



SEASON 1, EPISODE 4

Community Batteries and Conserving \$1.1B in Voltage

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SPEAKERS

Ty Christopher, Managing Director of Ty Christopher & Associates and Robyn Johnson, Director, Blend ESQ

Ty Christopher 00:00

So if we take a line through the middle of that what we could say in Australia is that a 5% voltage reduction would save everybody 4% on their energy bills. Now across the entire national electricity market. That's just shy of \$1.1 billion, with a B, in energy costs per year, and we can even set aside the debate now about whether that energy came from coal or gas or other fossil fuels, or whether it came from solar or wind or other renewable fuels. I'm talking here just about perfect efficiency, and saying, surely the best energy is the energy that you never had to generate in the first place regardless of the source that it came from. So there's terawatt hours of energy over the course of many years, that would just be no longer needed.

Robyn Johnson 00:54

Hi, I'm Robyn Johnson, and welcome to Wollongong, Let's Get Salty! For 20 years I've advised industry and business in environmental management, with leaders from community, environment and industry we'll deep dive issues that impact us all and discuss how we as a community can take action to move towards a sustainable future.

Robyn Johnson 01:23

Welcome back to our listeners. My guest today is Ty Christopher. He has spent nearly 35 years injecting his energy into powering our homes and businesses through his work with local electricity network providers Integral Energy and Endeavour Energy. Welcome, can you share some highlights from your career so far?

Ty Christopher 01:43

Hi Robyn, thanks for having me on your podcast. I had as you said a 35 year career with the electricity supply industry. I started with would you believe, Illawarra County Council way back in the 1980s. I studied at the University of Wollongong. I actually spent the bulk of my early career working in the field. You see people in trucks nowadays, driving around, climbing poles, digging holes, all those things to keep the lights on for our homes and businesses. That's what I did at the start of my career and then worked my way through all the engineering parts of the business, design, construction, planning, project

management, all of those things, and had a career that I have to say I'm forever grateful for within the industry, that in the cliché sense, went from the mailroom to the boardroom.

In the end, I was an executive the last 10 years of my career within the industry. I was privileged to be able to do things like undertake broad range planning for the Parramatta CBD, for example, and look at the 10 years, 20 years 30 year plans. Plan for the second airport in Western Sydney, and then implement the projects that were needed to lay the foundation for the expansion of the City of Sydney, and likewise for works down here in the Illawarra.

Renewing assets that are out there, renewing the electricity network to keep it reliable for customers, as well as building all of the new things that are needed to service expanding areas like the University and West Dapto, and the actual CBD of Wollongong itself. Towards the end of my career, I really enjoyed what's called, you know, future grid and pushing the envelope of what the electricity network can actually do to serve customers. One of the highlights I was particularly pleased with, was being able to devise, design and install the first real grid size battery here in New South Wales. It's actually already in service, not many people know about this, out at West Dapto. If you drive out to Wongawilli, it's just on the side of the road there.

Robyn Johnson 03:44

Yeah right, I was unaware. So, you're speaking to us today in your capacity as Managing Director of Ty Christopher & Associates, and also your work as a Strategic Advisor to Ecojoule Energy, can you tell us a bit about the work you're doing?

Ty Christopher 04:03

The work of my consulting firm, but also of Ecojoule Energy are very closely aligned. We're all passionate about transforming the electricity supply industry. In particular, using new technology and Australian developed, Australian devised and Australian manufactured technology to bring us up the curve on the journey towards more sustainable supply of electricity. More renewables, and really building this through the twin lenses of innovation and better results for customers in terms of their energy supply, but also jobs and employment within Australia. They really are our two objectives, both Ecojoule's and mine personally, within my consulting business.

Robyn Johnson 04:47

So, we are here today to talk about oversupply in the grid, but you've sparked my interest with the West Dapto battery. Can you tell us a bit more about that?

Ty Christopher 04:55

Absolutely, network connected batteries are a frontier issue and a very topical issue within electricity supply. If you start to unpeel the onion on all of this, you start to realise that the technology around energy storage is already present. It's already there, we could do it tomorrow. The main barriers that we're facing as a society and as a nation is really embracing energy storage, so that we can maximise the utilisation of all of this lovely solar that everybody's installing on their homes. I mean, we're leading the world on solar installation, the real key to it is being able to store that energy when there's too much of it during the day, and then time shift it to later times of the day, once the sun's gone down. It's quite a simple equation.

Home batteries are one way to do that, but they are still very expensive and they are still of quite limited size and capacity. So, you pay a lot of money and you don't get very many hours of storage when you put these in your homes, usually in the garage or on the side of a person's home. A study was done a year or two ago funded by [ARENA](#), the Australian Renewable Energy Association. The title of it says it all really, it's called [Grid Vs Garage](#). (Robyn: Yep, read that). The conclusion of that report quite logically says it's far more efficient and far better for all of us as energy consumers, if energy storage is placed on

the grid, so that everyone can share it, rather than have every house have to buy a battery. You can have one battery in the street that everybody shares. The beauty of that arrangement is also that it opens up the potential for the less financially advantaged members of society to also access locally generated clean energy. If you're a renter, for example, or if you're in community housing and those sorts of things, you can still access locally generated clean solar energy from a community battery that you're connected to through the local grid.

