ECONOMICS AND INDUSTRY STANDING COMMITTEE

INQUIRY INTO MICROGRIDS AND ASSOCIATED TECHNOLOGY IN WA

TRANSCRIPT OF EVIDENCE
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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 9.38 am

Mr FRANK TUDOR
Chief Executive Officer, Horizon Power, examined:

Mr TERRY MOHN
General Manager, Advanced Microgrid Developments, Horizon Power, examined:

Mr MICHAEL HOULAHAN
General Manager, Commercial Services and Finance, Horizon Power, examined:

Mr MARK PATERSON
General Manager, Consumer Energy, Horizon Power, examined:

Mr LAURIE CURRO
General Manager, Power System Services, Horizon Power, 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 regional microgrids. My shame 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 left: Deputy Chair, Sean L'Estrange, member for Churchlands; Yaz Mubarakai, member for Jandakot; and Terry Redman, member for Warren–Blackwood. Stephen Price may join us before we finish, or he may not. It is important that you understand that any deliberate of this committee may be regarded as 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. Before we begin, do you have any questions about your attendance here today?

Mr TUDOR: No.

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

Mr TUDOR: Yes, if I may. The committee has come together at a very interesting time in the development of the electricity sector. One of the things that we have already observed is that renewable energy at a centralised level is making significant inroads and becoming very cost competitive. I think the next wave of the revolution will be one where distributed energy in the form of solar panels and batteries, actually starts to make a mark on the electricity sector as well. In the last five years, it has been recorded that probably more renewable energy is being put in than thermal generation, and, as we have spoken to Navigant, a research organisation out of San Francisco in the US, they believe that out of their renewable energy component, more than half of that going forward will be in the form of distributed energy rather than centralised energy.

If you take Germany that was at the forefront of renewable energy and have a look at how their solar installations have shaped up, they have something like 40 000 megawatts of solar. Nearly 85 per cent of that is below one megawatts in scale down at a distributed level, and something like 98 per cent is linked into the low-voltage, medium-voltage part of the network.

The distributed energy revolution is happening and that really gives rise to the challenge of how distributed energy is managed, and that really gives rise to the concept of microgrids, and microgrids, at its heart, is a way of managing distributed energy when it gets to very high levels of

penetration at a distribution level in large grids, or in remote microgrids. We believe that basically microgrids are the DNA of the new electricity system. Whether it is in a remote situation of the type that Horizon manages or whether it has evolved and devolved in an embedded microgrid in a large system, you will see them in both and they both serve the same function, which is a way of managing at a local level, very high levels of distributed energy.

We have observed the utilities in Western Australia. They have done, broadly, one of the essentials, which is to become really efficient as you face this disruptive future. Each of the three utilities—Horizon, Synergy and Western Power—are on their own journeys to achieve that efficiency outcome. The other thing that we think is essential, which Horizon has done, and not many utilities have done across the country, is put in what we call "advanced meters infrastructure", which has all the smart functionality that allows you to connect with your customer. This becomes really important in terms of providing real-time price signals to customers as you think about playing around with different tariff structures which incentivise different behaviours, particularly when you are seeking to price the peak and actually bring that down. It also plays a very important part in the orchestration of this distributed energy as well.

Advanced meters is something that unfortunately the whole country is lagging behind, and, unfortunately, the state here is lagging behind. We in the Horizon Power patch, albeit small, have installed those and that gives us a starting point to look at the twenty-first century electricity sector. We also believe that, at our heart, we are a microgrid business. We see ourselves as looking at challenges that others are going to face. We are facing those today in terms of having to curtail distributed energy because we have seen issues with either protection, power quality, reserve capacity or things that have occurred on our systems which we have needed to take account of to make sure that we can run them reliably. We are dealing with some of the challenge that we expect to see on the bigger grids in due course.

We do present ourselves a bit of a sandbox in terms of understanding how technology needs to adapt when you have got high levels of distributed energy. We are focused on dealing with that technical component. We are focused on dealing with the smart meter infrastructure on pricing structures, the right sort of pricing structures to allow people to modify their behaviour, and also to enable the facilitation and take up of DER. The other component is the regulatory framework, which equally needs to change from a rate-based approach which is driven by assets in place and the value of those assets, to one where everybody works in harmony to deliver the lowest average cost. Our expectation is that in the future that is going to have a much bigger component of distributed energy. The evidence that I cited at the beginning suggests that that is going to be the case.

We have done a lot of work to think about how we position our business in terms of going forward. We have got a showcase project, which is Onslow, that is fast-forwarding into the twenty-first century and will have a very high level of distributed energy resource. We are going to solve—I hope—some technical issues and problems associated with that high level of distributed energy. Across other parts of our portfolio we are looking at different regulatory regimes—Warmun and I think another one for regulation. We are also doing pricing and looking at how we can real-time price and peak price in some of our towns including Hedland and Broome. We are doing a lot of innovative work across our portfolios all directed to providing information that we can start to use in a holistic sense when we start so look at some of our microgrids and think about all those components of technology pricing and regulation. We think that we would like to get a lot of that information across to the committee. I think the committee will take its own views, but one of the things that we would love to see is whether there is anything across the state between the three utilities and between others that is missing or is there anything that you feel is really worthwhile pushing. We would love to see that. That is probably the end of the opening statement.

The CHAIR: Thank you. I do not want to foreshadow what my colleagues might say but I just want to foreshadow the way that we anticipate this inquiry will pan out. We intend to adopt a two-stage process. The first stage is very much looking at the opportunities that these technologies present both in terms of upstream resources and energy, advanced manufacturing opportunities for third-party providers, and also the benefits that these technologies can deliver to both the regional networks and the south west interconnected system.

