ECONOMICS AND INDUSTRY STANDING COMMITTEE

INQUIRY INTO MICROGRIDS AND ASSOCIATED TECHNOLOGIES IN WA

TRANSCRIPT OF EVIDENCE
TAKEN AT PERTH
WEDNESDAY, 17 OCTOBER 2018

SESSION TWO

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 10.05 am

Mr DAVID MARTIN
Managing Director, Power Ledger, examined;

Ms SARAH GRAHAM
Policy Analyst, Power Ledger, examined:

The CHAIR: On behalf of the committee, I would like to that you for agreeing to appear today for our hearing for the committee's inquiry into microgrids and associated technologies in WA. 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 is Yaz Mubarakai, member for Jandakot, and to my left is Deputy Chair, Sean L'Estrange, member for Churchlands; Stephen Price, member for Forrestfield; and Terry Redman, member for Warren–Blackwood. It is important that you understand that any deliberate misleading 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. Before we begin with our questions, do you have any questions about your attendance here today?

The WITNESSES: No.

The CHAIR: Would you like to make opening statements?

Mr Martin: Yes. I would like to introduce you to Power Ledger because I am pretty sure that of all the people that have spoken to the committee so far, ours is probably very novel technology. It is something outside of what you are expecting to get as part of the course of this inquiry. We would also like to present a slightly different view of the concept of a microgrid to the inquiry as well. Probably the best way to explain all of that is to go back to where Power Ledger came from and how we started.

Power Ledger was founded in May 2016 by a group of five individuals from blockchain and energy backgrounds, mostly with a view to resolving the challenge of what we would call "load defection" on the distribution network. As more and more consumers install solar panels and other distributed energy resources, the consumption through the main grid falls and, as a result, the cost of the grid increases for those people left behind.

At the time we formed Power Ledger, and probably the two years leading up to that, I was working in a consulting program for Western Power called their emerging technology strategic theme, which was a great project. We were running around the countryside looking at the connection of large-scale batteries, microgrids in various places, disconnecting customers for standalone power systems and those sorts of things. But the whole time we were doing that, seeing the price of energy storage fall and the incentive for consumers to stay connected to the grid falling with it.

As you get load defection, because of the way network tariffs work and network regulatory frameworks work, the consumers that are left behind are the ones that end up holding the bag for the rising cost of the network. Ultimately, they are the people who can least afford it, so it is the social end—the financially marginalised who cannot afford solar panels or who are renting or homeless—that are wearing the cost of energy or those sectors of the economy that are contributing greatly to the economy, but for whom PV and storage do not work at the moment—small, industrial or engineering workshops, those sorts of things. They are the guys that wear the brunt of the increasing cost of energy because the way network tariffs work.

In order to combat that, we started looking at how we might change the way consumers connected to the network. But from a business case or a conceptual model, it was too big a leap at the time for Western Power to work through while it is still working through the technology challenges, and so at the same time, I met my business partner, Jemma Green who is finishing her PhD at Curtin doing a piece of applied research into sustainable housing and looking at how you create a governance framework to support embedded energy generation and storage in sustainable housing—much like the WGV project in White Gum Valley.

Jemma was kind of looking at the flip side of the same problem that I was looking at: how do we turn a network into a trading platform rather than just a one-way flow of energy? We grappled with this challenge. We came across the technology blockchain and we looked at how blockchain might be able to support an array of very complex, multiparty, temporal transactions across the distribution network that reflect the way the energy system works today.

Historically, we have had a one-way flow of energy from a centralised power source, through a market, through a retailer, through networks and to a consumer, so we had a unidirectional flow of energy. But in the last five to 10 years, with the build-up of distributed renewables, mostly PV, in the market—and it is one in four households in Perth now and one in three in Adelaide and other parts, so a deeper penetration—we actually have a very different flow of energy across the grid with multiple parties involved at various stages to differing degrees.

In order to create a framework where we could have a series of reliable transactions between those parties and encourage them to stay connected to the grid by monetising their excess energy, we needed a technology that could deal with the complexity of those arrangements, and blockchain is the only thing that we have found so far that can deal with all of the multiparty transactions in a way that is trustless, immutable, secure, and transparent and gives us the ability to take all of those complex physical transactions and incorporate with them a financial transaction at the end and actually turn the grid into a trading network or a trading platform.

When I talk about changing the definition or applying another layer or lens to the definition of a microgrid, we would like to look at microgrids from an economic perspective. A microgrid does not need to be contained, isolated or immutable itself. It can be a dynamic system of consumers are a continuous part of the distribution network trading amongst themselves, and those consumers may change from one trading interval to the next. People may opt in and people may opt out. It is more of an economic model for a microgrid rather than a physical model for a microgrid that says it is a contained piece of the network with some generation and some consumers. That is, I guess, the additional layer we would like to add.

Power Ledger formed in May 2016, as I said. We were the first Australian company to undertake an ICO, an initial coin offering, and we threw some cryptocurrency into the mix to further complicate things. That went very successfully for us this time last year. It raised in the vicinity of $34 million, and on the back of that we have been able to take our technology internationally. We are running microgrid projects in Thailand at the moment of the nature of the one I have described, an economic microgrid, in the middle of Bangkok. We are working with a Japanese utility called KEPCO, the second largest utility in Japan, on a virtual power plant project in Osaka and we have a range of projects in North America on both sides of the country looking at peer-to-peer trading with a retail entity—peer-to-peer trading across the Northwestern University campus in Chicago and with Silicon Valley Power and the City of Santa Clara an energy generation validation and carbon trading project that supports their low carbon fuel substitution program in California. We have been able to take our technology internationally. We have been able to apply it to the same challenge that has been

seen internationally around the impact of distributed renewables and the creation of what we would call dynamic microgrids, from an economic perspective.

