



Mine rehabilitation: an inter-generational process webinar transcript

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Emeritus Professor Rae Mackay, Chair Mine Land Rehabilitation Authority Board

Good evening and welcome to the Mine Land Rehabilitation Authority's July webinar. Thank you for joining us this evening. My name is Rae Mackay, I'm the chair of the Mine Land Rehabilitation Authority Board, and I'm going to be the host for this evening. Before we commence, I would like to acknowledge that we are hosting this webinar from the traditional lands of the Braiakalung people of the Gunaikurnai nation. I pay respect to their elders, past and present. I would also like to acknowledge the traditional custodians of the various lands on which you are all located, and the Aboriginal and Torres Strait Islander people who may be online with us today.

So before we begin, I'd like to just run you through a little bit of housekeeping. The first thing to note is that as a participant, you're not able to turn on your camera or microphone. This will help to limit interruptions to the presenters and improves the audio and web quality for all those who are attending. That means that you can't actually ask any questions orally. You'll need to actually ask your questions through the Q&A function that you can find within Microsoft Teams. So, if you want to access this function, click on the speech icon with a question mark on the top right-hand corner and the Q&A bar should open for you on the right of your screen. You can enter your questions there. If you don't intend to ask a question, please have a look at the Q&A questions that are highlighted. What we would like you to do is to put a thumbs up against any of those that you think are really important questions. That allows us to rank those questions and it allows us to set the priority for us in terms of actually asking those questions at the end. Obviously, if we get too many questions we won't be able to ask them within the time available. Hopefully everything will work perfectly but if you do experience problems, please let us know in the Q&A box and will endeavour to help. To ensure that nobody misses out, we are recording the event and we will publish the recording on our website. It's delightful to see so many have registered to attend and we have many of those who've registered already online. Thank you very much.

Okay, so the webinar this evening is split into two parts. The first part is about the development of the Authority over the past year and the second part is about the timeline for mine land rehabilitation. The first presentation will look at a little bit at the overview of the MLRA, what it's done, what it's achieved over the last year since its inception in June 2020 and we're going to provide a bit of a brief outline of future development. So here to tell you about all of that is David Salmon, our CEO. And so, I'm going to pass over to David. You are on David.

David Salmon, MLRA CEO

Thank you Rae, and good evening to you all. This evening I'm going to provide you with a very brief account of the Authority's development, and to start this story I'm going to go through the Authority's formation to give some context to its activities that I'll be describing later. Starting with the reasons for its formation, I will then give you background on the objectives and functions of the organisation, its organisational structure, relationships for the stakeholders, and then I'll provide coverage of the Authority's activities over the past year, and what is planned for the future.

The story commences with the findings of the inquiry of the mine Hazelwood fire. The findings noted that mine closure would require a commensurate increasing coordination and oversight. The recommendation that went with that was that there should be an Authority that should have ongoing tenure until all mines have been successfully rehabilitated, and monitoring and maintenance of the Latrobe Valley mines is no longer required. It is foreseeable that this would take decades after the last mine has closed. So, some background to the formation of the MLRA. After the Inquiry, the Latrobe Valley Commissioner was established in 2017, and with that there was the development of the Latrobe Regional Rehabilitation Strategy, or LVRRS. The Authority itself was founded on the 30 June 2020, and under amendments of the Mineral Resources Sustainable Development (MRSD) Act, and superseded that Latrobe Valley Commissioner. The MRSD defines the objectives, functions and powers of the Authority.

In July last year the LVRRS Strategy commenced and it had six implementation actions, and if you had seen some of our previous webinars, you're probably familiar with some of those, but I'll just take you through them. The actions are: firstly to provide guidance on the use of climate change scenarios for water resources planning for mine rehabilitation. That was developed and completed in December 2020. The others are all ongoing at the moment. These include: provision of new declared mine regulations; providing guidance on potential water sources and access arrangements for mine licensees to undertake rehabilitation. an investigation on the assessment of the feasibility of alternative water sources, and the identification of alternative contingency rehabilitation options if water is not available. And then the 6th item is: support from the MLRA to the Integrated Mines Research Group, which consists of the three main mines in the Latrobe Valley, which of course are Yallourn, Hazelwood and Loy Yang.

The objectives of the Authority are twofold; firstly, to provide assurance to the Victorian community and that assurance is in terms of that public sectors, bodies and the Latrobe Valley licensees are implementing the Strategy and that the public sector bodies and the mine



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licensees are planning for rehabilitation and ongoing management of declared mine lands. And the second main objective is the promotion by the MLRA of participation of the community and stakeholders in mine rehabilitation itself, and that there's effective and consistent rehabilitation of declared mines, and we further promote the sustainable and beneficial use of declared mines in our oversight role.

Our functions can be divided up into two areas. Firstly, those dealing with rehabilitation of the mines themselves. And in this form we review declared mine work variations; we monitor and evaluate reports; we report on the rehabilitation activities of licensees and public bodies; and we report on the implementation of the Strategy. We also investigate matters related to rehabilitation and the Strategy. Furthermore, we're going to establish a register of mine land. We also monitor environmental processes, and we can be consulted as part of the approval of the declared Mine Land Rehabilitation Plans, and also the Minister's decision on satisfying closure criteria. The second main area of functions: post-closure where relinquishment has probably occurred, and there we will be monitoring the registered land. Then we will also be in a position where we may actually take over and own the post closure mine land or any land in close proximity to it. In the future, we could also be involved with the rehabilitation and maintenance and continue the managing of the registration of the mine land thereafter. So, this is a function that is going to continue many decades into the future.

Our organisational structure is that we're a corporate body overseen by a board, who manages our affairs. In the longer term, we project to have up to 20 staff. Initially, we're going to build a team of up to nine staff members so that we can cover off our organisational administration, community and stakeholder engagement functions, knowledge management, and environmental assessment. The board itself manages our affairs and consists of six members and each of the members have specialisations in various areas. There's mine rehab, governance, involvement in local community, legal aspects, and specialisation in water and education. The board itself has two subcommittees; an audit risk and finance committee, and a people, culture, and safety committee. Each board member has a position on the board for a term of three years.

Our inter-relationships with people, are we report up and down to the Minister and we maintain contact to our stakeholders, and those stakeholders are the mines themselves, the mine licensees and the various public sector bodies, the research groups, various community members and then the development teams that are doing the work on the strategy.

