, the need to remove the infrastructure, for example, that's surprising to people. When they think about the opportunities that could exist through repurposing of those facilities, they really start to see that you can have economic, environmental and social outcomes potentially achieved through the work to closure. I think the other piece is that people are really keen to have a say in the future of the community. They are really looking to understand how they can be part of thinking about what the future of the region looks like and what those future uses of the site might be. Certainly, community voice is something we are hearing coming through very strongly.

**The Hon. SCOTT FARLOW:** You have got a consent until 2026. You have sought the extension to 2030 and, of course, as part of that, the whole renewal of the precinct. Are they tied, in terms of that extension and the consent for the change of land use on the site?

**LIZ WATTS:** What has been submitted in the modification—because it is a modification—is, essentially, an extension of the four years. The current final land use is a woodland and agricultural outcome under the existing consent, and that has been extended forward as part of the application as a modification in the most recent submission. In the back of that submission there is also some contemplation of future alternate land use alternatives, but there is some more work that would be needed and subsequent approvals that would be needed to realise those as an outcome.

**The Hon. SCOTT FARLOW:** So there are two different consents you would need or perhaps more than two, I suspect, in terms of this process.

**LIZ WATTS:** Depending on how many different land use options, alternatives and outcomes that would be sought. We believe that there would be multiple, so it would be a mixed land use outcome, not just a one-option outcome for the site. We believe the site—it's over 7,000 hectares—has the potential opportunity for multiple different land use outcomes, but coexisting land use outcomes.

**The Hon. SCOTT FARLOW:** I have seen some of those designs as well when it comes to what you are planning to do at Mount Arthur, the highlight being the zip-line going over the property but also manufacturing or industrial land, agricultural land, biodiversity conservation land and, of course, the pumped hydro. There are several different consents you are going to need as part of that process. That is not an easy process, is it?

**LIZ WATTS:** No, it would not be an easy process to engage with, but considering each one of those alternatives on its own merits would need to be an appropriate way to contemplate the approval of each of those, we believe.

**The Hon. SCOTT FARLOW:** What sort of barriers are you facing in terms of trying to get this over the line? It looks like an exciting vision for the Muswellbrook community. As you have outlined with the consultation that you have gone through, it seems like community is on board, but it also seems like a fairly complex process to go through as well.

**LIZ WATTS:** There would be an element of complexity, in that even our new modification would not enable the outcomes we have just spoken about. We would need to be able to engage somebody who would be

interested in taking on or exploring future economic potential opportunities of any one of those alternatives. Probably the first thing is being able to engage somebody to have a vision and then having enough money to be able to pursue an economic diversification outcome objective. But the second thing would be the timeliness and probably the complexity of the mining legislation and the planning aspects of how those pieces come together to enable that as an outcome for the future. If you're a developer who's maybe not as experienced as the miners in terms of navigating that legislation, it would be seen as a barrier and impediment to actually realising an outcome for the future, potentially.

**The Hon. SCOTT FARLOW:** What is the benefit for you in going through this process then? Is it a financial benefit? What is the upside for BHP?

**LIZ WATTS:** As you would know, BHP is a long-life company; they're a big company. We operate around the world. Part of the motivation for this is about doing the right thing. It is aligned with our values. We see that the current state doesn't provide a great long-term economic outlook in terms of the use of that land. So for us, it doesn't provide the best outcome therefore for the community and even, subsequently, for employees who may be seeking to stay in the region and who are wishing to diversify, get other skills and take up these other economic activities. It is more about wanting to do the right thing, aligned with our values, but also about the fact that we see ourselves as a long-life company and, as part of that, in terms of social licence into the future, this is part of that for our ongoing operations all around the world.

**The Hon. SCOTT FARLOW:** I take it that with a large listed company like BHP you have certain corporate social responsibility obligations. You have got a board that is, no doubt, quite focused in terms of being able to deliver outcomes like this and, potentially, pressure from the markets as well. Is that part of what underscores this focus that is being driven by a lot of mining companies that are looking at not just how to leave a site but how to leave a community as well?

**LIZ WATTS:** One hundred per cent. We definitely have internal aspirations around the social, economic and environmental outcomes that underpin our business. We see it as fundamental to our long-term business performance that we get each of those elements right. I guess that speaks to the motivation that sits behind sustainability and trying to achieve sustainable outcomes. It's about not wanting to target any of those above another, I suppose, is how you would say it. Definitely we have a social value framework that we are aligned to. We also have equitable change and transition principles that we align to as a company. It's part of doing business internationally, so we hold ourselves to a set of standards. We seek quite a high standard. Regardless of what the host nation or the host government policies may require, we aim to go above and beyond that in some cases.

**The Hon. SCOTT FARLOW:** Looking at the transition program, if you were to comply with your rehabilitation requirements at present and just do that, what would be the workplace or the job outcomes, so to speak, in Muswellbrook compared to if these proposals were to go ahead? What sort of difference are you looking at when it comes to transitioning a workforce?

**LIZ WATTS:** It's a little bit of a tricky one to answer, only because the future state is still, I guess, what you would say is a work in progress, in terms of the actual known outcomes for each of the different parcels of land or each of the different initiatives that we put down is still very much in a draft format. It would be quite difficult to provide an articulation of, if you like, what we're currently require to versus what the future state would be. But what I maybe would say is that any opportunity that affords the creation of jobs and the creation of future industry, new investments or new uses of the land would add additional jobs against the existing base case, if you like.

**Ms SUE HIGGINSON:** What has your engagement been to date and what do you intend to do in terms of engaging with the Plains Clan of the Wonnarua people?

**LIZ WATTS:** Sorry, of the Wonnarua people?

**Ms SUE HIGGINSON:** Yes, and in particular the Plains Clan, the registered native title party.

**AMANDA WALKER:** Just to acknowledge that we have a range of stakeholders across Muswellbrook who are interested in what happens at Mount Arthur Coal. Certainly the Plains Clan of the Wonnarua people is one of our stakeholder groups that we engage regularly with, alongside a number of other traditional owner groups and Indigenous stakeholders in the region. We've had a number of engagements where it's an open invitation to all our stakeholders, including that stakeholder group.

**Ms SUE HIGGINSON:** What have you actually done with them? Do you think that engagement is going well? Are you engaging positively and proactively with the Plains Clan?

**AMANDA WALKER:** I know there are a number of heritage-related matters that I'm not in a position to comment on today. If there are questions around that, we can certainly take that on notice.

**Ms SUE HIGGINSON:** Where are they in your future plan? I have this lovely diagram of BHP and I just don't see cultural heritage. I see nothing in there about First Nations heritage and wellbeing returned—nothing.

**AMANDA WALKER:** As part of our engagements that I mentioned recently this year, we've been very deliberate in ensuring we've had representation from a broad range of stakeholder groups, which has included our Indigenous stakeholders and the Wonnarua people. We've certainly taken the approach that all stakeholder voices need to be included as part of our engagements. That's the approach that we will continue to take on the path forward. I think, too, on my colleague's point earlier, we haven't set a finished view on what those land use pieces might look like. We will continue to take community feedback on those options going forward and incorporate those into our plans.

**Ms SUE HIGGINSON:** Do I take that you have an intention that you will engage with the Plains Clan and they will be part of this ongoing future development and what their opportunities might be in the Mount Arthur plan going forward?

**AMANDA WALKER:** We will continue to engage with all the stakeholders as we have been doing to date.

**Ms SUE HIGGINSON:** Do you recognise that a registered native title party may have some particular interest and that perhaps warrants a particular form of engagement going forward, given their rights, and their land has been completely and permanently disfigured, including their cultural heritage? Do you think they have a special part in the engagement?

**The Hon. WES FANG:** Point of order: The way the question is framed is potentially unfair to the witnesses. The procedural fairness resolution would suggest that if Ms Higginson wants to ask a question she should do so without the flourish that she's potentially prone to do.

**Ms SUE HIGGINSON:** To the point of order: I won't take the personal dig at the end; I'll accept that that was a mistake. It's no secret that mining dispossesses First Nations people of their culture and their heritage. There are specific projects that do that. There are management plans around that. On this particular occasion, all of the cultural heritage items at the Mount Arthur site have been removed, displaced and put elsewhere as part of the plan and the program. Could I continue my questions?

**The Hon. WES FANG:** That's not really to the point of order.

**Ms ABIGAIL BOYD:** To the point of order: It's important that the Hon. Wes Fang has not even identified exactly what it is that offends him in the particular question. It's a bit of an abuse of process to call a point of order on this one.

**The Hon. WES FANG:** Further to the point of order: I don't believe it is. For Ms Sue Higginson to frame mining in the way that she did is perhaps unhelpful.

**The Hon. WES FANG:** It was a valid point of order. Ms Sue Higginson again doubled down when she addressed it. I'm just seeking that we adopt the procedural fairness resolution and provide the witness with a fair question that they can answer.

**The CHAIR:** There is no point of order. I remind members and witnesses to be cognisant of the procedural fairness resolutions adopted by the House. While questions here aren't strictly bound by the same rules as the House, efforts should be made to minimise argument in questions.

**Ms SUE HIGGINSON:** Given that we've run out of time, I'll briefly rephrase the question. Given that the Mount Arthur project has done so much damage to First Nations people's cultural heritage and that we will be left with a permanently disfigured landscape, will you be engaging specifically with the registered native title party, the Plains Clan of the Wonnarua people?

**AMANDA WALKER:** Chair, if it's okay, we might take that on notice, come back and provide some specific information around the engagement with that particular stakeholder group.

**Ms SUE HIGGINSON:** Thank you, I would be very grateful.

**The CHAIR:** That's all we have time for today. Thank you so much for coming to give evidence to the inquiry. The Committee secretariat will be in touch about any questions that were taken on notice.

**(The witnesses withdrew.)**

**Mr MICHAEL MOORE**, Group Manager, Approvals, Yancoal, affirmed and examined

**Mr NICK McDERMOTT**, Policy Specialist, Yancoal, sworn and affirmed

**The CHAIR:** I welcome our next inquiry participants. Thank you so much for making time to give evidence and for your submission to the inquiry.

**MICHAEL MOORE:** Chair, I note that my previous title has been provided, which was manager of environmental standards.

**The Hon. SCOTT FARLOW:** Congratulations on the promotion.

**MICHAEL MOORE:** Thank you, but it was a few years ago. I still have a lot of responsibility over the environmental standards aspect.

**The CHAIR:** Would either of you like to start by making an opening statement?

**NICK McDERMOTT:** We weren't going to make an opening statement further to what was provided in our written submission. We welcome the opportunity to appear here today.

**Ms SUE HIGGINSON:** We've heard from the Minerals Council, and I know you were present during their evidence. Do you two accept, or are you also advocating for, this kind of special provision within the planning system? My final question to the Minerals Council about what that would look like didn't get answered. As an operator and a proponent in the landscape that deals with government through the approvals process, and has done, in your blue sky, dream view, what would it look like in order to best facilitate this next step of work that you're all so eager to be undertaking?

**NICK McDERMOTT:** I don't think we would be dogmatic about a specific special provision, as you call it, in the planning framework. What we can talk to is, on the current regime as it operates, it is not, in our view, built to facilitate an orderly and speedy transition from mine production to some alternate commercial use. I'm seeing, in particular, interest in relation to alternate energy uses. We note in our submission we see that both in the EP&A Act and the way that operates our development consent and the way that we are regulated by the Resources Regulator under the Mining Act, that it is still very much set up where the primary driver was to ensure transition of land to either native vegetation or grazing land. What we would like to see, given there is now apparently an appetite to assist with the transition of these sites once they've ceased mining production, would be a review to look to better facilitate that because it is quite challenging at the moment to achieve any sort of transition.

**Ms SUE HIGGINSON:** Thank you, that's incredibly useful and I hear that but, when you say that, what is that? What does that look like to you, as a participant, a user, a consumer or a profit-motivated entity? Whatever you are in this new-world space, what would that look like to you? For all other purposes every person who's looking for a commercial opportunity on any land anywhere deals with the planning system. That's how we do it, whether we're building a house or a park. What do you want, as miners, in this framework? What does that actually look like for you in your best world?

**MICHAEL MOORE:** I don't mind taking this question. At the very start I think it's been made clear this morning that the sector and, as a mining operator, we're not looking to obviate our responsibility from rehabilitating and closing out the mine development.

**Ms SUE HIGGINSON:** On that one, how do we know that? I hear it, but it doesn't sound like that when you're looking more closely. It looks like you are actually trying to do everything to get a new paradigm to not do that, and that may be for good reason; I'm not casting a judgement on that. I'm trying to say, "What is the evidence that you are not trying to not do that?"

**MICHAEL MOORE:** I think this is nub of the issue. The industry is heavily regulated. We have commitments that have been made under our development consents. We have the Mining Act, which imposes rehabilitation requirements under the mining leases. We report annually on all of our commitments and conditions of consent. We are inspected and audited by the Resources Regulator from a rehabilitation perspective, and we report on those rehabilitation outcomes and on the forward plans for that rehabilitation. All of that reporting is made publicly available on our websites, and I believe on the department's websites as well.

We know what we need to do from a rehabilitation perspective. We're on a multi-year, if not decade, journey to finalise the rehabilitation, which has been ongoing throughout the development and to close the mine out to the agreed end point, which, as Nick and other people have indicated this morning, is typically back to woodland or to pasture for grazing. I think the issue here is: How do we navigate a system to provide early opportunity for other developments to come in and benefit from the land that may be there, rather than waiting

for five, 10 or 15 years after the mine has finished and rehabilitation has been deemed to be completed, for that developer to then come in and access and use that land?

**Ms SUE HIGGINSON:** It's a wholly commercial imperative for you guys, in real terms. All the public benefits, or the employment benefits, come along incidentally with that. Rehabilitation costs money as opposed to mining that makes money, so you are looking to benefit, through a commercial imperative, to hand that land on for another commercial enterprise over the land.

**MICHAEL MOORE:** If not—yes. We own most of the land that we develop our mines on so there is economic interest in that land anyway, whether it is for long-term agricultural use, with some biodiversity opportunity through the woodlands, or whether there are other opportunities that are identified by other developers to come in and access that land. It is really navigating how that new development can come in early, if you like, and take opportunity of the land that may be there.

**NICK McDERMOTT:** Just to add to that, I think the final point that Michael made is about bringing on the opportunity sooner where it exists. Just to clarify from a commercial perspective, notwithstanding the healthy scepticism, it's not about looking to sidestep the rehabilitation obligations that are associated with post-mining. We have two case studies in New South Wales that are currently looking at alternate opportunities. Black Rock has been talked about already today. The rehabilitation obligations had to be finalised before that commercial opportunity could then be pursued. I think what we're looking at is finding better efficiencies in a process that everyone, at a high level, seems to recognise is a good idea, as opposed to the current system which isn't really structured for it, not to use this as a Trojan Horse to minimise rehabilitation obligations.

**Ms SUE HIGGINSON:** Finally, what work are you doing on your sites around First Nations relationships and future planning for involvement and return of loss that's taken place on your sites, particularly those cultural heritage outcomes?

**NICK McDERMOTT:** I suppose the best case study for Yancoal at the moment would be our Stratford operation, which is ceasing production this year. We've publicly noted that we're looking at the opportunity there for the pumped hydro and solar and we have had a dialogue with the Worimi people in relation to that concept. That will be a rolling dialogue with them, and obviously with other key stakeholders, as we continue to explore that opportunity.

**Ms SUE HIGGINSON:** Is them being a major beneficiary part of that? Are those land interests being a major beneficiary of any forward planning? Is that something of a priority for—

**NICK McDERMOTT:** Sorry?

**Ms SUE HIGGINSON:** Any further exploitation of the land through renewable energy projects, will the First Nations traditional custodians be major beneficiaries in the projects? Is that part of your design?

**The Hon. WES FANG:** Did she just say that renewable energy projects exploit the land?

**MICHAEL MOORE:** I think at the moment I could say that it's not part of our design. We engage with respect to the Stratford area. The mines are developed in areas that were previously cleared for forestry and agriculture so it's not like we came in and cleared all the land; there had been previous activity there. I can't comment on what happened in the past from a cultural heritage perspective.

**Ms SUE HIGGINSON:** It's compounding.

**MICHAEL MOORE:** But we don't just engage with Aboriginal stakeholders at the time of an approval. We have ongoing engagement with a range of Aboriginal stakeholders, whether it be the land councils or the local registered or native title claimants. Our modus operandi is to continue that engagement and, with respect to our proposal up at Stratford, we have been engaging with the local Aboriginal stakeholders, as we have done with the local community, with the business chambers and with all the special interest groups.

**The CHAIR:** I think there was something that Mr McDermott mentioned in a previous response when you talked about better efficiencies that could have been struck with the example of Black Rock. I invite you to talk a bit more about that in some detail for the Committee.