That is a lot to take in around a technology that is still in the very nascent stages of its development with the added complexity of cryptocurrencies. But, by and large, what we are suggesting is that a microgrid does not have to be a physical entity. It can also be an economic entity and it is important for the viability of distribution networks, particularly those like Western Power's distribution networks, that we find a way to encourage consumers to stay connected for the ability to increase the penetration of distributed renewables, but also to improve the economic viability of those grids and to contain the cost of energy for consumers who cannot participate in the DER economy.

The CHAIR: Fascinating. It is really great and encouraging to see the export of Western Australian IP to the world.

Mr Martin: To Silicon Valley, it is great.

The CHAIR: It is really exciting innovation and certainly one that we are really pleased to hear about. Dave, I am going to ask you, for the uninitiated, could you explain to us how the blockchain technology works with respect to energy accounting and how you would see the transactions taking place? It is a bit of a dark art. I would prefer to trade by carrier pigeon.

Mr Martin: It is probably easier, but not quite as fast as electrons. I should preface this by saying that of the people in my organisation, I am the energy guy with a background of nearly 20 years in energy both with Western Power and Horizon, and then consulting on both sides of the country. I am very much in the energy space. My view on blockchain as a technology is that there is lots of hype around what blockchain can and will do. But it is a very, very good tool for a very specific set of problems.

In energy, the problem we have now is that transactions are becoming much more complex than they ever were before. Blockchain is, in a sense, a distributed ledger to manage the complexity of those transactions by recording all of the physical elements of those transactions in virtually real-time in a transparent way that is immutable and not open to contest so that we can create an environment or a marketplace that does not require trust. We use blockchain, in our utilisation or the way we apply it, to read all the meters all the time—all the data around what is being produced by whom, when, where, through what is generating technology, at what price and then who consumed it, where, when, again, and at what price and how that energy was transmitted. All those physical components of that transaction are recorded into an immutable record that everybody who is involved in the transaction has access to and can see.

I can see that Dave generated a kilowatt hour at this point in time. It has been exported into the grid and his next door neighbour Sarah has a consumption at the same time. We know, through the laws of physics, that if Dave is pumping energy into the grid, the next closest point of demand is where that energy is being consumed. We know that it used a section of Western Power's network to get there. We know that we have agreed that Dave sells his energy for 20c and Sarah buys it for 25c and 5c goes to the network for the use on that part of the network. All of those physical components are recorded using smart contracts. An agreement around the use of the system and the price that we are prepared to pay each other or receive for that transaction is encapsulated in a smart contract, which is just a contract that executes itself when the physical components of the contract are satisfied. So Dave has excess generation. Sarah is prepared to buy it at a price. Sarah has the ability to pay it and the transaction occurs.

That is how we use the blockchain as a very clear record of all the physical components of an energy transaction. If you compare that to the way the wholesale market works now, meters are read

periodically—once every two months, all of that gross meter data is given to the wholesale market, somebody goes through the physical challenge of reconciling all those transactions and then settlement is achieved some months later. What we can do using blockchain is do all that settlement and reconciliation in real time. As the 30-minute market trading interval elapses, my energy is being consumed and Sarah is paying for it in real time. If we can reduce the lag around the payment of those transactions, we can reduce the risk of non-payment for those transactions and we speed up the whole process and reduce its intensity, so it is faster and there is less human intervention involved at the same time. That is basically what blockchain brings to the situation and why, as a technology, it has a really important and high-potential application in the energy market.

The CHAIR: So for it to function, you need access to real-time data?

Mr Martin: Virtually, yes.

The CHAIR: There are a few things a want to tease out. Firstly, I understand the concept that in an instant you know which energy is produced and consumed as a homogeneous product. If it is being injected at your place and Sarah is consuming it at the same time and you are using a little bit of the network to do that, I can understand that. But the rest of the network needs to be there to facilitate that transaction happening.

In a past life, dealing with the Dampier to Bunbury pipeline, when we got down near the metro area with new gas sources coming in, delivering gas loads a few kilometres down the road, one of the arguments that was always made was: I should only pay for the little bit of the pipeline that I use to put my gas in, transport it down and extract from. But the rest of the Dampier to Bunbury pipeline needed to be there in order for that service to exist. Presumably, you have not just got a skinny little electricity wire running from your place to Sarah's place. How do you, in this construct, recover the cost or recognise the value for the rest of the network being there?

Mr Martin: Yes, a really good point. I guess the difference between the Dampier to Bunbury pipeline example and the Western Power network, or South West Interconnected System, is that I cannot create my own gas easily. I can now create my own electricity. We are in an environment where the network is no longer a monopoly asset. We treat it like one. It is the only poles and wire asset in the street, but it is no longer a monopoly asset. If I can put PV on my roof and create my own energy, I have alternatives, and those alternatives are getting cheaper and more people are accessing them, and storage will round that out really well. We are in a period where we have some decisions to make around how we see the future of that network.

If the future of the network is that fewer people access it and the people that are left behind pay more and more, then that is the decision and the challenge that we have to deal with. If we want to maintain the viability of that network and switch the mode of managing or pricing the network from a regulated monopoly asset to something more akin to a typical competitive asset, instead of charging for the asset on the basis of if its peak carrying capacity, we should be charging for the use of that asset around its utilisation. We should be seeking ways to improve the utilisation of the network. I think for a period of time our networks are going to have to look at a period of under-recovery. I do not think we will get to a point where we need to write-off the value of the assets—that is a kind of doomsday approach—but we do have an opportunity to see the network very differently and we do have the opportunity to improve the utilisation of the network by creating greater capability for low-cost and zero-carbon energy to be a mainstay or a bigger component of our energy mix.