In the second phase of the inquiry we are going to be focusing a little more on the regulatory issues. The nature of the questioning today will most likely focus on the first phase of the inquiry and we would obviously welcome any views that Horizon may choose to give us in more detail on regulatory, but we will come back to that. Please do not feel that today is the only opportunity that you will have to present the committee with evidence, but we are trying to manage what is really quite a wideranging topic. It is a bit like eating an elephant—one bite at a time, so I will take the first bite of the elephant.

One of the things that we are very keen to understand as a committee is the benefits that these technologies can deliver in terms of energy system optimisation. We were wondering if you might be able to give us an overview in the different sandboxes that you are operating in, of the sorts of benefits that you anticipate in terms of resilience or network stability or least cost energy provision. If we could get an understanding of Horizon's view on that, that would be fantastic.

Mr TUDOR: I will give an opening statement and then perhaps ask Mike and another to come in.

We have looked at the CSIRO–ENA—Electricity Networks Australia—modelling, which looked at what the electricity system in Australia would look like in 2050 if you had a balance across reliability, if you had a balance across affordability, particularly driving towards the lowest average cost, and you were seeking to provide customers with choices that they wanted to make. That drives to a very highly distributed energy future. That is a piece of modelling done by our premier science organisation and it is done for the entire country system excluding Western Australia. It suggests that we are going to have a very highly distributed energy future and of the trillion dollars that will be spent by 2050, some 20 to 40 per cent of that is actually going to be spent by customers or their agents putting in distributed energy because that is the most affordable way of providing some of those issues around reliability, resilience and affordability at a customer level.

We have also done modelling on our own systems that has mimicked the modelling done by CSIRO–ENA. We have also asked the CSIRO people to come in and validate the modelling that we have done. When we have done that modelling, we have come to exactly the same conclusion: that if we looked at what is the most affordable, reliable, customer-friendly system that we can deliver over time, most of our 38 or 40-odd systems move towards being highly distributed. By that, I mean more than 50 per cent of the energy is being provided by the customers themselves.

What actually drives us in the long term is to look at some of the things that we are doing in the short term and the medium term. It is a really important point to have a look at what could the future look like and make sure that what you are doing today is relevant to building competencies and capabilities and testing things that need to be tested to make sure that future can be realised.

The CHAIR: Before we move on to Mike, Frank, are you able to share some of those findings with us?

Mr TUDOR: Yes.

The CHAIR: That would be very much appreciated.

[9.50 am]

Mr TUDOR: There is CSIRO–ENA modelling that we can certainly share, and there is the modelling that we have done in turn that we can share around our own systems and see what they look like going into the future.

The CHAIR: Thank you.

Mr HOULAHAN: That is the economics of our modelling which we call our system blueprints, and it articulates in most instances a higher penetration DER future. It articulates it as agnostic to the investment. In terms of absolute costs, DER is highlighted in most instances to be better than a centralised or base framework. That then provides further benefits in terms of who picks up that ownership. Clearly, and what we look to put in customer choice, is giving the opportunity for customers to put in that PV and making sure that there is a regulatory framework around to incentivise that, and that then further reduces that total system cost and it further provides avoidance of investment and therefore debt to the state. This is all part of our economic supply modelling. It is the first stage and it identifies what that looks like. The next phase for us then, which we are starting with Onslow, is to look at the design of it, and that again is —

The CHAIR: The physical design or the regulatory design? The asset design?

Mr HOULAHAN: It is both. When we move from where we are now to what we call advanced microgrids, we are actually looking at a total ecosystem of microgrids, so the technology aspect of the DER in terms of the hardware and even the software. It then moves into making sure the regulatory framework is supporting and incentivising the customer's orchestration of DER. It then looks also at what customer solutions you put in place to allow the whole-of-community to participate. Again, that all ends up lowering that total energy system cost.

The CHAIR: Let us assume a perfect regulatory framework—there is no such thing that exists but there are plenty of economists that do. Let us focus on the technical dispatch and energy efficiency benefits offered by microgrids. Could you perhaps give us from a technical perspective a bit more insight into that?

Mr MOHN: I will offer some ideas here. The benefits first to the customer are enabling customer choice. At some point in time, you will get a saturation of customers that want to install solar rooftop that causes coping difficulties with the distribution. One of the benefits that we want to enable is ways that we can encourage further adoption and customer choice, being that they want renewable energy, but still not at the sake of the system operation. So you interact with the customer-owned asset with technology. You identify the installation that they have, you put a little gateway device on their system and you couple that with your smart meter data that is coming in to understand the capacity of circuits that are supplying the power to that customer and what they are capable of delivering. That is just at the edge of the grid.

For the rest of the operation of the grid it is about how much backup generation you need to compensate for a customer not generating, and how much you have to input into the grid according to this. Currently, it is not a bidirectional flow of energy, but we are starting to witness more bidirectional flow of energy. How do you ensure that the safety of the transformers and switch gear are not compromised by this additional increase? Through technology we can identify how to reroute power, how to witness the temperature of transformers so that they can compensate for further ingestion of imports, but still allowing customers to have their own choice of generating power.

That is one of the decisions that we can come up with that benefits just the customers. Another one is: how do we make good investment in assets? There are ways in which we can install neighbourhood electric storage to deal with the variations the customers are not coping with now,

but it is right there at the edge of the grid. We can also install central storage, electric storage, so that we do not have to ramp up our generators to real-time. I think some of you had a chance to see some of our electric storage in Carnarvon. Those are the types of investments that we can make that are beneficial to the customer but will also benefit the operation of the entire system.

