Energy and Climate Forum

A conversation about climate risk, net zero, and the real cost of energy choices for the Sunshine Coast, Fairfax and Australia.

Saturday 5 April 5:00pm–6:30pm Small Change, Nambour Energy and Climate Forum edited version.MP3

Transcript

Francine Wiig: Good evening, everybody. Thank you so much for coming tonight. I am so excited to see so many faces here. This is such a positive and such an exciting event and I'm really grateful that you're all here to take advantage of the immense amount of knowledge that we have here with us. I'll give a formal introduction and then we'll get on with our questions

So this is our energy and climate forum, and tonight is a discussion. It's a public discussion about climate science, energy policy and environmental advocacy.

Together we will explore how Australia can meet Net zero by 2050, what's needed for a resilient and economically responsible energy system, and how the Coalition's nuclear plan stacks up against renewable energies.

So this forum tonight is about cutting through mis-information. It's about sharing credible evidence, and it's about holding political leaders accountable for real climate action. It's exciting!

So this evening is a question and answer forum. Questions have been submitted by members of the audience prior to this evening by email, so I will run through those with our panellists and then if we have time at the end, I'll also take questions from the floor.

I'll get on with introducing our amazing guests who we are very fortunate to have with us this evening.

To my right here is Professor Ian Lowe AO, Emeritus Professor Griffith University. Renowned physicist and science communicator. Former ACF president and respected advisor on energy and the environment. Thanks for coming, Ian. We're also very fortunate to have with us, Tim Buckley. Tim is Director of Climate Change Energy Finance, former managing director at Citigroup and one of Australia's most trusted financial analysts on the energy transition.

We also have Professor Steve Turton, Adjunct Processor Central Queensland University, Environmental Geographer with decades of climate and ecological research.

And the also-amazing Narelle McCarthy is with us. Narelle has been an environmental campaigner for 20 years undertaking advocacy, strategic policy and planning, community cross-sector engagement and representation across the Sunshine Coast.

So without further ado, I will get into the questions. If we do have time to take questions from the floor at the end, I just ask that we keep the questions as succinct as possible so that we can all get as much as possible out of the evening, and that you do use the microphone so that everybody can hear your questions. But we'll go over that again when we get there. I will take a seat and we'll get started.

So our first question is: First to buzz in gets to answer! These are climate-related questions, the first three.

Why is it critical for Australia and the world to achieve net zero carbon emissions by 2050, if not sooner?

Who would like to start?

Professor Steve Turton: OK, OK. Can you hear me OK? All right. Yes, we really have no choice but to rapidly transition towards net zero 2050. Some science will tell you we need to look at maybe going sooner than that. But look, it's better than nothing. If we want to keep global warming 2° C above pre industrial levels. So pre-industrial is 1850 to 1900, and that, of course, is the upper range of the Paris targets. We've already exceeded 1.55 above pre industrial last year. Last year was the world's warmest year on record. It was also the warmest year on record for the world's oceans, so we're now seeing global warming, or global heating accelerating. So yes, we have to do that, otherwise we will be moving into what the Climate Science Community calls dangerous climate change.

So even 2° C is not good. It's probably bad news for the world's coral reefs, nonetheless, anything like 3 or 4° by the end of the century will be catastrophic for the planet. I can't say that more firmly than that.

Francine Wiig: lan?

Professor lan Lowe: I have one point. Can I add one point?

But even if we achieve net zero by 2050, that will not stop increasing climate change, because there is more carbon dioxide in the air than the system can take out. So even if we achieve net zero today, climate change would continue for the rest of this century because the carbon dioxide we're putting in the air today will, on average, still be there at the end of the century. So really, net zero by 2050 is a very modest target. If we really cared about what world we're leaving to our children and our grandchildren, we would be demanding net zero by 2030, not by 2050.

Tim Buckley: Good evening. I'll bring a finance perspective to the question. And the question was why does *Australia* need to target net zero by 2050 or sooner? And the answer is because we as a country are the third largest exporter of fossil fuels in the world. And so as our key trade partners deliver on their Paris Agreement commitments to reduce emissions to net zero, our exports of our number 2 export - LNG, our number 3 export coking coal, our number 4 export thermal coal - they are terminally challenged. So, for Australia, just looking at it from a finance and economic perspective, our economy is going to be gutted by dramatically reduced exports and all of the industries that have been the background of our economy for decades - we need to develop alternative exports so that we can actually have a more sustainable economic profile. It's not so much what *we* do, it's what our trade partners do that threatens our economy. So we have to do our fair share of everything, but to presume that our trade partners aren't going to do what is needed is very naive and very dangerous for our economy.

