

ECONOMICS AND INDUSTRY STANDING COMMITTEE

INQUIRY INTO MICROGRIDS AND ASSOCIATED TECHNOLOGIES IN WA



**TRANSCRIPT OF EVIDENCE
TAKEN AT PERTH
MONDAY, 18 JUNE 2018**

SESSION FOUR

Members

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

Hearing commenced at 1.33 pm

Mr TIMOTHY MATTHEW WALTON
Director, Curtin University, examined:

Professor PETER WILLIAM GEOFFREY NEWMAN
Professor of Sustainability, Curtin University, examined:

Professor GREG MORRISON
Curtin University, examined:

The CHAIR: On behalf of the committee, I would like to thank you for agreeing to appear today for a hearing for the committee's inquiry into microgrids and associated technologies in Western Australia. My name is Jessica Shaw. I am the 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, the member for Jandakot; to my left is Deputy chair, Sean L'Estrange, member for Churchlands; Stephen Price, the member for Forrestfield; and Terry Redman, the member for Warren-Blackwood.

It is important you understand that any deliberate misleading of this committee may be regarded as a contempt of Parliament. Your evidence is protected by parliamentary privilege; however, this privilege does not apply to anything you might say outside of today's proceedings. Could you please introduce yourselves for the record.

Prof. MORRISON: I am a Professor at Curtin University. My name is Greg Morrison. At the present time we are working with a number of rather large research projects, which I head up: one with CRC for Low Carbon Living; one with ARENA; and a rather large one which we got, which I am sure we will come back to, the Smart Cities project in Fremantle.

Mr WALTON: My name is Tim Walton. I am the Director of Energy Research Initiatives at Curtin University. I work within the research office at Curtin and I am responsible for space, defence and energy, and bringing together government industry —

The CHAIR: It is a pretty small portfolio!

Mr WALTON: At the moment it is rather expansive—and we bring together different parties so we can solve problems now that are pressing us in the future.

Prof. NEWMAN: I am Peter Newman, Professor of Sustainability at Curtin. I know most of you. What I bring to this is I am on the IPCC—the Intergovernmental Panel on Climate Change—and we have been working on the report that comes out in October, which is essentially showing that microgrids are the future and essentially must come very quickly. There are all kinds of barriers that need to be overcome because it is quite a transition. I also have quite a team of researchers working with Greg and have, for the last 10 or 15 years, been working on the WGV project and others. The new project is "Lithium Valley", which is what we in Western Australia can do to make the world a better place, with microgrids right at the heart of it.

The CHAIR: Fantastic. 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 short opening statements?

Mr WALTON: Yes, if I might. On behalf of Curtin University, thank you very much for hosting us today. This is an area that we think is very important to the development of not only the state but the nation. Western Australia can play a leading role because of the geological and geographical challenges that we have to not only develop solutions for Western Australians but also the nation, and then exports. An important part of what we are working on is trying to create a sustainable cycle and how we are doing that is not only through the research of my colleagues, but also through leading a future battery industry CRC, which the Western Australian Government is supporting very strongly. That is a national cooperative research program and at the moment we are looking to submit on 3 July this year.

The CHAIR: Fantastic. Thank you very much for your submission, which was very informative and certainly gave us great insight into the breadth of activity that is underway at Curtin University. I would like to start with a fairly high-level question. I think it links quite neatly in with the CRC that you are spearheading, about the ways in which conversations can happen between industry, academia and government. There seems to me, and certainly the evidence that has been presented to this committee, is that there is an incredible amount of activity going on in this space but perhaps it is a bit disparate. I am interested in your views on particularly what recommendations could we make to government about how to bring all the different activities together so that we are all backing a “Lithium Valley” or a CRC. I welcome your thoughts on that first-order question.

Mr WALTON: I might start and then hand over to Peter and Greg. From Curtin’s point of view, Curtin University is a very collaborative university, listed as amongst the most collaborative in Australia. We know that we cannot solve all the problems without industry and government working together with the research sector. We have been progressing that for at least 10 years as a program and really understood that the days of universities doing research or blue-sky research for the sake of research, or pet projects as some people might call them, is well in the past. We are now working with community to understand what the real challenges are and then working with industry to solve those problems. That is a model that has worked really well.

We have a long relationship with the University of Western Australia, CSIRO, Murdoch and ECU in working in a range of different areas. Key amongst these are energy. There is the Western Australian energy research initiative which was started in partnership with Woodside and Chevron, and now Shell. We have a long history of working together in a very collaborative and positive way. That is the fantastic foundation that we have in Western Australia. Our isolation means that we have to work with each other, but equally so, both of these gentlemen are working nationally and internationally to progress our sustainability agendas, but also to develop new industries of looking at how we might solve these problems. I might hand over to Greg or Peter.

