

# **ECONOMICS AND INDUSTRY STANDING COMMITTEE**

**INQUIRY INTO MICROGRIDS AND ASSOCIATED TECHNOLOGIES IN WA**



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

**SESSION ONE**

**Members**

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

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**Hearing commenced at 9.28 am****Dr CHRISTOPHER GRAHAM JONES****National Secretary, Australian Electric Vehicle Association Inc, examined:**

**The CHAIR:** On behalf of the committee, I would like to thank you for agreeing to appear today before our inquiry into microgrids and associated technologies in Western Australia. My name is Jessica Shaw and I am the Chair of the Economics and Industry Standing Committee. I would like to introduce the other members of the committee: to my left, the Deputy Chair, Sean L'Estrange, member for Churchlands; Stephen Price, member for Forrestfield; and Terry Redman, member for Warren-Blackwood. Yaz Mubarakai, member for Jandakot, I anticipate will be joining us shortly. It is important that you understand that any deliberate misleading of this committee may be regarded as a contempt of Parliament. Your evidence is protected by parliamentary privilege; however, this privilege does not apply to anything you might say outside of today's proceedings.

Before we begin with our questions, do you have any questions about your attendance here today?

**Dr JONES:** No; so far, it is all quite clear.

**The CHAIR:** Good. Would you like to make an opening statement?

**Dr JONES:** Sure. I do not have a background in electricity generation or transmission. My background is plant biochemistry and genetics. How did I end up involved with electric vehicles? It is just science; it is all just science and that interest me. I have been involved with the AEVA for almost 10 years now. The organisation itself has been around since 1973. Basically, the oil shocks of the early 70s prompted investigations into alternative technologies. Electric vehicles have been around for well over 100 years but really, up until probably the late 1990s, the technology was uncompetitive with petrol engines. That has certainly changed now and we always knew, for the last 44 years, that the technology would get there if we put the effort into researching batteries and so on, and, sure enough, we got there. We believe this technology is immensely powerful and transformative, and it is going to happen whether we take care of it or not. Our advice on behalf of the association is to get ready for it and get used to it. We would encourage a few things that can be done to speed up that technology transition and I think the benefits to the nation are pretty huge.

**The CHAIR:** Thank you. When you say there are a few things that can be done to speed up the transition, what are those things? What do you see as necessary to enable the EV industry to blossom?

**Dr JONES:** Right now in Australia, the main reason why you do not see many EVs on the roads is because they are very difficult to buy and I do not mean just the cost, but the availability. Right now, if you want to buy an electric vehicle, you have the choice of three vehicles and two of them are over \$80 000. We know that there are cheaper makes and models of electric vehicle out there in the world, they are just not available in Australia. There were some recent changes to the commonwealth Motor Vehicle Standards Act 1989 and the idea is to make parallel imports of energy-efficient vehicles a little easier. That is ongoing, from what I understand. Basically, right now, if you want to buy an electric car, you have very limited options. It is steadily getting better, but I think changing the restrictions to what vehicles we can buy in this country would go a long way. I believe cost, although it is a significant impediment, will not be an impediment for very long. The number one selling electric car in this country is the Tesla Model S. It starts at \$150 000, so price is not really the number one impediment; it is probably the number two impediment and availability would be number one.

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**The CHAIR:** Is it a push factor or a pull factor around availability? Do you think there is an appetite from car manufacturers to push more EVs into Australia?

**Dr JONES:** Probably not. We are a very small market and we are a small right-hand drive market, so that already puts us at a bit of an international disadvantage. The automakers are saying, "We want a sign that there is a market for EVs in Australia; and, if we see that sign, we'll have confidence in bringing models out." I understand the dealership model that they run here in Australia is also kind of a hindrance to that because, ultimately, the dealerships have a lot more autonomy in what vehicles they put on their showroom floors. That is not the case elsewhere in the world. Basically, the manufacturers are looking for some kind of sign that our appetite is whet for EVs. That is code language for some kind of support over and above what they can offer, and other nations around the world have implemented incentives to get electric vehicles on the roads and they work extraordinarily well.

**The CHAIR:** Are they things like luxury tax breaks, subsidisation, or —

**Dr JONES:** Correct; reductions in stamp duties or equivalent stamp duties and even reduced registration fees. It is a very small chunk of the cost but it is a sign that says, "We take it seriously."