What we are seeing with all of this operation is a distributed management system. This is a new technology. It has been available for the last five years in the industry but we are now just starting to adopt it here within Horizon Power. It will probably be the first installation of distributed energy management systems in all of Australia because we understand that the state of the art has moved and, as Frank properly said, we are working with advanced microgrids. Advanced microgrids are the adaption and adoption of smart grid technology overlaying operational technology.

Through the proper implementation of smart grid technology, first of all, smart meters, to the distribution energy management systems and to other types of systems—outage management systems, SCADA monitoring systems—all of those come to bear to improve the operation of the grid, lowering the operating cost because we are not now spending so much money on diesel, but also we are encouraging a benefit to the customer with more and more customers implementing their solar rooftop and other types of personal generation. That is an orchestration process that has to occur and it takes a very mature operating platform and a very mature company to be able to implement that. Horizon has proven that they have done that over the last number of years. I have witnessed this change in the rest of the industry. I spent quite a bit of time in India and the United States, and the work that Horizon Power has been doing is right on the tail of all that other work that has been done and it has been shown to be very effective.

There are three types of benefits to the customer to look for in developing their own system. One is they want to have a very economic energy infrastructure, so they make their own investment for economics. The second is that they will make investments for reliability. They want to improve reliability and then we will find that microgrids are being designed specifically for reliable power, and the third being going green. Many customers say, “You know what? I just want to be a good steward of the environment so I am willing to make an investment that is probably not economically prudent, but I have a social desire to do that for myself.” Through the way in which you orchestrate that and provide the benefits through the technology I just mentioned, you are going to allow the customer to achieve all of those goals.

Mr D.T. REDMAN: Just an expansion of the introductory remarks by Frank, you talked about CSIRO work that they did, which basically said all roads lead to a microgrid solution. Is there a scale point where that flips to centralised generation in terms of the size of a community, and if you applied that to the two million people living in Perth as distinct from an Onslow—I can understand how it might absolutely work out there—is there a point where that flips to a different model?

Mr TUDOR: I think the industry bifurcates into two. You will see that lots of people are talking about very high voltage transmission lines, DC lines, to actually connect large areas that might provide solar or wind to large cities and industrial loads. There are certainly enough people talking about that and that is certainly something that is going to coexist. The microgrids are situational specific but it is not so much that it only belongs in a remote community. This is why I think you, as a committee, might want to look at New York and California and, in particular, in New York they are refreshing their infrastructure and they have some of the oldest electricity infrastructure in the world. Pearl Street power station was built in 1898 and was one of the first. The electricity infrastructure there is very, very old. It is in a concrete jungle and it is going to be very difficult to refresh and they are being hit progressively by superstorms. What they want to do, and they have taken a holistic approach, is actually use the distribution network owners to become platform

providers that is almost a bit like a Google; they enable the necessary services for people to actually put in place distributed energy and as they put in place distributed energy, you will find they naturally migrate to form little microgrids. Where we are doing something in Onslow, there is a sister microgrid in Brooklyn that is doing something very similar. In the middle of New York they are getting together as a community to control their distributed energy as part of a much bigger system, with the idea of addressing affordability and particularly resilience so that when they have these superstorms that come through, if the people of Brooklyn decide they want their security badly enough, and they have invested, then they will be able to disconnect from the bigger grid and remain with the lights on during the time of those storms.

Mr D.T. REDMAN: Does the lowest price to a consumer flow through to the best design model for Horizon Power? Is there a distinction between those consumers who can afford to get onto the system versus those who cannot get onto the system; and is there a disconnect that needs to be managed in a regulatory sense?

[10.00 am]

Mr TUDOR: Let me answer the first question. The benefit that comes to the community is that the distributed energy is basically going to be put in by the customers themselves, and that is going to deliver the resilience. It does have a big impact on the distribution company. My view is that potentially the distribution company will see a lot of investment taken away because people are going to be making decisions to put in distributed energy. The role of the distribution company for the system operator needs to be thought about. They have done that in places like New York and California and they have said that the role of the distribution operator is effectively to provide services whether they are metering, billing, analytical, access to data or whatever is necessary for people to come in, put in distributed energy and form clubs or microgrids or whatever they want to do to work on the back of that platform.

Effectively the business for the distribution company in a sense is reducing physically. Therefore, their businesses, if you just look at it in the confines of that one system, is going to look physically smaller. They are going to be required to go from what is really kind of dumb physically systems today to putting more intelligence, more communications on the system so they can provide these services for people who put in DER and want to aggregate and then present themselves to the wholesale market. But for the distribution system operator, their world looks physically smaller and probably from a value perspective, smaller, so that is an issue to go to your second point, which is, is there is a disconnect?

You somehow need to take the current regulatory framework, which in the mindset of a distribution business is, “How can I build out my network?” That increases my asset base, my revenue and my rate of return. You have to move it away from that: how do I incentivise the distribution business to actually deliver the last average cost where some of that means that distributed energy will be put onto the system by the customers and they will not have a role in that necessarily.

Mr S.K. L’ESTRANGE: Where does the generation come from in your Brooklyn example?

Mr TUDOR: It comes from two sources. One is still centralised generation and the community, if at the moment it is applying 5 per cent of its energy, it might get up to 20 or 30 per cent because they are going to deploy some solar panels and batteries, or they might do a communal battery. They are going to become more self-sufficient but not entirely self-sufficient. They will still be dependent on the bigger grid and the big centralised generation that still comes into New York.

The CHAIR: In that context, just around distributed energy resources, there is also demand-side management as a distributed energy resource, depending on how you flip it on its head. Could you

give us a bit of an insight into your thinking about the installation of smart metering and IT smarts, and then behind the meter management and deployability of these types of technologies to optimise energy?

