ECONOMICS AND INDUSTRY STANDING COMMITTEE

INQUIRY INTO MICROGRIDS AND ASSOCIATED TECHNOLOGIES IN WA

TRANSCRIPT OF EVIDENCE
TAKEN AT PERTH
WEDNESDAY, 9 MAY 2018

SESSION ONE

Members

Ms J.J. Shaw (Chair)
Mr S.K. L'Estrange (Deputy Chairman)
Mr Y. Mubarakai
Mr S.J. Price
Mr D.T. Redman

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Hearing commenced at 9.17 am

Mr CAMERON PARROTTE
Executive General Manager, Western Australia, Australian Energy Market Operator, examined:

Mr MARTIN MATICKA
Group Manager, WA Markets, examined:

Mr DEAN SHARAFI
General Manager, System Management, examined:

Dr NATALIA KOSTECKI
Principal Policy and Market Development Analyst, examined:

The CHAIR: On behalf of the committee, I would like to thank you for agreeing to appear today to provide evidence in relation to the committee's inquiry into microgrids and associated technologies. My name is Jessica Shaw, and I am Chair of the Economics and Industry Standing Committee. I would like to introduce the other members of the committee. To my right, Yaz Mubarakai, member for Jandakot; Stephen Price, member for Forrestfield; and Terry Redman, member for Warren–Blackwood. The Deputy Chair, Sean L'Estrange, will join us shortly. It is important that you understand that any deliberate misleading of this committee may be regarded as a contempt of Parliament. Your evidence is protected by parliamentary privilege; however, this privilege does not apply to anything you might say outside of today's proceedings.

Thank you for your submission to the inquiry; it was great and really comprehensive. Before we begin with our questions, do you have any questions with regards to your attendance here today?

The WITNESSES: No.

The CHAIR: Would you like to make a short opening statement about your submission?

Mr PARROTTE: If we could, I think that would be a useful way of probably summarising our submission. The Australian Energy Market Operator appreciates the opportunity to provide evidence to the Economics and Industry Standing Committee inquiry into microgrids and associated technology, particularly distributed energy resources. We certainly see the energy industry going through a fundamental and rapid change and we believe that microgrids and DER will play a key role in that transformation.

Just so that you are aware, AEMO is the market and system operator in electricity and gas markets across the east coast and, since 2015, in Western Australia. We have vast experiences in managing the system and we believe that places us in a pretty unique position to understand what is occurring and forecast out what will occur on the power system and the markets. We do see that DER is increasingly becoming a challenge for us to operate the power system securely and reliably and it is also starting to impact the efficiencies of running the market, but equally we see that it is a fantastic opportunity and it will deliver alternative means of providing energy efficiently, securely and reliably. So it is a challenge, but it certainly is an opportunity.

Speaking of the opportunities, we certainly see from a consumer perspective the ability to reduce their bills, it provides them choice, they can reduce their emissions impact on the planet and from a network operators perspective they can look at it to do load control and reduce their capital spend, which ultimately will be passed on to all consumers. From the system operator's perspective, from

our perspective, we see it as an opportunity to reduce peak demand and provide essential system services and there are obviously opportunities there for new businesses to start up within WA and the nation. Those are the opportunities.

On the challenges side, from an individual microgrid/DER perspective, the impacts are relatively small but when you are starting to talk about 200,000 homes, when they are in aggregate the impacts can be quite significant, particularly if they are not coordinated and that is sort of the world we find ourselves in in that space. This is the key crux of our submission—there are challenges there but there are opportunities through coordination and visibility. What we are seeing is the power system shifting from the traditional one-way flow—we knew pretty much what was going to happen on the demand side and you just matched supply to demand—to now having variability, particularly on the demand side but also on the supply side in terms of intermittence. This can result in system security issues and inefficiencies in the market, but again we have the opportunity to deal with some of those.

Some of the issues in front of us and challenges are greater inaccuracy in forecasting, so again we have a supply and demand side issue that we have to work through in terms of forecasting, increased ramping and cycling of generators to offset PV output, decreasing energy being supplied by traditional generators, which in itself is not a bad thing because that lets competition come in, but some of those traditional generators provided by-products, almost all essential system services like frequency control as a by-product. Where we did not need a market for some of those services in the past or we did not need regulation for that, we are going to need something in that space going forward.

Then there are the potential issues—wind the clock forward another five or so years—and we may have more output from PV than what we have in demand on the rest of the system, and power systems do not like that very much. We certainly believe that there are opportunities there and we are going to need changes to regulations, market constructs and technical arrangements to realise those opportunities and also address some of those challenges. Those changes should ultimately provide sufficient visibility and coordination resources to efficiently and securely operate the power system and the market, ultimately continuing to enable customers the choice in how they want to get their energy supply, but also lowering the cost to all.

