

LEGISLATIVE COUNCIL ECONOMY AND INFRASTRUCTURE COMMITTEE

Inquiry into Electricity Supply for Electric Vehicles

Melbourne – Thursday 26 February 2026

MEMBERS

Georgie Purcell – Chair

Richard Welch – Deputy Chair

John Berger

Gaelle Broad

Katherine Copsey

Moira Deeming

Tom McIntosh

Evan Mulholland

Sonja Terpstra

**Necessary corrections to be notified to
executive officer of committee**

WITNESSES (*via videoconference*)

Professor Ray Wills, Adjunct, University of Western Australia; and

Professor Peter Newman, John Curtin Distinguished Professor of Sustainability, Curtin University.

The CHAIR: I declare open the Legislative Council Economy and Infrastructure Committee's public hearing for the Inquiry into Electricity Supply for Electric Vehicles. Please ensure that mobile phones have been switched to silent and that background noise is minimised.

I would like to begin this hearing by respectfully acknowledging the Aboriginal peoples, the traditional custodians of the various lands we are gathered on today, and pay my respects to their ancestors, elders and families. I particularly welcome any elders or community members who are here today to impart their knowledge of this issue to the committee or who are watching the broadcast of these proceedings. I also welcome any other members of the public watching via the live broadcast.

To kick off, we will just have committee members introduce themselves to you, starting down this end of the room with Mrs Broad.

Gaelle BROAD: Hi. I am Gaelle Broad, Member for Northern Victoria.

John BERGER: John Berger, Member for Southern Metro.

Tom McINTOSH: Tom McIntosh, Member for Eastern Victoria.

The CHAIR: Georgie Purcell, Member for Northern Victoria.

Richard WELCH: Richard Welch, Member for North-East Metro.

Katherine COPSEY: Katherine Copsey, Member for Southern Metropolitan.

The CHAIR: Thank you so much for taking the time to appear before us today. All evidence taken is protected by parliamentary privilege as provided by the *Constitution Act* and further subject to the provisions of the Legislative Council standing orders. Therefore any information you provide during this hearing is protected by law. You are protected against any action for what you say during this hearing, but if you go elsewhere and repeat the same things, those comments may not be protected by this privilege. Any deliberately false evidence or misleading of the committee may be considered a contempt of Parliament.

All evidence is being recorded. You will be provided with a proof version of the transcript following the hearing, and then transcripts will ultimately be made public and posted on the committee's website.

For the Hansard record, could you both please state your full names and any organisation you are appearing on behalf of?

Ray WILLS: My name is Professor Ray Wills. I am appearing on behalf of Future Smart Strategies. I am also an adjunct professor at the University of Western Australia.

Peter NEWMAN: I am Peter Newman. I am Professor of Sustainability at Curtin University, and I am working with Ray on a number of these issues relating to the future of our cities mostly, but regions as well, on net zero. I worked for 15 years with IPCC on these issues as well as being on the board of Infrastructure Australia for eight years.

The CHAIR: Great. Thank you so much. We now welcome your opening comments but ask that they be kept to around 10 minutes to ensure plenty of time for discussion and questions.

Ray WILLS: Excellent. I can do that. To assist in that, I have prepared a brief PowerPoint, which I will now attempt to share with you on-screen.

Visual presentation.

Ray WILLS: Let us get straight into it. The core point that we made in our introduction is that EVs should not be seen just as a new problem load but as a key enabler of higher renewables and of low-cost energy systems. They provide flexible, schedulable demand at a significant scale, located precisely where Victorians live and work – their cars are at home. While I have had a bit of a history of being sceptical as to whether vehicle-to-grid/vehicle-to-load will be important, I have become increasingly convinced in the last couple of years that they will be a key part – certainly not the only part – so we will have utility-scale batteries and we will have domestic-scale at-home batteries. We should be able to supplement both of those with vehicle-to-grid, and we need to count them all in terms of our consideration of where we are at. Victoria has surpassed approximately 50 per cent renewable generation over the past year, as has the rest of Australia. On the east coast, though, Western Australia is still going hell for leather in terms of not yet curtailing wind or solar here, but that is now happening on the east coast. The reason it is happening is we simply still have yet to build enough storage, although that is happening rapidly, and EVs are an obvious form of additional control to absorb this energy and to improve asset utilisation.

Since the initial submission, EV uptake has accelerated and it is validating our projections. In 2025 in Australia battery electric vehicle sales have exceeded 100,000 for the first time, and the national plug-in share has reached the mid-teens in some months. Victoria has been leading the way in this. There has been significant adoption there, and that has been reflected in our submission to you, which of course this is commentary about. The main constraint today is not technical but relates to governance and to tariff design. Smart charging, vehicle-to-grid/vehicle-to-home capabilities and distributed energy resources are central to this planning. I think there is an opportunity for the whole of Australia to showcase to the world, certainly with Victoria leading the way, with the one exception of ACT, which has seen exceptional deployment, but that is that is something for us to discuss.

