T R A N S C R I P T

LEGISLATIVE ASSEMBLY ENVIRONMENT AND PLANNING COMMITTEE

Inquiry into Renewable and Affordable Energy for Apartments

Melbourne – Tuesday 24 March 2026

MEMBERS

Juliana Addison – Chair
Martin Cameron – Deputy Chair
Jordan Crugnale
Daniela De Martino
Wayne Farnham
Martha Haylett
David Hodgett

WITNESSES

Associate Professor Saman Gorji, Director, Centre for Smart Power and Energy Research, Deakin University;

Associate Professor Nicola Willand, School of Property, Construction and Project Management,

Professor Gary Rosengarten, Director, Sustainable Technologies and Systems Enabling Impact Platform, and

Associate Professor Anne Kallies, School of Law, RMIT University;

Professor Rebecca Yang, Department of Infrastructure Engineering, University of Melbourne, and Chair, Australian PV Institute; and

Dr Mike Roberts, Senior Research Fellow, Collaboration on Energy and Environmental Markets *(via videoconference)*, UNSW.

The CHAIR: Welcome to the panel hearing for the Legislative Assembly Environment and Planning Committee's Inquiry into Renewable and Affordable Energy for Apartments. All mobile telephones should now be turned to silent.

All evidence today is being recorded by Hansard and broadcast live on the Parliament's website. While all evidence taken by the committee is protected by parliamentary privilege, comments repeated outside this hearing, including on social media, may not be protected by this privilege.

Witnesses will be provided with a proof version of the transcript to check. Verified transcripts and other documents provided to the committee during the hearing will be published on the committee's website.

We will run this session in a question-and-answer format. Committee members will ask some questions. If you wish to answer, please raise your hand. To make it easier for our Hansard reporters, please state your name before you start speaking. There may not be an opportunity for everyone to answer every question. If there are any important points you do not have the opportunity to make during the session, you are welcome to provide additional information in writing.

One of our witnesses, Dr Mike Roberts, is joining via Zoom. Hi, Mike Roberts.

Mike ROBERTS: Hi.

The CHAIR: Could I please remind you, Mike, to mute your microphone when you are not speaking, to minimise interference. I invite each of you to make a 3-minute opening statement. This will be followed by questions from members. Mike, did you want to kick us off?

Mike ROBERTS: Sure. Thank you. Thanks for giving me the opportunity to present to the inquiry this morning. I am Mike Roberts. I am a Senior Research Fellow in the School of Photovoltaic and Renewable Energy Engineering at UNSW in Sydney, and I am a researcher in social, economic and technical approaches to deploying and integrating distributed energy resources. I did a PhD a few years ago which explored the challenges and potential solutions for putting solar on apartment buildings. Those challenges are many and quite diverse and are related to building form, technical constraints, governance, energy regulation, strata law and other issues. I guess if I had to summarise my PhD findings, it would be to say that there is no silver bullet. Apartment buildings themselves are very diverse, and the solutions are often very specific to buildings. There is a role to be played by building integrated photovoltaics on building facades, and there is a role to be played by plug-in solar I think. I think Rebecca and Niki will be talking more about those.

More research is needed to explore how to address some of the technical and regulatory issues around those and to provide more granular analysis and comparison of the costs and benefits of different technologies. But I would also say not to write off rooftop solar. There are challenges putting rooftop solar on apartment buildings. We did some analysis, and we reckon there is somewhere around a gigawatt of potential solar PV on the roofs of Victorian apartment buildings, which is quite a lot. We estimate the average on one- to two-storey apartment buildings is 5 kilowatts per apartment, and for three-storey buildings, it is just over 3 kilowatts. It is less for

taller buildings. In 2021 half of Victoria's apartments were low rise, three storeys or less, so there is a big opportunity on rooftops.

Where it is possible, the best way to supply apartments from rooftop solar is to have shared systems, because you can unlock more value because you are aggregating the loads and you can also share the solar more equitably. There are two ways to do this. One is embedded networks. I want to talk very briefly about embedded networks. They have had bad press, and there is no question that they have historically operated against the interests of apartment owners and residents. But I would argue that many of the problems stem from the interaction of strata law with embedded networks and not with embedded networks themselves, in particular the fact that developers can enter into long-term contracts on behalf of future apartment owners where their interests do not align. Cathy Sherry, who is, I guess, the country's expert on strata law at Macquarie, said in her recent paper that embedded networks can work but only if they are negotiated by apartment owners or solely in the interests of those people. I think there is work to be done looking more at what are becoming called 'benevolent embedded networks'. The other option is sharing solar behind the meter. I think you have already heard from Allume this morning.