We certainly believe that Western Australia is well placed to become a leader in the integration of these technologies and AEMO certainly looks forward to working with stakeholders to ensure a successful energy transition and really do welcome the committee's inquiry into this important opportunity.

The CHAIR: Thanks very much, and, as I say, your submission was great. What I would like to do is walk through it. Before I do that, the way that the committee intends to approach this inquiry, in this first phase we are very much going to be focusing on the technical opportunities, the system-wide efficiencies that could be had, outcomes for customers and what the technologies mean for the south west interconnected system and, indeed, regional WA. The second phase of the inquiry we are going to have a deeper dive into regulatory and market structure issues. I sometimes cannot help myself so there might be the odd question that strays into that territory, but that is certainly not our intent today. We will provide AEMO with another opportunity to have a chat with us about those more specific regulatory constraints and market issues. Hopefully, that will help frame the discussion for today. I will start off with some questions and then throw it open.

In section 1.3 of your submission, you talk about the rise and rise of DER. I noticed in figure 2 there was a significant difference in the high, medium and low scenarios around the installation of battery

storage, in particular. I wondered if you could talk us through what were the major difference in the assumptions to produce such a broad range of potential outcomes?

Mr PARROTTE: I will have a go but I might fall to Martin on that. It is a combination of factors. This comes out ESOO, I think —

Mr MATICKA: It would have been last year's ESOO, this one.

Mr PARROTTE: — which looks at a number of economic drivers. Obviously the better the state is performing, the more cash that consumers have got and the more available cash they might have to put in battery systems. They are still relatively expensive and really even though those numbers are quite large and certainly coming off a very low base, you know, 400 megawatt hours and the high case is really only about 200 megawatts in store capacity. It is not the size of a major turbine but compare that with PV and it is relatively small. You have obviously got economic growth impacts in that.

Also, when there is potential scenarios around what the cost reduction will be in batteries and also what customers might do in terms of the recovery of those costs. At the moment we have got pretty unexciting tariff structures, which do not really enable maximum optimisation of battery storage and recovery of cost, but if there are some changes in that space, things like virtual power plants and things that you might have heard about, those sorts of changes happen and you will see a greater influx.

Mr MATICKA: We can get back to you on exactly what the underlying assumptions were in the model but what Cameron said is correct; it is related to the economic growth. But the other thing to keep in mind is that this is the very early phase of adoption of batteries and it is normally the early adopters who are getting involved with it at the moment. There are questions about if they are going to be paired with new installations and if other people go and retrofit batteries, that is a question as well. But we do know that the underlying technology behind it is continually getting better so as a result the price will certainly decline. A lot of what we see at the moment, because it is early adoption, is very much people making decisions that are not purely made on economics, they are made on their belief that they want to have these things, they are more of an emotional decision. That is really the reason why there is such a large variation in the forecast.

The CHAIR: So you have specifically excluded grid scale battery from that forecast. What are your views on the deployability of grid scales? Have you done any work to understand where that might fix into the mix as a network system operator?

Mr MATICKA: The large scale grids, I think you guys might be more across. It certainly happened in South Australia.

Mr PARROTTE: Again, the economics are not really there for large-scale deployment, other than sort of niche areas. I think Western Power is coming to discuss, and they will talk to Perenjori and the opportunities at Kalbarri. At the big end of town, the South Australian one was really somewhat a reaction from the state government to be looking and needing to do something and certainly the ability to build these things in a very short period of time. Plus South Australia had some significantly high costs in its ancillary services, its frequency control, and batteries provided a very quick opportunity to bring something in and to bring some competition.

I saw, the other day, a report stating a 70% reduction in frequency control services in South Australia. Plus, there it is less about the megawatt hours in terms of long-term provision of energy but as a backup to the interconnector from Victoria. If the Victoria interconnector gets into trouble, like it did during the blackout, then the battery can very quickly ramp up, but it can do so only for a short period of time. It depends on how you design the things, but obviously the longer the

megawatt hours that it can provide, the more the energy storage and the bigger the cost of the battery. As is the capacity. There is a sort of trade off.

Certainly, for South Australia there was a niche need and I think it has paid dividends. I do not know what the costs were and whether the government gets its money back and the commerciality behind it, but other than that we are not seeing that the economics are there just yet. As Martin alluded to, there are other things when a resident, a consumer, decides to put one in plus the arbitrage can be quite attractive for mum and dad because you have 28cents versus 7cents. Whereas on the grid, while there is $14,000 per megawatt hour on the east coast—we do not go anywhere near that here—it is pretty rare that it gets to that, so the arbitrage is a little harder to recover your cost.