Now, that all sounds like almost utopian in terms of the future for us all, but the biggest problem with it is at the moment, the structures around the electricity industry were all set forth in the latter part of the 20th century, are really holding us back as a nation in being able to progress rapidly with large scale battery installations across the grid. There's lots of detail I could go into with that, and happy to explore that further if you want. The bottom line of it is that we're dealing fundamentally, with a set of 20th century rules that are no longer fit for purpose with our 21st century technology. It's a sobering thought, if you have a look at the calendar in 2022, we're very close to being a quarter of the way through the 21st century. Every single rule and the fundamentals of how electricity is supplied to all of us as consumers, were all laid down way back in the 1990s, at the latest.

So, what we find now is that a network company only with certain provisions, and with exemptions being granted by the regulations, only then can they actually install and operate a battery. And even then they're precluded by law, from being able to get the maximum financial return from that battery, because they're not allowed to trade in energy, because of the way the rules are set up. Conversely, the network retailer, the people who you pay your electricity bill to, they can't own an asset, and can't own a part of the grid because of the rules that have been put in place historically. So, what was once a very clear boundary between the grid and the customer service side of things, is now made a very grey area by new technology and by batteries. All of the debate is around trying to force it in one direction or another. Let's just reluctantly and begrudgingly allow the network companies to own batteries, or let's find a way for retailers to own batteries.

When, my position (and I can say this now that I'm outside of the industry, and not held back by some of the rules and regulations personally), I think the answer is we actually need a completely new operating model for the new technology that's out there in the grid. What we should be doing is putting in place Uber type solutions, something that's completely disruptive that operates in this grey area. A community collective, who we could all buy into, and would own and operate that community battery, that all other people could then share in. It looks and feels to me like a much better fit and a much better model for the technology that's available there. And also, I think, a lot better model that aligns with people's desires and where people want to go in terms of taking charge of their own energy, and sharing the solar that they're generating on their homes with other people in their local communities.

Robyn Johnson 10:11

Yeah, so let's explore this further because it is a social equity issue. Batteries are expensive, and it does mean that people are going to be left behind paying for the grid, while others who are on solar and battery are taking full advantage of clean energy that they're producing, because they're in a financial position to do so. So, with this model of a community owned battery, how do you see that working? So, we set up this collective, what happens in terms of construction and maintenance of this battery?

Ty Christopher 10:47

That's where it starts, there's wheels within wheels here, to start to explore. So, if I could just come back to your point there Robyn, one of the things that I think doesn't get enough airplay as well, is that the solar revolution that's occurred in Australia is globally unique and needs to be applauded, and applauded from the point of view of the regulation that allowed it to occur. Also, a pat on the back for all of us as citizens of this country who've jumped on this bandwagon and are transforming our own energy grid as a result. I mean, my own home is powered by solar and so are half the homes in my street.

But, again, coming back to my theme of unfortunately 21st century technology having to live within 20th century rules. One of the issues that I don't think gets enough consideration from a social equity perspective, is the way that network tariffs are set. The amount we all pay for our electricity is set based on the volume of energy that is consumed in the old direction, or call it one direction from the big power station down to the home or business. So, what that means is, as more and more customers who can afford it, who have enough affluence put solar on their homes, the amount of energy that they are pulling through the grid reduces and that means obviously their bills are less, yay, big winner for those customers.

For all of the other customers though, who can't afford solar, they are still working within, and for the network companies, the poles and wires businesses who are regulated monopolies. They have what's called a Revenue Cap, they have a fixed amount of revenue that they're allowed to earn each year. So, what it means is, as more and more customers install solar, they are recovering that total revenue over a smaller and smaller customer base, and guess what, those customers are the less affluent people in our communities, who can least afford to put solar on their homes. So, what we're seeing is the social impact of the widespread take up of solar at the moment on homes and businesses, is actually driving a greater and greater gap between the 'energy haves' and the 'energy have-nots' in our society and in our community.

Now, I'm never one to want to just point out a problem and walk away. The solution to this then is, as we're talking about here, community batteries. The challenge that we've got with community batteries is, when you start distributing individual batteries out in streets, say out throughout the electricity grid, each individual battery is of a reasonable size, but not that big. What it means is the economics of a battery are not that good. But the economics of 100 of those batteries is completely compelling. Literally, it's a volume-based type of economic equation, and so sorry, this is a long-winded answer.

Robyn Johnson 13:59

No, it's great. You're explaining it beautifully.

Ty Christopher 14:00

Thank you, but I get to the point of you know, an answer to your question is what does the model for this look like? What I think we really need as a community, and as a society here, is a large piece of venture capital investment. Now, I don't want to name names, but there are certain hyphenated names, and other names from people who've made their money in iron ore and that sort of thing. Others who are active in overtaking a certain retailer that has three letters in its name at the moment. I think those people, the Cannon-Brookes and the Twiggy Forrests and their large venture capital, clean energy venture capital funds are the key to unlocking our future here as a nation. They can provide the funding and that seed capital to start to implement, not just one, not just two, but fleets of these community batteries.

Those community batteries, I think would then be able to start to erode and redress the energy divide that's already occurring due to solar. As soon as you start storing the locally generated energy, you then create a mechanism where it can be accessed by people who don't actually have solar, because they're connected to the battery as well in the same street or in a couple of streets away, and electrically, the grids all interconnected. So, this is where I see the key to this.

