REPORT ON PROCEEDINGS BEFORE

SELECT COMMITTEE ON ELECTRICITY SUPPLY, DEMAND AND PRICES IN NEW SOUTH WALES

ELECTRICITY SUPPLY, DEMAND AND PRICES IN NEW SOUTH WALES

CORRETED PROOF

At Macquarie Room, Parliament House, Sydney on Tuesday, 31 October 2017

The Committee met at 11:00 am

PRESENT

The Hon. Paul Green (Chair)

Mr Jeremy Buckingham
The Hon. Ben Franklin
The Hon. John Graham
The Hon. Taylor Martin
The Hon. Adam Searle

CHAIR: Good morning and welcome to the first hearing of the Select Committee on Electricity Supply, Demand and Prices in NSW. Before I commence I acknowledge the Gadigal people, who are the traditional custodians of this land. I pay respects to the elders, past and present, of the Eora nation and extend that respect to other Aborigines present. This morning the Committee will hear from Professor Mary O'Kane, the NSW Chief Scientist and Engineer, and after lunch we will take evidence from representatives of the Australian Energy Market Operator. Finally, the Committee will hear from Mr Tony Wood, the Energy Program Director at the Grattan Institute.

Before we commence I will make some brief comments about the procedure for today. We are webcasting today, so the hearing is open to the public and is being broadcast live via the Parliament's website. A transcript of today's hearing will be placed on the Committee's website when it becomes available. In accordance with the broadcasting guidelines, while members of the media may film or record Committee members and witnesses, people in the public gallery should not be the primary focus of any filming or photography. I remind media representatives that they must take responsibility for what they publish about the Committee's proceedings. It is important to remember that parliamentary privilege does not apply to what witnesses may say outside their evidence at the hearing, so I urge witnesses to be careful about any comments they may make to the media or to others after completing their evidence as such comments would not be protected by parliamentary privilege if another person decided to take an action for defamation. The guidelines for the broadcast of proceedings are available from the secretariat.

There may be some questions that witnesses could answer if only they had more time or with certain documents to hand. In these circumstances witnesses are advised that they can take the question on notice and provide an answer within 21 days. The Committee hearings are not intended to provide a forum for people to make adverse reflections about others under the protection of parliamentary privilege. I therefore request that witnesses focus on the issues raised by the inquiry terms of reference and avoid naming individuals unnecessarily.

Witnesses are advised that any messages should be delivered to Committee members through the Committee staff. To aid the audibility of this hearing I remind Committee members and witnesses to speak into the microphones. In addition, several seats have been reserved near the loudspeakers for persons in the public gallery who have hearing difficulties. Finally, I ask everyone to turn off their mobile phones or turn them to silent for the duration of the hearing.

MARY O'KANE, NSW Chief Scientist and Engineer, Office of the NSW Chief Scientist and Engineer, affirmed and examined

The CHAIR: I welcome our first witness, Professor Mary O'Kane, NSW Chief Scientist and Engineer. Do you have an opening statement?

Professor O'KANE: Yes, I do have a short opening statement and then, of course, I am happy to discuss things further. First of all, thank you for the invitation. Since we have been working a lot on energy it is great to have the opportunity to air some of the work we have been doing. In terms of background in energy matters, I am a professor emeritus from the University of Adelaide in electrical engineering, although primarily in light electrical and control matters. I have been involved in a range of energy matters in recent years. I am currently, for the State, chairing the NSW Energy Security Taskforce, and I was a panel member of the Finkel review. From 2013 to 2014, I carried out an independent review of coal seam gas in New South Wales. From 2010 to 2012, I chaired the Australian Centre for Renewable Energy for the Commonwealth Government, which was the precursor to ARENA. From 2011 to 2013, I chaired the NSW Renewable Energy Taskforce.

I will focus mainly on energy security and reliability, so supply and demand issues. I am not going to speak at length about prices because the Energy Security Taskforce is primarily about security and reliability and does not touch on prices. However, I will make just a couple of glancing comments about prices. My team has been studying the Australian Competition and Consumer Commission [ACCC] recent report and we think it gels pretty much with the sort of findings we have held—its observations are highly consistent with the work that my office has been doing in energy security and what I observed in Finkel, and I find its reasoning fairly compelling. That is just one point in passing, and I refer you to that report.

We had a meeting with Rod Sims from the ACCC yesterday and one of the points I made to him I make again here, and that is the incredible importance in dealing with prices of open data and open information. One of the great problems with the energy system is that it is a very difficult system to track—there are not good information indicators to people outside the energy market bodies like the Australian Energy Market Commission [AEMC], the Australian Energy Market Operator [AEMO], the Australian Energy Regulator [AER] and so on, and we do have a great need of information that can be tracked by inquiries like this but also by the general public so people can make informed decisions as to which retailers to be with. Also I think there is an important point to push for transparency as much as possible. That might be some way back to what is the information that would go to the public, but transparency in the contract market, for example, is important. While you can see the open trading on the electricity market, the National Electricity Market [NEM], you cannot see the details of the contract market.

I think it is very important that as much information as possible be open and available and that it then be available in formats that are very useful. The public need it not only to know which retailer to be with but also to make personal investments—and this goes for business as well as for private individuals and homes. It is very hard to know whether you want to invest in solar panels or not—which ones, what cost, what type, what about batteries and so on. As microgrids and so on become more available, should you join up? Those decisions will require a lot of information for a family or a business. I point out that is something that is quite important.

Returning to the terms of reference, I probably do not want to say much about the impact of deregulation of prices but I would make a short comment about 1 (c), "alleged collusion and price gouging by energy retailers". In the work we have done on the Energy Security Taskforce we heard several suggestions about this without people being able to prove it. We looked into it and were not able to come down either way about it. We have noted the work done by the Australian Energy Regulator, which has also looked at it, and noted that it has not been able to actually prove it. It does seem that there are, understandably, some very clever practices in the market but of course knowing exactly how clever, and where that is in terms of the spirit of the market as opposed to the law, goes back to this information issue. I think that is an important issue. Whether it is price gouging or not, I think we do not know, but there are certainly opportunities for people to use the complexity and opaqueness of the market, and I think that is important.

I do not want to make any comments about the current regulatory standard or the "options for government oversight and responsibility in the re-regulation", but I do want to make comments on your next two subclauses. I will read out 1 (f) because I want to comment on it:

> the adequacy of planning to meet future electricity demand, including utilising high efficiency, low emissions coal technology as well as the use of nuclear, gas, solar and wind energies, and energy storage through batteries, pumped hydro and hydrogen, and improved transmission between regions …

I think you or whoever wrote it left out something important: Geothermal is something that should be—

The CHAIR: We did note that but it obviously did not make it onto the page.

Professor O'KANE: It did not. I want to comment on geothermal because in terms of base load and in terms of countries that have loads of it, Australia has it in spades. Admittedly it is very deep and is typically three to five kilometres down. There is some in New South Wales but there is a lot of it just over the border in South Australia and, of course, it is connected to our very extensive uranium and thorium holdings. It is referred nuclear just as solar is referred nuclear.

If money was not an object and we wanted secure supply, geothermal and long transmission lines would be a very nice, very secure thing and Australia would have no worries. We could even be exporting power. I think it is important to think we do have options in this when sometimes it feels very tight and awkward. It is there; it is expensive. It is also important to remember, I think, that Australia pretty much led the way for some years, remember, with all the geothermal companies that were around which have all disappeared now or been turned into something else. My colleagues and I were talking to the US Department of Energy the other morning about geothermal matters. It commented that, where Australia had led the world and particularly led it commercially—it was firms working with a lot of government money—now there is nobody around from here. It is an interesting example of the things that do happen in energy.

You could argue that much of the same happened in nuclear. Back in the late 1960s and early 1970s, Australia brought home all its nuclear experts and put a lot of effort into understanding how we might build a reactor only to abandon it, though there are good reasons for that. It is interesting that we go through these waves of great expertise, building up expertise and investing heavily and then dropping it, and we do not always have a very good record of it. Again, it is another comment like that on geothermal: It is a contextual but important comment.

I go on to the point of the subclause. I first of all say that, in terms of "adequacy of planning", I do not think you can plan in a time of great technology change and innovation and in what is emerging business innovation as well, as we see new entrants to the market like Reposit, Mojo and things like that. I think the question is: What should we do if we want to take advantage of the technology movements of various sorts? It is also worth remembering that Australia has every energy source available except we do not have a lot of oil. We are an incredibly lucky country in this regard, so all sorts of technologies, if they become appropriately cheap enough, could be used in this market. It is worth thinking and turning our planning attention to planning a very good market. Ideally the energy market is constructed to make investment in reliable and secure generation attractive along with investment in transmission, including interconnectors, distribution and retail, and all of this in a way that keeps the electricity costs low to consumers, whether industrial, commercial or retail. I think that is where the planning activity needs to go.

Australia was, again, rightly proud of its NEM, which has been running for just under 20 years, but the crisis of the September blackouts in South Australia and our hot day in February certainly called it into question. We have seen the incredible run of reviews, studies and whatnot this year that the Committee gets the benefit from and my work gets the benefit from as well. The market as designed has worked well but I noted the complexity of it and I also noted a certain amount of the data being somewhat opaque. There is a lot of data about it, but there is more that we would want. As well as wanting more data, we want very transparent modelling of what we could do, so in a time of great innovation I believe we do want modelling that is open, available, preferably done in places like our universities and CSIRO, which includes NICTA, in ways that can be interrogated by parliaments or appropriate groups.

Another very important thing is that we need a fairly good vision of what we want and what we do not want in the system. That rapidly brings us to questions of things like trade-offs. For example, you look at the reliability standard, which is not 100 per cent and we probably do not want it to be 100 per cent because that last fraction of a per cent is incredibly expensive. Given that we did not have blackouts for many, many years here, people had come to think that, except for a tree falling on the power lines, a blackout of some sort was an issue, whereas we probably need to think about those trade-offs in our vision.

I want to go to the Energy Security Taskforce. It was really interesting to do a study through the lens of a hot day. What we were asked to do in that work—and I have brought copies of it for you as well as a summary, which we will leave and, of course, it is online at the Chief Scientist and Engineer website—in summarising the terms of reference, was to assess the risks to and resilience of the New South Wales electricity system during extreme weather events; to review the adequacy of the State's management of the electricity system security events including prevention, preparedness and so on; and to make recommendations on actions

to address any vulnerabilities identified. The interesting thing about the system, as you will know, is that most of the time Australia, and New South Wales in particular, has loads of capacity. Our nameplate capacity is about 16,000 megawatts and about 99 per cent of the time load is beneath 12,000 megawatts and approximately 92 per cent of the time below 10,000. I will talk about my 50 per cent figure later, but generally we are awash with capacity. This says something about prices, but I will leave that to you.

On the hot day, however, the requirements went up to 14,000 megawatts. Why? Because of air conditioning. It is hard to get the data from the retailers to pull apart data on how much is domestic air conditioning and how much is air conditioning for businesses and so on, although it is believed the big problem is domestic air conditioning, added to the fact that, at the end of the day, given all our solar panels on roofs, the behind-the-meter activity, as the sun goes down and solar energy falls out of the system, people go home and turn on the air conditioning. That means the supply goes down when the demand goes up. The other thing with hot days is the power plant, which is often ageing—we talked about Liddell before—tends to work less well under the stress of high heat. This is not often understood, despite the fact that firms go through maintenance schedules and work out with the Australian Energy Market Operator [AEMO] more maintenance occurs in the spring months. There still is a major problem that things can fall off, so on the hot day all sorts of things happen.

As well as the power plants not necessarily working well and bits of the transmission system falling off, is that you get them coming up against environmental restrictions, such as the cooling ponds. If it is too hot there is a danger that fish will fry in the ponds et cetera. Despite the fact that the Environmental Protection Authority [EPA] was very responsive about allowing them to push up the limits a bit on 10 February, the whole issue of hitting the environmental restrictions is very important and tends to cause the supply to be restricted in various ways. It is really important to emphasise that that sort of scenario typically happens only for a few hours—in this case it was one day this year and it could be a small number of days in heatwaves. It is not as though we are facing a hypercrisis; we are facing what to do over a few hours on a few days.

On the other side, one of the things the Energy Security Taskforce has looked at is extreme weather events. We have been told by both the Bureau of Meteorology and the ARC Centre of Excellence for Climate Extremes, which is headquartered at the University of New South Wales and is a major national centre in this area, that we need to expect more extreme weather and, particularly in Sydney, heatwaves. While the current projections is that at least until the end of January next year we will have a cool, wet summer, February is the month to watch and we will see that projection fairly soon. Overall, in a summer coming soon we are likely to have more heatwaves, and the problem would be considerably worse if we got a string of heatwaves. Also the day of the week hot days occur is important. It gets hotter and hotter as the heatwave builds up, and if there is a weekend included there is a bit of relief but if it is all in the working week then it can be a problem. We were lucky that the hot day this year was at the end of a working week.

Another thing in terms of extreme events is that it is clear that Australia is seeing more tornadoes. In the day after the hot day, 11 February, a small number of transmission towers went out in the Snowy. They were mini tornadoes and they are very hard to track because you cannot easily get them on satellites. Understanding the phenomenon is not there yet. We do have to be ready, but most likely it is going to be limited to a small number of hours on a small number of days.

The recommendations in the initial report—the final report will be coming out at the end of the year—particularly go to what the Government should do. These recommendations were accepted by Cabinet. The important ones to point to are the importance of making sure of good integration of the emergency management system with the energy system and the importance of getting both the public ready and doing what we can in the public sector—such as the notion of "code warm", where buildings would operate at probably 26 degrees, although it is not as simple as saying 26 degrees because we have to manage heat in various ways. This is about the idea of dropping the air-conditioning load. If a heatwave is likely we need to make sure that there is good communication to the public about ways to manage to keep cool without pushing on extra load by doing things such as putting on the air conditioner early in the morning and closing up the house so when you come home at night the house will still be cool without turning on the air conditioner at that point. There is also managing load remotely.

I would be happy to speak at length about the task force. The other comment to make under this clause is that looking through the hot-day lens it becomes clear to us that, as several other reports have found, demand management is a really important part of this story along with management in all sorts of ways. Innovation in that area is really important. Things we are noting are new entrants into the energy market. We will see a changed energy market where firms—and not just smelters and steelworks but even smaller companies—are

looking at their own energy supply including solar panels and batteries. As I said, we are seeing a range of innovative new business models in retail and other sectors. On the demand management side, a particularly nice example is what was an air-conditioning firm in Yass becoming more of a near-surface geothermal firm for heating and cooling. A chap called Touie Smith is the third generation to run this family firm and he has put on a large number of apprentices, who go to Goulburn TAFE. This has affected the syllabus in this area, because they are learning how to do geothermal work in the Goulburn-Yass area. We are seeing quite a lot of interesting innovation. What we need to be ready to watch over the next phase are ways of tracking that innovation. As I said, we need to plan a market that allows that innovation to flourish, and we should remove in a government sense as many regulatory barriers as possible while making sure that reliability, security and safety and things are all in place.

In conclusion, I will make a couple of comments about the issue of adequacy of programs for low income earners and pensioners. Although we are not really looking at prices, we are concerned about those communities. For example, in saying to people not to turn on air conditioners at five o'clock on very hot days, it is very, very important to say that, if they are old people, appropriate air conditioning is used. That is one sort of thing, but we have also been studying past reports in the energy system. I draw your attention to the Productivity Commission report of 2013 which reviewed the electricity network regulatory frameworks. It points out that the system generally does not have incentives to shift consumption away from peak demand periods and it leads to hidden subsidies between peaky and non-peaky customers—an overinvestment in peak-specific investments. This report states:

> Currently, a low-income household without an air conditioner is effectively writing cheques to high-income users who run air conditioners during peaky periods. For example, a household running a 2 kilowatt (electrical input) reverse cycle air conditioner, and using it during peak times, receives an implicit subsidy equivalent of around $350 per year from other consumers who don't do this.

That is just one example I want to bring to your attention. I think it is important to remember that sometimes the system is geared in ways, partly because it is a very complex system to understand, that affect these vulnerable groups. Chair, I think I would like to leave it there and of course will happily answer questions and provide material, as required.

The CHAIR: Thank you, that is great. Just so that you know, bringing you in at this stage was about getting a foundation really for New South Wales and trying to see the different plethora of energies and innovation. It has been really helpful so far to have your information. Just generally we will go informally around the Committee with no set times to extrapolate some further comment on some of your questions. One you have spoken about is massive investments on types of renewable and other energies, and then suddenly that fell away. Can I get clarification: Is that because the political side fell away? Was that a political issue that suddenly dropped all that investment?

Professor O'KANE: It is an interesting point and a little hard to find out exactly what is going on. I think it is often put down to the changing climate, the instability on how energy policy and climate policy interact. That said, there is an awful lot of investments slated. People tell us, "We are thinking of doing this. We are about to do that." It is a very hard issue to get a picture of, but it looks as though we were getting a certain amount of investment over the years and we were building the amounts of renewable energy, but we were not seeing innovative businesses. We were seeing good things in the demand response but not a great sense of urgency around it.

Suddenly, all of that changed in the last year post the South Australian incident and things. Suddenly there is really great interest in doing things. That said, an important point I would make is in the period I was chairing the Australian Centre for Renewable Energy I had an awful lot of trouble getting the money out the door and was criticised by then Federal Minister Ferguson for the matter, but we just could not get the funding out. That was because we did not have enough good applications. There just were not people. I mean, we were trying hard in those years: It was the time of the geothermal flagships and the solar flagships and things. I did not have solar flagships; I had the geothermal one. But I am told by the current ARENA chair and chief executive officer [CEO] that they are having much the same problems.

The CHAIR: Is that because the business case does not line up, or is it the technology?

Professor O'KANE: It is both; the business and the technical cases were not lining up. It does seem that as a country we have got to—well, maybe we do not have to do it. Maybe we will be a fast follower in terms of watching innovation around the world, but it is an area where we could push up our capacity. One of the things that is another piece of background here is that in our universities we made the power part of our electrical engineering departments very small. From about the 1970s onwards it was almost as though we went

through the Snowy Hydro period and then we almost were producing too many power engineers and so we cut back. Over the years I chaired the grants part of the Australian Research Council we would have seen a handful of power engineering grants. I looked up the numbers the other day and found the numbers were not very much greater now, even though actually there has been a big investment in building up our power engineering capacity.

The CHAIR: As the Chief Scientist, are you concerned that our energy direction keeps changing because of retail politics: People are making decisions based on winning the next election rather than good, long-term common sense?

Professor O'KANE: I would not like—and I do not know if they are making those decisions—but I think I will sidestep the question and answer a slightly different one, which is to say that I think the recent stir-up has been a good thing. I think we are suddenly seeing both a good analysis of what is going on, which will probably help long term since the National Electricity Market [NEM] structures are meant to be long-term structures, and we are suddenly seeing a highly engaged population taking a real interest in innovation, importing technologies and developing things here. I think the stir-up has been an accidental blessing.

The CHAIR: Before I move on to the Opposition, I will ask this: You said it is a matter of saying what we want or what we do not want. Does that really come down to how much is it going to cost?

Professor O'KANE: I think it could and I think that is one of the really important things. How much do you want reliability and at what cost? Do you want the reliability standard to go up at all costs? Should people be prepared to turn off the air conditioners on these really hot days? Some people say that that is a very Third World solution, but it actually could keep the costs down if we change our practices a bit. I think it is exactly that issue: What are our trade-offs? How do we keep the emphasis on getting costs low? How do we make sure that our system is secure and reliable in ways that are acceptable? What does acceptable mean? If you live out in the country right on the edges of the NEM versus if you live in the city, what are those trade-offs? I think we just have to be clear about it. I think people are very understanding if they understand the reasons.

The CHAIR: The early indications that I hear are that people do want renewable energies, but not at any cost. They want to be able to afford their bill.

The Hon. ADAM SEARLE: You made an interesting point in your presentation about usual or regular demand in New South Wales at 10,000 megawatts or less compared to the peak time of 14,000 or 15,000 megawatts on a hot day.

The Hon. BEN FRANKLIN: It was 14,181.

The Hon. ADAM SEARLE: Yes, but who's counting?

Professor O'KANE: Good on you.

The Hon. ADAM SEARLE: But you then raise the interesting point about capacity. Obviously the capacity is quite a lot larger than demand or consumption on the usual day.

Professor O'KANE: Yes.

The Hon. ADAM SEARLE: Yet, for all sorts of reasons, we are having catastrophic price increases. I know pricing is not one of the focuses, but surely in a market where you have got people with the supply—and leaving it entirely up to them as to when they supply and at what price—obviously that has an impact on people's ability to afford energy.

Professor O'KANE: Yes. I really do suggest you ask Rod Sims in detail. His observations, not just in the report but from talking to him yesterday, reminded me just what insight Rod has into it. It also reminded me of the importance, as I was reminding him, of the Australian Competition and Consumer Commission [ACCC] inquiries because they have access to incredible data that cannot be got in the normal course of events. I think that is a very good question to put to Mr Sims.

The Hon. ADAM SEARLE: I will take that up. In relation to your observations about geothermal power, obviously with all sorts of technologies available some are coming down in price—like wind and solar—while others remain stubbornly high. Is geothermal one of those things where, as a matter of practical reality, if it was to be pursued it would not be done by commercial or private sector players; it would have to be done by governments?