The CHAIR: I am really glad he raised the South Australian battery trial because I was going to ask some questions about the performance of that asset, which undoubtedly AEMO at a broader level, as you are part of the system operations for the NEM, have a high degree of visibility of. There was a lot of cynicism about whether it would be able to perform well. I understand it has actually been more effective than a lot of the dispatchable, or a lot of the gas turbine technology, that they anticipate would have been able to provide that support. Could you maybe elaborate on that a little?

Mr SHARAFI: With regard to South Australia, we have seen the performance of the battery there very responsive to the signals that the system sends to them. The battery can follow the signals much more responsively than regular and traditional generators, so a good performance there contributes to system security. Given the experience that we have had with South Australia, and maybe you have seen some graphs of how responsive the battery is, we have seen interest here in WA from proponents of new generation to also add batteries. There are currently some regulatory barriers to that, but they all show interest to add batteries to their solar generation, for example. We get a lot of queries about how they can go about adding batteries and what are the impediments currently in WA for that.

Mr PARROTTE: If I can just add to that. What has been really interesting is—this is typical of all this technology. It is fantastic you think, the ability to follow exactly what we want almost instantaneously, but it is actually not what we want. Actually the power system and our control systems are designed for a bit of slowness, so the fact that they are operating so quickly, they almost operate too fast. Suddenly we have less generation—all right, ramp up—but then as quickly as that happens the load turns around the other way, so we can find this thing moving around all over the place where the older generators were a bit slower and followed the trend a little more. So they are great, but it is just a prime example of where the technology is probably better than we need at the moment and those other control systems, all the other components of the power system, need to change to optimise what we have.

Should we be paying more than the other generators? Should there actually be a different frequency class, one that can operate as quickly as the batteries? My key comment is: actually, do we need that? We get it—great. I think there is some benefit in it, but we have to look at it holistically to understand how the components fit together.

Mr SHARAFI: The international experience also shows the performance of batteries can positively contribute to system resilience. I was reading a report from EirGrid in Ireland. They did a test on batteries and found it multiple times more effective in providing grid stability services than regular generators.

The CHAIR: The point you raised about responsiveness to system signals, I think, is a really interesting point to emerge from your submission; in that, at a grid scale, there can be responsiveness to signals that are being sent, but you do not have any visibility beyond transmission

level. I am interested to understand the distribution scale connections. One of the things that you raise is the need to see them and then preferably to dispatch them. Could you elaborate on that a little? Maybe give us a bit of an overview of what that would take, because there is a smart meter rollout and there are a whole heap of costs as well that you have identified potentially around protection settings as these technologies come and you cannot see them and they start making the network jump around. If you could maybe give us a bit more of an understanding of what is going on at that distribution level, what you would like to see happen and what the potential costs associated with that could be, that would be great.

Mr PARROTTE: We might have to take the question about the cost on notice, because that is probably also bigger than us, but we can certainly touch on that. I will start and let the other guys jump in. Operating a power system—I go back to my opening statements—has historically been understanding and being able to predict what might happen on the load side with supply that we could dispatch. That was the traditional model. Now, on the demand side there is much more variability with batteries and PVs and people also have some opportunities in terms of how they use their load. Some of that has always been there, but there is a whole new scale in terms of uncertainty on that side.

On the supply side, yes, we still have the coal-fired power stations and gas turbines that we have direct control over and dispatchability through market or direct through the Synergy portfolio and now an increasing, and a continuing increase, variability with renewables. They are low-cost, zero marginal cost, and they have wonderful benefits in terms of emission reductions. Again, it is just different technology that we have to get our head around how it works.

So, under all that uncertainty, and, again, if I fall back to history, we could predict what was going to happen on the load side and we could dispatch what we needed to meet what level of uncertainty was there on the demand side. Now, we need to understand and predict both on the demand side and the supply side. We have some understanding of what people have up on their roofs. We obviously have weather forecasts that help us to forecast and predict what might happen in terms of PV. Batteries are another game changer; in that, how is it being configured? Is it there to maximise someone's bill? Is it there to maximise output at peak?

There are a variety of ways that you can configure these. We have a pretty good understanding that most of them are there to maximise the benefit for the consumer, which is fine and understandable in the present arrangements, so we can predict that to an extent, but as more and more of these go on to the system the harder it gets and the wider the uncertainty bands get.

Our forecasting systems continue to improve. If we had our forecasting system that we have for today 10 years ago, we would have been deemed to be legends back then. Our accuracy is probably the same as what it was 10 years ago, but with so much more uncertainty. We will continue to get better, but ultimately I am feeling that we are starting to stretch the friendship. We are working with CSIRO on a cloud forecasting system with cameras looking up at the sky to find out what is happening from a cloud perspective, so trials like that are underway, but that, again, is only going to help us to deal with some of that uncertainty that goes forward.

