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

**WITNESSES**

David Van, Head of Strategy, Arvio Technology;

Katharine Hole, Chief Executive Officer, Association for the Battery Recycling Industry; and

Steven Marshall, Chief Operating Officer *(via videoconference)*, Livium.

**The DEPUTY 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 background noise is minimised.

I welcome any members of the public watching via the live broadcast.

We will start by introducing the committee members.

**John BERGER**: John Berger, Member for Southern Metro.

**The DEPUTY CHAIR**: I am Richard Welch, Member for North-Eastern Metro.

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

**The DEPUTY CHAIR**: To the witnesses, I advise that 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 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. Transcripts will ultimately be made public and posted on the committee's website.

For the Hansard record, can you please state your name and any organisation you are appearing on behalf of. We will start on screen.

**Steven MARSHALL**: Thank you. Steven Marshall. I am the COO of Livium, also representing Envirostream.

**David VAN**: Hello. I am David Van. I am Head of Strategy for Arvio Technology.

**Katharine HOLE**: I am Katharine Hole. I am the Chief Executive Officer for the Association for the Battery Recycling Industry.

**The DEPUTY CHAIR**: Thank you. I will invite each of you to make your opening remarks. If you could keep it to about 5 to 7 minutes each, we will have lots of time for questions. I will start with you, Mr Van.

**David VAN**: Thank you very much, Chair and members of the committee. I appreciate the opportunity to appear today. I want to start with a distinction that sounds simple but that changes almost everything about how we think about EV charging: fast charging is not primarily an energy problem; it is a power problem. Energy is how much electricity we use over time; power is how fast we need it to be delivered. The important thing to remember is that we are not running out of electricity; we are running out of places that can deliver it fast enough. Australia and Victoria are building renewable generation at scale. Over time, renewables plus storage solve the energy availability question, but they do not automatically increase the capacity of the local transformer behind a supermarket, the feeder serving a highway service centre or the switchboard on a depot site. Those are connection and network constraints.

If you picture a council in your region, they run waste trucks, maintenance vehicles and a community transport fleet, amongst others. They have a net zero target, a fleet transition plan and a works depot with a 400-kilowatt electricity connection. They want to install four 350-kilowatt truck chargers. They apply to their DNSP for the connection upgrade required to support that. A quote comes back to them with a cost that makes the project completely unviable and a timeline, if they went ahead anyway, measured in years, not months, before a single

truck has been charged, before a single tonne of diesel is displaced, and that is before the second hit arrives, which is the tariff. Under Victorian distribution pricing a single charging event at 1.4 megawatts, which is what four 350-kilowatt truck chargers would need, locks in a demand charge based on that peak for the next 12 months. The depot is looking at roughly $150,000 a year in additional network charges – $1.5 million extra over 10 years, which you would assume is the asset life. The connection is the up-front price shock. The tariff is the slow bleed. That is why so many charging projects stall: because the economics of connecting high-power charging at the edge of the network is often brutal.

I want to be clear: grid augmentation is sometimes necessary and entirely appropriate, but it is capital intensive and its costs flow through regulated charges to all households and businesses. If we solve charging by upgrading the grid at every site, we will build an inflation machine. The question is whether we default to augmentation as the first response or whether we use non-network solutions to reduce peaks, accelerate deployment and avoid unnecessary costs.

That brings me to the solution that I refer to in my submission. That is what Arvio specialises in, and that is battery power buffering. A battery and inverter system is installed behind the meter; the site therefore stays within its approved connection envelope. The grid sees a stable, predictable load as the battery charges at a controlled rate. When a vehicle plugs in and demands high power, the battery discharges rapidly to the charger, delivering that power spike, and then the battery quietly refills. EV charging is not a flatline operation; it is spiky. So why charge everyone for the costs of poles and wires, transformers and switchboards to deliver power that only runs for minutes a day? Our solution caps the grid import. We then deliver the peak internally on the site. The business avoids a capex shock and the tariff hit. Here battery chemistry matters, because the duty profile is brutal. Buffered charging means repeated high-power discharge and rapid recharge day after day, which takes its toll, and not all batteries are designed to do that. Arvio focuses on lithium titanate oxide technology because it is suited to repeated high-power duty over a long service life. An LFP battery might have a design life of 6000 to 8000 cycles; an LTO battery has one of over 30,000 cycles.

So what should government do with this? I am not asking government or the committee to pick winners. We need as many solutions out there as possible. I am asking the committee to recognise this category of solution and recommend a structured, evidence-led pilot. Arvio has proposed to ARENA a driving the nation grant scheme pilot focused on heavy transport and fleet duty because that is where the power constraint will be most acute and where the public benefit is highest.

I will finish where I began. The transition is not just about generating clean electricity; it is about delivering high power where and when it is needed without making every household pay for peak infrastructure that sits idle for most of the day. Vehicles need high power for minutes; the grid needs predictable demand over hours. A power buffer reconciles those realities. Thank you, and I welcome your questions.