Prof. NEWMAN: It has been my life trying to bring these three areas together, because what I find is that when they work together, you get the magic. I have written about what is called the magic of sustainability, because when community, industry and government work together with universities, sort of, as part of the glue, you really do make a huge difference. Communities are very much about the long term, with their values and visions, and you must have that guiding it. Governments are shorter term, but still medium term, if you like, and they provide the frameworks and regulations and infrastructure that enables it, but you cannot do it without business. Industry drives the market that creates the goods and services that will make the difference. All three are needed, and when you bring them together, it is extraordinary.

The work that we are doing at CUSP is about those three being brought together. We do not define projects on the basis of saying there is a nice theory that it would be good to test. We go out and find a problem that needs solving and how to bring community, industry, government and

researchers together. When you do that, it is amazing the people who come along to work for you. Last year, we had 120 PhD students on our books, which is the biggest in the world in this area of sustainability policy. We have not found anything else like that, and it is all about essentially bringing people who want to solve problems to bring all these different partnerships together.

It is all about partnerships. It is why I love City Deals. This has come from a Liberal initiative, but I believe it is a completely cross-party thing. It is now happening around the world. City Deals are about partnerships, and on Thursday I presented to the Cities Reference Group, which is run by Paul Fletcher, the Minister for Urban Infrastructure and Cities in the Federal Government, on the partnership projects that I was suggesting it should be a City Deal in Western Australia. One was the trackless tram, which is a partnership around transport that could easily provide an inner-city transport system without government money being needed, and the second one was “Lithium Valley”.

“Lithium Valley” is taking off; it is like a feeding frenzy as we realise that the partnerships with industry that want to expand here, want to develop a new industries quite rapidly as they see the opportunities, is just going like this—five, 10 times increase in the demand for these new metals. And they are all here. Nowhere else in the world has all these metals, about 12 of them, that are necessary, not just the lithium, which is the biggest in the world here, but all the other metals, and they are here. There is secure supply, and that is needed for the world. It is no good getting your cobalt from the Democratic Republic of Congo, which is at the moment the main supplier, because they are just not secure enough.

There is security of supply, but there is also a new element. We have always wanted to have value-added here, and the new element is the quality that is required to make batteries. It has to be very refined and pure. That means you do not need cheap labour to do it, which is why China has been producing everything. The Chinese manufacturers are saying, “We want to come to Perth and do it, because of the quality of the product.” All of the science that is needed, all of the partnerships between industry, government and the community—the local, state and federal governments—all need to be brought together to pull off this deal and bring these companies to work here.

When Tesla came and met with the Premier and five other cabinet ministers and our group, it was very exciting to hear them say the world needs Western Australia. This is the next big agenda. The battery agenda is going to set up all of the solar and wind systems that are needed, and the batteries have to be very high quality, and that is going to be providing the base for electric vehicles. They are really setting the agenda now of very high quality—and we can recycle them here as well.

That is the new game we are in. I did not mention microgrids there, but you see that the microgrid is that little bit that enables the solar and wind and batteries to work together, which is what Greg can now pick up and talk about. I am talking about the big picture of why Western Australia will grow economically around this new industry.

Prof. MORRISON: I came here about two and a half years ago, having lived and worked in Sweden for about 30 years. The interesting thing with Sweden is that it is very industrial where I was in Gothenburg with Volvos, Ashkan and the rest of them. We worked a lot with the Norwegians looking at the innovation economy. A lot of the answer lies in their willingness to put in. When you have a tender to build new bridges and tunnels they put in a 3% research and development that you have to show in the tender to be able to even be considered, which means that they have to go to the universities, who then work together.

There are various ways you can work with that and increase at a more general level. Sweden and Finland are the two number ones in terms of innovation in the world, but the universities are not necessarily the best. I come here and I find that the universities are really good and, with all respect,

do a lot of really good research, but are not always particularly demand led. There is a lot of research that is done that does not go down that line. I know that Curtin has now said that it is going to be a demand-led university, and that is a great thing.

I spent about a year wandering up and down the Terrace, sometimes up this far, trying to work out how to work together. The interesting part of the whole of this space is that there has been a gradual dealignment of the energy system with the introduction of solar, and it has got to the point now where we have sort of more or less identified that this transition is happening now. It is not in a year; it is not in five years; it is now, to the point that we have actually got a Swedish researcher coming across—we have met her—in another couple of months, studying the transition in Western Australia, because it is happening here.

The interesting part of the work that we have been doing is getting together with the Western Power, Synergy, the City of Fremantle and a few others on a blockchain power ledger, bringing that together into a project that then got \$8million of funding from the Federal Department of the Prime Minister and Cabinet. That was created by talking together and identifying, using the power of the university—we have time to understand these types of transitions and other things that are going on in this place—and working with Western Power and Synergy, who actually own it, and we work as, if you like, a non-commercial broker. With blockchain technology coming in, what does that actually mean? Is there a sort of disintermediation that is going on or is it not going on? Is that going to actually happen?