Professor O'KANE: Almost certainly that is right. Thank you, that gives me a chance to say something I should have said before. I think one of the important things for us to do as a nation is to really

watch what are the technology pinch points. Why is geothermal so expensive? It is very, very deep but we can mine deeply. In South Africa—it is horrible to think about it—but the diamond mines go down five kilometres. One of the issues is that for geothermal you typically need to do very thin drills and using incredibly high-performance steels because of the highly sulphuric or highly acidic nature of what is down there. But probably the biggest pinch point, as well as having to understand the steels very well, is the drilling technologies. I was finding in my Australian Centre for Renewable Energy [ACRE] period we never got away with a drill under about $15 million. Part of it is actually getting the infrastructure out there, but it is the drilling technologies.

There are a few technologies in development in the United States [US], for example laser drilling. If those could become very good, the price could go down a lot. I think a lot of it is understanding when the price really goes down and thinking about what research and development we should fund or what research and development is coming, say, out of the Department of Energy in the United States, that might allow us to do it. If you think of—probably not the world's most wonderful example in some ways, but a good one from my point of view—coal bed methane or coal seam gas in this part of the world. Remember, you only have to think back to the eighties and nineties and America really had a gas problem.

In all those years the Department of Energy was doing a lot of work and looking at how to extract coal bed methane and using a lot of technologies from the general petroleum technology area, companies like Schlumberger and so on. Of course, once they perfected it, just look. America has loads of gas and will probably soon start exporting. Similarly, what we want somewhere in the world is someone to keep going on the deep geothermal stuff. Because we would particularly benefit I think there is an argument that Australia looking at it, keeping some sort of toe in that water, however sulphuric, is probably very sensible. At the moment it is not something you would ever see a commercial investment in.

The Hon. ADAM SEARLE: Do we have any handle on what the indicative costs of geothermal would be?

Professor O'KANE: The one done by, as it used to be called Geodynamics, now ReNu Energy, that demonstration plant did completely work. Right at the end of the program, I will take it on notice but I seem to remember it was around the order of $50 million or $60 million to get a demonstration plant going.

The Hon. ADAM SEARLE: What capacity did that plant have?

Professor O'KANE: I think it might have been a megawatt. Was it even that high? It was pretty low.

The Hon. ADAM SEARLE: If you could take that on notice that would be interesting. You made an observation about the importance of the ongoing research done by the United States Department of Energy, what ongoing research in energy is being undertaken by New South Wales Government agencies?

Professor O'KANE: There is very good work in climate happening in the Office of Environment and Heritage and that goes back a long way into the climate modelling done there and done in conjunction with our universities in various ways. That is superb work that goes back, you would know better but in the order of 15 years or so. There is not a lot of other work that is research out of government, but there is quite a bit of research in our universities. We have got some wonderful work. Of course, solar photovoltaics came out of New South Wales with Martin Green's work at the University of New South Wales and Martin continues to be a world leader in that regard. Updates in solar photovoltaic technologies continue to lead the world and beat all the records and keep improving it. That is happening in our universities.

There is quite a lot of work increasingly happening on modelling of various kinds, grid modelling. It is not in New South Wales but it is nearby. A lot of the work on hydro is happening at the Australian National University. Also there is quite a bit of work, often with government money, on cleaner coal technologies of various kinds but maybe not deeply productive work there. Overall, there has been good work going on, more in the universities than government. I think that is appropriate, often commissioned with government money.

The Hon. ADAM SEARLE: One of the big changes that has occurred is that in the past governments had the total responsibility for building and delivering power, now it is largely out of government hands, which makes, as you say, the planning exercise and knowing what is available a lot harder. Government does not have all of the information. You mentioned the retail market. Could there be better oversight of the retail market to make sure that the regulatory bodies had better data about what the retailers are offering and doing?

Professor O'KANE: Yes, I think so. I think they would agree themselves, but I see you are going to talk to them. Often they do have information. It is knowing what to ask and how to do it. Putting a lot of emphasis on information, and given that we have very good provisions on open data and open information, it is very important that we use them both at State and Federal levels and that we encourage the market bodies—they

do publish a lot, there is an awful lot there, but it is actually knowing if it is what you need. It was interesting to talk to the Australian Competition and Consumer Commission [ACCC] yesterday about that, though they had been able to get a lot more, it is interesting what had not been available too that you might have expected to have been collected that had not been collected. Getting clear on that and getting clearer and commissioning research on what we should be looking at is a tremendously important part of the future.

The Hon. ADAM SEARLE: What do you think we should be looking at in that area that the regulatory bodies may not be collecting?

Professor O'KANE: I do not have a simple answer to that.

The Hon. BEN FRANKLIN: On that issue, would you agree that the volume of information is important and the understandability of the information, particularly for consumers, is something that there could be more work done on?

Professor O'KANE: Absolutely. I also think the consumer bodies are good in this regard, Rosemary Sinclair's group—I forget the name.

The Hon. JOHN GRAHAM: Would you be happy to take that question on notice if there were additional thoughts you had afterwards?

Professor O'KANE: We have not done a lot on the retail side. I would be happy to take it on notice.

The Hon. JOHN GRAHAM: Or on the data?

Professor O'KANE: On the data information, very happy to talk. Would the Committee allow us—because you will be going for a few weeks—to comment in our second report, if we gave you a paper?

The CHAIR: About 25 weeks, to be exact.

Professor O'KANE: We will go longer than the normal notice period just to give you a good, comprehensive answer.

The Hon. ADAM SEARLE: I want to make sure I have an appropriate grasp of your task force recommendation. The recommendations all seem to be about coordination within the public sector, so all the public sector activities, whether it is consumption or management of crises information and all that sort of regulatory function. That is essentially where the energy security taskforce—

Professor O'KANE: Where the focus was of the first report, yes.

The Hon. ADAM SEARLE: Tell me if the answer is no, but are you looking at the issues of supply and how that can be addressed?

Professor O'KANE: We are inter alia. Without prejudice—

The Hon. ADAM SEARLE: Of course.

Professor O'KANE: We are thinking the second report is to make recommendations in three categories. One is what New South Wales Government should do; two, what New South Wales Government should do as part of the energy Ministers Council of Australian Governments [COAG] and COAG more generally; and three, urging market participants on certain things, things that we cannot actually enforce but we would suggest people take up, as suggestions I suppose you would call them.

Mr JEREMY BUCKINGHAM: Unbelievably your report has this line at 2.3.3.1: "In New South Wales an emerging issue is the availability of coal."

Professor O'KANE: Yes, absolutely.

Mr JEREMY BUCKINGHAM: How can it possibly be that the availability of coal in New South Wales is an issue to consider when we are thinking about energy security?

Professor O'KANE: Thank you for that question. It is like what a lot of people say about gas; a lot of it is forward contracted.

Mr JEREMY BUCKINGHAM: Just before you begin, it is really interesting you say in your report that several operators of coal-fired power stations have raised this with the task force. There are only four operators. We understand that EnergyAustralia has some serious issues with basically one mine. Could you flesh that out a bit?

Professor O'KANE: I do not want to put actual names because most of them say it, sort of, close to off the record so I do not want to go into who said what exactly but as you point out there is not a large number of them and it has been raised. But of course it is the forward contract issue and of course the shutting of Hazelwood because Hazelwood was a brown coal power station and ours is high-quality black coal, so with that gone there is a bit more work for our available power stations and they need to source black coal. But if the coal is forward contracted into the export market it is hard to buy and expensive to buy so that is a problem. The first problem sits around that issue.

Mr JEREMY BUCKINGHAM: How much of a problem though?

Professor O'KANE: That was harder to get a handle on because we found that at least one of the generators seems to be extremely clever; seems to have a great relationship with the coal suppliers and seems to have ways of knowing when coal is available and to get it. They just seem to have faced this issue a long time ago and have worked out really good ways to buy small packets of it and so on to do it. It is hard to know how desperate it is or if it was people beginning to worry. So there were aspects to the worry. There is definitely the forward contracting and the fact that Hazelwood has gone but just how big a problem we cannot quantify it easily. The second problem has to do with transporting issues and again we have not got a complete handle on whether there are bottlenecks on the rail arrangements because now all the coal goes by rail not by road. But the issue is that you could have bottlenecking in various ways there and managing to get the coal, and then the one you referred to with the more recent matters—

Mr JEREMY BUCKINGHAM: EnergyAustralia and Mount Piper, yes?

Professor O'KANE: Yes, so it seems to be those three things in various ways and we think it is really important. It is also important to note that the Australian Energy Market Operator [AEMO] technically watches the fuel but we are not convinced that the reporting arrangements were as stringent as they need to be. That is why our recommendation is extremely carefully worded—

Mr JEREMY BUCKINGHAM: Recommendation No. 2?

Professor O'KANE: Yes. We have raised that with AEMO. They understand the issue and they themselves are talking about it now, but yes, you are right, this was probably the first time it came up and we were probably a bit startled too for the reasons you are putting.

Mr JEREMY BUCKINGHAM: We could be importing coal to Newcastle?

Professor O'KANE: We might be but remember we have a lot of slightly closed mines.

Mr JEREMY BUCKINGHAM: We might be; that was a joke. It is a joke—

Professor O'KANE: It is not a joke if you move to gas. We might be importing gas.

Mr JEREMY BUCKINGHAM: Exactly, and I think the people of Newcastle would be remarkably surprised if we were importing coal from Indonesia.

Professor O'KANE: Yes.

Mr JEREMY BUCKINGHAM: Remarkable.

Professor O'KANE: It could be good enough for us. We tend to like very good coal here.

Mr JEREMY BUCKINGHAM: There is coal; oils ain't oils. That is remarkable. The other question is around the role of the State as a user and purchaser of energy.

Professor O'KANE: I agree.

Mr JEREMY BUCKINGHAM: You say this leveraging power is considerable. New South Wales government agencies own and operate facilities and infrastructure and use more than 1,800 gigawatt hours of electricity each year or around 2.6 per cent of electricity sales. What could the Government be doing to leverage that because my understanding is that the State does not purchase energy in a holistic way?

Professor O'KANE: Yes.

Mr JEREMY BUCKINGHAM: Should the State be doing that and what do you mean by "leveraging"?

Professor O'KANE: Exactly where we are going to come out on this is something we are determining at the moment for the Energy Security Taskforce second report so if we can take that on notice to answer that, along with that other question as we bring this down?

Mr JEREMY BUCKINGHAM: Yes.

Professor O'KANE: So it is working out what we can do that does not do inappropriate things to the market. It may be that it should not just be New South Wales but the governments of Australia should think about what they should do here.

Mr JEREMY BUCKINGHAM: Really? That is interesting.

Professor O'KANE: When you think about the amount of government and public sector use—

Mr JEREMY BUCKINGHAM: Yes.

Professor O'KANE: —so if you add the universities and what the incentives should be for those bodies too in terms of power use; a lot of our universities are doing quite a lot to become independent. Macquarie University, for example, has a plan to put in as much local generation, largely photovoltaic cells—

Mr JEREMY BUCKINGHAM: If you included local government too—

Professor O'KANE: Exactly.

Mr JEREMY BUCKINGHAM: —it would be an enormous body?

Professor O'KANE: Yes.

Mr JEREMY BUCKINGHAM: It would be one of the biggest electricity—

Professor O'KANE: And also there might be really important players when you think about microgrids too and embedded network arrangements; local government could be particularly important in that regard. I think the role of government as a consumer and aggregator and things like that could change.

Mr JEREMY BUCKINGHAM: Interesting. The other element is the emergency powers and Code Warm—I love Code Warm; it is not too frightening.

Professor O'KANE: It came from Mr Comley, not me.

Mr JEREMY BUCKINGHAM: It is very good. It is reassuring. Really what we are doing with these procedures is putting in protections so that the public interest can be enacted through emergency powers and that if we have to shut down certain areas of the grid or a particular private entity, people are protected from liability and the like. That is really what we are doing here, is it not? We are putting in a framework that means it can be expedited? There is a model that showed 10 February with the communications chart and it was Barry Jones' knowledge nation—it was difficult to decipher, was it not?

Professor O'KANE: Yes, it was. So part of it was dealing with that, but you are right; a lot of it is being prepared and a lot of it would hopefully not be after you are right into the complete depths of the heatwave but as the heatwaves build, you go a day or two earlier to get Code Warm on, and hopefully completely avoid any load shedding.

Mr JEREMY BUCKINGHAM: And you take it away from AEMO and hand it over to—

Professor O'KANE: No, you would do it jointly.

Mr JEREMY BUCKINGHAM: Jointly, but it is the responsibility of the Minister.

Professor O'KANE: Well, AEMO would oversee it, but it would be joint.

Mr JEREMY BUCKINGHAM: The powers of the Minister.

Professor O'KANE: And the Act has not changed; you would know better than I.

The Hon. ADAM SEARLE: The bill has been introduced.

Professor O'KANE: It has been introduced, right.

Mr JEREMY BUCKINGHAM: I visited Liddell recently and it is struggling.

The Hon. ADAM SEARLE: It is dilapidated.

Mr JEREMY BUCKINGHAM: It is dilapidated. One of the things that emerged from the presentation from AGL—and I am interested if you have done any modelling on this—is that wind is cheaper in terms of input costs and recurrent costs. Wind can bid first into the market under the market regime now and is consumed first?

Professor O'KANE: Yes.

Mr JEREMY BUCKINGHAM: The retailers buy that wind first. Basically you have a market that is being consumed from the bottom up by wind and to some extent solar and at the top end, during which profits can be made in those peaks, hydro and gas can come in.

Professor O'KANE: Yes.

Mr JEREMY BUCKINGHAM: But in the middle you have supposedly base load reliable power, the coal-fired power, that is competing for less; it is getting less market share yet its costs are fixed or rising. It has much higher costs than the others. Is there a possibility that coal-fired power stations could just decide that it is not economic to actually ramp up and turn on to meet demand?

Professor O'KANE: There is that possibility. It is a market.

Mr JEREMY BUCKINGHAM: Because we saw that with gas in Queensland. That is a possibility.

Professor O'KANE: It is definitely discussed and market behaviours at certain times are definitely wondered about. It is definitely there as a possibility.

Mr JEREMY BUCKINGHAM: What should we do about that?

Professor O'KANE: That is why when you get into these crisis situations there are emergency power arrangements so that the generators can be forced to be there. They are paid a very high price but they have to have everything available.

Mr JEREMY BUCKINGHAM: But the State should compensate them for having to turn on—

Professor O'KANE: It does. There are very strict rules about it in the market at the moment.

Mr JEREMY BUCKINGHAM: Would we not have been better served just to have kept generation in public ownership?

Professor O'KANE: Not necessarily in terms of total cost. Again, this happens for such a small time. As I said, it is a few hours of the year. This year it happened for a couple of hours, maximum.

Mr JEREMY BUCKINGHAM: But if we go from renewables like wind and solar being 10 per cent of the market up to 20 per cent or 30 per cent it is far more likely to occur more.

Professor O'KANE: One of the things that we have to do, and what a lot of the focus has been on, as you pointed out a couple of minutes ago, is dispatchable power. That is power that is firm, provides reliability and security of services along with the actual electrons. We do need to have that in various forms. You can put it on synthetically through synthetic inertia on wind power but those technologies need a lot of development. Or you can use battery technologies or you can use hydro to get that firmness into it, but we need appropriate mixes of those. It is not quite as simple as just replacing wind instead of coal. The coal might go, and I believe the coal will go. Probably it will be slow at the start but then it will start to disappear in favour of various things.

Mr JEREMY BUCKINGHAM: It could be quite autocatalytic in that it starts to feed back on itself.

Professor O'KANE: Absolutely.

Mr JEREMY BUCKINGHAM: The increase in wind causes not only—

Professor O'KANE: As we get firm capacity and we can do firming of the intermittent renewables better and better I think it will be autocatalytic then.

Mr JEREMY BUCKINGHAM: We have 1,400 megawatts of power behind the meter.

Professor O'KANE: We do not absolutely know what we have behind the meter.

Mr JEREMY BUCKINGHAM: It is like dark matter; we do not know where it is but it is there somewhere. We do not know what it is really doing apart from keeping the lights on. Isn't the short-term solution to roll out more PV? I am talking about the next two to three years.

Professor O'KANE: Particularly more PV with batteries. I think we will see it. Again, if we give people the right information then I think they will make decisions as to how much they want to do.

Mr JEREMY BUCKINGHAM: What is the policy setting? How does government do that?

Professor O'KANE: That is one of the great questions. This is in the area of the great unknowns: how much should we encourage this versus how much should we encourage pumped hydro versus what should we do? Watching the market response to the proposed National Energy Guarantee [NEG] will be really interesting and to watch how the big players—the generators—respond. I think it is going to be really interesting as the NEG starts to come in and as they get it defined. The Australian Energy Market Commission [AEMC] has to have their modelling done over the next few weeks, so we will see all of that soon.

Mr JEREMY BUCKINGHAM: We could overdo PV, could we not, and then not have the room for someone to invest in the dispatchables that we need?

Professor O'KANE: I am sure we will find that we overdo bits of the system all over the place, in fact. But I think we have to be ready for an incredibly turbulent period—not nasty turbulent but a period of innovation and change and overdoing bits and underdoing bits and being ready to fine tune it as new technologies come on. Also I think we will be ready for a point where this technology will look promising and then be thrown out 10 years later because something better has come in. We have to be ready when that is going to happen. What we want is a highly active market that is driving the prices down with lots of innovation coming in and lots of incentives for that innovation.

The CHAIR: That innovation cost is a big factor because that is where affordability comes in for pensioners and vulnerable people.

Professor O'KANE: We have to make sure there are protection mechanisms for them while the innovation comes in. But, hopefully, more and more innovation undercuts previous innovations if the thing is working well.

The Hon. BEN FRANKLIN: You would agree that unlocking distributed energy is an important part of the puzzle?

Professor O'KANE: I think everything is an important part of the puzzle. I think everything should be on the table and we should be willing to work through it and see. One of the things is understanding and studying the lot. Constantly monitoring technologies and things that we could do will be important for us.

The Hon. BEN FRANKLIN: One issue you raised in your interim report was the concern that as more people take on distributed energy resources it will make it more difficult for the Australian Energy Market Operator [AEMO] to have the information necessary to forecast load and manage the very hot days and so on, because it just does not know. Could you discuss that a little further and offer any potential solutions?

Professor O'KANE: I raised this a lot within the Finkel review too, so you will find a recommendation there.

The Hon. BEN FRANKLIN: It is going to become a more and more significant problem.

Professor O'KANE: Absolutely, so we just have to know. The answer is we have to cut across that black hole in the data and make sure that we do know. Just like the consumer needs to know more, similarly centrally we need to know more too as to what is there. Some of that will probably require some State regulatory changes as well as regulatory change to the AEMO bit. That will part of our next report too. We will talk about that. But I think it is terribly important that we do know. It is important not just for knowing what the available power capacity is. It is also important from the safety angle as people put batteries on and understand issues with potential fire risks and things with various power sources. While we do not want to overregulate that side of it, we need to make sure that people are safe and that, as they add more things on, things go well. Remember some of the issues during the Solar Bonus Scheme where various people came into the market who were not necessarily—

The Hon. BEN FRANKLIN: They were cowboys, perhaps.

Professor O'KANE: Maybe.

The Hon. BEN FRANKLIN: The main issue here is the few hours a year where there is a problem. Clearly, storage will be one of the holy grails.

Professor O'KANE: Yes.

The Hon. BEN FRANKLIN: You mentioned pumped hydro. Could you talk about what you believe is the feasibility for long-term pumped hydro projects?

Professor O'KANE: As you know, Andrew Blakers at the Australian National University has recently, with ARENA funding, produced that atlas of pumped hydro possibilities around Australia. It is really dense. There are loads and loads of possibilities. Hydro is a technology that Australia knows incredibly well. After all, we have been exporting the capacity to build hydro to other countries, learning from our Snowy experiences. That is a pretty straightforward technology in a straight engineering sense. What I think we need to study more is the environmental impact if you had a fair bit of pumped hydro. Even though it is meant to be a contained pond at the top, the pond is big. Understanding the environmental impacts of that is terribly important. We will say something on that in the next report. But in terms of just putting pumped hydro in, it is easy to do.

The Hon. BEN FRANKLIN: Would you like to make a comment about how we are positioned in terms of storage and where you see the future heading? Is there more that you would like to put on the record that should be done?

Professor O'KANE: I do not know about whether it should be done. I wish I could see into the future more in terms of storage.

The Hon. BEN FRANKLIN: You could not envisage a future where storage is not one of the most critical elements?

Professor O'KANE: No, storage is tremendously important. One of the things is weighing up hydro versus things like batteries and understanding where the battery technologies will go. At the moment you can have pretty big batteries and they will only help you for an hour or so to time displace things. That will be a very interesting time over the next period. Also those that control the appropriate materials like lithium will be important players. That is also important for Australia, which does have lithium of some sort.

If you want to hear about batteries you might like to call in Thomas Maschmeyer, a professor from the University of Sydney, who has really been a leader in that. As a matter of fact, while we are talking about people to call in, as well as Thomas Maschmeyer you might want to get Martin Green and Stuart Wenham to talk about solar photovoltaics too. But Thomas is great on the battery side and I think gives a great insight both for small batteries and for the grid scope batteries. But the timing on those is one of the great problems.

Mr JEREMY BUCKINGHAM: Could I ask a question following on from that? There has been a lot said about Snowy 2.0 and it effectively operating like a battery through pumped hydro. Do you think we should do more modelling about what the impact of a worsening climate change scenario could be on Snowy Hydro and its viability into the future?