**The DEPUTY CHAIR**: Thank you, Mr Van. Ms Hole.

**Katharine HOLE**: Thank you for the opportunity to address the committee. The Association for the Battery Recycling Industry, or ABRI, is the leading association promoting a circular economy for batteries. The focus is on safety, sustainability, best practice and building capability. ABRI represents over 60 companies and experts from across the battery value chain. Members handle all battery types, from small consumer devices to large energy storage and EV battery systems, and cover all chemistries, with the main areas lead acid and lithium.

Batteries are largely made up of metals. The sector is essentially a value-add metals and materials recovery industry. The good news? The sector is already actively remanufacturing and recycling, investing and building capability. Reuse and repair capacity exists through independent Australian companies, including in Victoria. Recyclers are exporting recovered metals and technology to recover those metals. This is Australian ingenuity. This is an industry building capability today. The priority for industry is quickly building safe and sustainable lithium battery handling to be ready at scale.

The sector has a strong record in lead-acid battery materials recovery. In excess of 90 per cent of batteries are recycled. The sector is rapidly growing, especially in lithium battery recycling and reuse. Overall the sector contributes an estimated $2.1 billion annually to the national economy, supporting over 19,000 jobs. By 2050 it is projected to contribute $6.9 billion to the economy and 34,000 jobs. Proven metals recovery technology,

drawing on Australia's mining expertise, backed by R and D investment, is increasing material recovery rates and reducing environmental impacts. In Victoria this research is at institutions such as Monash, CSIRO and Swinburne.

R and D is moving to solutions to improve safety and disassembly efficiency. EV batteries arriving for materials recovery are set to grow dramatically from around 1000 to 1500 tonnes per year today to more than 20,000 tonnes per year in the next decade. The community and automotive service sectors are seeking guidance on how to manage EV batteries in clear lines of responsibility – I should be clear, manage them at end of life. However, clear pathways and understanding around the options are lacking. The dangers of amateur handling and unsafe operations are real, and upmarked, end-of-life EV battery shipments overseas pose serious risks.

These are not challenges for the future but ones to resolve now. Our priority must be safe battery processing domestically. Leading car manufacturing countries China, Europe, India, Japan, Korea and some of the major US states are fast-tracking EV battery circularity policies. In many of these jurisdictions, policies are aligned with supply chain security goals. Indeed this week I have spoken to two major international investors exploring options in Australia. This is to support the country's supply chain diversity commitments.

Global estimates suggest that by 2030, with the right settings, 61 per cent of EV batteries collected at end of first life could enter a second life. This would be equivalent to around 6 per cent of needed energy storage capacity, with significant cost savings. Australia does not need to reinvent the wheel. The benefits are clear. This inquiry serves as a platform to increase awareness of the current situation and opportunities surrounding EV battery processing in Australia. It has the opportunity to emphasise the urgent need for the government to actively participate and facilitate the development of economic opportunities and safety within the sector.

Now I put forth three considerations. Firstly, ABRI is a firm advocate for a practical approach to mandatory producer responsibility. By aligning with policies implemented overseas, Australia can reinforce current practices. These measures would complement existing commercial arrangements between automotive companies and ABRI members. Adopting international standards enhances the transparency and availability of information regarding the life cycle of EV batteries. It supports competition and underpins a framework whereby consumers can have confidence in the reconditioned EV and the converted energy storage products they purchase.

Secondly, ABRI is collaborating with partners for continuous improvement in standards and skills. This includes development of an industry guideline for packing and transport of used lithium batteries, exploring a standards framework for EV battery reuse and remanufacturing, and skills training for recycling centre operators. Partners include Powering Australia, Standards Australia, the TAFE Centre of Excellence Clean Energy Batteries in Queensland and the TAFE EV centre of excellence in the ACT. Standards are critical to support EV battery conditioning and conversion to energy storage systems. Product quality and assurances are needed to underpin a vibrant market. There is no coordinating narrative to develop minimum standards; it lacks a planned, timely approach. The inquiry could call for coordinated action and ensure no gaps.

Finally, this inquiry has the opportunity to call on the Commonwealth for strengthened regulatory compliance action to meet Australia's commitments to process hazardous waste onshore. I note that since writing this yesterday there has been an announcement out of the department of DCCEEW in Canberra that they have issued a fine for somebody illegally exporting batteries offshore yesterday, which is great news. Processing lithium batteries domestically builds capacity and is safer. Retaining feedstock onshore helps local business build momentum and provides Australia with the option to choose which global supply chains to enter. The reality is that EV batteries are already entering the system for reprocessing, which means there is a pressing requirement for an established framework to manage them. Implementation of such a framework cannot be delayed. Action must be taken immediately to address the challenges and unlock the potential benefits.

**The DEPUTY CHAIR**: Thank you, Ms Hole. To you, Mr Linge. Thank you.

**Steven MARSHALL**: Thank you. Mr Linge is not here, unfortunately. I am Steven Marshall.

**The DEPUTY CHAIR**: Apologies.

**Steven MARSHALL**: That is okay, I will explain who is who as we go through. Thank you, Chair and committee members, for the opportunity to speak today and contribute to the Inquiry into Electricity Supply for

Electric Vehicles. Particularly for me, I will be focusing on the recycling, repurposing and reuse of large format lithium ion batteries with a focus on those used in electric vehicles. First of all I would like to apologise that I am not able to attend in person, though I do thank you for the opportunity to appear remotely to contribute to this important inquiry. I would also like to apologise on behalf of Simon Linge, our MD and CEO, who is currently travelling in the USA and had hoped to join, but flight changes have prevented him from being able to join remotely.