**Mr D.T. REDMAN:** Some of the presentations made to us have suggested some very aggressive moves in terms of moving into EVs, which would suggest that there might not be any need to have any incentives other than, for example, charge stations, which are a limitation rather than necessarily an incentive to drive an outcome. What is your view in and around that?

**Dr JONES:** On behalf of the AEVA, we support any initiative that gets EVs on the road and we know that cash incentives work, but we also accept that they are very expensive and can be quite inequitable. We would argue that if that was to be introduced, put a limit on it and put a means test on it. We do not really want to be supporting people who can already afford a \$150 000 car. But, at the same time, every nation that has introduced a cash incentive has seen EV sales accelerate as a result. In fact, even in Australia, the South Australian government and the ACT government have put out some small incentives, including reductions in rego and that kind of stuff, and they have seen the greatest market share of EV take-up in our very small pool here in Australia, so it does make a difference.

**Mr D.T. REDMAN:** Putting incentives in supports the EV association in terms of getting EVs but there is, presumably, a bunch of people that sell regular vehicles out there that might not be happy about that. Has the politics come into play at all in any of those jurisdictions in respect to push back on those incentives?

**Dr JONES:** Not necessarily because those incumbents also have an electric vehicle in their line-up.

**Mr D.T. REDMAN:** Are they responding?

**Dr JONES:** Yes, and they would be happy for more EV sales. It is interesting that the dealership business model will change drastically. EVs need very little service and maintenance. They have all but about four moving parts. So if you are running a dealership where 60 per cent of your revenue is coming from service and maintenance and all of a sudden you are going to be selling vehicles that basically do not give you that window, you are going to have to change your business model. I think a lot of them are quite understandably concerned about that.

**Mr D.T. REDMAN:** We have a bit of a unique state: very centralist with two million people in Perth and 600 000 in the rest of the state. Distance endurance of EV vehicles and access to charge stations in relatively remote areas of the state, how big are those types of factors in the take-up of EVs?

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**Dr JONES:** There are significant, but I would not say they are the number one. The number one would be availability, number two would be price and number three would be charging stations, I believe. You do not need a charging network to have a viable electric vehicle. Most people will charge at home, probably overnight, at a low rate when the rates are cheap, and they can go about their day with all of the range that the battery has stored in it. For people who want to, or need to, do longer trips, then charging infrastructure is certainly valuable and we were very delighted when the RAC invested heavily in the RAC electric highway—the first contiguous electric highway in the country. We would love to see more of that going on.

**The CHAIR:** Do you think there is a psychological issue that people have about range and worrying about being stranded in the middle of nowhere, running out of juice in the battery?

**Dr JONES:** Yes, and it is still there. I think people do not realise how little they actually drive. You can fill up your tank and you will know that you will have somewhere between 400 and 900 kilometres to go in it, but you know that you can get fuel anywhere at any time. When you have an EV, you kind of change your approach to it. It is always full when you leave in the morning, so you always have a full tank and you always know that you have a range of anywhere between 100 and 500 kilometres depending on the make and model. People who buy an EV and drive with it in their life for the first time very quickly get over that range anxiety when they realise they do not need that much to begin with.

**Mr D.T. REDMAN:** Can you just give us some of the basic numbers in EVs? You said between 100 and 500 kilometres; that is a pretty big difference—a fivefold difference in its range. How long does it take to charge? If you had an off-grid system, for example, which are becoming increasingly apparent in regional Western Australia, how much does it soak up of a week's supply of energy in a normal, domestic scenario? How long does it take to charge in those circumstances?

**Dr JONES:** At the affordable, low-cost, small-battery end of the spectrum, we probably have the Hyundai Ioniq. I say that because it will be available in Australia at the end of this year. It comes with a 28-kilowatt hour battery, which gives it about a 150 to 200-kilometre range under normal driving cycles. I believe it is on the market for a bit under \$40 000. Right at the other end of the spectrum, you have a Tesla Model S with a 100-kilowatt hour battery. It has a range of over 500 kilometres, but you are paying over \$200 000 for that vehicle. It is also a luxury, premium car, so a fair bit of that price is just the trim. The battery is obviously a significant chunk of that cost. Obviously, the vehicle with the smaller battery will charge up quicker—it will be fully charged quicker. The vehicle with the bigger battery will need a more powerful charger in order to achieve the same state of charge in the same period of time. So the vehicles that will be doing long-distance touring will need very powerful charging infrastructure to get back on the road. Typically, you might charge your vehicle at somewhere between three and seven kilowatts overnight. That would take somewhere between eight and 12 hours to charge the vehicle, again depending on the size of the battery. If you have one of these long-range EVs and you want to charge it at a two-kilowatt rate, it will take the best part of two days to charge the car, but with a 32-amp, three-phase connection, which is a very standard industrial connector around the country, you can charge that vehicle in about four hours.