I think ultimately we have to get more visibility of what is actually happening on the ground, on the day. If I fall back again to history, we knew those control systems in the power system on the generation side; we knew what was in it. There were technical rules that define that. The technical rules on the demand side are not so great. Ultimately, we just do not have the visibility and we cannot know exactly what is happening across 200,000 or 300,000 homes, but we can get a better indication of it.

It is all about having predictability and then ultimately to support that is not just understanding what is out there but how they are likely to respond. If the rules, or the market constructs, or the retail product offerings provided us greater understanding and predictability of it, that is one part of it. Then, ultimately you need some form of coordination, for want of a better word, as opposed to control. Look at something like the under frequency load-shedding schemes that we have had in the past.

Again, in the historical traditional power system if we run out of generation and we try to dispatch other generation to make up for it, ultimately you have to turn customers off. It is a last resort, we do not want to do it, but as the very last resort to keep the whole system up and running, you have to turn customers off quickly. This side of it, we are going, "We're seeing so much more generation going on to the consumer side of it that we may actually have excess generation." Potentially, we want to be able to coordinate that, which might mean, "Okay, we have excess generation, we need to turn on grid-scale batteries or we need to encourage mums and dads to turn their battery from a charge to discharge"—I might have got that the wrong way. All those things are in the mix of the technology that is coming and is available, but you need the market constructs, the regulatory rules and the technology to support that.

The CHAIR: I will ask one last question and then I will throw it over to my colleagues. What you have captured is a very important concept around your forecast and your dispatch. If you are dispatching around a merit order that is provided to you through the market structure itself—there are two questions—firstly, are you finding that participants are bidding into the process differently? Are you seeing the shifting to coal in particular, or do you anticipate that? If you are given a merit order that you are required to dispatch consistent with that merit order, and if, in your merit order, the type of generation that is the next cab off the rank is not the right type to deal with the variability that you are seeing from DER, do you have the ability to dispatch whatever you like to deal with that—would you like it—and what do you think the consequences for that would be for market participants?

Mr PARROTTE: There are a number of questions. Let us start with the key one which I think is: do we have the powers that we need to keep the power system secure and reliable? If we see anything that we are uncomfortable with—obviously, certain things are built into the rules and we just cannot go and do that every day—then we can call what is known as a high-risk state or an emergency state, which lets us put the balancing merit order to one side and dispatch as we see fit.

I have just one point to make: we are quite fortunate in this state that we have a lot of gas turbines that are quick to respond both to get onto the system and then ramp up or down. That enables a lot of flexibility that my colleagues on the east coast do not necessarily have at their disposal. It is also part of the reason we are not facing some of the issues and challenges that they have got over there. In terms of the merit order, yes, historically, everyone knew where they sat. Coal was cheapest, then you had your combined-cycle gas turbines and then your open-cycle gas turbines and then your diesel peakers, and DSM was in that mix at various levels as well. Now, we are seeing more and more PV during the day, so people are starting to change their behaviour. They are starting to bid more negatively so that they stay on the system —

The CHAIR: Do you mean market participants?

Mr PARROTTE: Market participants, sorry. They are bidding negatively to make sure that they ride through some of those solar troughs or the high solar outputs and then they can stay on for the afternoon peaks. That is a market responding. How long that construct can stay and provide the signals that it needs to with a market flowing onto mums and dads and others with DER and batteries is the really interesting one that is going to have to start to pan out. The key answer to your question:

do we have the powers we need? Yes, but again, that should really only be a backup. We would call that—I do not know—a dozen times a year, or maybe 20 at the most for maybe one, two or five hours. Sometimes it is an issue that we have got and at other times it is an issue on the network. We do not want to go into a world where these sorts of things are happening that we call high risk and putting the market aside, which tends to be inefficient because it is only meant to be there on the odd occasion rather than actually having market constructs to deal with some of the challenges and the opportunities that DER and microgrids provide.

Mr SHARAFI: Your question around cycling of the baseload generation is something that we are facing. On days, especially mild days and weekends, we see a huge excess energy from rooftop PVs. That affects the baseload generation because these are the generators that we need to keep running all the time. We find ourselves in a situation where we have to decommit some of them and it is not environmentally effective. It is not efficient from an economic perspective.

The CHAIR: Are you two-shifting coal at the moment or does coal run or bid in negative pricing or how —

Mr SHARAFI: They run negative pricing, but sometimes, for example, we will have to decommit a big coal plant because we do not have the need for that generation. That affects the way Synergy bids, for example. These are early indications of how things will pan out in the future.