The CHAIR: We have, yes.

Mike ROBERTS: I am not quite sure how I am doing for time, but I have got my top three recommendations. I can talk for longer, but I will keep it brief. One is to look at the strata law issues. There are a range of measures that could be used to address some of the issues in strata law. One is limiting developers where they enter into contracts on behalf of future apartment owners to like a term of one year or something of that nature. More subsidies for solar on apartment buildings – Solar Victoria's solar apartment scheme has been very successful. We are doing some analysis on it at the moment. The payback periods for apartments have been massively reduced by that scheme, and I think that is very positive. Then the third top recommendation, I guess, is more research into plug-in and balcony solar to compare the costs and benefits across those different technologies and what the implications are for equity as well.

The CHAIR: Terrific. Thank you, Mike. Are people happy to be called by their first names, or would you prefer me to refer to your titles?

Gary ROSENGARTEN: First names.

Mike ROBERTS: I am very happy with Mike.

The CHAIR: Great. Thank you, Mike. Next we have Saman.

Saman GORJI: Sama Gorji.

The CHAIR: Hello. Welcome.

Saman GORJI: Thank you. Thanks, everybody.

The CHAIR: Do you want to just say your title?

Saman GORJI: Yes, I am an associate professor in electrical engineering and renewable energy at Deakin University and also Director of the Centre for Smart Power and Energy Research. Just in line with what Mike mentioned, to give you all the scales, I am in charge of our on-campus microgrid at Waurn Ponds campus. It is 7.5 megawatts, and currently it meets 54% of the campus load, so having that on-campus microgrid enables us to be able to make some comments in this regard.

The CHAIR: Excellent.

Saman GORJI: Thank you. I just want to start with a few points and then give some itemised versions, the same as what Mike did. There might be some overlap from what he mentioned because I just realised our research focus has got some overlap as well. Thanks, Mike, for making my job easier. I am going to start by saying that Victoria is right to focus on apartments. Apartment residents are now one of the clearest equity gaps in the energy transition. Many detached households can already access rooftop solar savings, but many apartment residents still cannot.

The key point from our submission from Deakin University is that the main barriers are no longer the basic technologies; solar, PVs, batteries, smart inverters and controllable loads are already mature. The real barriers in our opinion are shared building infrastructure, governance and market design. Apartment residents do not usually have access to or control of the roof. They rely on owners corporations to make collective decisions. Many buildings have outdated switchboards, metering systems and export limits. Renters and social housing tenants have even less ability to initiate or benefit from upgrades. Without reform the energy transition risks reinforcing inequality by giving the largest savings to the households that already have the simplest access. This means the policy challenge is not simply installing panels, it is enabling fair sharing of energy and value across a multiowner building. That is why rebates alone will not solve the problem. Rebates can help to buy hardware, but they do not by themselves answer the hard questions. Who pays for common property upgrades? How is solar output allocated across households? How is a shared battery financed? How will virtual power plants – and we might hear these buzzwords more often, virtual power plants, or VPPs, which are a kind of community battery – scale? How are VPPs and their value shared? How are residents protected if embedded network models are used?

In practical terms I would prioritise four reforms. First, co-fund enabling electrical infrastructure such as switchboard metering and common property upgrades. Second, simplify owners corporations and planning approvals for renewables and electrification upgrades. Third, which is really important and which we are experiencing day by day, harmonise DNSP connection rules for shared solar, shared inverters and shared batteries. Fourth, strengthen consumer protection and support participation models that allow apartment residents, including renters, to benefit from shared systems, offsite participation and future VPP models. If Victoria gets these things right, apartment buildings can operate as a coordinated local energy system. That is what I would say is equalling what Mike has mentioned. They can combine rooftop solar, shared storage, flexible loads such as hot water, EV charging and HVAC and, eventually, VPP participation. That can lower bills, reduce peak demand and make the energy transition fairer. Just as the last point, the central message is simple: for apartments the problem is now less about technology than about the rules that govern access, sharing and consumer protection. Thank you.

The CHAIR: Nicola. Welcome.

