T R A N S C R I P T

LEGISLATIVE COUNCIL ENVIRONMENT AND PLANNING COMMITTEE

Inquiry into Nuclear Energy Prohibition

Melbourne—Thursday, 25 June 2020

MEMBERS

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Mr Tim Quilty

WITNESSES

Mr Geoff Dyke, Secretary, Victorian District Branch, and

Mr Mark Richards, Mining and Energy Division, Construction, Forestry, Maritime, Mining and Energy Union.

The CHAIR: I declare open the Environment and Planning Committee public hearing for the Inquiry into Nuclear Prohibition. Please ensure that mobile phones have been switched to silent and that background noise is minimised. We do not have any members of the public—members of the public will be watching online.

I would like to welcome witnesses Mr Dyke and Mr Richards—thank you for making yourselves available today—from the CFMEU. All evidence taken at this hearing is protected by parliamentary privilege as provided by the *Constitution Act 1975* and further subject to the provisions of the Legislative Council standing orders. Therefore the information you provide during the hearing is protected by law. However, any comments you make outside the hearing may not be protected. Any deliberately false evidence or misleading of the committee may be considered a contempt of Parliament. All evidence is being recorded. You will be provided with a copy of the transcript following the hearing, and transcripts will ultimately be made public and posted on the committee website.

Because of time, we have got 45 minutes for you here today. Members have read your submission. So if you want to do an opening statement for 5 minutes and then we will ask members to basically ask questions, and again we allow up to 5 minutes per member to do that. So over to you. Who would like to lead?

Mr DYKE: I will start off. I will introduce ourselves. Mark Richards is a former power station operator at Hazelwood power station. He is out of work at the moment, but he is currently our vice-president part time. I currently work at a major brown coal-fired power station as a control room operator full time. Part time I work as the Victorian Secretary of the Mining and Energy Division of the CFMEU. I hold qualifications in business and engineering. I have been trained in national electricity market bidding, generator operation and high-voltage protection. I will move on to the union's position.

The union acknowledges the science on climate change. We support emission reduction efforts within the national electricity market and the inclusion of intermittent renewables such as wind and solar. However, a reliable electricity grid requires dispatchable power to exactly match supply with demand to maintain system frequency at 50 hertz. The current dispatchable generation sources within the national electricity market are gas, coal and hydro.

Hydro is the Rolls Royce of renewables. It is the ideal power source: it has got massive inertia, it has got good characteristics, it is clean and it has got a long life. However, in Australia we believe it is limited by our flat, dry continent; the amount of dam storage capacity; and other resource demands on water, such as irrigation and drinking water. Typically, if you look at the Snowy Mountains scheme, it averages about 10 to 15 per cent of its output over a year, so we believe that there is a limitation on hydro in Australia. Gas and coal both produce greenhouse emissions. Gas is a very expensive and wasteful energy conversion. There are 11 gas power stations in Victoria, all open-cycle gas turbines. The highest efficiency is 32 per cent. We believe that that gas would be more efficiently used directly piped to people's homes and businesses rather than being used to make electricity. And obviously it still puts out CO_2, so long term there needs to be a transition away from it.

The CFMEU's preferred option for dispatchable power is high-efficiency, low-emissions coal-fired power with carbon capture and storage. Carbon capture and storage is currently not available in Australia, but it is being used in a number of places overseas commercially. One of the advantages is that in the Latrobe Valley there is potential, if there is a large-scale coal-to-hydrogen industry, that power generators could piggyback off carbon capture and storage and share the cost with the hydrogen industry. Overseas carbon capture and storage is usually funded by the oil and gas industry because pumping CO_2 in underground reserves pushes more oil and gas up. The commercially funded projects overseas are funded by oil and gas, so that cost could be shared with the oil and gas industry in Bass Strait.

However, if none of that is viable, we believe the only cost-effective and viable source of power would be nuclear. Australia has got large uranium reserves, we have an ideal waste-storage environment in that we are geologically stable and dry and there are plenty of remote areas. We have well-educated and skilled workers,

stable government, good industry regulation and—probably more importantly—communities who need viable transitions. And that is a critical part of the social licence for establishing that type of industry. Fourth-generation nuclear power designs are much safer—just like aircraft travel. The airline industry did not abandon flight just because of some major crashes and deaths. What they did was they systematically worked to make the industry safer and safer until it was the safest form of travel available today. Modern reactors have reached that point. There are reactors in the world that can lose power and shut down indefinitely without damage, and there are a number of other fail-safe features that have been built into them.