Now, and again, not wanting to sound like trying to politicize your podcast here, but our new incoming Labour government have committed to installing several 100 community batteries as part of their election promise. I think that's very much to be applauded. I think that the key to success of that government program is not that they install 200 batteries across the nation or 400 batteries across the nation. It's that they use that program to smash through some of the regulatory barriers that are in place and use that as a way to establish some of these new ownership models. If they do that, then that program will create a completely new market and will create a role for completely new entities.

Look, they could be owned by large energy finance corporations, they could be owned by Local Community collectives, they could be owned by local councils even. There's all sorts of ownership models here, but the real thing I think we need to do as a community here, is push for this, advocate for it, say to our legislators and our rule makers, why aren't you doing something about this, and create a market potential there for a new model and a new player in the energy markets. I'm confident with the way things have gone already in energy transformation, that as soon as you create that opportunity, I think it'll be taken up by a number of different entities. That will be for the betterment of all of our society, from a sustainability perspective, and also from a social equity perspective.

Robyn Johnson 17:08

So, two of those Labor promised batteries are coming to the Illawarra. I want to take this right down to the individual, how do we engage with this? So, you know, we've got West Dapto, we've got two more coming, within the Endeavour Energy platform they're working on a microgrid down at Kioloa / Bawley Point, what's the pathway here for individuals to do as you say, to put pressure on, to show interest in community batteries? How do we engage?

Ty Christopher 17:42

I'd like to say that engaging with the energy regulators is a great first step. I'd like to be able to say that, but unfortunately the A team, the [AER](#), the Australian Energy Regulator, the [AEMC](#), the Australian Energy Market Commission, and the [AEMO](#), the Australian Energy Market Operator. It's a festival of acronyms out there isn't it, are all individually and collectively, for us as individual citizens, organisations that are quite opaque and difficult to engage with individually. Indeed, organisations that aren't really obliged, and I'd go so far as to say historically haven't really been very comfortable with getting their hands dirty, and engaging with individual citizens.

So, our real point of engagement, I think there for us as individuals, needs to go to the people who have are in influence over those rule makers. That is, and will always be, our federal government. So, your local member, and their advocacy is, the key pathway for all of us as individual citizens in this path.

I don't want to sound like I'm dissing the regulator's too much in all of this, but the reality is they are individually and collectively the three A entities that I spoke about. They are large bureaucracies; they are bureaucracies that were founded over a quarter of a century ago. My observation is that in engineering, and I am an engineer so I can't help myself on this, in engineering, the strongest structure is a triangle. In bureaucracy and politics, I think a triangle is probably one of the weakest structures, because it means you've got to herd too many things into one direction. By definition, what a triangle does is it has a hole in the middle of it. What we're dealing with, whether it's community energy storage, or whether it's voltage management, really what we're seeing here is not something that's been done out of out of malice, or even out of incompetence. What we are dealing with is something that is accidentally operating in the hole in the middle of the triangle. (Robyn: It's Structural). Exactly, and it's again, 20th century rules not being fit for purpose in the 21st century,

Robyn Johnson 20:07

In relation to community batteries, and we'll talk about voltage later, what are the rules that need to change?

Ty Christopher 20:12

I'm actually not convinced that changing any one, or suite of the rules is actually going to help here. What I think needs to happen, is there needs to be a broadening of an existing, and to their credit, it does exist at the moment, with the Australian Energy Regulator have established what I'd call a sandpit provision. It's a provision where you can try new things in a safe environment, no matter who you are, whether you're an existing player, or a new player in the electricity grid. So, I'm not convinced that minor changes to the existing rules is actually the way forward here. I think an expansion of the sandpit

provisions and playing in the sandpit with more and more innovative approaches is going to be the better way to then write some new, more fit for purpose rules out the other side of it.

That's a generalist statement, so, to get into some of the specifics here, why the electricity industry in particular is structured the way that it is now, is because way back when it was formed out of the old government owned, state owned monoliths (which) were brought together to form a national electricity grid. I'm going back a lot of years now, 30 plus years in terms of history. The idea was quite appropriately and necessarily to establish markets in as many areas as you could, so that there was competitive forces and monopoly services where you had to, and where it was not logical for there to be anything other than a monopoly service provided.

So what that did, it set up a series of very hard boundaries, and this is all governed by something that are not just called rules, it's actually the National Electricity Law, these things are all enshrined in laws, there's about just shy of 1000 pages, exciting bedtime reading if you're an insomniac. What it means is the monopoly parts of the electricity grid, the poles and wires as people hear it, saying, that's basically the main backbone of the grid that forms the National Electricity Market, and interconnects all the states. Queensland, New South Wales, Victoria, Tasmania, South Australia, that's the National Electricity Market.

Those are all monopoly services, and have very strict rules around what they can and can't do, to restrain them as much as possible to operate just on their patch as monopolies and to allow as many other services to operate as free markets. In particular with electricity, those are the creation of electricity, the generators and the like, as well as the selling of that electricity to each and every one of us, and those are the retailers that that we hear about, the Origin, AGL, Energy Australia, Red Energy, etc. Most people, I think quite rightly, show very little interest in the details of how all of the electricity gets to the light and the power point in their home and fair enough. I've always said to young engineers, as we were talking within the industry, what is it we sell, here in the electricity industry? People say, oh it's you know, a service, a commodity, it's this, it's that. I'd always said, no it isn't, what we sell is hot water, and television working, and cold beer in the fridge. That's basically what we're selling here, it's the outcome of the use of electricity. So, what we see is these rules are all in place that put strict boundaries around what you can and can't do as a retailer, as a generator and as a network provider.