Our main activities over the past year have involved review of work plans and work plan approval pathways for Hazelwood and Loy Yang. We've done extensive oversight of the strategic actions, including providing advice and inputs on the declared mine regulations, evaluation of the empty pits, the various rehabilitation contingency scenarios, and looking at the access to local water sources for rehabilitation of the pits. We are in the process of developing a new monitoring and evaluation framework to support this oversight. We are further involved in community engagement and over the past year we've had three webinars. There's been extensive social media postings. We have developed the *Mine Land Post* which is our newsletter that comes out quarterly, and we've had three issues of that. Some of our Members



have also presented at conferences, and Rae and Rhonda presented at the AusIMM *Life of Mine Conference* earlier this year, presenting a paper apiece. Meetings with community groups have been somewhat restricted during COVID times and where this has happened we've had to do that online, but community groups have included a great variety of people, including the Latrobe City Council. During the year we delivered the Commissioner's annual report, and probably the last annual report since from now on the Mine Land Rehabilitation Authority will be taking over that responsibility. We've offered support in research and oversight of ongoing research programs, and during the year the board managed orientation and development of various government processes including the completion of a corporate report plan for 2022 to 2024.

Finally, looking forward to where are we going to go and some of the main things that we would be dealing with. I won't go into great detail, I'll just cover a few items off. Firstly, and most probably important at this stage, we have to maintain our communication base, that's through the media, webinars, newsletters and hopefully in the future face to face meetings. We have to build a staff base. We have to build that to nine staff members that we mentioned previously to enable our objectives and functions to be achieved over the coming year. We will deliver on our statutory roles and functions. And we're going to develop stakeholder and community engagement programs and various strategies to deal with that. We are going to establish the foundation to enable future potential ownership of the rehabilitated mine land through these processes. Stakeholder consultation and communication workshops are going to occur in the near future. We are looking at implementation action plans 3, 4 and 5. And finally, we're going to produce the Authority's first annual report in the third quarter of this year.

Thank you for your attention and I hope I can answer some questions that you will raise about what our activities are about and give you some more information during that session. Back to you, Rae.

Rae:

Thank you David and I trust that we'll have a chance to get a few questions from everybody published in the Q&A component in relation to the work that the MLRA is undertaking. It's really important that everybody does publish those questions. It will allow us to have a really lively input as we go through. Now I'd like to introduce Rhonda Hastie, who's the Technical Advisor at the MLRA. Rhonda is pretty well known to the large part of the community, having worked with the Commissioner's Office for a number of years. Rhonda's now going to outline a little bit about the timing and key phases of mine rehabilitation for the Latrobe Valley mines and factors that may affect those delivery timeframes. So over to you Rhonda.

Rhonda Hastie, Technical Advisor

So this evening I am going to talk about the timelines involved in mine rehabilitation and specifically I am going to be talking about the Latrobe Valley brown coal mines because that is the MLRA's remit. And there was a couple of catalysts for us choosing this particular presentation. One was back in March, Energy Australia announced that it would be closing its



mine four years earlier in 2028, as opposed to 2032. And so we wanted to discuss briefly the implications of that for mine rehabilitation, but also how potentially it doesn't change that much either when we're looking at the time frames involved. The second is that there's a lot of talk and a lot of interest in the future land uses of these mine licence areas. Each of the mine licenses involves hundreds of hectares of land and the community and certain projects are very interested in knowing when that would become available. And so, I'll talk about that in the context of how long it actually takes to achieve rehabilitation for certain different options. I'll start off just by going a little bit into the basis of mine rehabilitation planning and its role in the mine life cycle, and just as a bit of a chance to give everyone understanding what is really good and industry standard practice now and what the mines implementing now versus what we used to do back in the 'bad old days'. And my aim tonight is not to overemphasise one rehabilitation option or another but outline the timings and implications for the different phases of rehabilitation for each of those options. Although I know that there will be some people in the call specially interested in the feasibility of those options, that in itself is several hours worth of conversation and I would like to just say, look, if you're really interested in me going to more detail or Rae or David, we are more than happy to talk to you and please contact us to discuss that.

So, first a little bit about mine life cycles. So here, thanks to the Minerals Council of Australia, I've shamelessly stolen their picture of the life cycle of a mine. And as you can see, there's multiple phases, you can call them different things, you can break it down or you can combine them, but essentially you start with exploration and looking at is there even a resource? You go through the feasibility stage, is that resource usable? All the way through to developing the mine, the production phase, closure, rehabilitation, monitoring, and evaluation and relinquishment. Now this is a fairly traditional approach, these days we actually try and implement something which is called integrated mine planning. And where you actually integrate the rehabilitation throughout the entire mine's lifecycle. Even in the exploration phase there is rehabilitation where you're actually try and undo or reinstate the land after you finish your exploration. But rehabilitation for the mine itself really starts at the feasibility stage where you actually have to look at what is my potential future land use and ideally at this phase there would actually be some kind of community consultation where you ask the community 'well, what are your aspirations for this land' in the future as well. And based on that conceptual rehabilitation design you would actually also be lodging a bond, once you had your mine approved with the regulator, which would be there to provide a financial assurance against default or if you did default on your rehabilitation obligations provide a fund for the government to undertake those works.

It's worth saying that in a mine life cycle, the mines really don't make any money until you get to the production phase. That's where profit is, and so when you're actually spending money on something like rehabilitation, which traditionally doesn't actually make you any money the idea is that you really want to integrate as much of that rehabilitation as possible into the money making phase, because that's actually when you have funds available to be flexible, funds available to consult, funds available to change plans if you need to and funds available to actually undertake the works. Traditionally, we've left everything until we've finished production. We've made lots of money. We're very happy we got to close the mine and then realise that we've actually only set aside, say, \$50 million for rehabilitation when you really need \$150



million, and then you really have to think do I even have that money set aside as a company? Have I already allocated elsewhere? And historically we've seen a lot of mines defaulting because we didn't actually fully account for our rehabilitation costs. We can't afford to do this, here is our bond and we're stepping back from the licence.