One of the new advents is small modular nuclear reactors, which are fail safe. They are scalable in 60 megawatt modules. They are ideal for Australia's small-capacity grid in that you can size a generator to suit the grid. One of the issues in the grid is grid stability. If you lose a very big load out of a small system, potentially you could plummet the frequency and collapse the whole grid, so size is a consideration. Because they are modular they are potentially quick to manufacture and cheaper because they are manufactured in a factory and can be shipped over. Small modular nuclear reactors are estimated to be about the same price as wind, but they do not have the additional costs on the grid. When we talk about levelised cost, levelised cost is one thing, but total cost is what the consumers pay. There has been a heavy focus on levelised cost, but the focus needs to be on total cost of the system.

The ban on nuclear in Australia makes no logical sense. We regard it as emotive, and it is out of step with other developed countries. We believe a mix of nuclear, hydro, wind and solar will deliver the lowest cost, most reliable, zero-emissions electricity grid to transition to as coal-fired power stations retire. In France they installed 20 gigawatts of nuclear power in 20 years. Twenty gigawatts is about the size of the national electricity market, and the 20-year time frame is about the time that the coal-fired power stations would retire over. So that is relevant. You will see in the submission that France has fairly cheap power compared to us. We do not believe that the current grid design and where the grid is moving to is good science. It is not good economic or engineering practice, and we are concerned that we are transitioning to a system that may well be unaffordable and unreliable, and that could devastate Victorian industry and jobs.

I will give you some examples of what we believe is potentially madness, in our view. Snowy Hydro 2.0, which has had a contract let for $5.1 billion, will produce 2000 megawatts for seven days storage. In the next seven days it would need to pump back up and would consume about 2200 megawatts to pump back up. So ultimately it would be a net user of electricity. The transmission line from Melbourne to Sydney would need to be upgraded for that project, and that may well add another $3 billion to $5 billion. That whole system could be supplied with 2000 megawatts by two nuclear reactors built, say, where Hazelwood was, using the existing transmission line. They would deliver 2000 megawatts continuously to the grid.

Other examples—the federal government has announced a priority project of the Marinus Link, 1500 megawatts for $3.5 billion. Tasmania has been marketing itself as the battery of the nation. My research tells me there is no pumped hydro storage in Tasmania. In 2016 they had an energy crisis because they almost ran out of water. So we have got concerns about that. In summer last year AEMO paid $36 million to shut down industry at peak times. We do not think that that is symptomatic of an efficient, viable grid. There is currently a $370 million transmission upgrade in western Victoria purely to cater for solar and wind out in that area. Across Victoria and South Australia there is 190 megawatts of grid batteries that cost $190 million. They provide a supply that would last seconds to minutes depending on the load, and with a 10-year life. They were only installed to cater for the effects of wind and solar. Additionally the South Australian government spent $600 million on diesel generation. They have got 550 megawatts of diesel generators sitting there not running, which is one-third of the South Australian electricity grid. We believe that is symptomatic of poor system design.

The South Australian government has announced it is going to spend $80 million on synchronous condensers for grid stability. Synchronous condensers provide synchronous inertia, which helps hold the frequency up, and they also provide reactive power control when voltage leads or lags current, depending on whether you have got a capacity load or reactive load. That is very important because that prevents voltage collapse and a system blackout. The current reverse auctions by the Victorian government provide for fixed-price payments that potentially go above the wholesale price—for example, if the fixed-price payment is $50 and the wholesale price falls to $30, as is predicted, well, then the government has got to top up $20 per megawatt hour. Potentially that could cost another $40 million to $50 million in subsidies per year, depending on how much generation there is and what the price differential is.

The CHAIR: Thank you very much, Mr Dyke. Sorry, I am just going to jump in because of the time. Have you got more points to make?

Mr DYKE: I have just one more point. We believe nuclear power must seriously be considered for a future energy transition, not only for electricity but more importantly for electrification and the production of hydrogen for transport, which is also an important area.