Mr PATERSON: I will start from the broad picture and respond specifically to your question. One of the key things to comprehend with regard to the nature of this transformation is that it is a holistic transformation, not just incremental change. The deployment of all of these different DER technologies in, if you like, a chaotic uptake of technologies without a deliberate approach to the architecture and the orchestration, will not actually result in all of the good things that we all talk about. We often think and frame these thing around, if all of these technologies are deployed, how big will be benefits be? The benefits may actually negative if they are not approached in an architectural and whole system approach.

This goes to the notion of orchestration. It goes to the notion of how we orchestrate the whole range of distributed energy resources, be they solar, storage or demand response, which is actually in the proper definition of DER's demand response is one of the distributed energy resources. Demand response, for example, is a critical part of flatlining the "duck curve". If you are familiar with the duck curve, it is extreme: peaks on demand and also the belly of the duck being the extreme hollowing out of the supply curve during the day when there is an oversupply of grid energy resources.

Demand response, for example, is a key part of your tool kit for system economics optimisation. It is about the technological optimisation—not dropping out sections of network because of extreme peak demand—but it is also about the economic optimisation because by flattening that daytime load curve over that 24 hour period, you are actually moderating the amount of investment that the network business needs to commit to supply that system. In other words, it is a much more stable long-term economic investment. Chapter 11 of the network transformation roadmap focuses specifically on the topic of the critical ingredient of whole-of-system orchestration and the monetisation of building the transactional platforms that can entice privately owned assets into the market to provide services to the shared system in exchange for a cut of the value. So it is that combination of technologies, economic platforms, business models and value propositions.

The one other thing that I would say is that at the front of the network transformation roadmap is the notion of a balanced scorecard of outcomes. That is actually at the heart of Terry's question about the folks who are not necessarily able to invest into this; they may not even own their own home, are having a hard time paying their bills today, so what does this do for them? The architectural approach that my colleagues is really about looking at how we deliver the $19 billion of benefits that can be achieved through that orchestrated approach and how is that apportioned to the folks who invest in technologies and the folks who cannot afford to invest but have downward pressure on their electricity bill because instead of other people's solar panels and so on increasing costs for them, it actually helps moderate the overall societal impact.

The CHAIR: Those people also have, through ongoing tariff structures, paid for the infrastructure that supports a lot of these DERs as well. So all of society has paid and all of society deserves to benefit. Yes, we can argue the toss about who, in terms of new investments, deserves some form of additional return but, at the end of the day, these assets are also something that we all own.

Mr PATERSON: They are a shared good; exactly.

Mr HOULAHAN: The only thing I would add is that in terms of technology the basis is the advanced meters and DERMS. This puts in place the technology that provides the data for the customer and the utility to then provide the choice of information to make a decision and then the customer has

behavioural responses they can make to that. That is where it is for us. The technology is there and that provides the data that orchestrates the different types of solutions that can be put in place.

The CHAIR: The distribution management system that you said you would be the first in Australia to deploy, what does it do, how are you utilising it and where have you seen it applied successfully in other jurisdictions.

Mr MOHN: I come from California and still have my Californian accent.

The CHAIR: We will not hold that against you!

Mr MOHN: I spent quite a bit of time in California working with the major IOUs—investor-owned utilities—there coming up with standardisation for the integration of DER. California witnessed very high growth early on—five, six or seven years ago—on solar rooftop and then right on the heels of that was the emergence of electric vehicles going into the same homes that had large electric solar arrays. In many utilities, they had dual peaks during the day—a peak for the solar reduction and a peak for the electric vehicle coming home from work—so the utilities had to cope with this in a very structured way. The Public Utility Commission enacted a number of activities, including recognising how to standardise the design for solar inverters or power inverters, and even going one step further and saying, "How do we standardise the approach for utilities managing this DER?" So a large body of work was done to develop the standardisation for the distributed energy resource management systems.

The utilities were encouraged to apply to the commission for investments in a DER–MS-type system. That system is a software package that sits on top of the distribution management system, so all the utilities have, at the lowest level, system protection. Above that is the SCADA system, above that is distribution management, which really understands and orchestrates power flow across the network, and then above that is the orchestration and optimisation of all assets contributing to power flow. It has three different levers, and I mentioned the benefits of those earlier. It has an economic lever, it has a renewable energy lever and it has a reliability lever. All those are controllable at the utilities scale and also they can drive them even down even into the circuit and substation level.

[10.10 am]

These systems have been in place now for probably four to five years and the utilities are witnessing the value of the ones that I mentioned earlier. They are seeing a higher penetration of DER by the customer. The customer is making the choice to make their own investment but the things that Mike and Mark were mentioning earlier about incentivising the right behaviour also came with the DERMS—the distributed energy management system. That system understands contractual obligations the utility has with IPPs. That is a constraint. The DERMS also understands the constraints of the circuits: how do you prevent overloading and how do you have too much backflow? It also understands the contractual relationship to each of the DER owners. Some of them may have been aggregated by large institutional aggregators. Demand response is one of the large aggregation schemes right now used in California. All of these have been implemented by the DERMS systems in California. What Frank was referring to happening in New York—New York was two years behind what happened in California—but the exact same work that I have just described at the utilities scale is occurring in New York. One additional value that New York has found is that those same constructs for distribution management for the utility can be applied at the wholesale level. You can aggregate DER at the aggregate level and make that as a generation resource to the transmission operator.