Next slide, please. I have provided this graph in the report to you. This is actually slightly updated; this one is 26 January, but there is not a lot of change on this particular slide from that update. But what you are looking at on-screen is a little bit of heresy from Future Smart Strategies, using our global model and our Australian model to look at this as obviously looking at global uptake of electric vehicles. Back in 2015 I used to be called a fruit loop for suggesting these sorts of changes, but for the most part we have been right. I do provide a little bit of allowance on this slide, which again has been described to you in the report, but you can see that the solid lines are actually where we think things will go. The solid lines are basically reflecting current adoption rates. If current adoption rates continue at the pace they have been for the last few years and they continue into the future at that same pace, then those solid lines plummeting to 2030 are real. We, having experienced COVID and failing to predict COVID in our models and the ongoing supply chain issues that arose from that, and then also failing to predict the Ukraine war – very remiss of us; I am sorry – but if those sorts of things happen again in some other form, then we think the dotted line is what will happen. The trends are undeniable, the direction is plausible, and so that is where we think we will be.

Next slide, please. This is a slightly updated version of the graph you have in your reports. This is an outdated one, 4 February. We will be getting new data in at the beginning of next week, which will help update these graphs again. But as you can see, there has been very consistent growth in Australia of electric vehicles and also of hybrid vehicles. We think that the hybrid vehicle event will pass fairly soon, in the next year or two, and the hybrids will start to contract. Why do we believe that? Because that is exactly what has happened in every other mature market around the world: where EV adoption is higher, hybrid usage slips. People gain confidence in the fact that electric vehicles will do what they want, so therefore we expect that hybrid sales will start to contract over the next year or two, perhaps even as quickly as the end of this year. But we will see what the future brings.

Next slide, please. When we look at world battery demand, which is obviously important for the building of electric vehicles, but also the building of utility storage and of domestic storage, they are all portrayed here on this graph. You can see that we have seen, in the last five years, the rapid growth of electric vehicles being the top two bars, and now the emerging rapid growth of utility scale and domestic scale seen in the bottom two bars. This is again global data. Look at the next slide, but remind yourself of the shape of this one.

Moving on to the next slide, you will see that the same shape is there, but 2025 is now a tiny little bump in the middle. We believe that battery growth is continuing at pace. There has been no reason to suggest that it will not do so, and that has been absolutely important in terms of driving the growth of electric vehicles. But the growth of electric vehicles has led to even more battery development. That has brought the price of batteries

down, and so now stationary storage, which is a lower cost tolerant storage form as opposed to electric cars, we are seeing that growth continue rapidly into the future by our modelling projections.

Next slide, please – almost at the end. Again this is straight from the submission that we have given you, which is really just showing the various states' breakdown for EV uptake and highlighting the fact that as the largest contender in that mix there, Victoria is leading the way with uptake. We are now seeing battery electric vehicles well over 10 per cent in Victoria.

Next slide, please. This is a new slide for you. It is showing a couple of things which I will take 1 or 2 minutes to explain. It shows you the growth of electricity generation from a particular source after that electricity generation has got big. So 100 terawatt hours is considered to be big. That is a lot of energy. We see the growth: going up from the bottom is coal, it is hydro, purple is gas, black is oil. We tend to forget that up until the oil crisis in the mid-70s, oil was growing like topsy – oil-based generation for electricity. However, once the oil crisis hit, while oil generation systems that had been built continued to be operated, no new ones were built. So that is why suddenly what is a rapidly rising line becomes a fairly flat line and then starts to retreat 10 and 15 years later, as older oil-fired refineries are retired. The next line in there that is really obvious is the red one, which is the growth of nuclear. The growth of nuclear, particularly by France, but by a number of nations from the late 70s onwards, is depicted there. Again, the zero point is the point at which that generation source exceeded 100 terawatt hours. That has gone up. You can see that wind grew just as fast as we started to deploy it, but the difference with it and nuclear is of course it has continued to grow.

The next one, which is also very evident, was famous last year, including from us at Future Smart. We were publishing this graph showing the rapid rise of solar energy as a generation source globally. What you can see if you really think about what that line is doing is at this point it has not slowed; it is continuing to grow rapidly. Last year we were calling it the fastest energy transition in human history to a new energy source, and that remains true until we start to think about what batteries are doing now. Batteries of course are not a generation source, they are a storage, but nevertheless they can dispatch electricity. So the point of this graph is to say solar has been incredibly fast; the growth of batteries is incredibly faster again. This is a really important message to you as decision-makers, because what it should do is give you confidence with the ever-growing graph of solar and with the now newly emerging but really rapidly growing graph of batteries that the decisions you make for Victoria here are going to be backed up by the fact that this stuff is arriving en masse, and if you are confident of that delivery, you should be, because it will happen. That is all that this graph is saying.

