

TRANSCRIPT

LEGISLATIVE COUNCIL ENVIRONMENT AND PLANNING COMMITTEE

Inquiry into Nuclear Prohibition

Melbourne—Friday, 28 August 2020

(via videoconference)

MEMBERS

Mr Cesar Melhem—Chair

Mr Clifford Hayes—Deputy Chair

Dr Matthew Bach

Ms Melina Bath

Mr Jeff Bourman

Mr David Limbrick

Mr Andy Meddick

Dr Samantha Ratnam

Ms Nina Taylor

Ms Sonja Terpstra

PARTICIPATING MEMBERS

Ms Georgie Crozier

Dr Catherine Cumming

Mr David Davis

Mrs Beverley McArthur

Mr Tim Quilty

WITNESS

Mr Barrie Hill.

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 kept to a minimum. I would like to welcome any members of the public who are watching this hearing via live broadcast.

I would like to introduce our members who are joining me at this hearing today: Ms Bath, Mr Limbrick, Dr Bach and Mrs McArthur. We are expecting a number of members to join us throughout the hearing—they are attending to other matters. I would like to welcome our witness for this afternoon, Mr Barrie Hill. Mr Hill, thank you very much for making yourself available today. We appreciate that you have put in a submission, and we are looking forward to your contribution.

I would like to advise that 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 give during this hearing is protected by law. Any comment repeated 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 proof version of the transcript following the hearing. The transcript will ultimately be made public on the committee's website.

We have allowed around 5 minutes or so for you to give us a broad outline. As I said, we have your submission and we have read your submission, so do not feel you need to repeat everything, but we are in your hands. Then we will go to questions.

I have to excuse myself. Mr Limbrick will take the chair for the duration of this hearing. I might be joining later on. Thank you, Mr Hill. Over to you now.

Mr HILL: Thank you, Chairman, and thank you for the opportunity to support the committee. My submission is noted as personal, but I do hope it will eventually be of benefit both to my grandchildren, who live in Melbourne and who I have not seen for quite a while, and to the people of the Latrobe Valley, who I visited last year. My submission summarises a clear business case for nuclear power and a proven implementation pathway in order to justify the removal of the current prohibitions. I may have provided too much information, but nuclear power has been one of my areas of expertise and something of a passion, as you can probably judge.

I am an engineer. I have designed, built and operated a range of nuclear power stations and others, including coal, diesel, gas turbine and hydroelectric installations, plus in Australia a number of very complex metal and mineral processing plants as a major power consumer. I have also acted as a consultant to a number of major corporations and startups. All of this engineering work has included a strong emphasis on investment optimisation, risk mitigation and some very innovative personnel development. One early design period covered what was to have been Australia's first nuclear power station at Jervis Bay, a 350-megawatt steam-generating heavy water reactor. I still have the documents for that, so we can build it any day you wish. My team commissioned and operated the prototype 100-megawatt unit. We would probably call that power station a small modular reactor today. There is a brochure showing it. Small modular reactors have been around for a very long time.

I would like to highlight a few interesting quotations that have prompted sections of my submission: 'Privatisation will lower the cost of electricity'; 'Snowy 2.0 will cost \$2 billion'; 'The energy sector has sunk into anarchy'; 'The electricity sector rules are very complex and incomprehensible to all but a few'; 'To lower grid security risks we are proposing to shed demand and shed solar'; 'Firm renewables are cheaper than coal'; 'Renewable energy subsidies accelerated CO₂ emission increases when comparing the electric power sector to other sectors in all OECD countries'; 'The best way to destroy an economy is to install renewables, and the quickest way is to install renewables supplied from ...'—and I have had to redact the country, but I will leave that for you to guess. Only the last quotation did not appear on any official report or in the media; it came from a senior engineer currently attempting to resolve near intractable grid connection issues with renewables. If you

are truly genuine and you wish to cost-effectively decarbonise the Victorian electricity sector, the overall business case for nuclear power, as outlined in my submission, is overwhelming.