Just to give you a little bit of background on Livium and our work, sustainability is at the core of our business. Whilst we have technologies across the whole battery value chain, to put it simply, we are a clean energy recycler. We develop end-to-end processes that help accelerate us towards a decarbonised world. We deliver innovative solutions while prioritising environmental stewardship, social responsibility and safety. Our Envirostream business is the first licensed onshore company to offer lithium and mixed battery recycling in Australia. Launched in 2017, we developed safe and innovative management solutions for one of Australia's largest waste challenges: lithium battery recycling. This year we will divert over a million kilograms of batteries from landfill, ensuring their valuable contents can be reused in new batteries whilst avoiding the safety and environmental risks associated with them entering the general waste stream.

I am speaking today on the topic of recycling, repurposing and reuse of large format lithium ion batteries, particularly those from electric vehicles. This is not a future issue, it is a current and rapidly emerging one. Decisions made in this decade will determine whether Victoria and broader Australia can capture the economic, security, environmental and safety benefits of a circular battery economy, or whether we will export both the risks and the value offshore. By way of context, and as Katharine has just said, batteries are fundamentally a metals and materials story. They are manufactured from high-value critical minerals, items such as lithium, nickel, cobalt, copper, manganese, iron and graphite. At end of life, these materials do not disappear, they remain valuable. The question before us is whether we design systems to recover and reuse them safely and productively here in Australia. The good news is that capability already exists. Across Australia, including here in Victoria, industry is actively investing in safe handling and materials recovery related to batteries. Proven metallurgical expertise backed by research institutions is helping increase recovery rates and reduce environmental impacts. This is Australian ingenuity at work.

However, the scale of the challenge is accelerating. Electric vehicle sales are growing rapidly, and with that growth comes the inevitable wave of end-of-life batteries. While current volumes of EV battery processing are relatively modest, projections indicate a dramatic increase over the coming decade – we are moving from thousands of tonnes towards tens of thousands of tonnes per year. These batteries are large, energy-dense and potentially hazardous if handled incorrectly. They require specialist systems, trained operators, clear regulatory settings and safe logistics pathways. This inquiry is therefore very timely. Unfortunately, we see far too many companies, including some major brands that boast about their sustainability credentials, opting to ship batteries offshore to countries such as India because of their lower environmental and labour standards, allowing for cheaper processing. We think this not only runs against Australia's international obligations and commitments but also misses an early opportunity to play our part in the battery value chain today and into the future. A practical and effective mandatory producer responsibility framework for EV batteries would help address this issue.

If handled inappropriately, lithium ion batteries can pose significant safety and environmental risks. Victoria led the way in banning batteries from landfill, though improper handling, including storage and transportation, can lead to these items starting fires that have dire consequences. We encourage the committee to continue to put Victoria at the forefront with clear regulations in relation to end-of-life battery waste tracking and processing to ensure these materials are handled at the appropriate licensed facilities.

We believe that the key drivers to support the domestic battery recycling industry are banning batteries from export, banning all batteries from landfill and broadly harmonising the regulations and standards across the nation for issues such as labelling, handling, storage and transit. There would be environmental, safety and economic benefits from these changes. It is important to acknowledge that recycling of any product, let alone something as complex and potentially hazardous as a battery, does come at a cost. But so too does the unmanaged risk, environmental harm and lost economic opportunity. The long-term benefits – jobs, investment, skills development, supply chain resilience – substantially outweigh the short-term expense.

Perhaps most importantly, this is not an issue that can wait eight to 10 years. EV batteries are already entering the recovery system, whether that be true end of life or due to early failure and warranty claims. Automotive service sectors and the broader community are seeking guidance. Without clear pathways, we risk unsafe handling, informal operators and inconsistent disposal practices. Governments have understandably focused in recent years on smaller consumer batteries. That was necessary, but large format batteries represent a different order of magnitude in both opportunity and risk. Industry has been engaging government on the issue for some time. The message remains consistent: we must move from discussion to implementation.

In conclusion, Victoria has the opportunity to lead. By supporting a national mandatory producer responsibility scheme, accelerating coordinated standards development, strengthening skills and accreditation frameworks and advocating for onshore processing capacity, this inquiry can help ensure that EV battery circularity is safe, economically productive and environmentally responsible. EV batteries are not waste. They are a high value asset at end of life. With the right policy settings, they can underpin a thriving domestic industry and contribute meaningfully to Australia's decarbonisation and critical minerals ambitions. Thank you again for the opportunity to address the committee and I look forward to your questions.