So this integrated approach is really trying to prevent that from happening and also trying, through integrating rehabilitation throughout the mine's lifecycle, ideally you have less rehabilitation to achieve at that post closure, in that post cessation of mining phase. And it also enables you to be a little bit more flexible, but also it enables you to actually design a mine with the end in sight, and actually design your mine to complement your rehabilitation outcome. So generally, you get better outcomes if you actually design it throughout the process. So, once you finish your rehabilitation and closure, you then go into your monitoring evaluation phase and this is where when you've submitted your rehabilitation plan to the regulator, you have put in a whole lot of completion criteria or closure criteria which is basically what you say you will do and what the landform will be when you complete rehabilitation. There will be some alterations needed to these, but they will look at things like landform cover, vegetation cover, acceptable erosion rates, water quality rates, or water quality discharge criteria as well as if you're going to have a pit lake water quality for the pit lake. And you'll be undertaking that monitoring evaluation throughout the entire rehabilitation work. So as soon as you start them even during the early phases of production, you'll be monitoring and evaluating them, but that final phase is when you really finished all those other works, and you're doing your final evaluation. You prove to the regulator that you've met your completion criteria and then you relinquish your licence. Now it's important to note that in Victoria, at this point in time, when you release you can't have a reuse of land on a mine without. Sorry, let me start again. You can only relinquish your licence all together. You can't partially relinquish the licence on certain parcels of your land. You have to relinquish the whole licence all at once. So this means at the moment, and I'll talk a bit more about this later, in the Latrobe Valley, the licensees can only relinquish and we can only have a future land use post-mining, all in one go. And this has certain implications, obviously, for timing, etc. In other jurisdictions you can have what we call partial relinquishment, where parts of the land or parcels of that mine lease can be relinquished throughout the process. It depends on a lot of things. It normally depends on the risk profile for those lands. So it might be that maybe those lands have always been buffer zones which are no longer required, but then they've actually not been mined. So they've got very limited rehabilitation to do, and also because mining is no longer happening, those buffer zones can actually be reduced and so that land might be available for another use. So that's just important to talk about and I just wanted to bring, I guess give people an idea where we actually talk about monitoring and evaluation phases and relinquishment what that actually means.

So, Latrobe Valley's brown coal mines Now in doing some preparation for this talk and looking for the previous figure on mine life cycles I came across some websites and some people were saying or typically you mine for about 20 to 30 years and then your rehabilitation, it takes like 5 to 10 years. And I thought 'oh isn't that cute, isn't that sweet', because, the Latrobe Valley obviously has a very long history of mining. And potentially, atypical I'm not sure, but one of the things about here is that some of our mines, we've had mining happening at them for a very long period of time. So if you look at Yallourn, and I know they'll be history buffs out there who



want to talk about these dates. I've chosen start of mining from the current pits that we're talking about rehabilitating. I know there's other dates out there that are of interest to people, but Yallourn start of mining in what is now called Township Field is 1921. They recently celebrated their hundredth year anniversary, and they plan to end mining after 107 years of mining. That is a lot of rehabilitation to achieve and its particularly difficult for our brown coal mines because of the stability issues associated with those being a low-density consolidated material. So that's just sort of putting this in context, and when you think about some of the time frames that I'll be putting up, if we're talking about a 20 to 30 year rehabilitation time period for a 60 to 70 year mine, that's actually sort of relatively in context but the need to stabilise these mines does actually extend rehabilitation timeframes compared to other types of mines where you don't have the same stability issues.

So just for those who aren't locals and haven't been to this area very often or aren't well acquainted with it, just a quick overview of what our mines look like here. So I had a lovely slide showing what the area looked like in 1974 but I've run out of time to include that one as well. So, we just get the 2020 view. But here you can see the location of the three mines and the outlines of their licenses, which is in green. So you can see, for example, over here at, I'll just bring my little laser pointer on, over here at Loy Yang you can see that this cut out here, this is where the power stations are, that's outside the licence, and that's important to note that we're only talking about the area within the mine licence, which is this large boundary here. Same with Hazelwood here cut out for the power station and Yallourn over here. These two licenses are actually included, but they were actually included separately as environmental offsets, so they are slightly different but obviously Yallourn also extends south of the freeway here. I've cut off the edge of it a bit there, apologies, and then their power stations are cut out over here.

So in 1921 mining started up around this part here in Yallourn and this is what I like to call the Millennium Falcon, the Township Field pit here, Eastfield and, Maryvale Field here. And this is where they are currently mining and advancing south. Now Hazelwood is a really interesting one to talk about at the moment because if Hazelwood is rehabilitated as a full pit lake, this is essentially the land form that it will be. Hazelwood have finished their earthworks in relation to getting it ready for a full pit lake and they're waiting for the approval to fill. So it's a really good, if you're driving past on the freeway, it's a really good example to look at and say what would a landform look like if it was an empty pit, because apart from covering the rest of the exposed coal with soil and revegetating it making sure that soil can't erode, this is by and large the shape of what it would be. And so it gives you a really good idea of what actually that scenario would look like visually for the area and they've still got these water retention facilities in here. So, when we talk about an empty pit or a dry void scenario, we're talking about one where we haven't actively filled it but water will still come into these pits and will still require management. And then you've got Loy Yang over here to the east and they're advancing their mining front to the east as well.

Now on a previous slide next to Loy Yang, I think on the next slide as well, there's a little asterisk next to 2048 for the closure date, and that's because at the moment Yallourn, sorry, Loy Yang, (too many L's and Y's), they are scheduled at the moment to close in 2048, but that is likely to come forward. How far it's likely to come forward I don't know, but even AGL or as



soon as they become Accel Energy, are saying they recognise it's unlikely that they will be mining up until 2048. Obviously, Hazelwood's already closed and Yallourn has a definitive scheduled closure date of 2028.

Now this slide is talking about the data that I've used in terms how I've modelled certain scenarios in terms of timelines, and I've used some publicly available data and it's really important that I note that this is data from the LVRRS. It is not necessarily the data or the fill volumes that the licensees are using for their designs. I've had lots of conversations with the licensees and obviously we know what they're doing but because that data isn't publicly available I've decided to use the data published with the LVRRS.

The volume, so for example, Loy Yang are currently modelling a final pit that would have a volume of about 1,250 Gigalitres as what they would consider a full pit lake. So that would sit between what is a partial pit lake, which is achieving weight balance where you put enough water in the lake, in the pit, to counteract floor heave. And so their volume will take a couple of years less to achieve than a full pit lake, based on the rates that I've selected to model as part of the scenario. Yallourn as well today, were chatting to me about the fact that their volumes have also changed a little bit and I'll talk about that as we go through this process, but I wanted to use data that was already published because I know that those licensees are still working through those approval processes. It's important to note that Yallourn at the moment is the only mine that has a full pit lake in an approved rehabilitation plan. Now, full pit lakes are the preferred rehabilitation option for the licensees, but once again, I'm not emphasising any option, I'm just talking about what the different options have, and the feasibility, and timings involved with those.