The CHAIR: On the last comment on the social licence, how do we broaden the conversation around the issues of social licence and community acceptance of the potential of nuclear power? I mean, let us be realists; that is the biggest issue. Have you got any other thoughts about the social licence?

Mr RICHARDS: I can probably talk just briefly, and I understand the time constraints. What I would say is that the reason that we are here is due to the social licence. We have an area in the Latrobe Valley which has fairly high unemployment compared to the rest of this state. We are concerned about the engineering aspects of what is going on with some of the renewables—we fully support renewables, but to a certain point and factor—and as Geoff has mentioned, one point not to miss here is that we do not produce power for the sake of producing it; someone is using it, and we have to match that or the grid collapses. That is why we talk about dispatchable, and we see nuclear as a possibility, along with its low emissions.

Where it fits into the social licence for our area is that we have high unemployment, as we mentioned, and we have coal that is being shut down and phased out. With coal, it is a heat source, essentially, to produce steam, which then produces the rest of our energy cycle. When we go to nuclear, we would be using nuclear as that heat source, so we would have the same existing infrastructure, the same transmission lines—the boilers disappear, but essentially, we have a steam production circuit which then is put into the rest of the generation. It is the same jobs; it is the same technologies. We have the same workers transitioning to an equal spec job, to be honest, and we do have hundreds unemployed. We lost over 700 people at Hazelwood directly—3000 if you look at the numbers there. With Yallourn power station at a very similar age and quality of plant, that may be closing—they are predicting, I think, 2032, but there is the belief that it will happen before that. So we are concerned about, you know, the grid collapsing as well as jobs; that is where it fits into our social licence.

Now, we do not want to become—I hate to use the term—a Third World country, but I think there was an article recently where in Lebanon everyone was growing up with the expectation that the power went off every day for many, many hours and they would cycle their fridges and their cooking around that. I cannot imagine how good that was for industry; I dare say it was pretty pitiful. Look, we looked at France. France has 73 per cent or 70-something per cent nuclear, and they have got low-cost power, they have got stable electricity grids and they are providing it to the ones next to them. It is about jobs for us, not just the social licence.

Mr DYKE: Look, the reality is that the 'not in my backyard' thing is very strong, whether it be a highway going past your house or a wind turbine put in next door to you or whatever it is, and it is probably even more emotional when it comes to something like nuclear power, but nuclear power provides two to three times as many jobs for the same generation. It provides high-paying skilled jobs, and it is a very clean industry. I believe that when one is built, or if the community go and see a nuclear power plant, that a place like the Latrobe Valley—that is going to be economically devastated by the closure of coal—will reluctantly embrace it. There will certainly be opposition, but there would be a lot less opposition than if we went to build one in the eastern suburbs.

Ms BATH: Nice to see you from a distance, Mark and Geoff, and thank you very much for your very comprehensive presentation. I remember sitting in the CFMEU office, Mark, while you explained inertia to me as a student, so I appreciate your in-depth knowledge. The Latrobe Valley—and my office is in the Latrobe Valley—has always had a very strong history of excellence in engineering. I am interested in your perspective of the change or the upgrade of knowledge to run a nuclear power station. Engineers and electricians et cetera—what would they need for that change, and how long a lag time would they need to be upskilled?

Mr DYKE: I can answer that. We have had discussions with the nuclear industry, and they are saying an existing coal-fired power station worker could be trained in six months part-time. As Mark says, the heat source changes but the rest of the plant is very similar. It is a process-type industry—you know, valves, pumps and stuff that we are used to. Obviously the nuclear reactor part of it is new technology, but we have got very capable engineering and there is a local university in our area—

Ms BATH: Absolutely

Mr DYKE: that could be used to help provide that training with obviously overseas expertise.

The CHAIR: Can I go to Ms Terpstra?

Ms TERPSTRA: Thank you very much for your very comprehensive overview and presentation in regard to this. I do not have any questions at this time, but thank you very much for that presentation. It was excellent.

Mr LIMBRICK: Thank you, Mr Richards and Mr Dyke, for your presentation and the submission, which was excellent by the way. I was very impressed with it. I am interested in, rather than the technical aspects—and you guys know better than anyone—how energy workers feel about their future in the Latrobe Valley at the moment and how you think that future could be different if a nuclear industry was allowed in the Latrobe Valley.