Professor O'KANE: Yes. The various market bodies are supposed to be doing that, looking at the Snowy 2.0 feasibility, but I think we do have to make sure those models are very good. Again, that is something where the OEH and the New South Wales Government has been very good about encouraging that sort of modelling, and I think that modelling needs to be open and available and we all need to be tracking it. I think it is really important to understand the climate models. We are lucky we have so much expertise in our universities and government on that area here.

The Hon. BEN FRANKLIN: Just one final question from me, and that is on energy efficiency and what role you see both consumers and industry are playing in focusing on energy efficiency.

Professor O'KANE: I think there is certainly a great interest. It is something that is seen as a good thing, but I think we ought to encourage it both, as you suggest, industrially as well as at the domestic level and encourage looking at a range of technologies to do it—energy efficiency appliances through to self-contained energy systems with houses with appropriate storage like batteries and so on. That is why I mentioned the geothermal heating and cooling of Touie Smith activities where we can get good technologies at reasonable prices and get efficient houses, efficient businesses. It really does change the whole dynamic of the whole energy supply and demand system.

The Hon. BEN FRANKLIN: And it should be an important focus for government?

Professor O'KANE: Absolutely.

The Hon. JOHN GRAHAM: Can I just follow on on that point, which was really where I was particularly interested because New South Wales has been a leader in the past in that energy efficiency area. It has been a part of the Finkel review, it has been discussed recently by the Minister in New South Wales but it does not really have the prominence that it might have in the debate; it is really one of the areas that there is less

discussion about: we are having this debate about all the fuels but not about energy efficiency. Do you have a view about why that is?

Professor O'KANE: A very strong view about that. I completely agree and we are going to try and redress the balance to the extent we can do it with the second report on energy security to say that demand response issues are tremendously important.

The Hon. ADAM SEARLE: Freeing up the capacity?

Professor O'KANE: Yes. I think it really is there. I think we will see tremendous innovation in that space internationally and I think we ought to encourage it here very much.

The Hon. TAYLOR MARTIN: I would like to talk about Tomago aluminium smelter. It has 950 full-time equivalent staff and around 190 contractors. Tomago contributes around $1.5 billion to the Australian economy; it produces 580,000 tonnes of aluminium, of which 90 per cent is exported and the 10 per cent that stays in Australia accounts for around a quarter of our domestic supply of aluminium. Tomago uses a constant load of around 970 megawatts and has done so 24/7 since 1983. Matt Howell, the CEO of Tomago Aluminium says, "There is no smelter in the world that runs on solar and wind alone. Thermal baseload is needed for the plant to continue". The largest 100 megawatt hour battery in the world would power Tomago for just eight minutes.

Professor O'KANE: Correct.

The Hon. TAYLOR MARTIN: And the cells of the smelter can tolerate a power-off window of just three hours. After that they become destroyed, which happened to 70 per cent of Alcoa Portland cells in Victoria not long ago. In your expert opinion, what can be done to deliver constant secure baseload power to Tomago, especially in the context of Liddell being scheduled to close in 2022, and what projects are in train to replace the significant contribution that Liddell makes to supply New South Wales and the national electricity market?

Professor O'KANE: I am very familiar with that—we talk to Tomago a lot ourselves. There is another aspect to Tomago. It is an important piece of load balancing in the system—into the security system too, as things are here. So they are actually a contributor to our power system as well. I think the most important thing for replacing a supply to them is in the dispatchability reliability requirements of the proposed NEG. So as long as we do have dispatchable power of the amounts required we can do it. It is what the market draws forward, but as long as it is baseload in character you can manage Tomago. That has been an important point. We have talked to Tomago all the way through our work on the task force because you do want to be able to have things like Tomago and steelworks and other things of that kind. That is one of the reasons, but only one of the reasons, you do want dispatchable power.

The Hon. TAYLOR MARTIN: Liddell is closing in 2022. Are there any projects that you know of that would replace that capacity?

Professor O'KANE: There are. I do not have the thing with me but at AGL's recent AGM they had a presentation, I understand, that suggested that—Liddell will take out, I think, about 2,000 megawatts—I think the suggestion was, and my team here would know a bit better, they will bring on about 1,000 megawatts of dispatchable power. But AEMO is not suggesting that we are going to breach the reliability standard at the time Liddell goes, although things will be tighter, but if more comes on—and I think the NEG will draw more forward; if it is even halfway designed appropriately we should get appropriate firm power coming on. But I do not think there is any suggestion around things like Tomago are let go.

The Hon. TAYLOR MARTIN: Not deliberately, no, but by accident.

Professor O'KANE: I do not think even by accident. I think Tomago and others have been very clear about their requirements and, as I said, they make an important contribution into the stability of the system.

The Hon. TAYLOR MARTIN: But can they be met?

Professor O'KANE: Yes. I think the new requirements—because nobody is suggesting Australia wants to not have dispatchable power where the whole system collapses at that point. It is not just Tomago, it is your house too.

The Hon. JOHN GRAHAM: I agree with your views about open data being particularly important in this area both over the contract market and on the retail contracts. Can you give us any views about how well placed the ACCC is to deliver some more transparency? Are they the key body which might start to shine a light here, or who else is in a position to do so?

Professor O'KANE: I think everybody. Certainly Rod took that on board yesterday; so if you are talking to him I think it would be really important to emphasise it again, but he was very open to it, though I do not think they had thought of the role quite under the open data sort of provisions.

The Hon. JOHN GRAHAM: Even though it is pretty fundamental to competition in the market.

Professor O'KANE: It is. I think they are probably the best body, but I think all the energy market bodies should be encouraged to do it. Even though they collect a lot, are they collecting the right thing and so on? The new Energy Security Board I think is something Kerry Schott would be very open to talking about, and doubtless you will speak to her. They have been roaring through sorting things out. Whether there should be rule changes with the AEMC I think is something to think about. Certainly, strong support in this area comes from AER, from the energy regulator—they are extremely keen on appropriate data.

The Hon. JOHN GRAHAM: You have talked about AER's work looking at—

Professor O'KANE: Gouging and so on.

The Hon. JOHN GRAHAM: Gouging in particular. What information would they require? You have said they have got part of the way there. What information would they need?

Professor O'KANE: I think it would be better to ask them directly over that.

The Hon. JOHN GRAHAM: Who else has done work looking at price gouging or some of the market behaviour?

Professor O'KANE: It would be a good thing to ask Tony Wood about this afternoon. Some of those independent think tanks are probably the best area. It would be worth trawling through the Productivity Commission work—that 2013 report is quite a good one—and maybe even talking to Gary Banks, who is the former chair of the Productivity Commission, about that, although I asked Gary about some of this and he was going back to look for me but I think has not yet produced the goods. It has looked at it at various times. Also Rod Sims with IPART—IPART is another spot to look into this area—and the current IPART as well.

The Hon. JOHN GRAHAM: You have given evidence that it is hard to get data from the retailers. Why is that? What did you mean?

Professor O'KANE: No, sorry: They were not asked to produce things. What I meant when I said it was hard was that they had not been asked to produce things so when the ACCC asked for various things it realised it was not being collected. It said the retailers were very cooperative about trying to find it but could not always get to it, in some cases, because there just was not enough data to infer and respond.

The Hon. JOHN GRAHAM: So it is really designing a set of requests.

Professor O'KANE: Exactly.

The Hon. JOHN GRAHAM: You are not saying that the retailers are unwilling to do that.

Professor O'KANE: I do not think they are unwilling. I do not think they would necessarily go handing it out but I think a lot of players understand the importance of looking like good corporate citizens at the moment. I think it is a matter of using this time to get it. I think another person or group is Rosemary Sinclair's Energy Consumers Australia, which has very good views in this area.

The Hon. JOHN GRAHAM: One of the key things the Finkel review called for was certainty in this area. Without pointing the finger, because there are plenty of people in this space to do that, how important is policy certainty to the sorts of innovative businesses you are talking to and on the set of issues that shape how they are thinking about it?

Professor O'KANE: It is a complicated answer. My answer generally would have been as part of Finkel and writing it that policy certainty always make things a bit easier, but I heard an impressive series of comments from Rod Sims yesterday not saying that policy certainty in general is not a good thing but that with regard to energy and climate policy coming together it is probably less important—and often we have been blaming that when we should possibly have been blaming other things in the system. It was an interesting insight that we possibly need to look at some other things as well. The other thing is, in talking about the investment banks, the financing houses and the general sort of energy market players, we are getting the strong impression that they believe that investing in renewables is something that they want to do anyway because of global trends. While the certainty would be good, the trend as to what you can borrow tends to be in clean energy or in demand response.

The Hon. JOHN GRAHAM: So it would help, but it is getting driven by some bigger forces.

Professor O'KANE: That is what I am hearing. I do not quite know exactly what I think in this area at the moment but I have been impressed to hear some of those other comments.

The Hon. ADAM SEARLE: Do you have any information about the content of the National Energy Guarantee [NEG] apart from what is in the public domain?

Professor O'KANE: Not really. We keep asking questions too to find out. We are close to the players.

The Hon. ADAM SEARLE: Do you know when we might have some further details?

Professor O'KANE: Again, you should ask the AEMC itself, but we understand that its modelling has to be done over the next few weeks. It is on a tremendously tight timetable to get that done. You can ask it but I think it is moving reasonably quickly on that, which is great.

The Hon. ADAM SEARLE: Returning to the issue of coal security Mr Buckingham raised, there was controversy around the Springvale mine and Mount Piper issue. You said you did not think the national regulators necessarily had the sort of stringent information that perhaps they ought to have. Is there a security role that State agencies can and should play here to know or have greater visibility about what stockpiles power stations have?

Professor O'KANE: That is in the second report already. That has actually been drafted in to say, "Watching"—

The Hon. ADAM SEARLE: I thought it might be.

The Hon. BEN FRANKLIN: A lot of things are going to be in the second report.

Professor O'KANE: Yes. With intelligent people like you, you sort of guess the things that need to be addressed. If you think of anything else, do tell us.

The Hon. ADAM SEARLE: We will be in touch.

Professor O'KANE: We are up for really bright ideas to make sure we address them.

Mr JEREMY BUCKINGHAM: I have one more question. Is there a possibility that the system was gamed? On 10 February AEMO was forecasting the demand based on the weather, which everyone knew was going to be a heatwave. I would argue that the people who benefited the most from the forced outages at Tallawarra and the system breakdowns were the actual operators of those systems themselves. Is there a possibility that the system is being gamed so that you have a sweet spot where demand does not quite meet supply, price peaks to a cap of $14,000 a megawatt-hour, a few people make a lot of money and we are forced into crisis? Is there a possibility that that could happen?

Professor O'KANE: We certainly wondered about that and various people suggested to us that it might happen, so we looked at that quite hard. We cannot completely rule out that there was not so much gaming as playing to the edge of the market, you might say. And I think we also became convinced over time that there were just an awful lot of outages due to the heat. It was very hot and plant was being pushed at a very high level, so the Colongra and Tallawarra things were probably the sorts of outages you get under that weather. Not answering so much on gaming but on what we do not always think or have not thought, because we were so used to not having outages, is that it is the end of the day that you have to focus on. If you are going to swap fuels, maybe you have to think that through so that you know that you can really be there pumping it out for the end of the day. I think it is more a change of focus that is needed. Plus I think we always need to examine the market rules, which the AEMC does.

Mr JEREMY BUCKINGHAM: A lot has been made of Liddell, such as propping it up or keeping it going beyond the 2022 closure date. What would be the outcome for the State if one of the units, because it is generally operating well below—

Professor O'KANE: That is correct, at about two.

Mr JEREMY BUCKINGHAM: What would be the outcome for the State if one of the two units that operate most of the time were to fail and Liddell was operating on one unit?

Professor O'KANE: Which has happened quite a bit in various summers. Generally, because there is so much spare capacity, it is not an issue; it is when lots of others are failing or everyone is hitting the environmental limits on things that you start to worry, or we have bits of the transmission system down. Chair, I

will add something that I should have added before, and that is the importance of interconnectors. Another thing to look at is the importance of the capacity of our interconnectors—because they became overloaded on 10 February and the system could potentially have become insecure—and whether there should be more interconnectors. There is the mechanism for testing, the RIT-T, and how that changes, but interconnectors are potentially a really important part of the system, and an important part, I believe, on the innovation side of things too.

The Hon. JOHN GRAHAM: I would like to ask briefly about turning from coal to wind—

Mr JEREMY BUCKINGHAM: Before you do, I do not think that Professor O'Kane answered the question in terms of whether or not she had done the modelling or assessed the probability of that and what we would do—

Professor O'KANE: No, I do not know about the probability. I would always take a worst-case scenario. We did not model it in the sense of a very formal model but let us take the worst case that they are often out, as you point out—that is quite correct—but with, say, one of the units out we still have loads of capacity, and with that gone most of the time we are fine. As I said, even with Liddell gone we still technically do not breach the reliability standard. If you have part of Liddell there, you are sort of more than halfway in shape.

The Hon. JOHN GRAHAM: Turning to wind, many of the new renewable projects in New South Wales are in solar space, whereas we seem to be off the pace on wind compared to some of the other States and Territories and internationally. Do you know why that is or where that is heading?

Professor O'KANE: That is correct. I think it is a bit like coal seam gas, so a lot to do with local communities' concerns. We have a lot of what is called "good wind", which is to do with where we live. The area around Goulburn is a good wind area, but there has been a lot of tension around that. We have good wind further out as well.

The CHAIR: Is it unreliable? We need it to feed into the system, but can it be guaranteed?

Professor O'KANE: It is intermittent, yes. But there are areas where the wind is very strong at certain times of the year and certain times of the day. Again, you have to be near transmission and the transmission needs to be not too far from the centres it is delivering to. We could do a lot more.

The CHAIR: I think it is known as "green energy", or renewable energy, and it is more expensive.

Mr JEREMY BUCKINGHAM: It is not.

Professor O'KANE: It is cheap when it blows.

The CHAIR: It is more expensive in terms of—

The Hon. TAYLOR MARTIN: Capital outlay.

Mr JEREMY BUCKINGHAM: No, it is not. It is cheaper in terms of capital outlay and it is cheaper to run. That is why everyone is building new—

The CHAIR: To clarify, if you take renewable energy—and I would be the first to say that I will learn more about it during this inquiry—there is a perception that green energy is more expensive, and so it is used by those who believe in it and who are prepared to pay a higher price for a proportion of their energy.

Professor O'KANE: The thing is it is cheaper if it is just wind energy and the capital costs are not too high. What becomes expensive is if you have to supplement it in various ways. You can either do it through gas or synthetic inertia arrangements involving wind. That is expensive at the moment because it is not a technology we understand well. By and large, if you just have wind, when the wind blows it is nice augmentation to what we have and it certainly can reduce the price of electricity on an ordinary day, as Mr Buckingham pointed out. But we cannot rely just on wind energy.

The Hon. BEN FRANKLIN: That is why storage is so important.

Professor O'KANE: Storage is important for timeshifting, which is another way to do that.

The CHAIR: Thank you for appearing before the Committee today. Your testimony has been very valuable because this initial hearing is about getting a foundation before we move fully into the inquiry, and your testimony will go a long way in helping us to frame questions for future witnesses. We might have some

further questions on notice that we will put to you in the next 24 hours, and the secretariat would be glad to help you to get your answers back to us within 21 days.

Professor O'KANE: We will. Some of the answers will probably be beyond the 21 days, because they will be part of our final report, which is due by the end of the year. We will give you the report ahead of it coming out.

The CHAIR: Thank you. Would you be happy to return as a witness at a later time, once we are aware of other opportunities across New South Wales?

Professor O'KANE: Absolutely, I would be delighted to do that. I would also be delighted to supply materials, because we have collected a lot.

(The witness withdrew)

(Luncheon adjournment)

DAVID SWIFT, Energy Adviser to the Chief Executive Officer, Australian Energy Market Operator, affirmed and examined

DAMIEN SANFORD, Executive General Manager—Operations, Australian Energy Market Operator, affirmed and examined

The CHAIR: Welcome to the energy inquiry. Would someone like to make an opening statement?

Mr SWIFT: Yes, I would like to make an opening statement, Chair. Just for the information of the Committee about the Australian Energy Market Operator [AEMO]—AEMO is a corporate entity. We are 60 per cent owned by governments and 40 per cent owned by market participants. We operate on a cost-recovery basis, funded by market participants. Our vision is to deliver energy security for all Australians and meet the changing needs of the market involving multiple jurisdictions, participants and communities. AEMO delivers a range of operational, development and planning functions across eastern and south-eastern Australia's gas and electricity markets. We also operate the power grid and wholesale market in Western Australia.

Of particular relevance to the Committee is that AEMO operates the national grid and the National Electricity Market [NEM] in which New South Wales is a central participant. AEMO operates and settles the wholesale market and provides a range of services that support retail market operations across the NEM. AEMO also has a national planning role in the NEM and publishes a wide range of information on the operation of the market. We also operate in Sydney a short-term trading market for gas. I should note at the start, though, that AEMO is not a regulator. Regulation of compliance to the national rules is the responsibility of the Australian Energy Regulator [AER] and compliance with the Trade Practices Act is the responsibility of the Australian Competition and Consumer Commission [ACCC].

In the past decade across the NEM more than 5,000 megawatts of base load generation has retired. Over the same time those resources have been replaced with nearly 3,000 megawatts of gas-fired generation, 3,000 megawatts of wind power, 270 megawatts of new hydro, 265 megawatts of grid-connected solar and other small generation sources, such as biomass and liquid fuel generation. Since 2014 almost all new supply has been from wind and solar. While this is the situation nationally, New South Wales remains largely reliant on black coal-fired generation for much of its supply. In 2016-17 black coal set the price in New South Wales 63 per cent of the time. Wind and utility-scale solar constitute approximately 12 per cent of the installed capacity in New South Wales.

New South Wales is a key part of the NEM, interconnected to Queensland to the north and Victoria to the south. New South Wales has a very important influence on national outcomes while dispatch and pricing in New South Wales also is strongly influenced by the national market. Since the retirement of the Hazelwood power station in Victoria, New South Wales coal- and gas-fired generation has increased to replace that supply. Increased generation of New South Wales coal in particular has put pressure on coal supplies and we have seen higher prices offered by those generators as a result.

Commercial, industrial and residential customers are now much more involved in generating their own energy. The NEM has witnessed unprecedented growth of rooftop solar and photovoltaic [PV] resources from 14,000 units in 2008 to 1.7 million units today with an estimated output of more than 6,000 megawatts. New South Wales is part of that trend and has over 1,200 megawatts of rooftop solar installed. In the future AEMO expects customers' increasing involvement in the market to continue. We expect that the total capacity of rooftop solar in the NEM will triple by 2030. Whereas the initial uptake was due to generous feed-in tariffs, substantial cost reductions in the technology mean that that is now primarily driven by cost savings. Battery storage also is expected to grow strongly and has just started to do so.

We also expect renewable generation to grow at the wholesale level. As at 1 July this year there were nearly 22,000 megawatts of requests for connection being progressed to the NEM. That was split about 50-50 between utility scale, solar and wind. Taken together, those changes in the generation mix in the NEM will affect the dynamic behaviour of the system and impact a lot on the market. AEMO considers market arrangements need to change in response to ensure we can continue to provide a secure, reliable and efficient supply of electricity to consumers. In thinking about how to maintain the security and reliability in a transforming system, we think about the need for adequacy—enough resources to ensure that supply can meet demand— along with sufficient operating reserves to address variability in the system and deal with uncertainties and risks, and with the right mix of plant with the right capabilities.

Reliability and security need to be assessed in different time frames. We need to look at long-term planning for investment and disinvestment signals. We need a medium to short term planning time frame to ensure that resources are available when they are needed and we need to operate differently in real time. The resources required include not only conventional generators but also the demand side, storage, and other types of solutions that can meet the requirements to be dispatched when and where required. In the immediate future we have not identified any particular shortfall in New South Wales for this summer but we have been working with the New South Wales Government and industry here to ensure that we are as well prepared as we can be, should the power system come under any stress. In our preparation for summer we have focused on the availability of supply—fuel supply and transmission network availability, facilitating a number of government initiatives across the NEM, procuring additional resources particularly demand side resources to meet extreme peaks, and making some operational changes.

AEMO and the Australian Renewable Energy Agency [ARENA] have worked together to develop a new demand response product. With the support of the New South Wales Government 61 megawatts of demand response will be available this summer through this initiative. Currently we are analysing the success of that project and expect to promote Rule changes to make such product a permanent feature of the market in the future. We have also run a desktop exercise with the New South Wales Government and agencies to ensure we are all prepared, should a worst-case scenario occur. Looking ahead, in the future we expect that we need to improve national system planning. Taking a national approach is crucial to holistic planning across the sector as are transparent operating standards for reliability. Markets have to change to ensure that they reward those who supplied the security and reliability services that we need. Overall we look forward to working with Commonwealth and State governments and their respective energy Ministers to deliver the market changes that are required.

The CHAIR: Why has it taken until now to put something like a demand response initiative together?

Mr SWIFT: There have been many studies and reviews looking at demand response. There have been a number of trials. The reason is partly because of the need. We have had an excess supply for the last decade. It is interesting to speculate why that has happened but we are certainly very pleased with the support we have had from ARENA and the process that has gone on this year.

The Hon. ADAM SEARLE: You mentioned the 22,000 megawatts of requests for connection, is that Australia wide?

Mr SWIFT: In the National Electricity Market, yes.

The Hon. ADAM SEARLE: How much of that is located in New South Wales?

Mr SANFORD: I do not think we can give you that off the top of our heads.