Hazelwood and Loy Yang are both working through the approval processes at the moment and both of their latest rehabilitation plans, while not approved, do have full pit lakes in them. This is the design of the full pit lake that Yallourn proposed in their currently approved rehabilitation plan. They're currently refining it and obviously implications of the Morwell River Diversion, and this is the river diversion here which would have been inundated as part of a full pit lake under this scenario, is obviously impacting on and what they plan to do with their mine and obviously also their final years of mining. The last four years of mining, which will impact this area here, has also changed the design of the mine bit, to reduce the volume. And so that will also come into the how they change their rehabilitation design as they go through that planning process over the next couple of years.

So, estimated rehabilitation timeframes. So, I've undertaken some estimates for different scenarios. So, the first scenario is full and partial pit lakes. And so as you'll see here, based on the volumes that I put up before, about 640 giga litres for Hazelwood in terms of full pit like you would basically have the whole pit equalised in terms of you'd be counteracting both lateral forces and block sliding events as well as floor heave and fully covering all coal. A partial pit lake would really only be counteracting floor heave, you would still have to deal with covering any non-submerged coal, and deal with draining your batters. So those are the implications of those two options but you'll see that there actually isn't much difference in timing in terms of these two options, you still need a substantial volume to achieve weight balance. And you're



sort of, you're looking at differences in terms of five-ish years, but the biggest thing to takeaway here is that it's a long time, so based on a rate of 30 Gigalitres a year, and I'm not saying that that's the rate that Hazelwood or Engie want to use to fill them on, that's just the rate that I think is reasonable to assume considering the pit and its filling requirements, you're looking at a fill time of about 20 plus years, 22 years here. So it's a long time. It takes a long time to get that much water into these pits, and that would mean that if you had a five-ish year maintenance and monitoring period, and that's where they check whether the water quality is what they said it would be, if their wave erosion modelling matching what they're actually seeing in the pit, etc, proving that they've met their completion criteria. You'd have a relinquishment of the land just prior to 2050.

So that's a long way in the future for us. I will probably be retired then, so that's something to look forward to. But that's why we really talk about this being an intergenerational process, because what decisions we're making now are really what's going to be affecting our kids. And then if you think about this in the context of Loy Yang, our children's children. We're really when you start to think about relinquishing that land and getting access to that land for future use not until after 2080. That's a very long time in the future. So it's something that's very difficult at the moment to do. Also how do you know necessarily what our needs are going to be, what our wants to going to be, what technology is going to be available so far in the future? It's a very difficult process, but it's one that we have to go through. I think it's also worth pointing out here that for Yallourn I've only modelled one or put up one scenario and that's just because based on their modelling for a 2032 closure, which was used to inform the original LVRRS, they said that they could achieve weight balance with the overburden material that they have on site. Now Yallourn is the site that has the most overburden and also the lowest amount of groundwater pumping. So floor heave isn't as key an issue there, as it is at the other two mines. They only pump at the moment about one Gigalitre a year, whereas the others both pump in excess of 10 Gigalitres per year of water/ of groundwater from those aquifers.

So, I've only modelled one scenario because I couldn't really come up with a good volume to consider what would be a good path to look at like if you're not trying to achieve weight balance, what would you be partially filling the pit for? That being said, Yallourn's closure scenario, and I think the recent cracking in the MRD, is very indicative of this. Has always been around having a controlled flooding of that system. It obviously has other benefits such as counteracting any kind of block sliding, and other stability issues, as well as covering all of the coal that could create a fire. But the thing we've seen with Yallourn, and it's very long history of mining, is that it has flooded on multiple occasions, and we've had significant impact from those. So, the block sliding event that happened in 2007 with the Latrobe River batter failures is a significant one. And the general consideration with Energy Australia is that if we don't have a controlled flooding process it will have an uncontrolled flooding process, where it will just flood itself. And as we enter a more extreme climate due to climate change and we have more extreme weather events that scenario becomes more likely. So their aim is really to fill the pit in order to have a controlled and stable pit that doesn't have an uncontrolled flooding event with environmental impacts.



Now, the thing here, and I know a lot of people saying where are you going to get the water from and that is a very good question and that is something that as David said that the LVRRS is currently looking at, is what kind of water sources could be used. Can we bring in alternative water sources? Do we have enough water sources available within the Latrobe River system, considering our drying climate? So I'm not going to talk to all of that tonight. I'm just trying to talk about the time frames to give people an idea of how long these processes actually take. So obviously here we also have our maintenance and monitoring period and then we have this post relinquishment period here. And so this is the period where if there are any ongoing maintenance and monitoring requirements the MLRA will become the ones to oversee those. So it becomes the land owners responsibility to undertake them. But the MLRA has to ensure that they are undertaken.

Now, for some areas that are high risk, particularly say for example the former pit, there is the potential that the MLRA could become the land owner of those areas to ensure that they are kept adequately stable and maintained. Under a full pit lake scenario those maintenance and monitoring requirements are much smaller than some of the other scenarios that I will talk to you next. So what happens if Loy Yang closes early? So this is based on just using the time frames around the full pit lake scenario. What happens if Loy Yang closes at 2048. Sorry, 2040 as opposed to 2048. Now that's not anyone's date, that's the date I've chosen just based on what I think is a reasonable time frame. It's not based on anyone else's or AGL's opinion. No insider knowledge there. Basically what it does is it brings Loy Yang's forward, so you still get the same amount of time that over which rehabilitation would take if you had that 50 Gigalitres a year of flow, but you would have rehabilitation ending around 2070 and relinquishment of the land and future use of that could happen earlier. The other thing that you have here and this is something that also needs to be considered as part of the LVRRS and with each of the mines as well is that you have more overlap in terms of required resources for that rehabilitation and in particular water. So if we have increased competition for water, does that actually mean that we have a, does it actually then affect fill times because none of the mines can actually achieve preferred fill rates? So that gives us brings us into the scenario of extended fill times. Well, what happens if each of the mines took twice as long or had half the rate of water available? It will take twice as long for them to fill. So obviously under this scenario you're getting a relinquishment for Hazelwood pushed out all the way until past 2070, and same with Yallourn that's past 2080, and poor Loy Yang all the way into the next century.