So, what that means is that things like, in particular, energy storage and batteries, take what was once a hard boundary condition between monopoly and market area, and makes it a grey area. Because, now all of a sudden you've got a network asset that anyone could and should have access to and use, to buy and sell and trade and store temporarily their energy. In order to make that pay off as an asset, you've really got to allow it to do that. You've got to allow it to store people's energy when they're making too much of it from their solar panels during the day, and then use that energy back, once the sun's gone down, and they've come home from work, they're cooking and watching Netflix, they're doing all the exciting things that we do at the end of the working day. So, what that really means for us is, trying to change the set of rules that take this grey area, and force it to one boundary condition and say, okay we're going to allow existing network companies to own and operate batteries, but we're going to limit what they can do, etcetera, etcetera around it, because they're a monopoly, is always going to be suboptimal, that's not going to deliver the best result for us as a community.

Similarly, trying to force to the other side of the grey area, and say well retailers should own these batteries and avail themselves of the benefits of it and so forth. That's then going to lock them out of, and lock the network companies out of being able to use these batteries to minimise their costs of operating the grid, and that's going to flow through to us as increased costs as customers again.

So, I actually don't believe that trying to amend existing rules to force this in the grey area to one boundary or another is going to ever work. What we need is a sandpit provision to say, let's use the sandpit rules to develop a new model of a new entity. Call it a community battery operator, I don't know

I just made that up. Whatever it is, this new entity that works in the grey zone, and delivers the service across in one direction to the monopoly person and delivers the other energy trading services to any retailer who may come along, and then with all of it, delivers better results for all of us as energy consumers. Because we're being able to store our energy, use it at the end of the day, we're being able to let what energy we've created, that we don't want to use ourselves, be available for other people in our community to use as cheap, locally sourced electricity to power their homes, if they're renters or people in lower socio-economic areas. So, the rule change that I suggest is ignore the existing rules and operate something new and different. Then, once we've worked that out, write a new set of rules around that.

Robyn Johnson 26:56

Do you think the work that Endeavour Energy is doing down in Kioloa and Bawley Point will help us discover maybe what this looks like? My friend went to one of the first meetings in the last couple of weeks, and they're pretty open in saying that this is new, we're trialling this, we want to work with you. What do you think things like that will show us about the new way forward?

Ty Christopher 27:20

I need to start in the most respectful way I can by saying I don't presume to speak for Endeavour Energy. Even though I worked for them for many years, I'm no longer with Endeavour Energy. So, anything I say I'm expressing as a personal opinion. Now, having said that, I couldn't be more proud of the organisation for what they are doing down there in Kioloa / Bawley Point. I do think it is the way forward. I do think what they're doing there, they by their own admission, and the candor in what they've come out with is, I think is very commendable, and is genuine in terms of, they are trailblazing with this whole initiative. They want to bring the community along with this initiative that they're undertaking down there. They don't have all the answers right now. They're not going into this saying, 'oh, you know, here's a solution, how much do you love it?' They're genuinely engaging with the community to find out what do the community want? What does this shared energy solution or microgrid, if you like, solution look like in that area.

So, I do think it is a key pointer to the way forward for us as communities. I do also think that there are some particularities of the Kioloa / Bawley Point area that make it particularly suitable to use as a pilot. I mean, it's a gorgeous part of the world, if you've ever been down there, it's just lovely. It's also an area that from an energy supply perspective is quite challenging. Most of the year it has an energy demand of x, we'll call it a certain amount. Then through Christmas, Easter, and a couple of long weekends, its energy demand is 4x. So, there's really something you've got to do there from an efficiency perspective to deliver what customers want in terms of energy when they need it, when they're there on their holidays, and in their holiday homes etc. Whilst not over investing and bumping up everyone's electricity price as a result.

So, I think the opportunities that are there with Bawley Point, and I say this not wanting to be negative about them, but other what I'd call 'grid fringe' communities are huge. I think the other thing without introducing more topics for our discussion, but the other thing that is really important in those areas, these are areas that were deeply, deeply affected by the devastating bushfires of a couple of years ago. So, I think there's a huge opportunity for those communities, working with the local council, and in this case with their energy provider, their energy network provider Endeavour Energy. I think there's also an energy resilience piece to all of what could be done here, that could really position these areas to be in a much better position as they face the ongoing impacts of climate change, and its impacts in terms of remote areas that are populated with a reasonable number of people, a reasonably large population, and how they can have enough autonomy over their energy supply (that resilience locally), to really help them survive the changes that we're facing as a planet in terms of climate.

Robyn Johnson 30:40

Yeah, that ongoing access for people that really need electricity, for a range of things that run in homes and businesses. So, I've mentioned previously on my podcast, Saul Griffith and [The Big Switch](#), and I recently went to one of his book launch events where he's talking about that pathway in terms of some work that he's actively trying to establish in terms of community batteries right here in Wollongong as well.

Ty Christopher 31:07

Yes, on a personal level, I'd say yes, I've met with Saul. We've, spoken on a couple of occasions, suffice to say that he and I are in violent agreement on just about everything. So, yeah, I think we both got up on our ledges and were calling across when it came to the issues around how much some regulation is holding us back. As a nation, I do think that a lot of, (I don't want to be an advertisement for Saul too much), a lot of what he's doing in terms of the electrification of everything, and the thing that he's pushing here to decarbonize our society, our world, and our homes. The push towards electricity, local sourcing, local generation and local storage of that electricity is the key.