Okay, next couple of slides to finish. I will be quick here, but EV uptake is tracking at or above our fast scenario. Those solid lines that we showed on that graph that a lot of people think are still fruit loop are really hitting the mark. BEV sales in Australia have exceeded 100,000 nationally, as we have said, and are now represented around 8 percent of new vehicle sales in 2025 across Australia. It is our view that, combined with plug-in share, it will reach approximately 16 or 17 per cent by the end of the year. I think it will be higher, but I think that is a midrange number from us. It underscores the need for Victoria to plan for this rapid EV penetration, because, again, with the rapid emergence of battery storage but also the rapid emergence of EVs, there is lots for people that are managing, regulating and creating policy around power to do.

Next slide, please. System operators and distribution network service providers are now formally assuming higher EV penetration in planning. It is only a new thing, but it is coming out from last year. AusNet's published strategy relies on AEMO scenarios, which we regard as rather modest. Nevertheless AEMO's latest scenarios are highlighting the challenges of minimum demand caused by solar but also by the stress of demand integration. It strengthens the case for integrating flexible EV storage as well as the other scale of utility and domestic storage that is now coming and also growing like Topsy, to use that old phrase.

Moving on to the last slide here, what we are seeing is that there are real world vehicle-to-grid and kerbside trials in Victoria which are nationally underway. Victoria's projects are extremely important in demonstrating to Australia what is happening, but there is also the opportunity to demonstrate that to the rest of the world. As these things are proven to be workable and proven to be efficient, then we will see a lot of global interest in those occurrences, because these will be the first of kind. There are obviously other things in here, such as important work to do with how those electric vehicles are integrated and to demonstrate that what we are currently lacking in Australia still remains a strong commercial uptake in EVs. Our view is that that will be even bigger and more important in terms of its integration as long as the issues to do with warranties and standards are moved forward.

Next slide, please. It should hopefully be my conclusion. We have got three immediate levers that we see, including a mandate for smart, network-connected charging with dynamic pricing and pro-renewable defaults. Again, we have confidence in that because the evidence is clear that this is continuing to grow faster and faster. There is no evidence of any slowing, even in the US, where Donald Trump is going pro coal. Even in the last two months renewable energy in the US has continued to grow despite somebody literally opposing it. If there is no opposition to it in Australia, we should expect it to only go faster, not slower. Therefore we fast-tracked those vehicle standards to allow the battery connections, and we need to quickly move from pilots to large-scale fleet-enabled deployments. My analogy here is: the wheels on the bus go round and round. We do not need to trial these things. We know they work, because we have all of the evidence from the stationary storage markets. The question really is: how do we implement them in a safe way and one that ensures that we are meeting quality standards? As a consequence, we require AEMO and the DNSPs to publish planning scenarios where high-EV DER utilisation is made, because this will give us confidence.

I will finish with this one line: if we plan to use more gas, then we will use more gas. But if we plan to use renewables, where the evidence is showing that with battery storage, the renewables are extraordinarily secure, extraordinarily reliable and in fact more reliable than our energy system has been in the past, then that is where we are at. That is my last slide.

Peter NEWMAN: Can I add I am part of a group with the CRC RACE, Reliable Affordable Clean Energy. We have been working on V2G. That report is about to come out, and I can just tell you very quickly that on the SWIS, the south-west integrated grid that we have in Western Australia, up to 50 per cent of the storage could be provided by vehicles in the modelling that was done for them. Secondly, the key areas to work with on this are fleets, and there are lots of them, and precincts like the ecovillages that are starting up. They can be all trialled there. We have got one that is working beautifully. Finally, bus fleets and depots are ideal sources of V2G. They have got batteries sitting there during peak times, massive batteries that could be taken on board to help with the grid, and they can earn money from that, as the ACT is doing right now. They already have done that. I think the steps forward need to be in a transition from those initial starts, and it can provide all we need without any need for gas.

The CHAIR: Great. Thank you so much for that. We will move to questions from members. We have got about 5 minutes each, and then if there is time we will go around again. We will start with Mr Berger.

John BERGER: Thank you, Chair. Thank you both for your appearance this afternoon. Ray, I am interested in your initial opening when you talked about the confidence in electric vehicles. What could be done to lift the profile of and confidence in electric vehicles?

Ray WILLS: If we go by what has happened in many other countries – and Norway is obviously the star, with over 98 per cent penetration of battery electric vehicles there now – they also saw growth in hybrids in the earlier part of that growth as people were less confident. Really the only thing we can do is grow the market more quickly, because what we know is that once we get above the 20 to 25 per cent penetration range, that is when the hybrids start downhill. If we actually look at that same data from different countries and say ‘When did they tip over?’ it is around about that thing. What we need to do is continue to confidently promote vehicles. We have also made a submission to federal Treasury on this matter, encouraging them to continue to provide support, at least until we get to 20 to 25 per cent penetration of vehicles that are electric.