Under this scenario, and look, I'm really speaking for myself here, but this isn't something that is being thought about amongst legislators yet, so don't anyone say that this is what's going to happen. But under this scenario, I think it would be fair to say that you'd be really looking at how could the licence be relinquished early, or at least part of that licence be relinquished early to enable those future uses of parts of the land sooner, and integrate them back into the rest of the community sooner. And would there be a scenario where, for example, you might actually say to the licensees that someone else under a non-mining licence scenario would undertake the final filling of those pits. Now this is just not, don't let anyone tell me this is what's going to happen. This is just my sort of take on it, but those are things that would need to be considered because obviously you're really pushing out any future beneficial uses of those parts of those landforms for very long time frames. The other thing is also once again you've got increased



and extended periods of competing resources. So really, it's probably not ideal for that scenario in terms of slow fill and everyone wanting water at the same time for a very long period of time.

And then what if you don't use water. Now there are some big feasibility constraints about what I'm about to talk about, but I'm talking about it in terms of timing because I think it's important to outline that these are not quick processes. So here I've put up some data that actually Rae under his role as the Commissioner, he did some, I would say more than back of the envelope calculations, but some sort of desktop based high level calculations on volumes and timings involved in non-water based rehabilitation. And what am I talking about? So the option here that I've modelled is times for Engie and AGL, Hazelwood and Loy Yang, is about achieving weight balance, so putting solid material, be it soil or rock, into those mines to achieve weight balance. You're not necessarily counteracting block sliding, you're not necessarily dealing with ground strain, you are covering all coal with soil and you're also dealing with the weight balance.

The thing about Yallourn is once again, technically, there's a whole lot of modelling going on at Yallourn in terms of working out whether or not this is the case, but technically at Yallourn they said, based on the 2032 closure, they had enough material to achieve weight balance. So this is really this scenario here is just looking at how long it would take to achieve option two. Now option two is that you don't achieve weight balance, all you do is you put your coal batters back on a flatter angle. Typically we say three to one, so three meters of horizontal for every metre vertical and you flatten them back so that you can put material on them that won't then wash away and vegetations that covers them, and it prevents a fire risk, but you continue all your other active works. So you continue your groundwater depressurisation, and you continue that in perpetuity. You continue your draining of the batters and you have to make sure that your batter drains don't get blocked, and that's to prevent block sliding. You continue monitoring for ground strain, and you also have to continue not quite as active, but you do have to keep an eye on your erosion to make sure you're not accidentally exposing any coal and creating a fire risk. So that's what option two is there, and that's what sort of timeframe is being modelled for Yallourn.

So what does all of this mean? So basically it means if you look at Hazelwood in order to achieve weight balance using solid material, it would take about the same amount of time as it does to actually fully fill the pit, based on the rates that I have modelled, using water, but you're only achieving right balance. The thing about to really highlight this is obvious. Often people say why don't you just backfill the pits? It's like, okay, one; you have to find the material and we don't necessarily have enough material, we don't have material on site to achieve weight balance. We'd have to import material from external sources and so actually making sure that we had the millions of cubic metres of material, we would have to create several quarries in order to do it. So, feasibility aside, whether or not we can actually source that material, is that it's actually really a time consuming process and it would take about the same time as it would to create a full pit lake. It's not simply putting material into the mine, it's actually very long time frames involved in that as well. So that was really the point I wanted to make with that is that it's not fast. Any material that we use is quite a slow process.



So in summary, I think that the biggest undertakings I really want people to get out today is that rehabilitation is a long term undertaking, and particularly for our brown coal mines, partially due to their age, but also partially due to the need to stabilise them. In industry, it's always talked about the fact that the most successful rehabilitation is really the ones that have the least amount of active maintenance and monitoring going forward. And that's really the reality with these brown coal mines and why the licensees are preferencing options that are actually going to enable that. And so that's really why the end goal is to achieve a sustainable land form that can be managed in perpetuity. It's unlikely that there wouldn't be some kind of incident, some kind of stability issue in the future for a mine that didn't achieve any sort of stability outcomes in terms of weight balance or counteracting lateral pressures on the mine walls. Progressive relinquishment would potentially enable an early post mining reuse of low risk areas of the mine. And I think as we go through this rehabilitation journey further, I think that will become an important consideration for our community. Especially as our communities are starting to expand, and these mine licences/mine licence areas are really starting to integrate into more urbanised areas. The key decision variables that affect the timeline is whether or not weight balance is achieved, the fill rates that you use for water. So obviously there are some big unknowns around those at the moment. When in the process that mine licence is relinquished, and also closure date for Loy Yang, if that's brought forward, the implications from that. So thank you very much. And I look forward to your curly questions. Thank you.

Rae:

Thank you very much for that Rhonda, that was a very extensive conversation covering a really large amount of ground, and I think it was an important message. And I did spot in the Q&A a couple of people said that the information that you provided was very helpful to them, so that that's a great result.



Q&A Session**Rae:**

Okay, so we now move over to the Q&A session and we have received a very large number of published questions, more than 30, and that means that we're going to probably find ourselves incapable of asking all of those questions before we have to end this webinar. But we will make sure that we answer them in writing post the webinar and will publish those on our website. So, nobody should feel that their questions have been in vain.

Please continue to put your thumbs up to each of the individual questions because at the moment I'm planning to ask the questions through the popularity contest of who had the question with the largest number of likes attached to it. So I'm going to hand this first question to David. And the question really comes in two parts. The first part is, "*Who owns the post-closure risks?*" And the second part is, "*Does the mine operator own all the risks pre-relinquishment and when do the risks transition to the State?*" I may help out a little bit on that latter one, but over to you David.

David:

Firstly, the risks associated with rehabilitation stay with the mine licensee and the mine owner and the landowner up until the mine licence has been relinquished to another body or authority, and at that point any residual risk that has not been dealt with prior to relinquishment would then become the risk of that new owner. That is the simple answer, I think. I've got the answers to the two main questions, Rae, but there was the third one which you started and I wasn't too sure about.

Rae:

No, I think you've actually answered that well. I mean, effectively, the risks don't devolve to the State except in the case that the Mine Land Rehabilitation Authority takes over the ownership of land and manages risks for particular parts of the land. So the Mine Land Rehabilitation Authority, I guess as the owner owns it on behalf of the State, so that there is there is a slight connection to the State, but very much it is about the land owners who have to actually manage the risks to the land and that's why the registration process is in place.