Mr RICHARDS: The employees at the current power stations are rather nervous, as you can imagine, especially with the closure of Hazelwood. We had a worker transfer scheme that was fantastic—the first in Australia. Unfortunately we only achieved just over half of the numbers that were committed to. That is mainly due to the energy companies not participating. We do not have enough legislation to ensure they must participate. In fact they used it, in some ways, to reduce the numbers by stealth. In terms of Yallourn power station, they are next and they are quite concerned about their future to the point that some people are looking at retirement and planning that already, and the younger ones are wondering where they are going to go. We have had people in our community move to New South Wales and further just to get work, so there is a genuine concern about it, and that is not to even mention construction. In terms of a place like this, there are years and years and thousands of people involved in construction too, so that is another area that we do not directly manage.

Mr DYKE: Obviously under the SEC, the SEC was building new power stations, and there was growth. In 1990 when we lost about 10 000 jobs through privatisation the Latrobe Valley population was 75 000. Today, 30 years later, it is still 75 000, because there has been no growth in new industry. We have been unable to attract new industry to the region. Nuclear power, as I said, employs two to three times as many jobs for the same generation output. That would provide growth, and it would provide people at Yallourn that are in their 40s—you know, people like Mark's age that are put out of work but have still got 20 years ahead of them—with an industry to transition to. But transition obviously could not happen overnight. It would have to be managed and planned, but they would be able to look ahead and say, 'Well, when my job finishes here, I'll move over to there'. And they could probably do the nuclear training in advance so that they are ready to go.

Mr RICHARDS: Chair, if I may, one comment I would like to make is we are tied to other states—we know that. We saw South Australia black out and they came back online due to Victoria having an energy supply essentially. We rely on New South Wales with interconnectors. What I would say is: on I think it was 23 January 2000 there was a system disturbance where they lost one of the power stations, at I think Liddell—600 megawatts. That caused another one to go out in sympathy in New South Wales. We then had a system disturbance here that nearly blacked out the state, and it is the one document that has never been released by AEMO at the time that talks about how we nearly lost the state. The frequency dropped to 49.1, from memory. It was the worst we have had, and it is something that has never been released. This was 20 years ago. So if we are closing down more power stations, which is our spinning inertia, if we close another one, we are looking at a grid that is really reliant on interconnectors and possible brownouts and blackouts. So we have concerns.

Mr LIMBRICK: I have one other question. You spoke in your submission about social licence. Now, back in 1983 when this nuclear prohibition legislation was instituted, a lot of the talk was around—you know, it was during the Cold War—weapons proliferation; that was the biggest concern. We have seen people change their views on all of these things since. It was a long time ago. How do you feel the attitude towards nuclear amongst both workers and the community in the Latrobe Valley has changed since then? Do you think it is more possible to get that sort of social licence now?

Mr RICHARDS: Well, the younger people are actually talking about it being a zero-emissions generation. They are saying we should be moving across to it. Those that are older are a little bit more concerned, I guess, but that is generally not in our industry. Most people in our industry understand it is a technology and it is safe.

There is plenty of commentary about deaths with coal and there is commentary about deaths with nuclear, but when you look at the numbers, they do not seem to stack up.

Ms TAYLOR: Thanks very much for your comprehensive presentation, and I hear exactly what you are saying about jobs. It is obviously vital and a just transition, so no-one can argue with what is a very fair proposition in that regard, so thank you for that. Certainly the whole concept of debating nuclear or renewables et cetera is not about trying to kill jobs; it is about trying to preserve a sustainable future for everyone. I would contend with this idea that social licence is your biggest problem; I would have to disagree with that, because I think human health and the environment are the most important issues to be considered for everyone's benefit in the future.

Now, I did just want to flag a couple of issues. You were talking about generation IV nuclear concepts. These were considered and rejected at the 2015–16 South Australian Nuclear Fuel Cycle Royal Commission. I am just wondering, whilst they are heavily promoted, just how many are in operation? Is this large scale? Is this happening everywhere? How many homes are being supported by these SMRs?

Mr DYKE: Are you talking small modular reactors? Is that what you are talking about?

Ms TAYLOR: Yes.