All I am trying to point out is that the technology that provides this is very mature. It has been implemented in the United States for quite a number of years. I mentioned the fact that I was in India for quite a while. I introduced all of these technologies to India several years back with the intent of modernising India's infrastructure grid to lower the cost to India to encourage private investment into DER. At the onset of our work in India, we started out with the premise that we could encourage large penetration of microgrids. At present, they have close to 7 000 microgrids privately owned and supplying power to the wholesale market or providing power to the system at a system benefit. These capabilities are very mature and this is one of the areas that Horizon Power has decided they are going to implement now. We are on the task of implementing that technology in our next investment release.

The CHAIR: One of the things that I picked up on in your response there, Terry, was talking about the role of IPPs. Horizon is one of the few vertically integrated utilities left in Australia, probably the only one —

Mr MOHN: Correct.

The CHAIR: — other than Power and Water in the NT. You own and operate some of your own generation but predominantly, you have IPPs supplying you. You mentioned that IPP contracts are a constraint, but the role of the IPP, I would imagine, is going to change over time. Can you give us some insight into how you think—there are clearly a number of customers out there who have established positions in markets and networks and in the contractual arrangements sitting behind that. Could you perhaps give us some insight into your thinking on how the nature of IPPs will change over time and what the impacts on those more traditionally based generation providers will be as microgrids emerge, and how your own procurement practices may change to reflect the market changes?

Mr TUDOR: Where we were historically, if you go back about five or six years, the industry has been changing so dramatically that we did not anticipate this level of renewable energy, particularly at a distributed level coming into our systems and making economic sense. The contracts we constructed about IPPs followed that fairly rigorous procurement process where we would go to the market and seek expressions of interest, and typically they allow for up to 10 per cent of renewable energy penetration, which could have been in the form of a centralised solar farm or it could have been distributed, but it was not being anticipated at that stage. We have seen the difficulty of working with that and as contracts, and they tend to be clustered around —

Mr D.T. REDMAN: It was a government-initiated constraint—that 10 per cent?

Mr TUDOR: Yes. I think it is something we wanted to build into it. Had we made it much more, it would have been paying for flexibility that we really did not know we needed at that stage because it would have meant that the charges from the IPP would have just gone up for the units that we were buying, because they were going to put in place the kit to supply the power and they wanted to be rewarded for that. That flexibility costs some money, and we decided it was worth spending, but they did not really anticipate how it might eventuate.

Now, when we have refreshed contracts—We have done one in the Midwest where we went from a company called EDL to a company called Contract Power. When we dealt with Contract Power, we have already provided in the new contract with them for six of our towns, the ability to retire generation as we see distributed energy or solar farms or whatever form it might take, making economic sense. We have built that flexibility into the contract itself.

The other thing we sought to do is look at who can take the risk on, for example, diesel generation or gas-fired generation, that might be put in. We provide that flexibility and the IPP can take the risk

because they can move generators from one location to another, or from one company to another. They have been quite prepared to take on that risk, which has meant that in the context of the Midwest, that has not appeared as a financial liability for us if they can list it as an operating cost. That was quite a good outcome for us as a state-owned enterprise reflecting back on our balance sheet—the government's balance sheet ultimately.

The CHAIR: So the third party providers, as long as they have a sufficiently flexible business model, there is still a space for them to play.

Mr TUDOR: You can imagine the traditional IPPs start from, "We build something. We build it for 25 years." At the other end you have companies like Aggreko and their business model is: "We'll fly something in for an event for two weeks' time and then we'll take it all out again." Whether it is the royal show or whether it is some country show or something like that, that is what they do. But even they are moving and saying, "Do you want it for five years or 10 years? We can do that." You can imagine those two worlds kind of merging together where that flexibility is now having to be provided because people are reluctant to commit to long-term arrangements where you do not necessarily need to build in that flexibility.

Mr D.T. REDMAN: This might be slightly departing from where we are going, but it may be there. What we saw in Carnarvon was your efforts to run a pretty finely balanced system. You went right down to how much cloud there was at a particular point in time because that's how tuned the system is. What happens when a big user comes on board or wants to come on board into that grid network, and what is the difference between your current approach to that and where you would like to be if you had a very customised system? Is there a threshold to big users that flips the game?

Mr TUDOR: If I can say, it is almost, without thinking about it, Lake MacLeod, as a buyer on the Carnarvon system and how we deal with them now and how we might deal with them in the future, because that is a large customer on the Carnarvon system.

Mr D.T. REDMAN: How much are they asking for energy?

Mr TUDOR: I would be guessing—about two megs out of about 15.

Mr CURRO: It comes down to the level of orchestration that you have and one of the things that assists the IPPs to behave in the way that Frank described is coming up with a flatline-type approach to loads. If a user comes along and has a very peaky load, it is just going to drive costs and they are going to have to pay for the infrastructure to do that. The more they manage that down, the more they can flatline their load, self-generate and then pay for whatever they need to from the central infrastructure. Obviously, they will have to work out their own business model as to where that sits with respect to their business, but it basically comes down to working with the customers about how they drive their business and what costs they want to —

Mr D.T. REDMAN: So for new commercial connections it is the same as Western Power: they just simply pay the commercial cost and whatever they can work in in terms of balancing things, they will change that cost.

Mr TUDOR: The thing that is changing for large commercial customers is what Laurie just alluded to, which is that large commercial customers now have more choices. They can put in generation, whether it is thermal or whether it is—thermal is often difficult—diesel or gas—but wind and solar are available so they can make sense of wind and solar in a battery? What does that combination look like and is it better or cheaper to get it from us through a connection? As we are going to need to be on the system side as competitive as anything else, they can source separately. The off-grid alternative for them is going to ultimately dictate what prices we might need to get down to.