**NICK McDERMOTT:** Sure. Black Rock would not have come into being without the persistence of the proponent who has subsequently taken them on. It was quite a drawn-out process. Obviously mining ceased there in the 1970s and progressive rehabilitation was undertaken. There was a fire that had to be put out that I think was discussed earlier on today. Yancoal stepped in in 2017 as the owner of the operation, and it wasn't until the last year or so that we have been able to get significant traction into relinquishment of the obligations and subsequent transfer to the new proponent. There was a lot of goodwill from the regulator as well as the other

parties to making this happen, but it was essentially trying to find a pathway that obviously hadn't been contemplated previously. It was finding a bespoke method outside the traditional rehabilitation obligations.

We have had good subsequent engagement with the regulator in relation to key learnings, and I think it would be fair to say that there has been some recognition in terms of relinquishment obligations and how that could be addressed better for subsequent opportunities in that space. From a broader perspective, obviously that is a mine that stopped so many decades ago, and even that did take quite an extended period to subsequently achieve the desired outcome. If we are now contemplating a situation where mining stops in January and we start construction on a solar farm in December, that's a different proposal entirely which would need some consideration in terms of the current regulatory framework.

**The CHAIR:** You talked about the issues with the relinquishment. Could you give us an example of some of the issues you had that perhaps could have been avoided?

**MICHAEL MOORE:** I think at the start the regulator was looking for a zero-residual-risk outcome. We would posit that there is no land that is without risk, anywhere. Even as a home owner or agricultural farmer, land is subject to all sorts of forces, whether it's weeds, pests or whatever. Because this site had some obvious legacies, having had the fire, there was a lot of rehabilitation effort that went into the site from the former owners—so much so that about 10 or 15 years ago the Resources Regulator at the time had decided or agreed that the site was suitable for final closure and lease relinquishment. Unfortunately—well, fortunately or unfortunately—Rio or Coal and Allied didn't progress with the application to relinquish the mining lease at that time. We roll forward to our ownership and there are more contemporary standards, and rightly so. It was really just what residual aspects of the land could the Resources Regulator accept to be passed on, through management, to a future land owner.

**The CHAIR:** Was this zero-residual-risk appetite universally applied across the landscape of Rhondda Colliery?

**MICHAEL MOORE:** I think it's more that the Government has a very conservative perspective because the Government doesn't want to take on that risk in case of default anyway.

**The CHAIR:** We did hear a bit about the residual risk earlier this morning. Are there any suggestions that you have around an alternative approach with that risk? If it is the Government that doesn't take it on, are there any other examples of models or forms of tenure, as I think the Minerals Council mentioned?

**MICHAEL MOORE:** The Queensland model, although I don't think it has been taken up yet—I think they have implemented a model where there is the potential to make a payment based on long-term management of that potential residual risk. In the case of Black Rock, there was a land management plan that was put together. That sits with the land now as part of a positive and restrictive covenant on title. There are opportunities and there are processes that can facilitate that, but I think it's what is acceptable as an ongoing risk that a future developer could take on.

**The CHAIR:** In your submission you talk about reforms to the planning apparatus that streamline the ability to amend development consents or for this responsibility to be managed under the Mining Act instead. What would the practical terms be for the ability to amend a development consent under the Mining Act? What would that mean for an organisation?

**NICK McDERMOTT:** I think what was contemplated was noting the complexity of having two Acts regulating the operation and, therefore, indicating that one pathway to simplifying this could be moving it all under a single legislative framework, as opposed to straddling two separate regulators. With the rehabilitation reforms of several years ago, that looked to streamline some of this space, but it's still one regulator looking to operate while there are also burdens under our development consent in the EP&A Act. An opportunity seemed to be streamlining.

**The Hon. SCOTT FARLOW:** Do you have a view about which it should fall under—whether it should fall under mining or planning?

**Ms SUE HIGGINSON:** And there is the EPA as well. There are three regulators. Which is your preference? I'm keen to know, too.

**The Hon. WES FANG:** I can't imagine anyone is going to say the EPA.

**MICHAEL MOORE:** I'm not sure we have a preference. I think we'd just be looking to remove that duplication and the complexity.

**Ms SUE HIGGINSON:** So it's not necessarily the legislation; it's more the particular front house that you are working with. For example, if you had a person, a front of house or a gatekeeper, as we used to refer to it—



**The CHAIR:** The concierge.

**Ms SUE HIGGINSON:** Yes, the "concierge" is the new word the department uses. But if it was the Mining Act and EP&A Act for a period of time, your problem is not so much that there are these two pieces of legislation but the way they interface with you as the operator?

**NICK McDERMOTT:** Yes, it is certainly a case of having multiple Acts and multiple regulators often overlapping in the same space, which adds a layer of significant regulation that we see could be better streamlined.

**The Hon. SCOTT FARLOW:** Is there conflict in that as well?

**The CHAIR:** That is exactly my question.

**The Hon. SCOTT FARLOW:** We will do it as a joint question.

**The CHAIR:** Yes, a team effort.

**Ms SUE HIGGINSON:** How often is there conflict, where does it arise and where do you see it?

**The CHAIR:** And how do we simplify that?

**MICHAEL MOORE:** There was conflict in the sense that, up until the rehabilitation reforms, most development consents had rehabilitation requirements as conditions of consent.

**Ms SUE HIGGINSON:** That's changed, though.

**MICHAEL MOORE:** It has, yes. But there are still some consents that have that requirement still sitting in the consent. There is some complexity and conflict and duplication that is set up there. But that's just dealt with through modifying the consents to change or remove those conditions. I think one of the things that hasn't been spoken about is how someone could come onto a mining lease and, with development consent in hand for a future development, come in and act on that development. There are restrictions under the health and safety legislation that relate to mining projects. As a miner, there are people on the site that have statutory responsibility for any health and safety related matters across those mining tenements. It would not be in our best interests to have another developer come onto those mining lease areas and start undertaking activities. There is potential for resolution of how those matters can be sorted out to enable other developers to come on where then the miner is not taking on that health and safety responsibility.

**The CHAIR:** That was mentioned in a number of the submissions that I've read, about the different standards within the work health and safety legislation and the Mining Act. Would you have a view around which would apply to a proponent coming onsite or what would need to occur so that they were covered in terms of liability, but you were also?

**MICHAEL MOORE:** It does happen. We have examples in our own company; for example, the Kurri Kurri pipeline associated with the Kurri Kurri gas development. There was the development of pipeline across some of our mining leases. You can carve out, temporarily or permanently, sections. For bigger developments, certainly—and I think this is where the complexity or the conflict comes in—our preference would probably be to wait until we can relinquish the mining lease.

**Ms SUE HIGGINSON:** Is this the impersona in rem conflict? What runs with the company's obligations and what runs with the land? Is that the nub of—

**The CHAIR:** There are different safety requirements under the Work Health and Safety Act and the Mining Act.

**MICHAEL MOORE:** To your point, the consent sits with the land.

**Ms SUE HIGGINSON:** It does.

**MICHAEL MOORE:** And the Mining Act sits with the person.

**Ms SUE HIGGINSON:** Is that where some of—

**MICHAEL MOORE:** I'm not sure.

**Ms SUE HIGGINSON:** Sorry, I only just realised.

**MICHAEL MOORE:** Did we answer that question?

**The CHAIR:** Yes, thank you. Food for thought.

**Ms ABIGAIL BOYD:** Thank you to both of you for coming along and sharing your experience with us. I asked BHP about their program for transitioning workers when they know there is going to be a coal closure.

Can you tell us what Yancoal is doing? Given that you've basically got a renewable energy hub that you're starting up on the site of where a mine is closing, what does the level of transition look like between workers from one to the other?

**NICK McDERMOTT:** Stratford is the second mine in New South Wales that we've closed in recent years. We also closed the Austar mine several years ago. We have had experience in terms of post-mining engagement with the workforce. The general philosophy is essentially frequent engagement both with the workforce and through the unions. We offer redeployment opportunities. We have offered them to the workforces at both of those sites. In the absence of that, where they are exiting the business, we provide training opportunities, should they wish to take that up.

**Ms ABIGAIL BOYD:** When you say "training opportunities", is that paid for by Yancoal or is that time off?

**NICK McDERMOTT:** It's generally on a case-by-case basis but we have, yes, provided funding for training opportunities to some of the workforce. The uptake on those experiences was relatively low compared to either electing for redeployment or redundancy. But it was offered and we would continue to do so.

**Ms ABIGAIL BOYD:** Have there been any examples of workers where you have looked at what their current skills are in mining and upskilled them so that they can work across your other new projects?

**NICK McDERMOTT:** In terms of new alternate projects, I don't believe so. I'll have to come back to you.

**MICHAEL MOORE:** As it was indicated earlier this morning, mines are subject to economic conditions as well. Employment at a mine can wax and wane depending upon the market conditions, for example. At our Stratford mine, as we have come towards the end of the life, we have been reducing the workforce. We have previously, as Nick said, offered training and redeployment or redundancies. But, certainly, where some of the operators—the dozer drivers or the truck drivers—have developed skills through the course of their employment, we have sought to get accreditation and certification of those skills so that they could take those, if needed or if wanted, to access alternate employment.

**Ms ABIGAIL BOYD:** That is really useful and answers a question I asked BHP earlier as well. That is really interesting. In terms of that accreditation and certification process then, did that involve going and getting more training or did it involve a training provider coming in and accrediting? How did that work?

**MICHAEL MOORE:** I'm not 100 per cent across the detail, but I think it was a training provider coming in and accrediting.

**Ms ABIGAIL BOYD:** Are you able to take it on notice?

**MICHAEL MOORE:** We could take that on notice.

**Ms ABIGAIL BOYD:** I'm really interested in seeing how that works.

**The Hon. WES FANG:** In relation to approvals for mining land that is coming up to its end of life, is it the case that, for example, with the motorway project, there's potential that you could use the existing machinery that's onsite to remediate the site ready for another project, therefore, saving additional emissions, additional costs, and additional time being lost to assist with those future projects? There could be a more flexible arrangement in place, not having to just return the land to a remediated state to then bring machinery back in to then rip it all up. Effectively, by having approvals prior to closure, we're potentially doing more for the environment. Is that one way you think we could look at it?

**NICK McDERMOTT:** Sorry, are you talking about alternate uses on the site or within the region, so other infrastructure projects?

**The Hon. WES FANG:** If you've got a mining site and you wanted to, say, put a racetrack there and you've got heavy machinery that's already—

**NICK McDERMOTT:** Sure. Like a racetrack or pumped hydro.

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

**MICHAEL MOORE:** I think this comes to what we have been discussing as well. At what time through the closure and the final rehabilitation process, if there's another land use opportunity and a development consent on foot, can that development come in? If there is landform reshaping or some form of additional works that are required using that equipment, if the equipment is onsite and the landform can be reshaped to suit that development, it makes sense that it could be done at the time that the mine operator has that equipment onsite.

**The Hon. WES FANG:** That is ultimately going to be better for the environment, isn't it?

**MICHAEL MOORE:** Yes. However, in terms of scale, most mining equipment is much larger than another civil development that would come in that would just have civil construction equipment.

**The Hon. SCOTT FARLOW:** You have been pretty explicit in your submission that this is, in many ways, a choice for government as to whether it wants to choose to incentivise alternate land use on sites. With that being the case, have you had any discussions with government about any of your sites and potential land uses for them, apart from the ones that are already in train, like Black Rock and the like?

**NICK McDERMOTT:** We obviously engage heavily with the regulators when we are going through the process of relinquishment and finding a pathway to an alternate land use, particularly with Black Rock. Are you asking are we proactively engaging with government to address—

**The Hon. SCOTT FARLOW:** For instance, you've outlined renewable energy projects potentially on some of the sites and the like. There are things which I think we would all agree would be good for the State of New South Wales—not just good for your company or good for your workers but, overall, provide a community benefit. Part of that is incumbent on you in a certain financial interest in looking at those solutions, but part of it is incumbent on government as well in identifying, "Potentially, we might want this use here," and exploring those opportunities.

**NICK McDERMOTT:** Certainly. We're very happy to see that this current process is underway, because it seems to be a positive indication from the Parliament and the Government that they are now sharing our views or at least exploring the views to look into this opportunity to look to extradite the process. This seems to be that recognition from government that it's happening, so we're engaging through this process. In terms of on a site-by-site basis, we are exploring an opportunity proactively at Stratford, but the Black Rock example, and probably other opportunities that present themselves, they're not originating with our company. We dig up coal; we don't know how to run a motor park.

**The Hon. SCOTT FARLOW:** I'm surprised.

**NICK McDERMOTT:** Maybe some of us do. We may not have the best concept for what to do with a mine site when it's reaching the end of its natural life, but there are long-term obligations post production that we have to carry out before any land could be relinquished and handed on to a third party. It's not the most attractive structure at the moment if you look to incentivise external developers to approach a mine site and say, "We'd look to utilise your mine for X."

**The Hon. SCOTT FARLOW:** I guess that's how it's sort of happening now. You get a knock at the door, somebody comes up and goes, "I've got an idea for this site and how it could be reused," and then you make an assessment as to whether you think that's in your company's best interest. Then you've got to go through all of the hurdles, so to speak, through the process.

**NICK McDERMOTT:** We certainly think that letting the market dictate the best opportunities is the best way to get positive opportunities on these sites once mining ceases. That's certainly what happened to Black Rock. It was an external concept that approached Rio and then us about using the land. What we think would incentivise that further would be addressing some of the current regulatory roadblocks, given it is quite a drawn out process post mining.

**The CHAIR:** With regards to that, you mentioned in your submission about allowing the Stratford renewable energy hub a clear approval process to facilitate changes in rehabilitation commitments and that it must provide flexibility to allow rehabilitation to occur in parallel, rather than in series. I'm interested, in practical terms, what that would look like and what changes you're suggesting we make, or that the Committee recommends that the Government make, to the current arrangements and system that's in place.

**MICHAEL MOORE:** I think this comes to the heart of the time frame that it takes to get this relinquishment to relinquish the mining leases. For the Stratford project, we're the proponent of the pumped hydro and solar facility as well as the mine operator. At no stage at the moment are we not proceeding with detailed mine closure planning for the Stratford mine. Even though the pumped hydro and solar facility was declared to be critical State significant infrastructure, there's no guarantee that we will get an approval. Even if we do get approval, there has still got to be a decision on whether the company commits to the investment to develop that.

It's not like just because a developer has an idea, or even has a development consent, that the development may actually be undertaken. From that perspective, rehabilitation and mine closure still has to progress until, at some point, those two come together. It's more just in terms of trying to find a path to provide an avenue to look at allowing a developer onto a mine site—so you're taking away the responsibility of the miner for any health and safety related matters—and if there are opportunities where there could be some landform shaping to be done

during that closure process. It's just navigating that process and how we find an appropriate outcome where we can continue rehabilitating and closing the site but allow another development to come in.

**The CHAIR:** Just for clarity, are you saying that whilst you're awaiting the approval of, say, the pumped hydro, for example, there could be a process whereby you are still required to fill in the hole that you will require for the pumped hydro?

**Ms SUE HIGGINSON:** There are no requirements to fill in holes.

**MICHAEL MOORE:** We have requirements to rehabilitate the mine site. We are actively undertaking detailed planning and actions on the ground. That comes to the point that was made earlier. Certainly, from Yancoal's perspective, this is not about obviating or getting out of our rehab mine closure commitments.

**The Hon. WES FANG:** Is Ms Sue Higginson appearing later in the inquiry? She is giving a lot of answers at the moment.

**Ms SUE HIGGINSON:** I don't think there is one requirement to fill a final void. That's the whole point. I could be wrong. Can I ask one question to follow on from that? Do you think there could be quite clear and simplified objectives? Let's just say, as a hypothetical, that you've got somebody interested in a beneficial post-mining land use. Do you think there are some basic threshold gate questions that could determine whether you turn left at this junction in the rehabilitation process or you turn right? Do you think with the concierge, or whatever it is we're talking about, that there are consistent threshold questions across the sector? I know the department gave evidence this morning that each mine has to be site specific. We accept that; it has to be. But do you think there could be some earlier threshold criteria?

**MICHAEL MOORE:** It's hard to generalise because we necessarily come back to look at project by project. It could be as simple as rehabilitation commitments and, rather than being so prescriptive that you have to have a certain amount of woodland on this particular parcel of land, it's that to gain those rehabilitation outcomes and nature-positive outcomes across the whole site, you have to achieve X amount of woodland for rehabilitation, for example, so that you can move things around to optimise the benefit of a future land use that might come in, if that makes sense.

**The CHAIR:** Does the current system not allow any flexibility in that?

**MICHAEL MOORE:** We would necessarily have to potentially modify our development consent, because some of them are quite prescriptive in terms of where we have delineated those different final land uses under the consents.

**Ms SUE HIGGINSON:** That would've had many factors as to why, wouldn't it? Whether it was biodiversity corridors—it's not just sticks and grass, which is some people's version of what we're trying to achieve, but actually those genuine outcomes. They would have been designed at the outset. Any revision of that would have to be quite considered, surely.

**MICHAEL MOORE:** Yes. We're very careful these days to describe those final outcomes as conceptual or indicative so that we are giving ourselves flexibility. With biodiversity enhancement areas or corridors, does it matter whether they're 100 metres that way or 200 metres that way?