Rae:

Okay, I'm going to ask this next question to Rhonda it's come up the link very quickly. "*What will be the water quality in the pit lakes?*"



Rhonda:

Thanks Rae, that's a very good question and it's a difficult question because there's a lot of individual parts for each of the mines that interact upon that, but the general consensus is that the water quality is really going to reflect the quality of the water we put into the mines. The coal itself isn't water quality, doesn't contribute poorly to the water quality itself, it's relatively inert. It's the other materials, so the overburden materials and the other materials that are used to buttress the parts of the mine, the overburden materials in the base of the mine that could change that water quality. But generally, because the void space is so large it's really the water itself that we use. So if we use good quality water we expect to see good water quality outcomes for a pit lake.

Rae:

Lovely thanks very much Rhonda. So my third question, I'm going to again ask this to David. The question is, "*How does the MLRA interact with Earth Resources Regulation?*" "*Who makes decisions on things like mine rehab options?*" *And if ERR makes the decisions what's the MLRA's role?*"

David:

The MLRA interacts with the Earth Resources Regulations on a regular basis. We try and keep in communications with them all the time, and I know Rae has maintained a very close contact with them and I'm slowly getting myself into that same role. The decisions that are made are not made by ourselves. The MLRA only oversees and offers commentary on the decisions regarding those factors. And therefore we are not, we cannot prescribe, we can only offer opinion and if we feel that things are not quite right as far as rehabilitation goes, then we can take it through to further discussion and up to Minister's advisors. I think I've answered the three questions.

Rae:

Lovely, no, that's very good. I mean, one of the areas obviously that we have a statutory role is in the assessment of mine rehabilitation plans and we get those submitted to us from Earth Resources Regulation. So we have a very strong input in that space. David is absolutely right. We provide oversight and we give advice regularly to people. Thank you.

Rae:

So the next question that has come in is, "*To what degree has the MLRA and ERR assessed Yallourn's mine lake scenario or any other mine's for that matter?*" And I'm going to hand this to Rhonda if you don't mind. "*Against Victoria and Australia's obligations under the Environment Protection Biodiversity Act to minimise risks to wetlands e.g. the Gippsland Lakes, and if so, where is this assessment for the community to be able to see?*" Rhonda are you able to give a bit of a response to that?



Rhonda:

Yeah, I can Rae. That's a very good question and it's a great, tricky question. So, whenever any of the mine licensee's submit a new work plan which includes a rehabilitation plan the MLRA has a statutory obligation to review that, and actually provide formal comments back to Earth Resources Regulation on the technical feasibility, planning, and outcomes proposed under that plan. So we look very closely and in detail at those plans. Now under the guise of the Commissioner's Office I think I read through about 100 studies for the ENGIE rehabilitation plan, and now as part of the MLRA last year we did the same. Thankfully a few studies, 'cause they're not quite at the final stage for AGL Loy Yang, and I know Rae as the Commissioner, he did the same for Yallourn. So in looking at these options or looking at the proposals of each of the licensees we do look at what the licensees are saying their proposed impacts might be. And we do look at whether or not we think what they're proposing is feasible. But in terms of actually looking at it in terms of the downstream impacts it's a little bit more complicated because that's actually where the LVRRS comes in. And so the LVRRS is actually, one of their objectives is, to look at mine rehabilitation, where it doesn't have any impacts to downstream users. So basically saying given the current water conditions in the Latrobe River, how do we achieve mine rehabilitation without actually causing a detrimental impact to those. And so that's actually also a part of the LVRRS does as well, and it's our job to make sure that the LVRRS is being implemented. So it's our job to review those plans in relation to the findings of the LVRRS.

Rae:

Thanks very much Rhonda. I've just got to add a slight addendum to that you may have answered it but we have a question here which says, "*Does the figure of 30 giga litres per year that you put up for a water into Hazelwood take account of downstream impacts on other users, including the Gippsland Lakes? And does it take account of the drying effect of climate change*"? Over to you Rhonda.

Rhonda:

Yeah, so I chose the figure of 30 Gigalitres for Hazelwood because that's a combination of using their current groundwater licence. So if the mine hasn't achieved weight balance, they're going to have to continue to pump groundwater. So they have a licence for at the moment, I think it's up to 22 or 23 Gigalitres a year for groundwater. So that's assuming they would use about 15 Gigalitres of groundwater a year, and also assuming that it would use the 14 or 15 Gigalitres a year it used to access from Gippsland Water. So Gippsland Water has a Bulk Entitlement and as part of the, I guess the, Sustainable Water Strategy for the area and it's entitlements according to what's available in the storages, is that volume was provided by Gippsland Water under their entitlement. So they are able to continue to sell that either to Hazelwood or to another user. So under that scenario, Hazelwood actually wouldn't be taking any additional water from the environment compared to their historical water use, and that's why I chose 30 giga litres for them.



Rae:

Excellent, thank you very much. So now a question for David. This will test David's, how much he's been reading the background to these mines, but we will see how we get on did. *"Did the State Government, that's the State Electricity Commission Victoria create any land use conceptual designs? Did they have those approved by the regulator and were they priced into part of the sale of the SECV when they were transferred to the new mine and power station owners?"* Over to you, David.

David:

You are testing my ability to have read as far back as that. And I'm not sure if I can answer that question out right and correctly. So Rae, I may have to handball that one back.

Rae:

Okay, thanks very much. I think it would be fair to say that the new mine owners when the mines were sold in 1995 took on responsibility for managing the processes of rehabilitation after that date. I think it would also be fair to say that the State Electricity Commission did have conceptual designs and those conceptual designs were known at the time of sale. I think some of the things that probably weren't known at the time of sale included matters like climate change. We've seen fairly dramatic changes in water availability in the Latrobe River since 1995. Maybe people didn't factor those in as much as they needed to, but nevertheless it's an issue. I do think that there's probably something that we need to look at in terms of are there any effects that were handed over which were not foreseeable, but at the moment the assumption is that the mine operators own the responsibility for everything in terms of management of rehabilitation and completion of relinquishment and handing over of the mines.

Okay, I've got an interesting question. I might put this to Rhonda and just ask; *"What is holding up Hazelwood's pit filling process?" "Why is it taking so long for departmental approval?"* It's a complicated question.