**The CHAIR:** It sounds to me that if you want one of these longer range electric vehicles, keeping in mind that this inquiry is about microgrids, to achieve that sort of recharge, you need a grid connection because if you have a house that is disconnected from the grid—it has a battery and solar panels—the solar panels power the house during the day and the battery powers the house during the evening. If you simultaneously plug in an EV that requires a hell of a boot in order to recharge, that simply is not going to be possible unless you have one huge battery sitting there on

the house. In effect, you have to stay in the network; the big battery is supporting the recharge of these EVs. Is that accurate?

**Dr JONES:** In very remote locations, yes; that is correct. We have established a three-phase, 32-amp socket charging network around the state and we are constantly expanding that. That is simply our association, with the help of Synergy, offering up sockets and helping them get it installed.

**Mr D.T. REDMAN:** Is it in town locations?

**Dr JONES:** In towns, that is right. It is not necessarily remote roadhouses. However, several remote roadhouses have done it. They are powered by generators. In the case of Mundrabilla Roadhouse on the Nullarbor, they have a large solar array and if you arrive at 10 o'clock in the morning and plug in your vehicle, and charge it for four hours, all of the energy that is going into your car is coming from the sun. So, yes, you do need a sizeable battery but, alternatively, a bigger solar array with daytime charging would achieve the same thing for less money.

**Mr D.T. REDMAN:** That means the charging might not necessarily happen at home; it might happen in the workplace or other sites.

**Dr JONES:** Correct.

**Mr S.K. L'ESTRANGE:** What you are telling us also is informative in a sense that even for a metropolitan grid, because we have been discussing where people might be trying to go off-grid, if there is a huge drain on power supply overnight with everybody going to electric vehicles, for example, then there is a need for the grid to stay in place. Is that right?

**Dr JONES:** I believe—in some locations, yes. In Queensland—I believe Ergon Energy is the distribution group there—they said they are not concerned about electric vehicles even with 50 per cent uptake. They are more concerned about air conditioners. Air conditioners will put a bigger load than an EV charging and, worse than that, they do not know when people will turn them on. People will turn them on according to how they feel—hot or cold. EVs tend to get plugged in at about the same time every day for a predictable amount of time. As far as that load on the network is concerned it is far more predictable—aircons not so much.

**Mr D.T. REDMAN:** Just to take that discussion a step further, we are talking about EVs in the sense of being a receiver of a charge and they are talking about fairly complex market arrangements with distribution networks and energy balancing to use household batteries, for example, as contributing to the grid when it is needed. Do you know any jurisdictions and/or is there discussion in your own circles about EV batteries being used as a contributor of energy getting a premium if they can sign up to deals that require that?

**Dr JONES:** Absolutely. Any household that has taken on a smart grid or a distributed grid arrangement—I believe there are quite a few in South Australia at the moment—an EV would simply supplement the battery that they already have in that system. If you have a 50 kilowatt hour battery in your car and you are typically only using about seven a day when you drive to work and come back, you have a fair bit of extra storage there that you can either run your house or, with arbitrage, sell back to the grid. There are some pretty complicated smart systems around in making sure that you get fair recompense for what you contribute to the grid out of your vehicle, bearing in mind that will take a small toll on the long-term life of that battery but it is only small—let us say, five per cent over the life of the car—that kind of thing.

[9.45 am]

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**Mr S.J. PRICE:** My question goes back to availability of vehicles. You said there are pretty much three EVs available in Australia. What is that versus the rest of the world. How many options are there that are not imported into Australia?

**Dr JONES:** If you added up every make and model of electric vehicle in the world, you are somewhere over 200. That includes different variants of the same make of car and that includes different sized batteries, but different sized batteries give people options too. I personally do not drive very much so if I did need one I would only really need a 40 kilowatt hour battery. In that case the Renault ZOE, which is a compact—it is an electric Clio, basically. It is a very good option for me. Unfortunately, it is still out of my price range but all of a sudden for the first time in five years we have another option available. They also have the Kangoo, which is an electric van. I believe that would be quite popular with local governments as well, especially given the running costs. We are going to see a few more EVs come into the Australian market towards the end of this year and early next year. By 2020 I am pretty sure we will have more variety still. Again, that is going to happen regardless of incentives, but if incentives do come along between now and then that will only accelerate.