**Ms SUE HIGGINSON:** Sometimes it might—

**MICHAEL MOORE:** Potentially.

**Ms SUE HIGGINSON:** —depending on where the water flows and the actual attributes of the land.

**MICHAEL MOORE:** Notwithstanding taking all of that into account, yes.

**Ms SUE HIGGINSON:** Thank you very much. That's very helpful.

**The CHAIR:** Thank you very much for making time to give evidence to the inquiry today. The Committee secretariat will be in touch if there are any questions taken on notice or any supplementary questions. We appreciate you making time to give evidence.

**(The witnesses withdrew.)**

**(Luncheon adjournment)**

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**Dr CORINNE UNGER**, Convenor and Project Lead, Managing Mining Legacies Working Group, International Organisation for Standardization, before the Committee via videoconference, sworn and examined

**The CHAIR:** Thank you so much for making time to give evidence to the inquiry today. Would you like to start by making an opening statement?

**CORINNE UNGER:** I'm here in my capacity of convenor and project lead of the working group in ISO, the International Organisation for Standardization, as we have developed a standard on managing mining legacies, and on behalf of my co-authors, Tania Laurençon and Professor Peter Goerke-Mallet. The subject matter of mining legacies is really about dealing with mines that have fallen off a regulatory cliff, as it were, in that they have unclear ownership and responsibilities and environmental harms and often social conflicts around their existence. They're unremediated. They can also harm Indigenous cultural heritage because of their existence, not having been developed at a time when there was free, prior and informed consent by Indigenous landowners. They sometimes have decaying industrial heritage infrastructure that could be important to tourism and so on.

It's really about taking the negative legacies and creating a positive, beneficial, post-mining land use. Over four years a working group has worked on these standards. It's called ISO 24419. It has come together in two parts, where part one is a short standard and part two is a longer series of 18 case studies to illustrate how to implement the standard, and also a bibliography as a support tool to implement the standard. Importantly, the standard has a holistic view. It's not just environmental; it's environmental, social and economic transformation of these sites. There's a particular focus on governance and leadership because quite often, if that's not strong, mining legacies cannot be transformed. We also address stewardship and long-term management of these sites because they're not easily solved—easily reclaimed. They need long-term management.

Importantly, this standard can be used by anybody, whether it's industry, government, NGOs, civil society and Indigenous landowners. By multiple experts around the world bringing together these key elements in a framework, it simplifies a very complex task. It doesn't mean that the task is easy. It just brings it together in one place so you can see what all of the elements that are successful—project or program, at a jurisdiction level—would look like for managing these legacies. Finally, I really just want to emphasise the importance of transforming these negative legacies into positive legacies because society is judging mining rehabilitation, closure and post-closure by the existence of these sites that persist in all jurisdictions in Australia but, while they remain unremediated, they exist in this no-man's-land. There are programs that are focused on some of these sites, but they are very important for social licence for mining in the future, particularly as we face a critical minerals boom in this nation.

**The Hon. SCOTT FARLOW:** Thank you very much, Dr Unger, for your opening statement and for your submission. In terms of the current regulatory and legislative framework in New South Wales, is there any part of it that would conflict with the standards that you've developed?

**CORINNE UNGER:** There never is because legislation always takes priority. Standards are always there as a backdrop, in the background as a leading practice guidance or whatever, but they do not supersede or conflict with legislation in any way.

**The Hon. SCOTT FARLOW:** In terms of the principles that you've outlined and your assessment, they would all sit under the legislative framework. In terms of that and how it is actually implemented, you've outlined that the Committee should make a recommendation with respect to its adoption in New South Wales. How would you see that working?

**CORINNE UNGER:** It is a voluntary standard but, once it's adopted, there is a whole suite of activities that must be carried out: For example, fully accounting for liabilities, which is one aspect that is often neglected and the subject of Auditor-General audits in each State; setting up the governance frameworks so that all sites have been accounted for and there are thorough inventories that characterise each of the sites; and transparent engagement with relevant stakeholders. The priority sites that are selected to focus on—and in New South Wales they're referred to as derelict mines—must address each of the five elements of the standard so that the stakeholder participation, the management planning and the implementation, stewardship, performance and reporting are all in place.

Under governance, just to emphasise that, it's about applying the Sustainable Development Goals, recognising that landscapes cannot necessarily be used to their full potential for growing food and other activities while they're degraded and water is impacted; having shared governance frameworks, which means developing partnerships to work with landowners and Indigenous people. Setting out clear objectives and criteria; Obviously addressing the legal requirements where they're relevant, but sometimes derelict mines fall into a bit of a crack

there; Having inventories that are comprehensive so you know where all those sites are and the degrees of opportunity and harm that they may cause or create.

Cost and estimation I mentioned, as they have to have funding mechanisms in the long term otherwise none of these sites can be brought back into benefit. Competence capacity resourcing—having the right people employed. That is not just engineers and environmental scientists to deal with physical problems; it's about the social science as well and engaging those stakeholders and communities locally to find out exactly what the impacts of these sites are to help reverse them as well. Frameworks and instruments, which is picking up the relevant tools that are out there and then documenting it so there's a very good history of that site and you know exactly what has been done there as you transition to some sort of beneficial use.

**The Hon. SCOTT FARLOW:** In terms of what is being done at present, how many of those principles are being neglected or not properly implemented at this stage under the current framework?

**CORINNE UNGER:** I think the best source for that would be the Auditor-General's office, where they've audited such programs in the past. Perhaps it's timely to have another audit to see how that's done. In the case of an audit that was done a few years ago that was seven sites that had not been listed on contaminated land registers, that is just one example where very large polluting sites should be listed as contaminated because they are, and they had not been. That may have changed since then. This helps to keep them invisible. What we talk about in the standard is bringing everything to the surface and making it more transparent, and then transitioning the sites through beneficial use and having enough resources to do the work. I'm sure those individuals are quite competent in the sites that they're managing, but they probably always want more money, more resources and more capacity to do a good job.

**The CHAIR:** You talk about the difference between the standard and the legislation. Are there areas you think that other legislation in New South Wales, or at least your knowledge of it, could be improved or aligned to better assist with the standard?

**CORINNE UNGER:** I think that needs to be reviewed. Again, I'd say that the New South Wales Audit Office would be in the best position to do that comparison. These programs are always evolving and changing. Since the last audit, I'm not sure if there is legislation that properly addresses derelict mines. Sometimes they fall into a bit of a crack in the legislation. They are managed the best way that they can be, but if those seven large contaminated mines weren't put on the contaminated lands register, then it calls into question the transparency of the program.

**The CHAIR:** In terms of part 2 of the standard, where you mentioned 18 sites, would you say that any of those provide a good example for us here in New South Wales to have a look at in terms of their applicability to our situation here?

**CORINNE UNGER:** What's important in each of these is that they address different aspects, so I would say that they're all relevant in their own way. If we lift ourselves up out of the details of specific sites, the standard is about what are those general principles and what is the framework. When we go into the case studies, we find the design engagement process for a particular mine in Canada—mining legacy program performance evaluation and reporting from British Columbia—as an example. How do they account for the liabilities, and how do they show that they are progressively addressing those liabilities and creating valuable new land for use? In the Northern Territory, it is about uranium mines, specific radiological aspects and how traditional knowledge is brought into the Rum Jungle rehabilitation project. Again, it's about looking at those case studies and saying, "What are the challenges we're dealing with at this site, and which case study might yield some insight for us?"

I think that simply reading those case studies can turn some lights on to say, "Oh, I never thought of that." That's really important—even from Mali trying to improve the legal instruments in Africa. Asbestos mines and biodiversity offsets—how can legacy sites be used for offsets? That's discussed in South Africa. Limitations and mechanisms used to fund programs is where they talk about Western Australia's program. With long-term financing, we've already heard from some witnesses today about the Ruhr region in Germany. There is a case study specifically on how to fund that work and how a foundation was set up to sustain the management of those underground coalmines into the future as groundwater rebounds and they deal with the above-ground urbanisation and activities. Organising post-mining in France and so on—I could keep going. They've all got something to offer.

**The CHAIR:** In terms of the legacy mines as biodiversity offsets, I am curious if you could advise the Committee in a little bit more detail about how that occurred and if there are any learnings that we could take from that?

**CORINNE UNGER:** Mining leases may or may not exist on mining legacy sites, but within them they can be both the disturbed land and the existing undisturbed native vegetation. It's been sort of bundled together in

that site and perhaps isolated from any interactions because of the difficulties of safely accessing the site. Part of the inventory that the State Government should have should identify some of these opportunities. Is there biodiversity on these sites that is quite pristine, in relatively good condition or that could be brought to a better standard through Indigenous Rangers or some other use that might add value to that site while another site is being addressed for its contamination? This is a sort of mosaic approach. We talked earlier this morning about having multiple land uses. We've got to look at this site as having multiple values and also multiple risks. There is a lot of work to bring the negative through to the positive, but there is also surrounding buffer lands that are of value.

**The CHAIR:** A starting place is to have the inventory, as you mentioned. That is obviously key.

**CORINNE UNGER:** Yes, and perhaps looking with a little bit of a broader view than just harm. Bring in those opportunities and bring in those benefits that would come from that land.

**The CHAIR:** In the submission, you also talked about the importance of giving all voices the opportunity to be heard and to participate in the management of mining legacies to shape that transition to meet local and regional needs. I would wonder if, in your experience, there is a best practice model that is being used to approach this?

**CORINNE UNGER:** In our standard we refer to kinship leadership. That is a term borrowed from Indigenous people about shared governance. It ensures that all people involved are valued and respected for the unique knowledge and skills that they individually and collectively bring. This is a term that we use. It's based on some of the learnings from Rum Jungle, where there was a very strong effort to build partnerships with Indigenous people. In recognising the harm of the past—mining without their authority—how do you reinstate their cultural connection to land? How do you repair the landscape in a way that brings them healing as well?

That's just one example, but there are many other stakeholders as well. The importance is to not leave the expertise just in the hands of engineers and environmental scientists. I was one, I know, but now I'm a social scientist. I am a convert. I see social science, Indigenous cultural heritage and all of those aspects that need to be woven into the problem-solving. It may be that the derelict mines team is made up of highly competent environmental scientists, but they actually also need social scientists to deal with the conflicts, the hard stuff and the really difficult legacy issues—the downstream food-grower who has been growing watermelons on the flood plain and doesn't like this influx of dirty water every time it rains, for example.

**Ms SUE HIGGINSON:** Dr Unger, at the moment the New South Wales post-mine rehabilitation system looks very much at the individual land, the individual project. I understand the baseline we're trying to achieve is a "safe and stable environment"—I think that is the term. Is that a good informing principle, or should the standard replace that or bolster that? How do you see that working in terms of those post-mining objectives?

**CORINNE UNGER:** In most jurisdictions it's "safe, stable, sustainable"—

**Ms SUE HIGGINSON:** Sustainable, sorry. That's right.

**CORINNE UNGER:** —"and non-polluting". It usually captures all of those. You can imagine that "sustainable" is quite a broad term. That is where it brings in economic, social and environmental benefits. For New South Wales, I'm not sure if the word "sustainable" is in there. It doesn't replace that, but it does give you a framework that kind of explains how you might go in a sudden change. So while this standard is geared towards existing mining legacies, if you have a mine that has been going along and it suddenly wants to change direction in terms of post-mining use, it does give you some insight into how you might organise some of those aspects. But active mines are covered by existing legislation and so this standard is only there as a guide, if it's useful to them. Legislation is paramount, but this guide, this standard, is for where there are regulatory gaps or inadequacies.

**Ms SUE HIGGINSON:** One of the things that we're having to grapple with in terms of our framework is the notion of residual risk. We're trying to deal with it now, before these residual risks eventuate. I remember reading the Auditor-General's report from 2012, I think, about New South Wales legacy mines. It was quite frightening at the time. I think they were identified as New South Wales' largest financial problem. I'm not sure what work we have done since then to bring it into line. How do you contemplate this notion of residual risk upfront, earlier, at what point, to avoid being in the position that we have been put in with legacy mining?

**CORINNE UNGER:** That's a good question. Residual risk is inherent in every risk; there is a certain amount you can control and there is a certain bit that can't be. It is an ongoing process, and I think the challenge with residual risk and how we understand it today is that we think it's something we can evaluate at the end—that we wait until the end and we add up all these things that need to be managed. Written into the New South Wales guidance is a lot of talk about post-closure monitoring, as if that is all that is required. Obviously, for complex sites, there is active management as well. Monitoring is only applicable where it is a very easy site; it's straightforward. That's true, it was the 2012 Audit Office of New South Wales report that said there was more

contamination from mining legacies than their existing inventory of contaminated land. But there are also issues between Crown land and freehold land that need to be probed to understand what the State Government is taking responsibility for and what it is not. For example, is it leaving freehold land up to private landholders to rehabilitate?

Part of implementing a standard would be that you clarify ownership and you resolve these matters rather than leave them in some sort of yes/no binary bucket, as it were—either it is or it isn't our responsibility. It's about resolving them because, again, the community doesn't see these derelict mines as any different to an active mine, necessarily. They see them as unresolved rehabilitation, unresolved closure and unresolved post-mining land use. They want to see some value come from it. They want to see that repair, and that affects social licence for new mines.

**Ms SUE HIGGINSON:** You do not have to answer this if you do not feel comfortable professionally. Bearing in mind that most of our large mines in New South Wales are on private freehold land—only a couple are still on Crown land, from memory—does it concern you that there are requests from operators for frameworks that look at avoiding rehabilitation? I do not use "avoid" as a loaded term. I'm using it in the context that there is a genuine intent for mining corporations to look at beneficial reuse of mining land. But what is clear to this inquiry is that there are conversations and requests to say, "Hey, this might require"—

**The Hon. WES FANG:** Point of order—

**Ms SUE HIGGINSON:** Can I just finish my question? I'm nearly there.

**The CHAIR:** A point of order has been taken.

**The Hon. WES FANG:** I have two points of order: One, I don't know where the question is; two, the member has pre-empted the question by saying "It is clear to the Committee that". To pre-empt the Committee's findings is not helpful.

**The CHAIR:** There is no point of order. Please proceed, Ms Higginson.

**Ms SUE HIGGINSON:** I will just finish my question. We are being asked to consider frameworks that interfere with or intercept the current rehabilitation of side-by-side mines in certain circumstances. Does that concern you? And if so, what concerns do you hold around those kinds of requests from mining operators?

**CORINNE UNGER:** My first answer is that I'm not concerned. It is almost a natural progression. If you look back, over the past 40 years I have studied how rehabilitation and closure have evolved, and beneficial post-mining land use is like the next phase. It is taking each jurisdiction, one at a time, a bit of time to think about how it is going to be done. This Hearing is very important. And because legislation has grown up with the needs of the industry and with the need of government to adequately assure the public that they are adequately regulating mining, we have some of the complexities that I was listening to this morning, of three different departments involved, with different roles and different interrelationships. If you look at the way mine rehabilitation was once just soil conservation—grow grass and so on—it then evolved. Then water left the mine site, so "Oh, we have to manage some of these offsite impacts."

Now many more stakeholders are wanting to have a say. It's no longer just a relationship between government and industry. It's involving many more people having a greater say. We are hitting this complexity at a time when there is also opportunity and need for access to this land, whether it's buffer lands, whether it's former mine lands. There is a desire for it because we are in this energy transition. We have all these new sorts of operation coming along that want access to land. You have local governments that want to develop some of the buffer lands, and so on. I've been to the forums in the Hunter Valley. I think it should be embraced. I think it's a very good move. But what is needed is a statewide policy around it. That policy needs to be the connective tissue between these different agencies. I heard earlier you talked about a concierge. If the concierge goes on leave, does the whole thing collapse? I think you need much more than that. You need a policy position. You need an entity.

In Victoria there is the Mine Land Rehabilitation Authority. In Queensland there is the Rehabilitation Commissioner. I'm not saying any particular model suits New South Wales; it's for the New South Wales Government to work that out. But if you have an entity, you have to recognise that this is an ongoing process. It is not a one-off thing. It is not like a one-off policy change or a one-off piece of legislation. It is a process that has to almost look at where those barriers are between the agencies, look at where the opportunities are, look at where those risks are and begin to meld together something that satisfies this requirement for giving access to this land instead of locking it up and leaving it isolated or in suspended animation, like this is the state it's going to be in forever. It's about giving life. It actually brings truth to the term that mining is a "temporary land use". Otherwise, if you've got these derelict mines sitting out there unrehabilitated, they completely go counter to that. It's not a temporary use; it's permanent, unless it is brought back to life, and given new life and a new use. That's my answer.



**Ms SUE HIGGINSON:** Do you think, in order to be able to develop that policy framework and that next step, that it's incumbent and important for the Government to have a very clear audit of exactly what we've got, where we've got it? Then we can start to be more forensic in a more collaborative way, rather than just the mining companies—as you say, all the voices. Then we can start to get better, clearer understandings of what those beneficial reuses would be?