In contrast, the world-first renewables experiment promoted by our market operator is four times more expensive for consumers and a potential technical and economic disaster for Australia. In essence, it is unworkable and underpins the sector anarchy. I recommend that you put ideology aside and act to remove the nuclear prohibitions with the condition that if any real fears remain, act to strengthen the hand of our regulator, the Australian Radiation Protection and Nuclear Safety Agency. Thank you, and I welcome your questions.

The ACTING CHAIR (Mr Limbrick): Thank you very much, Mr Hill. Which one of our committee members would like to go first with questions?

Ms BATH: I am happy to go, David.

The ACTING CHAIR: I think Ms Bath got her hand up first, so I will go to Ms Bath first.

Ms BATH: This is not a competition. I am sure we will all have plenty of time. Thank you very much, Mr Hill. I am most appreciative of your level of expertise on this subject, which is far more considerable, I think, to mine anyway, so we will start from that basis. You mentioned the Latrobe Valley in your commentary, and indeed that is part of my electorate of Eastern Victoria Region. We have had the CFMMEU come and speak to our hearing and state that they are very much in favour, because at the moment they are of course very much in the Latrobe Valley in terms of coal and other things. But I am interested in why—I am going to make an assumption, so correct me if I am wrong—Latrobe Valley is well placed in your opinion, and I would like you to unpack some of that, if that is the case, and maybe talk about the grid. I think the grid connections—our grid network across Victoria and indeed Australia—are both our Achilles heel and also a key important infrastructure.

Mr HILL: Thank you. Yes, I visited the Latrobe Valley for a week with a colleague from the Australian Nuclear Association really just to question people and see what the attitudes were but also to have a look at the engineering infrastructure—water in particular. The grid connections are fairly straightforward, but we were concerned about, if there was to be a replacement of coal-fired power in the Latrobe Valley, what the water situation would be. It turns out, of course, that the brown coal-fired power stations use about, on a megawatt basis, the same amount of water that a modern nuclear power station would use. There is an obvious limitation—we could not put too much in that area—but if you wanted to replace those coal-fired power stations with a nuclear plant, then from an engineering perspective that is fairly straightforward.

We found a cautious acceptance that nuclear power would be acceptable on one condition, and that was that it would be managed by the government. I think the valley has found that privatisation and subsequent regulation of a number of other industries has not really worked. There was a great feeling—and it was very common across all levels of political divide in the valley—that by the state government driving a renewables agenda they had been abandoned. And as you saw in the union submission, it was abandoned for all the wrong reasons. There is no way renewables will replace the Latrobe Valley if you want to have a reliable power supply, so a lot of the comments we got were, well, for instance, that they may not be 100 per cent supportive of nuclear energy in the valley. As the union submission said, they were probably more supportive of modern, coal-fired power stations. But if the choice comes down to low carbon dioxide emissions, then I think you will find quite widespread support.

As for siting, for the larger power stations we probably would not recommend replacing the coal-fired power stations on exactly the same sites. For future, small modular reactors I think we would be able to, but I now understand there are many other sites around Victoria where nuclear power stations could be installed. In fact, I understand the old electricity commission had already investigated and allocated sites for nuclear power in Victoria, so I do not see any issues from that perspective.

Ms BATH: Thank you. David, I have got another one.

The ACTING CHAIR: Yes, please go ahead.

Ms BATH: Thank you. You talk about a full feasibility study—easy to spit out those words and huge in their requirements. You talk about nuclear technology, including financial analysis and engineering feasibility.

What are some of the benchmarks that you need to go into that feasibility study? What do we need to understand that is important for a feasibility study?

Mr HILL: Well, in essence what I have provided you with in my submission is an extract from what I would call a prefeasibility study. So it goes through most of the aspects that you would have to look at without going into a huge amount of detail. Usually when I am advising customers in a consulting role we try and do what I might call a 'back of the envelope' exercise first to make sure that—especially in the private sector—the economics will probably stack up or not stack up and is it worth going ahead. And then we progressively add more and more detail and document all that detail to the point where I could put it up in front of a board and the board could sign off on that investment. In the private sector of course it is 99 per cent about, 'Does it stack up, and will we make a profit out of it?', especially in the mining industry.