Once that happens, everything tips over, a bit like what is happening with renewable energy. Our model suggests that when we get past 47 per cent regular renewable energy penetration, then we will start to see an impact on pricing. The east coast has now gone over 50 per cent and WA has now gone over 55 per cent and we have actually been seeing in the last three to six months of AEMO data that there is downward pressure on pricing for the first time. My expectation is that for that particular scenario on renewables, once we get to 60 per cent, it will be a lay down misère and it will be clear that we will be able to reduce our electricity pricing. For Australia, that may be as early as the end of the year. At that time, we should see AEMO start to make decisions about electricity pricing. The next part of that, related back to EVs of course, is that if we reduce the price of electricity, unlike with petrol, which will never really go down again, it will bring us even cheaper transport supply energy in Australia. It is just awesome. It will be automatically decarbonised and it will be cheaper.

John BERGER: In recent weeks there has been a flurry on social media about the price of batteries – in particular that the rebate that is available is running out soon. Do you see the price of batteries coming down significantly after that for people to continue? Where do you see the subsidy sitting?

Ray WILLS: I am not an economist, but I do know some economist phrases, so I am a little bit dangerous. Of course it is opportunity costs that we are talking about. The question is: when will the rate of decline – the annual rate of decline of battery price, which is happening annually around 20 per cent – actually be so low that we cannot necessarily affect it with subsidy? My view of that is that it is likely to occur in the next two years. It is a bit like the saturation point I mentioned for renewables getting to over 50 per cent, or for EVs getting over 20 or 25 per cent. When we see those thresholds reached, everything else is just plain economics.

John BERGER: Yes. Thanks, Chair.

The CHAIR: Thanks, Mr Berger. We will go to Ms Broad.

Gaëlle BROAD: Thank you very much. I appreciate your insights. It has been an interesting one, this one, because it feels a little bit like we are building a house but we are not sure how much it is going to cost – and we will build it anyway. You talk about the low-cost energy system, and there is a lot of commentary around the subsidies, particularly for EV vehicles. There are solar subsidies as well, and there has been talk about sort of plugging into that. There is the installation of charge points by the CPUs as well, which is another cost, and then the recycling of batteries was discussed today, and again they were mentioning that there probably does need to be some grants or subsidies to do large-scale recycling in Victoria. What is the tipping point – is this always going to rely on subsidies to exist? What capacity is needed for that economy of scale and benefit-cost ratio?

Ray WILLS: Ultimately when things start getting a bit cheaper, people go, ‘Oh look, we don’t need to subsidise it anymore.’ To a degree that is almost true. The degree is that because these things are getting so cheap and so abundant, they will naturally continue to grow. But there is another driver here which is absolutely critical not to forget – the reason that we are doing all this decarbonisation is because of climate change. Climate change is real – driven by global warming. What we are meant to be doing is accelerating our rates of decarbonisation, not just letting it grow slowly into the future. I see the challenges here – we have got a tool to hand. Yes, it may be cheaper next year than this year, but that is no reason to procrastinate. What it means is that our costs will reduce over time as we do this, until such time as they start to reverse and indeed deliver much cheaper savings. We are seeing that with the data on volume-weighted wholesale pricing coming from AEMO. We know that every time we add more renewables, the electricity wholesale price comes down. When we add more gas, we know that actually that price goes up. We should be able to continue to do this. We could continue to do it without too much more subsidy. However, if we all agree that fighting climate change is important, we can do it at a stage that will continue to accelerate that. When we actually get this executed we will be benefiting by overall much lower prices, not just a little bit, they will be much lower. They will be lower for the car users. They will also be lower for the electricity users overall.

Gaëlle BROAD: I guess there has certainly been discussion that Australia is accountable for less than 1 per cent of emissions worldwide. So even if we stopped everything, there are other countries that are doing a lot of things at scale. Australia looks like a tiny player in the bigger market. I am just interested, because you showed a chart showing exponential growth when it comes to batteries: won’t that mean a huge increase in mining?

Ray WILLS: Yes, it does. Two things there: one is that my view is if Australia was only 1 per cent of corruption and we chose not to fight it, would we be happy with that. If Australia was only 1 per cent of children in poverty, would that be a sufficiently low bar for us to stop worrying about it.

Gaëlle BROAD: I guess some people have argued that even attempting to do something about the toilet system around the world would save a lot of lives as well. When you look at batteries, the Hazelwood big battery can charge 75,000 homes for an hour. That is 342 containers on site with a lifespan of 20 years. How do you see batteries being able to meet that need that we have and that demand that we have for energy? Because we have got a huge, growing population and a huge need for further power supply with data centres and the like.

Ray WILLS: Yes, certainly. Just to finish on the last question as well, you asked about the amount of materials consumed, and that is easily answered. Each year we dig up 8 billion tons of coal and burn it. With

the resources we are talking about taking out of the ground for battery manufacturing, we are talking about 2 to 3 million tons of lithium equivalent a year, which relates to about 100 million tons of ore a year to supply all the global batteries. While we are digging up new stuff, which we have not dug up a lot of before, we are going to stop digging up an awful lot of the old stuff, which we simply will not need to burn every year anymore. In relation to your question about –

Gaelle BROAD: But we do export it.