Rhonda:

Thanks, Rae that is a very complicated question and I hope I don't speak out of turn here. It's essentially at the moment what's really holding it up is how does mine rehabilitation sit within the planning scheme. So when a new mine is approved or prior to its approval an EES is needed. An EES looks at many things: What are the impacts of this mine? How will it affect the community? What benefits could it potentially bring to that community? How can any environmental impacts be offset? and What options are there in designing that mine or should that mine even go ahead at all? The problem is trying to apply an EES to mine rehabilitation, and in particular for these mines, is that it doesn't take into account that, as just seen in my presentation, is we have very limited options in terms of achieving a sustainably safe and stable landform, and that's what the licensees are required to do. So in asking them to go through an



EES process is that we are asking them to really present options when those are very limited and so at the moment the government and Hazelwood, or ENGIE rather, are working through how would an EES work, what would the terms of reference be, and is it even an applicable process for the mine considering all of those issues.

Rae:

Lovely, thank you Rhonda. Another interesting question that reflects recent events is that question is, *“The recent Traralgon floods were very sad event, but they highlight a huge opportunity to protect poor planning decisions.”* I'm going to actually answer a little bit of this question. It said, *“How much water actually traveled past Loy Yang during that last flood event? Is it true that event was a one in 20-year event, and so will miners be granted an opportunity to harvest these excess volumes that put communities at risk and reduce these long fill times?”* So apologies to our two speakers, I'm going to try and answer this a little bit myself. I actually did an analysis of some of the data that was there for the Morwell River and just to put it in perspective the water that flowed down the Morwell River and entered the Latrobe River was about 75 Gigalitres. Now to put that into perspective, that's about 80% or more of the total water that we would expect to go down the Morewell River in a normal year. So over a period of five days we had almost 80%. That's a very, very large flow and so many of us know exactly what that did for us. So was it a one in 20-year event? No, the calculations at the moment suggests that it was about a one in the 75-year event. Significant event. Now we don't know when the next one in 75-year event might occur. It might be next week or another week later, but that was way above anything that we've seen over a very long period of time. We had large flows back in 2012 but prior to that most flows have been significantly less than that. So is there a possibility of actually taking some of the high peaks of flows and putting them into the pits? Well, that's a conversation that needs to be had by the Department of Environment Land Water and Planning. It's very much part of the conversation that needs to be around integrated water management and very much look forward to seeing how the government departments that resolve whether or not it's a good opportunity to put things into the mines going forwards. So we'll see how that looks. Rhonda, David, I don't know whether either of you wanted to add anything to that comment.

David:

I thought I thought you covered it particularly well and I was not aware of your figures regarding the return flood peak, which was an interest to me. Thank you very much indeed. Nothing further to add to that.

Rae:

Lovely. So this question, I'm going to put to Rhonda, *“Are detailed plans and reports on progressive rehabilitation efforts on the Latrobe Valley mines available to the public? Is this a resource that will be hosted by the MLRA?”*



Rhonda:

So each year, each of the licensees has to prepare a progressive rehabilitation report to the regulator. And I'm not sure if they're publicly published or not. I think sometimes they are, but there's a bit of a delay. In the future we would likely become custodians of a lot of historical data as part of our future role. In that point in time it's likely that we would be able to publish and make things available, but at the moment we're not the custodians of that data and we can't publish it.

Rae:

Thanks, Rhonda that's good. David, *"Who are the community stakeholders that we interact with?"*

David:

The stakeholders that we interact with are numerous. I briefly mentioned the Latrobe Council because obviously that is the one that is high on people's minds. But the stakeholders include all various government departments, community, various community peoples and including Aboriginal peoples. We look specifically and have close relationships with the government departments of DEWLP, ERR, the Environmental Authority EPA, and also stakeholders in terms of those impacted by the Strategic Rehabilitation Plans. So we have a facility by which we can interact with a set of stakeholders and including a facility through our webinars where any other stakeholder or any other interested or affected party can get hold of us. So, we probably have, I might be wrong in saying this, I think we had over 60 different inputs from various community engagement processes on peoples in total. Rae, I'm not too sure if that figure is correct or not, but I believe it's definitely quite a high figure.

Rae:

It is a high figure. We've reached out to about 87 different community organisations, including neighbourhood houses and other groups, the Friends of Latrobe Water, etc. So a very wide number of groups. We're always interested, as I'm sure David would say, is we're always interested in people coming to us and saying we want to find out more about this. We want to actually get engaged and really commence the conversation. One of the problems with having webinars is the communication tends to be a little bit less fluent than it would be if we face to face for, so we like to engage with community members face to face if we possibly can. And I'm sure David and his team will be doing a lot of that work over the next year as we come out of lockdown and come out of COVID restrictions. So we'll see how we go. But we still can manage things over the internet as we go forwards.

I notice there was a question from Ron in relation to, *"What's being done to minimise the damage of ongoing subsidence in the infrastructure of Morwell and Traralgon, and who is responsible for the cost of damage to houses and other buildings and public infrastructure?"* I'm going to quickly answer that one. We've had good chats about this in the past Ron and I look



forward to continuing the conversation about it. Obviously, if subsidence creates significant damage then the cause of subsidence actually produces a liability, the causer of subsidence produces a liability that it is on the person who created the damage. It's always an interesting question about when movement actually is responsible for significant damage, and when it's not, and in due course we are hopeful that the MLRA will have a little bit of interaction in that space of overseeing just how significant damage is to buildings. Obviously we aim to minimise that and so part of the rehabilitation processes that are going on is investigating what the likely impact of rehabilitation will be on substance and whether those will have any negative impacts and we will be keeping a very strong watchful eye on that.

Rae:

Okay, so the next question I'm going to ask again to David is from Bronya Lipski, says "*The MLRA community engagement strategy seems at least in these early days of the MLRA to be a bit more like an information delivery service rather than engagement which I think to many people's minds would include working with the communities closely and other stakeholders. Could you please provide a bit more detail on how the community will be more engaged in the MLRA activities as your work progresses and as mine rehabilitation obligation deadlines are achieved.*" So I've given you a starter for ten, and it's over to you David.