**CORINNE UNGER:** I think one of the challenges of the existing legislation is that it has been one site at a time. So you regulate one site at a time, but there are cumulative impacts and cumulative opportunities. But what I've also heard this morning was that as mines are finishing at different times, of course they are demanding certain things from government so they can progress with their planning. It's that cumulative response that is needed, that policy-level position that is needed to take the process forward—and an entity, I believe, because it needs arms and legs, multiple arms and legs to deal with the complexity, and lots of social scientists, not just scientific people. Both, together.

**The CHAIR:** Dr Unger, you talked about the importance of having a statewide policy. One of the other submissions and one of the other witnesses we heard from this morning suggested a clear statement of support. Is that what you're talking about, having that clearer articulation so that agencies as well as investors and businesses are on the same page as to what the situation is here in New South Wales?

**CORINNE UNGER:** It may need that bit of research and probing and investigation and review to help flesh out exactly how it's going to work. Once it's in place, it definitely gives support to a direction. I was at a decarbonisation forum last week—this is new energy projects—and they were talking about how important it is for governments to have policy positions, because that helps them with their borrowing and lending and so on, so they can get the resources to go forward. Yes, there is a relationship in there around government policy, but it's also about the coordination that is needed, and the integration. I don't see it as dumbing it down to one agency, but it's about making the links between those pieces of legislation that have grown up over time and are now facing much more complexity. There's also an opportunity for research. You have research on mega-projects at Sydney Uni and places like that. These are mega-projects; they are large, challenging projects. Maybe we are underestimating the complexity.

**The CHAIR:** You talked earlier about the role of governance and the role that governments has to play in this, and you've just given us some examples of the Mine Land Rehabilitation Authority in Victoria and the Commissioner that exists in Queensland. Through the work that you've done and, obviously, taking into account everything needs to be on a case-by-case basis, has there been a model adopted by governments anywhere in the world that you would say would be applicable to us here in New South Wales?

**CORINNE UNGER:** I did my Churchill Fellowship on aspects of beneficial post-mining land use, so I did look at the German cases. What is beautiful about them is their clearly delineated responsibilities and the resourcing that is given to them. In the Lusatian region, which is the brown coal mining of former East Germany, they are equipped with enough resources for a 10-year program. That 10-year program, bearing in mind the sudden nature of those changes over there after reunification—they had 10 years to engage the community and develop landscape architecture plans and redevelop that area, tackle the physical and technical problems and stability of land use. So those programs provide insights on what's needed. That is the expertise, the resourcing and the capacity for a defined period of time—or it might be open-ended, depending on what you are focusing on. If it was regionally based it might be into the future. It's about having some identity and then creating new identities, and it's around the engagement with the community, so that what is going on is what the community also is satisfied with and wants.

**The CHAIR:** That is all the questions we had for you today, Dr Unger. Was there any final remarks or any clarifications that you wanted to make to anything that you've already stated today, or anything else you want to put on the record for us?

**CORINNE UNGER:** Simply that it's a voluntary standard. It can be used as a guide or it can be fully adopted. I encourage everyone to read it and find what is meaningful in there for the particular needs in New South Wales.

**The CHAIR:** Thank you for making time to appear today. We appreciate it. Our Committee secretariat will be in touch with you if there are any questions taken on notice or any supplementary questions at all.

**(The witness withdrew.)**

**(Short adjournment.)**

**Mr SIMON TOLHURST**, Chairman, Biortica, before the Committee via videoconference, sworn and examined

**Mr THOMAS VARGA**, Managing Director, Biortica, before the Committee via videoconference, sworn and examined

**The CHAIR:** Welcome to our next inquiry participants. Thank you so much for making the time to give evidence today. Would either of you like to start by making an opening statement?

**THOMAS VARGA:** Yes, I would, Madam Chair. I'd like to start by saying thank you for having Biortica Agrimed, Australia's leading B2B medicinal cannabis company and our cultivation brand, Green Farmers, and our genetics business, Apollo Green, as part of this inquiry. Biortica is a leader in protected cropping, predominantly through glasshouse production that enables year-round growing with a reduced environmental footprint. Our submission on the beneficial and productive post-mining land use to deliver both a great outcome for the site, as well as for jobs in the region, is based on what is one of the fastest growing new market segments in the world: the medicinal cannabis industry.

Based on previous reports by both the Penington Institute and Prohibition Partners, the Australian medicinal cannabis market is expected to exceed 100,000 kilos this year, supporting patients with a range of conditions. But the fact remains, the illicit market is estimated to be nine times that volume, with Australia sitting third on consumption in SCORE countries. That is a Sewage CORE group European, covering Europe, Australia and the Americas and Oceania, according to the National Wastewater Drug Monitoring Program. While not all of that is medicinal, a significant portion of the market is still self-medicating with the illicit market.

Continued conversion to the regulated medicinal market from illicit sources delivers significant land use for New South Wales. I also note 80 per cent of all medicinal cannabis products are currently imported. While there are a number of new sites and facilities coming online that will address part of this shortfall, there will continue to be a deficit of local cultivation for many years to come. There is a need for us to expand capacity without any regulatory or legislative change needed to the current framework, which could see medicinal cannabis play a role in the repurposing of the site. In fact, under the current legislation and regulation through the ODC, the Office of Drug Control, and the TGA, the Therapeutic Goods Administration, there is already a solid foundation for the industry. Any further framework must continue to enforce that current model.

Biortica is well placed to support the New South Wales Government in not only creating jobs and tax revenue in New South Wales from the medicinal cannabis industry but also the repurposing of the site to maintain the jobs in the region and create a centre of excellence for the Australian cannabis market. This will create thousands of jobs, leveraging the existing skill base of the region, re-skill synergistic capabilities to cultivation and manufacturing, and bring significant investment and use of a significant footprint for cultivation, packaging, processing, manufacturing and storage. A post-mining land use led by Biortica Agrimed in the medicinal cannabis industry could bring a potential 1,500 jobs to the region in direct employment with additional to ancillary services while leverage existing assets and infrastructure, Madam Chair.

**The Hon. WES FANG:** Thank you very much for appearing today. It is a very interesting proposal that you have put forward. Primarily, in relation to the Lake Macquarie area and the Upper Hunter region, what advanced work have you done in relation to possible sites, what needs to occur, and what is already in place to enable your facilities to advance into that region?

**THOMAS VARGA:** There are a number of aspects to that. The first one is, because we're a protected cropping business, some of the most important aspects to us are the availability of power and water. We have already spent some time with a number of the stakeholders to ascertain whether or not that would be available. As you know, obviously, being a mining site, lots of those tend to be quite prominent. So we ticked the number one priority for us around access to power and water.

The second key aspect is, because we are protected cropping, site location plays a role. We have a site in Victoria that's cold for a long period of time and rainy and cloudy for a long period of time. We have a site in New South Wales, up towards the Lismore area, where we deal more with humidity and some of the other challenges. It is just sitting behind Simon, and you may have received some photos around the sites. Site location, climatically, is less of a concern for us. We are looking for, as I said, power and water, but also skills. Do we have access to the human resources that can be skilled or re-skilled to be brought into our facility and enable us to achieve what we need? We are quite labour intensive. Both of those clearly appear, whether it is in Lake Macquarie or the Upper Hunter. Both of those are prevalent in those areas.

**The Hon. WES FANG:** So you have the triple advantage of post-mining land use. You have got existing water supply, availability of power and a skilled workforce which is, potentially, looking for post-mining

employment. What is required to enable the investment that would be required to have a site transformed into a medicinal cannabis production facility?

**THOMAS VARGA:** If anyone wanted to join this themselves, one of the biggest challenges is passing as a fit and proper person with the Office of Drug Control. That is the number one hurdle, which can take anywhere from 12 to 18 months and, in fact, for some it hasn't happened at all despite applying and trying to get through the process. Biortica is already a licensed facility or a licensed operator under the Office of Drug Control. So the first hurdle has been taken away, because it is what we do for a living. The second piece that is required is, obviously, we need to have some local council support so that we can build infrastructure like, for want of a better word, a big shed, which is what a glasshouse is—infrastructure for a big shed to build the glasshouse.

The proposal we put forward would also have other growing form factors. We would have indoor capability. Provided we had council support or local regional authority support, that would be the next priority. Finally, it's about actually building it and making the investment. Biortica is well funded from some of our existing investors—so making the investment and locking down an ODC permit, which is the final piece of puzzle. For us to come into the region, provided there are existing examples of large sheds and large structures on the facility, we know we will be able to get a glasshouse up. We have the Office of Drug Control licence, so we know we can move forward. It is about bringing those parties together and successful site selection, and then we are prepared to make the capital investment to bring it to life.

**SIMON TOLHURST:** I just thought I would jump in and say, we already have a fully functioning glasshouse down in Victoria. It's spun off over 200 crops out of that glasshouse. The second glasshouse down in Victoria is 5,800 square metres and has been built. It is just being fitted out at the moment. The glasshouse sitting behind you is 10,000 square metres. It's just outside of Lismore, and it's up and running. We are growing product out of that in a small section, but we are in the process of fitting it out. We have what you would call runs on the board to be able to have access to the capital. But it's not just access to capital; it is also knowing how to grow the plant. It is a horticultural product; it is not a pharmaceutical product.

**The Hon. WES FANG:** On that very point, effectively, it is just farming, whether it be cannabis or whether it be another crop. In relation to cannabis, if you were to grow hydroponic tomatoes or cucumbers, is it more labour-intensive per square metre of hydroponic facility? Is it more costly? Is cannabis more profitable per square metre compared to another hydroponic crop that you might grow in a similar facility?

**THOMAS VARGA:** Absolutely. I think everything that you have just touched on there is spot on. There is no doubt that it is extremely labour-intensive. We do use a lot of labour. Per square metre, on a kilogram basis, we are producing less kilograms or less grams. We are producing less grams per square metre. However, the value of medicinal cannabis—to give you an example, on the site that we are on today, we used to grow basil in our Victorian site and, in fact, in the New South Wales site, it used to be Freshzest, so it was herbs as well as. We might be selling herbs for somewhere between \$8 and \$14 a kilo. On a business-to-business basis, which is what we are, medicinal cannabis is north of \$3,500 a kilo.

**The Hon. WES FANG:** So it is vastly more profitable on a per-square-metre basis to do a hydroponic cannabis crop than it is to do another crop.

**THOMAS VARGA:** Absolutely. It comes with a different cost structure and different risks. We are consuming a lot of energy that goes into the production of cannabis that wouldn't go into tomatoes, cucumbers or capsicums. Our energy load is higher and the load in terms of labour is higher. Yes, it is more profitable, for want of a better word, but on a square-metreage basis, a tomato farm in the region might put out something like 40 or 50 kilograms per square metre per annum. If you think of one of our footprints, our 4,000 square metre facility in Victoria puts out 5,000 kilos per annum in total.

**The Hon. WES FANG:** In relation to workers for the facility, I think you said there would be about 1,500 jobs if you were to put one in the Upper Hunter region.

**THOMAS VARGA:** Yes.

**The Hon. WES FANG:** In the same way that your organisation is required to pass the fit and proper person test with the regulators, what are the requirements for the workforce in relation to their checks? What extra requirements, if any, do you put on top of the workforce that you might have as an organisation?

**THOMAS VARGA:** Certainly as part of our ODC licensing—Office of Drug Control licensing—we're required to make sure that everybody who works onsite that is a full-time employee is passing appropriate police checks, background checks and bankruptcy checks. We go through that process with every employee. On top of that, that process is regularly updated by rechecking their certification on that. Everyone does have to have a clean record. That is just part and parcel of what we're doing. Diversion and the risk of diversion is one of our primary

concerns, so we are making sure that we minimise that risk. But going through appropriate police checks, background checks and bankruptcy checks is our number one priority that allows us to make sure that we have the right people onsite.

**SIMON TOLHURST:** In addition to that, there are a number of other security measures as well. Obviously you've got significant capital outlay in terms of securing the site, both in terms of checking in and out of every room that you go into and out of as well as getting access to the site, but then all waste product needs to be weighed and is audited. So you've got absolute lockdown control over every part of that supply chain.

**The CHAIR:** I wanted to ask you about the 1,500 jobs that you've mentioned. They are ongoing for the project or is that just set up in the Upper Hunter?

**THOMAS VARGA:** No, ongoing. If you think about where we're heading, it will be cultivation, manufacturing, processing, packaging and distribution, so it will be closed loop. One of the greatest challenges is freight. We can now remove a whole heap of freight by bringing this all onsite and just managing it locally.

**The CHAIR:** The Committee secretariat tells me that you've provided us with some images. Do you want to table those as evidence?

**SIMON TOLHURST:** Yes, please.

**The CHAIR:** I'll get the Committee staff to circulate them now. In terms of the energy load that you talked about being higher, have you got examples at your other sites where you've taken measures to use renewable energy structures or anything like that?

**THOMAS VARGA:** Yes. We're in the process right now for our Victorian site of leading that very project. Our Victorian site, if I was to think about how we might categorise it, think of it as our pilot site. It's where we started. It's our 4,000 square metres. We wanted to prove concept and make sure we had a sense of energy loads. We're in the process of working with a company called Constructive Energy, who are designing a full battery, solar and then backup power generation for the site. Our priority is to ensure that all of our sites have a light footprint, even to the point where water is recycled in all of our facilities so that we reduce the environmental load. That's now the blueprint that we built that will get rolled out across each of those sites. So you'll have battery for everything, solar to charge, diesel as backup in the event something ever happens on the grid. Simon, you might want to touch on MeOH as well.

**SIMON TOLHURST:** Yes, if I can. Just before we deviate from there, when we set up the first glasshouse, we did all our budgeting on \$1.30 a litre for diesel. You can understand exactly the sort of pain we're getting now in being able to keep the lights on. We're acutely aware of the need to make sure that we have reliable energy sources at a reasonable cost, and we have redundancies in place. Madam Chair, you would also have received a submission from a company called MeOH GigaBattery. Biortica, our cannabis cultivation and genetics business, as you've heard, has two major costs: one is people and the other is energy. You've heard a bit about the people and a bit about the energy. I see that you've received submissions from Gravitricity, which is submission No. 13, and Green Gravity, which is submission No. 15, who you'll hear from later today.

I'd commend to the inquiry to read also submission No. 70, which is from MeOH GigaBattery. The reason for that is, unlike the other two submissions, MeOH GigaBattery has the potential to form part of a circular economy on a site. By that I mean this that particular technology—and it's proven technology; it's just deployed in a different way—takes municipal waste, tyres and, importantly from Biortica's perspective, biomass. We throw up a lot of waste. Once we've picked a flower off the cannabis plant, we have a lot of biowaste to get rid of. At the moment that's an enormous cost to us, to package that up, tag it, audit it and have it disposed of by, effectively, a security firm. If on site we have someone who is authorised under the Office of Drug Control to deal with that biomass and turn that into effectively a waste-to-energy output, then that's a cost saving to us but also it's a benefit obviously to the environment.

MeOH takes that biomass and can then produce what we call sustainable fuels, which are things like ammonia or methanol which are excellent carriers of hydrogen molecules. They can then take that fuel and store it and, as and when energy is required onsite, they can deploy that fuel—either methanol or ammonia—through turbines and generate electricity. There are two products that come from that. One is the ability to generate electricity for anyone who happens to be on site, and it produces that at half the carbon output of coal generation. It is equal to or less than natural gas generation and can be significantly less than gas generation, depending on the inputs or the feedstock that you are putting into it. So what we're suggesting is if the feedstock that's coming into it is a biomass, then you can reduce that carbon footprint.

The second product that spins off that is if there are carbon emissions, they can be pumped back into the glasshouse because those CO<sub>2</sub> emissions generate growth within the cannabis glasshouse. So what you end up

having is the waste from the glasshouse being used to generate electricity, as well as creating a carbon product that can be used within the glasshouse. I don't think that's a product or a concept that the other two submissions that are before you at the moment deal with. I just thought that it would be interesting for that fact but also so that when you look at this proposal, you have an opportunity to be able to set a gold standard for mine recycling or upcycling. If you do it properly, I think you have a great opportunity to be able to create circular economies within some of those sites.

**The CHAIR:** Your submission talks about the processing and manufacturing of medicinal cannabis requiring sophisticated technology and processes. Could you talk a bit more about what that entails and what is needed?

**THOMAS VARGA:** If you think of any of the facilities in those pictures that have been provided to you, those facilities start by effectively creating what Simon referred to as biomass. We're creating the raw flower. From that raw flower there are trichomes that sit on the flower that need to be extracted and then brought back into the market for various other products. The market is dominated by flower today, but for various other products. They will include things like methanol or CO2 extraction to remove the oil from the biomass. It will also be technology that then takes that oil that has been produced and turns that into other form factors, which could be an oral oil for someone to take or a soft gel capsule that is generated, so there would be some soft gel capsule manufacturing capabilities.

But it could also be, Madam Chair, the conversion of that into, say, gummies for the elderly or CBD gummies for children. We can vary the form factor that needs to come in. The thing I want to stress is, while sophisticated and relatively unique to the cannabis industry, none of the technology that we're talking about requires some R&D innovation leap of faith or long development time. We have a strong cannabis market globally, particularly in North America. This is technology that can be acquired off the shelf. In fact, much of that technology is already in Australia with other companies.