The great thing about this particular project is that we have 12 partners in it, which means I have full-time project managers holding it together. We recruited somebody across from Lendlease, whom I met in various types of meetings—somebody who can professionally work from the business side into the university and hold together a project of that sort, and understands the business people. I can give the date—10 April—which I pronounce as transition day that we actually sat down together and said, “Well, let’s really trial properly peer-to-peer trading across the grid in Fremantle.” So we have got 50 people signed up. We have put all the meters in now; Synergy put meters in and Western Power are helping us as well, and we are starting that process, in real time. They will be in in about a month, and water as well, just interestingly, which is another issue.

Then, moving with LandCorp in a new site called the museum site, which is in the Knutsford area, putting in batteries and starting to use that as the peer-to-peer trading platform, with a blockchain enabled. That is first in the world—we know it is. The closest was Brooklyn, but the retailer there did not want to play ball, and did not need to either. I think the difference here is because we have an islanded grid network, this is where it can happen—and such a lot of solar radiation, which I am discovering because my skin keeps going red! But there is a good side to it, and the good side is that it is creating something that is very special.

I think, to get back to my point, that cooperation which Peter talked about is absolutely essential but it requires—it is at several different levels to be able to get that to happen. For us as a university, we can do our bit. I know the companies want to work with us—we need to find the problems together—but we need a political will as well. That is very clear. To be honest, the whole innovation agenda started at MIT USA. It started coming in 2005 in Europe with the knowledge innovation communities and has really taken off there. They are now putting €2billion or €3billion into knowledge innovation in Europe by 2020, and it is coming here as well. I think we have got to make sure that we are on that platform moving ahead.

The CHAIR: Fantastic.

Prof. MORRISON: Sorry; I get carried away on that one!

The CHAIR: No, no, no! There is a lot there. I am trying to digest it all.

Let us start with the “Lithium Valley” concept, because it is one that we heard about from the Clean Energy Finance Corporation earlier today. We had AMEC in front of the Committee talking about the lithium project that they have been doing. We know that the Chamber of Commerce and Industry and the CME are doing a study at the moment into the entire value chain analysis: where in the value chain could Western Australia most effectively play a part, and where is the best value that we can extract? There is a lot of focus in WA on the fact that we are a quarry, and there are, obviously, as you point out, the raw inputs into the batteries. Do you see the opportunity for advanced manufacturing as well, or for chemical processing? Whereabouts in the supply chain associated with lithium are we best positioned to participate?

Prof. NEWMAN: I started on the idea of “Lithium Valley” being in Western Australia nearly three years ago. The government at the time said, “We don’t pick winners.” I understand where that was coming from. But we know the winner now. Lithium-ion batteries have won. They are so significantly cheaper and easier to put in place. They are light. They are being adopted by everyone. There are different kinds of lithium-ion batteries out of the different metals. So the first stage of processing lithium and nickel and cobalt and so on is we do that at the mine sites. But the next stage, which we have not actually done before, is now happening. We have got two processors in Kwinana and another one now announced in Kemerton, and in Kalgoorlie I think as well. So because the lithium hydroxide is a far better product—it is about 25% lithium compared to about 5%—we have started down the value chain in a way that was not being driven a few years ago. Now they are desperate to get into the market, and it has got to be high quality, so they are coming here to do it.

The step after that is to then take the lithium hydroxide and the other metals and start putting them together into electrochemical combinations that can be used by battery manufacturers. That step might be another set of industries or it might go direct to the battery manufacturers. The battery manufacturers are quite happy to buy that stuff from around the world, but if they came here, they may well set up and do those steps at well. We think that state and federal governments should say, “Yes, we’ll provide this for the world”—there’s enough of it—“But we also want you to contribute to being here. We want you to have a certain proportion of production that goes on here, right through the value chain.” I think you can do that, because we are in a position of strength. We do not have to say, “Oh, we haven’t got the labour”, or, “We haven’t got the security of supply.” We have everything; it is in place.

So government can now say that and set up with the companies who want to meet this global market and to produce something locally, and then we can keep going down the value chain. What Greg was saying was the end product where the batteries are being used. The solar battery EV and blockchain approach is world-first, and it is happening here because we like doing innovative things, we have got the sunshine, and we have made it very cheap to do it. If you put solar on your rooftop here, it is half the cost of doing it in America. It is mostly about permitting and financing.

Mr D.T. REDMAN: Just on a point of clarification, when you are using blockchain in this circle, are you talking about the security of the comms tech necessary to make the system work? Is that what you are talking about?