The Hon. ADAM SEARLE: These are not trick questions. We are happy for you to take them on notice.

Mr SANFORD: There is quite a bit of solar going into New South Wales. There is also some wind going in but a lot of it is either focused on Victoria, New South Wales or Queensland, with still some development in South Australia.

The Hon. ADAM SEARLE: Do you have visibility of what is the maximum generation capacity within New South Wales?

Mr SANFORD: Currently installed?

The Hon. ADAM SEARLE: Yes.

Mr SANFORD: Yes, we do.

The Hon. ADAM SEARLE: Can you tell us what that is?

Mr SANFORD: Yes, absolutely. At the moment it is around 19 gigawatts, that includes imports as well through the interconnectors. But if you look at spread across wind, large-scale solar, solar, hydro, thermal, being your gas and your coal, then rooftop photovoltaic [PV]. There is also embedded generation within the networks. I do not have the exact figures available to me here but we do have a list of that embedded generation.

The Hon. JOHN GRAHAM: When you count the imports what are you calculating? Is that the 11 per cent we get through the interconnectors?

Mr SANFORD: It will be the maximum capacity of the interconnectors, noting that that is variable depending on system conditions.

The Hon. ADAM SEARLE: Leaving aside imports and the interconnector, what is the current installed generation capacity within New South Wales alone?

Mr SANFORD: It is about 18.7 gigawatts. That is installed capacity, noting that they do vary season to season because of thermal limitations operating under high ambient conditions. There is a winter capacity and a summer rating capacity as well.

The Hon. ADAM SEARLE: Is your body one of the bodies responsible for drafting the National Energy Guarantee [NEG]?

Mr SWIFT: Yes

The Hon. ADAM SEARLE: You have had input into that?

Mr SWIFT: Yes. We are one of the three bodies. The Energy Security Board [ESB] is a new body. It has an independent chair and deputy chair and has our chief executive and the chair of the Australian Energy Regulator and the Australian Energy Market Commission on it. We are definitely a part of that.

The Hon. ADAM SEARLE: I would be interested to get some more details from you if you can provide them about what the NEG will consist of. I have seen the Prime Minister's statement, I have seen statements by the Commonwealth Government, but there does not seem to be any detail beyond what has been published in the newspapers. Are you able to provide the Committee with any additional details about the content of the NEG?

Mr SWIFT: Not really because I am not a spokesman for the ESB, so I do not think I should outline what their view is. There is more work going on at the moment though, including modelling, and there will be a paper put to the ministerial council at the end of November.

The Hon. JOHN GRAHAM: The 61 megawatt demand response that you are talking about perhaps moving to make a permanent feature, do you have a view at this early testing stage about how scalable that might be?

Mr SWIFT: We are excited by the response that we have got. There is a range of different parties and they are using technologies that we all have these days with much better connectivity. They are able to do things at the customers' premises. There is a range of different ideas that the players use. Some of them just turn the thermostat on an air conditioner up 2 degrees, for example, and get a reduction in demand. Others use various forms of energy efficiency, switching load that is non-critical on and off. Some of them are using local generation to reduce demand on the grid. More than one business model sits behind that, but they all provide to us the same products so that we have a guarantee that we can access an equivalent reduction of megawatts with a certain notice period and a certain payment.

The Hon. JOHN GRAHAM: What do you see as the potential of this? You are testing now but how big could this be for the system?

Mr SWIFT: There are plenty of experts out there who think that we could get in terms of 5 per cent to 10 per cent of peak demand out of this kind of product.

The Hon. JOHN GRAHAM: What sort of costs do you anticipate for the trial?

Mr SWIFT: There is material coming together on that. We will publish what the costs of the projects are and that sort of material later. Obviously, some of them are relatively small so we would expect the costs would come down over time. The 61 megawatts is only the first year. It is a three-year program and it increases over those three years as different parties establish their systems to provide that product.

The Hon. JOHN GRAHAM: You have talked about the New South Wales outlook and have said there will obviously be some stresses on the system looking ahead. What are the likely major stresses that are of concern to you when you look at New South Wales?

Mr SANFORD: Part of our preparation has been ensuring that the installed capacity that is currently in New South Wales and the broader NEM is actually available. A lot of work has been done with generators this year ensuring that technical issues that they faced in the last summer have either been rectified or have been better understood so that capacity reduction can be forecast so that we can manage that risk. The transmission risk is that you either lose interconnection or you can constrain off generation because you lose transmission.

We are working closely with TransGrid as the transmission operator in New South Wales to ensure they are as best prepared as possible, including for their bushfire preparedness that each of the transmission network service providers [TNSPs] do each year.

We have also been looking closely at the fuel availability. Coal has had some prominence in the media and politically and we are working closely with Hunter Valley coal-fired power stations to look at their fuel supplies, but also broader gas supply across the eastern seaboard and obviously the hydro. The contingency planning that we have done is looking at if our preventative measures are unsuccessful or there are large bushfires or storms that impact on the power system, how do we manage and how do we communicate that with governments, industry and the broader community. Then also, as Mr Swift has already pointed out, the demand and response. The residual risk that we see is very extreme temperatures.

We had a very hot summer in New South Wales last year. I believe it to be the hottest on record on average since 1910. That is my understanding from the Bureau of Meteorology. There are obviously risks associated with forecasting demand under those extreme conditions. We cater for what we call a 10 per cent probability of exceedance [POE]; normally a one in ten-year type event. What we saw last summer, based on our analysis, particularly 10 February, was around a 5 per cent POE, so a one in 20-year type demand for Sydney.

The Hon. JOHN GRAHAM: Uncommon but not wildly uncommon.

Mr SANFORD: No, one in 20-year type events. But if you have a look at a range of environmental kind of events that have occurred, flooding and whatnot, nationally, you have had one in 100-year events and the following year you have a one in 200-year event.

The Hon. JOHN GRAHAM: We certainly will not have a brand for a one in 20-year event. That was pretty robust.

Mr SANFORD: That is right. Large-scale bushfires can also have an impact on the system. There remains a residual risk, there is only so much preparedness, a lot of the interconnectors and large-scale transmission lines run through heavily forested areas.

The Hon. JOHN GRAHAM: Thank you for that, you have given the Committee a good flavour of the sorts of things. We have been given evidence this morning about the need for a lot more transparency about the data that is available, both to the centre of the system and separately to consumers about what is going on with their bills with their energy use. Do you have any views about the importance of that issue?

Mr SWIFT: I guess we split that into two parts. There are issues for the general public about how much visibility you can have and how much you are able to compare and see what different products offer and different alternatives. We are not directly involved in that but obviously we support things that make competition work. For us the wholesale market information is important. Mr Sanford just outlined a whole range of issues where we are working with generators to find out information about that sort of stuff. They are generally cooperative but we do not have the power to necessarily get all the information on their risks, their upstream contracts, that sort of thing. That has been addressed in several reports.

The Hon. JOHN GRAHAM: What sort of information might you need that you do not have access to?

Mr SANFORD: Certainly there has not been the level of information that we would have perhaps liked around generator fuel supplies. Obviously that really does factor into our risk assessments around the ability of generators to run either on an ongoing basis or over the peak periods. We have been working closely with generators, the industry and the Australian Energy Regulator to improve both the position and also our knowledge and awareness of what would not normally be considered our remit around coal with the New South Wales Government. Other information is obviously recall times. There has been quite a degree of scrutiny around the availability of generators to enter the market and getting some clarity around both commercial and technical availability of some generators has been an important consideration for us for this summer.

Mr SWIFT: We have also been pursuing with the States the issue of getting information in the future about what is happening out in the system where people are installing batteries or undertaking those sorts of things to understand how the system is going to work in the future, and there is a process underway to improve information in that space.

The Hon. ADAM SEARLE: I return to the power stations and their reporting to you. During the Springvale-Mount Piper controversy we had here recently EnergyAustralia swore blue to us that they had to report to you down to the sort of last piece of coal they had stockpiled. Is that not the case?

Mr SANFORD: They do need to provide us, under the rules, information that allows us to assess the risk. I cannot speak for what EnergyAustralia do or do not provide us. I know the information they do provide us.

The Hon. ADAM SEARLE: Just on that; this should not be any mystery. What do they provide you?

Mr SANFORD: Under the rules they are required to provide us energy limitations on their plant, which means how much fuel they have available and how long they can run for. Under our processes, for a seven-day outlook they are required to provide us a daily energy limitation, so that is how much fuel they have to run on any given day, and in a two-year outlook they are required to provide us a weekly energy limitation, so how much fuel do they have to run the generator over a weekly period. Beyond that we do not collect that information.

The Hon. ADAM SEARLE: Are they required to inform you of how much power supply they have—gas, coal or whatever the inputs may be—if supply were to stop and how long they could keep going without supply?

Mr SANFORD: Absolutely, and in that circumstance EnergyAustralia did do that.

The Hon. ADAM SEARLE: What information could they be supplying that you do not have visibility of that you think you might need?

Mr SANFORD: There are intraday issues, particularly, say, with gas where you would need to nominate, say the day before, your fuel supply to a gas pipeline operator; understanding any energy limitations that may prevent gas-fired power stations from running under those circumstances is always useful information to us. I suppose there has been a loss of corporate knowledge in the industry around how some of these processes should work or have worked in the past and this year we have undertaken an extensive piece of work to reinforce the need for that information.

The Hon. ADAM SEARLE: To what do you attribute that loss of corporate knowledge?

Mr SANFORD: I think there is a lot of history and a lot of experience that has left the industry in terms of trading experience and also operations of power stations, transmission networks or distribution networks and as that knowledge regrows, so, too, do unfortunately some of the painful lessons.

Mr SWIFT: We have had a period where we have had this excess supply so we have not really had to focus on that quite so much. That is certainly not the case now. We have put a lot of effort into this summer to ensure that we are as well prepared as we can be so that has naturally revitalised some of those systems that were perhaps quite evident back in the mid-2000s when there were also questions about that.

The Hon. ADAM SEARLE: Is it your organisation's responsibility to potentially issue market directions for generators to enter the market to bid in if the supply is running short?

Mr SANFORD: Yes. When we direct, we direct for system security or reliability purposes so we will not direct them to bid into the market. We will direct their capacity to come in regardless of whether they bidded in or not. What that enables us to do is manage, say, a reserve shortfall or where we are breaching a technical limit on a transmission line, bringing on additional generation may bring that back within safe operating limits.

The Hon. ADAM SEARLE: What obligations rest on generators to be ready, willing and able to comply with a direction like that or at least a request?

Mr SANFORD: It is a best endeavours approach. We would not issue a direction if there was a safety-related issue with a power station.

The Hon. ADAM SEARLE: I understand that, but going back to last summer and the Pelican Point plant, is it the case that it was not able to operate because it had sold its gas?

Mr SANFORD: I do not know whether it had sold its gas but certainly the communication we had with Pelican Point that afternoon said that it would be four hours before they were available to run. The issue that we were managing there was a security issue so an overloading of the Murraylink direct current interconnector. You have two options to address that; you either bring up additional generation within 30 minutes to alleviate the overload or you need to take load off to reduce the overload. Given that they were only

available within four hours and then about three minutes prior to us load shedding they came and said they could be available within an hour, at our request, when we asked them to explore that further, our only option under that circumstance was to reduce load.

The Hon. ADAM SEARLE: What lessons has your organisation learned from that instance to try to ensure that generators are more ready to comply at short notice?

Mr SANFORD: Yes. This comes back to my point earlier about understanding the availability of generators. At the moment they need to give us a capacity that is available within 24 hours notice. This year we have worked with the generators to improve our awareness of the recall time so if it is under 24 hours and prior to summer this year or prior to the peak of summer we will have a new process that does not just give us capacity within 24 hours; it actually gives us a figure in hours around how quick we can actually get that generator on, so that will actually better inform us around managing risks of shortfalls.

The Hon. ADAM SEARLE: In relation to your capacity to give market directions, did I understand it correctly that you would not give directions to ensure supply per se?

Mr SANFORD: No, that is not correct. We would issue a direction where we had identified a reserve shortfall. The way we manage reserves is we need to normally cover the loss of the largest single input in a jurisdiction, normally the largest generator, so where we could not cover that for the next contingent loss, we would direct on additional generation to be able to do so.

The Hon. ADAM SEARLE: And who pays?

Mr SANFORD: It is normally the market customers or the market will pay for that; the costs of that are worked out and then smeared across the market.

The Hon. JOHN GRAHAM: When is the last time you issued a market direction in New South Wales?

Mr SANFORD: The last time we issued a market direction I believe was 10 February; it was actually an instruction, what they call NAL 116 instruction, to TransGrid to reduce load at Tomago.

The Hon. JOHN GRAHAM: And it was just that single instruction on 10 February?

Mr SANFORD: That is it, if my memory serves me correctly.

The Hon. JOHN GRAHAM: Prior to that when was the last time you issued an instruction or direction?

Mr SANFORD: I could not—

The Hon. JOHN GRAHAM: It would have been quite some time?

Mr SWIFT: Several years ago.

The Hon. TAYLOR MARTIN: And they did reduce load and how long for?

Mr SANFORD: Yes, and they came off for an hour.

The Hon. TAYLOR MARTIN: An hour?

Mr SANFORD: We will only take the Tomago smelter off for one hour.

The CHAIR: Can you run through what a load shedding situation would look like, how those decisions are arrived at and when you dump a section of New South Wales to recover that load? Can you walk us through the process of who does what and who you have to contact?

Mr SANFORD: Yes. Where we get a lack of reserve three condition is normally where we would shed load. You may also do locational load shedding to manage a locational issue so there is no broader jurisdictional supply demand imbalance but you have a local issue trying to deal with it, but I will focus more on the jurisdictional one.

The CHAIR: Some years ago—I do not know if you were around—they load shed and they shut down the South Coast virtually. Were you aware of that?

Mr SANFORD: I was not.

Mr SWIFT: Yes.

The CHAIR: It was not very nice. I am still reminded of that wonderful, amazing time that they virtually shut down electricity on the South Coast and I am still trying to understand exactly how that came about because a lot of businesses suffered.

Mr SWIFT: The rules outline responsibilities for different parties and each State appoints a jurisdictional security coordinator and that jurisdictional security coordinator notifies us of what the priority ranking of loads are that would be shed if it was needed. We have systems that carefully monitor the situation. As Mr Sanford was saying, we go through these lack of reserve notices. As we are going through those notices the market is being informed and bringing stuff forward. The price is going up, so people are responding. We direct, if there is an opportunity to do so, to get further generation on or to change the transmission arrangement. But eventually, if you get to the bottom of the bottom, the only thing you can do is shed load and shed it quickly before you have the system collapse. That is when the operations team go through a process. Generally, that is done through the transmission and distribution chain of command against that list.

The Hon. ADAM SEARLE: Who is the coordinator for New South Wales?

Mr SANFORD: It is Angela Catt, I think her last name is.

The Hon. ADAM SEARLE: Where does she work? Does she work for you or for the State?

Mr SANFORD: She is from the Department of Industry, I believe it is.

The Hon. BEN FRANKLIN: Returning to 10 February, there are a number of issues around the performance of thermal power stations, particularly against their nameplate capacity. What has AEMO done specifically to ensure that your understanding has increased to such a level that we will not face the same problem?

Mr SANFORD: That is an excellent question. This year we kicked off very early with our summer preparedness activity. Part of that was really understanding some of the generator risks that we saw such as reductions in capacity at very short notice that then pushed us into reserve conditions not just in New South Wales; we saw that in South Australia on 8 February, again on 9 February and then again on 12 February in Queensland. We engaged some consultants this year. We have been out working to get additional confidential information out of the generators to better understand some of the limiting factors or some of the technical parameters that would limit their capacity under high operating temperatures. We have taken that information and we will feed that into our systems and our risk profiling for this year. We are starting to see that on the 40-plus degree days we will use that degree of uncertainty around their capacity or their capability and factor that into our reserve calculations and bring on additional generation earlier if need be.

The Hon. BEN FRANKLIN: More broadly, Mr Swift spoke about some general things that you are doing to improve energy security over summer, which is great. You have addressed some of those specifically and I appreciate that. There are other programs that you are putting in place in order to improve energy security over summer that you have not talked about. I would like to give you the opportunity to do that.

Mr SANFORD: Specifically?

The Hon. BEN FRANKLIN: I think Mr Swift talked about seven or eight areas. Mr Sanford, you have addressed two of them.

The Hon. ADAM SEARLE: While we are on that, I am interested in the 61 megawatts of demand management. I do not expect you to spell it out here, but could you provide us with whatever documentation you have around those measures and where they are to be implemented so that we can get an idea of how they will look in a tangible sense?

Mr SWIFT: Yes.

Mr SANFORD: I spoke a little bit about the generation. Where we have had surplus capacity in the market the need to have all that capacity available over the summer period has not been as important as it probably is for this coming summer. We have worked pretty closely with generators. Outages and maintenance still need to occur. Some of the plant is ageing, so reliability is not what it once was. It is similar to when you buy a new car. Fifteen years later it is not what it once was.

The Hon. ADAM SEARLE: Or 50.

Mr SANFORD: Or 50 years later. I was being polite. We have sought to better understand the outages that need to be taken over the summer period. Where possible, those outages have been moved by the generators to the shoulder seasons or to more opportunistic windows within the summer period where we do not expect to

see extreme conditions. The key risk period is really from around 15 January through to probably the end of the first or second week in March. By understanding the generator outages we are able to direct them if need be right up until what we call the latest time to intervene. We would direct them not to take the outage where it did not present a reliability problem or a safety risk to their employees.

The Hon. BEN FRANKLIN: That was not something that you had done before last summer?

Mr SANFORD: We did, but we have gone on a deeper dive this year down to the smallest of generators that are registered with our systems. Obviously, forced outages still occur and there is nothing we can do about those, but it is about keeping those lines of communication open with the generating companies to understand both the progress with return to service and also looking at managing the risk if they do not return. In terms of fuel, obviously there has been a lot of talk around gas this year. The Gas Supply Guarantee is a mechanism that will extend the NEM pre-dispatch or the forecast out for seven days to get a better understanding of supply and demand conditions. Where we hit particular triggers then we will bring together the gas pipeline operators and production facilities and gas-fired generators to make sure that gas is positioned within the gas transmission system so that fuel being available is not an issue. It will come down to commercial terms of whether or not people buy that, but obviously we have the powers to direct if need be.

We have also done quite an extensive piece of work around coal and understanding the coal constraints in New South Wales. We have a process of monitoring coal stockpiles and also looking at any other risks such as industrial issues or issues on the rail network that might prevent fuel getting to the generators. We have worked closely with every transmission operator on the east coast to make sure that planned outages again on interconnectors are not taken over the summer period, which can have an impact on transfer capability. At the start of the summer we identified about 19 outages that were constraining off generation for planned outages. Four of those were material and the transmission network service providers have moved all of those as well. Those that monitor the NEM would have noticed over the last month or so that there have been quite tight conditions. The outages need to be taken somewhere for the maintenance to occur. Unfortunately, if you push them outside the summer period you push them into a shoulder period. If you get unseasonably high demand you are managing risk in your shoulder season, and that is what we have been doing.

On the contingency management, on 12 September we held the very first national gas and electricity joint exercise. Historically, the NEM exercises for all of the jurisdictions have been conducted in September. There is normally a northern exercise with Queensland and New South Wales and a southern exercise with Tasmania, Victoria and South Australia. We also hold national exercises for gas. This year, looking at the convergence of the markets for both gas and electricity, we have brought together those two national bodies, which include all of the jurisdictions, to exercise the national arrangements and look at opportunities for improvement. That was conducted on 12 September. The learnings from that have been taken away by both jurisdictions and those peak bodies to look at improvements to the national arrangements. They will be in by summer.

On the demand response, Mr Swift has already touched on the ARENA product but in the southern States in particular, South Australia and Victoria, under our Reliability and Emergency Reserve Trader [RERT] provisions, which is an existing mechanism under the rules, we have been procuring additional reserves to support the southern States. We will also seek to procure some additional reserves if possible under our short notice RERT in New South Wales, which would only be activated under extreme conditions. We are looking to do that over the next month or two.

The Hon. ADAM SEARLE: When you procure excess reserves, what does that look like?

Mr SANFORD: It is similar to the ARENA product. In fact, the ARENA product is an adaptation of our short notice RERT product. ARENA has funded what would normally be an availability payment which under the short notice RERT is not normally paid. The long notice RERT that we have procured in the southern States actually ceases to be a process under the rules at midnight tonight. It means that can procure reserves nine months in advance. We have gone and done that for some loads or additional generation in the southern States because that is where we have identified a shortfall. For the short notice RERT we would ask for a large industrial load or an aggregator or additional generation capacity that would not normally be available to the market to offer that in. We will agree commercial terms for using either that demand reduction or additional generation under certain triggers.

The Hon. ADAM SEARLE: Do you pay for that?

Mr SANFORD: No, again it is the market customers that would pay for that. One obligation of AEMO is to consult with jurisdictions prior to activating or using those contracts because obviously ultimately

the consumer would potentially pay. We seek again to minimise cost and impact to the community under the National Electricity Objective.

The Hon. BEN FRANKLIN: Does it cost anything if it is not activated?

The CHAIR: If they are on call do you pay them to be on call?

Mr SANFORD: Under the long-notice RERT it does because we pay an availability payment. Under the short notice, which is what we would be seeking to procure in New South Wales for this summer, we do not pay anything unless we use it.

The Hon. JOHN GRAHAM: You have talked about the southern States; what reserves are you procuring that are relevant to the New South Wales market?