Introducing yet another thing into our discussion here as well, I think Saul's on the money when he says that transport also needs to decarbonize as well. When we talk about batteries in our homes, and the like, I would say that the best home battery that you could probably buy is one that has wheels under it.

I think that's a whole other area that we really need to think about and explore ourselves, and as a community. The vexing issue for me is that the best time to charge your EV is probably the time when you're away from home during the day, because that's when all the solar is generating. So again, that's where I think we get to some really good interfacing between new models of energy providers that could be out there, community-based models, and as well as community batteries that can store the surplus energy during the day, and then discharge it into an EV during the evening or overnight as it's charging.

All of these sorts of models are really important and have the underlying theme of we decarbonise and we move ourselves off fossil fuels here, by moving to electricity more and more. I'm biased, I'm an electrical engineer, I've had an all-electric home ever since I built it 20 plus years ago. I certainly believe once you put solar in it, and with storage then being the final piece of the puzzle, it's the key for us all to be able to achieve a decarbonized life as individuals, and then that will just add up all across society, and start to really decarbonize everything that we do.

Robyn Johnson 33:35

Yeah, and I think working with organisations like ARENA, who are providing funding for fleet vehicles, and the avenues that we need to take in order to provide fast charging in car parks so people can do that when they are not home.

So, just coming back before we switch topics to speaking to your local member. As of Saturday, we have [Alison Byrnes](#) here, the Labour MP. I chatted to her briefly before casting my vote, and she's open to talking about energy futures and hearing what it is that we would like as a community to get this decarbonisation happening at a rapid rate. So, there's many ways to engage with your local member, and I encourage people to digest this information and to reach out and voice what it is we'd like to do.

Ty Christopher 34:33

Absolutely, I'd certainly agree with that, and yes, I think that the local member, now that we have a federal government who's committed to decarbonisation, net zero, and really addressing climate change, I think we've got a pathway. Having a local member who is of that party is obviously, something that is not going to be the case across the listening audience I'd expect and across our country. But it's still I think important, this election and this election result, amongst many other things, I'm sure is widely being recognised as having been a statement by us as a society and as a nation on climate change.

I think that's appropriate and I think we've got their attention now, that's the best way to put that. There's also other groups, Renew Illawarra are a good group. I am and declare interest, I'm involved with Renew Illawarra as well. They're passionate about all matters decarbonisation and have some lovely and very passionate people as part of Renew Illawarra and that's another local group that are here that people could become involved with.

Robyn Johnson 35:46
Awesome.

Robyn Johnson 35:47



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Robyn Johnson 36:23

So, let's switch our conversation now to talking about the oversupply of voltage in our grid.

Ty Christopher 36:29

It's hard to describe the supply of electricity to most people, it's a completely intangible thing. You don't have any visible reference for what's going on with your electricity supply. So, the analogy I try to use for people and to the electrical engineers in the audience, then I'll beg your forgiveness upfront here for this. But, if you consider that electricity supply is like a water supply, what it means is voltage is the pressure that's applied, and you need to apply that pressure to get the water to flow. Your current is then the water flowing through the pipe, so that's voltage and current explained. Then of course, the power that you use out of your electricity system is the product of the two, voltage x current is the power that you consume.

Now, there are Australian Standards quite appropriately so, that set the voltage that we should receive out of the power point in our home. Not literally just the power point, but to our homes and businesses. It's got AS6038, and blah, blah, number. Suffice to say, there's an Australian standard. Now, not many people know that, and most people would still refer to our system as 240 volt, when it isn't. The reality is, the Australian Standard changed in the year 2000. So 22 years ago, except for Queensland, they only changed a couple of years ago. We're all now on the same Australian Standard. What they did is they moved the Australian Standard from 240 volt to 230 volt, as you'd call it, the nominal voltage or the preferred voltage that the system is going to operate at.

Why did they do that at the time? Well, they did that to align with the rest of the world. They did that so Australia wouldn't be unique in what we're asking for, for all of our electricity appliances, etc, etc. Now, when they change the standard, nothing's perfect in the world, so you need to have a tolerance around

that standard. So, when they changed it previously from 240, it used to be 240 volts plus or minus 6% either side. When they changed it to 230, they made it 230 minus 6% plus 10%, so that all of the system wasn't instantly out of standard when it occurred in the year 2000. So it's a 230 volt system, but it has a large range above the 230. If you read the documentation at the time, and again this is back just at the turn of the 20th century, if you read the documentation at the time, the idea was 'change the standard immediately and then over time, the system will progress downwards to be a 230 volt system'.

Now, every appliance that we've purchased since the year 2000, and think back, how many things you own that are older than 22 years in terms of electrical appliances. The equipment that we are recording this podcast on, is all designed to operate optimally and best at 230 volts. Now, the reality is that the bulk of the electricity grid across the country has never really moved very much from the old 240 volt system.

So, what that means is every single appliance that we've got, is being force fed at least 240 volts. In the majority of cases, 245 volts for most of the time during the day, and especially during the night, when it will work quite comfortably on 230 volts. Now, what does that mean?

Well, it means that a lot of pieces of equipment, the majority of them, not all and again, respect to the people with electrical knowledge in your listening audience, please don't troll me on this, I'll get to some evidence in a second. What it means is it's being force fed more power than it needs. If you've got a load in particular, that is what's called resistive in nature, it's a fixed resistance. If you put more voltage through it, then it's just consuming more power and dissipating that as heat.