In this particular sector it is a little more complex, with climate change issues, carbon dioxide issues. Siting would need to be properly investigated, and we are talking about not just drilling a few holes to look at what the foundations look like but actually social attitudes in the area: what are the community feelings on this sort of thing. So just as a general rule of thumb, for a proper feasibility study before sign-off you are probably looking at about 5 per cent of the cost of the final operation. In the previous large study I did it took about two years to do that.

Ms BATH: Where was that, Mr Hill? Where was that study?

Mr HILL: That was a study for a big mineral plant in Queensland — Queensland Magnesia. It is not easy to cut back. I have noted in my submission that much of the early engineering has to be done at the feasibility study stage, and then you have to lock it in so you have to be very careful. So it is not a matter to be rushed, and the proper team—an experienced team—needs to put it together. It is not a matter of ideology or what you would like; it is what is realistic. Say, if we look at Australia in total, our current estimate to replace all those coal-fired power stations that are scheduled to close is about \$150 billion. The federal government has very clear guidelines on studies for investment in major projects. Just to fill in some of my time in retirement I have gone through those guidelines, and my submission is a partial edit of what I have already done following those guidelines. So I have tried to cover most of the aspects, but as I have noted, I would be the last one to recommend that you go ahead based on my submission.

The ACTING CHAIR: Thank you, Mr Hill. Mrs McArthur.

Mrs McARTHUR: Thank you, David. And thank you very much, Mr Hill, for presenting before us today. I am interested in a couple of aspects. I wonder if you would just clarify a little more about the Snowy Hydro project being a dud, for a start.

Mr HILL: I think you only have to look far as your own Victorian energy policy analysis at the university. In the market as it currently stands, pumped hydro is not an economic proposition, and we have already seen that with the Queensland government corporation that owns the Wivenhoe operation. The team at I think it was Victoria University—and I can pass the papers on to you—noted that the problem with pumped hydro and the repayment of capital is the utilisation. So if you put yourselves in the shoes of the operator of a pumped hydro system and he sees the market running at \$14 000 a megawatt hour and he also has a coal-fired power station supplying that power at \$14 000 a megawatt hour, is he going to turn his pumped hydro system on and lower the price in the market and lose his yearly bonus? Sorry, no. It does not work in the market as we have currently designed it. If, on the other hand, the government owns a fleet of power stations, including nuclear, then Snowy Hydro makes a lot of sense because we can get the utilisation up to say 40 or 50 per cent—maybe not 50, sorry, 40 per cent—by running all of the either fossil fuel power stations or nuclear power stations at full load, and when the load in the system dips off we can use the pumped hydro to pump it up, and then we can balance out the load at a later time using the pumped hydro system.

One of the other aspects with all projects is to actually include in the capital cost every dollar that is required to make that project work. Now, we have seen from the first announcements the price go from \$2 billion to \$5 billion, but that still does not include the network and transmission costs to either use the electricity to pump it up or distribute the electricity that will be supplied from the pumped hydro. The excuse given was, 'Oh, that money will be supplied by somebody else'. But if we look at the project, if it does not have those transmission lines then it is a complete dud.

Mrs McARTHUR: David, if I could continue in this line of questioning: given that governments seem to have got it wrong in this area, why would you suggest that governments should be running these things? We have got a situation in Victoria at the moment where the government cannot manage a hotel quarantine scenario. I would hate to think that we might put them in charge of a nuclear power plant. Much as I might like a nuclear power plant, I am not confident of their ability to run anything much. The government embarked on the Snowy Hydro and you were saying it is a dud. Is there some other way we could feasibly do these sorts of things without the government actually owning and running them?