Mr SANFORD: For the southern States?

The CHAIR: Relevant to New South Wales.

Mr SWIFT: In New South Wales the only additional reserves is the ARENA AEMO product.

The Hon. ADAM SEARLE: That is 61 megawatts.

Mr SANFORD: But we are out looking at the moment and we are talking with a number of large industrial customers about their short notice.

The Hon. BEN FRANKLIN: So you are actively looking at opportunities for New South Wales for this summer?

Mr SANFORD: That is right.

The Hon. JOHN GRAHAM: And for what scale of reserve or what capacity might it be?

Mr SWIFT: With the short-term RERT, because there is no upfront payment, if we can secure people onto that it is at no cost. So we would try to find any volume we could get and then it is at least on the books to deal with if you do have an emergency. We would stress though that our analysis shows that New South Wales is projected to be well inside normal reliability standards, so we are not expecting any issues in New South Wales unless you get some extreme event, and we all know that you can get extreme events, and we are certainly not complacent about it. There are lots of issues that could cause a problem.

The Hon. JOHN GRAHAM: It is precautionary at this stage?

Mr SANFORD: Absolutely.

The Hon. ADAM SEARLE: Regarding the interconnectors, where does responsibility now rest for operating and also planning and constructing any improvements required to the interconnectors?

Mr SWIFT: In terms of the planning of the interconnectors, that is a cooperative function. AEMO has a national planning function, so we annually do a major plan where we look forward and look at the opportunities, what the cost benefit would be of augmenting interconnectors, and at various times where that work shows some potential, they will be picked up by the individual transmission companies who would be involved in that. There have, for example, been several cases where TransGrid and Powerlink have cooperated together to study potential upgrades to the Queensland-New South Wales interconnector.

The Hon. ADAM SEARLE: For example, Professor Blakers at the Australian National University has postulated that improving the interconnectors between each of the jurisdictions would be a profound step towards energy security more generally. Is that something that is under active consideration?

Mr SWIFT: Yes, it certainly is.

The Hon. ADAM SEARLE: Particularly South Australia?

Mr SWIFT: Yes. There has been work done, as you are probably aware, of a New South Wales to South Australia interconnector. If you went ahead with Snowy 2, that would create profound changes to the network to support that. We have done work which has looked at a combination of interconnectors across Australia including things like a second Bass link and other interconnectors. That is why we would say a national approach is really important because you have got to look at the whole picture, and certainly interconnectors bring real benefits. The issue then though is that they cost money. So you have got to get a clear view of what the cost versus benefit is and you have got to make that decision in an environment where the

future is not that certain. How much is behind-the-meter stuff, for example? The work done by the CSIRO and the networks association talks about getting up to 45 per cent of your energy coming from the customer.

The Hon. ADAM SEARLE: That is by 2030.

Mr SWIFT: Yes, so you kind of think under that case how much is it going to be. There are different scenarios and there is a lot of work done on that and I expect that over the next couple of years you will see us come out with a major review of the requirement for that work. Under the Finkel review we are required to do what is referred to as an integrated grid plan, which goes into that area with a great deal of depth.

The Hon. ADAM SEARLE: I have got two questions about the spot market, how the market and bidding works. As I understand it, bidding occurs in half-hour blocks, is that right?

Mr SWIFT: We dispatch the market every five minutes. The five-minute prices are averaged up into half-hour blocks and the half-hour blocks are used for the market settlements.

The Hon. ADAM SEARLE: But in terms of those half-hour blocks, is it the case that when those bids close, all of the entities bidding in are all paid at the highest price? Is that what happens?

Mr SWIFT: You have a clearing engine which sets the marginal price in each region and it is what we call security constrained optimised dispatch. So you have a mathematical engine which takes all the bids and offers plus incorporates a whole lot of equations about how much power you would allow under different dispatch patterns and still remain with the network being secure and operating inside its safe technical envelope. That then sets a clearing price across each of the regions of the NEM, which is, effectively, the marginal price for additional consumption or production in each area.

The Hon. ADAM SEARLE: In setting that sort of marginal price how do you make sure that the price is not at the higher end rather than at the lower end for the customer?

Mr SWIFT: That relies on competition in the bid process in the first place.

The Hon. ADAM SEARLE: But are all the entities bidding into that block paid at the same rate? When that optimal price is set they are all paid at the same rate?

Mr SWIFT: Yes.

The Hon. ADAM SEARLE: Irrespective of their bids?

Mr SWIFT: That is right. It sets a clearing price in each region.

The Hon. ADAM SEARLE: That does not sound very efficient. Why should they be paying more than their bids?

Mr SWIFT: Actually it is very efficient. That is getting into sort of economic theory, but I could refer you to several pieces of work and papers that will show how that works. Generally, a competitive market operates at a clearing price when you have got what we call a fungible good. All electricity is the same, that is the view, so that you set a clearing price based on that as the price of electricity. At that point that sets the price which gives you the right signal. So if you can produce more cheaply than that you should be running and if you cannot consume at that level because it is too high then you should reduce your consumption. It is meant to provide all the right signals. Every participant knows that is the way it works.

The Hon. TAYLOR MARTIN: It works the same in financial markets—you get slippage.

The Hon. ADAM SEARLE: I understand that. Given the growth in the wholesale part of the market is said to be one of the key drivers of escalating household and business costs, I am just wondering whether that sort of clearing price is actually working in favour of the customer if people who bid in actually end up getting paid more than their bids, whether that is actually really efficient or very good for customers.

Mr SWIFT: You will find at any point in time a very large number of the generators bid negative, and that is because they are not intending to be a price setter, so they will let the competitive generators set the price they are prepared to take. If you are a large baseload generator you have to, at least for a block of your output, keep generating through, you cannot just turn on and off. You will find that most of those will bid at zero or even down to minus 1,000 for a minimum block of energy. The whole market works on incentives. If you have a contracted output that you have done with a marketplace then there is no benefit in you pushing high prices or whatever; your incentive is to bid your actual costs. So the market does work on incentives.

One of the things I did mention is that we are very keen to see the market design revised for the future, and what we are looking at there is that at the moment the market does not value some of the services that we require, like the flexibility and controllability of those sorts of things. So that is part of that NEG debate as well, how you actually provide some value to generators that supply these other services. But, in general, the clearing price mechanism is an effective way to go. I can understand how you can think it is unusual, but it is not. Most competitive markets would work in that way.

The Hon. TAYLOR MARTIN: Mr Sandford, you spoke earlier about a one in 10-year or a one in 20-year level of high demand, similar to what we saw in February of this year. There are serious consequences to our economy and our society if we cannot meet or manage that demand. For example, in Adelaide, when South Australia had widespread lengthy blackouts, IVF clinics saw embryos become damaged and were subsequently destroyed—devastating for families. In Victoria, the aluminium smelter, the Alcoa Portland smelter, saw 70 per cent of their cells freeze beyond repair. Are you certain that the right steps have been taken to ensure that the IVF clinics in New South Wales, the smelters in New South Wales and other heavy industry will not face the devastating and irreversible consequences seen very recently in South Australia and Victoria?

Mr SANFORD: As Mr Swift has already pointed out, we are not forecasting breaches of the reliability standard in New South Wales for this summer. Under certain circumstances, certainly in South Australia and Victoria, we are. We believe that the measures that we have taken to prepare for the coming summer have been sufficient under most circumstances; however, those extreme conditions that I described earlier—those one-in-20 peak days—do present a significant risk, particularly when coupled with environmental-type disasters such as bushfires or severe storms, and there can be no guarantees provided about the reliability of supply. We have had an independent review of our summer preparedness activity, and I believe we will be coming out with that review shortly. In fact, I believe it may be going to COAG on 24 November and the key outcomes of that are that risk remains. I pointed out earlier on some of those residual risks that remain, but we believe that the steps that we have taken to prepare for summer have been prudent.

The Hon. TAYLOR MARTIN: In your opinion, is that certainty improving or deteriorating year on year?

Mr SANFORD: The Electricity Statement of Opportunity [ESOO] analysis that we published in September shows that the conditions were improved going forward. Obviously with 22 gigawatts of additional coming into the market across the NEM those conditions will improve, but the key thing for us is around ensuring dispatchability and the additional grid services that we need. We are obviously intervening on a semiregular basis in South Australia, particularly over the weekends, for things such as system strength. They are some of the services that Mr Swift spoke about in terms of the market changes that we would need as the grid transitions to a lower carbon future.

Mr SWIFT: The other issue across the market is the retirement of major plant. If you look at that ESOO that Mr Sanford mentioned, you will see that we expect improving reliability for the next few years progressively and that continues until Liddell exits, and that of course creates a shift the other way. At the moment that is still within the reliability standards that are set for the market. I point out that we do have reliability standards, and I think they probably need reconsideration from time to time as society gets more dependent on electricity but the standard is not 100 per cent. The standard is currently an unserved energy of 0.002 per cent—or saying we are going to supply 99.998 per cent of all electricity people require. Obviously it starts costing disproportionate amounts of money as you try to cover every eventuality. Individual customers can be affected by things at their own premises or networks up the street a lot more than the national market. Generally the average outage that you might have at your house will not be national market outage but will just be a local pole top transformer, possums in the poles or whatever—

The Hon. ADAM SEARLE: Substation.

Mr SWIFT: Yes. That sort of thing still goes on. Every customer also has to think about their own supply and think about their UPS, backup or whatever if they have critical loads.

The Hon. BEN FRANKLIN: To clarify a point you made to my colleague before: With the usual caveat of an extreme weather event, you suggested that you do not have concerns about the reliability of supply in New South Wales this summer but you have some concerns about Victoria and South Australia.

Mr SANFORD: Our analysis shows that there is sufficient capacity within New South Wales to meet the forecast demand, but the key challenge remains—even bushfires or extreme weather events aside—that you still have a reliability on machines, and when the machines break down you have a partial or full outage. We cater for the loss of a single element, be it generation or transmission, at any given time in the NEM, but where

multiple events occur concurrently that will always present challenges to us. On 10 February, there was the loss of the Tallawarra Power Station. At Colongra Power Station the four units there received a dispatch signal which would have covered for the loss of Tallawarra, but unfortunately they failed to start so we basically lost five units in quick succession. Those types of events, if they occur under the right circumstances this summer, will also present challenges regardless of the available capacity.

The CHAIR: Perfect storm.

Mr SANFORD: It is.

The Hon. TAYLOR MARTIN: Do you mind elaborating on why it is that Victoria and South Australia are not prepared?

Mr SANFORD: They certainly are prepared. I think the measures that have been taken by the respective governments in those States have been prudent to shore up supplies. The southern States have had Northern Power Station and Hazelwood Power Station come out, which was 2,300 megawatts in very quick succession, and that has reduced the surface capacity under those very high demand conditions. That has been a relative shock to the market, and the market will adjust to that in the medium to longer term, but in the short term under those conditions it is presenting some challenges. If you look at average summer conditions, there is sufficient generation to meet demand in those States.

The Hon. JOHN GRAHAM: Is it true that New South Wales will face similar pressures as Liddell comes off? In the short term there is not a New South Wales issue—

Mr SWIFT: That is right.

The Hon. JOHN GRAHAM: —but looking slightly ahead we will have some of those pressures here.

Mr SWIFT: Again, that would depend on the market incentives, the behaviour of participants and what sort of an investment you might get as a result. I think the good thing about Liddell and the action so far is that it has advised the market well in advance. Hazelwood came out with about five months notice, if I remember rightly, and that is not much time for people to adjust, whereas with this longer notice period I know that AGL and a number of its competitors are looking at what opportunities that presents and what might replace it.

The Hon. JOHN GRAHAM: Given the limits to the information you have described about what you can and cannot see in the market, do you have concerns about price gouging by some of the companies?

Mr SWIFT: We are not responsible for the regulation of that sort of market conduct. The ACCC is doing an in-depth review of that at the moment and it has the benefit of being able to get confidential information on people's costs. It is difficult for us to answer that. It is also hard because you do not really know what the costs of these participants are. We know that coal prices are as high as they have been for a few years and with coal at that price you can see that there is a good reason for it to be up. There used to be low, long, many-year legacy contracts years ago; those have run out, so people are buying coal off the market. When you push them to produce more, there is a problem with the availability of trains and the availability of the coal itself, so that is coming in at a higher price than it would have in the past.

The Hon. JOHN GRAHAM: I understand your comment about the regulatory agencies but you are in a very good position to have a view, particularly on the spot market, as companies are bidding in half-hour schedules. Concerns have been raised about market manipulation within those 30-minute intervals. Do you have any views you would like to share with the Committee about whether those public concerns are accurate?

Mr SWIFT: You always have to remember when you are looking at the spot market that that is actually just the overs and unders. The vast majority of energy—

The Hon. JOHN GRAHAM: Is under contract.

Mr SWIFT: —is under contract and should be under contract, and one hopes that that is more competitive. Obviously in the five-minute period at times any different participant might have a range of market power for that five minutes or half hour, so you see some quite dynamic bidding. Obviously if that threatens security or reliability we do take action, but generally it does not and the effect it has on overall prices is arguable. Certainly the main point for competition is to ensure that the contract markets for the large customers and the retail offers for—

The Hon. JOHN GRAHAM: So they are really your concerns. If the public is worried about that driving up prices—I accept that this is just a small portion of the market but it is driving the price—that is not your concern. You are dealing with the security and reliability issues.

Mr SWIFT: We have a close relationship with the AER, and it takes information from us regularly and pursues matters that are in breach. It is a part of the ACCC, so those are the agencies that deal with those matters.

The Hon. ADAM SEARLE: Is it possible to know what percentage of the volume of electricity consumed in the NEM is traded through your spot market and what percentages are under contract?

Mr SWIFT: No, it is not actually.

The Hon. ADAM SEARLE: Can you explain to us why it is not?

Mr SWIFT: That is an area where the financial markets are difficult to monitor. Last year the Australian Financial Markets Association did not produce their report; they usually do. About double the energy in the physical market is traded in the financial market, so it is certainly a large amount. I was on a national review a number of years ago, and we did quite a lot of work trying to find that out. Certainly in the mid to high 90s seems to be the indicative number of actual energy that, when it goes through the spot market, has already had a price set on it. There is a whole range of different mechanisms—of course, the Australian Securities Exchange [ASX] trade as well as a lot of bilateral trades. Many generators are under various types of power purchase agreements, so there is a range of different mechanisms that parties might use in terms of contracts. You would not normally expose yourself to that cost as a prudent participant, so all the larger participants will have very strict internal codes about how much risk they can take and normally work on what they call "value at risk" metrics. There will be some process by which they have to calculate how much of their costs or their revenue is at risk and keep it down to limits.

The Hon. JOHN GRAHAM: Some of that trading is visible to the public and some of it is not.

Mr SWIFT: Yes, that is true.

The Hon. JOHN GRAHAM: I am happy with a rough rule of thumb, but what proportion is visible in public and what is happening behind closed doors?

Mr SWIFT: We will take that on notice and see if we can get some information on that for you.

The Hon. BEN FRANKLIN: I move to demand forecasts, which I raised with the Chief Scientist and Engineer earlier. The increasing uptake of distributed energy resources is a great thing on the one hand, but on the other hand for you there are significant challenges in terms of visibility.

Mr SANFORD: That is correct.

The Hon. BEN FRANKLIN: On that issue and generally, could you tell us what you are doing to ensure that your forecasts are the best they can be?

Mr SANFORD: Forecasts, particularly under extreme conditions, are very challenging. If you have a look at weather service providers, even their own metrics show that, on your average predictions, around 80 to 90 per cent of the actual temperatures are within two degrees of their forecast temperatures. Temperature has a very big impact on electricity demand—for example, in South Australia it is about 100 megawatts for every degree, give or take, of increase in temperature. Predicting temperature on extreme days is a challenge, which has a major input into our own energy forecasts so they also become a challenge. A very good example was in late September this year in Queensland, when all major forecast providers—the Bureau of Meteorology, Weatherzone and Telvent—that we use got the temperature wrong by about three or four degrees. In Queensland that is about a 300 or 400 degree forecast error.

The Hon. BEN FRANKLIN: I think that is megawatts not degrees.

Mr SANFORD: That is right, sorry. If you look at that, that is a large generating unit in itself. There is a large degree of uncertainty, and a forecast is exactly that—a forecast or we would all be sitting in the Bahamas probably. This year we have introduced quite a sophisticated approach to managing that forecasting uncertainty, which is called a Bayesian belief network. It basically takes a probabilistic assessment of forecast error and a degree of generation reduction as a probabilistic assessment. It looks at a confidence level of around 96 per cent—I think that is what we are currently looking at—of the temperature being right and so our forecast being right at certain temperatures and the generation being available as well as wind and solar output. It looks at every five-minute forecast that we have done since the NEM—I think it is in the millions—and it does an

analysis and looks at the temperature at that forecast. Basically it says that if the temperature is going to be 30 degrees, there is a probabilistic outcome that says your forecast might be off by a certain amount, and then it calculates it at 40 degrees and so forth.

The Hon. BEN FRANKLIN: It takes into account the specific days, obviously, including weekends.

Mr SANFORD: Yes, specific days and different demand daytime. It is quite a sophisticated model and it gives us a forecast error. I said that we normally take for our reserve conditions the loss of the largest unit. This year, this probabilistic assessment will look at the likelihood of the combination of the temperature error in the forecast and supply availability will be larger, and if it is larger than the normal single input then we will use the larger one to manage our reserve levels. You are always going to have uncertainty and we always focus on improving the forecasts. There is a range of work and initiatives underway and being considered at the moment to continue to do that, but we will couple that with managing a degree of uncertainty going forward in terms of reserve management.

The Hon. BEN FRANKLIN: Will that algorithm be available this summer?

Mr SANFORD: Yes, absolutely.

The Hon. BEN FRANKLIN: Was it available last summer?

Mr SANFORD: No, that is right.

The Hon. BEN FRANKLIN: Could you also comment on the capacity side with the challenge around the distributed reserve?

Mr SWIFT: Perhaps we could talk about rooftop solar. A few years ago we entered into an agreement with the Clean Energy Regulator that has records of all the rooftop solar in Australia because it gets a small renewable energy certificate payment for their capacity. The regulator has been sharing that with us for a while, and we have developed a solar forecaster, which is based on all that information. We have information on all the 1.7 million rooftop solar installations that are grouped into connection points across the NEM and monitored. We are fortunate that that data was collected because of that process, and that is why we worry about future stuff because whether or not that gets collected is a bit in the wind at the moment. We do a lot of work on forward plans. Mr Sanford talked about the very detailed work we do to try to get our operational forecasts right. We also have long-term plans, and they are essential for things like planning the transmission network and the need for generation. Those are regularly published, and we have a lot of consultation with industry and experts on the network.

I might say there is plenty of uncertainty if you start thinking about the world going forward over the next decade or so. There are quite a few uncertainties to think through, such as how big electric vehicles will become. On batteries, a couple of years ago you would have said that one man and a dog who are really crazy would buy a battery, but now they are starting to come into force and the price is moving down at an unbelievable rate. We are also looking at how quickly new products and services will come in, where people can use beyond-the-meter management tools and techniques. There are a lot of uncertainties when you do that sort of forward planning. Energy efficiency is a very important thing. If you looked back five or 10 years and saw our forecasts, they would have trended up.

The Hon. BEN FRANKLIN: That was going to be my next question. Please comment on the importance of energy efficiency.

Mr SWIFT: As I said, 10 years ago if you went to your local hardware store you would have found incandescent bulbs; now you go there now and the vast majority of them are light-emitting diodes [LEDs]. The difference in energy efficiency is very significant. Air conditioners and fridge-freezers have improved their efficiency a lot. There has been a concerted effort by the States and the Commonwealth under the MEPS program, which is the Minimum Energy Performance Standard, that has driven improvements in the efficiency of individual machines. Energy efficiently is obviously the way in which you can reduce the environmental impact and at the same time potentially reduce the cost to customers.

The Hon. BEN FRANKLIN: Win-win.

Mr SWIFT: The extent to which you can make that work for you is a good thing, along with the opportunities for fuel switching and different types of approaches such as using microwaves instead of other forms of heating. There are all sorts of things that are available to industry and to consumers. At the moment we do find unfortunate increases in prices across Australia driving people to take a lot more interest in their energy costs and what they can do about them.

The Hon. ADAM SEARLE: A surge in prices will do that for you. In relation again to the structure of your bidding, people in the emerging battery industry have indicated that they think the structure acts as a disincentive for battery technology to be taken up in terms of the half-hour blocks versus the five-minute blocks.

Mr SWIFT: Yes.

The Hon. ADAM SEARLE: Can you explore any views you have about that and how the regulatory setting can be improved?

Mr SWIFT: Yes. Recently a major study was completed for rule change. The issue there is that since market start we dispatch every five minutes and set the price every five minutes, then that is averaged up to half-hour. The interval meters, which all the bigger customers have and in New South Wales quite a few residential customers have, record half-hourly data. All the settlement is done on that average half hour. Now with batteries, of course one of the big benefits of a battery is that it is very fast acting. It can actually get in and supply a five-minute peak. It has not been an issue in the past because conventional plant cannot really do that, but the new internet of things, the electronic approach, you can have customer load that acts within five minutes and certainly batteries can act within milliseconds. They are interested in being able to, if you like, access the five-minute pricing and be paid for the five-minute prices. There are some issues for conventional market applicants and the financial market products around moving to that. The decision has been made by the Australian Energy Market Commission [AEMC] to move to five-minute pricing but to give three years notice to the market of doing so.