That means every one of those loads for us as a consumer, we're using more energy than we need to. We're paying more for that energy through our electricity bills, when it's just completely unnecessary. It's just going out as waste heat. Moreover, it's shortening the life of the appliance, versus spending more time hotter than it ever needed to.

Robyn Johnson 41:02

Yeah, so kind of four issues.

You're consuming more, which means more emissions (Ty: Correct).

You're paying more, that you don't need to pay.

Your appliances are being overcharged (Ty: Yes), and through that overcharging, creating heat, which potentially creates fire.

There's a range of issues here.

Ty Christopher 42:22

Exactly, well, fortunately most of our appliances die with a whimper, not a bang. That's a good thing for all of us. So, the overheating really manifests itself as, well do you really know if your television dies after seven years? How do you know that, well it probably could have lasted 10 or 12 years if it hadn't been overstressed for its entire life, you don't know, do you? (Robyn: No) That's the challenge, this is why I call it the invisible electricity thief, because we're being force fed all of this voltage.

Now, don't take my word for it, this is now for the appropriate questioners our listening audience. Have a look at the [study](#) commissioned by the Energy Security Board (ESB). It was commissioned and performed by the University of New South Wales (UNSW). It showed that the majority of customers in the national electricity grid, the majority of the time receive 240 volts, and that is an issue and is causing more CO₂ emissions and causing higher energy bills than is necessary to deliver service to customers.

Look, also at the [Australian Power Quality and Reliability Centre](#) National Electricity Audit that's been going on now for 10 years, and has consistently revealed over voltage in the low voltage network that we're connected to, as an issue. Yes, there'll be people that will say, but not all loads are resistive, and

some loads if you reduce the voltage, the current just goes up, and they use the same power anyway, and your bill won't go down, etc, etc. For some types of load, that is correct.

What I would encourage people out there to do, again, don't take my word for it, type into any of the reliable search engines, the phrase conservation voltage reduction (CVR), conservation voltage reduction. Bung that into whatever search engine is your preference, and you will immediately be presented with dozens and dozens of case studies and peer reviewed academic papers. All of which consistently show that voltage reduction within reason, and within the appropriate Australian Standard, and all we're saying here is, get off the top of the tree and move down towards the middle to lower section of the band here. It shows that it consistently reduces energy consumption across the board.

In the UK, Electricity Northwest have recently done a smart street study where they did exactly this for over the course of a year, reduce the voltage. Depending on the amount that you reduce the voltage by, it's not a perfect one to one relationship. What we find is a 1% voltage reduction will usually give an energy reduction of between 0.7 and 1%, depending on where you are in the network.

So, if we take a line through the middle of that, what we could say in Australia is that a 5% voltage reduction would save everybody 4% on their energy bills. Now across the entire national electricity market, that's just shy of \$1.1 billion dollars, with a B, in energy costs per year. We can even set aside the debate now about whether that energy came from coal or gas or other fossil fuels, or whether it came from solar or wind or other renewable fuels. I'm talking here just about perfect efficiency, and saying, surely the best energy is the energy that you never had to generate in the first place regardless of the source that it came from. So, there's terawatt hours of energy over the course of many years that would be no longer needed, were we to move our voltages down.

Now, why isn't it happening if it's so obvious. Back to my statements around the triangle and the hole in the donut. At the moment, we go to the rule maker, the AEMC and they say the voltages are within standards. They are, they're just at the upper end of the standards and they're not in the best interest of customers where they are, but they're within standard. Then we go to AEMO, the market operator says their job isn't to keep prices down for customers. Their job is to make sure the grid operates. From a grid operation perspective, high voltages are great, everyone's getting power, box ticked, we move on. We go to the Australian Energy Regulator (AER), by the way this isn't a hypothesis, these are actual conversations that I've had. You go to the Australian Energy Regulator, and they say, oh this is a technical issue and we're the economic regulator. So, we go round and round the points of the triangle here and the one thing that's missing is anybody around that triangle who's actually looking after us. Us being the end use energy consumers, because voltage is a technical issue that has significant economic impacts and significant environmental impacts for all of us, but none of the regulators and none of the people involved in this are interested in looking at it, because it's not in the rules that they are obliged to follow.

Now, there is some good news though. The good news is that the more enlightened of the electricity network companies here in New South Wales and in Victoria, are taking action on voltage and voltage control at the moment. But the problem is, they've kind of got to do it by stealth. They've got to do it for other reasons, they can reduce the voltage, where it's going to lower network costs because it'll reduce the demand, which means they don't have to augment or rebuild network in a particular area. What they can't do, is reduce voltage across the board. Because if they do that, there'll be locations that you've got to go in and spend some money because the voltage will drop a bit too low at the absolute remote end of some streets or whatever, and as soon as they go and spend that money, the conversation they'll be faced with having in particular with the AER, the energy regulator is why are you spending the money. They'll say because the voltage is too low, and they say, why is the voltage too low, its because we wound it down. The AER will say and have said well wind the voltage backup, and don't spend the money. So, this is the challenge that we've got, this hole in the doughnut if you like, none of its done out of malice, but it's just the gap in things.

So, the good news is, in New South Wales, the two biggest network companies are adjusting their voltage down as far as they can get away with without having to spend money. That's good, that's good for us as consumers.