Nicola WILLAND: Thank you. Professor Gary Rosengarten, Associate Professor Anne Kallies and I, Associate Professor Nicola Willand, are all from RMIT University. We represent 22 interdisciplinary researchers from RMIT across the engineering, built environment and social and legal disciplines. Thank you for covering the challenges that apartment dwellers and renters experience, so I can go straight into our recommendations. They encompass better energy efficiency standards for apartments, portable plug-in solar systems, innovative energy storage options, smart demand management tools and integration designed around people.

First of all, we need high energy efficiency standards and apartment retrofits to reduce energy use through passive means. These are especially important for low-income households, who tend to live in poorer quality households and experience higher bill stress and heat stress as well. Innovations include radiative cooling textiles, which passively remove heat and lower cooling needs, bills and emissions – easy to retrofit. Then there are portable plug-in balcony solar systems that combine PV panels and microinverters with or without batteries. These can simply be plugged into a power point. You buy them at the supermarket or at Bunnings, go home – plug them in. They are currently illegal in Australia, but widespread adoption overseas shows that safety and technical issues can be managed and that streamlined regulations can democratise access. They reduce bills and emissions and particularly empower renters and other disadvantaged population groups, who rarely control building-level decisions. Third, innovative energy storage options have expanded through heat pumps with thermal batteries – so using water to store energy. These operate across whole buildings. They can maximise the use of onsite solar PV for efficient heating, cooling and hot water systems, making these essential services more reliable and cheaper. Lastly, smart demand management tools using automation and, increasingly, artificial intelligence can shift usage to cheaper, cleaner times of day, making apartment energy use more adaptable and efficient without solely relying on household behaviour change. Importantly, the biggest gains are achieved when these technologies are integrated and designed around people, because it is us who use the energy. Using digital tools and human-centred design promises that these systems are easy, fair and accessible.

To make this work at scale we propose targeted reforms. Technically, we need apartment-specific standards, clear pathways for portable plug-in solar and batteries and centralised heat pump systems with thermal storage,

updates to the National Construction Code and wiring rules and reforms to strata and tenancy regulations. Non-technical reforms should enable service-based and third-party financing models, standardised contracts, stronger consumer protections in embedded networks and mandated, transparent benefit sharing so that all householders, and not just owners, can benefit. Recognising apartments as collective energy market participants and resourcing local governments and community organisations to provide practical on-the-ground support will be critical. Ongoing collaboration between policymakers, industry and researchers will be essential to refine these approaches as technologies, markets and household needs continue to change. Thank you.

The CHAIR: Thank you. That was on behalf of Team RMIT?

Nicola WILLAND: Yes.

The CHAIR: Fantastic. Rebecca, from the University of Melbourne. Welcome.

Rebecca YANG: Thank you so much. Good morning, and thank you for the opportunity to contribute. My name is Rebecca Yang. I am a professor from the University of Melbourne. I am also the Chair of the Australian PV Institute. My work focuses on renewable energy integration in buildings and urban precincts. I also contribute to international work through the International Energy Agency photovoltaic power systems program and the IEC and ISO joint working group on building-integrated photovoltaics standards development as well. Australia ranks second globally in solar PV capacity per capita, with around 45 gigawatts installed, largely driven by distributed rooftop systems. The economic fundamentals for residential and commercial solar are very strong. Solar also plays a very key role in managing surging demand in Australia during heatwaves. However, the success is not shared equally, and apartment residents remain disadvantaged in accessing affordable renewable energy.

There are three key barriers in my view: first, limited roof area, significantly reducing or precluding solar access in apartments; second, decisions must be made collectively through the OC, creating delays, while renters are largely excluded; third, current market and regulatory frameworks are built around individual households, limiting access to shared energy benefits. Despite this, there are strong opportunities. Our research shows that by combining roof and facades, PV can significantly increase onsite generation and better match morning, evening and seasonal demand profiles. Batteries and community energy systems can further improve affordability by storing excess solar and reducing grid reliance. Building level coordination through virtual power plants can also unlock additional value through energy optimisation and market participation. That has been validated through our work for Solar Victoria in the VPPs, highlighting projects' technical assessments.

So beyond technological solutions, there are three reforms that are critical: first, to enable shared energy systems through clear regulatory and ownership frameworks that support collective and transparent investment in apartment buildings; second, update planning, building and electrical regulations and funding opportunities to support facades and balcony solar, with clear safety guidance on that; third, develop financial and assessment tools to support investment decisions in multi-unit development, including alternative technology pathways and business options from both an individual building level to a precinct planning level. That concludes my statement. Thank you.