Ray WILLS: But the whole world is going renewable, and Treasury has already given us the heads-up that they expect Australia's coal exports to drop as a consequence of the whole world going renewable. If people do not need to burn coal, they will not. If they have to buy it from Australia, they will not. However, I am trying to get back to your other point you have just made which was in relation to – I might need a reminder.

Gaelle BROAD: Just the size of the batteries, I guess.

Ray WILLS: The size of batteries. I guess one of the points of that graph is that as you saw it growing to 2025, gee, it looked big, but actually it is not going to be as big as it is going to be by 2030. The scale is actually not daunting. The scale of renewables needed to power the whole of Australia covers less than 1 per cent of Australia. All of the mining leases in Australia cover 17 per cent of Australia. Past releases cover a similar amount. I guess the question of scale is perhaps a bit distracting, so I am going to leave it there. I think that is an important question and we need to consider it. As you were pointing out, people are concerned about that, and I understand why. It is also a question of ensuring that we present it in the way that actually shows just how inconsequential – if Australia planned all of its solar farms and we used all of the land for golf courses for solar, we would actually still have 13 holes left; it would only use five holes worth of golf course if we put all of the solar onto golf courses in Australia.

Peter NEWMAN: Can I just add very quickly a comment, if you do not mind. I get asked to speak on media and in public presentations all around the world about how we are doing it in Australia because of my IPCC connections, and it is very interesting to see that the world is looking to us to see how to do it. They know we have got good resources, they know we are close to China geographically and therefore we can get cheap goods from them and they know that we are interested and committed to new technologies and they are working, and they want to know how. So with this kind of work that you are doing, it is very important to show that we can proceed into an area where we are building something that we may not know the full price of. It is the right thing to do, and it is so far proving to be a lot cheaper than anyone else predicted.

The CHAIR: Great. Thank you so much. We will go to Ms Copsey.

Katherine COPSEY: Thank you. I have been asking quite a bit about technical barriers to vehicle to grid, and you have got some really good information in your submission that I am reading now. Given we can have EVs operating as batteries on wheels, in your view should we be extending subsidies to facilitate the uptake of the charging infrastructure as well as the electric vehicles themselves to make access to that technology more equitable across different households? Would that also then give us assistance in delivering the benefits for this technology to the grid?

Ray WILLS: There is so much depth to that question, but let me just focus on one thing first of all. I expect Peter will want to comment on this as well. Generational equity is really important but so too is access. People are having to live in outer suburbs and then are using their vehicle to commute instead of public transport. We have got to do as much as we can to get them on public transport so that they will save money but also decongest the freeways so we spend less money on freeways. This is a wicked question. But ultimately, I guess, the most important thing in there is individuals and people who need assistance. I see that we need ways to actually allow them to get into the car market as well. One of the obvious ways is to, first of all, load up the car market so that then there are second-hand vehicles. That can work very well. One of the things battery manufacturers did when they first came out 10 years ago was to offer six-year warranties. We now know that batteries actually last much, much, much longer than people ever were prepared to admit, especially the manufacturers, because they were giving us only short-term warranties. Now they are giving us long-term warranties. What we now know is that even those long-term warranties are not all that generous, because these batteries last a long time. However, if a battery collapses through manufacturing fault, then that warranty period is important, so it should be extended.

What does that all mean? It means that when we sell second-hand electric cars, they will be reliable. We need a way of certifying that. Indeed the Australian Electric Vehicle Association are very heavily into this, and they are looking at issuing tests which would only cost about \$150 per vehicle and would give you a certificate of performance for the battery to show how much more life it has got. I am familiar with what AEVA are doing. I am less familiar with that technology; I am not an engineer. But that is what we need, that confidence and assurance for people buying new cars but also for people buying second-hand cars. That will be much of the disadvantaged market. We need to be able to say to them when they buy that car, 'Don't worry, it's still going to work.'

Peter NEWMAN: I will add to that. I go to a local Anglican church which has got its own recharge service available. They are now beginning to adopt this across the whole diocese because they think it is a new part of the Anglican ministry to provide something cheaper for those people who cannot easily access power through their own homes. Those people with a second-hand EV that needs recharging can now do it in their local church. So that is the kind of thing that is starting to happen. I do not see anything wrong with seeing more and more of that. There are service organisations that will start to work on that side of the cost of living in our cities and regions.

Ray WILLS: The reason that Peter is glowing sitting in his room is he is a saint.

Tom McINTOSH: Hallelujah.

Katherine COPSEY: Thank you. I am interested in your views. We can see that there is going to be huge growth in the number of batteries over this time. What do you think are the biggest opportunities and the biggest difficulties that that will present to our energy system, and how can government help overcome those difficulties?