**The DEPUTY CHAIR**: Thank you, Steven, thank you very much and we will move to questions. I will start with Ms Broad.

**Gaelle BROAD**: Thank you. I think you have highlighted a really important point, Steven. Just the amount of batteries and – I am in regional Victoria, so it has been a topic of conversation amongst residents for sure, because when you look at wind turbines, you know they have got a limited lifespan. You look at solar panels, again, they have got a limited lifespan. I have been on other inquiries where, with solar, we ask questions about recycling and it is very limited, what is being done at the moment. In a way it is convenience, but then it seems like there is a tidal wave coming of inconvenience. How do you see that? What impact? Because when we are looking at EVs being 2 per cent of the market now, if suddenly we have got another million cars on the roads, batteries that last perhaps 10 years, that is a huge amount that needs to be recycled or go to landfill. A lot of these things rely on subsidies to get started, to get people into it could be wind, solar, EVs. We are seeing the subsidies there. Is it possible for whole battery recycling to exist with no subsidies, and what impact do you think it is going to have on landfill in Victoria?

**Steven MARSHALL**: Good question. So is it possible for recycling to exist without subsidies? In the future, I 100 per cent believe yes. It is an economy of scale situation we sit in from a recycling perspective today. Victoria is fortunate that the two currently processing lithium ion battery recycling facilities – us being one – are both actually located in Victoria. At the moment we are shipping batteries from around the country back here for processing. There are other facilities currently under development in the other states, primarily New South Wales; there are also future plans for Queensland and Western Australia. In the future with what we have can we deal with the tidal wave? Yes, we currently have capacity, so as that gradually starts to come, we are okay. We need to ensure that there are incentives for recyclers to build plants, because financially it is very difficult for it to run with a 'build it and they will come' model. Initially there may be support –

**Gaelle BROAD**: Do you say incentives is the subsidy?

**Steven MARSHALL**: Incentives or grants to assist with the up-front capex. The fortunate thing about lithium battery recycling is that it is somewhat low capex in terms of recycling plants. It is not overly complex, but it is a high fixed cost operation. So as we get that economy of scale and as those volumes start to come, we will more and more be funded by the tail end and the commodities that we can recover, and that will offset the fixed costs and we will see the price of recycling start to drop away. We see that in established recycling economies such as broader Asia, with what happens in China and South Korea, we see that in the US and we see that in Europe, where primarily recycling is funded from tail-end commodities. But unfortunately in Australia it is a nascent industry, and I feel it needs support to get to that stage.

**Gaelle BROAD**: Did either of you have anything to add?

**Katharine HOLE**: I would just add to that that in a number of those economies they have done some of the OEMs. I know you have got the automotive sector talking to it tomorrow, and they will be able to talk to that much better. Some have taken the lead and are managing their own products. I note that some of the OEMs here have direct commercial relationships with the battery recyclers, albeit, again, it is nascent and it is more

focused on the warranty, but that is coming through. Again, some of those have been focused through regulatory obligations to drive the OEMs to develop those supply chains.

**Gaelle BROAD**: I am just interested too in where batteries originate, because I have mentioned before during this inquiry the *Spotlight* program on Channel 7 looking into nickel and the devastating impact that has had in Indonesia. It is not easy to know the source of your battery in your car. You are talking about battery recycling and the risk of going to countries where there are lower standards. Are we also perhaps now importing some of that risk?

**Steven MARSHALL**: At this stage, no, we are not drastically importing batteries into Australia. Australia is a higher-cost economy to be recycling within due to economies of scale and it being a nascent industry.

**Gaelle BROAD**: But isn't there a huge influx of cheaper vehicles from China that are EV?

**Steven MARSHALL**: Sorry, I was under the impression you were asking about whether we were bringing end-of-life batteries into Australia for recycling, not the influx of vehicles.

**Gaelle BROAD**: Sorry, no, I mean new vehicles that contain batteries and where they are from.

**Steven MARSHALL**: Yes, correct, there are a lot of new vehicles containing batteries coming into the country. They are primarily one of two chemistries: NMC, nickel manganese cobalt, or LFP, lithium iron phosphate, but either way, a lithium ion battery. What we are seeing is a differing on safety standards around the systems that control the battery, but all in all, for the recycling of the battery, it does not matter if it is a new brand or a well-established brand. The recycling process that we follow is the same.

**Gaelle BROAD**: I have run out of time but might come back later. Thanks.

**The DEPUTY CHAIR**: Thank you, Ms Broad. We will go to Mr Berger. Thank you.

**John BERGER**: Thank you, Chair. Steven, I have got a couple of questions for you, if I could. Do you think Australia is up there in terms of developing the technologies to recover the batteries, and how does it fit with the rest of the standards across the world?

**Steven MARSHALL**: At this stage Australia is primarily focusing on what would be called preprocessing, from an international perspective – the recovery of a battery to black mass, also referred to as mixed metal dust, which is in essence the cathode powder within a battery. So it is the powder that contains the lithium, the nickel, the cobalt and the materials we are looking for. At this stage Australia is only looking at, or we are currently in development of, smaller scale processing of that black mass. Australian companies are coming up with new technology that is smaller and scalable, though it is still a few years off until we are extracting those valuable materials out of that black mass. There are plants in pilot stages or in early development – small semicommercial plants. Overseas, they are very well established in that sector. Black mass we are good at. We are not quite at the recovery stage yet. Once again, that is due to economies of scale. A full hydrometallurgical plant requires feedstocks of around about 10,000 to 20,000 tonnes per annum. At this stage in Australia we are not even producing 1000 tonnes of black mass per annum.