Mr DYKE: NuScale are going through US government approval at the moment. They are planning to start construction next year of a commercial power plant. I believe Russia recently constructed a nuclear unit that they shipped to one of their remote regions. Obviously, I am like you: safety is the critical part of nuclear. We certainly would want the government to consider the safest design and system, and perhaps the Russian ones would not be the ones you would go after. There are 450 nuclear reactors in the world, and there are a large number under construction and planned for construction. Most of the countries that do have zero emissions are basically all hydro and nuclear, and all the major developed countries use nuclear as a fuel source.

Ms TAYLOR: So are you saying that there are 450 SMRs in the world? Is that what you are saying?

Mr DYKE: Not SMRs, nuclear reactors. The small modular nuclear reactors are about 60-megawatt modules. Most of the current commercial reactors are either 1000 megawatts or 1400 megawatts in size, so they are very large. One of the advantages of being large is scale of size reduces the cost because you do not need as much equipment. The only thing is in the Western world nuclear construction costs have been increasing. They are probably 50 per cent higher than Asian power stations. So one way of reducing construction costs is to have modular reactors mass-produced in a factory and then shipped out to the country of use.

They are the two main options, small modular reactors—but even the current technology for the big power plants that are 1000 and 1400 megawatts are into their third and fourth generation of safety improvements. Things like where the roof blew off at Fukushima, that would not happen now because they have hydrogen venting and other things to prevent those sorts of things. They have learned from those past disasters and older designs.

Ms TAYLOR: Yes, that is often a line, with respect, that is trumped out with nuclear, but it is always this pie-in-the-sky future: 'One day it'll be perfect, everyone please bank on that and just ignore all the disasters that have happened because that would never happen again'. I am afraid the best evidence for the future is usually what has happened already, so we might have to agree to disagree because I cannot put workers under that kind of risk, personally. That would be too much for me to bear, personally.

The only other thing I was just going to say: with regard to France, I know that they have had to dig very deep caverns to be able to bury the waste and they are running out of space. Admittedly they are, as you say, about 70 per cent nuclear and they probably use some of the latest technology, so even with all that and even with reprocessing, which they are able to do and I do not think the US do, they still have an extraordinary problem with waste. I mean, if we had that kind of level of waste in Australia, are we going to put it out in traditional Aboriginal sites? Where are we going to put it? Or are we going to bury it in the cities? I mean, where are we going to put it?

Mr DYKE: Well, I do not know whether you have flown over Australia but there are thousands of kilometres of vast wasteland to put it in, and I might point out that they have dropped an atomic bomb in the

open air at Maralinga. Australia did not come to an end because of that. Obviously you are not going to plonk it on Aboriginal land, but there are vast areas where there are suitable sites to run such a facility. You know, we could accept radioactive waste from France and store it and have a very profitable hundred-billion-dollar industry safely storing waste. Nuclear waste is not large in volume; that is the other thing you need to consider, that a few tonnes of uranium will run a power plant for a year or something, whereas we burn millions of tonnes of coal.

From the safety point of view—and I take an interest in it—there have been some very major disasters with coal-fired power plants and even hydro plants. I have seen photos of coal-fired power plants completely demolished because of turbine overspeeds, and I have also seen hydro plants completely demolished, so the danger to the workers occurs. If you look at the safety record of the 450 nuclear power plants, I think you can point to Chernobyl, which is a very old design—it did not even have a containment structure to properly contain any disaster—and Fukushima, which did not have hydrogen venting. The rest of the power plants have got an unblemished record, so I think it is a little bit illogical. If we took that tack, because a DC-10 crashed we would not fly in an Airbus A380. To me it is illogical.

Ms TAYLOR: With respect, comparing a plane crash to nuclear reactors I do not think is a fair analogy. I just think the ramifications are very different—both devastating, but I do not think that argument is very compelling. I just say that respectfully.

The CHAIR: Thank you. That is a comment.

Dr BACH: Thank you very much, Mr Richards and Mr Dyke, both for your fantastic submission—I thought it was just great—but also for what you have had to say to us today. I, like you, have a real concern for the environment, but I think also it has been great to hear from you regarding your deep concern for workers, of course, because I do think that so oftentimes in these debates the fact that we are talking about a huge number, as you said before, Mr Richards, of real people with real jobs is forgotten. So I think for injecting some sanity into this discussion for us on that really important point, I say a big thankyou to you. I thought it was fascinating that your expert view, Mr Dyke, was that if we were to lift the prohibition on nuclear energy and if we were to make a transition, well, then—if I understand correctly from both your submission and your comments today—with some entirely manageable retraining we could have jobs for just about the entire workforce that we have right now in coal. Just for the record, have I got that right?