David:

Okay thanks Rae. Thanks Bronya for the question. I think when we talk of stakeholder engagement, we often also think of how we engage with communities as well and during this COVID time, obviously we have had very limited face to face, so we're not actually seen by the public in and around and about in the Valley as the team have been in the past. So a lot of this revolves around communication of information through social media. And I guess that's one of the perceptions that one would get is that we're not actually there, 'cause you don't see us, but we are there in the ether of the internet. And I do believe that a lot of our engagement does tend to appear to be dissemination of information rather than face to face. We do however, have a lot of contacts from interested parties, additional stakeholders through our website, and through our 'ContactUs' feed, and we deal with those one on one and we have been engaging with people over the past year or so on this basis of contacting them electronically and having various meetings, and or phone calls as a result of that. Where we can meet with people we would do so face to face. The other thing is that part of our role would be education of communities and this is one area where we are developing, our big issue again has been the fact that type of education of communities is not easy unless you are doing it face to face. We've not been in a position to develop programs that we could put out via the internet at this point in time. We have, however developed programs and projects for schools and for communities which we would like to do on a man to man basis if I can put it like that.

At this point in time we are, I should have put a plug out there, we're looking for an education officer to fulfil some of those requirements. And that would be fabulous if we have that person in place. We're also going to be developing our own strategy around that when that person gets put into place so that we can formalise what we're doing. At this point in time, we have had



communications with Broadening Horizons which is a group that allows us to interact with high school students and provide them with either projects or information about mine rehabilitation. But again, none of these have been able to take off on a face to face basis which is limited what we've been able to do. But I would like to say that I think as we continue in the vein of having to work extensively with media, it is the way of the future and we are going to have to adapt to some degree to being reliant on that as a means to interact, and I think that I felt since I've been here in the few months that I've been here, that it has worked quite well. And please, if you are a stakeholder in any form whatsoever, please use our contact details which are up on the screen at the moment I believe.

Rae:

Lovely, thanks very much David. I'm going to just now ask two more questions and then we'll bring the webinar to a close. So the first question, or the last question to you, Rhonda. *"We often talk about that there is insufficient material to fill the pit for weight balance, but we do not consider that there is also insufficient water as well. So from an environment and social sustainability perspectives, should we use water or fill material to achieve weight balance?"* That's a good either or question.

Rhonda:

Thanks Rae, and it's a really great question and I didn't have time to cover this when I was throwing information at everyone. The reason why water fill is used is because water is generally more transportable than solid fill. So if we can't use water from the Latrobe Valley there's always the potential, albeit it an expensive potential, that we could import that water from somewhere else. So some of the options that the Regional Rehabilitation Strategy are looking at is could we build a desalination plant and pipe that water in for the mines instead? Now, granted that also has environmental impacts, it's energy intensive, you need to build a pipeline etc. but so does digging up material. So in order to dig up enough material to fill the three mines we essentially need to cut off the top 200 meters of the Baw Baw Plateau. We need a lot of material. And if you think about the environmental impacts from just using the earth moving equipment alone to generate that amount of material, I mean they're huge. Also, the fact you've got obviously irreversible ground disturbance at wherever you took it from. I'm not suggesting we take it from Baw Baw Plateau but you have also got at the moment even in Victoria itself, we've got an extractive shortage. So finding enough rock and lime and sand for building materials in itself, that's already difficult. And then trying to actually find enough material to fill the mines, feasibly it would be very unlikely. And that's really why using fill material, even if we could source it, it's actually not more sustainable than using water. There's huge environmental costs from using that as well, and I think we need to remember that as we are going forward. It's not necessarily better than using water, it might not be worse either, but I think that's just something to consider.



Rae:

Lovely thanks, Rhonda. Yep, lots of pluses and minuses for both options and we will be interested to see where we where we finally land when the rehabilitation approvals are given. Okay so this is the last question for you David. I think it's kind of a nice question for us to finish on and I know there are lots of other very good questions and we will get around to actually answering those in writing in due course, but this one I'll pick out.

“So what role does the MLRA expect to have in developing future economic activities involving the use of the rehabilitated areas, e.g. mining, heritage and geotourism?” “Will community inputs be sort re such uses.”

David:

Thanks Rae. As I mentioned previously, the mine licensees themselves are doing the rehabilitation. The mine licensees, therefore are creating land forms for various purposes and to a great extent they can design for other purposes as well, but essentially we've been looking at the bigger picture. The opportunity for us to get them to think perhaps a bit beyond that has been actually occurring all the time with various stakeholders wanting to know what can be done with the areas of land. And this is where we have the facility to either direct that stakeholder to the mine licensee and say if you want to develop a particular area of declared mine into a particular facility in the future it's perhaps a discussion you have with the mine licensee. We would encourage, however and would listen and provide feedback as far as we can because at this point in time we are not the owners of that land and therefore, it is up to the mine licensee to make that decision themselves. Except that we do have the opportunity to review what those plans are, the rehabilitation plans, make suggestions and try and encourage as much use, especially economic use, of the land as possible. I particularly like the idea of heritage of mining and of tourism. The final outcome will depend very much on what we do in terms of filling the pits. If they're all filled with water that will actually reduce a certain amount of a great percentage of the land for additional activities. But a lot of the activities mentioned in the question don't require large areas. And I think there's huge opportunities for further investigation into that. We would provide that oversight and assurance if those things are progressed and suggested.

Rae:

Lovely, thanks very much David. I think it's really important that the community actually gets engaged with looking at future economic activities. The City Council has a strong view on the regional development and there are lots of plans and visions being put in place by a number of groups, predominantly through the City Council and I would like to see a lot of the land that is going to be released and go into potentially other people's ownership, be potentially free to be used for very significant and very positive activities going forward. So kind of a nice thing for us to be thinking about and for community to really engage with.



So, it's beholden on me just to say thank you very much to everybody who's attended. And just to note again, a couple of things. First of all, that the recording of this webinar will be available on our website once it's been processed. We obviously would appreciate feedback on this event and so will be sending out a survey to everybody to get your views on whether we actually have provided useful information. And obviously if there are areas that you would like to see us discuss and talk about into the future please provide us with those because we are very happy to work with everybody in terms of delivering a good engagement process. And finally, I just like to say obviously all those questions that we didn't get around to answering, there are some over 40 questions that were actually asked in the Q&A session, we will be responding to those and will provide written answers on our website and I think that's good. You will see actually on the display all the details about how to contact us, but the key one is to go to the mineland.vic.gov.au website because you'll get all that information there and you will if you connect with us through Facebook or LinkedIn, you'll find good information there as well. So thank you again. I'd like to say thank you to Rhonda and to David for their presentations and for gamely answering some particularly curly and interesting questions, so that was good. And overall I must thank all those people behind the scenes that helped us to put this together. And I thank you for attending and trust that you have a good evening and we look forward to engaging with you in the future. Thank you. Bye bye.