That is a very longwinded way of saying that if we discount access to the network for a period of time and we do encourage the introduction of more renewable sources at a distributed level where the load is, so putting the generation where the load is and using less of the network as you

described, we can improve the utilisation of the network. For the last 10 years we have been telling customers to beat the peak. Consumers do not know what that means. All they hear is "use less energy" and with the prices going up, they need to use less energy. We tell them it is carbon intensive and they need to use less energy, so we are driving down the utilisation of the grid and making the grid more expensive.

If we can take our foot off the hose and say that this stuff contributes to your standard of living and it contributes to your economy and it has zero carbon and it is low cost, we take the foot of the hose and you can use more of it. If we change the way that we charge for access to the grid, we can start to improve utilisation, reduce our investment requirement, put that investment opportunity into the hands of consumers, then we can address capacity once rather than centralised generation and network capacity, and we can start to change the economic nature of the energy system.

The CHAIR: So what change is needed then to the way that the utilisation of the grid is paid for? Presumably we are talking about some form of tariff reform. To encourage what you say needs to happen, what changes need to be made?

Mr Martin: We need to change the way consumers pay for their access to the grid. There are multiple ways of doing that. We could simply discount the cost in a peer-to-peer trading environment by taking out the transmission charges or creating a distribution tariff that is reflective of the amount of the distribution network that has been used.

The CHAIR: If you take out the transmission tariff, though, does the transmission network still need to be there to facilitate—let us be very careful here. There is a value in a meshed network context—let me be very clear, let us remove the regions from the picture for the moment. Let us just say we are talking about the meshed part of the network here. There are still transmission assets that are located there. There is still a service that those transmission assets are providing to distribution connected customers. Removing the ability to recover the cost for those transition assets, though, is presumably very problematic. There still needs to be some recognition of the value that those transmission assets provide.

Mr Martin: Absolutely, and I think while you are in an environment where consumers have no choice, you can take that luxury. You can sit back as a regulated network business and go, "I don't care what they do. I can just recover the cost of my network." That is what has happened for the last 40-odd years, but when a customer has choice and the ability to get off the grid —

The CHAIR: So you think complete grid defection, in Cottesloe or Osborne Park, people just completely disconnecting?

Mr Martin: Yes, why not? In places like White Gum Valley, some of the developments we are seeing there and the WGV project is showing that those developments can be 97 per cent self-sufficient now.

The CHAIR: But the cost of that three per cent—I do not mean to hammer you on it, Dave.

Mr Martin: No, I am glad you are!

The CHAIR: It all sounds lovely, but there are some very big assumptions made here about prospects and costs of complete grid connection. That last 3%—everybody says it is 97%, but that last 3% is extraordinarily valuable and extraordinarily costly to provide. The supply security for that last 3% is provided by the grid and it has a value. In order to move from that 97% to the 99.–whatever per cent that the grid provides is an extraordinary amount of additional incremental cost if you choose to defect from the grid. I guess I just want to really test this, Dave.

Mr Martin: I think it has been an extraordinary additional cost, but it is becoming less of an extraordinary additional cost. It discounts a whole range of other opportunities and secondary markets that will emerge over the next five years or so. The price of PV continues to fall. The price of storage is falling at the same rate that PV has fallen over the last 10 years. So we are seeing that that additional 3% is getting cheaper and cheaper to install. The pressure around reduction in carbon emissions is growing and, no disrespect to anybody here, but from a political perspective, we are not seeing a lot of pressure in that area, but consumers are taking that view.

The CHAIR: I can only agree!

Mr Martin: I am not pointing fingers at anybody here; it is a global thing. We are talking about secondary markets. Who imagined five years ago Uber having the impact that Uber is having? But imagine if I could whistle up an electric Uber and say, "That 3%, I didn't want to spend an extra $5,000 at the time putting on another four solar panels and another five kilowatt-hours of energy but I'm happy to spend 50 bucks on 12 kilowatt-hours of energy today for you to come and flash charge my PV." They are the sorts of challenges we are seeing or the opportunities that will emerge over the next five years.

When we make investments in distributed networks, networks generally or the traditional power system, we do not make investments for five years; we make 40, 50, or 60-year investments. Look at the rate of change we are seeing in the energy system now. We know that virtually every investment that we make in the continuation of a centralised system now is potentially stranded. Before we even start putting in development applications for a new substation, we may not ever need it. We might be doing work now to increase the carrying capacity of a substation in an area like Cockburn—wherever it is—where we are still seeing some level of growth, which in five years' time will be met by those consumers themselves.

What I am saying is that we cannot be looking at our prospects today on the basis of what we have been able to do for the last 50 years. Everything is changing and it is changing faster than it ever has in the energy industry. But we still have this pace of change in the regulatory framework or in the policy framework that is consistent with the way we had to operate energy systems 20 years ago. They had to be slow and they had to be certain because they were expensive and, as a commodity, killed people. You did not want to muck around but we do not have that freedom now. We do not have that flexibility to sit back and think about it and think about it and think about it because consumers are making those decisions for us.

The technology is changing out from under our feet and, for as long as you can strand a centralised asset by putting a power generator and a battery on your roof or in your garage, all of those assets are at risk. So we need to think very carefully about how we manage and how we even consider how we are going to recover the cost of the assets that we have on the ground now.