**The CHAIR:** It is fascinating that there are so many new models that are potentially going to come into the market. I have been thinking about upgrading my own car. I have a four-wheel drive. It is really juicy. I do a lot of kilometres and I know I am not alone. I think Terry is pretty much in a similar situation.

**Mr S.K. L'ESTRANGE:** Maybe a bit more.

**The CHAIR:** Yes, a fair bit more, but still, he drives the same car as me. Our heart bleeds for the member for Warren—Blackwood.

One of the things that concerns me or I have considered is the rate at which the technology is changing and what that means for the depreciation of the car. EVs are very expensive as you point out and if you buy one now, in five years' time it will be worth next to nothing because the technology in that five years will have moved on so much in electric vehicles that, whereas petrol vehicles tend to hold their value to a certain extent over a similar period, because of the way the EVs change they are going to rapidly lose value very quickly. I wonder about your thoughts on that.

**Dr JONES:** A couple of points. One, it only loses value when you go to sell it. One of the appeals of an EV is the long retention period. It is not just a fiscal kind of, "I want to hold onto it for as long as I can to get my money's worth", although that does play into it. You are buying a piece of congealed energy. A whole bunch of emissions were released in its construction—petrol or electric. Personally, I think we should hold onto our possessions a lot longer and sweat them as long as we can rather than flip them every three years, but some people like to do that. You are right. Technology is marching on—at least the technology is steadily getting better. When the 2012 Nissan Leaf came out it was priced at over \$55 000 and it had a range of about 110 or 120 km. Now you can buy a Renault ZOE for about \$50 000 but you get 400 km range around town and probably 300 on the road. Price per vehicle has not come down but you get more value for money.

**The CHAIR:** Can you change the batteries?

**Dr JONES:** Yes, you can.

**Mr D.T. REDMAN:** Before you answer, if I could just expand on that. The chair talked about technology moving fast. Is that battery technology or is it the tech in the vehicle? Therefore, if it is simply a matter of replacing it with a high-quality modern battery but you still have the same vehicle.

**Dr JONES:** Absolutely. That is the case too. The electric drive—the thing that actually propels you down the road—has not really changed since Nikola Tesla designed the three phase motor. It has

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gotten more efficient. It has gotten lighter and gotten more compact, but that has not changed. Technology improvements, particularly with the Tesla, is internet connectivity, autonomy and advanced lane departure—all that kind of stuff.

**Mr D.T. REDMAN:** The same as other vehicles.

**Dr JONES:** The same as other vehicles pretty much, yes. But the battery is far and away the thing that everybody watches with a keen eye to see it getting better, seeing battery capacities getting better, the energy density is getting better. I should point out that a vehicle—let us say its range depletes over time. That is chemistry. These things happen. It will retain 80 per cent of the original charge, so that may put you out of reach of certain destinations so that battery can wind up delivering energy for home storage or a fast charger or something like that when you get the new battery installed in the vehicle. That battery will have a long service life at relatively modest power levels in a household setting and will probably do that for another 10 years before it is up for recycling.

**Mr S.K. L'ESTRANGE:** Is the service life 10 years? Is that what you are saying?

**Dr JONES:** I would say the service life would be the life of the car.

**Mr S.K. L'ESTRANGE:** What would you predict that to be?

**Dr JONES:** Somewhere between 15 and 20 years.

**Mr D.T. REDMAN:** Focusing on batteries for a second, right now it is lithium batteries. Lithium ion batteries have the density that suits the lighter weight and is chargeable and so on. Is there any other tech that is testing that? And as somebody mentioned to me over this weekend just gone, there may well be some massive demands on lithium which we are seeing in the share market right now, but there are other battery technologies coming in, albeit heavier ones that are used for stationary loads, which may not put all the demand on lithium. Have you done any work in terms of where future battery resources are coming from and hence whether there are any limitations in that space?