The CHAIR: Thank you very much, Rebecca. I know there are a lot of questions, so, Wayne, would you like to kick off the questions?

Wayne FARNHAM: Yes. Thank you, Chair. I suppose, as we move forward, in all the studies everyone has done, what models exist internationally that could be adopted by Victoria to improve the governance? I open it to anyone; I do not mind.

The CHAIR: Saman, do you want to kick off?

Saman GORJI: Yes, I can.

Rebecca YANG: You go first.

Saman GORJI: Just from my point of view, what exists internationally would be one thing, but what makes Australia different would be another thing, in the sense that, for example, in AEMO's – Australian Energy Market Operator – ISP, integrated system plan, we see that there are some specific issues around Australia.

They call it something like 'grid strengths' as a kind of inertia thing. In my opinion there should be a hybrid solution. There are some international available solutions in practice in other countries. I think Denmark would be a very good example. In wind turbines Denmark was very pioneering, but in solar Australia still could be the first here. Getting the models of just interconnected microgrids would work here. But the other thing is that as far as our research shows none of those countries internationally have the special situation that Australia has in terms of regional areas, grid connection issues, those single lines, bushfires et cetera. So when we are just trying to find a solution, in my view there is not just one single solution. There is a hybrid solution – as you mentioned, there are other international models – and we could just kind of customise that. We do have the capability to adapt it to the Australian power network.

Wayne FARNHAM: Coming back to you, Rebecca. In your statement your second point was updates to planning and the National Construction Code. How does that look in your mind? What needs to improve to unlock more of this in our system?

Rebecca YANG: I think that is a very important angle, because I do have a building and construction background, but I have worked in renewable energy for years. The complexity sits between those cross sectors in terms of the adoption. We have regulations under Energy Safe Victoria, for example, relevant to AS 5033 or AS 5777 or AS 3000 regarding the electrical side. From the building side, the NCC is the current kind of bible for people to follow. Under NCC, if you look into the 2022 version, it says about 20% of roof space should be kept for PV installation. If you look into the recent draft version for review in 2025 under NCC – and we did some internal calculations – actually the requirements for potential onsite renewable energy generation have increased in terms of the threshold for that. If we want to meet that – although in some of the tables they did not specifically say a class 2 building – what is the minimum peak output per square metre? Even the lowest yield is 40 per square metre. That is the lowest requirement in the table. If they do the calculation and we use PV as 400-watts per panel – because that is already very good in terms of the performance – equally that means that, per panel, for every 6.5 square metres inside apartment buildings we need one panel to be installed to meet that requirement.

Personally I feel very good to see that. It shows that the NCC really pays a lot of attention to renewable energy generation in those buildings. But practically, how to make that happen is another question. When we look into the PV opportunities, we did some studies and to match 1 square metre of rooftop PV generation if they use the same efficiency PV panels on the facade, on average in Melbourne-based climate conditions, we need about 2 square metres on average. It depends on the orientation, definitely, but on average we need 2 square metres to match the generation. If we imagine in the future the facade system – because with the facade system, we can look into different types of PV options – it can be at very high energy efficiency, but we can also consider aesthetic value by incorporating colourful or patent PV products. If they do that, when we look into the comparison, even the efficiency on the facade is only half of the roof PV efficiency. You only need about 4 square metres to match the per-square-metre energy generation on the roof. We have optimised the energy output on that.

However, it is not only about energy – and within NCC – I think there are at least another two sections relevant to facade PV or rooftop PV. One is related to fire safety. Two years ago we did a scoping project for Victorian Building Authority at that time regarding facade PV fire safety, and there were concerns on that. However, in the market I do see that there are good practices, such as using microinverters or optimisers or even using rapid shutdown devices to reduce that fire concern. However, I personally would like to see more support from the state government to look into that. The solution we provided to VBA at that stage was that we need to work hard together regarding how to do the test and really look into the panel in an energised situation – what would happen in a fire situation? We need to bring the firefighters on board and talk about strategies.