[10.20 am]

Mr D.T. REDMAN: Is there much difference between the price differential for those sorts of new connections in costing your network as distinct from Western Power?

Mr CURRO: I guess the biggest difference for us would be whether or not we need to charge for additional generation, and that factors into the type of business they might be—the size of the business, for example. The network costs obviously are marginally more expensive in those very remote areas. But I think the advantage in this new world is that because the customer can look at what is the best choice for their energy supply, they can actually optimise that not only from an energy point of view, but also from a cost point of view. Security is very important to commercial customers, so they will be very keen to make sure that that is dealt with as well.

Mr PATERSON: To the question, I think the very nature of the future of electricity systems is increasing dynamism and therefore the need for increased flexibility across whether it is IPP contracts, whether it is around how we modularise our approach to connecting new customers and so on. In that context, the best way of thinking about the role of a utility such as Horizon Power is that we are fundamentally custodians of this shared asset on behalf of society. A lot of these dynamics, as I emphasised before, can play to either some very significant societal disbenefits, if they are managed poorly, or very significant societal benefits if we actually take a systemic approach.

At the heart of this whole transition is the supply and demand balance, and that is why solar PV per se just by itself, without storage, without demand response and without all these other enabling things, is actually a bad outcome societally, because you have a radically misaligned supply and demand curve. At the heart of the economics around all of this is asset utilisation rates, and that is really the key economic metric, if you like, with the duck curve. The duck curve is an expression of horribly misaligned network utilisation rates such that we have a societal asset base that grows but the actual utilisation rate goes from something like what should be 80 per cent to 30 per cent and falling. That is actually at the heart of what we need to deal with in all of these solutions.

So, to take it to a very practical point, in the case of our hypothetical large customer that wants to connect to the grid, our role is to work with them to architect an offering that may enable them to connect to that shared asset without any further expansion of investment base there simply by the way that their utilisation is optimised such that we are actually able to draw down on periods of underutilisation of assets. That is at the heart of our role. The future utility is very much about that very advanced asset management. In the past, we used to build electricity systems like they used to build Victorian-era bridges—so, massively oversize everything. Those days are gone. That is really what we are talking about here—squeezing the lemon for societal benefit.

Mr D.T. REDMAN: For an extension for a place like Esperance, Frank, you would recall the local IGA in Esperance, which is by no means an outlier in terms of a big user, paying the full-blown commercial rates and Ron was really feeling the pinch on power prices in a place like Esperance. You have got—what?—four gas-fired turbines or whatever it is down on the wharf there and a wind farm generating some into it. When you do move to your new distributed energy–related model, is that going to throw benefits into a group like an IGA?

Mr PATERSON: Can I speak to that directly, because I was just meeting with Ron, the owner of the IGA in Esperance, yesterday as it turns out, and this is exactly the discussion. As a member of the local chamber of commerce, I presented to their event yesterday. The basic message I was conveying to them is that it is our role to work with them, and I literally mentioned Ron from IGA. I said, “To work with local businesses to create a good-for-all electricity system.” In other words, we need to actually work with you such that we can bundle product offerings—solar, but not just solar; solar plus storage, plus demand response—so that at extreme peaks on the Esperance network,

Ron's refrigeration can drop back one degree and slightly cycle back their compressors such that his load profile drops, he gets a benefit on his immediate demand charges, society gets a benefit because we are actually not maxing out the system, if you like, and having to build more resource.

So, at the heart of this is literally, if I can put it this way on the question of the Ron-equivalent or the IGA-equivalent, how do we as a business get very sophisticated in matching what customers are trying to achieve—manage or drop their bills—what the shared electron infrastructure, the physics-based system, needs to do to stay operational and stay efficient, and how do we share those benefits in a fair way with the folks who do invest and the folks who cannot invest? It is that virtual cycle. That will not happen by osmosis; it actually requires intelligent architecture.

Mr TUDOR: If I can add, Esperance is not unique. We have got 40 of those systems. What we have done is the macro-modelling that I talked about, which predicts this highly distributed future, is one level of work. The next level of work, which Mike was referring to earlier, was blueprints. For any one of our towns, Esperance included, we have got this blueprint of how will Esperance, given what it currently has—the electricity infrastructure that is currently there—when do we actually have the opportunity to renegotiate a contract? Will that have any economic life in the wind or the solar turbines that are there? How might we progressively move to what is the most cost-effective solution over time, taking into account all of the constraints?

So we have a blueprint that we actually work up. People like Leyton and Donna in Esperance should be specifically talking to the local development people, the local shire and actually talking about as you look at your blueprint for Esperance in its entirety, here is how the power will change. The one thing that is really interesting about DER, and that is why there is a groundswell within Esperance wanting to look at DER solutions, is we have to try to come together with that because overnight you cannot say that this town will be better served by 50 per cent of the people taking out DER on 1 January, 2021, actually when our contract finishes, because people are going to be at different points in their life and capacity. So we have to work with the community to say, "This is where we want to get you; how can we get there? You are all going to move at different paths in terms of your financial capability et cetera." Meanwhile, we have to provide reliable electricity and maybe try to eke out the last bit of economic life in the turbines that are there and the wind that is there. The path of moving there gradually is very complex, because you are also moving with individuals that you want to make economic decisions to do things and you also, as Mark says, want to come back and make sure that that does not create inequity within the town of Esperance and also between people who are doing things in Esperance. It makes sense for them and, ultimately, the taxpayer, who is actually providing a subsidy either into Synergy or ourselves.