**Dr JONES:** Lithium ion batteries are the current state-of-the-art. They have been for a long time and I think they will be for a long time yet. Lithium is the lightest metal in the universe. There is nothing better. You are right. When we come up with new battery technologies, it will be in the lower energy density home storage bulk storage kind of realm. But for vehicles I think lithium ion will reign supreme for a long time yet. The cost of batteries have come down but it has come down for the likes of GM and Tesla. It has not come down for retail sales—not yet. Of course, demand is through the roof, so that is what is keeping the price high. As for demand for lithium, there will be more demand for lithium. Western Australia is fantastically placed to take advantage of that. But it is not just lithium. Other metals like nickel and cobalt, manganese and iron—we have that stuff and I believe we should make the most of it.

**The CHAIR:** What about car manufacturing? Do you think we will ever see the rebirth of a car manufacturing industry here in Australia into EVs?

**Dr JONES:** I would dearly love to see that. I do not know how likely it is. Car manufacturing is expensive. That said, Tesla is in an amazing situation. They have said, “We are only going to build electric vehicles and we are going to supplement that with a grid-scale energy storage business.” Despite the fact that they have not turned a profit since 2008, their share price steadily climbs. I think it is because people know that it is not going to happen now but long-term this is a winner. They are manufacturing in California, which is considered a high-cost place to do manufacturing. They are necessarily expanding where they can in other cheaper places to manufacture. Could we

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do that in Australia? I do not know. I remain optimistic that we can build electric cars in this country. It will just take a good business case to do it.

**The CHAIR:** I just want to come back to the point that you were making earlier about the predictability of cars coming home and plugging into the network—it is fairly knowable. One of the concerns that has been raised by the market operator here is that that could exacerbate the problems we are seeing on consumption around the duck curve. We are moving into periods where negative loads exist. The worst thing that could happen is that not only is everyone turning on—the solar panels are pumping out this electricity and everyone is turning on their aircon at the same time, just as the sun is going down and then all of a sudden we have all these EVs plugging in and it could really dramatically increase the duck curve problem. How amenable do you think people would be to some sort of IT smarts sitting there telling the cars when to charge and when not to charge so that we try and ameliorate that problem.

**Dr JONES:** I do not think there would be any pushback against that. However, the vehicles can be told to charge, if they are plugged in and going to be unattended for quite some time, they can set a timer. They can be programmed to charge without the AEMO saying when you can and cannot charge.

**Mr D.T. REDMAN:** Without flicking the switch, do you mean?

**Dr JONES:** Yes. You just set a timer and if you are not going to be driving your vehicle by day and the sun is shining gaily then that is the time to smash the charge into your car. I think Western Power would really appreciate it if vehicles charged in the middle of the day rather than in the evening. That said, there will be a need for some kind of a load overnight. Honestly, I think a tariff structure would do a pretty good job of directing when people charge their EVs. If you are going to charge from a high powered charge point on the road, you are paying for the convenience so charge accordingly.

**Mr D.T. REDMAN:** You talked about incentives and I can understand why—you are representing the industry—but putting incentives aside for a second, are there any other recommendations you would like to see out of our committee that are relevant to the EV industry.

**Dr JONES:** I believe there should be, fairly soon, some kind of a policy position on charging at the workplace and taking advantage of peak solar generation to charge our cars. I think that would have the most benefits for the grid. That would mean there would be probably changes to fringe benefits arrangements in the tax code. At the moment you get a fuel card for a company vehicle. What if you take the vehicle home and charge it off your own power? There needs to be some kind of arrangement for that too. Relevant to this committee I would say that incentivising charging while the sun shines—workplace charging and workplace charging infrastructure—would be a wise move.

**Mr D.T. REDMAN:** One more, which is going into the tough space, right now there is a fuel excise for vehicles travelling on roads. How do you project that out? Presumably governments are going to be looking for some sort of kickback on the roads. Have you got a particular model in mind or is that a no-go zone?

**Dr JONES:** Part of me says, “This is the world’s smallest violin playing”, but we drive on roads—we all drive on the same roads and we do not have a problem with paying for that. I think that longer term the federal government will have to come up with a road-use charge, whether it is per kilometre multiplied by the weight of the vehicle—something like that. Currently it works out to be about 4.2c per kilometre.