Prof. NEWMAN: Certainly the security element of that is important, but it is also a very powerful software that works to enable instantaneous optimisation of the system. Yesterday, I was reading a thesis from a Mexican student who has come here to study what we are doing and then he wants to bring it to Mexico. He has discovered that the first evidence coming from the WGV project shows that the people in the Gen Y project and the Shack project who now have all this in place are using blockchain, but they have no idea what that is or how it works. So it is quite silently working away

in the background, where there is solar on their roof, and the batteries, which are all shared. That is the big thing—it is shared in a complex. It is being distributed optimally to their needs and the weather needs and so on. It works it out and enables that to happen, and it all happens and enables them to know what their bill is and nobody else knows what that bill is. So it is secure, but it is also clever. It is very smart.

The CHAIR: Can I just tease that out a little, because, as I understand it, blockchain is essentially a ledger to account for the financial transactions and measure the energy and allocate the energy accordingly. But there is a second part to that, and I am interested to hear your views on this, around dispatchability and control and network management, because optimisation is not just about facilitating the allocation of the electrons and the dollars and cents behind that but about managing an energy system at the end of the day. I really want some views on that, because, at the end of the day, optimisation is important.

Prof. NEWMAN: I will just finish my bit and then I will hand over to Greg, because he has the experts working on it. What was clear in this experiment at WGV is that they can only do this within their own little microgrid. They cannot dispatch to the rest of the grid. That is not yet feasible to do, and there are rules against, but it is also like a next step anyway just in terms of the complexity of it. That is still not legal to do, but this project in Fremantle is going to show how to do it, and that is the breakthrough, because in Brooklyn and wherever else, you still cannot do that. The utilities everywhere in the world are saying, “Oh, we’re not too sure about this. This is all coming from underneath here. We normally provide the energy and you pay for it.” But this is going to be going both ways in the system, and the grid utility has to work out how to toll those flows of electrons in both directions. So all of that, the issues of dispatchability —

The CHAIR: And visibility, even.

Prof. NEWMAN: And visibility; okay. The way the grid works and how this fits in with all the different elements, that is what we are all now moving into. We can help the world to do that as well, at every step along that “Lithium Valley” chain, right through to the provision of carbon-free electricity in a seamless way, cheaper than what we have got now. That is the main game.

Prof. MORRISON: The bit on top of that which we have been discussing a lot with Western Power, Synergy, ourselves and Power Ledger is about the tariffs and what signal that should give. It is clear that, on the bigger picture, by not just sticking to strata—it works in strata; we know that—but when you are across the grid, it can be hugely beneficial for Western Power, because they can, with Synergy, start to put in incentives to cut out the duck curve basically, and by putting in batteries, you can do it. But it requires that peer-to-peer trading across the grid. Really, the blockchain is just a very fast enabler in doing that in real time. But there could be other systems that could come into place and maybe will; who knows? At the moment it is Power Ledger. Let us see what it is tomorrow.

That is perhaps not so important for us in the project; it is about sitting together and working out what those tariffs might be and how can we incentivise the customers, who are the most important people out there, in either storing their energy, whether it is through a system that enables them to do it, but getting them to get connected to the grid, because it is a good thing with the solar penetration. I think I read something in *The West Australian* that said it was a bad thing. I did not quite understand that article at all. I think it is a good thing. I think it is something that is coming, whether we like it or not. I think the key is sitting down together and working out what this will look like in the future for all of us.

Mr D.T. REDMAN: I just want to pick up a point that Peter made a little while ago about picking winners. I was probably around the table when that discussion happened. I get a few people, when I start engaging on this front, who throw some other little curve balls in. I am interested in your

comments on it. One of the risks, as I understand it, with lithium is fire risk, and there is some work being done on zinc–bromine batteries as a solution. I am interested in your comments about that. The other one that has come as recently as this recent weekend was one of the massive advantages of lithium is its weight; hence, in electric vehicles and others that works. Where you have got a stationary battery, that really is inconsequential and, hence, I think it is called vanadium flow-through batteries as an alternative that has some other characteristics that in terms of stationary battery storage are a solution. What is your view about other tech and is there a bit of competition here? You come out very strongly on the lithium space and say that they have won.

Prof. NEWMAN: I have nothing to gain from saying that. I am just someone who has been watching for the Holy Grail to appear, which is a cheap enough battery that is light and can work in transport, as well as in the home. It does not hurt to be light if you are bringing it into a house, because it is very easy to put in there. The zinc–bromine battery, for example, was invented at Murdoch when I was there. We were all thinking, “That’s going to be the next one.” The vanadium batteries and so on are all around, but they have lost, essentially, the fight in economic terms. The reality is all battery manufacturers are now moving to lithium-ion batteries. There are still odd applications where a vanadium flow battery may work better, but it is still very expensive compared with lithium ion. The benefit of lithium-ion batteries is you can make 500 megawatts of it by just putting all the little bits together. It is modular and it does not seem to make it more expensive to do it that way, rather than having something big. It actually operates well at each scale. It is about 10 times cheaper now than anything else.

