LEGISLATIVE COUNCIL ECONOMY AND INFRASTRUCTURE COMMITTEE

Inquiry into Electricity Supply for Electric Vehicles

Melbourne – Thursday 12 March 2026

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Necessary corrections to be notified to executive officer of committee

WITNESS

Dr Peter Sherrell, Vice-Chancellor's Senior Research Fellow, Department of Applied Chemistry and Environmental Science, RMIT University.

The ACTING CHAIR (John Berger): 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 all mobile phones have been switched to silent and that background noise is minimised.

All evidence taken is protected by parliamentary privilege as provided by the *Constitution Act 1975* and further subject to the provisions of the Legislative Council standing orders. Therefore the information you provide during the hearing is protected by law. You are protected against any action from what you say during this hearing, but if you go elsewhere and repeat the same things, those comments may not be protected by that privilege. Any deliberately false evidence or misleading of the committee may be considered a contempt of the Parliament.

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

For the Hansard record, could you please state your name and any organisation you are appearing on behalf of.

Peter SHERRELL: My name is Dr Peter Sherrell, and I am here representing RMIT University.

The ACTING CHAIR: And our introductions.

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

The ACTING CHAIR: I am John Berger, Member for Southern Metropolitan Region. I invite you to make your opening comments, and if you can keep them to 10 to 15 minutes, that would be great.

Peter SHERRELL: Thank you very much. To give a little bit of background on myself and why I am here to speak to you today, my background is really as a scientist and engineer. Any commentary I make on economics, I have trepidation around; I am really focused on the technical challenges surrounding some of the terms of reference for the inquiry today.

I am here specifically to address two of those terms of reference: whether old EV batteries could have a second life as a household or community battery after removal from vehicles and the barriers and opportunities to the manufacture, reconditioning and recycling of EV batteries or other elements in the EV supply chain in Victoria. That is where I would like to try to start my statement.

In my view, developing a pathway for end-of-life EV batteries is just imperative. There are 450,000-odd electric vehicles on the road at the moment in Australia. When these reach end of life, there is no clear strategy, at least to the best of my knowledge, for where these batteries go. If these can be redeployed as household batteries, it appears extremely advantageous from a technological, minerals and economic point of view to me, with the caveat that I am not an economist. This has the potential to add resale value to end-of-life electric vehicles whilst also helping Australians who are currently paying, even with significant government rebates, between $8000 and $25,000 for a home battery installation. The key challenge to do this, from my view, is developing a pathway where the size, structure and power management system of the diverse, different types of electric vehicle batteries that are deployed in Australia can be assessed and safely transferred.

When I was looking at preparing for this hearing, there are more than 20 different types of batteries in EVs deployed in Australia. These are dominated by the Tesla battery, which still relies on a nickel manganese cobalt cathode material, which is a high-value material that people look at for recycling, and the BYD, which relies on lithium iron phosphate. These have vastly different energy profiles and have different strategies that you have to use for recycling and reuse. Given these are our cars and we drive them every day, each battery that comes out of these cars will also have a different life experience. That is the speed it is being driven at, the acceleration, the distance it is being driven, what impacts it is being exposed to and what vibrations it undergoes given the different chassis model or something like this. To date, there is no effective way to really clearly assess the state of a battery after it is pulled out of an electric vehicle, and I think this is the big challenge that we need to do, both in terms of technologically – how do we as engineers and scientists develop pathways to do this really well – but also from a public communication standpoint: how do we convince the public that these reused batteries are safe to go into a household? In my view they are, given the demands, but that communication strategy is a challenge.