Ray WILLS: To be frank, with the performance of batteries to date – so Western Australia has the world's most isolated grid. I am not saying that as a West Australian, I am just saying that because it is a fact. Therefore the battery uptake in Western Australia, with stationary storage, has been very high, and what we are actually seeing is a very rapid uptake of batteries. Those batteries are actually bringing greater reliability to WA's grid than we had anticipated – or many had anticipated. Peter and I were certainly expecting it. But what that means is that we can expect that reliability to continue. I do not see any downsides on the inclusion of batteries onto the grid. The only downside that might come is if we fail to use them fully because we have not created enough renewable energy to generate and fill them up every day. That would be the travesty. The opportunity is absolutely to do with every voter who will be experiencing – should be experiencing – downward pricing in energy costs in the next two years, in the exact reverse of what the last four years have been about. The last four years have been about accelerated gas pricing from the Ukraine war, causing Australia's energy system to reflect that. But just one final sentence, and Peter may have something to say here too: that opportunity cost is to not do this.

Peter NEWMAN: I have written a book about this. It is called *Net Zero Cities with Sustainability: A Practitioner's Approach*. It is just out from Edward Elgar. It shows that the next economy is clearly going to be a net zero one, and those places that are embracing that first are getting the best economic benefits from it. It is a normal process of innovation in waves that has occurred throughout industrial history. This one is now being driven by net zero, and it is clearly economically beneficial to get behind it. If you do not, you will become a loser. This is why America is going to miss out on this phase. I think ordinary Australians can understand that now, because in their own budgets they are finding that net zero works cheaper.

The CHAIR: Great. Thanks, Ms Copsey. We will go to Mr Welch.

Richard WELCH: Thank you, Chair. Thank you both for joining us today. I was interested in some of your submission around vehicle-to-grid transfer of energy. What infrastructure investment is required to upgrade the grid for V2G?

Peter NEWMAN: We have a PhD on that – two of them actually. One was working within Western Power itself, and he has just finished that, and the other one is from outside but is working on exactly that issue. There are about 18 different technologies that can be brought to bear on a grid to enable it to increase its hosting capacity for this transition, and they are all worth doing. Some are a lot quicker and easier and cheaper. V2G is

one of those parts and, as I mentioned before, is likely to provide up to 50 per cent of that capacity into the future.

Richard WELCH: Would that be the actual infrastructure required? Is that on a street-by-street basis or a residence-by-residence basis? What infrastructure is required?

Peter NEWMAN: It is a combination. There are things that can be done with your own meter, but mostly it is going to be at the substation level where that is coming in for the area that is feeding into it. It will be different in different places and at different rates, and they are already being adjusted. They are places where the batteries will be. We are getting community batteries put through the various suburbs and big industrial-scale batteries in industrial areas. They are working out how to do that, but the processes that they have to do in their own grid to enable are mostly software that needs to be changed. Every time they do that it seems to work in ways that they had hoped would work and were not sure. The old guard are still waiting and saying, 'We're still going to need baseload, and we're going to need gas to inform it and help it.' But at every stage it has shown – there is a group of about 200 people in this exercise across the various disciplines working on this, and they are coming up all the time and saying, 'This is working better than we thought.' So they are constantly able to expand the hosting capacity of the grid for this transition, and it is working very rapidly.

Richard WELCH: Do we have an estimate of what it will cost?

Peter NEWMAN: They are very little costs so far. The distributed energy costs are so far –

Richard WELCH: No, I do not mean 'so far'. I mean, is there an estimate of what it would cost to do the transition as you have described?

Peter NEWMAN: Well, I have not seen that. I dare say someone has had a go at it. It is the kind of question I could ask in our system that may well have been asked, but I have not asked that one, because it is such a transition. You are doing it in steps, and each of the steps is not very big. They are not even having to go to cabinets and things like that. It is an exercise to just do step by step, and as each of them works, they just adopt it. It is a transition, like sailing a ship that is needing to be rebuilt as you go, but it is still a ship all the way. At the end it is a different ship but it is all there. And that process is happening quite quickly.

Ray WILLS: I can add just a little bit of colour to that. It is work that Future Smart Strategies – we are a private consultancy – have done. Last year we wrote a report for electrifying the Great Northern Highway, a 1600-kilometre stretch of road going from Perth to Karratha. We do not have specific figures that would be applicable here to the question you are asking, unfortunately, because that is the work that we have not done.

Richard WELCH: I just want to be clear, and I do not want to put words in anyone's mouth. But you are saying that this is predominantly a software exercise, not an infrastructure exercise?

Ray WILLS: In relation to vehicle to grid, yes, it is, obviously in relation to charging stations that will be used. And at this point charging stations charge vehicles; they are not actually equipped to recover that energy from vehicles. So the vehicle to grid from a common charging station would need to be adapted as well. That is actually a bit of a hardware fix but also a bit of a software fix. It is not a big step for it to be able to feed back into the grid, but that is also something that can be done. Probably the critical thing here is really the question of really how we are equipping our residential villages, our strata, to ensure that those buildings that are going up in new strata are being equipped, that buildings that are going up in new towers are being equipped for this, and if we are building bus stations for more transport, then those building requirements are also known there and integrated into what we do.

Richard WELCH: In terms of the return on investment, making the investment worthwhile, what penetration of EVs would be required to justify the investment in vehicle-to-grid infrastructure?