Mr HILL: I guess if we look around the world, the short answer is no. Nuclear power is such a complex issue. There are two parts to the answer. There is the financial risk element, and governments are really the only operators that we see around the world who are able to accept that financial risk. Of course part of the financial risk is: how much does it cost governments to borrow money? And with nuclear power the cost of capital is such a significant factor in the cost of electricity. If we had to rely on the private sector, they would be lucky to borrow money at about 6 per cent. A government may be able to borrow between half and 1 per cent. That is why in one of the parts of the submission we have put in the discount rates—to give you an idea of just what a big difference interest rates make for projects of this nature, and when we are looking at \$150 billion, that becomes a major aspect.

The other part to it all is that while it might have appeared a very good idea for economists to spruik the idea that the electricity sector should be broken up and sold to individual companies and then regulated in a way by a market operator, it does not allow the system to be run efficiently. A lot of my early work in the mining industry was to apply what we called investment analysis economics to very major fleets of very expensive trucks, and luckily I was able to tap into a lot of data about how fleets of machinery and items are managed. In a fleet we look at the whole fleet—new items versus old items, how they are utilised—and we manage how the whole fleet runs to ensure a minimum cost of the whole operation. Obviously there has to be a decision on if you maintain things or just buy new items and so on, and we can apply the same principles to a power system. If we as a government had control over the whole of the power system, it would be very easy for us to run it at minimum cost. When I say easy, I mean it is a lot of work, but the principles are very clear. So there is a very good argument to maintain the power system, particularly in Australia, in government hands.

In fact at one stage I was a director of the Queensland Mining Council and asked by the Queensland Treasury to comment on this particular aspect—whether the Queensland government should privatise the power system in Queensland. My advice to them was, ‘Just be very careful; watch what happens in the south’, but probably not to privatise the whole lot, and they took that advice. So they have a very different power system running in Queensland than you have in Victoria at the moment, and it is to do with those factors—control for minimum cost, although of course the Queensland government operate in the market, and what they do is take the profits that are arising and those people who are in dire straits paying their bills, they support. So it is a different way of operating in the current market.

The ACTING CHAIR: Thank you, Mr Hill. I might have a question. One of the things that you mentioned in your submission is that we face a crisis in the electricity sector. What do you mean by that? What sort of crisis are you talking about, and what might be the implications of this crisis?

Mr HILL: The crisis comes back to the design of the market. In the perfect world of economists—and I do not count myself as an economist—the perfect market operates on price signals. Price signals in the electricity market are supposed to go up, and that sends a signal to people to invest in a new power station. Sorry, nowhere in the world does that form of economics work in the power sector. What we are seeing we have seen for about the last five years: the major private operators saying there is currently no way they can take the risk of building a new power station of any type in the market as it currently stands. In other words, it is an energy-only market. It is the energy that you can supply on the day. It is not what we might suggest needs to occur. There needs to be a capacity market there which rewards investors for providing capacity into the market. And lots of countries around the world have woken up to this. And there are some now, particularly in the United States, saying, ‘Yes, it’s about time we changed the design of the market to encourage a capacity market’. And some of them are also saying, ‘It’s time we changed the market to encourage low emissions release as well’. So the markets are changing around the world. We have been very slow to catch up on that.

The ACTING CHAIR: Thank you. And one thing you have done which is very interesting is actually going out and talking to people in the Latrobe Valley. And I think I will try to channel Mr Melhem here. He has

asked this question a number of times about social licence. Who are the key people that would be required to get social licence for let us say some sort of project down in the Latrobe Valley? We have had some people come in already, like from unions, for example, and the CFMMEU mining and energy division was quite keen on the idea. But what do you think is required to get that sort of social licence so that the community accepts it? Because we have heard from other evidence that this is critical to anything going ahead. And when heard from Canadian energy operators they said, you know, that is a really critical thing.

Mr HILL: One word: education. What we find around the world is most countries with existing nuclear power plants have got a much better educated community who have a much better understanding. They are not scared off by all the negativity which has been promoted as a result of the Cold War. I take a lot of what we see in Australia back to Cold War days when Australia in particular made a decision to move into some enrichment technology. That upset a few people around the world, and we ended up with very clear campaigns which I think are the basis of the legislation which occurred to prohibit—

The ACTING CHAIR: If you look at the *Hansard* that is exactly the case, actually. Yes.