Mr DYKE: Well, you would double the workforce, because you would need twice as many people. So there would be growth as well.

Dr BACH: Alright. Thank you. Just quickly for me, I note and I respect those people who are strongly against nuclear energy on a whole range of grounds. I come to this debate with an open mind—certainly not as an expert but with an open mind. You have spoken about cost. I thought your points about cost were fascinating, because so oftentimes detractors of nuclear energy talk about that, and I was interested in your responses then to other questions about issues like waste disposal. What about—and you spoke about this a little bit, Mr Dyke, in your presentation to us—the various other prerequisites that you would need? You have spoken about workforce, about suitable sites. In your mind, are there any other prerequisites that we would need to set up a nuclear industry here in Victoria that would be problematic?

Mr DYKE: I think the difference, say, between building a coal- or a gas-fired power station is you just build one station. If you build a nuclear reactor, you have to have a nuclear industry. You have obviously got to have government regulation, you have got to have government oversight, and that is important for safety, obviously. But you obviously need fuel processing, fuel disposal, waste disposal and all that. So it is a whole industry. That is one of the reasons there is a higher number of jobs, because it is a complete industry. In all likelihood, if Australia did go down the nuclear path, it would be unlikely that it would be viable to build one reactor—you know, you would build 20, because it is a whole industry. To get the viability you would need to make a decision to transition. We think it is inevitable, and the reason being is gas still puts out CO_2, coal puts out CO_2, hydro is limited, and that only leaves nuclear. Regardless of the arguments and the concerns, we think inevitably you either run out of electricity or no-one can afford it, or you are going to have to transition to nuclear. That is our belief.

Mr RICHARDS: An engineering inevitability, essentially.

Mr MEDDICK: Thank you, gentlemen, both for coming today and for your submission. I have got a whole number of questions that I obviously will not have time to ask you, but I would like, through the Chair, to be able to put them to you on notice.

The CHAIR: Just on that, a number of questions will be sent to you later on because of the exact point that Mr Meddick has just raised. Ms Taylor will be doing something similar, so absolutely. Mr Meddick?

Mr MEDDICK: No problems. I just want to come back to the social licensing thing a little bit, and the two questions that I am going to pose could perhaps be somewhat philosophical in that respect. I appreciate that others will ask more technical questions. Is it more that the social licence problem is around winning the public over on that safety issue but also winning the public over on waste, because there seems to be a lot more information out there, and from the submissions that we have received, on the technical aspects of building a reactor, the technology improvements and all those sorts of things, but there seems to be not a lot around, well, what is actually going to happen with this waste?

We talk about disposal and that we have got all of these areas, as you were saying, in outback Australia where we can dispose of it. For many people it is going to be about the whole idea of, 'What do we do with the waste?'. Is it just that a hole in the ground is dug and this glow-in-the-dark stuff is just thrown down that hole and it is covered up, and that then there is a problem? Can you just expand upon: what are the current methods of disposal in Australia and are they sufficient for an expanded industry in Australia, or is that going to be also something that has to be looked at and put in place before we even start building reactors, if that is what we do?

And on the second question then—so I will get them out of the way—we were sold many years ago, not just in this state but in this country, that the privatisation of the electricity market was going to lead to a dramatic reduction in prices and everyone was going to have the cheapest power in the world, when exactly the opposite has occurred. Is this going to be an industry, in your opinion then, that if it is to deliver what you say it will in terms of cost savings for consumers, will have to be in public hands, or do we end up just blowing that whole thing out the water again and going down the privatisation path?

Mr DYKE: On the first question, I am obviously not an expert on nuclear waste disposal, but I am aware that we have currently got a problem. We have obviously already got a nuclear reactor at Lucas Heights that makes radioactive isotopes for medical purposes. Currently that medical waste is being stored in hospital basements, I believe, in the city, not in the remote desert. There is currently an issue about disposal of that medical waste, which is very small in volume obviously but still needs to be disposed of correctly. Obviously if you have a nuclear power plant industry, you would have a higher volume. All of the stuff that I have read points to the fact that Australia is the ideal geological environment because of the dryness, because of the remoteness, because of the geological stability—there are no earthquakes; you are not going to have a tidal wave out in the middle of the desert—and all of the other stuff. Potentially it may be able to be stored above ground, because it is remote, it will be contained. And as you know, the most dangerous radioactivity has a half-life, so it may well be 120 years before it gets down to a level where it is medium-grade radiation, rather than high, but there is a time period where it will decay and become safer. But I am not an expert in that area, and a smart person would always seek out the expert.