**Ms ABIGAIL BOYD:** Good afternoon to you both. I wanted to ask if you had some specific examples of workforce reskilling and employment of people who had come out of coalmining. Have you got any firsthand examples of the types of skills those people had, how you could upskill them and how they're then deployed in your operations?

**THOMAS VARGA:** Being completely straight up, in terms of mining directly on either of our sites today, I could not tell you whether or not any of them have come directly out of the mining industry. What I can tell you is this: We have the majority of our workforce in roles that we would call technician roles, whether that's a crop technician or post-harvest technician. What makes a good person in one of our technician roles—and this is a majority; we're talking 85 per cent of our workforce who sits in that level of role. The ability to follow SOPs—standard operating procedures—and the ability to work under instruction are two of the key aspects there. If we take something like mining, where there is a significant level of following the SOPs, there's a safety culture, and, to some extent—I'll use the parallel—something that's akin to the regulatory culture that we're looking for, that's the skillset that we find always works best with us. So if they've got previous experience of working and following procedures and previous experience of reporting information, that works well.

With the types of roles that we have, our leaders and our managers within our business are able to then take most transferrable skills—so 80 per cent of those skills will transfer across—and top that up with the 20 per cent of on-the-job type training that is mission critical for us. Most of our roles can actually be taught by someone that's been doing them. Because of the growing site, and because of our business and our future pathway on growth, we are then also taking a select group of these technicians and providing them with role-specific training. There's a number of courses now that have been developed through TAFE, all geared around medicinal cannabis cultivation. It's the same with our post-harvest. So it allows a pathway, if you will, for them to move through into the higher roles of team leaders and eventually site managers.

**Ms ABIGAIL BOYD:** Very interesting, thank you.

**The CHAIR:** Just a final question for me to you both. In terms of your conclusion, you talk about obviously the medicinal cannabis cultivation being viable under the existing legislative framework. I wondered if you could make comment on whether or not, or how well, that extends to the post-mining land that the Committee is considering, and whether you've explored any feasibility in terms of accessing that sort of land.

**THOMAS VARGA:** We've done a little bit of work on that, certainly with our discussions. Jeremy Buckingham has been extremely helpful in making some introductions for us in this area. We have spent a little bit of time with BHP. I want to make sure that I'm clear: It is a little bit of time, so this is not a detailed feasibility process that we've worked through. We wanted to make sure before we put a submission in that we were comfortable that there would be opportunities and parcels of land and infrastructure that fit our requirements.

We are comfortable that hardstand land, for example, I want to just come back to—flat, well-compacted hardstand land is ideal for the development of either a glasshouse, indoor cultivation or the addition of some form of facility for processing. As it turns out, also on the property there are a number of sheds that are available—so the repurposing of those sheds to then become our manufacturing, our distribution and our storage. We're comfortable that there are adequate opportunities onsite that would be able to meet our needs to be able to build a cannabis centre of excellence.

**The CHAIR:** Have you explored the availability of that flat, hardstand land that you speak of? Have you explored the availability of that in the Upper Hunter outside of existing mining sites?

**THOMAS VARGA:** We are constantly on the lookout for new sites. We are a growth business. When 80 per cent of the Australian market's being imported, we are quite often looking at facilities. Up to now, historically our modus operandi has been to buy facilities that have already been constructed and to retrofit those. We're now in the second phase of our life in looking at sites where we can actually take control and build facilities up-front. We haven't been looking at the Upper Hunter specifically, and I think it was fortuitous that this opportunity has come up and the conversations have developed, but we are continuously looking at the moment Australia-wide around suitable sites that we could place the future cannabis facility on. As I said before, the freight and the dead freight that exists in our industry is one of the biggest costs that's impacting medicine to patients. Finding sites that would allow us to remove that cost is mission critical for the industry and for Biortica.

**The CHAIR:** You talk about having the glasshouses. How water intensive would this crop be in a climate like the Upper Hunter?

**THOMAS VARGA:** Certainly one of the reasons why we do protected cropping is to reduce that. If we were outside to the elements, we'd have some challenges around that. We recycle not only the water runoff from the plant but also any dehumidification, for want of a better word, or condensed water from the facility that the plants put off. From a water-intensity point of view, medicinal cannabis probably sits mid-range. We're not talking cotton. We're not talking anything along those lines. It's not a rice paddy, so we're certainly not at that level of water usage, but it has some level of water usage that is required.

**The CHAIR:** Thank you. Do you have any final remarks or clarifications or comments you wish to make in terms of giving evidence today?

**THOMAS VARGA:** The only thing is that we really appreciate the time and thank you for even considering the Australian medicinal cannabis industry and Biortica's submission. I think this is a great opportunity to repurpose the land, but also to help some Australian patients. Let's get rid of that 80 per cent of imported product that's coming into the market.

**The CHAIR:** Thank you so much for making time to give evidence to the inquiry today. Our Committee secretariat will be in touch with you if there were any questions that were taken on notice or additional questions.

**(The witnesses withdrew.)**

**Mr MARK SWINNERTON**, Founder and Chief Executive Officer, Green Gravity, affirmed and examined

**Mrs TANIA JONES**, Sustainable Development Manager, Green Gravity, affirmed and examined

**The CHAIR:** I welcome our next inquiry participants. Thank you so much for making time to give evidence to the inquiry. Would either of you like to start by making an opening statement?

**MARK SWINNERTON:** Yes, thank you. Thank you very much for the opportunity to speak today and to make a submission to the inquiry. To quickly introduce Green Gravity, we're the developer of a gravitational energy storage technology that specifically targets repurposing legacy mine shafts. We store renewable energy by lifting heavy objects up a mine shaft to consume energy and at a later time lowering those objects again to release the energy back to the grid when it's most needed. It has significant environmental benefits, including low water use, low resource intensity, no waste, and the ability to repurpose assets. There's also considerable strategic benefits to the technology. We can create sovereign energy storage technology and a low reliance on critical minerals, and these really assist the energy transition.

New South Wales has a large opportunity for repurposing mines. We have thousands of sites across the State, many with attractive potential. We also have lacked the traditional history of achieving relinquishment of these sites for future use. That's something that I think we need to talk more about, and this inquiry is really assisting with that. The incentives need to change. Miners who are doing the right thing and are working to rehabilitate and relinquish their sites can't get certainty around relinquishment currently. Miners who are not actively working to rehabilitate their sites face little disincentive. There is reasonably low transparency across this situation. Clean energy projects have changed the dynamic and the context for this State. The significant landholdings and significant need for energy projects—we need to bring these two things more together.

We should enhance the development of energy projects by enabling mine holders who want to develop such projects to be able to achieve that. But, even more, we should create more transparency so that people advocating for projects can get better access and have a pathway to develop projects on land that is not being otherwise productively used. We also need to manage the environmental and safety considerations of repurposing mines. The scheme for rehabilitation bonds and relinquishment is a good start, but the scheme isn't serving many of the obvious objectives very well. We need to create tools where sustainable changes to planning objectives can be achieved. We need to enable the transfer of mines to different platforms, or at least parts of mines to different platforms. Where we have a low residual risk sitting there, we need to find ways and mechanisms to be able to transfer those to better-value projects, and that includes for better social value.

Finally, we need to improve the coordination, speed and consistency of how this issue is dealt with, both within New South Wales but also around the nation and even beyond. A coordinating authority would certainly help increase the speed and drive enhanced outcomes. As a small company, we're dealing with a lot of complexity and legal costs and things. Perhaps more coordination from government could assist us to better understand and move more quickly. There is a market and a desire to attain better value from these lands. We think that through the right changes to policy and intent we can get both the miners who want to relinquish sites and the developers, including particularly in energy—we can bring them together and achieve quite an outcome. Thank you very much for the time today.

**The CHAIR:** Did you want to make any opening remarks or will we proceed with questions?

**TANIA JONES:** No, Chair.

**The Hon. WES FANG:** I'm very keen to understand how this works. So you have a mine shaft. Let's presume it's a straight up and down vertical shaft. I imagine that you're effectively converting potential energy to kinetic energy and then, through a number of means, whether it be with a cable—you have a weight, you suspend it, you let the weight drop, and that creates the kinetic energy. You'll then use that to spin something and then you'll convert that to energy. Are you spinning up a flywheel which you then run a generator off? How do you make it work? How do you generate?

**MARK SWINNERTON:** I'll use a Tesla as an example. We use a regenerative electrical motor, which is essentially an electric motor that can behave as either a motor to winch, to wind up and consume electricity, or it can act as a generator as we break the descent of the mass. The mass, as you rightly point out, is attached to a cable, and the mass wants to drop. If we place it over a vertical mine shaft and let it go, it wants to drop very quickly. We don't let it happen. We control the descent of the mass. In doing that, we're effectively placing a magnet into the electric motor to retard the velocity. The consequence of that is it spits electrons off, and we can send those back to source. The technology can achieve quite high efficiency—in the order of 80 per cent efficiency of the energy.

**The Hon. WES FANG:** In relation to the mass itself, what's the break speed you can then drop it at?

**MARK SWINNERTON:** Standard mine winding technology around the world runs between five metres per second and 20 metres per second, and we are within that envelope. It depends on the precise mine and the precise conditions we are trying to achieve as to where we sit, but we're well within the normal operating bands of this equipment class.

**The Hon. WES FANG:** Let's say you're at the lower end and you're at five metres per second, what's the average depth of a mine shaft that you would potentially use?

**MARK SWINNERTON:** In the Hunter, the average is around 350 metres, and in the Illawarra it is closer to 500 metres. They're good examples of shafts. For context for Committee members, Sydney Tower is 300 metres tall. They're quite deep holes.

**The Hon. WES FANG:** Five metres a second is the rate that you're falling at and you have 500 metres, so you have about 100 seconds worth of power that you can generate. So it is just under two minutes of power from the top of the shaft to the bottom of the shaft.

**MARK SWINNERTON:** For a single mass, yes.

**The Hon. WES FANG:** To generate power for two minutes might be beneficial for extreme peaks, but once the mass is at the bottom you then need to obviously draw from the grid again to come back up—in the same way that you would using excess renewable energy loads. How many of these systems would you need to be able to power a grid over an hour? You'd need probably 30 at least.

**MARK SWINNERTON:** You're right in the proposition that if we considered a single weight moving through a mine shaft, even if it was a very large mass, it would not generate a meaningful amount of energy storage. It would potentially contribute to some grid stability, but it would be limited in its application. Our technology works through that issue by deploying many more than one mass. We move hundreds of masses in series. In doing that, we're able to generate a continuous impact to the grid either by charging—so taking away energy—or discharging, by placing it back to the grid. We're able to do that for several hours. In fact, the technology is suited for anywhere between four and 24 hours of continuous operation. So it can be deployed where required, depending on the grid need.

**The Hon. WES FANG:** How many shafts and systems do you effectively need to be a complete closed system that can operate either as a storage or production facility?

**MARK SWINNERTON:** We need either one quite wide one or two of medium diameter. It depends on how much space you have inside the shaft itself. There are many that are seven metres or eight metres wide and there are many that are four metres or five metres, so it depends. But usually there are no more than two. We can achieve continuous generation or continuous discharge from that kind of asset. To quickly add, many sites that we are working with have many more than two, so it is quite attractive to be able to deploy the technology within the boundaries of individual mines.

**The Hon. WES FANG:** How many operational systems are there across the world?

**MARK SWINNERTON:** There are no current operational systems. There are several large demonstration devices. We would say that Green Gravity is right at the forefront of this technology globally. Our next stage is full production demonstrations, which we are planning for next year.

**The Hon. WES FANG:** If you were able to access a site that had a 500 metre shaft and the ability to fit in the number of systems that you would require to be a fully-fledged closed-loop system, what would be the cost of a trial in order to test the real-world validity of your proposals?

**MARK SWINNERTON:** It's an excellent question. We currently have funding to proceed next year, and it is in the order of less than \$10 million to complete final development of the technology to full commercial readiness.

**The Hon. WES FANG:** In that trial, if you were able to access the grid and the like, how much power are you able to produce over a 24-hour period, provided you have been able to fully charge the system—like lift everything up? How much power can you deploy out of the system, do you expect?

**MARK SWINNERTON:** Our demonstration plans are for a system of around 300 kilowatts, but not a meaningful amount of storage capacity. But that's not the thing we're trying to test for; we're testing for physical operability in the mining environment and the mechanical system validation with the relevant mining and engineering parties. For a commercial system at sites in the Illawarra, the sizing is between five megawatts and 10 megawatts, with capacity between six and 12 storage hours.



**The CHAIR:** In terms of your submission, you talk about establishing a clear framework for post-mining land use assessments and a repurpose tender process. Could you explain a little bit more about why you're proposing that as an idea?

**MARK SWINNERTON:** Absolutely. We're engaged with around about 45 mining companies, both in Australia and outside of Australia, in many mine sites. A few of the observations we've made is that many mines have portions of land that are at final use or are, indeed, rehabilitated—even within a site that's not fully rehabilitated. Consequently, there is a clear opportunity to be able to take a portion of a site and see it transferred to project developers, whether that's energy projects like ours or otherwise.

One of the impediments we see to that right now is this question around whether the miner can satisfy the relinquishment obligations for that. There hasn't been a great history of it, although I do note that this morning's speakers identified some great examples that we can actually build on. We've seen that and we think the opportunity exists to take portions of those sites and move them immediately to greater use. In fact, even earlier in the process, before all the rehabilitation is completed, there's obviously an opportunity to reduce the spend on rehabilitation and improve the spend on preparing for future projects. We note that in Queensland there is a tender process right now for legacy sites to be brought to the market. That's in its infancy, but it is an interesting model that has been adopted there.

**The CHAIR:** That is interesting. In terms of mining assets remaining in care and maintenance, you mentioned developing public policy to cap the time; assets can remain in care and maintenance. How well perceived do you think that would be by the industry and, indeed, by the mining leaseholders?

**MARK SWINNERTON:** I think it would need to be received in combination with the question around relinquishment and pathways and certainty therein, and these are very interlinked. There are many reasons why sites will stay on care and maintenance for extended periods of time, but I would note that the longer they are in care and maintenance the more public benefit is being missed from repurposing opportunities on those. If the mining company was able to have more certainty about how that site could indeed be ultimately relinquished, I think that there would be an open conversation to be able to find the best use for that site—maybe that it should stay in care and maintenance waiting for the market to change or conditions and technology to change to extract more resource or maybe there are alternatives where, indeed, we can both still preserve the option on the resource and repurpose the asset to get greater public benefit in the near term.

**The CHAIR:** You talk about New South Wales Crown land in your submission and the potential for it to generate greater income for the State. What are you suggesting the Government look at in terms of New South Wales Crown land, particularly the mining leases there?

**MARK SWINNERTON:** In the first instance, there's an opportunity to lease some of these sites with the right provisions and work around how to manage liabilities and exposures. I think there are leasehold relationships and there may be sale or other opportunities. But what we have, fundamentally on the public balance sheet, is a large number of legacy mines, some of which require investment from the Government for ongoing rehabilitation and some of them are probably in the waiting lounge for that over time. We have this opportunity as our starting position and yet there are proponents, including us, that would be able to take advantage of some of those to be able to drive economic value, jobs and environmental outcomes in those regions. To that end, we think there is an opportunity for the Government to review those sites systematically and understand which ones could be released to the market.

**The CHAIR:** Your submission also talks about a shift that allows for partial rehabilitation to be recognised and introducing a phased release of bonds associated with the original mining activity. I'm curious to understand, given some of the evidence we've heard this morning, how that would work in practice. Some of these sites received a development consent 30 or 40 years ago and the size of their bonds may not reflect, in actual terms or in actual reality, what is required. Also, there is a narrative that there is a certain amount of flexibility under the current framework in terms of lodging a modification and having part of the site carved off.

**MARK SWINNERTON:** I think the two items brought together in your question include the question around whether the bonds are sufficient for the liabilities that are present as well as this question around carving out a component—potentially relinquishing it, but at least carving it out. We acknowledge that there are methods to be able to carve out. But the commercial reality for a miner is that, in carving it out, they're going to be considering what their ongoing liability is and how that's going to influence their statutory obligations and their long-term business needs at the site.

We think that, all things being equal, if there is a liability and bond, it is attached to different elements of remediation at the site; if, for example, we were to consider the mine shafts themselves at a site but not the tailings dam. We think it's reasonable to say that we should be able to carve out the area around the mine shafts

for greater repurposing benefit and if there were bonds attached to the repurposing or refurbishment of those, why wouldn't they want to be released? That is aside from the question about whether the overall bond is the right amount, and I think that's a separate issue to take up, potentially, if it exists.

**The CHAIR:** You talk about the clearer definition of land use changes being required. I wonder whether you have any suggestions for the Committee on how that could be achieved or what the implications of that would be.

**MARK SWINNERTON:** I think that we have a significant amount of work to do on the clean energy transition. There is a need to accelerate our work in the area of the energy transition, but in a way that is more beneficial to the environment and the communities so that we get this huge buy-in. I think the potential to create a characterisation that, where we have an ability to deploy projects that are clean energy enabling, we should think about giving those a special status and an ability to move more quickly through processes. That, to me, is in the public good. The miners who want to liberate the land for better use can be satisfied, the public interest can be satisfied, and the clean energy developers can get on with business and get the transition happening.