The Hon. ADAM SEARLE: In New South Wales the big three companies control something like 90 per cent of the retail market, about 96 per cent of the gas market and I think 69 per cent of the generators. That is a lot of market concentration. Given what you have said about very high volumes of electricity not being traded through the transparent mechanism but through opaque contracts—for example, AGL and Origin are vertically integrated; they have generators and they also have a retail interface—how do we know, and how can we guard against, the generator and the retailer acting in an uncompetitive way if we do not have visibility of the volume?

Mr SWIFT: In that case, the ACCC is doing that inquiry, but what we do not have the visibility of is wholesale contracting—the financial market contracting. A lot of that is not publicly available in relation to what the price was or how that transferred.

The Hon. ADAM SEARLE: Sure.

Mr SWIFT: And of course a lot of it is internal to the company, so that concentration has reduced some of the financial market liquidity. Most commentators would say that the horizontal market concentration is the thing more to focus on. If you have a large share of the retail market then that by itself is an issue in the retail market. If you have a large share of the wholesale market, that is important in the wholesale market. The linkages between the two are not apparent necessarily to drive a lack of competition in that space.

The Hon. JOHN GRAHAM: On the question of the visibility of market transactions, is it an issue or not, or is it really that the spot market is setting the price anyway so it does not really matter? Do you have a view on which of those two propositions is correct?

Mr SWIFT: My personal view is that in many markets you do collect and publish anonymously what the financial market prices were. I think there would be benefits to do that from a personal point of view. It is not an AEMO perspective.

The Hon. ADAM SEARLE: Where would that requirement have to be built in? Would that requirement have to be through the Council of Australian Governments [COAG]?

Mr SWIFT: I have not actually looked at the legality of that. Normally that would be done through the financial markets and services Act, which I think is a Commonwealth Act.

The Hon. ADAM SEARLE: It is. Feel free to take that on notice and come back to us with some more thoughts, if you have any.

The Hon. JOHN GRAHAM: Jumping back to your batteries point and the three-year delay in the implementation of that change, does that mean that until that change happens batteries effectively are disadvantaged in the way the bidding process is structured? Is that too long, that three-year period? What discussion has there been about that?

Mr SWIFT: There was a lot of consultation and discussion through the AEMC process. As you no doubt would have heard, there has been quite a bit of debate about that. That is not our decision. The AEMC made that decision but they did do it with a lot of consultation and thought. In their view the market needed to adjust. There are a number of other financial instruments that rely on the market being as it is today, and most of those are what we call the cap contracts. There is a lot of trading of cap contracts in the market and parties and counterparties to those instruments would often be disadvantaged by that change. It is a bit of thinking about the past versus thinking about the future.

The Hon. JOHN GRAHAM: But at least it gives people certainty to be able to plan.

Mr SWIFT: Yes. I am not sure how. You can certainly see individual examples in particular half hours where it would be really advantageous to get access to the five minutes, but overall I am not sure how much that advantage or disadvantage is. We are seeing batteries come in. In fact, we are dealing with four that are connecting at the moment.

Mr SANFORD: That is right.

The Hon. JOHN GRAHAM: In New South Wales, is there a black system restart plan in place at the moment?

Mr SANFORD: Yes.

Mr SWIFT: Absolutely.

The Hon. JOHN GRAHAM: For how long has that been in place?

Mr SANFORD: There has always been a black system restart plan in place.

The Hon. JOHN GRAHAM: When and what sort of testing is going on? What is happening?

Mr SANFORD: We do annualised testing on the contracted services, which I cannot share with you because obviously they are confidential, and we do annual testing and activation of that plan with TransGrid as well.

The Hon. JOHN GRAHAM: This was a problem in South Australia. Is that correct? That was one of the things that compounded the issue there.

Mr SANFORD: Yes. The issue there was a technical failure of the contracted services.

The Hon. JOHN GRAHAM: So what assurance have we got that that will not happen in New South Wales?

Mr SANFORD: Look, we cannot give assurances. One of the contracted services took a direct lightning hit, which caused a technical issue, and the other one was a network issue that was not actually an issue with contracted services. The energisation path to get the generator away was what the issue was.

The Hon. JOHN GRAHAM: The news that you cannot give assurances is reasonably concerning.

Mr SWIFT: Oh, we know, but I think just to correct that—

The Hon. JOHN GRAHAM: Is that not what the testing is supposed to deal with?

Mr SWIFT: Just to correct that, the Committee can be quite assured that after our experience in South Australia, we have drawn a number of lessons out of that and there has been a heck of a lot of work done across the organisation and especially in the operations area to make sure that those things we learnt in South Australia are not repeated elsewhere.

The Hon. TAYLOR MARTIN: Can you give us some examples?

The CHAIR: But are you talking cyber attack or something like that as well? You cannot give an absolute guarantee, can you?

Mr SANFORD: Absolutely. There are absolutely no guarantees. What we can do is make sure that we have identified the right services that need to be procured and a range of contingencies that we can manage. If you have a look on 28 September the two contracted services were not available to us, and the third plan—and it was a plan, it was not ad hoc—that we had available to us and our preferred approach is actually to restore from the interconnector. The reason for that is that you have the whole weight of the NEM behind you. With these things you have got downed transmission lines, you still have a storm event going on and you are trying to restore services. On 28 September our preferred option, and the very quick decision made by our control room

once they identified the issue with the two restart services, was to restore from the interconnector. If you benchmark that restoration internationally, you will find that against similar types of events it was a very fast restoration.

The Hon. JOHN GRAHAM: Mistakes happen: That is understood. You learn from them. But what changes has that made to what this might mean for New South Wales? What assurance can you give us for our State?

Mr SWIFT: We have adopted a whole new software system for modelling in detail how the system operates and is rebuilt off those services to ensure all those work. We have done a lot of work in testing as well.

The Hon. JOHN GRAHAM: So there has been additional testing in New South Wales since that contract failure in South Australia?

Mr SANFORD: We have done testing in New South Wales.

The Hon. JOHN GRAHAM: Since that?

Mr SANFORD: Absolutely.

The Hon. JOHN GRAHAM: Okay, thank you.

Mr SWIFT: I guess when we say "assurances", you cannot imagine a normal accident or problem which actually causes a system black. It has to be quite a very severe or catastrophic incident that does that.

The Hon. BEN FRANKLIN: Or series of incidents.

Mr SANFORD: That is right.

Mr SWIFT: When you have a catastrophic incident or series of incidents you do not really know what the outcome of that is and the storm front that blew over the towers in South Australia also struck by lightning one of the restart pieces of equipment. What would cause a system blackout would be a very severe event of some nature and that could easily take out pieces of infrastructure that could make it very difficult to start. We do have redundancy. We have done a lot of work on ensuring we have that.

The Hon. ADAM SEARLE: Going back to the jurisdiction coordinators and their responsibility for advising you as to the hierarchy of who is to have the outages and if that is needed, how do the jurisdiction coordinators determine that hierarchy? Is that a decision made by the government in each jurisdiction or is it made by the distributors?

Mr SANFORD: Social and economic priorities for the government and then they provide those lists to AEMO and then through to the transmission network providers and the distribution networks.

The Hon. JOHN GRAHAM: Specifically on Tomago, we discussed earlier some of the concerns about a plant like that and some of the risks involved with them being central to the load shedding. Is there a better option, not looking under pressure immediately now and not with decisions to make in a very short amount of time, but at an alternate way given the pressures on Tomago and the risks for a plant that big when it comes to load shedding?

Mr SWIFT: Those things are to be assessed by the jurisdictional security coordinator but when we are doing planned load shedding the intention would be you rotate that. The intention would not be to turn them off and leave them off, neither for other feeders. If it is going to go more than half an hour to an hour they would rotate that. The important thing with the smelter is, turning it off is actually a very good way of getting a very large load reduction but you really need to make sure you can bring it back up again.

The Hon. JOHN GRAHAM: But there are risks.

Mr SWIFT: Within a reasonable time, otherwise there is quite a severe risk, that is right.

The Hon. JOHN GRAHAM: What are the alternatives though? You have members of Parliament from both sides here. What are the alternatives for a jurisdiction like New South Wales if there are concerns about the risks?

Mr SANFORD: The demand reduction product under the Australian Renewable Energy Agency [ARENA] program is a good step forward. Obviously the Reliability and Emergency Reserve Trader provisions that we are out seeking to procure also provide an alternate. I certainly think the ARENA product will give us a good indication around alternate options.

The Hon. BEN FRANKLIN: But load shedding is the last resort?

Mr SANFORD: Absolutely.

The Hon. BEN FRANKLIN: All of the things you have outlined today for the last hour and a half are in fact what you are doing in order to make load shedding less likely?

Mr SANFORD: Absolutely.

Mr SWIFT: That is right.

Mr SANFORD: A point on the load shedding: When we issue a direction to shed load, we do not do that lightly because we understand the community impacts that occur, and obviously the last thing we want is the community having a lack of faith in the industry to deliver the essential service.

The Hon. TAYLOR MARTIN: To stay on Tomago for a moment, you said before you would ask about whatever took place and that there was load shedding for an hour there. Three hours is my understanding until the cells essentially start destroying themselves.

The Hon. ADAM SEARLE: It is less than that.

Mr SANFORD: We have a very close relationship with Tomago. I was up there recently visiting with Matt Howell, the chief executive officer [CEO]. On 10 February or during that heatwave event we had very close communication, I personally did, with Matt Howell every few hours during that event to make sure that they were kept informed of the changes and circumstances. One thing I would say is they really do understand how important they are to managing those extreme types of events and we would only seek to take them off under the most extreme of circumstances.

The Hon. BEN FRANKLIN: This has only happened four times since 1991.

Mr SANFORD: I could not tell you the exact number.

The Hon. BEN FRANKLIN: That sounds about right.

Mr SWIFT: That sounds about right. And at the time the market is clearing at $14,000 per megawatt hour, that is mighty expensive aluminium you are producing at that price. That gets back to this whole idea of demand side. You really should be looking at only using that when it is really valued. Otherwise the whole productivity of the system, you are building networks, building generation, et cetera, et cetera, just to supply a peak demand. Thinking about overall productivity and efficiency, that can make a very successful—

The Hon. JOHN GRAHAM: On the demand side of response, which was my other question, we are looking at 61 megawatts here in New South Wales working with you; how does that compare to other States?

Mr SWIFT: That is a trial of a specific product. The retailers would be offering certain interruptions to some of their customers. You could ask them about that.

The Hon. JOHN GRAHAM: Do you have similar trials going on in other States?

Mr SWIFT: That exact same trial is occurring across Victoria, South Australia and New South Wales.

The Hon. JOHN GRAHAM: That is not in the 61 megawatts, is it?

Mr SANFORD: No.

The Hon. JOHN GRAHAM: How much is happening?

Mr SANFORD: The exact number, it is a similar amount in the other States.

The Hon. JOHN GRAHAM: It is roughly proportionate.

Mr SANFORD: Yes. We are expecting that will grow over the next three years. The funding to support that is over three years and as we develop, I suppose, a better understanding of its usefulness. One of the key things about that is we have never had a 10-minute product. I spoke previously about the two types of load shedding we do, reliability and for security. Under security we need to get secure within 30 minutes. We have never had a product that has been able to be enabled; we have had fast-start plant you can bring on, but to be able to take load off and compensate people for that in 10 minutes is a critical tool to smoothing off those peaks in the longer term to making sure that you are not over investing.

Mr SWIFT: It is a trial product. We certainly very much appreciate the New South Wales Government chipping in to help make that happen and we have had a good partnership with ARENA in

designing that. Our idea is, having done it this time, we will be evaluating how successful it is as a business proposition for the parties that are part of it as well as for us as users of it and the cost effectiveness of it all.

The Hon. JOHN GRAHAM: It certainly sounds like a pretty useful tool in your toolkit.

Mr SWIFT: Yes. When you go to load shedding you have to turn off a whole feeder at a time. That is a very random way to do it. You are going to turn off everything that is on that feeder, which will include traffic lights and all sorts of loads that are quite sensitive, as well as something you do not mind turning off. The ability with these new tools to be able to precisely turn off things that are of a lower level of concern to you is obviously a very emerging, valuable tool to improve the productivity of the whole system and reduce costs.

The CHAIR: Thank you gentlemen for coming forward today. You have been immensely helpful. You have taken some questions on notice and will have 21 days to get the answers back to the Committee. The secretariat will be glad to help you with that. In light of your evidence the Committee may put some further questions on notice.

(The witnesses withdrew)

(Short adjournment)

TONY WOOD, Energy Program Director, Grattan Institute, affirmed and examined

The CHAIR: Would you like to make an opening statement?

Mr WOOD: I will. I refer to the submission that we made and I apologise to the secretariat. We did not quite meet the deadline date but hopefully you have had a chance to see it. One of Grattan Institute's principles is not to make submissions too long. In some ways this inquiry is occurring at both a timely and I suspect from your point of view a frustrating time because things are happening all around you as you try to grapple with the very issues and some of the questions that you pose. However, I am not sure that doing the same thing in six or 12 months would make any difference; these issues will still continue to unfold.

The other thing is that since we put the submission together I spent most of last week in Singapore and the one trite but accurate statement is that no-one knows how to solve some of these problems. Everybody in the world is grappling with very similar issues: How do you integrate intermittent renewable energy into a system? How do you deal with market structures that were not necessarily designed for this sort of new world? How do you deal with uncertainty in relation to gas—and the gas issue is a global issue? Everyone has a different version of it but there are different versions.

The search for simplistic answers is doomed to fail but the search for ways forward is part of the solution here and I think New South Wales is in a particularly important position because of its physical centrality and also the relative size of the State. In terms of some of the points that I refer to in relation to this we have, like many people, looked at some of the underlying issues that were raised in the terms of reference and there is none that we disagree with.

We may have some minor concerns about the relative size of various elements and the timing because what is relevant is that for the period 2009 to 2012-13 the fundamental issue was basically a very poor regulatory regime across the eastern States, characterised by a number of things which I am sure you are aware of. Not only did they contribute to price increases but they have also left a legacy of asset valuations that will at some point need to be addressed and whoever owns those assets today is faced with a serious regulatory risk, some of whom, I assume, went into those deals with their eyes open and some may not, but that is the reality of that world.

The network side has obviously moved forward and we certainly supported things like the removal of the limited merits review and some of those things. More recently the factors that have driven price outcomes are somewhat obvious but I guess the things that seem to me to be the four contributing elements to what we now see in 2017-18 would be that very poor regulatory situation, some elements of which have been fixed but some of which require some painful decisions both by government and by current asset owners. Secondly, we have seen the retirement of ageing assets with no credible mechanism for replacing those assets with like sort of characteristics.

The third, related to the second one but not the same, would be the issue of what has been a pretty ugly saga in relation to Australian Government policy on climate change; and the fourth issue, which came in perfect time to make things more difficult, is what has happened with gas. The consequence of course has been that everyone in that mess who has an opinion can find a fact to prove their opinion. That makes it great fun for the media; it makes it harder for someone who is trying to unpick this because if any of you have got an opinion, I am sure you will find a fact to prove it. You only have to look at what happened in the South Australian blackout to see how people can prove quite clearly that renewables caused the problem and quite clearly that renewables did not cause the problem.

In fact, I was in Singapore with Tony Marxsen who is, until today I think, the chair of the Australian Energy Market Operator [AEMO]. He made the point to that conference that the cause of the blackout was the settings on the wind farms. The storm was what triggered the initial events, which then led to the situation in which the wind farms triggered themselves to turn off, but it was those settings on the wind farms. It was not because they were wind farms; a gas plant would have the same issue. But what was weird was that nobody knew that they had those settings, including AEMO and the owners of those plants. In hindsight that seems so bleedingly obvious but in foresight that was never foreseen. That is one of the challenges we have in terms of looking at some of the issues that now have to be addressed.

I will not say any more about networks. We can explore that further if you are interested. In terms of the wholesale market, clearly there have been at least three potentially contributing issues. Look at the forecast that people had when the owners of Hazelwood announced it was going to shut down with about five months

notice and look at what people were saying would be the impact on prices and what turned out to be the impact on prices. That was with five months notice. Then think about the projections people are making now for prices in 2025-26. I would suggest that is about how seriously you should take those projections of prices in 2025-26 because let us just say it is difficult to forecast any of that sort of stuff. Part of it is just driven by the dynamics of the Australian energy market. You have a relatively small number of players and you do not need much of a change to fundamentally change the market dynamics. I will come back to that in a couple of minutes

Wholesale is a challenge. There are issues in the wholesale market which are driven partly by climate change and partly by gas. As I am sure you already know, they are driven partly in New South Wales by coal and the availability of coal. I am not suggesting that we should have a domestic coal reservation policy, by the way. They are also driven maybe partly by the generators' bidding behaviour. That is not necessarily to criticise or suggest their bidding behaviour is illegal or outside the rules. But as Rod Sims said, it may be that the rules need to be changed in relation to the market we have today. Several things emerge from that.

In terms of retail, we undertook quite a substantial piece of work ourselves. As the first chairman of the Energy Retailers Association it was somewhat heretical for me to challenge what I thought was a fundamental issue, and that is that retail competition was a good thing. At least on the evidence we saw—and we did most of our work in Victoria—we did not find that was the case. We might want to explore what you do about that. We came to a somewhat different conclusion from where the Thwaites review ended. I guess we will see where the final report of the current Australian Competition and Consumer Commission [ACCC] review lands. One issue, of course, is the accessibility of real numbers from that sector. But clearly what is going on is that whether you blame consumers or whether you blame retailers or whether you blame a fundamental characteristic of electricity, you are left with a conclusion that many consumers are paying much more than they should.

The final piece which has been so far a relatively modest piece is the various loosely called green schemes. They have been a contributor to some part of the price increase. Arguably the Renewable Energy Target [RET] delivered modest emissions reduction for a modest price, but of course renewable energy targets were never supposed to be climate policies; they were supposed to be industry policies. If a State wanted to have more renewable energy in its State or if the Commonwealth wanted to provide at least for a while some incentive for renewable energy that was not a bad idea, but historically that was on the assumption that there would be an overarching climate policy. Of course we never had that either and so the Renewable Energy Target turned out to be, in my mind, a diabolically bad piece of policy instrument for a number of design reasons but also contextual reasons.

Finally, the thing I would say about this Committee—and this is not intended to be a political statement—is if the general view would be that New South Wales is part of a national agenda, and in theory at least that is what I understand was signed off on at least several times by the Council of Australian Governments Energy Council and its predecessors, it continues to be a concern that some jurisdictions make that commitment then behave parochially. Each individual State is a sovereign government and, of course, they will have policies they need to progress, but one of the very important recommendations of the Finkel review which did not get a lot of publicity was the one that suggested we should be basically recommitting to a new national Australian Energy Market Agreement and that there should be a requirement on jurisdictions that have State or Territory policies in this area that they be reviewed against what impact they would have on either the reliability or the price across the market. That does not mean they do not go ahead, but the consequences should at least be thought through more substantially than they are today.

I think the interconnection is going to become more difficult than we have seen in the past. Therefore, it would seem to me that your thinking and your development of whatever conclusions and recommendations you come out with should be done in the context that New South Wales is in a position to have a substantial influence on the outcome regardless of the political parties in power in either the State or the Federal governments. It would seem to me a very bad outcome if we saw the disintegration of the current National Electricity Market [NEM]. It is not exactly all that well stuck together at the moment, but it is sort of stuck together. In my view, that will become more important.

The National Energy Guarantee—which we supported very quickly, and I can talk about that if you are interested and why we did that—is more likely to put more value on a national approach than less. That is again why I think that if New South Wales remains at least in the tent for now in terms of how this progresses then the recommendations that you develop in relation to that need to be in that context of a national approach. That is because the way in which this is playing out now very much reflects the consequences both for reliability and price, if not for where we end up with our greenhouse gas emissions.

The CHAIR: Could you elucidate a bit more on the renewable energy targets and the clean energy targets, given the fact the Federal Government has suggested it might drop those, and some have suggested New South Wales should go it alone? Could you elucidate on that?

Mr WOOD: One of the somewhat bizarre characteristics of what we have been seeing in the past 10 years is we have an emissions guarantee because we could not have a clean energy target; we have a clean energy target because we could not have an emissions intensity scheme; we have had an emissions intensity scheme because we could not have a carbon tax; and we have a carbon tax. You end up going back to where this all started which, I guess, was back at the beginning of the century when people like John Howard were seriously thinking about what we would do in relation to climate policy. So these labels, most of them have not been very helpful.

One of the problems with the clean energy target is that the name sounds far too much like the renewable energy target, so it must be similar. It is not similar at all; it is completely different in a sense because it was fundamentally looking to try to drive emissions towards an objective, which was about NEM-wide emissions, not a particular technology. There would obviously be consequences because, by definition almost, high-emissions technologies would be replaced with lower-emissions technologies, but it left that to the market to determine what they would be. There is the tiniest sliver of space between the clean energy target and the emissions component of the National Energy Guarantee. I am using the words "National Energy Guarantee" only because that is the label that has been stuck on it; the words themselves make virtually no sense in relation to the actual thing that has been announced. Clearly, if you cannot call it a whole lot of other things you then go into your Thesaurus and work out what words you might use and you call it one of those, but it is not a guarantee of anything.