On the second question to do with power prices, people have been saying that renewables are far cheaper than coal et cetera. When Northern power station in South Australia closed down, the price increased; when Hazelwood power station closed down, the price increased. The reason for that is because wind and solar and not dispatchable. How the system works is it says, 'I have got so much demand, I need so much supply', so it takes the cheapest bidder first, which will always be wind or solar—one, they are subsidised, but two, their short-run marginal cost is zero, so they form the bottom of the bid stack. But then to get the rest of the bid stack, you have got to be able to dispatch power, and that is where your dispatchable power comes in.

As the coal-fired power stations have shut down and you have reduced that cheap supply of coal-fired dispatchable power, the system has to use gas. Gas is more expensive and the last generator dispatched sets the price for everybody—and because the last generator that is dispatched is gas, that is why you are seeing higher prices.

Now, what happened in the initial days: the power prices were really low because the government always made sure that we had an excess of supply to meet demand. What has happened over a period of time is the excess

supply has shrunk away so there is less supply to meet demand. Obviously as something becomes scarcer you price it higher. Short-run marginal cost can affect pricing. The other one is business decisions: if you have got a scarcer resource, you can price it higher. What you can see is—and this is where the unaffordability will come in—if we do not put new dispatchable power in and we shut down Yallourn and the two Loy Yangs are the only dispatchable power, where they might price their last bit of power at $100 dollars a megawatt hour, they might price it at $1000. That will push the system price to $1000 because that is how the market is priced. So what you will see is, yes, they will off-load more so they make less profit. To recover that profit when you have got a peak and they know you need their power and they are the only dispatchable power source you have got, they will just lift the price up.

Mr RICHARDS: Just to make it really simple, everyone, when Hazelwood—

The CHAIR: I am just mindful of the time. Can I ask, because this is quite an interesting response you have given, I would not mind actually—if that is okay with Mr Meddick—to actually be able to be provided with further details in written form, because it is quite interesting.

Mr DYKE: Yes.

The CHAIR: That would be excellent. But Mr Richards, you have got a quick point—

Mr RICHARDS: I was just going to add, in terms of when Hazelwood was producing power, we were producing at, say, call it $40 a megawatt hour, wholesale cost. The moment it shut it went straight to the gas price essentially, which was over $100—say, $130, $150. It floated. It was never below $110, from my recollection. So I would call that a tripling of wholesale price for everyone in the Victorian market—or the NEM, sorry, the national—

The CHAIR: Look, it is quite an interesting remark you made. Can I just allow two quick questions. Mrs McArthur and Ms Terpstra have got two quick questions, quick responses, and then after that members will be encouraged to submit further questions, which will be done through the secretariat and will be forwarded to you, and we would really appreciate it if you are able to respond to that when you have got time.

Mrs McARTHUR: Thank you, gentlemen, for an incredibly comprehensive submission and for your presentation today. I am sorry that you are unemployed, and hopefully we can change that if we convert the Latrobe Valley into a nuclear power energy area. That would be quite something.

I am interested that we have this situation where we happily export uranium and we also go and have X-rays all the time, but it seems that we do not like uranium. I just wondered if you want to comment on the hypocrisy of that sort of position.

I am a bit concerned about small- and medium-sized reactors in that you said we would import them, basically. Is that a good idea? Why couldn't we manufacture them here in Australia? And surely small SMRs have diseconomies of scale—for instance, you have got to transport the waste. If you have a large-scale reactor, it is more centralised and the waste can be more easily disposed of from one location or a few, whereas you are going to be transporting waste from small reactors all over the place. So I just wonder if you would like to comment on those, please.

Mr DYKE: Yes. Say, if you had a 1000 megawatt power station, you would have obviously one conventional unit. If you are using small modular reactors, you would have 15 modules and they would be shipped out. Obviously first you need the expertise to build them. There is potential that Australia could build them under licence. Obviously you would have to—

Mrs McARTHUR: Where are they built now?