There is work in the university sector to try to look at addressing this problem. At RMIT University we have an AEA Ignite grant looking at establishing an Australian electric vehicle battery passport, which would assess these types of status changes within a battery. That is being led by Associate Professor Mahdokht Shaibani, who unfortunately could not be here with me today to discuss this, but she has provided a statement to the committee. In alignment with that, in answering this pathway for end-of-life batteries, I suggest there really is a need to establish a certification pathway. By this I mean similar to solar installation certification and solar quality, which would require each EV battery at end of life to be certified that it can be used as a household battery, particularly meeting those safety and performance metrics. One thing I will note here is the typical household battery people are looking at putting in is somewhere in the order of 10 to 20 kilowatt hours. A current EV battery is often greater than 80 kilowatt hours, so these are much, much bigger than is typically used in a consumer environment, which makes the option of community batteries promising but also may provide some technological leverage for saying we are not going to use that full 80 kilowatt hours as a battery; we are going to put performance metrics in place where we only use 20 per cent of that power as the battery, ensuring we do not go over our limits of degradation of our battery materials. I think that is most of my initial statement for question 5.

For question 6, the barriers and opportunity for manufacturing, reconditioning and recycling of electric vehicle batteries, I am going to try to break this down into each of those individually: manufacturing, reconditioning and recycling. First of all, Victoria is positioned really, really well to be a leader in all three of these areas. We have the infrastructure, we have the energy expertise and we have the innovation hubs to look at battery manufacturing and recycling. However, there has been significant investment in this space from governments at different levels. We have had CRC program investment, which is Cooperative Research Centre investment through Future Battery Industries. We have had a $500 million investment from the ARENA big battery initiative, and there is still not a really established battery manufacturing facility in Australia. We have the battery hub at Deakin University, and we have the Australian battery manufacturing facility up at the Queensland University of Technology. They are really the dominant ones, to the best of my knowledge.

However, if you look at where batteries are currently manufactured, these are broken down into mostly facilities in China. We have CATL, who produce most of the batteries for Tesla these days. We have LG Chem in South Korea; BYD in China; SK Innovation in South Korea; and Panasonic, which has some plants in the USA and some plants in Japan. I will note here that CATL also do have facilities in Germany, Hungary, Indonesia and Spain, but their primary manufacturing of batteries themselves – not the vehicles, just the batteries – is still in China. This means there is significant sovereign capability and sovereign exposure to changing geopolitical climates that we should be aware of as we continue to move forward.

I am just going to emphasise that Victoria has the research capacity, with RMIT, Deakin University, the University of Melbourne and Monash, who all have significant battery expertise to try to take the lead in solving the technical and research-based challenges in this area. Along with the development capacity at CSIRO and emerging industries and energy precincts such as Gippsland, where we are looking at putting in significant data centre infrastructure, there is an opportunity to put this type of manufacturing there.

In terms of reconditioning, this is the area I can probably speak least to. I believe the key limits here are really legislative. It is unclear what is legal and safe for end-of-life EV batteries to be reconditioned into. The opportunity here is to conserve minerals. For context, in those CATL nickel manganese cobalt batteries, that is about 40 per cent of the battery weight of precious minerals, and this has driven the recycling economies of batteries for a while. However, when you move to the BYD-style batteries, which require the lithium ion phosphate, these are much less valuable minerals. There is much less value to recycle them, so if you repurpose and recondition them, you have a better opportunity for a business to come in and be economically viable. I am unsure of our current technical expertise to deliver reconditioning at scale, and we probably would need training-level support via TAFE and other tertiary training to get a workforce able to do this effectively.

Recycling really brings me back to my answer to the terms of reference (5). This is a really big opportunity to recycle these EVs into household batteries, contingent upon appropriate safety measures and certification processes. EV sales are continuing to grow. That means there is going to be a continued burden at end of life for something to do with these batteries. I tried to have a look at some numbers on this, and there were 183,000 household batteries installed in 2025, with a significant government rebate – those numbers are from the Clean Energy Council – and in 2025 we sold 157,000 electric vehicles to put on our road. So even with the greatest uptake to date of household batteries, we are still putting approximately the same number of electric vehicles on the road each year as the highest number of household batteries we deploy, so we need to figure out a way to do this. Again, establishing key metrics on safety condition and use state is critical.