Mr HILL: Well, it is not only the *Hansard*. ASIO has let slip a bit of information, and I have got a few press releases and so on and so on about the time in the 1970s and 80s when the Cold War was raging. But my advice to you if you really want to engage in this is to then use your parliamentary privileges and dip into ASIO's files. I think you will find a huge amount of information that they have collected and are sitting on.

Unfortunately, I mean Australia has a history of this. A very good book which you will never find in any university library is *Australia's Secret War*. It is a collection of news clippings from the period of World War II. And from the secondary title, we had very serious problems. It is really about the issue of communist influence in trade unions, and particularly the wharf unions, in World War II. And some of it is very well understood if we look at the history of Russia and Germany alliances at the beginning of the war. And it is logical that that resistance occurred in Australia, but when Germany invaded Russia the people who were pilfering materials off the wharves and stopping the loading of ammunition on ships did not understand the change that had occurred but kept on with the old habits, even to the point of stealing emergency rations from lifeboats. It is a dreadful part of Australia's history, and unfortunately a lot of the cultural attitudes which developed in that time flowed on to the 1950s, 60s and even into the 70s. So it is no wonder that it was pretty easy for outside influence to influence the development of nuclear power in Australia.

The ACTING CHAIR: Fascinating. That is a really fascinating history.

Mr HILL: Well, I tell people I might be an engineer and I came to history late, but those people who fail to read history are forced to repeat it. And you only have to pick up any newspaper in Australia today to see the same thing going on. The country might have changed, but actually according to my reading it has been going on for the last 200 years. I am currently reading a history of Afghanistan, and I am pretty sure most of these attitudes started back then. It has got almost nothing to do with communism or political attitudes; it is country rivalry that has caused most of these sorts of problems.

The ACTING CHAIR: Thank you. I believe Mrs McArthur has her virtual hand raised and would like to ask another question.

Mrs McARTHUR: Well, thank you, David. I am interested in where we could potentially locate a nuclear power station. In my electorate on the other side of Victoria to Ms Bath's electorate, we have got an aluminium smelter that is powered by energy that comes from Ms Bath's electorate in the Latrobe Valley across Victoria, losing a considerable amount en route. Would it be logical to build a nuclear power station near a major production facility like an aluminium smelter rather than transporting energy from one side of a state or one side of a country to the other? In other words, could we have energy better sourced near a need rather than what we have got at the moment, especially with the wind energy operation that is going across my electorate in many places? That has now created a need for a massive transmission line to pick up the energy from the wind farms and get it to other parts of Victoria, so we have created another environmental problem because we have not got power in the grid, we have got to increase the size of the grid and we have got to connect it to all these renewable plants that are scattered all over the place.

So there is the issue of the location of the power plant near where it is needed. I mean, I have got dairy farms in my electorate very near the smelter who have to run on diesel because we do not have three-phase power. For

all the environmentalists, I am sure they do not want operations running on diesel, but I think we were even going to build a site in Victoria—on the peninsula—where we were going to receive diesel to power things. That seems extraordinary. So just the location of these power plants—what is feasible so that they could plug into existing gridlines and how do we go about it? I am still a little nervous about your idea that the government should run these things. And could you also comment on the Reserve Bank potentially managing this? It would also seem problematic.

Mr HILL: Yes, I could probably talk for about 4 hours on that question. I emphasise that number one I am not an electrical engineer. I have a number of colleagues who could answer those questions much better than I can. But putting a nuclear power plant alongside a smelter is not such a big issue. With modern electrical engineering we do not lose too much energy down a transmission line that is running at 100 per cent capacity. In fact there are advantages of course of not having transmission lines that are too long. A large part of my background has been in aluminium smelting, in both New Zealand and Australia. Sometimes you do not have much of a choice on where the power is, as in the case of New Zealand where the Manapouri Power Project runs the New Zealand aluminium smelter at Bluff. I think that is about a 160-kilometre line, and no-one sees any real issue with that.