Narelle McCarthy: It's also a memory of what's already locked in, as Ian pointed to. We're already experiencing increasing intense weather events and climate events, and they're happening more frequently as well. So much has already been reduced in terms of the adaptation capabilities and resilience in ecosystems and also within communities as well so there's little to no time to actually build that adaptation. We're seeing climate refugia becoming even increasingly difficult to find for species as well. With warmer ocean temperatures, sand temperatures, that's changing the sex of marine turtles, for example. So there's a whole lot of cascading effects that actually go across all ecosystems and species and natural systems as well. So there's very compelling reasons why we need to reach net zero sooner rather than later.

Francine Wiig: Thank-you Narelle. **That did touch on the next question which asked** what the adverse effects would be of climate change on Australia, but we might stay with you for some local perspective on what those adverse effects might be for the Sunshine Coast region specifically?

Narelle McCarthy: Well, certainly inundation. We're seeing that through more recent events. These are cumulative as well. So there's like a whip-lash effect where there's no opportunity to recover from previous events. So we're seeing estuarine systems coming closer into our floodplains as well, and obviously that's where some very ill-thought development has occurred over time. So we're really going to be faced with the consequences of poor planning decisions where we've actually reclaimed and filled and modified great swathes of different regional floodplains, such as the Maroochy River Floodplain for example. So we're already seeing those changes and how they are actually going to affect communities, but also our species as well. So we really need to maintain the flood resilience that we have, through the retention of our flood conveyance and our floodplains and also looking at major waste solutions to basically try to have some natural defences against these frequent weather events that we are going to be experiencing.

Francine Wiig: Is there anything else that you might like to add with respect to Australia?

Professor Steve Turton: Narelle really has covered the ecosystems, the biota etc, but also I think we have to remember there'll be a whole lot of health impacts, not only on wildlife but also on humans. The Sunshine Coast is a retirement destination. It has an older population, there is increasing risk of heat waves for example, and stress associated with extreme flooding events like we have seen this year. Look at what happened in Hervey Bay, for example. It's just up the road, but that impacted very severely that community up there, with Cyclone Alfred. The human health impacts will be significant.

Greater risk for heat waves, more hot days, but also risks associated with possibly diseases as well. So again, there's a lot to talk about, but that would be the key things that I think are important as well.

Professor Ian Lowe: I was going to make a similar point, which is that vector borne diseases are inevitably spreading with climate changes; and a tip for planners, floodplains flood. The name's a bit of a giveaway. We really shouldn't be building on floodplains

Tim Buckley: I'll maybe add again a finance angle to that. Insurers are absolutely clear about the risk of climate change. They've been talking about it for decades. But they don't have a duty of care to offer insurance to properties that are uninsurable. They literally renew - you renew your insurance every year - they will walk away from whole suburbs, whole areas, because we should never have built there in the first place. They've warned our government, the government's ignored it. The state, the local and the federal government has ignored it. The insurers don't wear that risk, they wear it for one year.

The banks actually, where it is your mortgage provider, but you ultimately all wear it. And so there are just going to be huge chunks of our property market - and we have a residential property market valued at the moment at \$11 trillion - and there's going to be huge percentage of that, which is uninsurable. You just have to look at your insurance premiums in the last three years. They've all gone up double digits every year. That's going to continue until your insurer then turns around and says, "by the way, we will no longer insure your property." So, we all wear the cost. **Professor Ian Lowe:** I understand something of that. The insurance industry has been aware of this for decades. At the Kyoto Climate Change Conference in 1997, world commerce was there, saying "nothing to see here." The one sector that was there saying this is an issue was the insurance industry. They were saying in 1997 "We can read the readings on our balance sheet" and they were saying that by 2020 the actuarily responsible insurance premium will be unaffordable for hundreds of thousands of people, who will be losing their homes uninsured, and governments will have to bail them out.

Francine Wiig: This next question is a big one. It's two parts, and the first part of it is:

Does the panel consider that net zero by 2050 could be or will be achieved by any of the policies of the major parties? So, it brings in the Coalition or Labour. And what are the specific risks of those policies to climate specifically?