The other form of recycling that we can talk about, rather than redeploying into household batteries, involves breaking batteries down into their principal components, so taking the cells apart, taking the stacks apart and taking the anodes and cathodes apart. This level of recycling still requires significant research and innovation to get there. We do not have something that is currently commercial and scalable at that fundamental back-to-basics and then reassemble from nothing – we just do not have the technology yet. This is due to the removal of binders and active materials in what is called a residual black mass once you take a battery apart, which typically incorporates somewhere in the order of 40 per cent of the overall battery weight that is lost. In Mahdokht's response, she noted that currently there is no progress significantly in this space in Victoria or Australia – there is research and there are research partnerships, but nothing commercial – and if we do not develop a strategy for this level of recycling, we risk shipping all our precious waste minerals offshore to get them processed, only to come back as an extra cost to us. I will note this is really challenging again for EV scale batteries. I have tried to go over the top of this very gently, but each chemistry is very, very different, and each cell assembly and cell component is very different, and these require different technologies and different processes. There is no one-size-fits-all way to recycle a battery, and therefore any industries that come in need to be flexible and adaptable to emerging form factors, configurations and power profiles of those batteries. I would like to leave it there as an opening statement. I am happy to take any questions.

The ACTING CHAIR: Thank you, Peter. I will go to Mrs Broad.

Gaelle BROAD: Thank you, Chair. Thank you very much for coming in today. I do have a number of questions. You mentioned that there is no current way to assess the state of a battery out of an EV but that it is important to convince households that they are safe to be reused and you seemed to indicate that they were safe to be reused. But if there is no way to assess the current state of the battery, how do you have any confidence?

Peter SHERRELL: Let me clarify that slightly. When I am referring to the state of the battery, I am referring specifically to its ability to hold its charging capacity over time. So if we look at an EV, we might charge it, depending on heavy use, between once a day and once a week. A household battery is being charged probably relatively constantly every day from solar installation, so there is a different energy profile. In terms of assessing the energy capability, we can use certain advanced electrochemical techniques to probe how much charge is being stored. These are very time consuming and not scalable, which is what I mean by there is no industrial way to do this across a large number of batteries. However, if the batteries are not able to store charge, that does not change their inherent safety. Particularly for LFP-based batteries, they are not more flammable if they cannot hold charge. There is no greater risk, to the best of my knowledge; they just will not serve their purpose.

Gaelle BROAD: So they are less efficient, but you are saying that does not –

Peter SHERRELL: That will not impact safety specifically. When you get a car battery – for instance, a BYD has a power of around 88 kilowatt hours for its battery size, give or take. At the end of life, so after five years of an EV, it will typically have a power profile of around 70 to 80 per cent of that. That is more than enough, typically, for a house battery, which only looks at using 8 to 20, from what I was able to see. Therefore if you have a power management system that can address this, so says, 'We only need to use this middle-range state of charge, where we have a Delta in charge of discharge and charge of 8 or 25, depending on the use case,' then that should be okay. But at scale, there is no way to really assess, 'This is the exact total amount of charge left in the battery', to the best of my knowledge.

Gaelle BROAD: Okay. You just mentioned the life of an EV battery being around five years. On the uptake, we have heard different responses, but it is minimal at the moment, and that is likely to increase. If there is no opportunity for recycling in our country at the moment, is it a tsunami of batteries that we are going to be facing?

Peter SHERRELL: Let me sort of clarify that, because I think I used the wrong words with 'end of life' at five years. Most people who get an EV keep it for about five years, from my understanding. The resale on EVs is really low. The batteries themselves will continue to work, but their efficiency will go down. If you compare that with a petrol car, where the engine really will keep working until a catastrophic failure after 20 years, you do not have that same gradual decrease in performance over time. The batteries themselves will last much, much longer than five years, which is why I think they are very suitable to go into household batteries, but it is about that transfer between owners and continued use of the EVs. I think the EV market is still emerging, and we are going to see changing consumer sentiment. We are going to see changing practice for how people are keeping these EVs for longer.