The reason we started Power Ledger in the first place was so that we could preserve the value of the existing system, not because we love Western Power—we do—but because the people who rely on those networks are my kids and your kids. They are the small business owners that live in our communities. They require, and the environment requires, the benefits that come from the diversification of demand that you can manage when you have a grid.

Everything we are doing at the moment is actually putting that grid under more and more pressure because we are allowing consumers and secondary markets to emerge to say things like, "We're one step off the grid" or, "It's good to get off the grid." That is the last message that we want to be putting into the community. We want people to stay connected to the grid but we want to do it in a way that is incentivising for them, not a penalty. We do not want to sit there and say, "It's a fixed price. You can't go anywhere. You have to pay for it" because then we will reduce the incentive to

put distributed renewables into the system. There is a balance that says, "Install it; in fact, install more than you need" and then you can monetise your excess by selling to your neighbour who cannot afford it.

The CHAIR: I have one more question, then I will throw it to my colleagues. The recognition of putting the existing assets at risk from a trading financial debt by all disconnections perspective is one thing; operating risk is something that has also been put to us. Is the model that you are proposing or speaking to us about today primarily about accounting and trading for financial services or a financial clearing house as opposed to some sort of operating platform that dispatches distributed energy resources and presents to the network or an operator, or operates itself? Tell me about the operations.

Mr Martin: It is exactly that. Smart grid technologies have been around for probably 20 years but they have not proliferated because they are just too expensive. Traditionally, to build a smart grid, the network operator would have to install generation and storage and switches and inverter technologies and sensors and all those sorts of things. For the incremental benefit you get from doing that, in terms of reliability, there is just no value in it so no regulator in the world would let you do it. It is great technology and the technology has been around for a long time.

Now, consumers are doing that heavy lifting. Consumers are installing the generators and the batteries and the sensors and the inverter technologies but we still have no way of orchestrating the behaviours of those assets because we do not have that clearing house. The thing that is still missing is the ability to say that Ms Shaw has a battery that she would be quite happy to allow us to use to manage voltage or frequency, or any of the value stack that a battery can provide, if only we can pay her for it. Because if we do not pay her for it, she is going to say, "Thanks very much, but I'll look after myself."

The CHAIR: But dispatch it as well?

Mr Martin: Those technologies are there.

The CHAIR: Let us just part with the monetisation of the value streams and that is an issue we have been pursuing. We can move on to that, but let us focus at the moment on dispatchability and operations. Is your platform—No, so you are assuming, then, that either the consumer themselves is going to proactively sit there and work out when to switch things on or off, or is that being operated by someone else? How do you then determine merit order? What is the interface between, essentially, your financial clearing platform and an operation of the network supply reliability security–type?

Mr Martin: There are dozens of those technologies. There are some brilliant technologies in Australia.

The CHAIR: But who is doing it? Are you doing it?

Mr Martin: No, we are not. We took the view that there are lots of clever people playing in that space. We have probably met with most of them. Everyone from AVB through to Schneider, through to GreenSync on the east coast, Reposit—all of those guys and they have technologies that will orchestrate those assets. It will bring in a cluster of assets and create a virtual power plant kind of model.

The CHAIR: You are just clearing the financial transactions?

Mr Martin: I would not say "just" clearing.

Mr D.T. REDMAN: They still plug their own algorithm into it, do they?

Mr Martin: Yes; an algorithm that meets the needs of whichever entity needs those needs being met. I will explain what I mean and why we are not just a clearing house. Typically, if you put a battery in the grid and you say to the network operator, "If voltage starts to drop in my area and you need to inject some energy into the grid, I'll let you do that." That is the only service you can provide. If you are under a traditional contractual arrangement and if I agree that we are going to do peer-to-peer trading, that is it.

We can only really do peer-to-peer trading. Using a modern technology like smart contracts and the ability to switch between multiple actors in the trading arrangement under multiple operating conditions, we can create a series of smart contracts that say, 90% of the time, everything works beautifully, and it is just that we have some excess energy that we are happy to trade amongst ourselves. When it is really, really sunny and there is an excess of solar, then the network really needs me to operate my battery in a way that helps manage voltage. So for that 5% of the time, "Thanks, that was fun, but I'm going to switch to this transaction now."

We have parties there that are already in a transaction under a prioritised basis with agreed contractual terms and those contracts execute themselves. Then all of a sudden we have a problem in the grid and we actually need the network to do some self-healing right at the other end of the spectrum. It does not matter what we are doing for each other now, because if we do not operate the grid in order to keep the lights on, it does not matter what we are doing with voltage, so we will step out of that priority into this priority. Now I have a different contractual arrangement with the network operator. I think the role of aggregating all of those value opportunities for distributed energy resources is not the key to this. Nobody wants to sit there and access buy and sell prices. We are not energy traders.

The CHAIR: Absolutely.

Mr Martin: But the role of the retailer—the existing retail model, which will have to evolve as well—is probably going to evolve into something like that, because they are well placed to understand what value is available to an orchestrated set of DER and then how to package that value into a set of contractual terms and offer it to a customer base. So it is not just a clearinghouse, but it is a clearinghouse. It is not the consumers that are going to be doing this. It will be as invisible as pushing a button on your phone to call a taxi. There will be people out there like the Synergys of the world, the Origins or the AGLs, who are all looking at VPPs and they are all looking at what their business models need to be into the future that will provide those levels of services.

The CHAIR: Would demand response come into this model as well?