Another one – quickly – is related to the solar heat gain coefficient, because there are also higher requirements in NCC related to the solar heat gain perspective. When we consider solar on facades and we think about a solar-shading device as another possibility, that definitely can bring in benefits to the heat transfer inside of the room. There are other products which we look into the SHGC value of, and we use those products as curtain walls, for example. Of course we need to look into the heat transfer from those products, but by doing that we actually substitute the conventional building material cost into the installation. That is a big benefit that should be considered in the calculation.

The CHAIR: Thank you, Rebecca. I see Mike has his hand up.

Mike ROBERTS: Thank you. A couple of things: one is that in Europe, in the EEC, they have legislated for renewable energy communities within apartment buildings and also in precincts of multiple apartment buildings. I am not across the detail of how that works, but it is similar in principle to the idea of a benevolent embedded network, where the owners and residents have an interest in the embedded network rather than it being operated as a means of exploiting them, which has been very common in embedded networks in Australia. What it does is enable the sharing of onsite generation and offsite generation and shared batteries in order to distribute renewable energy between apartments, so I would say that is something to look at. I guess the other one, in terms of strata law, is not so far away and is looking at some of the other Australian jurisdictions. New South Wales has fairly recently, I think, introduced changes to strata law which restrict grounds for objections to sustainability infrastructure and also have reduced the threshold for voting within owners corporations for sustainability infrastructure, so there are some barriers that can be reduced in terms of decision-making and governance within strata organisations.

Nicola WILLAND: If I can just add to strata and tenant regulations – thank you, Mike – when it comes to portable plug-in solar and batteries, overseas the experience really showed it was the political will that made it work. Germany, for example, decided they had to democratise access to solar PV, so they changed rental laws. If you want a PV balcony system, it is a privileged modification, so the landlord cannot unreasonably refuse it. They have changed strata law, so the owners corporation cannot say, 'We don't like the look of it.' We did some numbers for Australia. Two-thirds of these systems would probably go into rented detached homes, just because we have got a higher share of detached housing stock. In the UK, last week they announced that plug-in solar PV systems will be available, just as a quick response to the crisis in the Middle East. They have not worked out the technical bits yet. Utah is the only United States state that has fully enacted solar PV. When they passed that bill, there was no certified product to be bought yet, but Virginia and Illinois have just followed. There are another 19 states now where the bill is tabled, and it was much pushed by the members of parliament rather than industry. In Germany, I know the distributors were not too happy about it, but then they decided to come onboard because they needed to build trust with the consumers. They have a registration system, and there is a limit of 800 watts peak. The limit in Utah is 1.2 kilowatts, so the distributor knows where they are. The registration process in itself was a barrier at the beginning because it was a digital form and that excluded some people, but now if you buy it at your local Aldi or IKEA, they will register you, so that barrier has also been removed. Anne, is there anything you would like to add?

Anne KALLIES: Yes. A quick follow-up: I should say I am a law academic, so the legal part kind of sits with me, and for the Hansard record, it is now the RMIT School of Law. Sorry, I am just looking at my tag. It is a fairly recent change, so fair.

In the end legally wherever you look – the German system is quite advanced, and you have got a little bit of an overview. I have literally this morning printed off the Virginian one, which looks like it passed the house, the lower house, and I am not quite sure if it is through the Senate yet – the American legal system is a bit confusing. What you see is always, in terms of the laws around plug-in, you need to define 'plug-in solar' separately with clear size limits. you need to streamline registration, and then there is the kind of safety standardisation piece, which I understand from our engineers is a bit of a thing in Australia, while it seems like it is easier elsewhere. And then there is what Niki just mentioned: the right to solar access, privileging this use. Interestingly, in a way our *Residential Tenancies Act* here in Victoria already does this in section 64. But I am thinking it is also about we have a very tight rental market – people do not want to rock the boat, but it does say, you know, that a residential rental provider must not unreasonably refuse modifications that are necessary, for example, to reduce energy and water usage costs, which one of those would be.

But overall, you need to get out of 'This is a big interconnection construction project' to 'We treat this as an appliance.' This is an appliance; we plug it in. That also means it falls under your home and contents if something goes wrong. The other thing that the Germans have not expressly done in legislation but Utah has done, and I can see it in the new Virginian Act, is basically: if you – renter or owner – put in this kind of plug- in portable system, you are responsible for any damage this does, either to your house system or if it falls off your balcony or any of these situations, so it might be worth considering whether you want to spell that out. With that benefit and that ease of construction or – it is not even construction – connection comes responsibility, which may have to be spelled out. The beauty with this is almost all of what you can do apart from, of course, the national building code sits within Victorian parliamentary powers; federal does not really need to get involved here. So owners corporation law, the *Electricity Industry Act*, if you want to pull it out of

certain registration requirements, maybe the *Residential Tenancies Act*, kind of sharpening this up a bit – they are your levers.