The problem which has emerged with the wind farms is that—it is a twofold problem again, as I understand it from an electrical engineering point of view—many of the wind farms are being connected to older power lines which do not have the capacity to take too much, and because of the nature of the design of the inverters in the wind farms or solar farms as well, they are tending to introduce harmonics into the power system. That is one of the reasons why the market operator is starting to curtail some of the power that is going in from wind farms and from solar farms. So then there is a pressure to increase the size of the power lines. It is a very topsy-turvy situation where the power lines are not fully utilised and are having in some cases very serious stability conditions. But again, I am not an expert on that particular subject; I can certainly put you onto some people who are making a lot of money trying to resolve these issues for power grids at the moment—and that is one of the reasons why we are starting to see promoters of solar and wind projects starting to back out of the market. We have almost reached what I would call a technical saturation point where we would have to build a lot more grid all over the place to cope with these intermittent sources of power, and it is just not economic.

The ACTING CHAIR: Thank you, Mr Hill. I am just conscious of time, and I know that Dr Bach raised his hand before. So, Dr Bach.

Dr BACH: Thank you very much, Acting Chair, and I know I speak for all my colleagues when I say that you have been doing a wonderful job in your acting role since Mr Melhem left us. And many thanks, Mr Hill, for your presentation today and also for your really detailed submission. As a historian before coming into the Parliament just a few months ago, I was particularly heartened at the praise that you heaped upon my profession just a little earlier.

I am really interested in the commentary that you made about the costs of nuclear energy. So I wonder would you mind walking us through in a little bit more detail how that works. I jotted down a question as you were speaking before. It also relates to your submission, as I say, regarding the total operating costs of nuclear power—thinking about construction as you have discussed, decommissioning, waste management, the lot. Would you mind talking to us a little bit about that and how the cost compares. I understand from what you are saying that there is a very significant startup cost, but would you mind putting that into some context for us over a longer time period—10 years, 20, perhaps even 50 years, sir.

Mr HILL: Well, that is a very broad set of questions. In general terms, nuclear power installations are very capital intensive, and of course they take a reasonable period to build—four to five years maybe. So you are faced with financing the high capital cost over a period where there is no return, and then, when the power station starts operating, it operates at relatively low cost, but it also operates maybe for an initial period of 50 years. What we are seeing in the United States at the moment is, because they have been so conservatively built, that life extension is quite easy. Some of them are out to—they have a life extension period of 80 years at the moment.

We would never advocate that a grid would be 100 per cent nuclear power because it is not an economical proposition, again because of that very high capital cost. Because of the high capital cost, there is great pressure to run those plants at 100 per cent capacity. In fact in South Korea the modern nuclear power stations run

100 per cent of the time for a whole year, and they may go for 18 months before they are shut down for refuelling. That is the economic way to run them; whereas, say, for a gas-fired peaking plant, because the gas is very expensive in the plant, the capital cost of the plant is very cheap, you can have a very low utilisation regime for a peaking plant that picks up where the nuclear plant might fall off.

This is one of the reasons why the government running the whole electricity system can manage the system for minimum cost, and that is what was done in the past. In some of the mining industry areas, obviously having to buy off-peak power at 3.5 cents, for instance, and today the problem becomes for any organisation trying to utilise electricity: number one, they cannot write a long-term contract to support an energy-intensive industry; and number two, if they could, the price would probably be up around 10 to 15 cents, which is just non-economic for a lot of mineral processing, for instance.

So the whole area of energy economics is actually a very complex area because first the engineering has to be done, then the economics have to follow that. This is why so many people confuse what they think are very cheap renewables, because the energy obviously is free, but have no understanding of plant utilisation factors, backup factors and so on and so forth. Again, with a properly constituted set of numbers, I could probably talk on for a week on that. In fact part of my consulting experience in the past has been trying to help people through these issues.