It is perfectly reasonable and, I suspect, depending on how it is done, could potentially deliver very similar outcomes. The difference between that and the clean energy target mostly is it looks like, in practice, a clean energy target would have looked if we did not have a threshold, and a clean energy target without a threshold—the point below which technologies get credits—looks more like an emissions intensity scheme. When you drive that down to the point where there is no threshold, it looks exactly like a renewable energy target. So they are not fundamentally different in principle, they are different in the mechanics of the way they work. Of course, you have got different versions of the renewable energy target. Some of the States now—the Australian Capital Territory has for some time—are looking to progress renewable energy not through a mandated share of their energy supply but through a process of reverse options. If you need to do something like that reverse options is probably a more efficient way of doing it than a renewable energy target and it certainly is more likely, in my view, to lead towards lower prices.

The problem with any of these things is that you end up having to determine arbitrary targets. The Europeans had 20, 20, 20—20 per cent renewables by 2020 and a 20 per cent increase in energy efficiency. This is something that Rob Stitch would have dreamed up, not a serious piece of policy. The same thing applied in Australia. As you know, we had that saga of a 2 per cent mandatory renewable energy target, then a 20 per cent renewable energy target, which became 45,000 gigawatt hours, which was then split between the large part and the small part, and then it became 33,000 gigawatt hours. That was hardly what was originally intended, which was to provide investment certainty—in fact, if it did anything, it provided investment uncertainty.

Where you end up with a narrow definition of what you are trying to achieve, particularly things that look like industry policy they are bound to be a mess at some point, and the only issue is how far away that point is, and for the RET the point is 2020. I do not think anyone at a Federal level, either political party—I think The Greens might be still pushing to have the national RET extended, but no other, Federal Labor or the Coalition—would be looking to do that. I think that makes sense. Now we try to move on to something different and I think the clean energy target or the emissions guarantee under the National Energy Guarantee would do very similar things, and they would do very similar things to the emissions intensity scheme. There are differences, obviously, in the detail—an important difference politically—but most of the differences are more political than they are real.

The Hon. BEN FRANKLIN: I will follow up on that issue. Obviously the addition of the second objective of reliability is the key. I want to give you the opportunity, in talking about the NEG, to give us your recommendations on what should be put in to ensure the delivery of the dual objectives plus, of course, having some attempt at trying to keep prices low for consumers and businesses.

Mr WOOD: The cynical view of the modelling that has been currently done around the cost savings that will be achieved through the NEG is that at least the modellers know what the answer is, so it makes the modelling task a lot easier. But only a cynic would say that. I am surprised how much we depend upon

modelling when, as I said, you cannot even forecast prices in five months time let alone in 10 years time. In regard to this guarantee, I think we would have ended up in a similar place without it, in a sense. What Finkel was grappling with was exactly the same issue and what many countries around the world are grappling with is exactly the same issue—that is, a wholesale spot market that is designed to do two things. First, it is designed to be an efficient dispatch engine. What enabled the NEM to be an extremely efficient dispatch engine in Australia was oversupply. When you have oversupply, a wholesale spot market does things incredibly aggressively—not great for the balance sheets of the companies who bought those assets from the Victorian State Government, but that is what it did. Prices which had been $45 a megawatt hour went to $20 and stayed there for a long time. So that is the way that sort of system works.

The second thing prices are supposed to do, of course, is provide a signal for new investment. The theory always is that as you soak up your oversupply, prices start to move and you get some volatility of prices. In this case gas would have started to set the price more often. Someone would look at that opportunity and say, "I can come in there and make money. I can build my new coal-fired power station and call it Kogan Creek." They come in there, push the merit order out and the whole cycle starts again. That works only if you have some confidence about what things look like going out. When you start to create a whole lot of uncertainty about where that starts to look you have some interesting challenges, which is where I think we ended up.

We would have still ended up in that situation. Alan Finkel—I would not verbal Alan Finkel but in his report it is pretty clear that he and his panel looked closely at some form of capacity market. Many countries in the world looked at the sort of issue I just described. When you end up with price scarcity, increasingly what happens is that when the wind and sun are going hell for leather prices are very low and when they are not there at all prices are very high. That becomes, in a price volatility sense, far more difficult for risk management than others. For example—the maths might be the same—a large number of $300 events might be arithmetically the same as a small number of $50,000 events, but the risk profile is completely different—both political risk and investor risk. Most parts of the world have nothing like the price cap that we have on our market, which is $14,000 a megawatt hour. Most of them, when they started to see this risk occurring, intervened and put in place a capacity market.

What Finkel recommended in the absence of that was this thing called the generator reliability obligation. He was only recommending that was done when the level of energy supply in a jurisdiction reached a certain level. He never defined what that would be and he never really defined what the reliability obligation would be. That was going to be left to AEMO. I guess most assumptions would have been that it probably would have applied straightaway to South Australia and not for a while to the other States. That is the most logical thing to do.

In our most recent report we looked at this issue and said, "We think one of the things that happens as you move towards a zero marginal cost system—it makes a difference; it is not a straight line—and move up that slope, things start to change increasingly quickly. You end up with a system in which either everyone deals with the risk I have just described and you do get investment—a very difficult one—or the market participants solve the problem themselves by entering into contracts. An example would be when, fairly recently, Origin and some industrials in South Australia did a deal with Engie to effectively reopen Pelican Point, which had been mothballed, or when the Government intervenes and does something else. That is where capacity markets tend to evolve. We said, "We think before you intervene you should at least do some bloody hard work to work out what sort of capacity market you mean, because capacity markets have a history of costing a lot of money." When you listen to people who have had capacity markets, the ones who love them are the ones who have the capacity that is being paid for whether you need it or not and the ones who hate them are the ones who are paying for it. You might have to go to Western Australia and talk to people over there and find out how bad it can be.

There are different models in different parts of the world. The Australian proposal out of this NEG is most similar to the French system, which we looked at in some detail because it tried to learn from what other people had done: PJM in California, US. What do you do to get an arrangement in which contracts are being entered into to meet your future liability for demand with confidence without overpaying? That is a lot more difficult than one sentence could possibly describe, and you start to think about what that looks like. That is where you end up. It is a pretty difficult question—and it opens up some fundamental questions. I think that is why we need to be very careful about the way we proceed with this thing. I was not here for the AEMO presentation but I have heard the current CEO talk about this. She will talk about the reliability index or reliability requirement, but what does that mean? It means a lot of different things. A simple example would be a situation where this week New South Wales weather's pretty good but Victoria's is crap, so Snowy Hydro is pushing power into Victoria, and the next week the opposite—that is fine. The week after, both are stinking

hot—then who gets Snowy Hydro, and how do you contract for that? Under the reliability obligation, who contracts for what?

Our version of this in Australia is different. It is not so unique that we are some sort of weird subspecies of the human race but we have an unusual physical and financial system with a small number of medium-sized cities connected by thin wires. These transmission systems were never built for redundancy; they were built to throw excess power across the fence when someone had too much. We now have to grapple with that. I think some fundamental questions emerge from this, so we have to go down this path because I do not think there is any alternative. Not doing this will expose us to worse problems later, but going into this with our eyes wide open is critically important. Even the uncertainties that exist in this process will require some "sleeves rolled up" hard work to test this. The other thing this will expose—and people have talked about this already—is the potential that embeds what is already a highly concentrated market in the hands of AGL, Origin and Energy Australia.

The Hon. ADAM SEARLE: The retail market in New South Wales has those three players with something like 90 per cent of the market. In your report of a year or two ago, as well as your submission to us, you cite the increase in retailer costs as being one of the cost drivers, and the lack of visibility the regulators have of what the retailers are charging and their actual costs, particularly where you are talking about a vertically integrated retailer which also has a generator. How do we have any visibility of whether the costs being paid for by the end user, the householder or the small business reflect the cost of doing business with those firms or is it, whether deliberately or not, price gouging? How can we address that issue?

Mr WOOD: With difficulty!

The Hon. ADAM SEARLE: Yes.

Mr WOOD: It seems to me we almost have two trains going in different directions. One is gas and the other is electricity. The current Federal Minister, Frydenberg, has made the point that when he started looking at the gas industry he was concerned to find that it was dominated by what he called something like "secret commercial bilateral contracts". We have some of those in electricity; we are going to see more of them under this arrangement. I think we would have ended up with contracts. I mentioned before the three paths we could go down and they all end up in contracts. The interesting question is, then: How do you get transparency around the contractual arrangements that we have? On the gas side of things, there was a proposal through the Energy Council to introduce a published price index—and this goes right back to 2014 if not the 2012 white paper put out by the Federal Government which recommended a published price index—and the ABS to be tasked with doing that. Industry did an incredibly good job snowing the ABS, so it has not been done. My understanding is it has given up on that question.

One answer is to basically impose a regulatory arrangement on the transparency of pricing. It does not have to be every single contract but it needs to be something. If you think about the parallels—I mention gas because it is so parallel to what we are talking about—where you have, in particular, industrial customers who are faced with a market which is almost opaque, the same issue would arise here. On the retail side we thought we were getting a reasonable amount of cooperation from retailers, but the issue of vertical integration is a trick because you have transfer pricing and you have to determine what is appropriate. They will argue vociferously that the issue they are faced with is managing the internal risk across the chain. But what we found compelling—and we were surprised that the AEMC did not find it as compelling—is that the retail gross margins in Victoria, where there are more retailers than anywhere else, are higher than they are in the other States. All of the States have gone backwards except Queensland which, at the time those numbers were done, was regulated, so it is not obvious that this is working.

John Thwaites in his report made the point that prices have gone up because costs have gone up, but what he was talking about was the costs of competition, so the question of that particular subsegment is: Do the costs of competition actually outweigh the benefits of competition?

The Hon. ADAM SEARLE: I think in your submission you found that the competition in Victoria and in New South Wales was causing cost increases because a very small part of the market—something like 9 per cent—was actively engaged in competitive behaviour. Is that right?

Mr WOOD: In most sectors of the economy if we introduce competition what tends to happen is that the competitors are forced to drive up costs because they are competing on price the closer you get to the commodity. When you are competing on price the only way you are going to do that is to drive up costs, and scale matters in retail. That, of course, has played to the benefit of the three larger retailers because they can survive. When the small retailers are on a wafer-thin margin the big retailers are probably doing quite nicely.

Every retailer has to incur costs. When you think about what the retailer actually does compared to, say, what generators do, there is not much you can do to make yourself more efficient; what you actually do is just add costs. There are not many costs you can take out relative to what you had before you introduce competition. It is a challenge to see how anything has been driven down in terms of cost that would therefore have been passed on as benefits to the consumer.

Up until now we have seen precious little in relation to the other aspect of competition, which is innovation. We are starting to see a little of that. Our recommendation was: firstly, fix up some of the rubbish, the obvious things. Some of them have already been partly addressed through the Prime Minister's intervention in telling the retailers to write to their customers. That is window-dressing to an extent because it has obviously created some noise but that noise, that wave, will certainly subside—

The Hon. JOHN GRAHAM: Competition is effectively driving marketing costs in many instances for a product that consumers have to use anyway—you need electricity.

Mr WOOD: You cannot opt out.

The Hon. JOHN GRAHAM: That is right. But increasingly money is being shifted into marketing. Is that one of the costs they are adding?

Mr WOOD: Yes. If we are competing with each other we will beat each other up but the consumer is not getting any benefit out of that—or when we are adding costs but all we are doing is swapping customers.

The Hon. JOHN GRAHAM: And a significant cost has been added in New South Wales over a decade. You suggest $183 in real terms, which is quite a big increase over a decade.

Mr WOOD: Yes, exactly.

The Hon. BEN FRANKLIN: You said that we should not give up on competition just yet. The nub of it is, what can governments do to assist customers?

Mr WOOD: Everyone talks about more information, but I think that is rubbish because consumers cannot absorb any more information. I have talked to people who are smarter than I am and they get a spreadsheet but cannot work out how to do it. One retailer has 200 offers at any one time, and some of them give discounts. The first thing to do is to get rid of discounting—ban it. It is nonsensical.

The Hon. ADAM SEARLE: Discounting of standing offers.

Mr WOOD: Exactly; it is so close to misleading. I would not want to verbal Rod Sims, but I think they went very close to taking action on this. When you are told in an advertisement that you are going to save 45 per cent, what it means is that you are going to get it at 45 per cent lower than you would have paid if you had taken the offer that you would have got if you had not bothered to phone.

The Hon. BEN FRANKLIN: And probably for a finite period.

Mr WOOD: Yes, exactly. It is just dumb and it should be banned. I know the numbers are significant in New South Wales, but anybody on a concessional payment arrangement should be, by regulation, on the best offer. I understand there is an issue to do with fully informed consent, but I cannot believe there is not a way around that. I am told there are ways around the idea that a retailer cannot put you on their best deal without your consent, which means the retailer has to contact you and if you do not bother to read the mail you are being sent that is not the retailer's problem. I think that is a hard call.

The Hon. ADAM SEARLE: It is to their benefit because it will drop the costs, so how can the lack of informed consent be an issue?

Mr WOOD: There is a noise being created that is not real in that context.

The Hon. JOHN GRAHAM: In fact, many of them are on the worst deals.

Mr WOOD: Yes, many of them are on the worst deals.

The Hon. JOHN GRAHAM: It could cost them $1,000.

Mr WOOD: We have seen much greater price dispersion between the best and the worst offers. Five years ago I would have thought that people are too stupid to bother, but it is the nature of the product.

The Hon. JOHN GRAHAM: It is deliberately confusing.

Mr WOOD: Yes, you have to get rid of the deliberate confusion, and you might have some chance. Also, if you sign up for two years on a direct debit arrangement, you pay on time and at the end of those two years you are still paying on time using direct debit, it is hard to see how a retailer can be justified in removing that benefit. The retailers are still getting the cost benefit, and so those arrangements should be completely changed. Then you need to look very hard at what you do next. I would not rule out more intervention, but the issue to grapple with is what impact that has on the integrated retailer-wholesaler and whether it changes the dynamic.

The Hon. ADAM SEARLE: Should that integration be permitted, given the massive market concentration of both the generator and the retailer and the resultant effective lack of competition?

Mr WOOD: If you said tomorrow that we are going to force the disaggregation of the gentailers, either of a certain size or completely, and, say, AGL decided to keep the retail business and get rid of the generation, they would still effectively control a substantial part of the market through contracts. I do not know that that would solve the problem.

The Hon. ADAM SEARLE: Was that part of the solution?

Mr WOOD: To be honest, we have not done that work and there needs to be some thought given to it. What are the alternatives? We have been quite closely involved with Rod Sims' work on how to do this. We did not have—and neither did John Thwaites, by the way—access to real data. We synthesised our own costs and asked the retailers to tell us if the costs were wrong because we were going to reach conclusions from those costs. It turns out we were not far out. Rod Sims' final report will be more than interesting because he has said that he is hesitating to break up companies but he is going to have to come up with some solution. In the same way that you deal with stranded assets on the network side, you will end up with a small number of unpleasant alternatives and you need to think seriously about the adverse consequences of each of those. If there is one sector in our economy where there has been a great deal of evidence of unintended consequences, it is energy.

There are some obvious things you could do, but you must make sure that they are tested properly, thoroughly, before making a choice on which way to go because it will be hard to come back. In the UK, every time something was tried they got the opposite outcome to what they were hoping for. They tried to make it simpler, and all the cheap deals got pulled. The same could happen here. Yes, there are three or four things you could do, but you need to look very closely at, first, how that would impact retail competition and, second, what it would do to the risk. There is an argument that gentailers are a cost-effective way to manage risk and so consumers end up benefiting from that, but I am not completely convinced.

The Hon. ADAM SEARLE: Certainly there is little risk to the gentailers themselves.

Mr WOOD: Not just the Independent Pricing and Regulatory Tribunal [IPART] but other State-based regulators described the cost stack for a retailer and allowed headroom for competition. That means you are allowed to put up your prices so that you have bigger margins and other retailers can come in and cut the margins.

The Hon. ADAM SEARLE: That seems ludicrous.

Mr WOOD: If you go back to the last few years of regulated price outcomes on the East Coast, including New South Wales, you will find headroom is one of the allowable cost elements.

The Hon. ADAM SEARLE: In the recurrent retail market you said that in Victoria the retail margins are about 14 per cent, I think. Do you have any sense of what they are in New South Wales?

Mr WOOD: No, but I do not have any reason to believe they are that different, although maybe they are a bit smaller. There are not many physical assets in the energy sector; a retailer in a shopping centre often, although not always, has physical assets on the balance sheet and they certainly have inventory because retailers have working capital but not that much. They have some exposure to risk, and retailers talk about those costs being real and not negative but not much. I would have thought that retail net margins should be in the order of 5 or 6 per cent, and they are clearly well above that. I do not know whether the Australian Competition and Consumer Commission [ACCC] can pass on monitoring that to IPART or the Essential Services Commission at the State level in Victoria to do the same thing, because there is an issue. Either the ACCC or the State regulators should get the actual aggregated data and publish it each year, but not individual retailer information. If that is not improving—so heading towards 5per cent or something like that—that is when I would think we should be thinking about intervening. It has to be in the self-interest of the companies to fix it themselves.

The Hon. JOHN GRAHAM: You made suggestions about banning discounting and making sure that disadvantaged people get the best offer. Where does regulatory responsibility for those measures live? How much freedom does the State have to act on those measures?

Mr WOOD: I am not sure, because it is not something I have looked at closely in terms of which legislation might need to be changed to trigger those arrangements. At the very least, I would think the ACCC could do that nationally. Some of these things touch upon consumer law, some consumer law issues are State based and I suspect each State is different. Victoria has its own version of retail regulations for historical reasons and there is some State-specific legislation.

The Hon. ADAM SEARLE: One thing retailers said about their increased costs is that wholesale costs are going through the roof and they are having to pay more to the generators. When talking about AGL or Origin, that means that they are paying themselves. Is that a problem?

Mr WOOD: It may be, but it may not be. It would not be if those wholesale prices were transparent. There are two elements to the wholesale price; there is the spot price, which is transparent and then there is the hedge contract, which is not.

The Hon. ADAM SEARLE: We heard from AEMO that a lot of electricity is traded not through the spot market, but they could not tell us the volumes. Is that a potential real risk to the consumer?

Mr WOOD: It becomes greater under the model that is now being contemplated.

The Hon. JOHN GRAHAM: How much of a risk is it? Does not the spot market just drive the contracted prices over time?

Mr WOOD: Yes.

The Hon. JOHN GRAHAM: Do you have concerns about how that part of the market works or not?

Mr WOOD: At the moment, the contract market currently is mostly a derivative market of the spot price, right?

The Hon. JOHN GRAHAM: Yes.

Mr WOOD: They talk about caps and collars and all sort of arcane structures, but fundamentally they are a derivative market. The ones that are not are the ones that have been written under the renewable energy targets, which are basically power purchase agreements in which the entities with the liability, the retailers, enter into contracts with renewable generators. The difference there is instead of a capped arrangement with Snowy Hydro or something, which is basically an insurance product against high prices, this is about a revenue stream. What I think starts to happen increasingly under the sort of world we are entering is when you get more high fixed costs—overwhelmingly fixed-cost supply—and you end up with more of the revenue-type contracts and fewer of the insurance-type contracts. I think that is where the dynamic changes. It is not as simple as saying, "We are just going to go from the spot market to a contract market." We already have a contract market. Nothing will change. Qualitatively some things are going to change and I think that is why the next six months or so the hard work needs to be done around how that is going to unfold.

The Hon. JOHN GRAHAM: That goes to the point about visibility under that contract market, which becomes very important as those changes are made.

Mr WOOD: Yes, exactly.

The Hon. ADAM SEARLE: In regard to visibility at least for consumers, things like the Thwaites review talked about a basic service offer. I think some of the energy companies have even talked about having a basic comparator rate in the market to stimulate competition. That would be an idea worth exploring, would it not?

Mr WOOD: When we looked at a hierarchy of things you could do, we had both of those on our list. Some of the retailers were quite supportive of a comparative offer. They could set the price but the product would be the same. It is very similar to saying, "Don't give me all this rubbish. Just tell me how much I am going to save if I switch." Retailers will try to tell you, "Oh, we don't know how much you're going to use." "If I use exactly the same amount of electricity as I used last year, how much will I save?" That is making that sort of comparison very simple. It would be one way to do this.

The Hon. ADAM SEARLE: In a supermarket you can get that with products. If you are buying butter, there is a how many cents per gram comparator.

Mr WOOD: Correct.

The Hon. ADAM SEARLE: Surely you could ask the retailers to have a mechanism by which all the different offers are readily comparable. That would be a step forward for consumers, would it not?

Mr WOOD: The thing that gets complicated—and retailers will have an incentive to make it more complicated—will be the fixed component or the demand charge and the usage charge and, when you have a solar arrangement, the feed-in tariff and so forth. It does make it more complicated, but the vast majority of consumers of course would still be on a straightforward simple offer that should be able to be compared and can be published. Some of the retailers were happy with that. With that the basic service offer—we did not call it that: we called it something else—that would be when you have a regulated price. That regulated price would not have the cost of competing—the cost of acquiring and retaining customers. That would be imposed only if you accepted the thesis, which we partly did and Thwaites certainly did, that the cost of competing is the problem.

The alternative is what the Queensland Government recently floated and that is the idea of basically re-entering the market with a government-owned retailer. If you want to go and compete with that body, go for your life. In the United States in a number of States, that is what they basically did. They kept the incumbent retailer-distributor and allowed other retailers to compete. They were able to buy the distribution from the existing incumbents. Ninety-five per cent or more of the household consumers stayed with the incumbent because most of the new entrants did not bother anyway—the costs were too high to bother—but there was a lot more activity in the commercial and industrial sectors of the market.