**John BERGER**: If I want to put it in some simple terms, out of a recycled battery, how many of its constituent parts do we in Australia get out of that recycling process?

**Steven MARSHALL**: When you look at a battery itself, at the moment we are recovering approximately 95 per cent of a battery. We lose a small amount of that through offgas and dust capture and a little bit through a liquid stream. I am speaking to our figures from our company. We are recycling about 70 per cent of that battery, and that is because there are a bunch of mixed polymer soft plastics that currently do not have a home, so they are going to landfill. The good thing about the constituent parts that we do recover within the black mass, for instance, is that they are infinitely recyclable, so we can reconstitute the lithium, nickel and cobalt back into new batteries. That is currently going offshore for processing, but it is a very valuable export commodity product. The way I like to describe it is we are doing, in essence, urban mining. We are extracting these materials and then going for further processing offshore. With the battery production of battery cells, Australia is not really active in that space at this stage. They are going offshore to countries where they are

manufacturing those cells. Those cells are then coming back into battery packs and the like. I am speaking quite generically; there are a few small companies that are starting to look at cell manufacture onshore.

**John BERGER**: In terms of battery life, you mentioned there are a few reasons why a battery lasts the way that it does, and some of them have been through failure and things of that nature. What is your experience with battery life?

**Steven MARSHALL**: Battery life is quite broad. It depends on where it is being used. Typically we are seeing 20,000-ish cycles for older lithium NMC chemistry batteries. David had some good figures on LFPs, which are a lot of new batteries that are coming into the market with circa 20,000 cycles – or up to 30,000 cycles if you are lucky. We are only really starting to see now the very first EVs that came into the market hitting true end of life – so from cycles. What we see primarily from OEMs is warranty or internal failure. It may be an internal failure within the battery, it may be the system that controls it or it may be from external damage – i.e. it has been in an accident or was mishandled or mischarged. That is where we are primarily seeing batteries hit end of life now.

**John BERGER**: Thanks, Chair.

**The DEPUTY CHAIR**: Thank you, Mr Berger. The first question I will ask to Mr Van. The notion of load balancing through batteries seems eminently sensible in concept. From a practicality point of view, is the proposition that the battery doing the balancing would fully discharge per load, or is it actually operating and is going to provide a percentage of the charge, leaving a reserve in there?

**David VAN**: It really depends on the duty cycle of what you are asking it to do. Rarely would we build or design a battery system as a power buffer for EV charging such that you would be fully discharging and recharging all the time. An LTO battery can do that; it can operate like that. Batteries have what is called a C rate, which is how fast it can charge and discharge. An LFP battery typically is a 1 to 2 C battery, whereas LTOs can be up to 10 C, but normally you would operate them at around the 4 or 5 C.

**The DEPUTY CHAIR**: I will have to translate that into layperson speak.

**David VAN**: What that means is, yes, you could fully discharge and recharge, but that is not the point. The point is more that you are trying to buffer that such that the grid is seeing just a very constant level. You are not incurring the connection costs, nor the network upgrade costs, and then, as I said, the third element, the third cost, is those increased demand tariffs, which are all significant.

**The DEPUTY CHAIR**: I am just trying to think of the real-world examples. When you are at a supermarket, you are obviously not going cycle through one car; you are hopefully cycling through a dozen cars across the day or something like that. Within the concept, the levelling is not that you are going to discharge the whole of the buffer battery in one go, you are going to –

**David VAN**: That would be unlikely.

**The DEPUTY CHAIR**: Through very nice modelling you can average it out.

**David VAN**: Indeed, and it depends on how many chargers you have got and how fast they are. But as policymakers, what we are charged with is looking forward. The CPOs that have been before us today are taking care of passenger charging very well, I would assess. Where we are running very quickly into the future is with heavy transport, and where we really need to start to bring down emissions. In heavy transport there are currently demonstrations of 1-megawatt chargers for trucks and buses, and that is here in Australia. So the level of grid augmentation, connection augmentation and demand costs that are going to ensue from that are really enormous, and that is what is going to be the impost on rolling out the charging infrastructure, not the amount of electricity available. You can build a battery to do that duty cycle easily. That design work is a piece of cake. We would look at how many chargers, what size, how big the trucks and vehicles are that we are charging, and be able to design that really quite accurately with an energy and battery management system that handles all that.

**The DEPUTY CHAIR**: The economics are interesting in that we have heard from other witnesses of course, 'This is the innate cost of installing the charger, the cost of connection, the cost of the tariffs.' We are

putting a new cost into here, but you are trying to offset it against infrastructure. How you amortise or allocate or reallocate that cost into a business model, into numbers that actually are transparent enough for a market – that would be quite challenging, right?