The CHAIR: I am just conscious that time is getting away. There are two topics that I did just want to cover off on. Firstly, Horizon Power has a multitude of different types of systems and we have focused very much on the distribution-grade systems—the small islanded systems. You obviously also operate the north west interconnected system. Parking regulatory issues, which we will come back to and I understand that Horizon Power is going through an access coverage process at the moment, are there any technical differences or could you maybe take us through on transmission systems the sorts of benefits that you perceive or challenges that you perceive from the emergence of microgrids? To pad that out just a little further, recognising that on transmission-grade systems, you have significant block loads, significant block generation, and a lot of these distributed resources are happening at the residential small-scale commercial load proportion, generation proportion relative to those systems.

[10.30 am]

Mr TUDOR: I was just going to say the Pilbara system is a great example of what is going to happen globally where you still have a requirement for large transmission lines. Particularly, one of the things that needs to happen in the Pilbara is that transmission lines need to be built out to connect all of that approximate generation that is currently underutilised—snap; that needs to happen. If we do that right as a state, we will not need to build any generation of a large scale there for many, many years even if there is an upturn in the mining sector.

On the other side, the towns of Karratha and Port Hedland are like any other towns that would benefit from the availability of solar. Bearing in mind that you can put this stuff in place in cyclonic areas, which I think you can, it is going to be a higher cost to get people to install this in places operating in some of these regional areas. In fact, we have just recently rolled out at a pilot level a solar offering in Karratha to try to kickstart that to understand whether there is going to be more take-up. It is important that people have choice and it is important for us to get the experience and maybe establish the installer base to actually work there.

Mr CURRO: If I can just add to that a little bit to that. Another way of looking at it is that as microgrids and as orchestration of DER at the residential levels takes peaks off those transmission systems, there is more and more there to be utilised by the industrial guys who really cannot do much about it, particularly in a place like Hedland where you have ship loading going on and loads going up and down. That is the transference of the technology that we are playing on the little grids into the bigger grids—the embedded microgrids. You can imagine it as two worlds: the microgrids which are self-sustaining and flatlining in terms of loads, and then you have the industrial loads that sit beside them.

The more you take away from those transmission lines, the less losses you have and the less power quality issues you have, and that translates to long rural networks that you would be familiar with, Terry. It is a very similar concept there. The physics are the same. We estimate that we would like to run those transmission networks in null points as much as you can because that is the most secure approach as well to account for any events that you might have. There are benefits from a total system management approach here.

Mr PATERSON: The best analogy, really, is that with the generation fleets for the nation transitioning from one end to 50 per cent at both ends, if you like, that is the nature of the transformation that we are dealing with. The more that you can optimise the bottom end of the system where customers are, whether they are residential, commercial, industrial or whatever, you can, if you like, modularise those in microgrids, all of those benefits accrue all the way up the value chain. It is a bit like a light bulb. If you change a traditional incandescent light bulb with a fluoro, all of those benefits actually multiply all the way back up the supply chain and provide societal optimisation.

The CHAIR: There are so many questions that just keep popping into my mind as we go on. One thing that I do particularly want to focus on and ask you about is the implications the transition in your business model will have on your workforce. You obviously have linesmen, engineers and retail staff—or contracting your call centre function or however you operate. I would really appreciate an understanding on what implications you see for your current workforce, what sorts of workforce planning measures you are putting in place and how you are assisting your workforce to transition to this new business model.

Mr TUDOR: It is a really important piece of work, which I think is going to be a long process for us. Part of what we are doing at the moment is what I would call baselining. We have a strategy. We know what our business model looks like, providing things do not change dramatically. We know the sorts of skills we are going to need into the future. We are setting up an organisation that is ready to deliver on that. The next level of work that we need to do, and we are doing, is looking at

the skills of almost every individual in the business and basically profiling them and having an individual conversation about where people are at this point in time in their lives and whether they want to invest in themselves to be relevant to this business or whether they are keen to actually just move on an retire, whatever it happens to be. That is a long-winded piece of work that we are involved in at the moment.

The first part is to have a strategy then to do the baseline on what skills you will have in the organisation. We are taking immediate action on some of the things that we are doing. Linespeople that we are recruiting across the regions at the moment, we are looking to see whether we can get people that are competent in doing lines work—traditional sort of work that a utility would do—plus also have an electrical qualification of the type that allows them to work on microgrid power systems, for example. We are already trying to build in some of that flexibility so that we are building it in as we move forward. That is a key piece of work that we do not have an answer to right now, but it is a plank of what we need to do to make sure that we are actually relevant and people see us as being relevant to our workforce.

The one thing I would say is that everything that we do has a focus on jobs and, more importantly, the multiplier for the state. We do helicopter up to the state level and attempt to put ourselves in your shoes and say, "How are things that we are doing helping the state overall in terms of directly or indirectly creating jobs through the actions that we take?" One of the things that we observe is that if we do things incrementally, we may lose significant opportunities. If we can aggregate some things and do things at scale, we might actually provide real competency in this state based on what we have currently got in this unique position and transition of the industry to create things that are valuable across the nation, if not broader. That actually leads to a real sustainable industry being developed. We are also going to be thinking about how we can work with people like CSIRO and some of the local universities to look at that economic impact from looking at things in different ways.

Mr S.K. L'ESTRANGE: On the job side, introducing new technologies and new ways of doing business can create structural unemployment. I note the point that you said by upskilling your linesmen to be able to do electrical work on the microgrids helps them transition from one role into another without therefore becoming structurally unemployed—I get that. With regard to microgrids and other forms of distribution and technology into the future, has there been a look at this in terms of outsourcing to the private sector so that you oversee that? Without a view to what the impact will be on the workforce, is there a view to just trying to get the cheapest best outcomes for the state?