Mr MATICKA: In terms of the microgrids and the rooftop PV spilling energy into the market or onto the grid, it is not something to fear. What we have is zero-cost generation providing zero-cost energy. One thing to keep in mind is how we actually make the most of the fact that during the middle of the day, going forward on sunny days, there is going to be very cheap energy available for industry to use. From an economic point of view, certainly there are issues associated with managing the coal-fired power stations, which have to run so they bid at negative price to ensure they stay on, but there is also an opportunity there in: How do we make the most of that and how do we shift the use of that energy, which is actually very cheap, to another time where it is more valuable? How do we encourage industry usage at that time or is there an energy-intensive industry that we should be encouraging?

These are some of the questions that can be raised when we have these opportunities for very cheap power in the middle of the day. In terms of the getting visibility of what is happening, I think of it from an economic point of view and that the building blocks are out there. In a lot of cases, things like inverters and air conditioning units all have standards that enable them to be interconnected. This is a fantastic thing that in a lot of ways has marched ahead much faster than, say, legislation or our ability to measure the power system. We are looking at how to bridge the gap to make the most of that technology. Certainly trials are going on to try to harness that as an aggregated point of view. If we can get these building blocks pulled together, and get the visibility, that is incredibly powerful. There is a bit of a way up on either side, but from a bidding-into-the-market point of view, "what does it mean" has multiple aspects with where it could go.

Mr D.T. REDMAN: You are trying to run out models of predictability with an uncertain market and new technologies that are coming on in what is a pretty set, rigid, government settings—I do not want to get into regulatory arrangements here, but a bunch of settings are there that are somewhat fixed and not responsive. I am interested in your assessment of what proportion of your predictability going forward comes from what is actually happening as a product of new tech coming on in the game and changing technology, and how fast that is changing versus those government settings that are somewhat fixed and slower moving in terms of your judgement about what the right sets—we are going to write some recommendations soon that are going to hopefully help

government, of whatever colour—to make some decisions about what the landing point of this stuff is likely to be.

Tech is moving awfully fast and regulatory controls and other stuff are sitting behind it. How much of this stuff is influenced by government decisions on pricing availability, money, cash and a whole range of things that can stick that stuff into the market and be proactive about it by active definitive decision-making as distinct from what is actually just coming at us and we have to be responsive to? It is a bit of a subjective question.

Mr PARROTTE: I think the gist of your question is how much of what we are seeing is just technology doing what it is doing as opposed to either government or regulation not helping that or getting in the way of it? Like in any industry, we are seeing in the electricity industry in particular that technology is just running away, as it does in multiple industries, and the regulations are struggling to keep up. But I think here, if anything, the regulation might be putting a foot on the hose and allowing us time to work through some of this. Whilst AEMO will always say we want to see markets operating efficiently and effectively, with the scale and the speed of the transition at the moment, there is a lot to be worked through, and I touched on that before. We are probably five or seven-ish years away from some of this stuff actually starting to really hit us. It is hitting us now but not to the scale where Dean loses any more sleep over it than what he historically has done.

More to your question, I am looking at it as an opportunity to ask: what do we need to do in terms of the regulations, the legislation and the rules to enable this technology to continue to come onto the system but in a way to actually provides benefits for all? My personal feeling is that what is occurring at the moment is great for the individual, but not great for everyone else who does not have the capacity to put some of these things in their garage. Historically, it probably did not matter.

Over the last eight years since PV has really taken off, it probably has not made a big difference, but now it is starting to have some of those impacts that we just talked about in terms of two-shifting. We are starting to see plants turned off on a weekend that are really very efficient, and where you would sort of go, "If we didn't have that amount of PV, we'd probably leave it on the system." From a society perspective, if we invested in PV at the detriment of a perfectly good asset, yes, it puts carbon into the atmosphere, but in terms of a purely economic model, I am not quite sure. It has not mattered to date.

We are certainly getting to that point going forward, and then as Martin has alluded to and Dean: what are the market constructs and what are the changes in the technical rules that are going to allow customers to continue to have choice, but to do it in a way that has a benefit for the industry and/or consumers? That is the opportunity, I think, the industry has in front of us.

Mr D.T. REDMAN: Does that significantly impact how you take the decisions forward, because you have a very different environment over there where borders are crossed?

Mr PARROTTE: Yes; we do. I assume Horizon is coming to speak to you, so they will give you the insights of the nano and micro. The north west has a good sized system. The SWIS is somewhere between the north west and the east coast. The big thing about the east coast that we do not have here is interconnectability. South Australia has a larger penetration of particularly wind. They have been producing 120% of their output at times, but they can export. We do not have that opportunity but I think we have some other opportunities—as I said, the regulations have maybe put the foot on the hose a little bit—to set that up for success, because, again, you would have to question whether what we are seeing in South Australia is the best outcome.