Nicola WILLAND: Also on this point on safety, there is safety data and there is mostly perception around safety. Rebecca also talked about that: the one barrier they come across is safety, but it is a perception of safety, and if you look at the fires that come from solar PVs, they are probably less than the fires that come from batteries in homes. My daughter is a firefighter, so I hear that from her. Having safety standards around portable batteries could even extend into those kinds of batteries. Most importantly, it is the people who use the systems. How you communicate how to use these systems safely is going to be key. There is very much the human component that comes into it as well.

The CHAIR: Daniela, do you have a follow-up question?

Daniela DE MARTINO: I did want to ask about the portable plug-ins because I –

Jordan CRUGNALE: So did I.

Daniela DE MARTINO: Okay. We are both on there. I think you have comprehensively covered it, though. You are saying it is more a perception of safety? I know currently they are prohibited because there is a concern about risk of electrocution; being able to plug it back into the house is considered a danger. So how do we deal with that? How do we mitigate the actual risks? There are always risks with any electrical appliance. For example, a kettle can do terrible things as well if faulty. But how do we mitigate for it and then how do we address the safety perceptions? How do we take this forward, I suppose is really what I am asking.

Saman GORJI: I can start from an electrical engineering background, and then I will leave the harder part to my colleagues. When it comes to safety, I can add a couple of points, because of the lessons that we have learned from the incidents of fire in the batteries in Megapacks and others, just going from larger scale to a small scale. The first thing is that I would echo what has been said about the safety of the battery. That is not my comfort zone, but I just want to add something on top of that. We have patented safer technologies in Australia as well. Where Mike comes from, their university, is the pioneer of the perovskite solar panels as well as the flow batteries. This is just a dual benefit thing; it is not only safer but is a sovereign technology as well. Even at Deakin University our colleagues have some patents, and the technology readiness level is now market design ready for sodium ion batteries, which are much safer than lithium. It is not only sovereign technology, it is safer as well. These are the points that I want to make, and just getting back to my submission, that technology is already there; it is how we implement it.

Apart from the safety aspect, as an electrical engineer, I would just add that the harmonisation around the DNSPs is not just about Victoria; it is all over Australia. As an electrical engineer, if you tell me that you are going to buy something from Bunnings and plug it in, I would be panicked as well, because there is currently that kind of regulation for up to 7.5 kilowatts of solar, which goes down to a 5 kilowatt inverter, which is what we have as the residential system. They do not need to go through a strict standard or study, because they do not impact the grid that much if it is done by a certified electrician. But if you go beyond that, just assume that it is a very large complex of units and then you are going beyond 5 kilowatts per detached house, those kinds of updates would be required. I would just say, yes, the best case is that, as an electrical engineer, I would love to see, for example, tenants get a portable solar and battery system which is safe, and then they could actually go from this house to another. But there are some gaps with the DNSPs and regulations for grid connections. Both parties are right here; the consumer wants to connect and benefit from that – they are right, but the grid operator would be panicked because it basically means harmonics impacting the grids and all the solar systems. I mean, it is not just about the solar and batteries. All the discussions around the data centres, which are essentially huge battery energy storage systems, are the same. There are some gaps for grid connection. You cannot simply plug into it; there are some kinds of requirements for think tanks to go through.

Anne KALLIES: Just very quickly, for plug-in solar we are talking 1200 watts, so it is not bigger than that; that is the max.

Saman GORJI: Yes, that is the best size.

Anne KALLIES: I am just hearing your numbers, and I am thinking, 'No, they are not talking about plugging in bigger than that.'

Saman GORJI: Yes, that is perfect. Regarding the sizing, that would be the perfect scenario for both parties.

Anne KALLIES: I understand you are talking about 1200 watts of course, so you are absolutely right.

Saman GORJI: Exactly. That is a sweet spot for both. DNSPs would love to see below 5 kilowatts, and also consumers would benefit from that. In terms of size, that is the ideal size, I would say.