**Mr D.T. REDMAN:** Is that amortised across all vehicles. Is that what it is?

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**Dr JONES:** Yes, based on the average passenger fuel economy—at 4.2c per kilometre. Our association has in the past proposed introducing a 1c per kilometre levy on all vehicles and keeping the fuel excise as it is so it is a disincentive to keep driving a petrol engine vehicle and an incentive to move towards EVs. That can be scaled up. At least the system would be in place. That can be scaled up as necessary, but hopefully no more than 4.2c per kilometre.

**Mr S.K. L'ESTRANGE:** Have you been making those types of recommendations to the federal government?

**Dr JONES:** We have, yes.

**Mr S.K. L'ESTRANGE:** And what sort of response have you got to date?

**Dr JONES:** There is nothing in my inbox yet.

**The CHAIR:** One of the issues that comes up in this space as well is around planning and that the move to electric vehicles but could potentially change the way we use our roads and our freeways. Obviously, autonomous cars are becoming—it is not necessarily related to EV, but if we are going into high-tech, IOT type—into that sort of environment, obviously planning becomes quite a material issue. What is the thinking in your organisation around that?

[10.00 am]

**Dr JONES:** We would say that at many levels, probably even a local government level, planning codes could be written such that the garage of any vehicle had a 32-amp single-phase connection wired into it—even if you do not use it, having the wiring there—for any new home that is built. That saves costs later on. That is a very minor thing we can do. I think for charging infrastructure for the highways, planning is definitely required. Western Power is well aware of those kinds of costs. We were quite involved with the RAC electric highway as they were installing it. I was witness to how Western Power was being very careful about where the charging location was. It had to be close to a transformer that still had capacity on it. When a town decides to plan what goes where, make sure that the charge point is somewhere central, well serviced and not in a dingy service station. Put it in the middle of town. If they are going to spend half an hour charging their car, they can spend money in the town. That was one of the real incentives we wanted to have with the charging stations in the south west. If you have a captive audience for 30 minutes to an hour, let them enjoy your fantastic town.

**Mr D.T. REDMAN:** Just for my benefit, I have never charged an electric car; I have never seen one being charged but I know where the ones are in my electorate. You are right; they are out by themselves. Is it just a case of having your credit card there, you plug it in, you wait for half an hour and away you go? Is it as simple as that?

**Dr JONES:** It is pretty much like that. They use an RFID card that is not a credit card but you can put money on it like a SmartRider and that credit gets used up. There is a push towards consolidating all the different schemes that are out there, so you do not have a glove box full of cards to use that particular charge network, and that is getting better. Charging infrastructure at the moment, it is a bit strange because people will not go to the effort of installing it if they do not think there are enough vehicles to use it, but we also know that that encourages vehicles to come and use it. That is why we have seen so many different groups set up their own payment systems. I think that is why we have seen a proliferation of different charging networks because everyone is trying to find a way to charge.

**Mr S.K. L'ESTRANGE:** Has there been any frustration from consumers to your organisation with regard to wait times to charge?

**Dr JONES:** No. I think our members are quite aware of the process involved in charging a car. Again, 95 per cent of our charging is done at home at a low rate when we do not notice. Very rarely do we go out on the open road where we need a fast charge. We know that it will take somewhere between 40 minutes to an hour to put another 150 to 200-kilometre range on your vehicle. We kind of plan. EV drivers are a bit like pilots; they have a flight plan. As charging infrastructure becomes more abundant and becomes more powerful and our vehicles carry bigger batteries that can be charged faster and we can go further, that will become less and less of an issue.

**Mr S.K. L'ESTRANGE:** Linked to that answer, is that why the hybrid vehicles might still have a fair way to support industry?

**Dr JONES:** Interestingly enough, the main reason why plug-in hybrid EVs are the top selling non-Tesla electric vehicle is not because of the versatility that they offer but because they are cheaper. People would buy a battery electric vehicle if they could.

**Mr S.K. L'ESTRANGE:** Where does that research come from?

**Dr JONES:** That is from VFACTS data. I have a selection of graphs here you can have a look at. Plug-in hybrids are great because people buy them thinking they might need the extra utility of the petrol engine to go beyond 50 or 80 kilometres and then they pride themselves on having never burnt a tank of fuel. So then you think, “Why didn’t you just buy a battery electric vehicle?” “They were more expensive or they weren’t available.”