Mr D.T. REDMAN: With what is coming at us, and it is coming at us pretty quickly, where is the sweet spot in terms of the necessity to have change of those settings? You talked about there being

a bit of a need to catch up, to manage balancing and a whole lot of issues that come with the game. Is this coming at us? You are making some sort of prediction as to when the government needs to respond because there is going to be a sweet spot there where you actually get that right on the rise and you finish up with the right settings at the end of it. When do you predict that to be?

Mr PARROTTE: Let me answer the question in a slightly different way. We are looking at the reform that the WA government is kicking off now; it is what we call foundation reform. That is the way we are looking at it, so introducing constrained networks—I will not bore you with the techo stuff if you are not across it—but we see that as fundamental to get some of our systems, because we have been talking about reform now for probably 10 years in this state, so some of the systems that Dean is using to run the power system are not really where we would like them to be. They are good enough, but they are starting to creak and groan a little bit under the existing market construct and with what we are seeing coming down the pipe.

We see that as absolutely fundamental and necessary foundation reform for the SWIS and the WEM—wholesale electricity market. We want to see that happening but we are really pleased that the committee is starting to look at this piece of work because some of these things might take five, seven years. If you look at reform, that is sort of the window that it takes. We think, again, we are five or seven years from actually needing to make fundamental changes to avoid Dean having to call high risk more often than we would like and in efficiencies and, potentially, as Horizon has done in places, had to stop PV coming onto the network. We think we are a long way away from that and there are other means of dealing with that, but to answer your question the longwinded way, I think we have a year or two to work out what the issues are, what the challenges and opportunities are and what some of those solutions are. It has started the momentum on the reform and has kicked off a reform program to come online by the mid-20s to deal with some of this stuff.

We do have the opportunity with the reform program that is underway to look at some of the challenges. Again, I will not bore you with the techo stuff but we do see some challenges happening sooner than that. But under the existing reform, we are looking at ancillary services, so there are a couple of things we think we can slot into the existing reform, providing we can do the analysis and prove that it is worth doing and can be done in the existing reform mandate, which will buy us another couple of years as well.

There is a little bit, Terry, in terms of looking at what is going to happen over the next five years. The Public Utilities Office is doing a generation mix study to understand what the system is going to look at in five, 10, 15, 20 years out, which will help inform some of that. We think there are some short-term fixes that need to be done on top of that foundation reform and then parallel, if this piece of work lands on some recommendations in the next year or so and then it is four, five years before that sees light of day. That timing should be okay.

Mr SHARAFI: The other point to make, which refers to your previous question is that the challenges that we see currently in the smaller systems are more pronounced, so in WA, because it is not interconnected, these effects will have more critical effects and also they will be seen and observed much quicker than, for example, the NEM, which is interconnected with bigger systems. We have seen in the world some jurisdictions that run on 100% renewables, you know, for days or even weeks, but they are interconnected. The bigger system holds that stability together, but here I would say we do not have a lot of time to address some of these issues. But the time line that Cameron has put forward, I think, is adequate. Two years should be enough for us to deal with these issues.

Mr D.T. REDMAN: What standards do you measure that reliability risk against? In other words, you talked about the 15 or 20 times a year when you throw in the high-risk scenario. The most efficient systems will always have an element of that there because it is one in 50 days or 100 days, or

whatever you want to pick. Are there benchmark standards that you run by? What is the standard that you choose to put that risk against?

Mr SHARAFI: The benchmarks are changing. We see new things emerging that require our attention and actions, like lack of inertia in the system. Previously, with conventional generators, inertia and system and strength came with the generation, but now because the new technology does not provide this, we will see ourselves reaching those limits very quickly so we need to take action. Previous high-risk states in the SWIS have been due to, for example, loss of big generators or loss of a network element that affected generation. But we will increasingly be in a situation where we will call a high-risk state because of the emerging issues like inertia and system strength.

Mr S.K. L'ESTRANGE: Linked to what you were talking about then, on page 26 of your submission, you talk about the regulatory framework. You mention in here —

> So that the new arrangements have sufficient longevity, AEMO is working with the PUO to redesign the regulatory and technical aspects of power system operation to enable the participation of new technologies and new ways in which consumers are seeking to use Western Power's network.

I am interested in that redesign of the regulatory and technical aspects—mainly regulatory.

The CHAIR: We opened the hearing today saying that the second phase of the inquiry is going to focus on that and we are going to get AEMO specifically back in to look at the regulatory aspect because we have only got these guys for another five minutes and it is a long conversation!

Mr S.K. L'ESTRANGE: Just a quick answer then. Thanks for clarifying that. Where are you at with regard to having something ready?