Ray WILLS: Again, the vehicle to grid – that one component is mostly software, and it is really just a question of the car makers actually empowering that. Famously, the Nissan Leaf is capable of vehicle to grid, because the software has been included in that vehicle. The Zeekr, which is a new brand coming to Australia, very strongly –

Richard WELCH: Sorry, you maybe misunderstood the question. In the Victorian/Australian – but let us say Victorian – marketplace, how many EVs would we need to have as a critical mass of EVs to make it viable to have that as a reliable piece of a grid architecture?

Ray WILLS: It is really a question of volume.

Richard WELCH: Yes.

Ray WILLS: The average battery of an EV is 60 kWh. Therefore if you have got 100 EVs, then you have got 60,000 kilowatts. Multiply that by one more – I am just doing the maths in my head here – and we get to 600 meg. So you are talking about a thousand vehicles giving you 60 megs and then you are talking about 10,000 EVs giving you 600 megs of batteries. For something to be critical it would be at least, I would have thought, 3 to 4 gigs, so another four times that many. So we are talking about 50,000 to 60,000 vehicles using vehicle to grid, which would be delivering significant infrastructure support.

Richard WELCH: Okay. Thank you.

Ray WILLS: That was just maths in my head.

Richard WELCH: Very flexible thinking. Thank you, Chair.

The CHAIR: Thanks, Mr Welch. We will go to Mr McIntosh.

Tom McINTOSH: Very good numbers on the run; thank you for that. You talked about curtailment earlier. Just so everyone is clear, we have excess solar or wind that is being switched off at the moment, so EVs give the opportunity to store some of that solar that through curtailment is not being sent into the grid, yes?

Ray WILLS: Yes, exactly.

Tom McINTOSH: Great. Thank you. I am going to just rapidly fire a heap of questions at you. We have had a lot of questions about subsidies and costs and this sort of stuff. Last century, am I right in understanding that our roads, our dams and our electricity network were publicly funded by taxpayers as a service for those taxpayers and for our society and for our economy?

Ray WILLS: That is right. I mean, we have seen a privatisation of infrastructure as a priority really since Reaganomics came along, but it has got particularly strong in these last couple of decades, where there has been a view that the private sector will deliver more cheaply than public sector delivery of services.

Tom McINTOSH: But there has always traditionally been government investment in new services for communities and for our economy.

Ray WILLS: Absolutely, so what I was going to –

Tom McINTOSH: Sorry. I will just keep it quick. Sorry, go on. I have just got lots of questions to get through.

Ray WILLS: Importantly, Western Power is still 100 per cent owned by the Western Australian government.

Tom McINTOSH: Yes, and obviously there will be –

Ray WILLS: And it allows the government to make more decisions when that control is there than having to negotiate with –

Tom McINTOSH: I am going to come back to DNSPs shortly because it has been a big point of our conversation. When we went from newspapers and print services to the internet, when we went from landlines to mobiles and when we went from horse and cart to cars, we saw a transition in investment in new infrastructure across decades and centuries in human evolution. Does that sound right?

Ray WILLS: Yes, absolutely, and we are seeing it –

Peter NEWMAN: I do not agree entirely. I think that we still subsidise diesel for 55 cents –

Tom McINTOSH: I am very glad you asked that, because I know the Nationals are the party of big miners, but we have \$11 billion of diesel subsidy in this nation every year. Now, I grew up on a farm; I am absolutely for farmers. Forty-five per cent to 50 per cent of that goes to multinational miners. You have got Fortescue getting off diesel and going to generate power locally at their mining assets – Aussie jobs onsite, all the money staying in our country, supporting our own economy. We are not importing diesel that goes to foreign nations and sometimes is going to dictators, as a word, with Putin and their war machines. So what do you think is the benefit to our country in electrifying not only EVs but industry, and do you think the subsidies – I think subsidies are important. We have talked about regional areas. I do not want regional areas left behind. So whether we are talking about EV charging, roads, dams or electrical infrastructure, subsidies are important for our farmers and our regional communities, because without those subsidies they simply do not have the critical mass of customers to enable the private market to go in there and operate. Thoughts?

Ray WILLS: On that one, first of all, our submission to you guys has also been reflected in our submission to Treasury, where the importance of regional Australia and remote regional Australia is critical. We have got to take everybody along. But the savings to be had remotely are enormous. In Western Australia, where remote electricity users get subsidised by the city, if we could actually get them all across to renewable energy more cheaply, then there would be less subsidy coming across. Everybody's power would be cheaper in that scenario. The same is true for the electrification of farms. I am commonly a presenter at agricultural events talking about the opportunities for electrification of headers and all manner of farm equipment and –

Tom McINTOSH: And it will give them resilience, too, in storm events and natural weather events.

Ray WILLS: Yes, and if you if you have a hectare of soybeans and grow diesel, that will give you around about 800 megawatt hours equivalent of energy. If you do the same with 1 hectare of solar panels, you will get about 10,000 megawatt hours of electric –

Tom McINTOSH: We as legislators, what can we do to assist? We have talked a lot about the DNSPs; you say in your submission about neutral enablers. What are we able to do to support the uptake of charging infrastructure? We have heard a lot of criticism of the DNSPs, particularly here in Victoria. What are we able to do to support more electric car infrastructure to go out more quickly?