**The CHAIR:** You note that if GESS deployment was noted at the time of initial design of mine shafts, the cost and ease of future installation would be enhanced. What requirements does this technology need in terms of the actual shaft and the current legacy shafts that we have? Are they suitable?

**MARK SWINNERTON:** Many of the shafts are suitable and the requirements sit in a combination of geotechnical requirements and hydrology and, to some extent, the nature of the build and the monitoring capabilities. If we consider all of those requirements, some of those can be installed very cheaply early in a project at design phase of a shaft. We're sinking multiple mine shafts in New South Wales right now. If we were to simply set some additional minimum requirements around geotechnical stability at the time and about ability to close off ingress water at end of life and some of those things, I think we could see a really beneficial outcome.

**The CHAIR:** You also talk about the residual risk, which we have heard a bit about this morning, and suggest that we transition bond liabilities from the Mining Act to the planning Act as it would align the financial assurances with the new land use. What are the implications that you see for final rehabilitation requirements or, say, impacts of unforeseen subsidence on a proposal such as that?

**MARK SWINNERTON:** I think that there's always going to be some residual risk in these sites. If our baseline is, as today, that we want to achieve the lowest reasonable residual risk, that really entails no repurposing as it stands right now. If we were to lift the total value of these lands through repurposing activities, there should be a commensurate increase in risk tolerance around some of these final risk positions. Western Australia has a different method of dealing with mine liabilities and has a more socialised approach, for want of a better word, where there is a pooling of resources. I think New South Wales could consider a way to pool resources together and change the risk tolerance a little bit to get the greater value and find a way to then transfer these liabilities more easily. That can unlock projects more quickly.

**The CHAIR:** Tell me more about the Western Australian approach, if you like, in terms of pooling resources.

**MARK SWINNERTON:** There is a fee paid by mining companies—like a royalty-type fee—into a scheme that enables an overall discussion around managing rehabilitation, including for closed sites, actually. I noticed the CRC TiME made a submission to this—a very well-positioned submission. They are certainly experts in this area and spend a lot of time in WA. There are a number of models around the world. You've got Queensland bringing public sites from the public land forward, but in Western Australia it is a different scheme around pooling resources to try and treat what is a residual risk issue that may appear at some sites and not others. I think they're taking a different view on it.

**The CHAIR:** In terms of managing that residual risk, are there any other considerations you think the Committee should be aware of or any other examples, whether it's in our country or elsewhere in the world, of places that have done that well?

**MARK SWINNERTON:** It's an excellent question. We're certainly making inquiries in many countries. We're very active in Romania in central Europe, and now also in North America and South Asia. Each jurisdiction seems to have very different approaches to this. We have been informed that people see Canada as being one of the leading locations trying to think through modern architecture for managing the residual risk and liabilities. There are clearly not a lot of mature policies anywhere in the world that are able to quickly transition lands to greater use. That, I would say, is an opportunity for New South Wales as much as a difficulty. There is one thing for sure: New South Wales is viewed globally as one of the top jurisdictions for regulatory frameworks. It's tough but fair and at the upper end. To set the precedent will actually have a great opportunity globally at aligning people around mechanisms to be able to deal with these residual risks.

**The CHAIR:** One of the other things that the Committee heard about this morning to an extent was around the social impacts of mine closures. I noticed in one of your recommendations you suggest that we consider reforms to integrate social obligations and community engagement in mine closure plans. You talk about using independent bodies. I'm interested if you have engaged in any work to that extent or have any suggestions for us.

**MARK SWINNERTON:** We have. Even as a small company, we've put more than 1,000 hours into community engagement in our local area in the Illawarra already. We're a great believer that engaging the different stakeholders around a project like this can get us better outcomes. There is a huge opportunity to transfer jobs and skills from the current mines and from the rehabilitation activities into new technologies like what we're proposing with gravitational storage, and the kind of work types—maintaining equipment and the like—can really bring high-value-added skills into the region. We're a huge proponent of local-level engagement in the regions to be able to find the solutions.

**The CHAIR:** What has the community feedback been around the transition or the jobs that you're proposing?

**TANIA JONES:** One thing that we pride ourselves on is being that active community member. Even though we have only had our Gravity Lab, which is our R&D facility, up and running for 12 months, in that period of time we have brought through over 600 community members from Probus, Rotary, school groups and international trade groups. I think one of the things that is the consistent theme is that it's simple. People can see the concept and the repurpose. It talks to the heritage of much of our mining and manufacturing, but it also looks to the future in terms of, "Okay, I can see how it's going to spin that engine and that turbine a different way."

There are questions around environmentally what it's going to introduce, and there's the safety question around personnel, but predominantly they're factors that we're building into our design. The concept is one that people can understand. The other important thing that community engagement has reinforced is the importance of energy storage or firming as we transition across to renewables. There's not only the urgency in terms of looking at replacement energy forms but making sure we have the storage capability to provide that guaranteed and firm storage as stored energy.

**The CHAIR:** Obviously, mining is a temporary use of land. Gravitational energy storage systems would also be a temporary use of land. Who would take on the ongoing liability for that mine shaft?

**MARK SWINNERTON:** I think this has got to be case by case. In some cases here, we already have the mine shaft with a liability attached to it right now. In New South Wales, that's often to fill it in. In some jurisdictions, it's not to fill it in; it's just to put a cap on it. It depends. I think we need to look case by case to say there's an existing liability. We're not in the business of thinking people should be off the hook for their liabilities, but if that can be discharged in a more efficient way, then that's the right thing. If we were to move, for instance, the provisions from one entity to another, it may be that we need to also move financial resources and backing around that as well. That leaves you with a residual risk and uncertainty factor. We then need to look at what's the right level, how much should be State backed, how much should be backed by a conglomerate of all of the different holders of these sites and how much should be borne by the private proponents of projects.

**The CHAIR:** You talk about the technology using mechanical parts that can be manufactured in New South Wales. Are they currently manufactured in New South Wales?

**MARK SWINNERTON:** Some parts are. We're working with Sydney-based manufacturers right now who are supplying part of our components. Others are solely imported. Some of the technology goods are imported, and others can be manufactured here. We note and acknowledge the New South Wales Government's clean energy manufacturing program. That's certainly welcomed. We certainly think that's an area that we should continue to invest in to find the right subsets of manufacturing that can suit this country.

**The CHAIR:** Do you have any final remarks, clarifications or comments you wish to make for the Committee?

**MARK SWINNERTON:** No, thank you, Madam Chair.

**The CHAIR:** We really appreciate you taking the time to give evidence to the inquiry today and for your quite detailed submission. Thank you. For any additional questions or questions that were taken on notice, our Committee secretariat will be in touch with regards to the details of those.

**(The witnesses withdrew.)**

**(Short adjournment)**

**Mr CRAIG BAGNALL**, Director, Environment and Regulatory, SEATA Group, affirmed and examined

**Mr SCOTT FAIRBAIRN**, Director, Energy and Communications, SEATA Group, affirmed and examined

**Mr RUSS MARTIN**, Chief Executive Officer, Global Product Stewardship Council, affirmed and examined

**Mr ANTHONY REID**, Member and Technical Advisor, Global Product Stewardship Council, affirmed and examined

**The CHAIR:** Good afternoon and welcome to our next inquiry participants. Thank you so much for making the time to give evidence to our inquiry. Would any of you like to start by making an opening statement?

**RUSS MARTIN:** I will. Thank you, Madam Chair and members of the Committee. I head up the sustainability consultancy MS2, and I led development of the world's first biochar industry road map, detailing 10 initiatives to scale up the industry and supporting demonstrations to regenerate marginal or degraded land through production and use of biochar, including mine site rehabilitation. In full disclosure, I also chair the policy and regulatory working group for the Australian New Zealand Biochar Industry Group, although I'm not here today in that capacity. My colleagues have extensive experience in mining across land, water and energy. Thank you for the invitation to appear. The GlobalPSC supports broad interpretations and application of stewardship and circular economy principles, including those in our submission. We also support collaborative practical approaches between aligned industries and governments that draw from domestic and international best practice. We'd like to table for the Committee potential New South Wales regulatory reforms for improved circular economy and climate action in the land and primary industries sector using biochar. We look forward to today's discussions and are happy to provide additional information to the Committee as appropriate.

**Ms SUE HIGGINSON:** I'm just curious about whether you think there is a role for native vegetation to be used in the product stream of your products.

**CRAIG BAGNALL:** I'd be happy to take that one. It's a great question. Obviously the world is facing both biodiversity and deforestation threats. What we're looking for are ways to look at afforestation and to improve biodiversity. Like anything, there are always opportunities to look for improvements. What we're looking at with this particular technology, and this industry with biochar, is to look at using native species—for example, in mine rehabilitation—to build soil carbon and regenerate biomass crops for that purpose in a way that could be helping biodiversity at the same time.

For example, the NSW Department of Primary Industries Biomass For Bioenergy Project, which is doing wonderful work with cropping of native species that use very little water—rather than just leave land or soils degraded, we can start to pump carbon from the sky, put it back down in the ground where we need it and start to improve our soils, helping better outcomes for mine rehabilitation, which is more circular and regenerative. In the past, we've seen linear systems like combustion bioenergy, which is very different, so I'd like to make that point very clearly: that we see this as an advanced and different form. This is nothing like what we've seen for the last century where we've basically burnt vegetation. There are big opportunities right across Australia, not just New South Wales, for this to be used in that way rather than in a negative way.

**Ms SUE HIGGINSON:** Are pyrolysis processes used? Is there genuine confidence around those processes in terms of their emissions impacts?

**CRAIG BAGNALL:** That's a good question. We've actually got a very big range of different technologies. You've got everything that ranges from little kilns—biochar is nothing new. It's been practiced for thousands of years. All our Indigenous cultures—there's a very strong linkage with First Nations, including with our Indigenous groups here in Australia, through earth ovens and dating back thousands of years. We range all the way up, then, to commercial industrial-scale technologies. The emissions for these are well and truly world class. With our particular technology, we're at field-scale demonstration now and we're looking to go through testing. We're working closely with NSW EPA to go through a detailed testing program to validate that and meet the European class standards that are set by the NSW EPA.

**Ms SUE HIGGINSON:** My understanding is that the European standards are not necessarily accepted as being clean green or emissions-free processes, and that they've been interim steps in the process of trying to find carbon-neutral processes to generate these kinds of products. In terms of what we would do here in New South Wales for mine rehabilitation, what is your primary drive here? I see this idea that we're putting back into the land and we're building biomass, but why do you see the mine rehabilitation space as a space for your industry or your sector to benefit from this area?

**CRAIG BAGNALL:** I've spent nearly 30 years working in mining—solid waste management a little bit as well, but primarily in the mining sector. I've worked with mining rehab companies and with an ecology

company for a long time, and I've seen the limitations. We take soils that have been down at depth and bring them up to the surface. We have topsoil deficits in some cases, particularly in our western mines. It's difficult to get soils that can have high carbon content to battle some of the challenges for erosion, sediment control and revegetation. There's a real opportunity.

I've got two young children, too, and I'm very much passionate about climate change. I'm looking at this and going, "This is a chance to actually bring and do good with a technology and an area that I've looked into." I've looked at the challenges with it, too—and there are. We're not here as silver bullet salesmen. This is an industry that is growing globally and has certifications and standards to make sure we meet not just the emissions standards but also the fit-for-purpose quality of the biochar: some things can be used for soils and other things can even go into feed grade at premium grade. There are people researching methane reduction of agriculture with this. As you know, with mine rehabilitation, we're seeing a lot of land go back to both agricultural purposes, primarily grazing in that area, but then also native species. Of course, we can have areas where we need to lock that up and we want to try to re-create endangered ecological communities.

Then there are other areas where we can put these areas of mosaics in, and I'd like to table a couple of things. I've brought with me copies of the NSW Department of Primary Industries Biomass for Bioenergy Project. There are some photos in there that show their Trangie site out near Dubbo. In a three-year trial, they've managed to take very degraded land and, at about 2,000 stems per hectare, they start to try to generate these native tree species out there. While I was there, there is wildlife coming in. They're seeing both reptile and bird life coming in there. If you're managing the land in a mosaic, you can start to rotate this and use that as a genuine upward system to reverse land degradation.

**Ms SUE HIGGINSON:** I've seen this. I've been there.

**CRAIG BAGNALL:** I wouldn't mind tabling, too—our system is something that's hard to visualise and pictures tell a thousand words. There's one page here that shows what we're trying to do with our technology, which is take these feed stocks and break them down into carbon and hydrogen as a gas form of energy where we can separate those and then also solid carbon as biochar. The economics of this is a step-change from what we've seen in the past. If there are those that have heard about biochar in the past, it's been researched for a number of decades. There has been R&D put into it from the Federal Government. The benefits of all that research are now emerging with multiple companies nationally, with Australia leading the research and NSW DPI having the longest field trials for biochar on the planet here in New South Wales.

**Ms SUE HIGGINSON:** Just looking at the diagram, the end-of-life plastics residues, are there technologies that are working on how to overcome PFAS and those kind of very difficult—

**CRAIG BAGNALL:** Absolutely.

**Ms SUE HIGGINSON:** There are?

**CRAIG BAGNALL:** Obviously, being the technology provider, the water utilities—one of the things we put in our submission is that the WSAA, the Water Services Association of Australia, has just put a submission up to the Circular Economy Ministerial Advisory Group to Minister Plibersek regarding the benefits of both circular economy and dealing with emerging contaminants. The water industry is facing significant challenges with biosolids through both microplastics and PFAS and halogenated issues. What we're finding with thermal treatment is that it can deconstruct that safely and manage it through gas form after that. The solid that's left out, you've got your phosphorous to go back to land safely. Three EPAs in Europe have now approved biosolids to provide biochar specifically to go back into agriculture into the food chain. As you know, water utilities here are often looking at mine rehabilitation. It really is a chance to take it truly circular in a safe way without having any issues through these type of emerging contaminants.

**RUSS MARTIN:** If I may add, one of the things that we've been looking at for a while is decentralising sources of feedstocks and the usual idea of seeing waste as resources instead. There is great potential for decentralising technology pyrolysis and gasification across various technology types in different uses. Specifically, you could have water treatment plants, for example, being a hub of a regional development that would address PFAS, microplastics and co-feed with other feedstocks from other uses in the area and going into a range of non-soil applications such as industrial filters, water filters et cetera. PFAS and microplastics could actually be a driver for a range of other circular economy initiatives and regional development.

**SCOTT FAIRBAIRN:** I was going to say that SEATA has had quite a bit of detailed experience back in 2019 where we made submissions to the Federal Government, and also the Department of Defence, with various parties in there. They were looking to do some trials on contaminated soils. We have had some data that has been conducted through our test plant where we've done various parts for mean testing, and we've got some results out of that. We saw that, as a group, as an opportunity to potentially support the local landholders that were going

through some of those challenges in their property with contaminated lands and contaminated soils. We said that this is a large issue, not just around the RAAF bases. We know it's on most airports, and it's on most major industrial sites with power generation assets.

This is something that's not going to go away. If you see the class action over in the States with what's happened there, I think it's a much bigger problem that we need to think a bit more outside the box to solve. I think we do have a solution to that. I think the challenges at the time were both regulatory and political, in other words. Unfortunately, we were an emerging technology. We are a lot more further advanced than we were five years ago. We've been working closely with those stakeholders. We work closely with, out of Canberra, the department of energy and environment. They're well aware of some of the outcomes that the plant back then could achieve. We're now more aware, five years on, of what that can solve as pain points.

**Ms SUE HIGGINSON:** Have you realistically modelled the competition for biomass and where you think this goes? I can hear the pitch—that you see this as this great thing. Realistically, what tools have you looked at specifically for New South Wales?

**CRAIG BAGNALL:** Gee whiz, I'm going to give another plug to the DPI here—they're doing some great work in this space.

**The Hon. WES FANG:** Well they did until they were gutted.

**CRAIG BAGNALL:** There are over 22 million tonnes of biomass residue in the State, dominated mainly by wheat straw, and some other agricultural residues. There is high potential for that, particularly in those rural and regional areas. This is where there is a really good synergy. Whilst we sit here for mine rehab, this is a sector that crosses over into regional New South Wales for other areas.

**Ms SUE HIGGINSON:** Particularly ag?

**CRAIG BAGNALL:** Particularly ag. DPI has actually brought out a smart tool for biomass looking to help from a GIS-based system to look at those residues. We look at that. Also looking at it from a national level, I should declare in open and full disclosure that I am also on the executive board of the Australia New Zealand Biochar Industry Group as well. I am obviously looking at speaking to industry there, but I'm not here on their behalf.