Mr DYKE: They are being built in the USA, and there are other countries. There are other designs of reactors, like helium-cooled reactors and there are fast breeder reactors. There are a number of designs. A lot of research would have to be put into selecting the best reactor based on safety but also commercial viability and suitability to the Australian grid because overseas grids are like a spider's web, I guess, of interconnected transmission lines. The Australian grid is a bit like a big L. You know, we have got massive distances and few lines that interconnect. There is not much interconnection between states, as you would have heard. South

Australia wants a line to New South Wales, for example. There is only the one line coming in from Victoria, one line going to Tassie. So the Australian grid is very different to the European grid or the American grid. So there would have to be a lot of research put into what is the best configuration and obviously where to site them. The Latrobe Valley would have enough water to run a number of nuclear reactors. We could probably run three. And we have obviously got the high-voltage transmission lines and all the other infrastructure that you would need. But siting around in other places may well be that you build them on the coast, where you have got access to seawater and stuff.

Mrs McARTHUR: At Portland.

Mr DYKE: Yes.

Mr RICHARDS: In terms of manufacturing in Australia, we have always had the know-how. I do not believe we have got the foundries as we used to have That is not to say they could not be fired up. Yallourn used to have a foundry and the State Electricity Commission of Victoria, before it was privatised, was essentially making all their castings onsite. That does not happen nowadays because most people go for cheapest production, but we certainly have the engineering know-how. I do not think our steel foundries are what they used to be. In fact South Australia nearly shut down, and a lot of that boils down to energy costs. We have got Alcoa down at Portland. They had a $220 million lifeline back in, I think, 2018 and my understanding is a lot of that essentially went straight to potentially a company like AGL to provide a contract. No matter how you look at it, that is essentially to ensure they had cheap power to run their business. So in terms of energy, if someone was to say, 'Well, if we shut down Portland', Alcoa's smelter, 'that would give 500 megawatts extra to the grid and we could go longer without putting in new dispatchable power'—what people fail to realise is you need something like Portland to disconnect when we lose a major power station so that everyone's lights do not dim and we do not have a frequency drop. They are there to quickly disconnect to give all the other power stations more time to come back up, in which case then Portland comes back online. So Portland is part of our grid stability, which a lot of people are not aware of.

Ms TERPSTRA: I will just quickly ask this question. I was just reading a study that was done some time ago in the *British Medical Journal*. It was a study conducted of around 400 000 nuclear workers. What they found was that workers in the nuclear sector had a 10 per cent higher risk of death due to cancers because there is a low-level dosage exposure for people working in the nuclear industry. I accept that there might be other technologies that might have improved that, but it did say that the risk of death due to leukaemia was found to be higher, at 19 per cent. So what do you say about those risks of being exposed to low-level radiation, those risks to workers? How could they be improved, and are they being improved? Because I would think that leukaemia is not a very nice cancer to have, and workers being exposed cancer is not a good thing, so it is quite concerning. And according to this study 1 per cent to 2 per cent of all deaths among nuclear industry workers may be attributed to radiation exposure. So what do you say to that?

Mr DYKE: Well, I actually have leukaemia and I work in the coal industry. Look, there are a number of health risks in all industries. Black lung is a problem that has been in underground coal mining and it is preventable with proper safety standards and processes. We have seen the same with the stonemasons and the kitchen benchtops—a lot of deaths in there with serious lung failure, and all of that is preventable. If people are cutting wet and wear the right safety equipment and stuff, a lot of that is preventable. The study that you are quoting—it is a little bit hard to know in what country and in what safety standards—

Ms TERPSTRA: It was 400 000 nuclear workers across the whole sector in a range of countries, so it was the most extensive one done in the history of the nuclear sector.

The CHAIR: Can I suggest we take that on notice as well, if you like, because I think it is an important issue and I am sure your organisation will be keen and very well equipped to actually provide the committee with an answer on that. We would appreciate it. I do apologise. We have to cut it there. On behalf of the committee, gentlemen, thank you very much for your submissions and your evidence. We really appreciate your time and effort. Keep up the good work. We will hear from your soon. Thank you very much.

Witnesses withdrew.