Tim Buckley: The two major parties. Well, one of them actually is even debating walking away from the climate science and walking away from the Paris Agreement. So they're not even interested in policies that even pretend to align with the climate science. And as our professors to my left have already highlighted, the climate science says Australia's got to go faster than 2050. Because the developed world needs to move by 2040, so the developing world has the extra 10 years to deliver. So the LNP have absolutely no credibility, in my view, when it comes to aligning with the climate science. Individual MP's do, but then you look at their voting record and they all vote consistent with Barnaby Joyce and so Barnaby doesn't accept the climate science, he never votes in alignment with it and every backbencher, so it doesn't matter whatever you're doing sorry, I'm from Sydney. Some of the Sydney MP's say they do accept the science. But then they're going to have to vote against what they actually believe because they have to vote in alignment with their party. The ALP has been making very strong progress, but it's not yet aligned with the climate science, so being too timid and too lacking in courage to do what privately they know has to be done. And when I talk to them privately, and I have talked to a lot of the ministers, they'll go well, if we get back in, we'll go a lot harder in our second term. But ultimately both major parties still take donations from fossil fuel companies and so ultimately, they've gotta sing for their supper.

Francine Wiig: On that current projectory that we're working on at the moment, is zero by 2050 possibility with what's being done right now?

Tim Buckley: I'm actually rather bullish. I spend half my time studying what China is doing and it's amazing the technology that China is investing in every month, they're doing major breakthroughs. The scale of what China is doing. So if we actually put our foot to the floor and try to actually deliver on it, we could easily do it. I do think the ALP have made good progress under Minister Bowen. The Murdoch media will tell you every single day 82% renewables by 2030 is impossible. It's rubbish. We've actually averaged

44% renewables for the last three months across the whole of the national electricity market. So we're more than halfway there and we've still got five years and nine months to do it. We could easily do it, because China, they would do it in months what we want do by the end of this decade. But we're a democracy. We've got to deliver it as a democracy. It can easily be done, but it will require concerted policy effort, and it, most importantly, requires continuity of policy. The idea of flip flopping. Finance can't respond when you flip flop and they can't respond without a price on carbon.

Professor Steve Turton: You know, if I could answer that? Australia - we are a very carbon intensive economy, particularly for our energy and for our transport, but also in many ways that's low hanging fruit as well because we can rapidly replace our old antiquated coal fired power stations with renewable energy and storage and also we can electrify our transport network. Increasingly, so in many respects, they're the two big polluters in terms of putting carbon dioxide and other trace gases into the atmosphere. So, in a way, I mean agriculture is another story, and both sides of government don't want to go there. But agriculture needs to be part of the solution as well. But still, I agree, I think we can do it, the numbers are there, definitely.

Professor Ian Lowe: The period when we made the most rapid progress was the Gillard minority government, where there was a Labour government that had to depend on greens and independents. To get legislation, to have a carbon price. We moved rapidly to decarbonise. So, it is possible that we could get there by 2030, but your vote counts. Vote for a candidate who will pressure whoever's in power to move rapidly. South Australia today, with about 95% of its electricity from solar energy, that is possible. All it requires is political will. So hold your blow torch to the belly of people who want your vote and make sure they know that if they don't change rapidly, you'll vote them out and elect people who will.

Narelle McCarthy: Well, unfortunately there was a massive vacuum of policy, so we lost some momentum that did start to have some traction, you know, back in 2009/2010 and ?not getting? the carbon price. So I think it's quite evident that we're not where we need to be at this point in time, particularly the impacts and what we know should have been done. So the policies need to be coherent and consistent and impactful to get us where we need to go.

Francine Wiig: Thank you. There's a lot in that climate focus section of scary and worrying news, so finishing on that note that we *can* do it and that "where there is a will, there is a way", is really helpful as well, to our future. So, thank you.

Our next questions revolve around energy, so I'll move on to those.

What are the best sources of thermal power and what is the best energy mix for Australia? And does the coalition's nuclear power need to be part of that?

So, that's a three part question. Sources of thermal power, best energy mix for Australia, and should nuclear be part of it?

Professor Ian Lowe: It well, the short answer to the last question is no. I can give you a longer answer. There are a whole heap of problems with the proposal to build 7 nuclear power stations by 2037. Firstly, it's illegal. The Howard government legislated in 1998 - from memory Section 148 of the Environmental Protection and Biodiversity Conservation Act - prohibits the building and operating of nuclear power stations anywhere in Australia. And Queensland, NSW and Victoria also had state legislation prohibiting nuclear power.