In Victoria, they're taking an even more aggressive stance, and most of the Victorian distributors have systems to really be pushing down their voltage. They're not implemented across the board, and they're trying to get the approvals to do that. From a regulation perspective, the Victorian Department of Environment, Land, Water and Planning ([DELWP](#)), a more clumsy acronym has not been created, they're doing great work.

They actually have a consultation paper on voltage management out at the moment. So, as an engagement point again for our listeners, go on the DELWP website, have a look at that consultation paper on voltage management. Feel free to put a submission in on it and say I am concerned about my voltage. Admittedly, not all of our listeners will be in Victoria, but how can it hurt to highlight the fact that this is a national issue.

So, the opportunities here are as voltage gets higher and higher, the other factor that we didn't speak about that I think is again a hidden part of the concern, is as voltages get higher and higher, the ability of our solar to export from our homes gets less and less. Not many people realise the thing that connects your solar panels to the grid is called your inverter. It converts the direct current from the solar panels into alternating current to connect to the grid, if we get into the technical side of things. What it needs to do, physically, is bump the voltage up to apply pressure, that pressure that I spoke about right at the start here, to push your clean solar energy out into the grid, it's got to apply a little bit of pressure, so it's got to climb over the voltage in the street. Now think about what happens if you've already got a street, the voltage is high, and then a solar inverter comes along, it's going to bump it a little bit to put the solar out. Then next door has solar as well, and so they've got to climb over the high voltage plus a little bit, plus a little bit, and then the next home the same, and so on and so on and so on. Soon you find yourself where the voltage in the street has gone so high that the inverters, because they're set to have a maximum that they can go to, can no longer export clean energy. So now we've got solar going to waste, it's sitting there, it could be used but it can't, all because the voltage in the street is too high and hasn't been wound down to the 230 volts that Australian Standard says it should be most of the time. Not the 240 volts that the Australian Standard says, well it can be but ideally not all the time.

So, this is where we really need a push across our network companies, and some help from our regulators. In terms of doing something about this, and yes, I have engaged with each of the regulators, and of all of them, the one who's shown the most engagement with this as an issue ironically, is AEMO, the market operator. Why I say ironically, is because they're the ones who are least positioned to do anything about it unfortunately. The Australian Energy Market Commission could do something about it by changing the rules. But to give you an idea of the rule change process, the standard rule change process takes five years. (Robyn: Yeah, we don't have five years.). The accelerated rule change process where they're just put some things through takes two and a half years. So, there's glaciers that move faster than regulatory change in this space. Sloth on Valium is the phrase that I'd use for the speed that they work at.

So, the Australian Energy Regulator, already have a regulation out there that's meant to encourage efficiency and improved customer service levels. It's got an exciting title, called 'Service Target Performance Incentive Scheme', another exciting acronym, because you know there aren't enough in the industry, STPIS is the best way to describe it. It actually has within it a section that talks about power quality. That's what voltage is, it's about the quality of the power that you're receiving. That power quality page is blank, it says this page is blank, and we'll fill it in later.

What if we put voltage as a measure of power quality into the existing STPIS scheme?

What that would do is, it would provide a financial incentive for the network companies. It will give them a way to get the money to actually improve voltage out there on the grid. Once they've done that once, the benefits every year afterwards would flow to all of us as consumers. This isn't one where I'm saying grab your pitchforks and burning torches and you know, let's go and lobby for something here.

There is literally a very simple rule change that could be enacted to massively change the dynamic around voltage and voltage management out there in the grid. Rest assured the AER have been provided with this as input or provided in writing more than once. We're still waiting to see a response from the AER and from their action on this.

That is certainly something that I think we could, as a nation, take swift action on. I think we should also positively reinforce and really encourage the good work that a number of the energy grid companies are out there doing now, frankly, more out of altruism than anything else, reward them for that. Also, really make voltage and voltage supply a known issue for us as a community, so that we can all have lower bills, use less energy, not have our appliances die earlier than they have to, and be able to export the maximum amount of solar that we're generating out there into the grid.

Robyn Johnson 54:23

Yeah, because this is a big barrier to decarbonisation and a tonne of energy that we're wasting.

Ty Christopher 54:30

It's literally a gigawatt of demand that you could take out of the grid in a year. That's one whole unit in a coal fired power station, not an entire power station. It's one generator (Robyn: It's significant). We are using a gigawatt of demand more electricity every year than we need to, due to every home having more voltage than it needs.

Robyn Johnson 54:55

Very interesting conversation. So, let's do a bit of a wrap up. What are the actions that we as individuals and businesses here can take?

Ty Christopher 55:08

The best actions are engaging with like-minded local community groups, let's engage with [Renew](#), engage with other active community groups.

Lobby your local member, feel free to use as many of the homilies and phrases that have come out of this podcast. In particular, why do we have an energy and electricity grid that is governed solely by 1000 pages of rules that are more than a quarter of a century old and have not been updated at all to reflect the realities of wind, solar and batteries? There's the question, why aren't we doing anything about it? With the sub question, why does it take five years to undertake any minor rule change? I think maybe the bureaucracies a little bit big and cumbersome.

Point one, ask those questions, engage with local community groups, community advocacy groups and your local member. When there are these engagement points, get out there and have a look at conservation voltage reduction. Google that or whatever search engine that that you like and find out what's going on. Engage with the people who are on to this issue.

Ask your local network company what they are doing about this. Most of these network companies actually have community engagement forums, they hold workshops, etc. That's the point to raise it with them, to let them know that you've got their back as a consumer. That will embolden them to push the boundaries on this as well. You know, there's a real potential here for us all, in cahoots with our local network companies, to hunt as a pack and win as a team. So, that would be the bottom line.