Mr Martin: Absolutely. I think as the energy system changes and as storage becomes more of a permanent part or an important part of the grid, demand response will change its nature as well. Imagine a day—and I am not talking in five years' time; I am talking 10, maybe 20—when we have got enough non-dispatchable generation and enough storage in the system that we can manage demand very, very flexibly. Demand-side management becomes a very different beast then.

What we are talking about is stepping away from constraints and that kind of constrained mentality to the very open-growth mentality around: this stuff is cheap, it has zero carbon impact, it improves your lifestyle and your contribution to the economy. Use more of it. That is where the networks then start to say, "Hang on, that is where the value proposition is for me now, not charging enough to cover my peak investment, which we have done forever. It is charging enough to be able to optimise the performance of my assets."

The CHAIR: If you just got your tariff settings right, though, and the right signals were being sent through to end users and you had a network operator there with the capacity to dispatch the assets

according to the most economically efficient solution, does that solve the problem without going through the establishment of a complex trading platform?

Mr Martin: I do not think you can get to a point of being able to dispatch assets, because you are dispatching them for various purposes that have different levels of value, without having some kind of clearance mechanism, some sort of transparent trading platform that says, "I will pay you what you think it is worth to use your assets to provide a particular service."

The CHAIR: I will hand over to my colleagues because I am questioning too much. Go for it, Terry.

Mr D.T. REDMAN: We have had a number of presentations, obviously, going through this fantastic inquiry, but we have had some sort of futurist visions about what level of uptake there is likely to be, particularly with electric vehicles, and some very aggressive pathways for that. We can see that is flowing out in the lithium price now. We have had presentations about the challenges with the network, particularly around ancillary services, which are not priced into it now, and the disruptive behaviour of PVs as they come on to the system messing up that. So, we have quite a broad spectrum of sort of views to look at it. I do struggle with the argument about—to me, the network is an essential piece of kit.

I think you have reflected that, but you are talking about the fact that people have a choice to go off and it is probably not measuring what I am seeing as an essential piece of kit in the new world, because, at the end of the day, you are still going to have to move electrons around to get the most value out of opportunities. You also have the industrial space there. It is not just someone's household. It is an industrial level as well, which requires big needs, in some cases, in isolated areas. You also have security and diversity where we have wind assets in certain parts of the state, which is much better, and time-of-day issues come into play.

How applicable is what you are bringing to the table here, which I am seeing at a White Gum Valley level, to a broader industrial and Western Australian landscape, including the regions?

Mr Martin: I think the challenge is not look at our system as a single system anymore. We always say that this challenge now is not a technology challenge. The technology is rapidly changing and will manage itself. There are plenty of brilliant minds dealing with the challenges of how you manage voltage. As broadly deployed as PV is now, I am not seeing too many detrimental impacts on the distribution network as a result of it. They are manageable. The challenge we face now is a cognitive one. We have always looked at this system as a single system and we have always looked at the need for having some kind of centralised control and centralised planning. We have looked at frequency as if it is a total system problem.

Now, the opportunity that sits in front of us is we can actually crunch that down into discrete regions. We can make systems smaller. So, instead of relying on a big centralised plant to provide inertia and frequency with control, we can look at a smaller system, down to even a smaller system as a White Gum Valley–type dynamic and manage those things with power electronics in a localised system. So, I think we are not talking about flicking a switch and this being a reality tomorrow. We are talking about this being the thing that occurs in the energy system over the next 20 years, over a period of time. Over that period of time, the opportunity for self-generation for industrial customers will improve. PV and other technologies will get more efficient and lower cost. So we will move to a point where the network will continue to provide value, so long as we can continue to provide an incentive for consumers to stay connected to it.

If you look at Western Power's modelling, you will see that where there are intensive energy consumption zones, it makes more sense to keep people connected and to manage diversity through the use of the network, because it is an important asset. It is an important social asset as

well. But then, as you get out into those regions, then looking at those regions probably in isolation—dynamic isolation is probably a better way to look at how you manage the possibilities of new technologies and the need to maintain the value of those existing assets.

It is really tempting to sit back and kind of apply the logic and the controlled thinking and the system planning thinking that we have had for the last 50 or 60 years on an emerging marketplace, but that emerging marketplace is changing so rapidly that you cannot just think about it in terms of new technologies. You have to think about it in terms of new planning paradigms and operating paradigms and new economic paradigms. It is a fundamentally new space we are heading into.

The CHAIR: I just want to pick something up quickly. You talked about retaining an incentive for customers to stay connected and the ability to demonstrate the value to them in doing that. There is also a cost associated with them installing these new technologies, and the cost is being picked up by traditional assets that are also connected to the grid. So, traditional generation sources in particular are providing things now far more frequently and are being required to change their operating modes to cover the hidden cost of these distributed energy resources. So, thermal plants being asked to provide things like VAR support, flexibility, a whole range of ancillary services that currently are not defined as such, valued as such or remunerated as such.

I would welcome your views on ensuring that the right signals are retained to encourage, incentivise those guys to stay connected and continue to provide those things as complementary technologies to these distributed energy resources and the role of this sort of platform, or trading or clearinghouse or however we want to call it, in facilitating that.

Mr Martin: Yes. I think we need to step back and rethink this system from its bootstraps. So, it is not just about looking at capacity price in the wholesale market; it is kind of a fixation. We need to look at the system as a system now. I think one of the unforeseen consequences of the reform program that we have gone through in Western Australia over the last 15 or 20 years is that when we created the Public Utilities Office, away from the old Office of Energy, we started looking at utilities in isolation. Whether it was intentional or accidental, we have lost this ability to see our system as a system now, as a physical system, as an economic system, as an environmental system. That is where we need to step back to. We need to look at all these things from the ground up. It is not just us. This is happening around the world. We just got a view into the future probably earlier than most people, because of the penetration of DER that we are seeing now.