**The CHAIR:** I went across the US a couple of years ago and I stopped at a roadhouse in Nevada and there was a bank of Tesla charging stations there. I was chatting to one of the people who had their car plugged in. I guess it is a convenience thing—the fact that if you do need to stop and wait half an hour as opposed to pulling into a petrol station and in five minutes, you have a full tank and you are ready to go. It requires us, as you say, to change our mindset a little and plan ahead. How quickly is the technology changing? How quickly do you think we will get to the point where there is superfast charging available?

**Dr JONES:** That is already available now. We have 150-kilowatt fast chargers. The RAC electric highway has 50-kilowatt chargers. The Tesla superchargers are 120 kilowatts. The Brisbane-based company Tritium have a selection of fast chargers that are already doing 150 and 350-kilowatt fast charging. That is an enormous load on the grid.

**Mr Y. MUBARAKAI:** What is it coming off—the grid?

**Dr JONES:** Yes. If you need to put one in a location where the grid may not be up to scratch, you can use a battery to buffer that because batteries can deliver tremendous power in short periods of time. They do not necessarily need to be very big; they just need to supplement the grid, except in really remote locations where they will have to do all the work. Again, those locations are quite rare. Vehicles will be able to be charged faster but I also think that people will kind of slow down a bit and I hope that happens too. We have already pushed the “drive for two hours” or “stop every two hours” thing. That pretty much suits when you need to charge. If you need to stop for half an hour and charge your vehicle, I do not think most people would have a problem with it. They think they will, but in our experience, they do not.

**The CHAIR:** We have been talking about passenger vehicles. What about freight and trucking? Obviously, if a truck driver needs to stop every two hours and he is crossing the Nullarbor, that is a considerable additional cost on road freight. What is happening in that space?

**Dr JONES:** Electric trucks are definitely being developed, and they have their appeal. They have enormous torque. They can get up to speed with a full load quite quickly because of the torque of

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the electric motors. They are very safe because they have regenerative braking. It is not like a compression brake on a truck that makes a terrible racket when it works.

**The CHAIR:** What is that—regenerative braking?

**Dr JONES:** Instead of throwing it down a gear and using the compression of the engine to slow you down, you are just putting energy back into the battery and you are recovering some of that momentum back into the battery. It makes for a very safe truck to drive. They are quiet. They are very low maintenance. These are all the appeals. They are not going to be much more expensive than a conventional prime mover. The downside of course is that their range will be limited and the charging infrastructure required to recharge a truck in a reasonable amount of time is immense. For that reason, I do not think we will see electric trucks crossing the Nullarbor probably in the next 10 years, but we may well see it after that.

**Mr Y. MUBARAKAI:** Why would you say that, Chris? Most of the witnesses that we have heard from and the trajectories and people trying to quantify this particular industry changing in its paradigm is for the next five years. They are saying, “Within five years if radical changes are not made, we’re going to see ourselves in Western Australia really be hindered with this growth that is going to take shape.” On the other hand, you are saying for the next 10 years —

**Dr JONES:** That is for trucks only. For passenger vehicles, we are going to see it in the next five years without a doubt. For heavy haulage and that kind of stuff, I think diesel trucks will be on our roads for a while yet. Bear in mind, most of the trucking is done along urban corridors and typically less than about 400 kilometres a day. That is a fantastic candidate, those predictable routes. Even Transwa buses could be electric because they run predictable routes, they stop at regular occurrences. Charging an electric bus is not out of the question with our current infrastructure. That would only get better too.

**Mr S.J. PRICE:** That is charging one. What if you want to charge 100 of them?

**Dr JONES:** Not all at the same time at the same place. Our observation has been very rarely will you get to an EV charging station to see another EV in the way. We are a pretty interesting crowd so we like to have a good conversation anyway. But it will not be long before that gets tiresome and we just want to get on the road. That means there is more demand for it, which is wonderful. You can justify building more charging infrastructure.

**Mr S.J. PRICE:** What does a charging station cost to put in place?

**Dr JONES:** A 50-kilowatt DC fast charger is about \$30 000 in hardware. The installation to a grid connection may cost—ask Western Power; it depends on the site, it depends on lots of things—up to \$50 000 to make that connection. Bear in mind, a petrol station costs a lot of money to install as well and they have a lot more environmental regulations to encounter. In terms of dollars spent per vehicles moved, they are still pretty good value and they are getting more powerful. The interesting thing is that a 50-kilowatt charger is not that much cheaper than a 100-kilowatt charger.