**The Hon. WES FANG:** You had me right up until you said New Zealand.

**Ms SUE HIGGINSON:** It's okay. We can hear very clearly in your submissions that—

**CRAIG BAGNALL:** You can see it in there.

**Ms SUE HIGGINSON:** Yes.

**CRAIG BAGNALL:** To go to that, one of the IPCC lead authors looking at carbon dioxide removal who is very pro-biochar is based here in Australia and works with DPI—there's another link there. They have looked at the global food security issue. This issue of biomass and food security is a real key one. Again, this is where there's a big difference between last century and the burning of material which is linear and can threaten food security.

**Ms SUE HIGGINSON:** We're still burning cane in the Northern Rivers.

**CRAIG BAGNALL:** Absolutely. We should be using those residues instead of just burning it. We can get it here into circular waste to energy rather than linear. One of the things we've proposed, in terms of a recommendation from a regulatory perspective, is to decouple in the waste hierarchy linear waste to energy—combustion—from circular and regenerative waste of energy systems like this that can actually upcycle and improve our environment rather than degrade it. Globally, the estimate from the IPCC is up to 6.6 billion tonnes of carbon removal without competing with land for food production. When you actually look at the studies—there's been a lot of meta-analyses on this—we're seeing that we can enhance food production. We're seeing increases in yields. I'd rather call it circular carbon than biochar, really. Carbon is the basis of everything. It's our building block for life. If we can get that back into our soils in the right format to hold and build soil carbon, we can see benefits to vegetation and therefore yields from that.

**RUSS MARTIN:** To put that into perspective, the amount of carbon drawdown that Craig was referring to is equivalent to the US's annual emissions from CO<sub>2</sub>. The extent of carbon drawdown available through biochar globally is equivalent to the US's annual emissions as the world's second largest CO<sub>2</sub> emitter.

**Ms SUE HIGGINSON:** But you're still talking about the pyrolysis process to generate that. I understand and go down the path, but then come back to this processing that we do undertake. Whilst it may not appear to be so clearly the combustion process, there is something in there that I feel is a bit of a dark magic to many. If you

could extrapolate on that, I'd love your views. My final question is about your vision for these projects and processes and their use in the post-mining space in New South Wales. Is it actually about looking towards that kind of agricultural post-land use ultimately? That's where this takes us. There are two things in there, if you wouldn't mind addressing them.

**SCOTT FAIRBAIRN:** I suppose that I'll take the first question on.

**Ms SUE HIGGINSON:** The dark magic?

**SCOTT FAIRBAIRN:** Yes, in regards to what we're looking to achieve out of the scaling of the technology. From that perspective—from an energy point of view and from a land use point of view of rehabilitating the mines—we're looking to work with both the mining and the agricultural sector hand in hand, once those mines have been rehabilitated, to allow for those lands to be brought back to a state where they can be utilised for other activities. The mines are very on board with a lot of these areas because of their current liabilities on the balance sheet with closures imminent, and assets that are currently sitting on their balance sheets that they need to repurpose. I think there are some opportunities for the mining companies to also take part in this proactively, and they're open to doing that. From an energy point of view, we want to try and work with all the agriculture uses to get the energy back into the crops and to put the carbon back in the soil—cropping that allows for energy cropping in a regenerative way.

As Craig said, it's important for us as our population expands to produce more fertile soil that allows us to produce more cropping, more food security and also some biodiversity opportunities around that. From a scaling point of view, we've worked very closely with the EPA for them to understand where we're at and the steps we are taking. We've gone to them in a very proactive way up-front. That's been done very deliberately for the reason that we want them to understand the steps that we need to take for someone to be best practice. That's where we want to try and end up being—basically, best practice globally. To do that, we've needed to go through and work with the regulators which are working with the framework and policies. Probably some of the policy documents are quite old and need some reform, that they've been working closely with. We have actively sought, step by step, to take them through this journey as we expand. I might hand over the next bit to Craig.

**CRAIG BAGNALL:** Just to go back to your question, I remember the first time I heard about biochar and I was like, "What's this about?" Like you said, it's a bit of a dark art. It's not well known—that's one of the biggest issues facing this industry. You'll see in the industry road map that's come out, the number one initiative that we want to execute first is education awareness to deal with "What is it?" As we said, it's always been around. Instead of full combustion, if you limit oxygen and constrain it to no oxygen, carbon doesn't convert to CO<sub>2</sub>. You don't get oxidation up to CO<sub>2</sub> and you'll have more solid carbon. With these advanced systems, the gas that comes out is called a synthetic gas. It's a mixture of carbon monoxide and hydrogen, primarily, with a few other minor gases in there. Whereas, when you combust, you get CO<sub>2</sub> and you get heat.

At the moment, we try to make power with that heat by boiling water to run turbines. You end up with about one-third of your energy efficiency because of how much energy it takes to boil water and to run through that at industrial scale. If you take a fuel gas like syngas—that's not just CO<sub>2</sub>; it has the hydrocarbons in there—you can either split it into hydrogen, as we're hoping to do, or you can burn that if you have a high-concentrated syngas. You can then run it straight to a gas engine and you are looking at 50 per cent energy efficiency. Straightaway you're leaping from conventional bioenergy that you might see in Europe where people are just combusting it and trying to make power. We can do more with less; we can make power and we can have drawdown as well. Drawdown is carbon dioxide removal—taking it out of the sky with nature.

**Ms SUE HIGGINSON:** What trees do?

**CRAIG BAGNALL:** What trees do, exactly.

**Ms SUE HIGGINSON:** It's incredible stuff, isn't it?

**CRAIG BAGNALL:** And that's the way we should be doing it. This is about planting trees and turbocharging nature. We're getting it back in the soil, growing more trees and doing that in a positive upward cycle rather than just down. The biochar is what happens. That's the solid carbon. This is not a great analogy but it's probably something that, certainly, I've test on my kids; when you do a camp fire and sometimes you see the black charcoals left rather than the white ash, white ash is the minerals you see at the end when you have combustion. If you go to full combustion, you'll have nothing left but white ash. When you have charcoals left, that's the solid carbon. That's char. It's like a sponge under a microscope. It has a very high surface area, almost the size of a house per gram. It's very, very high in its surface area. That is what is providing the microbes and all of the nutrients and the water-holding capacity in the soil when we get it back down. It's how nature works. When you have cool temperature burns, Indigenous burns, you start to see more charcoal forming rather than combustion.

**Ms SUE HIGGINSON:** So we're still talking about burning, but not at that temperature?

**CRAIG BAGNALL:** No, it's constraining. It's limiting oxygen.

**RUSS MARTIN:** One key difference, though, is that with biochar you have the carbon going into the char rather than up in the air. So especially if you combine that with mechanical harvesting or processing of the residues, say with agricultural residues instead of burning them, then you are taking the carbon and actually putting it back in the soil. One of the benefits of biochar is sequestering that carbon for hundreds and thousands of years. There is a much longer sequestration that you are drawing into that. A number of the technologies that we see, including SEATA's, are actually carbon-negative technologies. They are negative emissions technologies.

**Ms SUE HIGGINSON:** Where do I find those? Where do I look to find evidence of those technologies?

**CRAIG BAGNALL:** I might take this on notice. I have actually done a few talks. As we're starting to roll out the road map nationally, we've been giving State-based forums to do this. I have been giving some talks on the Australian technologies, so I could provide that through to the Committee, if you'd like to see it?

**The CHAIR:** Yes.

**Ms SUE HIGGINSON:** That would be so good, if you could, please.

**CRAIG BAGNALL:** And the wide range—everything from the little kilns that Landcare groups can use to deal with lantana and weed management, all the way up to these industrial-scale technologies like what we're developing.

**ANTHONY REID:** Just to mention, the winner of the national award for commercial use of biochar is actually a company that's involved in rehabilitation on mine sites, replacing bitumen fossil fuel carbons with a biochar in their spray grass rehabilitation. Obviously, there can be growing the biomass for biochar, but also uses of the biochar in the rehabilitation.

**Ms SUE HIGGINSON:** There is one in my region up north, as well, who has been exploring it. I have used some product on my farm—so, there you go.

**ANTHONY REID:** A biochar believer?

**Ms SUE HIGGINSON:** No, I'm definitely not.

**The CHAIR:** It's very interesting.

**Ms SUE HIGGINSON:** I could go on for hours. I won't. You don't have some vision of filling all these final voids full of biochar, do you?

**CRAIG BAGNALL:** No.

**SCOTT FAIRBAIRN:** No.

**ANTHONY REID:** No.

**Ms SUE HIGGINSON:** I was joking. In terms of this versus, say, a compost process, have you ever considered—

**CRAIG BAGNALL:** Absolutely. Whilst I'm not here to speak on behalf of it, the Australia New Zealand Biochar Industry Group has just signed a memorandum of understanding with AORA, the peak body for the composting sector. They're synergistic. By putting biochar in compost—and there are a number of companies nationally doing this, including here in New South Wales—they can reduce their turnover time for the compost, and they can reduce their emissions with it as well. Even though it's not an industry that has to report its emissions, they can lower that. They can get better yields, better quality compost, by having the char in amongst it. There are whole webinars on all this stuff. It's a bit of a deep dive into this to go further, but they're very synergistic.

They're not competitive with each other. Indeed, the compost sector also has issues with dealing with oversize. Depending on different facilities, 10 to 20 per cent of what comes in might not be able to go through in the composting system. At the moment, that's going to landfill. Also, in that it might have stuff like plastics and PFAS and things like that too. The thermal treatment systems that can safely manage that are complementary. Certainly, the ones that don't have plastic and things like that in there, you're making a higher quality product that is good to go back into soils. If it does have that in there, we would expect that possibly to go towards an industrial-grade char that might end up in roads or concrete, and bioplastics. There is a whole range of things. Big companies like BMW, Audi and Mercedes Benz overseas are partnering with this to look at making materials out of it. It's not just about soils. Of course, soils is where the highest order use is, though. We put our best product into that.



**SCOTT FAIRBAIRN:** And there are other industrial uses, like Craig just said, in cement, steel, reducing emissions. The industry is in talks with those companies now, because they're looking at replacing existing commodities, or blending, to get a better outcome from an emissions profile point of view. Just to your question, Sue, the step change in the technology around what that black box we talked about is, that our inventor or designer came up with, was quite clear. We get a lot of our outputs by heating internally with a catalyst. That's very different than a lot of the other gasification and pyrolysis plants in the past.

He has been able to reverse-engineer a technology that's probably hundreds of years old. Because he's worked in the industry before, he understands where the bottlenecks are. He's been able to take those bottlenecks out, process by process, improve the process, and that's why we get our efficiencies where we are today. We talk about the different stages that we're at, and that's why we're very comfortable to say that we'll be able to scale, as the next steps. But we want to work with the regulators and the end users, plus the relevant government, be it State or Federal, so that it's part of solving a pain point going forward, across multiple sectors.

**CRAIG BAGNALL:** To go back to you, Ms Higginson, it's very common to see this. There is a fantastic paper that looked at four decades of research, led out of here in Australia but globally, that did a meta-analysis on biochar. The heading would probably lend itself to what you said; it's "How biochar works, and when it doesn't". That is because different chars are for different soils. It's not a case of just putting it in. Often, a lot of the stuff that didn't work was when they just made the char and it acts like an activated carbon, like a sponge, and sucks everything out of the soil. But if you charge it first and work with, say, a compost tea and leachate and things like that to charge it with nutrients, it will release. It has a very high cation exchange capacity.

There are a number of scientific factors I can go through about why it works, but it's basically about making sure that what you put into your soil matches what you want to do with it. You start with your soil constraint and then you work back to match the char to go with it. Most of the research where it failed in the past, globally, was where they didn't do that. Normally now where they are doing it, they are finding that it's all working very well. Like always, research eventually comes up with—the science reaches a point where they know how to do it and get the good results through repetition. That's where it's up to globally.

**Ms SUE HIGGINSON:** You accept there is still quite a bit of suspicion, particularly from the enviro, climate conservation sector, that scepticism around is this another—

**CRAIG BAGNALL:** Another way to burn trees.

**Ms SUE HIGGINSON:** —like the waste-to-energy process? Is this just another way of having a system that you can feed something in, and churn something out, and work needs to happen around that?

**RUSS MARTIN:** There is also a lot of old information that is the basis for a lot of that. I've seen so many developments, even in the past 18 months, probably. Where, in some cases, it's hard to keep up with the emerging technologies and uses. One of the things that we've laid out in the principles that we've provided to the Committee, is adopting these more circular approaches. Many views have not been considering that properly to date. We think a lot of the potential for addressing past conceptions and undertaking new research are in these more circular approaches. Post-mining could be applicable for broadscale trials. It is one of the reasons we highlighted that in the biochar industry roadmap. Moving forward is because of potential and things like mining.

**Ms SUE HIGGINSON:** There would need to be strict governance, integrity, guidelines, frameworks, systems?

**RUSS MARTIN:** Robust trials, systematic approaches.

**CRAIG BAGNALL:** Correct.

**RUSS MARTIN:** Consistent methodologies, appropriate data collection, rigorous process et cetera, and we've advocated for those.

**CRAIG BAGNALL:** The industry is not seeking to be seen in any way as being out there to chop down forests. It would make no sense to be chopping down forests to satisfy the climate.

**Ms SUE HIGGINSON:** Would you put out a statement to that effect? Tell the Government, perhaps, they should stop doing that too? That could be good for your corporate governance. There is no intent of that kind of—

**CRAIG BAGNALL:** No. It's about dealing with those wastes.

**The Hon. WES FANG:** Don't fall for her trap.

**The CHAIR:** Order!

**RUSS MARTIN:** In fact, there's over 22 million tonnes of agricultural residues, over a million tonnes of forestry residues just up in the north-east New South Wales region alone. There is a lot of biomass looking for homes.

**Ms SUE HIGGINSON:** We have no forest residues up there. I tell you, it's a myth; there's none. It should all be going back into the ground.

**The Hon. WES FANG:** We're trying to make more—a lot more.

**The CHAIR:** Order! We are now straying outside the terms of reference.

**The Hon. WES FANG:** She was outside the terms of reference.

**Ms SUE HIGGINSON:** It is interesting. I've finished; I've hogged all the time, and I'm sorry.

**The CHAIR:** It has been very interesting. I was happy to let it continue.

**Ms SUE HIGGINSON:** We have finished where I started. If this was some way of sweeping the environment for these kinds of products that need to be reused and circular, then there has to be a kind of cut off and limit. Coming from that biodiversity, natural system and ecosystem function, we can't keep taking out of natural systems. We've got a bit of a biodiversity crisis. I know a lot of people don't realise it, but we actually have.

**RUSS MARTIN:** There is a lot of work to be done, but also policy development on things like higher order use. It is enshrined in various regulations and policies, but there is usually very little guidance. For example, the EPA, when they consider higher order use under resource recovery, they are really just thinking, "40-plus-year-old waste hierarchy". We're talking about circular approaches and using various items as co-feedstocks. There is a very wide variety of co-feedstocks that can be used to produce biochar and that can be tailored to the local needs. Again, there is potential for a lot of regional development and job creation through using local resources that would otherwise be considered waste or may be difficult to manage—expensive to manage—then using those to produce new products, a range of bioproducts and build more resilient local communities. The potential for that is huge. It just requires looking at it a little bit differently.

**CRAIG BAGNALL:** Let's bring it back to you've got the wonderful environmental side to it, but it comes with jobs—green jobs—in regional and rural areas. The transition from mining, the skill base can be brought across at both blue collar, right through to advanced training people, across into this industry quite well. It's a great opportunity for the regions. I come from the Hunter. I've grown up in that sector. I've seen what it's done, but I can see where the transition needs to go. There is a really good opportunity here for providing this balance between the environmental side, but also looking at the economics of it. We can make the sum of the parts be worth more than the whole, and we can do it in a better way. That's pretty well what we are here to say today. We've got a technology that's doing that. There are others out there, too, that do it in different ways. But it can be regulated in a better way to do this. Looking at the outcomes, what is it that New South Wales wants? Not be prescriptive in our regulation but more outcomes-based and allow—we heard some of the earlier testimony—flexibility for innovation to allow the outcome you want, and to let industry drive it.

**SCOTT FAIRBAIRN:** The other thing I would say is along with the education program that has got to be rolled out, it's the opportunity to create advanced manufacturing. Bespoke opportunities here in New South Wales but also federally. That engages different types of outcomes. Both TAFEs and universities. Also, it allows for skills and assets that are on some of these regional sites to be repurposed and re-used; maintaining and even growing the jobs in these regional areas. There is already the reses that are out in the regional areas. It just increases those opportunities for a different type of employment which complements a lot of those renewable energy zones.

**The Hon. WES FANG:** I have read your submission. It's interesting and puts forward a lot of concepts and ideas. Before I get to the submission, I'm just trying to understand the relationships. Mr Martin, GlobalPSC, what is it? How was it formed? Where is it based? What is its function?

**RUSS MARTIN:** I formed the GlobalPSC back in 2010 with a colleague from the UK, David Perchard. We had both been active in issues like container deposits and packaging recycling, a lot of material use issues. We had gotten fed up about the level of debate involved. A lot of times you'd have extremes fighting, when the truth was really somewhere in the middle. There was a lot of misinformation about, say, overseas programs. What I wanted to do was try and understand the different circumstances under which different stewardship and producer responsibilities schemes work most effectively.