Gaelle BROAD: How long would you say the EV market has been in Victoria?

Peter SHERRELL: I do not have a good number. I would say it has really exploded in the past two or three years, but it has been going for a bit longer.

Gaelle BROAD: And why is the resale value on EVs so low?

Peter SHERRELL: I believe it is predominantly public perception and really fast technology advancements. If you look at the new car batteries, they have significantly more power and significantly better performance than car batteries even three or five years ago, and this is coming from continued development, advancement, engineering and technology development at these manufacturing plants. Particularly in Australia we have had the entry of BYD into the Australian market, which has given a significant alternative to Tesla, which was the primary one for quite a few years.

Gaelle BROAD: Our previous witness said that there was no product out there that can stop a thermal reaction. What needs to happen?

Peter SHERRELL: Sorry, are you asking what needs to happen for technology development to stop a thermal runaway?

Gaelle BROAD: Yes.

Peter SHERRELL: This is one of the big reasons people have moved away from nickel manganese cobalt cathodes and to lithium iron phosphate chemistries, because these are inherently significantly safer. There is also a lot of work in pack design to minimise thermal runaway in these systems. It is a much bigger risk in NMC batteries than LFP batteries, NMC again being nickel manganese cobalt and LFP being lithium iron phosphate. Several years ago there was a fire in the Tesla battery in Adelaide – the big stationary batteries, not EV batteries – and the only solution to that was to let it burn. There is a lot of research and development to isolate and address these. It is a challenge that is being worked on. I do not have a clear answer to what the best solution is at this time.

Gaelle BROAD: It is pretty incredible. It is kind of like a big push to adopt something, but then it is not clear what some of the risks are. You talked about the need for battery recycling onshore, and we have heard from other witnesses as well that have talked about how companies like to say that they are all about sustainability, but then they are exporting the batteries over to countries – as has been said to us, countries like India where they have got lower environmental and labour standards – that enable that cheaper processing. Do you think it is feasible, given our population size and the market size, potentially, for that to be a reality? Because there is a lot of theory and well meaning, but what will it take in reality?

Peter SHERRELL: This is very similar to where establishing Australian battery manufacturing has fallen down – it is labour cost and it is the cost of establishing large-scale manufacturing infrastructure. It just costs more than in China or in India or in places with lower labour costs. I think if you look at particularly the challenges in Australia, where we are geographically isolated and we would need to ship these very heavy, complex batteries offshore to do such recycling and then ship them back, I think the value proposition of doing it onshore should be much higher than comparing to such manufacturing, where you are basically bringing everything in once and building and assembling it here. But without a proper economics background and being able to look at the dollar value of those costs, I cannot give a strong answer or say yes. But in my view, it is much more attractive than the other pathways at the moment.

Gaelle BROAD: You talked about there being 20 different types of batteries and that BYD is a popular model. I guess most batteries are being produced in China. Do you support consumer information and awareness of where batteries originate from? Because evidently there are different labour standards that exist in other countries where these batteries are being produced. We have heard about some companies introducing a passport with a bit more information, but I am just interested in your thoughts on consumer awareness and information.

Peter SHERRELL: Yes, I would be a strong advocate for open and transparent information. My understanding – and I may be wrong in this – is that currently information that is disseminated is the company's information if they choose to disseminate it, and that always has some implicit bias. It would be better to be able to clearly communicate and inform the public generally of what is in their battery and what its performance is, as standardised by, let us say, an Australian or Victorian testing system.

Gaelle BROAD: Can I ask one more question?

The ACTING CHAIR: Yes, sure. Do you want to have a break for a minute?

Gaelle BROAD: Yes, over to you.