**David VAN**: No, not challenging at all. We see it as that we can build the business case very easily, because yes, there is capex, but it is a percentage of what it would be for the connection augmentation. Then you have got on top the monthly, annual demand charges. So the business case stacks up incredibly well, but it also stacks up in the case of consumers – your constituents – because every time that the DNSPs have to augment the feeder, say, to get more electricity capacity, network capacity to the substation, to the transformer, to the cluster of chargers and other businesses that are drawing on that, when that is done that goes on to their regulated asset base, and that goes on to every one of our energy bills. If you turn it over, that supply charge is just going up and up and up, so it has an inflationary effect as well, which we mitigate.

**The DEPUTY CHAIR**: Yes, and poor use of capital.

**David VAN**: Yes. What we are trying to show is how to use the grid more intelligently.

**The DEPUTY CHAIR**: Does that mean in practice then that with the DNSP providing the connection, you can actually say, 'I'll have a lower capacity connection, thank you very much. I'll pay less for it, but I'm augmenting it here with my battery.'

**David VAN**: Yes. Well, you do not have to augment that connection, because it all happens behind the meter. So you do not need to upgrade that connection, and you avoid those costs, and you let the battery do the work. Rather than taking your current connection capacity and raising it up here, you are keeping it down here, and you are charging the battery, and it is doing that work in between that. Rather than having the grid being available all the time but you are only drawing on it periodically –

**The DEPUTY CHAIR**: I understand that part of the concept. It is where the cost base shifts in doing so, you actually lower your connection costs.

**David VAN**: It keeps it at the same. We are talking about existing sites. Obviously greenfield sites are slightly different. I know the CPOs go out and they do find high-capacity connection sites, but they are going to dwindle certainly as we get towards megawatt-class charging, the amount of sites available to those and where they are. Where we are talking about is, especially in the coming years, being able to charge trucks and buses as well as passenger vehicles en route between here and Adelaide or out to Alice Springs or depots, rather than where the trucks or buses come and recharge overnight, they are constantly coming in and out during the day. That sort of capacity just does not exist in very many places. So those costs –

**The DEPUTY CHAIR**: Sorry, just in the interests of time –

**David VAN**: Please, of course.

**The DEPUTY CHAIR**: Do you see this as primarily a commercial freight or commercial trade application as opposed to a residential apartment building-type solution?

**David VAN**: At most residential and for that matter, destination sites, the car can charge overnight or over a period of time, so you do not need that extra power. But certainly as we electrify our heavy transport and our medium transport, we are going to need much more power. That is just not available at the moment. Rather than doing all that augmentation, which costs everyone, our solution caps it and keeps it at a manageable rate and again avoids all those demand tariffs, which every business is going to have to pass on, regardless.

**The DEPUTY CHAIR**: Thank you very much. Ms Hole, just regarding the recycling industry: Victoria is home to some really interesting recycling industries, whether it is solar panels or carpet recycling – there is a lot of it. Would it be fair to say that the battery recycling industry is still – would you describe it as nascent?

**Katharine HOLE**: Lithium, yes – nascent but working extremely hard. They are investing in the capacity now, which comes back to Steven's discussion and others about how you cannot just build a little bit at a time – you have got to build for scale for 10 years time, which is a big commercial risk. So things like batteries being shipped offshore rather than processed here. Aside from the dangers and the safety issues, there are economic considerations as well. You have got best-practice manufacturing companies, be that in energy storage or

automotive or renewable energy developers, who are at the front end and who are leading that sustainability and recycling drive – it is a very important commitment to them – versus those that could do a lot better.

**The DEPUTY CHAIR**: With some of these other recycling industries, the business model at the moment is 50 per cent of the revenue or more is people trying to dispose of the item. So to dispose of the solar panel, you pay for the panel to be taken away. Where are you in that value cycle?

**Katharine HOLE**: Steven might be able to talk to it. One of the biggest challenges in the batteries is actually the logistics costs, because they are dangerous goods.

**The DEPUTY CHAIR**: Yes. It is the same with solar panels too.

**Katharine HOLE**: Getting them in – because of the fire risk. Once they come in, particularly the larger batteries, there are labour and disassembly costs. But this is a materials recovery space. As Steven talked to, there is value in most of the materials in the battery, so once you get it in and process it you can recover –

**The DEPUTY CHAIR**: Yes. That is what I am really trying to get to – the profitability at the moment.

**Katharine HOLE**: I will let Steven talk to actual numbers.

**The DEPUTY CHAIR**: Is it in pay-to-take-away or is it in the materials recovery side of the ledger?

**Steven MARSHALL:** Yes, I am happy to jump in. Thank you, Katharine. At the moment – I will speak to our commercial model without going into exact details – the way we work with batteries is they are very much similar to other commodity-type materials in that the end products that we are getting are being sold on a global market. We sell based on LME rates for metals. At the moment we are seeing that those commodities are as low as they have pretty much been in recent history, whereas if we go back three years ago, they were exceedingly high. They were probably overinflated then and underinflated at the moment. The way that we run our commercial model at the moment is we have, in essence, a tolling charge. We charge a customer up-front and that would cover us as a business, and we are assuming we are going to get a base level on our commodities. Then what we do is, as those commodity prices increase again, we will rebate a customer based on commodities. At the moment, with commodity prices very low, it is a fee to a customer. But the ideal world for everyone involved is that as commodity prices continue to rise, we get to a point where we are actually rebating more than we charge. We have to do that as a nascent industry to ensure we can survive the ebbs and flows of commodity pricing.