So, I think you are absolutely right. I guess I talk about our technology as a transitional technology. It is about the transaction of value and it is about making sure that we can evolve to a new distributed system, rather than a distributed system emerging in front of us like it did with taxis. So, all of a sudden, Uber is sitting there and what are we doing with the taxi industry? We will see the same disruption occur. So, Power Ledger is not talking about disrupting the industry. We are talking about industry being disrupted already because the price signals are already there for disruption.

All of a sudden Rita is sitting there and, “Oh, what are we doing with the taxi industry?” We will see the same disruption occur. Power Ledger is not talking about disrupting the industry; we are talking about the industry being disrupted already, because the price signals are already there for disruption. If customers are going to continue to go down the path of supplying and storing their own energy, how do we turn that around? What price signals do we put into the market? My view is that initially it is going to have to be some kind of prudent discounting of network access. The existing regulatory frameworks already consider that. We presented to the AER, the ACCC, the ERA and the AEMC about four weeks ago in Melbourne in their offices. We teleconferenced around with all of their offices around the country. Right at the end of the conversation is really where we got to

prudent discounting for a period of time that allows us to integrate those distributed technologies in a way that keeps them integrated rather than disintegrated.

The CHAIR: But recognises the costs that they cause the system to incur.

Mr Martin: Absolutely.

The CHAIR: We have to focus on this because the first phase of our inquiry very much focused on the benefits and, quite clearly, in terms of increasingly on the fringe of the grid, the cost benefits, the carbon mitigation opportunities, a meaningful response to climate change, which people are demanding. But there are costs and these assets are causing traditional thermal generation plants to be dispatched differently, to operate differently. Those costs are not recoverable. They are being borne by the asset operators themselves in terms of increased starts for different types of traditional technologies that were never designed to start-stop, start-stop to counteract an incredibly volatile—the amplitude of the peaks we are seeing on account of the increased penetration of PV in particular.

There are consequences and costs that are currently being hidden but borne and that are not being borne by the causes of those costs. We need, from a system perspective, the services in terms of voltage control, VAR support—all these things that these traditional thermal units provide. If they went off the system tomorrow, DER would not be able to support the whole system as it currently exists. Ensuring that the incentive to stay, not only to encourage these technologies to come on, but old technologies to remain connected and continue to do the things that we have just been taking for granted—I guess I want to understand in this platform and in this valuation and monetisation model that you are speaking of, how we continue to ensure that things we have taken for granted and have been provided for free and things that are now being done at increased cost because of these new technologies, how that plays out.

Mr Martin: I agree with you 100%. I think a platform like ours allows you to disaggregate all of those costs and, in a very clear and transparent way, allocate value between all the participants in that environment. I would say, though, that we need to look at the impact to DER not just in the short term and not just on the basis of what DER can do today because what DER can do today and what DER can do in five years' time will be fundamentally different. From a system perspective, maybe not—maybe all of the PV systems and batteries in Perth in five years' time are not going to keep the system running, but it might keep my house running and that is the thing we need to be cautious of.

We need to keep a system as a system because it allows us to diversify risk. It allows us to optimise the diversity of demand and keep our investment profiles down. The other benefits of diversifying the risk of investment by giving a thousand customers the chance to spend $5,000 rather than a $5 million singular investment in a substation—that benefit needs to be looked at as well. I think there is a period of time when we will need to work these things through, but working them through with a view of they are fixed so we need to get them right now is pointless because it will all change so steadily for the next five years.

I do not know what the answer is in terms of where the price goes, who pays what for what—that will all change. What I do know is that if we do not get it right—if we do not get the incentives right for consumers to stay connected to the grid, then we will lose the massive value that the grid presents for large loads, for distributed wind farms—whatever it is—and for consumers themselves, because it is getting cheaper and cheaper and easier and easier to get off the grid. That is an end state that none of us can live with. What is Western Power worth—$12 billion? That is what is at risk.

The CHAIR: Allegedly.

Mr Martin: Allegedly. They rebuilt very big chunks of it recently.

Mr S.J. PRICE: According to others.

In your second submission, you talk about the RENeW Nexus in Fremantle. You then also point out some, I suppose, errors that might need consideration for change, including third-party access and the advanced metering infrastructure. How is the peer-to-peer trading and everything going to be set up in the trial? I know you can do a trial to try to get around some of the limitations.

Mr Martin: I was just thinking before I probably should point out what we are doing with RENeW Nexus because it actually is a good case in point. I should say from the outset that Western Power and Synergy have been involved in that project and their engagement and their conduct has been first-rate. They have been really supportive of the concept of peer-to-peer trading in the way that we are proposing it and really interested to find out how, from their perspective, they can incentivise consumers to stay connected, so it has been brilliant. We are looking at, for that purpose, a bespoke tariff arrangement for the consumers that are involved, so a different type of tariff. It has not been determined what the level of that tariff will be, but it will probably be something like a subscription fee, where a customer will pay for the ability to stay connected to a grid—a monthly fixed fee—and then trade energy or consume energy purely on the basis of the value of the energy. That is one option there.

To get around some of the regulatory challenges and the legislative challenges that sit in place around the transfer of data, we are doing things in a very manual way in managing the data flows between the customers' meters, Synergy and us, so there is a bit of paralleling going on. But it really is, at this stage, a matter of understanding what incentive can we give to the consumer to maintain their access to the grid? How can we give them access to renewable energies to encourage the increased or continued penetration of distributed PV systems? Then through the manual management of all of that system and its integration with the market, what changes do we need to bring back to the table at a regulatory or legislative level around metering data flows, market rules—those sorts of things—in order to make what we think will demonstrate value to the consumer and to the grid and to Synergy a reality in a scalable way?