The Hon. ADAM SEARLE: One of the other big cost drivers—and a lot of the submissions we have received so far point to this—is the increase in the generator costs, or rather the costs that generators are charging. Do you have any visibility of whether those generators themselves are experiencing increased operational costs that they are merely passing on, or are they simply able in this market arrangement—and I am trying to use a neutral term here—to take advantage of the competitive arrangements and perhaps the high market concentration to yield bigger revenues to the disadvantage of consumers?

Mr WOOD: If you were an existing gas-fired generator with a legacy contract, you would have done very well in the past 12 months. That is not to say that that is inappropriate. It is certainly not illegal. Competing and taking advantage of your competitor position is always acceptable, but it is what you do to your competitors and how that works in terms of destroying competitive markets that is the problem. I think we end up with this issue of concentration, which is the challenge. The idea that we have these high prices that have been sustained because no one is coming in, normally if prices have moved from where they were—about $50 or $60 a megawatt-hour to $120—there is a lot of space therefore someone else to come in and compete but they have not been. In the case of gas, one of the reasons of course is because of the moratorium on gas, particularly in Victoria. In the case of electricity, it is because no-one is too sure about what to do. Why would anyone go and build a new gas-fired generator when, first, you have a problem with getting gas at a sensible price and, secondly, you are not at all sure how many hours a week you are going to run.

The Hon. ADAM SEARLE: Let us just talk about a fairly standard model. New South Wales gets 80 per cent of its electricity from coal-fired power stations.

The Hon. BEN FRANKLIN: Seventy-nine, sorry.

The Hon. ADAM SEARLE: Seventy-nine per cent. If you are looking at the inputs, for most of these stations the price of coal has not gone through the roof. As far as I have been able to tell they are not paying their workforce double or triple rates they were in years gone by and in terms of another major cost, plant and equipment, they have not built new coal-fired power stations. They might be doing a bit of patching of some of the older ones, but what would be their cost drivers, or are they simply able to take advantage and sweat the existing asset and charge more?

Mr WOOD: There are three or four things. One is that there have been some issues about coal availability in some cases and that is a historical issue as much as anything else. I have not looked at coal trains recently but you would certainly accept that logically that makes sense. Origin certainly has been sweating Eraring pretty hard. Liddell does not seem to be running all that often and I am not sure that I accept it is because it is breaking all the time. There is also not much doubt that in the world we are in today there is some issue of how much do you spend on plant when you are thinking that maybe it is not going to last much longer. It is literally a sign of: You have an old car, and how much do you keep spending on it? You keep spending small bits until something big breaks, and then you say that is it. The work that the Australian Energy Regulator

[AER] is doing right now on this question is critical because it seems that those two things we have just mentioned would seem insufficient to justify some of the prices.

The Hon. ADAM SEARLE: Yes.

Mr WOOD: My suspicion is that the bidding behaviour is perfectly within the rules and they are doing very well out of it. That does not mean that that would suggest, as Rod Sims has said, maybe the issue is the rules for the current market. In the absence of fixing the fundamental problems we talked about before, which is one of the barriers to new entrants to drive those prices out, we think about changes in the rules around bidding behaviour. If you are thinking what do you do about it, they are the two things: The market should solve it. Why is the market not solving it? Are there barriers? The answer is partly yes. The other one is changing the rules. I would defer to the work that Rod Sims is doing as to how we might look at the rules. I think it is an important question.

There have been questions about whether or not the current arrangement by which the bean stack is determined and everyone gets the last marginal price should be replaced with one in which you get payer's bid. I have not thought that through yet but there are alternative bidding rules which could produce different results. Now, this is again where I would make the same warning. I would not jump into any of those. We spent a lot of time in this country—I did not but some people did—designing the current rules and for most of the past 20 years that has worked very well. So you have to come back to: Why is it not working now? What would you do about that? I certainly would not throw it away easily but I would want to know what I am going to do to change it. Would it fix the problem? I would make sure that it does not make it worse.

The Hon. ADAM SEARLE: You were saying it worked well before when there was oversupply of electricity. Do we have to go back to that situation to fix the market problems?

Mr WOOD: I think we are facing a really interesting turning point. We are not the only country in the world doing this. I think there is an issue that the NEM is being challenged, first, by the drying-up of oversupply and, secondly, the introduction of so much zero marginal cost supply, and that the spot market fundamentally will be challenged in that world. That means that we think about what we do about that. I think there are some things we can do. The people who are looking at this right now are the AEMO, the AEMC and the ACCC. They have their agenda. I have no concern that they will not address those fundamental issues. There are not that many solutions but each of them needs to be looked at closely to avoid making it worse. That would be the risk that we would have. I do not think there is any doubt that something has to change. I do not think the NEM, the wholesale spot market, is any longer the ideal model to take us forward. I also do not think we need to throw it away.

The questions are: What do you do to augment the market to make it more effective? Do you have a day-ahead market, for example? That is a very different model from what we have today. It imposes very different costs. Who bears the liability for some of these costs? Under our current arrangement if you bid and you do not supply to some extent, AEMO has got the problem. When you think about it differently you will not have a problem as the bidder and the way you bid would be very different. It does not matter whether you are a wind farm or a gas plant. If you have to wear the risk that your plant is not online at 10.30 tomorrow morning you will do things to make sure your risk is covered. Thinking through how that would work and to what extent you would be adding costs under any of them I think is the challenge. Where we are now is not sustainable. Where we might go is not completely clear.

The Hon. ADAM SEARLE: Getting back to one of your first points, one of the challenges is to make sure that we at least replace capacity when capacity exits. There was Hazelwood power station and a power station in South Australia. We are told most of our coal-fired power stations comprising the 79 per cent will come to the end of their life over the next 10 or 20 years. How do we make sure that we have new supply that means we do not run short?

Mr WOOD: The fundamental thinking behind this guarantee is specifically to address that. As I said before, the issues of the market are, first, to be an efficient dispatch engine and to try to make sure that the generation that is there is dispatched efficiently and produces the lowest cost and therefore the lowest price. The second part is new investment. It is in the new investment space that I think we still have a challenge. A combination of stable, credible climate policy, together with some mechanism around what AEMO was calling dispatchable capability, the reliability guarantee is part of that solution.

The Hon. ADAM SEARLE: You mentioned a moment ago in America having a government retailer to try to set the tone in the market. Most of the power stations we have today were built by governments. If the market is failing and is not meeting consumers needs do we have to contemplate the possibility of government

getting back into building and operating generators at some point, if the market does not get the signals to invest?

Mr WOOD: That is as big a hypothetical as you can get. I will give you an example of how this could unfold. If we were to contemplate such significant choices my only concern would be to do it consciously and not unconsciously, in a sense; we do not drift into it. What worries me a little at the moment is some of the interventions we have seen recently by the Commonwealth Government into the gas market, for example. Certainly the gas reservation policy I think is a dumb idea. Gas restrictions, the threat of them, might have been a good idea, given what was going on. The industry did not do itself any favours, I should add.

Look at the United Kingdom. The United Kingdom does not have a market any more. The United Kingdom basically has a centrally planned system. The assets are on the balance sheets of the private sector, but all the risk is with the public sector because the governments have contracted. That is a different model. That is where they have ended up. All I am saying is that if that is where we want to go we need to do it consciously and lay out why we would do that. I think there is, by the way, a serious argument that we are entering into a very different space and that the value of electricity so far outweighs the cost of electricity that there is a question as to whether or not a market of the sort we have had in the past can continue to deliver that investment. If you have a private sector that is not prepared to invest, you have two alternatives. Either you provide a way of encouraging the private sector to invest, or the Government invests. I do not at the moment have a strong view either way.

What I would be concerned about is we do not do it with our eyes open. Those are the sorts of issues that I think should be on the table for the Council of Australian Governments [COAG] Energy Council, rather than worrying about the fine points of whether it is a clean energy target [CET], or a renewable energy target [RET] or an environmental impact statement [EIS] or a National Energy Guarantee [NEG], or whatever it is called. The climate stuff, by comparison with what we are talking about now, is a walk in the park.

The Hon. BEN FRANKLIN: I agree with you. That is if you accept there is limited, little or no investment, which is not the case in new energy suppliers. The point I make is if you take the Hon. Adam Searle's point about a government building or creating a new energy supply that will have impacts on the market in and of itself and on investment?

The Hon. ADAM SEARLE: It depends on what it was in. If it was in something private, investors would not invest.

The Hon. BEN FRANKLIN: I am referring to your suggestion that there needs to be a well thought through policy. Just building a power station is not the sort of—

Mr WOOD: You do not build one. Once you start something running you will not be able to stop. That would be my concern. That is why it has been raised several times. It is all very well for the Government to say, "We are going to impose export restrictions on gas." Once you do that the signals you send to the market create behavioural things which you cannot see and you do not know what would have happened if you had not done it. The same thing applies with what South Australia did. I understand politically why they needed to be seen to be taking some action. Some of what they did I think were bloody good ideas. Some of what they did were terrible ideas. The battery and gas-fired power stations I think are dumb ideas. We will see. The idea that we would be looking at that I think needs to be raised.

One of the issues that is raised in the terms of reference of this Committee is planning. What I do not think we should be doing is going back to central planning. We have all forgotten our history. The history was that we built a whole lot of stuff, we created that overcapacity that we talked about before and we lived off it very well for a while. Now we are in a different cycle. The question then becomes: Is the nature of what we are now doing with a very different set of cost structures such that the market structure will not be the most effective answer or not? You can look around the world at countries that have tried different approaches but I do not think any of the solutions you will see are the ones we should be adopting.

The Hon. TAYLOR MARTIN: If we had politicians making these investment decisions would you see a future where we are running a significant risk of ending up with a white elephant such as the desalination plant?

Mr WOOD: I do not know enough about the desalination plant, but herds of stampeding white elephants come to mind. For example, transmission lines or the proposal that is floating around to build a gas pipeline from Western Australia. The risk is not that you could not deliver gas at a price on the East Coast that might be interesting; the issue is that will be a 50-year or 60-year asset that in 20 years time will probably no

longer be required. I think you are absolutely right. Whether it is a government or a government agency, such as AEMO, their inherent bias will be much more towards reliability and much less towards costs. None of those is the right place to be.

Rod Sims made the very well made point that there is a position. I would suggest that the history in New South Wales and in Queensland is that because we had some problems—the ship went whack a couple of times—we are now paying for that. We would face the same problem. It does not mean you cannot have an agency that does this. For example, there is a difference between the French system for dealing with reliability obligations and the Californian system for dealing with reliability obligations, both of which are on the retailers. One of them has much greater involvement from a central agency and the other does not. In the United Kingdom they went back even further because that is more historical. The Government basically determines how much we want, where we want it, what sort of technology we want and how we are going to pay for it.

I do not think any of this is black and white. Whereabouts on the spectrum do we want to be? Let us make sure that we do this and that we have thought through what we are doing. I do not think I would have a fundamental objection to one or the other but I have a fundamental objection to being stuck in the middle some place and blindly going in one direction and then saying in 10 years time, "How the hell did we get here?"

The Hon. ADAM SEARLE: You make the point in your submission that electricity is an essential service without substitutes and we have also had a decade of potentially underinvestment in new energy supply. If that does not turn around in the next two or three years there is going to be a significant supply problem, at least in theory. It does not have to be an actual supply constraint; it just has to be the perception that there could be one that causes the generators to spike the prices. How do we make sure that we head that off?

Mr WOOD: I will give you an example of what almost happened in 2008-09. Who was in government then in New South Wales? Bob Carr maybe?

The Hon. TAYLOR MARTIN: The Labor Party.

Mr WOOD: The thesis was that we had not yet seen that energy demand was falling. We thought energy demand was continuing to grow and my recollection—and I was working at Origin at the time so maybe it was before 2008-09—was that the projections were that by 2009 we would need a new large generator in New South Wales and that if the private sector did not build it, then the Government would. The concern we were raising was exactly what we were just talking about—even the threat of government doing it causes the private sector to back off. Fortunately no-one did because it turned out that eventually we realised that actually demand was falling and we did not need it. That is why if governments had gone ahead and made that decision it would have been a very bad decision and so that is what you want to avoid.

The Hon. TAYLOR MARTIN: That is the point I was trying to make.

Mr WOOD: The problem we have at the moment is that because we have had this mess of policy—and there are fingerprints of industry as well as both sides of politics, to be honest, on this—we have got a situation, as you described, where we are not seeing the investment. We are seeing lots of investment in wind and solar but because of the nature of the RET, it was all built in one place because that was what was built; policy did not care where it was built, it did not have a reliability obligation as Finkel recommended or anything like that, that is what we did. We have had investment but that investment itself has driven certain outcomes.

You have a situation where the market is flat or falling and you are forcing new subsidised supply, you are only going to get one outcome, and that is going to be ugly, and we did. That is when we have to back off and say, "Okay. What are we going to do about creating the incentives for that investment that we are going to need in four or five years time? From the point of view of the Government, it does not matter whether it is a new coal-fired power station or a new wind farm with storage. You get the same result for both price and reliability, and if you are worried about emissions, for emissions as well. I think this current arrangement, even though there is an enormous amount of detail, as we discussed before, is one of the best chances we have got.

The Hon. JOHN GRAHAM: You talk in your submission about the AER investigation that has been recently launched. How unusual is it for that investigation to be launched and how much scrutiny is there of this sort of market behaviour?

Mr WOOD: There have been quite a few in other States. The AER has certain rules by which any price that meets certain criteria has to be investigated, so price excursions above a certain number they automatically treat as an intervention to have a look at the bidding behaviour. It was not that very long ago that the AER looked at the bidding behaviour in Queensland. This one unusually I think was triggered by a direct

letter from the Federal Minister based upon, as far as I can see it, mostly media comment about what was going on.

The Hon. JOHN GRAHAM: But otherwise it has been triggered by the ordinary rules of the AER looking at the market?

Mr WOOD: Yes.

The Hon. JOHN GRAHAM: And you are reasonably confident that that is a robust way to oversight the market?

Mr WOOD: I think yes, within boundaries. If I compare that with what happened in South Australia a year or so ago, the AEMO followed the rules. The problem was that the rules were no longer the best rules for the arrangement that they were in. If you have ever tried to read one of their reports about what happened in South Australia they have things called non-credible contingency events. I suspect most people in this room would think "non-credible" means that is not going to happen. That is not what they mean at all. They have a very precise, technical definition of what a non-credible contingency event is and it is not the way most people think about this stuff. When they publish a report you need a dictionary or a thesaurus to read the bloody thing because it is driven by this stuff and the same with the AER.

The only thing that concerns me about these sorts of investigations, because they can be a little bit machine-like—"Yes, we've got to look at this. Here are the rules. What do they do? Is there any evidence that they did follow the rules or didn't follows rules? They followed the rules—fine". My suspicion, like I said before, is that is what they will conclude: that the bidding behaviour in New South Wales followed the rules. The question then is: Has the market structure emerged to the point, for the reasons we have been talking about, that the rules no longer apply? Do we have to address the market problems, so we do have the right number of participants in that market or do we need to change the rules for a different market?

The Hon. JOHN GRAHAM: Do you have a view about the Vales Point power station, which was sold for $1 million and has been recently valued at $730 million by its private owners?

Mr WOOD: Yes, Trevor St Baker is well known for that sort of deal. I understand a liability went with that purchase and at some point I presume that liability will be crystallised and that price may not be sustained. I have not invested in this company. I do not have a view about whether that re-valuation is reasonable or not. I think in the short term it was almost certainly an astute investment decision by Trevor and his partners but the issue is: What is it you are faced with down the track? The owners of Hazelwood decided that when they looked down the pipeline they could see costs coming at them like a train and at the same time they also had a shareholder who wanted to get out of coal. Those two things put together made them make a decision.

The Hon. JOHN GRAHAM: But if you are describing an astute business decision by the person who bought it, you are describing a less astute business decision by the person who sold it at that price, are you not?

Mr WOOD: My only concern would be that there is no way that the current owners can get out of that liability at some point because that was the thing that would have made it more difficult presumably for other people to pay any other price for that asset.

The Hon. ADAM SEARLE: Leaving aside the valuation, the publicly available information suggests that the revenue for the electricity sold by the new private operator is more than 40 per cent what was being charged when it was in government hands yet I understand the Government is the major customer of the new private operator so it sort of looks like taxpayers are underwriting a higher electricity price for the new private operator. That would seem to be a perverse outcome of privatisation, would it not?

Mr WOOD: I am not familiar with the detail of what you are describing in terms of who is paying what to whom. If you sell your house and want to rent it back, you had better make sure you have got a good deal. My concern with those is always to make sure that when the seller makes a well-informed decision to sell, that what comes next works out the way it was planned. The infamous case in Victoria was around the whole issue of when they extended the coal lease at Hazelwood some years ago. There were great claims that certain promises were made or were not. In principle if the deal was done with open eyes from both sides then that seems perfectly reasonable to me.

The issue is to make sure that that then sticks in the same way that the people who enter into the arrangements with the semi-privatisation of the network assets in New South Wales, to the extent that there are

any regulatory risks about those assets, they should all rest with the new owners, not with the Government. That should be the deal. Again I am assuming that there is no—

The Hon. ADAM SEARLE: Technically the Government still owns these assets?

Mr WOOD: In terms of regulatory risk. In terms of the physical assets the Government owns them but the lease arrangements, the multiplier that was paid by those who now enter into these arrangements was based upon a regulated asset base and that should not in any way have been protected by the Government in the privatisation. It is my understanding that is the case in which case that is fine. My position on all those things would be that the data that we have seen on network businesses and most businesses that privatisation, other things being equal, produces a lower cost result. Other things are not always equal. You will see examples where that has not been the case. We always thought that if it was well regulated it would not matter who owns it. It turns out it does matter. Generally speaking, private businesses run businesses at a lower cost than public businesses for all sorts of reasons, many of which do not appear in computer models.

The Hon. BEN FRANKLIN: In a throwaway line you said that you thought the South Australian decision to buy the $100 million big battery was stupid. Do you believe that storage is going to be an important part of the energy future for New South Wales and the country, and do you think the government should play a role in storage in any way?

Mr WOOD: The answer to the first part is yes. At the moment the balancing of intermittent renewables can be done in several ways. One is storage. There are other more exotic things we can talk about but fundamentally that means pumped hydro or batteries. There are molten salts that go with solar thermal and there are all sorts of other things, but put them aside for a moment. There is hydrogen and ammonia and so on. The second one is gas for fast start and the third one is demand response type mechanisms. I think they all potentially will have a role to play in Australia. The idea that batteries of the sort that is being built right now in South Australia would have prevented the problem is one of those ones where you have got an opinion and I can find a fact. It certainly would have done something, but the 129 megawatt hour battery will be connected to the 300 megawatt wind farm, which means it will take about half an hour's output. Relatively, in half an hour it will be empty.

I have a small property in rural Victoria. I have batteries and I have solar and at times the batteries are empty. I have a diesel generator in the backyard. You cannot put a diesel generator in every backyard in Sydney, I do not think. Batteries will play a role, but that is not the role they are going to play. Bloomberg New Energy Finance says it is going to be decades before batteries will play that sort of role in terms of seriously dealing with large percentages of intermittent supply. In terms of balancing, they do a fantastic job. They would have certainly ridden out some of the problems we saw during the last summer in South Australia.

To your last point about government, I cannot see a reason why governments would be involved at all. I can see why the government might support through ARENA or something some research and development in Australia, but why would we do support R and D in batteries? We are not going to develop technologies in batteries. What we and ARENA do very well is fund things that are specific to the Australian context. For example, it might be in some parts of regional New South Wales there are opportunities for large-scale things which we could learn a lot from. They are the sorts of things we should be supporting.

The Hon. JOHN GRAHAM: Could you expand on your view about price dispersion, particularly that interaction with consumers who might be a credit risk? They might go to their retailer and be on the standing offer rather than any of the discounted deals. That is increasingly a problem, is it not, given what you are pointing out about the increasing price dispersion? The consumers most at risk are the ones who might end up paying the top rate .

Mr WOOD: Are you saying that retailers are deliberately putting people on low incomes on the highest cost deals?

The Hon. JOHN GRAHAM: If you are a credit risk the financially responsibly retailer might have to offer you a contract; everyone else can turn you away. That means you are going to be on the high rate, does it not?

Mr WOOD: My answer to that from my own practical experience is no, not necessarily.

The Hon. JOHN GRAHAM: Why not?

Mr WOOD: Partly because it turns out that a substantial number of people on low incomes are actually very secure. They take their obligations very seriously. They do not want to be on credit lists. They do

not want to have other things cut off. Of course you get the outliers, but if you go and sit in a call centre half a day you will find out about some of the ratbags. I do not think they do.

The Hon. JOHN GRAHAM: I understand that point but that is talking about something slightly different. That is talking about people on a low income rather than people who have a credit risk history.

Mr WOOD: Remember this is also an essential service and there is always an obligation to supply. There is no obligation to supply the best price deal. I think it is quite possible that if you have someone who has defaulted on their bill several times you would not give them the best deal. That is not based on evidence, that is just based on human behaviour.

The CHAIR: Thank you, Mr Wood. You have been very comprehensive. You might have taken some questions on notice or we might write some, given your evidence. We appreciate what you do. You will have 21 days to provide your answers and the secretariat will ensure that you are able to get those to us.

Mr WOOD: We are more than happy to do anything we can to assist, because you have got a challenge.

The CHAIR: Thank you. We may send you some further questions to help us along in our inquiry.

(The witness withdrew)

The Committee adjourned at 4.35 p.m.