**The DEPUTY CHAIR**: And what proportion of your costs are transport?

**Steven MARSHALL**: We do not do small-format batteries much, your household batteries. They are very, very transport heavy. From our perspective, transport costs sit at around 10 to 15 per cent of incoming large format. But we are typically shipping very large quantities in any one hit. If we shrink that down to going to an individual car dealer, then transport pricing can quickly come up to being 50 per cent or more.

**The DEPUTY CHAIR**: You are importing from the rest of Australia into Victoria to do it.

**Steven MARSHALL**: Correct.

**The DEPUTY CHAIR**: Do you warehouse batteries in, say, Queensland until you have got a volume worth transporting?

**Steven MARSHALL**: At this stage, no. We will use 3PL dangerous goods transport. That is the most cost-efficient way, so [Zoom dropout] will get a small portion. The most difficult part for us is the packaging. You need to have appropriate packaging for the state that the battery is in. The dangerous goods transportation is difficult, but 3PL limits our cost.

**The DEPUTY CHAIR**: So different standards for different states.

**Steven MARSHALL**: Not different standards. There is different waste tracking. The dangerous goods standard is national, so we have to hit that, but out of places like Western Australia at the moment we are waste tracking lithium batteries, whereas not necessarily in other states around the country.

**The DEPUTY CHAIR**: Could you just expand on that a little bit? What does that mean? What is waste tracking? Who does it and who does not do it?

**Steven MARSHALL**: It comes down to where batteries fall in terms of definition. If I speak from a Victorian perspective, lithium ion batteries are not a reportable priority waste. We feel they should be. In my opening statement I talked about harmonised regulation, and that is one thing that we think should be in place, because that will mean that batteries are tracked from the generator through to the receiver, the receiver being us as a waste processor, and the generator would be any OEM out there or whatever site we are picking it up from. It means you also need a registered vehicle to do that transit. Waste tracking will track point of origin, who has done the transportation and who is receiving on the end.

**The DEPUTY CHAIR**: Does it add cost to the logistics?

**Steven MARSHALL**: We are already doing it for other aspects anyway, so it does limit the number of transporters that you can use. If you were to look at major waste processors, for example, most of their vehicles would be registered for waste transport at the moment. Where it will add cost and complexity is how we do third-party logistics at the moment from other states. That would become more difficult. At the moment not being a reportable priority waste means those batteries and their end locations are not tracked and reported back to Victorian EPA.

**The DEPUTY CHAIR**: Thank you very much. I will just pass back to Mr Berger, who has got one more question.

**John BERGER**: Just one more question on the dangerous goods side of it: is it the volume of the amount of batteries that gives it a certain higher class of dangerous good?

**Steven MARSHALL**: The amount and the chemistry. I am not an expert in this space by any means, but obviously we do a bit of it. It depends on the actual chemistry that we are moving through the place. Mixed batteries, for instance, are not classed as a dangerous good. But if I am moving pure lithium ion, which are primarily what we are seeing in the EV space – there are a few nickel-based chemistries from some older hybrids – they are tracked as a dangerous good, and it comes down to volume.

**John BERGER**: Is the preferred method rail or road?

**Steven MARSHALL**: It is primarily road. Moving on rail is quite difficult. It can be done, but primarily road.

**John BERGER**: Thanks.

**The DEPUTY CHAIR**: Thanks, Mr Berger. Ms Broad.

**Gaelle BROAD**: Thank you. You were talking about tracking battery origin and end locations. I mentioned earlier some of the cheap imports that we are seeing of EVs and questions being raised on where those batteries are produced. Are you talking about the need to track from that point of origin through to the end?

**Steven MARSHALL**: Waste tracking would be from point of end-of-life origin. If we are talking EVs, it may have gone to a mechanic, they may have found that there is an issue with that battery and therefore they are putting it on the shelf and it is now end of life. That is where your waste tracking would commence from, not from when it is still used for its intended purpose.

**Gaelle BROAD**: Do you think it is possible to track batteries from point of origin like with car sales? What is your view, Katharine?

**Steven MARSHALL**: Go, Katharine. Sorry.

**Katharine HOLE**: This is where I come back to that the major jurisdictions are doing this already. They are tracking the batteries. I would have to double-check the materials content, but there is certainly a number of countries now putting recycled content requirements in those batteries, or to be rolled in over the next five to 10 years. Europe has got this concept called the battery passport. China does tracking of their batteries as well, so they know where they are going from start to finish and that they have ended up with a recycler. There is a

lot of that happening already. It is not like you are asking the car companies to do something they are not already doing elsewhere. There is tracking in that sort of sense. There is tracking that Steven mentioned, which is just hazardous waste tracking requirements in Australia, so under the environment portfolio. There is lots of different tracking going on. A number of companies are also tracking their product, because they make environmental claims. There is one phone company that say they want to use 100 per cent recycled cobalt, for some of the reasons that you have discussed, and there are ISO standards – international standards – around how to do that. There are a lot of the nuts and bolts forming out there. Some of that in other jurisdictions will be mandatory. They are not subsidising, but they are making it mandatory for companies to do this and change their processes.