Ms Graham: I will just add to that as well. I think whatever the tariff arrangements end up being finalised as, because we are dealing with different houses with different sized PV arrays and houses with different load profiles, it might be that not all of them are suitable for the specific terms of the tariffs we decide on. I think that in itself should not be a thing which defers continued interest in this sort of project. I think it is really important to show what does work for certain people and what does not work for certain people. I think this is a really valuable thing about Synergy and Western Power proposing an arrangement which might be really good for some and then in the future we can determine an even better arrangement for the next cohort of people.

Mr D.T. REDMAN: You used the word "incentives". There has been a bit of commentary in the media in the last couple of days about how much penetration there is in WA compared to other states and supposedly we are behind the play. I have had people talk to me in the renewal energy space, saying, "You need to ensure that every new house that's built has a solar PV and also a battery as incentives to hook up a level of connectivity in the renewable space." Your discussions are a bit different. You are talking about incentives about being part of the grid. Have I read that right? If you are talking about incentives, what is the nature of those incentives and, if we were to have a recommendation that reflected incentivising something that led you to the vision of where we would like to see things land, what would they be?

Mr Martin: You are absolutely right. We are about staying connected to the grid—not disconnecting. Those proposed policies around every new house has to have enough PV and storage to be self-sufficient are disastrous. They are an additional investment in distributed capacity that is just duplicating the amount of investment that is already there. It is not recognising the fact that if I have got five kilowatts of solar on my roof, I will probably only use 50% of that. The other 50% goes to the grid. The guy next door to me has got the same amount of PV on his roof and he is at work as well. Where is his energy going?

You need to kind of get to an economically efficient deployment of distributed renewables. That is where you get tacked to the incentive programs. How do we provide a price signal to the market that says, "Your five kilowatts of storage—actually you've got enough roof space for seven. Why don't you install seven and spill that into the grid?" Instead of getting 6c from Synergy, which is really just incentivising you to install a battery in the garage and look after yourself, what if you can get twice that from the guy next door and still pay for the grid that you are using and still pay for some of the ancillary services that the broader market is paying? It is about getting to a point where you actually get an efficiently developed or deployed energy system when you have got no way of centrally controlling it anymore.

We have got a project underway in Japan with KEPCO, and they were introduced to us by Austrade. They came to our office at about four o'clock one afternoon and they were only supposed to be there for an hour. Two and a half hours later we had to kick them out the door because we wanted to go home. The head of the delegation that was there used to be KEPCO's head of network planning. He kept coming back to this point of, "How does this work, because it needs to be centrally controlled, it needs to be centrally planned, it needs to be operated and managed?" We have lost the opportunity to do that; that horse has bolted.

The only way—probably not the only way, but the best way we can get that sort of level of control back and maintain power system quality, minimise the level of investment in the grid, is to put the price signals into the market, the incentives into the market, to say, "You've made an investment in distributed capacity. If you put a battery in there as well, it means we haven't had to install extra network to meet your need and extra centralised generation. You've contributed to the system."

Well, how do you reward somebody for being a part of a system? We talk about how do you make sure that those thermal generators are getting rewarded for the service that they provide. How does that consumer get rewarded for the services that they could provide, because if we do not do that, they will only provide those services to themselves and we get that fracturing of a system. Incentives are part price; they are part community based. A lot of the people who want to be involved in the RENeW Nexus like the idea of contributing to their local community and being able to help the guy next door. A lot of people said, "Well, what if I want to supply my mum down the road with free electricity? How can I do that as well?" There is a whole lot that comes into it, not just the price of energy or a day ahead forecast on what pricing for a particular asset might be in a cost stack. That has changed.

The CHAIR: That is a really nice segue to a question that I have about recognising the fact that the community has also paid for, and continues to pay for, these network assets, and lifetimes have been spent investing in and paying for these things. Some people can afford to install distributed energy, some cannot, but we all continue to pay for the system and for the impacts of these distributed energy resources. In your first submission you talk about one of the applications of PTP energy trading being benefits for people who cannot afford solar, for people who are renting and socioeconomically disadvantaged people. Could you expand on that, because the social implications

and ensuring that everyone shares in the benefits of these technologies because everyone has paid for the platform that facilitates them is a really important part of this overall debate?

Mr Martin: Absolutely. That really is what was at the heart of that concern for the grid—not necessarily for the grid, but for the people who rely on it. If I am, at the moment, a customer of Synergy, I might put up five kilowatts because that is as much as I can put on and know that I can still get access to a feed-in tariff. I look after myself for the main part. I get 6c or whatever the feeding tariff is from Synergy now, and as soon as batteries get to a point where the up-front cost is palatable, I install it and then I disappear and then I do not pay for that grid.

But if I am encouraged to install as much as my roof can take, so I can afford it, I can put seven kilowatts on my roof and I can produce 60% of all of it—it is 60% of my production goes into the grid, not 40%—and I can make that energy available to my next door neighbour at a discounted price because it is only using that section of the distribution network, then I can give him or her access to low-carbon, low-cost energy in a way that he could not participate in before. It helps bring down the average unit cost of energy—similarly in apartment buildings.

The CHAIR: But the single mum in Ellenbrook with three kids, just running around trying to get her kids to school every day and she is living in an energy inefficient rented property, she does not have the smarts to sit there and talk to the guy who lives down the road, who she probably has not even spoken to, who has the seven kilowatt system, how is she accessing the benefits of this? Is she really going to say, "I want to participate in a trading platform"? Realistically, how do we ensure that everybody benefits?