Dr KOSTECKI: As Cameron indicated earlier, we are working with the Public Utilities Office as part of this current reform program to implement a constrained network access regime but also supporting arrangements in the market for security constrained economic dispatch. As part of that program, there are programs within the market programs which also have a power system security and reliability component. What that particular part of the program is looking at is to ensure that AEMO has sufficient time frames in which they can undertake forecasting. There are time frames at the moment that provide that forecasting for supply and demand to make sure that there is enough capacity online and that they are capable of ramping up in time to meet demand.

Practically anyone who wants an electron can get it so long as they are connected to the network. We are looking to make sure that the forecasting processes are appropriate as they become smaller and smaller and smaller in size, leading up to the dispatch period. We are making sure that we have sufficient metrics in place. To turn back a bit, we are actually looking at putting in place, perhaps, a dedicated reliability standard. We have an implied reliability standard that is part of our long-term projection of a system adequacy forecast, but that is to procure sufficient levels of capacity. We are looking to put in place a reliability standard that we can then involve as part of our medium-term and short-term and pre-dispatch processes. That will enable us to make sure that we have sufficient metrics to measure that there is enough capacity installed and available, and not an outage, for example, and ready to meet demand.

Mr S.K. L'ESTRANGE: I suppose what I am looking for is: Have you set some time line for when the regulatory change will be finalised? Do you have an idea for that?

Dr KOSTECKI: We do. It is part of a much larger program of reform in regard to the regulation. It is something that will need to be stepped through over a period of time. There are things that we can go ahead with right away. There are other things that need to go, as a matter of course, later, because there is a sequence for doing these sorts of things. One of the things that we are looking at

doing right away, simply because it brings benefits to the management of the power system straight up, are these regulatory changes to enable AEMO to have sufficient capabilities to manage their business as a power system operator on a day-to-day basis.

That is things like the reliability standards, making sure that the functional boundaries between what Western Power is responsible for and what AEMO is responsible for on the transmission as well as on the distribution system talk to what the roles and responsibilities are of those two parties and to ensure that if there needs to be visibility of DER and microgrids that are being connected up, that there is sufficient notification and information flows.

Mr Y. MUBARAKAI: That is the follow-up question on that. Going to your submission, again on page 19, we talk about this paragraph with the growth in microgrids and DERs and how the distribution works, again coming down to the point of energy efficiency. Your view on smart meters and how that is helping, assisting, industry to basically use energy more efficiently, meeting those escalations and declines within the framework—if I could just get your point of view on that.

Mr SHARAFI: Smart meters are the key components of a smart grid. So, we think by selecting the right smart meters, we can get visibility, we can get predictability and probably controllability of this large amount of distributed energy resources. In overview, smart meters can play a key role in giving us visibility and control.

Mr Y. MUBARAKAI: Where is that technology at? Is that the new business, Cameron, that you were talking about earlier before? New business as a start-up—is that what you guys are looking at to help assist with the visibility factor?

Mr PARROTTE: Potentially, it is probably more on the software side of it. Australia is not renowned for its manufacturing capability. We have produced meters in the past, particularly smart, and electronics has not been our strong point. But I think it is in the application. It is the control systems, the coordination systems, where I think Australia can play a lead role, simply because we have got the sunshine, we have got the wind, we have got the technology, we have got the consumers who are interested in this; it is just the frameworks to enable that all to come together.

Adding to Dean's point, you need a meter that can read regularly, so the old clunker meters do need to go the way of the dodo, and you need some form of visibility in real-ish time, and potentially the opportunity to control as well. Smart meters do that all in one box, but there are other opportunities. You can put in a relatively dumb sort of meter that can read regularly and have an internet connection, which is not as reliable. There are certainly opportunities to look at going forward. We are pleased to see that Western Power has put that in their access application, because we feel that is a foundational piece to move us forward, but just to say that there are other mechanisms of getting that done.

Coming back to your question specifically, yes, I feel it is actually the smarts; it is how you pull it together. Horizon has done a lot of work in that space, but there are certainly the Power Ledgers and the GreenSyncs and those sorts of companies that are playing in this space that just need the red carpet laid out a little bit easier and the regulations and the technical rules et cetera to enable them to play more in this.

Dr KOSTECKI: I just want to add to that from a regulatory point of view. Smart meters are the hardware component, but there is obviously a regulatory regime that sits around metering. The metering code will need to be revised and reimagined, depending upon what needs to happen behind the meter—how much regulation you want behind the meter as well.

The CHAIR: Which we will pick up down the track.