Ray WILLS: I think Peter will have some responses on this as well, but quickly from me – first of all, I think we need to get our building standards right. Buildings actually have to meet electrical standards; we just need to ensure that these electrical standards are captured as a part of that. Even in my home council they still only allow 2 per cent of electric vehicle penetration into new developments, which is just nuts. So we have to actually get our building infrastructure tiered towards it.

Tom McINTOSH: Where is home for you, again, sorry – what state?

Ray WILLS: I am in Western Australia.

Tom McINTOSH: Western Australia, thank you.

Ray WILLS: I am talking about the City of Stirling, which still has only a 2 per cent requirement of new high-rise buildings to have vehicle charging in them, which is well below what the volume of sales is. So there is a whole range of – it is not necessarily a simple fix but it is not necessarily a hard fix. That is, we need to get our legislation sympathetic to the changes that are coming, instead of – I mean, the electricity regulations in Western Australia are dated 1991. I do not know what the Victorian ones are. I should know; I should have checked.

Tom McINTOSH: Thank you. And so –

Peter NEWMAN: I would just add an opportunity for community-based electric vehicle recharge – if you subsidise that for groups like Anglicare or Salvation Army or whatever group is out there doing things for services, they can have that ability. There are ways in which people can access the next economy through that means. There are all kinds of little electric vehicles and electromobility as well that can be helped by that.

Tom McINTOSH: Thank you. Thanks, Chair.

The CHAIR: Great. Does anyone else have any other quick questions? I might just do one really quick one and then we will go round to Ms Broad. We have heard a little bit throughout this inquiry process about concerns with batteries when they are used, or second-life batteries. I know that your submission speaks to this in some detail. Can you tell us your view on what can be done with batteries?

Ray WILLS: When you use a battery in an electric vehicle and its performance falls to, say, an arbitrary number of about 75 or 80 per cent of normal, it starts to become less useful as a vehicle. However, it does bring the cost of that vehicle down. But even if it drops to 60 per cent, it is really starting to get to the limit of its use in the vehicle, but it has still got 60 per cent capacity, so that use – that reuse – does not mean it needs to be recycled. It does mean it can be reused within stationary storage. There are enterprises that are already doing that; we will see more volumes of those occur. But hopefully before we go to recycling, we go to reuse.

The CHAIR: Great. You say that is already happening in some places; can you speak a little bit more to that?

Ray WILLS: There are few examples, because the reality is the cars have not yet reached their end of useful life for those batteries. That is also an important thing on the recycling of batteries – while there are already a lot of batteries out there, which we are really not making an effort to recycle, the volume will be much bigger in 10 years. That is the logical time for us to be able to press the green button saying, ‘We got ready, we prepared – now let’s launch this recycling.’ You can store those materials until that point. That is not really a big drama, because it will not be a big volume of batteries in the interceding period.

The CHAIR: Great.

Peter NEWMAN: Social media shows that the EV groups, the people who have gone past that 60 per cent phase, they are using their batteries in their own homes. They are not putting them in the tip. I think that is an effective way to deal with these.

Ray WILLS: I think the Australian Electric Vehicle Association would have a lot more material on that, if you are interested in this.

The CHAIR: Great. That is really interesting. Obviously some people have raised concerns about the disposal of batteries, so that is interesting. I will just go to Ms Broad quickly. We have got a couple of minutes.

Gaëlle BROAD: Thank you. I am just interested – this probably comes under other matters. But you were talking about nuclear earlier, because nuclear keeps going up across the world, the use of it. Australia obviously has uranium, but we export it. What are your views on nuclear usage in Australia?

Ray WILLS: You are referring back to that growth chart, the last one that I showed. That was a 35-year history growth chart. Thirty-five years ago was 1980. What we are seeing is that nuclear growth has in fact slowed down and nuclear generation’s share of global electricity is in fact falling. I was anticipating back in the middle of last decade that it would actually grow slightly. It has not. Even I was surprised how little nuclear has been contributing since that time. There is talk of a renaissance. There is no evidence of one. There is no data that shows increased generation from nuclear, apart from – the nuclear advocates are certainly grabbing hold of the fact that Japan is reopening some nuclear reactors and that is actually therefore causing a lift in Japan’s share of nuclear energy, simply because they have started using those nuclear reactors again. It has not been a growth of new nuclear facilities, it has been a regrowth of old.

Gaëlle BROAD: Thank you.

Ray WILLS: I can give you more data on that if you like.

Gaëlle BROAD: Yes, I would be interested if you are able. Thanks.

The CHAIR: Wonderful. Thank you so much for your time today, for answering our questions and for submitting to the inquiry. You might receive some follow-up questions on notice from committee members via the committee staff. That concludes the public hearing for today.

Committee adjourned.