Mr TUDOR: No, we have not gone to that stage. In fact, some of the things that we are doing have two angles to it. One is that we do want to create meaningful work for our own employees, without question. The second thing is that the microgrid world and people who might provide components to it do not exist. Terry made some observations about the existing pockets in the world but it does not readily exist. What we have at the moment it a cottage industry that is at different levels of capability and competency that exists in the state. One of the things that we are really, really mindful of is that as we move this way, we need to have the confidence of the customer with us. If we lose the confidence of the customer, we will go backwards at a rate of knots. With off-grid systems that we have deployed in Esperance—equally, Western Power has deployed in Ravensthorpe—we have been very mindful to make sure that they are backed by a utility guarantee. If any of these things that we do end up failing, it will reflect badly on all of us and people will then become disillusioned with the technology and we will not be able to move forward and we will lose and opportunity for moving and getting a lower cost to the overall system. We are very mindful of that.

The microgrid industry does not exist in this state in the way that we think about it at the moment. There are pockets of people who can do things—build solar farms; build a battery. The elegance of the microgrid, particularly in the way that we talk about them, is actually integrating all of that, making it work, being able to work with regulation and being able to work with pricing. You bring that together and then people can provide components into it whether they be multinationals or whether they be small local industry players, but the integration of that is all important.

Mr PATERSON: To your point as well, Frank, we, as a business, have outsourced many different elements of what we do through other strategic review process. Where you have existing mature markets that are able to provide credible services into our business, we have made very significant cost reductions to our business and therefore the customer or society. I think the point that we have discovered where you have an emerging industry or an industry that does not exist, and we have gone out to do deployments of, for example, off-grid solutions, at very best what we do is we have to take a vendor solution, which is designed for a completely different context, and significantly invest into that to get it anywhere near a utility grade offering.

I guess the societal question that arises is: is it actually viable for us, as an asset manager? That is, it is incumbent upon us to manage those assets well to leverage the benefits of our core competencies in a way that gives overall societal benefit. Does it make sense for us to hold by the hand specific private operators who do not have competency and actually essentially pay for them to upskill and basically hand over that IP in a way that provides no societal benefit back to the whole? It is a live question that we deal with every day, particularly in a space where there simply is no integrated service offering.

[10.40 am]

Mr Y. MUBARAKAI: I just have a question to ask with regard to some of the statements that have been made. I have to say that the input coming from Horizon with regard to what we are trying to achieve here has been extremely valuable for me. I do not know if it has been the same for other committee members—I am sure it has. The advice I seek from you at this point in time is: if you were given the opportunity right now, based on where you are right now, and if you had a crystal ball in front of you where you have experienced or you have seen what you are anticipating, what changes would you like to see the state make to the regulations and the legislations? Is there any particular advice that you have right now that you say —

The CHAIR: Yaz, can we park that because we have literally got three minutes before Western Power, and I reckon there is another two hours in that question. If we can just do that, because it is a huge question. It is one that we really do need to do in the second phase of the inquiry. Terry, have you got a quick one?

Mr D.T. REDMAN: Yes, just a quick one. Frank, one of the challenges for government, and I guess us, looking at the societal benefits is the jurisdiction of Horizon and the jurisdiction of Western Power. There is an interface there that meets on the fringe of grid areas. Horizon would argue that it is building up a level of technical evidence and its experience in other areas says that it could probably solve a range of solutions in there. Western Power would argue the same thing: "Just unlock the regulatory opportunities for us to have access and we'll deal with that." Any advice for the committee as to whether there is a structural way of managing that or is it simply a government decision with a line in the sand?

The CHAIR: We have two minutes left.

Mr TUDOR: Everything is changing. I believe nothing should be taken as gospel. The lines of demarcation that have been put in place 15 years ago where this was not actually thought about as

our future should equally be challenged like the regulatory framework, the pricing framework and the technology framework. I would argue that if I was sitting as a simple shareholder with three utilities, I would have one focused on microgrid, I would have one focused on large-scale centralised thermal generation in the SWIS and also a significant job in actually retiring and remediation of power station sites. The issue for Western Power is, really, I would ask the committee to go to New York and to California because the role of a distribution network business in a big city is going to change dramatically. Both of those jurisdictions have had a look at how it needs to change. You need to have some modelling work which looks at the end state.

One of the things that we are doing at the moment is reacting to kind of decisions on an incremental basis without an end state in mind. What does the end state look like? It does come down to the heart of the distribution business. It needs it to move from what it is currently doing to start to integrate planning for distributed energy. If you think about our past, it has all been sitting here, as a distribution operator seeing this stuff done to us. Now you want to get on the front foot and say, "How can we make it work for us?" Integrated planning becomes really critical.

The next level of that is to actually become the platform service provider that allows it to be implemented. This is where New York differs from California. New York has said that the distribution playout will actually become the platform service provider and that third parties will provide the DER. They will aggregate and they will actually work on top of the platform. In California, they have gone for a much more technically focused, utility-driven approach around DER. There are some real differences that need to be observed and you have to come back—my comment is: what does the end state look like?—and make your decisions in terms of the end state. I think it does not make a lot of sense to duplicate capacity in your three utilities. We will learn the same mistakes and we will duplicate. The taxpayer will bear the cost of the duplicated capacity.

Mr PATERSON: One simple —

The CHAIR: I really have to wrap it up because we have to be over the road at 12 o'clock or we will get shot. It is probably not much of a problem for us backbenchers, but for these opposition frontbenchers, I am sure we are keen to go. We will have you back at some point in the future and there is opportunity to make additional submissions to us in writing. 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 point, please include a supplementary submission for the committee's consideration when you return you are corrected transcript of evidence. Thank you.

Hearing concluded at 10.46 am

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