**Mr S.K. L’ESTRANGE:** Most metropolitan Perth people do not drive to the north west. Most of the driving is confined to the south west. Given the price of EVs as being inhibitive for a lot of consumers, are you finding that people in the EV market who are buying the vehicles, are they installing their own chargers in their holiday homes down south and that is how this market is sustaining itself?

**Dr JONES:** Yes, but they do not need to do a great deal. A power point will work perfectly fine. That is the really cool thing. That is a fuel station.

**Mr S.K. L’ESTRANGE:** I suppose what I am getting at is that for the next leap, to move away from those who can afford it, to the general public who would like to be able to afford it, once that shift

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has been made, then you are going to have much increased demand on charge stations because they will not have holiday homes down south to be able to plug their homes into, for example. Have you got any studies as to when that point will hit or what needs to happen infrastructure-wise to support that move?

**Dr JONES:** I cannot really say with any certainty when that will happen. I guess what I do know is that there will be more vehicles available. There will be more choice available in that sub-\$50 000 vehicle bracket, possibly as low as \$30 000 in the next two years. That will massively accelerate the number of EVs on the road. As I said earlier, you do not need fast-charging infrastructure to have a viable EV but if there are enough of them that want to drive on our highways, that will justify the installation of more infrastructure to charge them. I think as the cheaper models come online, that is probably when we will see that uptick.

**Mr S.J. PRICE:** Chris, you just touched on it briefly then. Is it that simple to charge an EV at home—to plug it into a socket—or additionally you mentioned earlier the faster 32 amp? If we were to look at making sure new builds had that included in them, what sort of costs are associated with that? Is it that simple just to plug it into the power point?

**Dr JONES:** It is literally that simple. Most people with first generation production EVs—so the Nissan Leaf and the Mitsubishi i-MiEV, they had small batteries; they can be charged overnight off a 15-amp plug. Most garages and outdoor places will have provision for a 15-amp plug. You can make life a little bit easier for yourself by instead of a socket, actually having a dedicated piece of charging infrastructure with a plug. Instead of having to plug something into something, when you plug that into the socket, you just plug it straight into the car, saving 15 seconds. Sometimes that matters. That is literally all that is involved. It is relatively inexpensive—a few hundred dollars.

**Mr S.J. PRICE:** And the 32-amp stuff is —

**Dr JONES:** The sockets are 32 amp. A three-phase socket —

**Mr S.K. L'ESTRANGE:** They are the blue ones, are they not?

**Dr JONES:** No, the white ones with five pins. They are about \$50. It might cost a few hundred dollars to install, run extra cable or something like that. I will leave this document here with you. All of these pins represent places where you can charge your electric vehicle around the country. We finished that contiguous route not so long back. Most of them are made up of 32-amp three-phase industrial sockets. Some of them were pre-existing. The businesses said, “Sure, use it any time. As long as you buy a meal at our cafe, we don’t care.” They may well choose to upgrade them in future. We hope they do.

**The CHAIR:** How is the power paid for then? You do not even pay for your electricity? You just turn up, order a burger and chips and you can plug in and they are quite happy to cover the cost?

**Dr JONES:** It entirely depends on the business. Some of them are happy for you to do that. Others, like on the Nullarbor, where the generators run and power is quite expensive, will say, “A dollar a kilowatt hour.” A Tesla Model S will pay somewhere between \$50 and \$80 for that charge. We appreciate that; we are paying for the convenience. For places closer to Perth, they are more than happy for you to just get a top-up while you spend some money because power is cheap. Despite what some politicians will say, it is actually relatively inexpensive and likely to get cheaper longer term. There is no business in selling power. You sell convenience.

**The CHAIR:** I guess, particularly, if you have a solar array sitting there and the variable cost is nil.

**Dr JONES:** That is right.

**Mr Y. MUBARAKAI:** I want to request, Chair, if we could have a soft copy of that in an email.

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**Dr JONES:** Absolutely, yes.

**The CHAIR:** That would be great.

Thank you for your evidence before the committee today. A transcript of this hearing will be emailed to you for correction of minor errors. Any such corrections must be made and the transcript returned within seven days of the date of the letter attached to the transcript. If the transcript is not returned within this period, it will be deemed to be correct. New material cannot be added via these corrections, and the sense of your evidence cannot be altered. Should you wish to provide additional information or elaborate on particular points, please include a supplementary submission for the committee's consideration when you return your corrected transcript of evidence. Thank you.

**Hearing concluded at 10.15 am**

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