Secondly, it's impractical. The idea that you could build 7 nuclear power stations in 10 years - if Mr O'Brien seriously believes that, I want to know what he's smoking and where I can get some. The Switkowski report to the Howard government said it would take at least 10 years, probably 15, to build 1 nuclear power station and all of the nuclear power stations built in the Western world this century have all taken about 15 years or longer. Thirdly, its uneconomic. Average world prices for different forms of energy last year, solar 3.7 cents a kWh, wind 4.1, nuclear 16. So it's not just a bit more expensive, it's a whole heap more expensive. The CSIRO Gencost report says it's uneconomic and they take at face value the industries claims of what it would cost to build nuclear power stations. But every one built in Western Europe or North America this century, has been over budget by at least a factor of 2, and in some cases by a factor of 4. It's not economic, it's not legal, it's not practical. And even if it were done, the total output would be about 5 gigawatts. Twenty-five gigawatts of coal is going to be retired by 2035. It wouldn't even achieve replacing all of the small fraction of the coal that's going to be retired. So it remains true what somebody said in the 1970s, if nuclear is the answer it was a bloody silly question.

What should we do? We should move rapidly to low emissions renewables.

There was a study done by three scientists at ANU, Ken Baldwin, Matthew Stocks and Andrew Blakers looking at what we would need for storage throughout the entire eastern grid, on solar and wind. They identified something like 15,000 possible sites for pump, pipe and storage, around the eastern states grid; of which you would need to use about the best 50 to have enough storage to run Australia totally on solar and wind. And just to prove you don't have to be an idiot to be a member of the Liberal Party - although it clearly helps - when Matt Kean was the energy minister in the NSW Liberal government, he commissioned 8 pump hydro storage commercial developments to get to their target of 90% renewables by 2030. It can be done, all it requires is the political will to invest in solar, in wind and in storage. And nuclear just does not make any sense for Australia.

Professor Steve Turton: If I could just add to Ian's comments, more in the climate space now, rather specifically in the energy modelling: If we were to go down the

nuclear path and in this case, that's not going to happen anyway, it will actually make it more difficult to reach Net zero because it will keep our coal-fired power stations operating longer than they need to. As it is, they're quite antiquated. It will also mean the use of more gas. Now the latest thing from the coalition is they're now re-visiting the gas-led recovery. Remember that? In climate science, we call that a mal-mitigation pathway because what you'll end up doing is basically shooting our carbon targets completely out of the water, which means, if that's what they're planning on doing, they want to keep coal going longer than usual for these fantasy nuclear power stations. Plus, they want to start basically extracting more gas, for our electricity. It will blow our budget, and also it probably means they intend to pull out of the Paris Agreement. They more-or-less would have to, to save face because they will blow the target out.

Narelle McCarthy: The nexus renewable sources, it's already in play. So its about scaling those up in the right places and done in the right way. So building renewables, that is a win for nature and climate. So we actually are having a regenerative impact where new renewable projects are sited. Borumba Pump Hydro is the one that's on the books at the moment, 2000 megawatt storage. Massive project, it's on the sale of Snowy 2.0, so there's a there's a lot for that project to go through, but that doesn't negate the need for the mix of renewables and wind and solar. The combination of increasing even more gas is going to be catastrophic, not only for the climate, but also for nature as well when we're talking about the scale of the Northwest shelf and Burrup Hub over WA, the Pilbara, the impacts on ecologically significant pristine Scott Reef for example, we've got the oldest rock art in the world of the Murujuga first nations people that would just be completely wiped out. Already it's being affected by the acid rain that's actually coming from the existing activities over there. We've got agricultural land, that's being impacted in Western QLD, and habitat being cleared for more and more gas wells, impacting on aquifers and groundwater, and sustainable agricultural production. So all of these other fossil-fuel based sources have this multiplier effect in terms of catastrophe. So having renewables done well in the right places, and having that smoothing of the grid, we've got an opportunity here on the Sunshine Coast with the local renewable energy zone at Caloundra, so that demonstrates that there's opportunities to get solar onto rooves, even for people who don't actually own that roof. So it actually distributes out through the community and smooths the energy system as well. So there's so many other alternatives that are proving that technologies are there. The investment is there as well. So the distraction of more and more gas, and prolonging the life of coal mines is just dangerous and really unnecessary.