Mr S.J. PRICE: My question follows on from that. It was in regard to the visibility of what is actually being consumed and produced out there, sort of behind the meter, because you see what comes at the front, which is your point about behind-the-meter access to information. Essentially, my thoughts on all of this are that it is amazing where it is heading, and South Australia I think is a good example for WA. I do not think we will see another baseload power station built in WA ever. I think going forward it is going to be where do we put the batteries to capture that excess generation that is going to happen as a result. Is that a view that you have as well?

Mr PARROTTE: What is interesting is that on the east coast AEMO has a defined function to be a system planner, so someone that sits above it all, forecasts out, looks at where the world is going and comes up with a plan. It was actually a Finkel recommendation to produce an integrated system plan to provide advice to the industry in terms of what is changing and where the opportunities might be, which will include interconnection, whether there is a need for more power and what sort of power might be needed, whether it is batteries or storage, gas turbines or whatever it might be. There is no such role in Western Australia. It is something that we are working with the Public Utilities Office on to include in this reform. It requires dollars, time and effort, but we think that is a valid effort.

So, I cannot answer the question, because we do not do that in this state. All I can say is that we do do it on the east coast. I have been heavily involved in that. And, yes, you would have to question whether there will be another baseload power station, because of the cost of renewables and the zero marginal cost is always going to beat them on an energy perspective, but as we have talked to a bit today, it is not all just about energy. We need to provide contingency services and frequency control, and those things add other costs that renewables do not today, but are actually showing some green shoots that they could provide in the future.

When you look going forward, what we expect to see playing out on the east coast is more renewables coming in—wind and solar, supported by some battery storage to firm them up a little bit—and more interconnection, so that if the sun is not shining in Queensland and the wind is blowing South Australia, it can go the whole way through. It is a pretty weak sort of system. Our system here is also weak and we have touched on before that it is on its own, but there are still strong sources—so, the Geraldton area is really good for wind; the Kalgoorlie area is going to be great for solar. We can make use of those things with a little bit of interconnection and more storage.

I think you are going to see gas replaced going forward. Interestingly, there was a presentation that we saw a couple of weeks ago where they were saying that nuclear may well be the future baseload. How that plays out here and the politics behind that—what I think is important is that there is a body looking at where the industry should go in WA, what that should look like, and then you have the challenge of deciding how much of that plan just gets mandated to be built and how much is provided as advice. We produce an electricity statement of opportunities. It provides advice in terms of where we think we are going to be short in generation and then the market decides to build or not. I think we are needing something more than that in WA.

Mr D.T. REDMAN: This point is where my earlier question was going to. You are sort of suggesting a system planning approach to what happens on the east coast. You have a whole heap of moving parts you can manage and interact and whatever else, and you can land some sort of visibility of what might be a good outcome. I would suggest that the influence of government policy in Western Australia is a much greater overriding influence in terms of what the likely outcomes are going to be. In fact, you are almost better to have planning internally where within the cabinet table you are making decisions that actually mean something as distinct from a clean-slate approach that

a purist might look at from outside. That is probably not something that you would want to comment on!

Mr PARROTTE: That is a conversation that needs to be had. I think you have hit the nail on the head. You have gone from very much a market construct—particularly on the east coast it is very much market oriented. WA is a little bit of both, we have obviously got some government-owned utilities as well that swing it back to more centrally planned. Irrespective, I think you need a central planner, a system plan, to provide advice. Then you decide which components get mandated and built either through a regulatory construct—the government says, tick, build it—or you leave it to the market to respond. We have to work through that, but if you do not have a plan, you cannot even decide which components fall into that category.

The CHAIR: You almost need to define your requirements and you can then put a tender out even and let the market operate it. It is just the point at which you show those market signals.

Mr PARROTTE: Yes, that is right.

Mr D.T. REDMAN: And then front up to a public meeting in Collie!

The CHAIR: We will definitely park that!

I am very conscious of the time. There is one point that I would be happy if you could take it on notice. In your submission, you talk about the overlap of functions and responsibilities between AEMO and Western Power. From a technical operational sense, we would really appreciate a bit of an overview of that. We do not have the time, unfortunately, today, but if you could take that on notice, and perhaps also give us some thoughts on how overlapping could be resolved, it would be fantastic.

I will proceed to close today's hearing. Thank you for your evidence before the committee today. A transcript of this hearing will be emailed to you for correction of minor errors. Any such corrections must be made and the transcript returned within seven days of the date of the letter attached to the transcript. If the transcript is not returned within this period, it will be deemed to be correct. New material cannot be added via these corrections and the sense of your evidence cannot be altered. Should you wish to provide additional information or elaborate on particular points, please include a supplementary submission for the committee's consideration when you return your corrected transcript of evidence. Thank you so much for coming out, I really appreciate it.

Hearing concluded at 10.07 am

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