Mr D.T. REDMAN: By extension, the next question is: has there been any work done to your understanding in terms of the supply issue of lithium versus where your projected use is on a world scale, which is obviously pretty substantial if all the car manufacturers are any sort of measure right now?

Prof. NEWMAN: The other one was the fire issue with lithium. There was a particular kind of lithium-ion battery which did have a tendency to have a blow up. It was not a good idea. They do not make them anymore. That is by changing the different metals that are used in them. They have avoided that. I think lithium iron phosphate was the breakthrough that could enable that. They are quite safe now. They are also very simple to recycle. There is nothing toxic about the product. You can hold lithium carbonate in your hands and there is no problem. There is that.

The supply is of great interest, because I constantly got told if I was talking about electric transport coming in that you have got to realise that the lithium comes from Bolivia and they are going to have an OPEC and the price will go up and you will be worse off than having oil. That rumour was traced to an oil company at the time, but it continues. At the IPCC, I had to constantly tell people, “It’s going to be okay. Come to Western Australia; we’ll show you the biggest lithium mine in the world. It’s 100 kilometres south of Perth and we’ve got eight new ones that have started.” It is a crustal element. Our crust is highly exposed. They are all over the place. Lithium is well distributed and it is more like iron and aluminium. It is very much available. All the other ones—the nickel, cobalt, vanadium and manganese—are all here in Western Australia. They have very specific spots, but when you look at the known reserves of each of the new energy metals, as we call them, Australia has about three times any other country and right down the end is China and the US, who are wanting all these metals. They have hardly any of them. We do.

Mr D.T. REDMAN: I was interested in another comment. You talked about securing, dare I say it, a State Agreement with companies like this that want to invest here to secure long-term value-adding. We had a good crack at that in the 1960s and it did not seem to get that.

Prof. NEWMAN: It did not work too well, did it?

Mr D.T. REDMAN: What do we need to do differently, Peter?

Prof. NEWMAN: It might not work but —

Mr D.T. REDMAN: Can I say I agree with the concept.

Prof. NEWMAN: It is so obvious. Would it not be great not to have the boom and bust, but to have a steady economy, because at various times commodity prices go up and down, but it is not totally dependent on it? We have something going for us this time because of the quality product, if we can get this CRC working very closely with each of the groups that are wanting to get to the elements and export them to show that we can help them produce them but also help them to set up local industries. We have got some local industries. We have got some battery manufacturers here. There is a new young guy who is joining the CRC who makes his own. It is very clever stuff. It is possible that we could do things well, but you need all of those to fit together. We have got the end, we have got the start and we have got the second phase.

There are two bits in the middle that now are needed. I think that does need government intervention to be able to say, “Let’s work out a decent contract with the State that you can have access to these minerals that are unbelievably expensive if you do not, because they are coming from other places that are not able to produce the quality or the quantity that you need. You need us. We need you to commit also”—because these are big companies—“to doing some value-adding here.” We need to get some of the battery manufacturers like Samsung and LG and some of the manufacturers like BMW who are doing their own battery now and say, “Well, if you want that, come here; you’ll have all the supply you need, but you’ll also make some of them here and export them to the world.”

Mr WALTON: Just to tie your initial comment around where can Western Australia compete and Terry’s comment around State Agreements, I think the important thing is—Peter touched on this—the actual chemical packet that gets delivered to the battery manufacturer. In the short term, Western Australia will be able to do that. With the Tianqi plant coming online and some of the characterisation facilities that are available in this state, we will be able to confirm supplies of that package of lithium, cobalt and nickel in whatever form is required within a short term. That is really good for the state because that is an export—not a tertiary but secondary—product that goes directly into making batteries.

The issue we have here in Western Australia is that there is no battery manufacturer of any great scale. They are buying their batteries, but they are producing their control systems. What we do have, though, is an opportunity in the next 10 to 20 years when we will have lots of fringe-grid batteries coming on when you are going to need a different type of battery. So, just to talk about vanadium: vanadium is a really good stationary battery. There are also other flow batteries that are chemical plants. The CRC we are looking at is open to all batteries, not just lithium. Lithium has one for certain issues, so its ability to be lightweight and discharge a lot of energy and recharge a lot of energy in a short amount of time has it winning at the moment and probably in the foreseeable future for electric vehicles, but then those are recycled and reused from EVs into stationary battery storage and to grid management.

The other part to keep in mind is that within the Australian economy, we have a push towards a sovereign defence capability and a sovereign defence industry. We will be building 12 electric submarines. They will be powered by batteries.

Mr D.T. REDMAN: We are going to build 12 what?