It is a very complex area, and part of the problems with the push to renewables has been a complete lack of understanding of the complexity of the financial aspects of the power systems as they run around the world. That has caused all sorts of problems. Just as an example, operating in a free market system like we have in Australia at the moment is forcing out higher capital cost installations because it is an energy-only business. So what you are seeing is pressure on your power stations in the Latrobe Valley, and you may find, if the market is not reorganised, they will shut down prematurely and you will be left with a system which is in blackout for 10, 20 per cent of the time. So it is a very complex area which very few people understand.

The ACTING CHAIR: Thank you, Mr Hill. I think Mr Hayes was next. Mr Hayes, do you have a question that you would like to ask?

Mr HAYES: Just listening at the moment, thanks, Mr Chair. I have nothing to ask at the moment. Thank you.

The ACTING CHAIR: Okay. I wanted to follow up then. Mr Hill, you brought up the idea of the talk around education. This is something that I have noticed. I grew up in the Cold War, with all of the antinuclear hysteria and everything during the Cold War, and I had to change my mind. But what I have noticed talking to young people is that they do not know anything about nuclear technologies at all. A lot of them are very open-minded about it, I have discovered. What is your experience talking to people about this, and what are your views on education and what needs to be done there? As far as I am aware—and I am sure Dr Bach would know a lot more about this than I would—young people in primary and high school are not educated pretty much at all about nuclear technology, as far as I can tell, except maybe in physics or something.

Mr HILL: Well, historically what we see is that we say the older generation—which I do not count myself in—has been heavily influenced by Cold War propaganda. And that has changed; it has changed quite dramatically. Originally I think the communist countries were very worried about the West gaining, or too many countries having, nuclear weapons and so the pressure was on through the nuclear weapons program. I was in England at the time of the ladies revolts against American cruise missiles being stationed in the UK, and I think that really triggered the antinuclear movement and was very heavily supported by the communist countries. Once you get yourself into those situations it is very hard to back away. That has all changed in today's world where the communist countries are probably the fastest implementers of nuclear power for very good reason, which you really need to understand. The way China is operating at the moment, the cheap supply of electrical energy will continue to make China an absolute world dominator in trade. In fact, the connections I have had through Australia's energy policy institute indicate connections with China and speakers who have come from China.

The Chinese energy planning institutes, which are slightly separated from the government, are advocating building another 200 nuclear power stations in China. There are already plans on the book for 50, and there is another 200 on the way. So I guess the younger generation is seeing all of this and saying, 'Well, if China is

advocating building another 250 nuclear power stations, then what are we doing sitting here trying to build wind turbines?’ In fact, remember I said in my opening address, ‘The quickest way to destroy an economy is to install renewables’. That is the comment coming out of the electrical engineering sector of Australia who are generally very, very quiet on these sorts of things.

You will see from the submissions I have put in that we are very lucky to have an engineer at the University of Wollongong who has actually made the effort to properly cost everything and put it into perspective, and I add that those figures that I have given you in the second submission have never been challenged. They have never been challenged. In fact, subsequent to that first paper that we put out that covered all those costings, we have had the OECD also do a similar study through Massachusetts Institute of Technology showing pretty much the same thing: that the more renewables you have in the system and the backup costs and the under-utilisation, in particular, just throw the cost up to four times what you might achieve with other options. In the submission I have said that the work we have done on economics we would have to take at a very general level, hence the recommendation that the first step after removing any prohibition would be to do a proper feasibility study.

I sat in on the federal hearings where AEMO and CSIRO were questioned, and they made it very clear that the prohibitions have stunted their proper investigation of nuclear energy. What is the point? They might come up with all sorts of answers, but because it is prohibited none of those answers would be put into practice, so they do not waste their money. They do a very good job. Renewables are the flavour of the month, so they put all the effort into renewables.

The ACTING CHAIR: Thank you, Mr Hill. I notice that our Chair has come back, Mr Melhem.