**Gaelle BROAD**: Do you have any examples of it being done well that you could share with the committee?

**Katharine HOLE**: In terms of corporate examples?

**Gaelle BROAD**: Tracking. Yes.

**Katharine HOLE**: We do not see their full chain. I am aware of some, particularly in the electronics space. There is one car company out here that has very strong commitments to 100 per cent circularity and 100 per cent net zero, but I have not seen the internal workings. Steven, I do not know if you have seen the internal workings of any of the OEMs?

**Steven MARSHALL**: I have seen a few of them. There are certainly some companies that are much more stringent around following their waste requirements and doing the right thing. I am happy to take this one on notice, Ms Broad, and just maybe pass on their details to the committee afterwards.

**Gaelle BROAD**: That would be great.

**Katharine HOLE**: A lot of it is commercial-in-confidence. They are very strict about where their product has gone in and come out.

**Gaelle BROAD**: I am just interested – can I ask this?

**The DEPUTY CHAIR**: Yes.

**Gaelle BROAD**: Just with the fire risk, I know certainly in regional areas there have been fires with battery energy storage systems, and CFA have said that they lack the training and the equipment to respond to these fires. With EVs and the increase, what are the risks? I have heard that there are not standards for, I think it is batteries, in Australia. I just want to get a bit of clarity on the fire risk and the response. Do we have the equipment, resources and training to handle that? That is particularly in regional areas, but comment on what you can.

**Katharine HOLE**: In some respects this is a new technology at scale. Coming back to the need for coordination, there is skills training happening in some spots and there is some great work the fire agencies are doing in terms of training their staff. Is it sufficient? Is it fast enough? Do we need to be doing more? We are working with TAFE – started actually by Livium – on building skills for handling and recycling. It is kind of like there is a lot happening, but is there overall oversight, and have we got it right? Do we need to be doing more or faster? I think it is a good question to ask.

**David VAN**: If I could just add something, again, this is something where battery chemistry plays a role. Lithium iron phosphate has a higher fire risk than lithium titanate oxide. LTO operates at a much broader temperature range from minus 20 up to 50 or 60 degrees. So especially out in the regions where you have not got a lot of HVAC or first responders available et cetera, we are seeing lots of deployment out there. In fact our first LTO-buffered site is up in your area, up in Oxley, and I would encourage the committee, or at least the local committee member, to go and visit that. I can arrange that if you like.

**Gaelle BROAD**: Yes, that would be great. Thank you.

**The DEPUTY CHAIR**: Thank you. I have got two sneaky questions to get in, but we are up against the clock, so concise answers. The buffering concept: I can see the logic of the principle. Why haven't the other

suppliers to the marketplace jumped on board with this from the get-go, because it would seem to leap a lot of obstacles?

**David VAN**: They have not needed to. I have only recently joined Arvio, trying to be an advocate for this. We do this in lots of other industries. Other industries use this principle all the time. Now, whether it is a cold store –

**The DEPUTY CHAIR**: Is the answer because it is such a new idea?

**David VAN**: It is a new idea. You heard how they were walking away from sites et cetera. They were problems that we could have fixed with it.

**The DEPUTY CHAIR**: So those marginal decisions, it could actually fall the other way.

**David VAN**: Absolutely.

**The DEPUTY CHAIR**: Very good. Last question, I think to you, Katharine: there are jurisdictional differences. There are benefits in having some national standards, but as parochial Victorians, where is the opportunity then for us in being jurisdictionally ahead of the curve? What could add to our state's economy if we do something smarter or better?

**Katharine HOLE**: I think it is looking at the skills question. One of the pilots we want to do with Queensland TAFE is actually have a pilot in Victoria. So how can you get behind that and support that and have training down here, because clearly there is a centre for recycling down here? That training, at the moment, yes, it is for industry and warehousing and the risks of accepting goods in and out, but that is going to have much broader implications for everyone across the supply chain. A battery in, a battery out: it is pretty much the same product. It might be a bit more dodgy – sorry, 'dodgy' is not the right word – a bit riskier at end of life.

**The DEPUTY CHAIR**: We will take that off the transcript.

**Katharine HOLE**: Take that off the thing. It is because it is just end of life. It is tired. But once you have got that training set up, this is where you can see what other links can you make across? How can you roll that across? How can you become the experts in that space? Again, I would encourage Victoria to look at mandatory requirements. How can you lead in that space? There is a lot of good work on the manufacturer side. How do you push the good ones out there to promote that more and say, 'This is what best practice looks like,' and bring the rest on that journey?

**The DEPUTY CHAIR**: Thank you very much. I think we will end there as we are out of time. Thank you to all witnesses for their contributions.

**Witnesses withdrew.**