Mr WALTON: Submarines. The nation will build that. There is going to be a need for some sort of large-scale battery manufacturing. There is Pacific Marine Batteries at the moment, which is in

South Australia, which we are in discussions with. But it is the demand side that will make sure that we get to that next stage. That is not going to happen in the next five years in my view; it will be 10 or 20 years. Once that tipping point demand comes on, the opportunities for manufacturing become real. It is not just producing the lithium, nickel or cobalt that is required for lithium batteries; it is processing down into the packages. The third part is producing the cells and packaging them up with the management systems. Equally, they can be put in a defence situation but there will also be flow-on benefits to end-of-grid, fringe grid and microgrid applications as well.

The CHAIR: Before moving away from this 'picking winners' concept, at the end of the day, batteries are about storing energy, which is kind of the Holy Grail of any energy management system. You need to be able to store and if you can achieve that in an economically sustainable way, fantastic. The alternative technology that has been put to us is hydrogen and, clearly, we have a gas network that is a sunk investment, which, with a blended gas stream, comprising both traditional gas sources but with hydrogen represents another way to store energy, and hydrogen converted from sunlight, essentially. That has been put to us as an alternative around this energy storage dilemma. I just wondered what your thoughts were on that.

Mr WALTON: When you are talking hydrogen, when they are talking about the concept of pumping hydrogen, that is to include it in the existing gas stream, rather than taking the methane out and putting hydrogen in it?

The CHAIR: Absolutely, yes. It would be a blended stream. They would have to make some changes to the gas specification, but I understand from having read the submissions of the relevant parties, that if a gas spec change were allowed, they could utilise those assets for a blended stream, yes.

Mr WALTON: Thank you.

Prof. NEWMAN: I am one who has written about the hydrogen economy and the potential of it and saw its potential in Western Australia, and I am a convert away from it now, and I will tell you why. Hydrogen, when it is mixed with methane is reasonable for being able to transport through pipe systems. But if you just had hydrogen, the pipes are no good. Embrittlement is a problem and they need to be completely replaced. That is one major issue. The other one is the hydrogen fuel cell vehicles, which really looked as though they could be a winner at the same time as the lithium-ion batteries were there. They have lost the race. They essentially are that much more expensive. The only vehicle manufacturer left, I think, is now Toyota and the only reason they are continuing with their program is purely a political one, of saying, "Look if we're all getting lithium-ion batteries and something happens to that stream, we've at least got something else to fall back on." It is a resilience thing.

We have got hydrogen fuel cell vehicle workers at Curtin who do not like me saying it, but it has not come down in the same price curve as the lithium-ion battery. It is an extraordinary drop in price. The hydrogen economy, which was invented by an Australian, where everything was going to be based on that, I just think is a bit silly now, because we can produce directly from the sun and do electric transport. We do not have to do it that way. But there are some parts of our economy, like industrial fuels, that may find that when they produce hydrogen from the sun in times when they have got excess sun, they could just produce hydrogen from water, store it up and then use that as an industrial fuel. That is possible. It is a difficult fuel to use.

Natural gas is easier because it is less dangerous, and when I hear them say that I say, "All you've got to do is CO_2 plus $2\text{H}_2\text{O}$ gives CH_4 and O_2 . With the right catalysts, you can create renewable natural gas and use that as your fuel and put that in the pipelines. That is one of the things that the Pilbara—there is a group up there that is planning a major solar network, and we have been talking to them about how they could produce natural gas renewably, using Pilbara sun, and put that into

the pipelines, liquefy that and send it overseas. There are ways to do that. There are 20 laboratories trying to find the right catalyst that will work cheaply. I have not heard who has won that battle yet, but it will happen and that will be quite commercially successful. I think then if you have got renewable natural gas, why do you need hydrogen?

The CHAIR: I am conscious that we are running short on time. Peter, you mentioned in your opening comments a paper that you are about to release with the IPCC specifically on microgrids. I wonder if you might be able to give us an overview of that piece of work.

Prof. NEWMAN: Yes; it is not specifically on microgrids; it is on the 1.5 degree centigrade agenda, which is, essentially, saying that the two degrees, which was agreed to in Paris, is great but we will have to accelerate. If we do not, there are a series of things that will need to happen, one of which is we will have to start dragging CO₂ out of the atmosphere. That is the other thing about this renewable methane, of course, you can drag CO₂ out of the atmosphere and make it into a product. Carbon dioxide removal is talked about a lot in this report because there are technologies and ways of doing it. Trees are pretty good at it too. We need to get more of them planted than cut. There is how that happens. It happens in the rangelands and so on. That part of it is there.

But between the report—the AR5 came out in 2014 and the next one is going to come out in 2020, so there is a gap—it was thought to be necessary to try to catch up with these new technologies. We did not see coming the dramatic revolution that has happened with solar and wind. Solar has come down in price by 66 per cent, wind by 30 per cent and batteries by 50 per cent in a five-year period. That is an extraordinary change.