You'd have somebody saying, "Oh, this is perfect in Denmark. We should just do it here." We're going, "Well, does it work in Denmark?" There are circumstances there that we don't have here. Maybe there is something better for our jurisdiction. That was kind of the rationale. Then we worked with various recycling producer

responsibility and primary use groups over the years, and governments at Federal, State and local and provincial levels, to better understand the lessons from international programs—not as advocates or activists on issues, but to say, "What are the circumstances under which these different stewardship schemes can work?", or, "Where are they most cost effective? How can we have more circular approaches?" Part of that is taking a more encompassing view of stewardship and product stewardship than saying, "You're going to set up an organisation to recycle a material."

**The Hon. WES FANG:** Would it be fair to say then that it's more of an analysis organisation, like a desktop analysis, looking at different studies from across the world? You're not, in effect, the testing and the implementation—more of a scientific organisation that tests through experimental analysis?

**RUSS MARTIN:** A lot of the issues that we're active on aren't necessarily best covered through academic studies, for example. There are over 400 producer responsibility organisations globally, and we work with them on practical insights. How do you reach consumers? How do you get people to bring items back through a collection program? We've worked with the pharmaceutical industry to look at how you have responsible health care, for example. How can producers make it better for people and deal with things like end-of-use drugs or used needles and things like that. It is basically saying, if you're putting a product on the market, you have some degree of responsibility for minimising the impacts.

**The Hon. WES FANG:** What I am trying to understand is, obviously, there is a lot of analysis in relation to the biochar submission that is before us, but who is it that does the scientific testing so that I can say that field A is better than field B, and field A has biochar introduced into it but field B does not? How is that assessed? How can we measure success? Who does that measurement? If it is not GlobalPSC, is it SEATA that does it as the more mechanical-type nuts and bolts?

**CRAIG BAGNALL:** Who is doing the validation?

**The Hon. WES FANG:** How do you measure success in this? How are you able to tell us that the submission has been proven, and how are you going to scale it up in the future?

**RUSS MARTIN:** Craig can go into more detail on the academic—we work very closely with the academic community on testing on that. GlobalPSC is more of a think tank and facilitator of these efforts, and we work with people doing these approaches on a practical, local level. We work with the people actually getting things done.

**The Hon. WES FANG:** Before I go to that, I have got some more questions. As a think tank, how are you funded? How do you continue to operate and then continue to do the work that you do? There must be some mechanism of funding. There must be some continual study and work program that the organisation does, even if it is a not-for-profit?

**RUSS MARTIN:** It is on the smell of an oily rag usually.

**The Hon. WES FANG:** Mr Reid must love the sound of that!

**RUSS MARTIN:** We do have membership benefits and members join us. We also have a discounted rate on project work for members. We do a range of applied research projects that include desktop studies, reviewing different stewardship programs or issues and developing policy positions on those, but we also have done a series of international stewardship forums to bring people together. In the past we had done an international product stewardship summit in Sydney in 2010, an international stewardship forum in Sydney in 2018 and an event in Paris in 2019. The Australian forums received some funding from the Commonwealth but, ultimately, we had an even split between government and industry groups on our funding sources for those, and then we make a small profit off registrations. We try and have sponsorships cover the bulk of the events and then charge lower registrations.

**The Hon. WES FANG:** Is SEATA a member of your organisation?

**RUSS MARTIN:** We hope they will be soon.

**CRAIG BAGNALL:** Not yet. We are obviously an emerging company.

**The Hon. WES FANG:** So you are freeloading at the moment.

**RUSS MARTIN:** We work closely together in a lot of ways.

**CRAIG BAGNALL:** There are obviously synergies there, but we're still an emerging company. We are a pilot. We're totally self-funded. We haven't had any government funding yet. It is not an easy way to go through, but we have managed to get through the field pilot, which you can see in some of the submissions there. It has been a good achievement to where we've got to now. It's taken some time.

**The Hon. WES FANG:** In relation to scaling—I imagine that is where you were going to—what is the next stage in trying to prove the concept?

**CRAIG BAGNALL:** When you're developing something that's next level, obviously, you've got to be able to walk the talk, so we've developed this demonstration centre in Glen Innes and, for a good reason. The land there is owned by our technology developer who, apart from being a world-renowned process engineer, is also a fifth-generation farmer. So he's very much mindful of the source. That's why it is there. That demonstration plant is set up so that we can take feedstocks to that site. We have got a number of what we call clean feedstock. We're not allowed to take plastics and things like that there, but we can deal with PFAS contaminated materials. We can take agricultural residues and things like that there and do testing and, by doing that, validate a commercial-scale deployment. What we're doing is de-risking investment for industrial-scale take-up, and we then want to try and get our first commercial plant out that way. Basically, the data from it can feed into both approvals but also into bankable feasibility to basically enable investment to go to that scale.

**The Hon. WES FANG:** I guess the next stage for your organisation would be investment into a scalable plant and then further distribution and rollout of biochar into different processes and different products.

**SCOTT FAIRBAIRN:** Correct.

**The Hon. WES FANG:** Where would you consider would be the likely or ideal location? I imagine it would have something to do with former mining or land that has been formerly mined. Why is that more beneficial to you than, say, just a greenfield site?

**SCOTT FAIRBAIRN:** To go back to your previous questions around analysis as well, as Craig said, we do have a laboratory on site where we do our own testing, but we also send material offsite to registered laboratories to do the testing independent of SEATA to be able to measure that. We've done that through our batch tests, and as we are moving through the scale we will continue to do that. Most of our clients that are looking to either take a plant or take agreement from the plant, that's the measurement of how we are going to go forward—so independent testing.

In regards to scaling and whether it's a mining or whether it's a landfill or, potentially, whether it is an industrial site or a rural site, we're looking at potential opportunities right now, working with clients that have a need in either biochar or our other products for offtake agreements. Those offtake agreements will allow us to go with some confidence to either a funder, or they may want to participate in the end outcome. We're actively working with a range of different clients—not just mining, but mining is one of them—across many different sectors, because hard-to-decarbonise industries are looking for solutions, and we bring a solution to the table, albeit not at that scale yet, but our next step is to get them to have the confidence for us to be able to scale up.

**Ms SUE HIGGINSON:** Are these your other products, when you say biochar or other products?

**CRAIG BAGNALL:** Syngas.

**Ms SUE HIGGINSON:** Syngas is the product.

**CRAIG BAGNALL:** Whether they want to use that for energy or whether they want to then make things out of it, once you've got syngas, it is like Lego building blocks of chemicals to make either green chemicals or biofuels, or you can make it into hydrogen and CO<sub>2</sub>. If you do it the way that we've illustrated there, you're looking at the potential for it to become a very significant drawdown machine which allows transition. Just to come back to that thing about testing, I guess, as an industry, beyond SEATA—if I take my SEATA hat off and just think of it as an industry—there is extensive research globally. It is one of the most researched soil sciences on the planet now. There are over 3,000 peer-reviewed papers coming out annually. It's more than what most people can keep up with in the science. There are over 30,000 papers out globally on this. There is very significant research, and it is because it is carbon and carbon is used for so many things. So, obviously, our technology can be used to deal with scope one and scope two directly, but once you then take that biochar and use it in materials or in products, you can start to look at the supply chain and start to decarbonise supply chains through scope three as well.

**The Hon. WES FANG:** See, Sue, we can sell it.

**CRAIG BAGNALL:** So that's a very significant thing. Testing becomes, both at an individual product level all the way through to research—there are a number of different organisations out there that answer that question. We are looking at industries for certification. There's a whole stack of things—meetings with Standards Australia and all kinds of things that are moving in that direction to give confidence both to regulators and to the community that it is safe and fit for purpose.

**The CHAIR:** Just before we finish up, this has been a very insightful session. Thank you for the evidence you've given. As someone who also lives in the Hunter and has two small children, I care very deeply about the future of our area also. You've provided this helpful diagram that I really like. What is the cost of setting up one of these?

**CRAIG BAGNALL:** It depends on size. Our pilot is a 300 kilo an hour—it's in approvals, but it can go to half a tonne an hour. We are looking to go to 10 times scale up in the first jump to a five tonne an hour plant. Because of the multiple products, it's actually got a payback of less than five years. So it's going to cost more up-front, but it pays back quickly because you're not just producing one thing out of it. It is not just making, say, biochar; it's not just a biochar machine. They're typically, for a five tonne an hour plant, of the order of about \$15 million to \$20 million, but it depends—like I said, it pays back quickly because if you're making hydrogen or something like that with it, you've got high value outputs to return on that very quickly. It gets cheaper as it gets bigger, so our next jump is another nearly 10 times jump again to go to large scale. We're hoping to be able to replace incinerators in the future and stop last century combustion and start doing stuff in a more circular manner.

**The CHAIR:** When you say five tonne an hour, is that how much you're putting in?

**CRAIG BAGNALL:** That's indeed, yes.

**The CHAIR:** How much will that then produce? What's the end product?

**CRAIG BAGNALL:** Typically up to about one-third of that is coming down into solid char by mass, and about half the carbon in by mass is reporting into that char, about one-third by mass in total. The other two-thirds is going up into the syngas. Of that gas with us, because of the way we've designed it, you're getting about half of that, by volume, is hydrogen, and by mass, of course, carbon monoxide, because of its weight, is dominating. We can shift that into food and medical grade CO<sub>2</sub>, which currently all of our beer and beverages in this country are coming from a by-product of making—from fossil gas into fertiliser. Of course, if we can take that from a biogenic source, we can start to displace that as well.

**The CHAIR:** There you go. That's a very interesting concept.

**CRAIG BAGNALL:** So you could have a green beer. You could have a beer at the pub and a conscience.

**The CHAIR:** I'm sure there's quite a market for that. The "many other derivatives" column that you talk about—hydrogen, food and medical grade CO<sub>2</sub>—what are the many other derivatives?

**SCOTT FAIRBAIRN:** I'll answer one of those. One of the other outputs that we get from the plant—obviously, still with the char and syngas; there are bolt-on applications that go at the back end of our plant that are already in operation elsewhere—is sustainable aviation fuel, or SAF, and biomethanol that has been talked about. Those fuels are able to be utilised or operated through the process that we have, with an additional cost, obviously. Part of the scaling will be—that's why we're looking across industry, not just ag and mining. We're looking across industry because there are different drivers and different industries that require different outcomes and solutions. Those opportunities will exist and, as we scale, we feel that some of those—depending on what the offtakes are and who those clients may be, they may be some of the people who want to be a part of the action as we scale. For instance, someone like Qantas potentially could be someone that—they're looking to mitigate their emissions through the use of sustainable aviation fuel.

There are many other applications. It comes back to the level of offtakers and what their drivers are, both from a corporate perspective—whether they're an Australian-based company or a global-based company trying to look at their emissions profile and how they can reduce that while participating in a technology that's advanced and been de-risked. As Craig said, we have done all the heavy lifting to date. We've got it to this stage, but we now need participation from other people outside to help work with those ethical companies to deliver the outcomes.

**Ms SUE HIGGINSON:** Do you think that some of the lands, the mines of New South Wales and the post-mining land use should be systems to create energy?

**SCOTT FAIRBAIRN:** We'd like to think that they would be a participant. We would hope—and we've had some dialogue with mining companies to date, who can see the benefits of what we bring, because ultimately mining companies are a commodity-based business and what we potentially offer is a change of commodity or an opportunity for them to reuse their land, their infrastructure and then also redevelop their people. We see that as a great opportunity for the mining sector, as we do for agriculture and some of the other sectors that will potentially emerge over the next five to 10 years.

**Ms SUE HIGGINSON:** But if it is bio for energy, then that's where you no longer get your zero emissions. That's just not the case.

**CRAIG BAGNALL:** No, that's not right.

**SCOTT FAIRBAIRN:** That's correct. No.

**Ms SUE HIGGINSON:** I feel like that's where—

**The CHAIR:** It sounds too good to be true, doesn't it?

**CRAIG BAGNALL:** It does, doesn't it. That's been the issue.

**Ms SUE HIGGINSON:** From what I understand of Europe and the models there, they have real problems. They're the early uptakers. Sure, the technology has improved or whatever, but the evidence is they are emissions intensive energy—

**RUSS MARTIN:** I'm currently working on a policy paper about decoupling the view of pyrolysis gasification to produce biochar from the linear combustion. We'd be happy to bring that to the Committee's attention when it's done. We are working on that.

**Ms SUE HIGGINSON:** Is there a time? Do you know what your time, in terms of working on that, is? I hear what you're saying, but there's just so much evidence out there that this is not the case and that these are emissions-intensive projects when we're looking at the biomass for energy. I accept that there's this other thing you're talking about, but—

**CRAIG BAGNALL:** Absolutely. It would be wrong of us not to recognise that there's been a lot of scepticism out there over time, so that's why I would like to extend an invitation to yourself to come up and see the plant. Come and see it when we get it going. We're in hot commissioning but when it's going we want to demonstrate it, and then we'll show how that works and why. It would take a while but we're here to say that we're going to walk the talk, not just say that this works and then hope that you believe it. The science, the data and the engineering will be there, and we're happy to go through it.

Like we said, we hope this is world leading. It's been a hard place to come through with the way the regulations have been here because it's been set up for dealing with, as you said, thermal combustion energy systems and trying to keep things at bay, understandably, as the governments wanted to do. But we are a different technology and we think that we can achieve this, and we'll show you why. To talk to that, combustion, as I said, produces CO<sub>2</sub> and heat; we produce hydrogen and carbon monoxide, synthetic gas similar to town gas. So in the old days town gas was used before LPG and LNG came though. It was how we did a lot of our energy systems in this State and globally. The calorific value of the syngas that we produce is very similar to town gas.

**Ms SUE HIGGINSON:** What do you do about the fugitives? What do you do about those? I'm assuming you'll say it's a completely closed system.

**CRAIG BAGNALL:** For example, last year I went over to look at one of the world's supposedly best waste incinerators in Denmark, the one with the ski field on top. I don't know if anyone's seen it; it's an amazing place. We went there to look at it because dioxins and furans are carcinogenic materials that form when you've got burnt plastics and halogens. You get chlorine and it causes these materials. When those form as a product of combustion, we've got to look at how that stuff's managed. With our system we are looking to try to leave half the carbon behind to minimise the amount to react with anything that's left, and we also separate out those halogens and they fall through to a gas-scrubbing system.

Because we don't use air to combust, which is 80 per cent nitrogen but only 20 per cent oxygen—which is the bit you're actually trying to burn in the case of combustion—you've got this huge amount of air you've got to treat. You have huge systems. We had to catch a lift up nine floors to go through their gas scrubber to look at the size of their gas-scrubbing system. If you've got a system that doesn't use air, your capex can be a lot smaller because your gas volume is only a fraction of a full combustion system. So the ability to have environmental pollution controls at high level in place to deal with it, as well as the engineering to have the right materials—those Lego bricks going to the right places—where you've got the products in the right spot and you've separated out and deconstructed the problematic materials. That's why people talk about PFAS being deconstructed. You don't destroy things; you deconstruct or reconstruct them.

**Ms SUE HIGGINSON:** We are back where we started, though. Why is this not, then, just another system to deal with waste products? That's ultimately where you're at in terms of what we're seeking to do now. It's not, in that sense, in terms of the linear waste stream and the circular economy. You're talking about a system that will require eternal feeding for it to be productive and useful because you're not putting the same product back in. You're essentially bringing these other things. That's what I mean. I think the issue is that many

communities that have been asked to face waste-to-energy systems have said, "No, we don't want this because ultimately this is just another system where you can generate for whatever purpose—profits, whatever—through the continuation of waste streams." The assumption, I suppose, is there's forever waste streams coming your way. That's ultimately it.

**RUSS MARTIN:** I've worked with those systems since 1990 in Florida and went through a lot of those waste-to-energy plants like that. One of the things that you're talking about there is you have a large, expensive facility that economically needs large volumes of waste to keep going through it in order to cover your capex costs so you get put-or-pay contracts where if you don't burn enough, you still have to pay the provider. That is vastly different than what we've been talking about today. We're talking about significantly lower capex, smaller-scale facilities and energy production and a range of products, not just disposal of the material and a little bit of energy coming out of it. So that is quite different, and the economics are quite different.

**ANTHONY REID:** Yes, and the scale of the pyrolysis equipment can be scaled to the needs of the particular region or place. The Department of Primary Industries has the map spatially identifying where biomass is available, the currently underutilised or burnt landfill biomass that is otherwise decomposing back into the atmosphere. You can site these things more strategically.

**The CHAIR:** Thank you very much. That's probably all we have time for. We have gone a bit over time but it's been very interesting. Thank you very much for the science lesson this afternoon. It's been fascinating. The difference between pyrolysis and combustion takes me back to first-year science. Our Committee secretariat will be in touch with you with regards to any questions that you took on notice, and if there are any supplementary questions from us. Thank you so much for coming in person to give evidence to the inquiry. It's been really valuable.

**(The witnesses withdrew.)**

**The Committee adjourned at 16:10.**