Gary ROSENGARTEN: They need to learn from Germany how they actually implemented that with the DNSPs. I think it is a simple fix for that. If it is all regulated and monitored, then they can control that and increase the safety.

Nicola WILLAND: Two things – on the technical bit, the federal DCCEEW has put out a request for a quote, and I believe Mike has put in a quote for the feasibility of plug-in solar systems and batteries. The report should be finished by the middle of the year. Mike, Anne and I are leading an RMIT bid with RACE for 2030, which is a cooperative research centre, to look at implementing and really finding the pathway from portable solar batteries and PV systems via not only the technical bits, which seem to be fairly easily solvable or manageable, but also the social side. How do you make sure that people only have one system and not one on every balcony, for example? In Germany it is one per household. You can have it in addition to your rooftop, but please only one. How do you make sure that it is fixed safely? It is that bit as well. It is about social acceptance, it is about integrating renters, strata, organisations, community groups and talking to them and what kind of information they need so it fits them and so we make sure that people who need it the most are then part of it. If anyone is listening, please contact us. You are welcome to be a part of the project.

The CHAIR: Excellent – an important plug. We have got Rebecca and Mike to go, but I am conscious of the time, so if you could give succinct answers, please.

Rebecca YANG: Sure. In terms of the risks, there are three types. First, a structural, wind resistance and long-term duration for the structure. I think for that one, because every balcony is different, it is better to coordinate with facade engineers to find solutions. The second one is electrical shock – electrical safety. Currently, for example in AS5033, there are already standards or regulations regarding electric shock, earthing and bonding of exposed conductive parts, mechanical protection of PV cables and installation of those isolators. Also in AS3000 there are also regulations regarding appropriate protection against environmental conditions. We also need to think about back feeding that problem as well. For that one, my suggestion is to work with Energy Safe Victoria together to see how we can develop very clear regulations on that. That would possibly also influence IEC standards, because both me and Energy Safe Victoria representatives are in that committee. I see the possibility there. The last one is fire safety. Fire safety I personally think is about how, from the state government perspective, you can support a demonstration in terms of the fire test so that could generate awareness about the possibilities and the possible hazards and how to mitigate those. You would need to bring fire engineers, building surveyors, firefighters and regulatory bodies and maybe researchers like me all together to talk about how to do the test and how to generate the most knowledge for the public around that. I will stop here.

The CHAIR: Thank you. Mike Roberts – where we started, we are going to finish. Great to hear from you.

Mike ROBERTS: Thank you. Keeping it brief – just on some of the technical issues with plug-in solar. To my understanding, I think there are three things. One is around what is called anti-islanding. In Australia household solar inverters that are connected to the network, under Australian standard I think 4777, have to have anti-islanding protection. What that means is that if the network goes down – if there is some kind of power outage in the network – the inverter will not continue to feed into the grid. That is a safety requirement because there could be people working on the distribution network to mend it, and they would not be aware of this connection and it could kill them. These plug-in systems have microinverters, and we already have in Australia microinverters that are used for rooftop systems. This is where you have an inverter attached to each panel. The microinverters that are currently available in Australia have to comply with this anti-islanding anyway. The solution there is just to make sure that any plug-in system has anti-islanding protection.

The other issue is about electrical wiring, household wiring regulations – which I think is AS3000, but do not quote me. There is a slight grey area here that I am not quite sure about, which I have heard anecdotally, which is around the standards for switchboards in Australia – that the RCDs in Australian-specified switchboards will

not necessarily trip if the current is running backwards. So if there is a big surge going outwards rather than inwards as it normally would be, then they might not operate in that situation. That is something that I want to look into more because I do not quite know the details.

Then I guess the other thing is, as Saman was talking about, the visibility for DNSPs. But if you are talking about one kilowatt in a household, then there is usually some kind of load in the household, so you are talking very small power exports into the grid. We have had some kind of initial conversations with Ausgrid in particular, and I do not think they see that as a big threat if those limits are maintained.

The CHAIR: Thank you very much, Mike. Our time is up and actually beyond, but I just want to say thank you to the panel for your expertise. We could spend days learning from you. Thank you for the work that you are doing and the future work that will be done. It is an incredible space that you are all working in at the moment and one that is going to be very transformative, so thank you very much. If there are any other important points you still wish to make, you are welcome to provide additional information in writing, and we would welcome that as a committee. Thank you on behalf of all the committee for making yourselves available today.

Witnesses withdrew.