Those three things are now where the world's finances are moving in terms of power and transport. This has been documented to try to say, "Well, look, here's some good news for a change in climate." This is actually not harming our economies. We do not have to spend a lot of money to get rid of carbon. You do not need a carbon tax; that is actually part of the report. It is essentially saying, "This is now a better option" and how to facilitate it. That is where the Western Australian story—and some of our case studies are in there—comes in. The microgrids, the blockchain and the ability to enable this with smart systems are essential, because bringing those three things down in price dramatically is only the first step. You then have to put them into widening circles of demonstration. We have had Josh's House. We have had WGV. We have Beyond WGV and the City of Fremantle. We have increasing opportunities both in the city and end of grid off-grid trials, that now need to show how these things work. That is what the report is about. It is essentially a lot more good news. It is very hard for IPCC just to say good news. They are full of—sorry; off the record —

The CHAIR: You are on the record, I am afraid.

Prof. NEWMAN: I will not say it. It is very depressing for me to hear despair dispensed all the time when there are good news stories happening. I love the fact that the world is responding and there is hope. You can tell your kids, "This is the future. This is how it's going to work and it's going to be okay and there's jobs in it." I have been constantly showing that the increase in GDP whilst decreasing greenhouse gases indicates decoupling of those. You do not have to get poorer to save the world. It is good news, and this report has at least gone some way towards saying that.

The CHAIR: Can I pick up one final issue; that is one that came up when I came to a CUSP event just after I had been sworn in.

Prof. NEWMAN: Yes. I remember it well.

The CHAIR: It was a bit of a baptism of fire for me. It was curly, but I survived. Planning came up as a barrier and at that conference I communicated the announcement that had just been made that

day on planning reform to facilitate community title and encourage these types of shared community title —

Mr D.T. REDMAN: Strata title.

The CHAIR: Strata title and community title—the creation of a new form of title called community title. What are your thoughts on that? We put a consultation paper out in the last three weeks on that. I just wondered whether you had an opportunity to review that and what you have used more broadly on the sort of planning considerations to encourage these types of technologies for microgrids?

Prof. NEWMAN: I have not seen the new report, but I have followed the issues about strata title, community title, and I still do not know why we just have not done it. It gets up the agenda and then drops off again. I just say, “Get on with it”, because there are a lot of businesses out there saying, “We would find it a lot easier to do these innovative things you are talking about if we had community title.” I do not know what it is about community title that makes them more at ease, but it is essentially saying share things that we have not shared before—I mean, we have little bits of open space and parking area and shared rooftops, and that is what the strata title committee looks after, but now we want to share a whole lot of other things. That is what is happening at WGV. It can be done.

Mr D.T. REDMAN: None of those things is the barriers. Barriers are other things like termination clauses and a range of things that have some public sensitivities. That is the other issue that is sitting there. None of the stuff that you are talking about is a barrier. In fact, it is a massive opportunity; I agree with you.

Prof. NEWMAN: Well, let us do it.

Mr Y. MUBARAKAI: It is just away from the theme. The question mainly I have is with regards to the ownership of EV vehicles, especially in Western Australia. In Australia, when you compare it to the European countries and other countries around the world, the ownership or the uptake or the acceptance of the EVs is far slower in Western Australia. So, from a government perspective, is there any advice on what we could do to build that initiative and incentive to build the momentum moving forward?

Prof. MORRISON: Having lived in Sweden for quite a number of years, you often get passed on the motorway by a Norwegian in his or her Tesla. They have the fastest uptake in the world at the present time despite being an old country. They put in very early on incentives. So, the road tolls are waived if you have got an electric car. A whole range—I think there are five policies —

Prof. NEWMAN: Parking is free.

Prof. MORRISON: Parking is free and that sort of thing. It has made a very big uptake. The interesting part of what we are talking about here is suddenly you are going to be doubling the electric use in the home if you have an electric vehicle in your home. If you buy a Tesla, that is a lot of batteries. That is very interesting for the type of projects we are doing. It adds on another possibility. At the present time, that has to be separate from your PV system, but as we move along, I can sense that we are starting to say, “Hold on a minute; how do we have a really integrated grid structure?” Those sorts of challenges for Western Power as we move ahead are going to be very interesting. That is the next step. Once we get the peer-to-peer trading tracked, which I think we will in the next half a year, once we get revenue grade peer-to-peer trading starting to happen in Fremantle, it is just going to happen. I cannot see anyone stopping it. Then we get the electric vehicles coming in. What a fantastic opportunity to have an integrated grid in a way that is just not seen elsewhere. I see it as marvellous.

Mr WALTON: I might just make an additional comment. The thing to understand about the EV itself is that it is just another storage device. Depending on how you manage your EV, it is your transport, but it is also your battery.