Mr MELHEM: You are doing a fine job, mate, carry on. I believe Nina Taylor may have a question. So carry on, David. You are doing a fantastic job.

Mr HILL: Okay. Maybe I should mention that—

The ACTING CHAIR: Ms Taylor, do you have a question?

Ms TAYLOR: Yes.

Mr MELHEM: I think Nina had a question.

Ms TERPSTRA: Hello. Thanks. Nina has not asked one yet.

The ACTING CHAIR: Yes. Please, Ms Taylor.

Ms TAYLOR: Apologies for being late, too. I was trying to listen to as much as I could. I did want to just refer back to your submission. You were mentioning about the South Korean nuclear industry.

Mr HILL: Yes.

Ms TAYLOR: Yes, and I think there was also a reference to—pardon my pronunciation—Barakah, the investment in the UAE. I am just going to refer to a couple of issues with that and just get your commentary. I understand with Barakah there was a \$18.6 million deal for four reactors. Twelve years have gone by and there is one reactor, I think it was recently reported, starting to get up and running. No public consultation, bad labour conditions, alleged military defence deal with South Korea, counterfeit parts, and noting also that with South Korea in 2014 there was an inquiry that escalated to the investigation of collusion and warranty forgery and a total of 68 people were sentenced and courts dispensed a cumulative 253 years of jail time. Guilty parties included Korea Hydro & Nuclear Power. Final point, where that has landed today—this is according to this article, which I am happy to provide to you:

Less than a decade after Barakah broke ground, Korea is dismantling its nuclear industry, shutting down older reactors and scrapping plans for new ones. State energy companies are being shifted toward renewables.

And the original plan to use it to combat climate change seems to be dwindling. So what is your commentary on that, noting that South Korea has had some significant issues on its path?

Mr HILL: I think every country that has engaged in nuclear power has had some issues. What we are currently seeing in South Korea—and I spent some time over there investigating the power stations—is there is

a natural progression of slowly shutting down old power stations. They were built with technologies we would now see as outdated and maybe even not quite as safe as we could build today. What heartens me, though, is after Fukushima the Korean government halted for a very short period the existing program that they were building and essentially put it to the vote whether they should continue, and they got a 70 per cent agreement among the Korean people. And what we see in the nuclear industry is, because of the very negative attitudes that have been induced by the Cold War, 70 to 80 per cent of people who really do understand the nuclear industry is not a bad outcome in a voting situation like that.

As for corruption, which you are generally dealing with, all sorts of corruption goes on in the construction industry in all countries. In fact my experience in Australia in some ways is not too far off the corruption that we see in those cases you have mentioned in South Korea. It is a fact of life for anyone in the construction business. It is why the law courts are full of construction issues and cases and so on and so forth. I think the South Koreans have got past those particular issues. Most of them dealt with people forging quality certificates, and I have to assure you we have had the same problems in Australia. It is not unique. It is part of life in the construction industry. It is a part of life that as managers of construction we have to be always on the outlook for. It is the way the private sector runs, and sometimes it is the way governments run. It is part of the human condition. It is nothing unique.

Ms TAYLOR: Right. So you think that is good then, what happened there?

Mr HILL: There is nothing good about it, of course not. You have to be on the outlook—I mean, that is where our lawyers come in, trying to sort those sorts of problems out and make sure they do not occur. So yes, I have been through it all, up to the doors of the court but always avoided going into court in Australia. It happens in Australia. It happens in South Korea. There are other issues of corruption which I believe are much more significant than anything you have mentioned in the nuclear industry. In the nuclear industry, in California, for instance, the governor is under investigation for shutting down nuclear power plants and the allegation is that it seems he has more interest in gas and oil interests. Corruption is a wonderful subject, and offline we could have a wonderful discussion about it.

The ACTING CHAIR: That might be a good point to finish up. I think we have run out of time, but thank you very much for your contribution today, Mr Hill. All broadcast and Hansard equipment must now be turned off. Thank you.

Witness withdrew.