Mr Martin: We call that the role of the application host. Look at it in terms of an imbedded network or an apartment building, and we have a strata manager that manages all of the utility services. Your strata manager will go to Synergy or Perth Energy or someone and get a contract of energy supply, make sure all the internal meters are read and pass the price through. We have a role in our platform called an application host that brings a group together—so your single mum in Ellenbrook and the guy a couple of kilometres down the road, or maybe only 500 metres down the road—into the same trading environment. We like to keep it local.

It makes sense to keep the generation where your demand is. That is how we can justify the reduction in network pricing, because it is co-located generation with demand. The application host will bring those into the same loop. There is no need—you do not have to become a day trader for electricity; you do not have to see buy and sell prices. You become a participant in trading—like a Facebook group, if you like. You sit there and you are a member of that group. You agree that the terms of the contract are that if Dave has got some excess energy and you have got coincident demand, he is happy to sell it to you at a particular price if you are happy to pay for it—it happens. There is no involvement. There is no manual involvement.

The CHAIR: But if you are a pensioner on a fixed income—you know, we all find energy absolutely fascinating, and we are right in there and we geek out on it and the idea of sitting there on a phone with an app and doing some—that sounds great. But your average Joe just wants to flick the light on and know that the energy is going to be there when they need it and that they are not being ripped off when they pay for it—that they are paying a reasonable, at least hopefully, lease cost for that electricity. I mean, there are things that engineers and commercial types and us energy people can get really, really excited about that your average Joe really does not care about.

I guess I am really trying to think of how you engage consumers and how you ensure that the person who is not IT literate—some people in my electorate do not have Facebook. They do not even correspond by email. They are traditional. I get handwritten letters, and they are the people that really are most vulnerable, have spent lifetimes paying for these assets, cannot participate in these

sorts of funky structures, but deserve, nonetheless, a benefit. How do we ensure that they receive it too?

Mr Martin: Our very first trial in Western Australia was at National Lifestyle Villages in Busselton with a group of 15 retirees, so exactly the sort of people you are talking about. There was a diversity in those. Some of them had PVs; some of them did not. Some of them were really interested; some of them went, "Yes, I'll participate." The single common factor was that they wanted certainty. They wanted to know that if they were injecting energy into the grid, they were going to get a fair price for it, and if they were buying energy from the grid, they got access to the cheapest energy available to them. That was the premise we went to them with, not, "You have to sit there and pull this lever."

We enrolled you into the platform and that was it. We had access to your meter data in the same way a retailer now has access to your meter. I am sure most of your electorate has an electricity account. It is as simple as that. You are enrolled into the platform and you participate in the platform. Ultimately, we would love to get it to a point where consumers can prepay their electricity, so we can reduce the risk of the whole transaction even further and take the cost of that risk management out of the system as well, so that you can prepay your electricity in whatever chunk you like, how frequently you like, and know that you can continue to participate in that system simply by having a—I do not know—direct debit kind of account, in the same way you do now, and you do not have to think about it again. You are getting access to cheap —

The CHAIR: Is someone managing the portfolio then? Is someone then managing —

Mr Martin: Over time it becomes an autonomous platform. In the same way you are now relying on Synergy to manage all of that, read all the bills, do all of those sorts of things, using a technology like blockchain, IoT and distributed smart meters, that can become an autonomous platform. But in an apartment building kind of scenario, we are giving the strata manager the ability to pull those strings and bring those groups together. It is what we are doing in Thailand. In Thailand we have nine buildings, and about 850 kilowatts of solar distributed across those buildings. There are a couple of school buildings, an international school, a shopping mall, a dental hospital and a high-rise apartment building. Everybody in that high rise apartment building now is locked out of the DER market in the same way they are here. If you are above five stories, you do not have the roof space to make any meaningful difference.

But they are able to buy energy from the school when the kids are not there—during the school holidays, on the weekend—because the diversity and demand in that dynamic microcosm means that there is excess renewable energy being pushed into the grid at a time when they can access it. That is how you encourage a broader array of the community—the socially, financially marginalised—into a system that otherwise excludes them. Anyone who comes to you and says we should be tearing the network down or replacing the network with something else, or permanently devaluing the network in some way, take that with a grain of salt.

The basis of what we are talking about is the importance of a network to keep people connected so that those that do not have the ability to participate in it themselves, if they are renting or if they just cannot afford it—take my house, for instance; the roof is completely the wrong shape but my neighbour has five kilowatts of solar on his roof. His kids have all grown up. He runs the post office down in South Lake, I think, so he is never at home. All of his energy is going straight to the mini pillar that we share in the middle of our verge and my kids are home and we are consuming the energy. Where is the energy coming from? Instead of Rod coming home going, "No, I am sick to death of getting paid 6c for all this energy I am putting back into the grid and then buying it back at 28, 29, 30 or 34c over time", his incentive is just to stick a battery in. That is what we need to avoid.

I cannot tell you what the right answer is in terms of all the price signals or all the price points for all the points.

The CHAIR: That is a shame. It would make our job easier!

Mr Martin: If somebody was looking at it, we could do it. But I can say that we need to provide an incentive structure that says to Rod, "Don't get off the grid. Share your energy with Dave next door."

The CHAIR: I will proceed to close today's hearing and thank you for your evidence before the committee today. A transcript of this hearing will be emailed to you for the 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. That was really interesting.

Mr Martin: Our pleasure. Thank you for your interest.

Hearing concluded at 11.05 am

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