Mr Y. MUBARAKAI: Peter, you talked about, obviously, lithium is here in abundance in Western Australia and manufactured here, and taking the point the chair asked the question before, do you see manufacturing of vehicles being the next step in the sector since we have the storage side of things resolved? In terms of having the dominance in that sector, would manufacturing be an easy component to add as a value-add in the new industry moving forward since the numbers and the trajectory in which it is going to grow is going to be another market in itself?

Prof. NEWMAN: There are all kinds of electric vehicles, including the Curtin little electric bus that seats 10. It is like the RAC one. It is running around and it is autonomous and electric. There are electric motorbikes and electric scooters. There is an Australian-made electric scooter and it is a shared electric vehicle for a new housing development in Spearwood that provides—there is PV on the roof and you plug in the scooter and any time you want to get it, you just write it in the book. It is part of what it means to pay your rent in that set-up. Those kinds of shared vehicles come in, and the autonomous vehicles as well.

But what I really like, and the trackless tram really got me going on this—that is autonomous and electric. It has lithium-ion batteries on the roof. You can put it in overnight. We have been talking out at the airport about how they are going to go solar electric and the potential for them to run it straight down Great Eastern Highway where you already have a taxi-bus lane. Overnight, you put it in and you have a rapid transit system. That, we know, can be made in Perth. The bus manufacturers here have said, “Yes, we can do that.” It is a licensed operation, but there is no reason why not. So, these transit systems, if you like—the small local shared systems will increasingly be autonomous and shared. The fast corridor ones can all be made locally and that is a very good way to start an industry. You can see how at stations, that is the recharge point and you recharge the trackless tram in 30 seconds, but that is also where the small buses can come and the electric vehicles if they are running out.

Mr D.T. REDMAN: We had a discussion with the Australian Electric Vehicle Association and one of the critiques about electric vehicles was that people are too afraid to go and buy one because they know, as with the iPhone, things are out of date before you have a chance to get used to it. There are two elements to electric vehicles. There is the battery and battery tech, and there is the tech of the vehicle and its efficiency. We know what is happening with batteries. What is your understanding of the tech and the vehicle efficiency component of it, and how quick is that changing? Is disruption happening in that space?

Prof. NEWMAN: That is where all the autonomous sensing characteristics are being built in. They are coming in together, so the rapid change towards autonomous vehicles and electric are coming together quite rapidly, and together that is the vehicle of the future. But I just keep saying it is not just the car; there are ways in which it can be done with this mix of local and corridor-based transit that is new technology that is so much cheaper. The trackless tram is \$5 million per kilometre to build; light rail is usually about \$50 million. That is what they estimated for the MAX. The Sydney light rail was \$120 million per kilometre because they had to dig up the streets and it was so expensive. This is a game changer, and it is here. The Chinese are making them and can sell them.

The CHAIR: I am just very conscious of our next conference, which is a videoconference. I am very conscious of time.

Mr S.J. PRICE: My question is to Peter—back on “Lithium Valley”. The potential there is not actually to manufacture batteries; the potential there is to coordinate the supply of the components to other parts of the world. Is that a fair analysis of it?

Prof. NEWMAN: I would like to do both. I would not give up on the other one, and because we can produce really high quality products here—and they are all here—that makes it very easy just to take it down there and do the battery there. The batteries are mostly automated. They are not requiring cheap labour. They need specialist labour, so why not do it here, and then we can export them? We have a port that will take us to the rest of the growing world—Africa, India, Indonesia, Asia, China—so it is an opportunity for us.

Mr S.J. PRICE: Is there a window of opportunity there?

Prof. NEWMAN: There is a window of opportunity. In our full report that is coming out—the short report is out—we say there is a two-year period where we have to really grab this; we have to grab it.

Prof. MORRISON: I want to answer your question very briefly; I cannot answer it, but I can give an example of when I was in Gothenburg, they were asking what it was that drove innovation in this space. The answer of whether it should be certain types of vehicles, that is one thing. There was a decision made between Chalmers University of Technology in the city of Gothenburg and Volvo to create an electric bus, and that happened very quickly. What was it that really drove that sort of innovation? The Volvo Ocean Race was coming to town and there was a date—20 June, or something, midsummer eve—about three years ago, and they got it ready in time.

Prof. NEWMAN: Politics drives everything!

Prof. MORRISON: There was a very common ambition and vision to create something. The technologies were all there; it was just a question of determination and setting a date, and then that is it—and guess what? They did it. They have now sold 100 such buses—electric and electric hybrid—to Luxembourg, and 100 to Brussels, and the sky is the limit.

The CHAIR: All right. I will have to call time, unfortunately. 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 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 very much for coming out today.

Hearing concluded at 2.34 pm