If you ever get the opportunity, ask the Australian Energy Regulator, why don't they have a voltage measure in [STPIS](#)? Why not, because it'd be very easy to do. You could implement it within a couple of months.

Robyn Johnson 57:20

Yeah, and I'd add to that, having a look at the [Grid vs Garage](#) report that AECOM prepared for ARENA. Having a look at Ecojoule Energy's website, because there's a great [presentation](#) that you did on there in one of their insight articles. Which will help you to get the language around what we've talked about today.

Ty Christopher 57:40

Absolutely, and as well, I would also steer you towards a paper that was put out by the Total Environment Centre, called [Designing DERtopia](#). Okay, it's the geekiest title ever, and I know the fellow who authored it. It's quite deliberate, but seriously have a read of Designing DERtopia, it covers a lot of the issues that we've spoken about here today in the podcast. It's a really encompassing and helpful read, to bring your thinking along, and to give you some good engagement points on these issues as well.

Robyn Johnson 58:18

Okay, before we wrap up, I feel really privileged that we have people like yourself and the others you've mentioned here in Wollongong, and I ask this of all my guests, what is your favourite way to immerse yourself in nature?

Ty Christopher 28:32

My favourite way to immerse myself in nature, bear with me, might not sound like it to start with, but we'll get there. Riding my motorcycle is my favoured way to immerse myself in nature. Why I say that is we drive around in our cars, and most of them have climate control, air conditioning, and they have an air filter for the cabin and that sort of thing. It's all about really distancing ourselves from the environment that we're travelling through in cars.

I'm a lifelong motorcyclist and one of the things that I'm still always surprised about, when you talk to other motorcyclists, and you see and read lots of things, as you do if you're into a particular sport. It's not talked about how much it is about the smells, and the oral sensation and the sounds. In particular, the smells and the sensory aspects of riding a motorcycle.

The saying is, 'only motorcyclists really understand why dogs stick their head out of the car window as you're driving along'. It's about force feeding yourself, all of these aromas and everything that's going on out there in the world. So, for me, the immersion in nature is when I'm on a ride, we have such a beautiful environment we live in here in the Illawarra. So for me, a ride up through the National Park, it'd be the best example where you go through the real dense under the tree canopy, rain forest areas of the National Park, and you ride through that. There's this rich, damp earthy, mossy smell to in the air. So for me, you get these aromas hitting you and they're force fed to you when you're traveling on a motorcycle.

You're also struck, or I'm also struck by the texture of the air. It's thick, and it's rich, and it's got that density to it. Then you pop out of that and go into more traditional scrubby Australian bush as you're riding through the National Park and the air has a dryness to it. It's lost all that rich density and you can smell the grass seeds and the pollens and there's that grey dryness that characterises a lot of the Australian bush for much of the year.

Then again, you'll clip in towards the coast, now you get the rich salty smells, and you know, the sea and you smell the rotting seaweed. All those things that growing up on the coast as I have, bring so many childhood memories from days at the beach. They all assault you and are forced down your nasal cavity.

Again, the texture of the air, it's a different texture again, the saltiness seems to give a different density to the air. It's not that it's humid, but it's not like in the rainforest humid. So, for me each of these things is just an experience in immersion in nature as I cruise along and experience all these smells.

Robyn Johnson 1:01:29

Yeah. I mean, it's such a valid point, because you have different ways to connect with nature, visual or the sensory. But that olfactory response really is part of the very many things that make us human and connected to that place. I guess the good news here is that you can keep riding your motorcycle into the future because there's a lot of electric motorcycles available.

Ty Christopher 1:01:58

There is. Yes, at the moment, I'm still burning dead dinosaurs to undertake this passion. But the fascinating thing is, we see at the moment, whether it's one end of the spectrum, Harley Davidson putting out the Live Wire, an all-electric motorcycle, it's fantastic to see wish I could afford one but terrific. Even better than that, and this aligns thematically with a lot of what we're talking about in the podcast here is, how much the energy future if embraced by us as a country can be economically prosperous for us, as well as environmentally a huge success. Up in Sydney up in Redfern, there's [Fonz Moto Company](#), who are manufacturing electric motorcycles. Down in Victoria, there's another company [SAVIC](#), if I'm pronouncing it correctly, SAVIC motorcycles designed and built here in Australia, their first motorcycles are being delivered to customers come the end of this year. So, I'm very excited as well that eventually when I have to give up burning dead dinosaurs in my motorcycle, there's certainly a future there. Better than that, looks like there's even a future there where I'll be able to buy Australian made electric motorcycles. How good is that!

Robyn Johnson 1:03:18

Oh, it's amazing. Yep. It's super exciting for our nation to have onshore manufacturing, (Ty: Absolutely) that we can export to the world and lead the way. Well, thank you so much for our chat today. I've found this all super interesting and I'm really happy to be able to be a conduit to share this information more broadly. Thanks for your time.

Ty Christopher 1:03:39

Thanks Robyn. Again, thank you for giving me the opportunity to talk to your listeners, even though it's a fairly one-way thing here in a podcast. Thanks for the opportunity, and if anybody is interested in all these matters, then as I said, let's follow the links. I'm sure if as a community we hunt as a pack, we can win as a team.

Robyn Johnson 1:04:01

Yeah, we're stronger together. (Ty: Absolutely) Thanks again.



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