The ACTING CHAIR: Thank you. I am always interested – some of the evidence that has been given so far is about the intended purpose of the battery. For all intents and purposes, it is to run a car and its capacity does that – you know, it is up to 80 kilowatts or 88 kilowatts is around about its capacity. Why then when you go to repurpose it are we talking about – at the end-of-life stage, if you are doing it for a different purpose – what the issues could be if you are only getting it to discharge to a point where it is around about 80 to 20 kilowatts?

Peter SHERRELL: I am going to go off on a tangent and then come back to your question. If you look at fast-charging stations in Australia or in the world, if you plug in your electric vehicle, it will fast-charge up to about 80 per cent and then slow down. That is because there is a risk of causing internal damage to the battery as you charge all the way up to 100 per cent at a very fast rate and all the way down to 0 per cent if you discharge your battery absolutely completely. We have seen this in other battery chemistries, not lithium-ion, for many years. If you fully deplete your phone battery and fully charge it, you know your performance goes down over time. It is the same thing in electric vehicles.

What I was trying to get at with my statement about if we run these at the range needed for households was, from my understanding, a household battery only needs to sit somewhere between 8 and 25 kilowatts, if it is connected to solar, to power a house continually so it is effectively off grid. That means if we put a battery that is 88 kilowatt hours in, sure, you can charge it up, but it is never going to deplete all the way down before that solar comes out, barring an emergency; it gives you a longer lifetime supply. However, if you put power control management software systems in that say 'We're only going to let this battery charge to between 40 and 60 per cent of its total charge,' you are in a regime that would give it a much longer lifetime, because you are not approaching those ranges of the battery's state of charge, we call it, where it is fully discharged or fully charged – discharged being 0 per cent and charged being 100 per cent – where you are potentially causing damage. This comes back to my point in my opening statement where I mentioned that an EV you might charge once a day or once a week, but a house connected to solar is getting topped up with energy every day. You are expecting a different charging profile and a different discharge use profile to an electric vehicle.

The ACTING CHAIR: Does it then follow that, if you are using a car battery for its intended purpose, for the car, charging it up during the day and then using that battery back into the grid or back into a thing, again, is not its intended purpose? What does it do to the capacity and the performance of the battery?

Peter SHERRELL: Typically car batteries are significantly overengineered in comparison to household batteries. The amount of energy required to accelerate a car from 0 to 60 kilometres an hour is a much, much greater draw than a household or grid drawing energy slowly and consistently out of a battery. If we are repurposing EV batteries into household batteries, they are really not going to risk damage from the rate of that draw out. They are almost being engineered beyond the requirements for a household battery, if that makes sense.

The ACTING CHAIR: Would it then follow that you would be better off waiting for a recycled battery than a standard household battery?

Peter SHERRELL: I do not want to say it would be better, but there certainly is merit to look into that in much more detail. I think it would be a really attractive opportunity from a price point, because I would imagine – again, without the economics background – that the repurposed car battery would probably be cheaper than a current brand new house battery. If that enables uptake of batteries into a wider variety of neighbourhoods and environments or communities, then that would be beneficial for green electrification of suburbs. I cannot tell you it would be 100 per cent better, because the same way car batteries are continuing to be engineered and improved, so are household batteries. People are building them for purpose, but they are typically much less engineered in comparison to car batteries because they do not have that power density requirement, with power density being the acceleration of a car, whereas the energy density is the distance you can get it to travel.

The ACTING CHAIR: You said in your opening the life of the batteries was about five years, yet BYD warrant their batteries for a minimum of eight years.

Peter SHERRELL: Yes. Again, those five years, from my looking at the data, is about the lifetime a user keeps the car typically today – or people expect to keep the car, perhaps is a better way to say that. The batteries themselves, as I answered Gaelle’s comment before, I expect will last much, much, much longer. That eight years would be extended out even more under lower demand conditions, such as being put into a house.

The ACTING CHAIR: I do not have any further questions. Thank you for your contributions today.

Committee adjourned.