Professor Ian Lowe: Can I just add one more point about this irresponsible notion we should use more gas. Gas is methane, and inevitably it's use results in what are called fugitive ignitions, from gas wells, from pipes. Methane leaks into the atmosphere and it's a much worse greenhouse gas than carbon dioxide, by an order of magnitude, so using more gas inevitably means accelerating climate change.

Tim Buckley: I might just add to Steve's comment about nuclear: If you look at the Danny Price Frontier Economics modelling. So it's a very detailed report that the founder of Frontier Economics put out, eventually, to justify the LNP policy. Read the report. It's there in the public domain, and it actually acknowledges Steve's point entirely. It says between 2030 and 2040, the emissions profile of the Australian energy grid electricity grid will be 400% higher than the current integrated system plan of AEMO (Australian Energy Market Operator).

So, the devil's in the detail. They say we might get to net zero by 2050, but independent accounts, in next decade, emissions in Australia will go up 400% versus the current trajectory. It's an absolute crime. That's in the report. And yet, of course, people aren't seeing that. The other point I'd make is that I think the biggest disruption in the world's energy market in 2025 is actually battery energy storage. So pumped hydro storage was definitely the clear solution for firming renewables, for seasonal storage and for long duration storage, but battery technology has moved phenomenally faster than anyone has predicted, and so Ian talked about the high penetration of renewables in South Australia. It's world leading - variable renewable energy penetration is the highest in the world. Last year it averaged 74%. This morning at 7 o'clock, 30% of the electricity in South Australia came from batteries. It's the highest penetration in the world. The previous highest number was in California and it was 20.4%, and that's before a lot of the batteries have all been commissioned. Australia is building more batteries than you can poke a stick at, as is America, as is Europe, as is the UK, as is China. So batteries can be built, utility scale, in one year. A nuclear power plant - 10 to 20 years, and so the solutions are there, and the cost of batteries has dropped by 50% in the last 18 months.

Francine Wiig: I think that's particularly relevant for Fairfax, for our electorate, we have one of the highest uptakes of rooftop solar in Australia here. So we have half the picture, we're halfway there, and batteries are going to be a really critical way for us here in our electorate to move towards energy independence.

Professor Steve Turton: Just one comment about batteries, the materials can form part of what's called the circular economy, so they can be recycled, alright? You can't really recycle nuclear waste, or I suppose you can, you can make it into something nastier.

Also, Australia has potential to be a world leader in critical minerals. We have a lot of these critical minerals in our environment. Naturally, they have to be extracted in an environmentally appropriate way, but if anybody has seen an open cast coal project. You can see how ugly that is in the landscape, so I think the critical mineral sector, critical metals will be an important economic driver as well in in the sense of the demand for these products will go up, but they are recyclable despite the rhetoric out there.

Professor Ian Lowe: To underline Tim's point about the carbon footprint, if we were stupid enough to build nuclear power stations, to build one nuclear power station of the

type that the coalition want to build 5 of, would require 12,000 tonnes of steel, 230,000 tonnes of concrete, 180 tonnes of enriched uranium, 50 or 60,000 tonnes of carbon dioxide. So a bare faced lie to say nuclear power is zero emissions, as Mr O'Brien and Mr Dutton invariably do. Zero emissions is bullshit.

Francine Wiig: Thanks everybody. That's an amazing segue into our next question, which is relating to the assessment, so I've specifically directed this one to Tim and Ian: How do you assess the financial, environmental and political viability, which you did touch on, but of nuclear energy compared to renewable technologies like solar and wind? And I think this the real meat of the question, is it really 44% cheaper than Labor's plan, as planned?

Tim Buckley: No, there is no chance. But I'll come to it from a different perspective. There is not a single nuclear power plant under construction in America. So, Ted O'Brien has said that the world is embracing nuclear. But the American market is the second largest electricity market in the world, and there is not a single nuclear power plant under construction in America. China is absolutely embracing nuclear. Without a doubt, and I spend half my time studying China, I've been doing that for 15 years. So let me just remind you, China is the biggest builder of nuclear in the world. They built last year 3.9 gigawatts of nuclear. They will probably build 5 to 10 gigawatts a year for the next decade or so. But 3.9 gigawatts last year, they built 370 gigawatts of wind and solar. So when Ted O'Brien says there's a nuclear renaissance, reminds him that 1% of China's capacity adds last year was nuclear. It's a rounding error in the biggest electricity market in the world. In the one country that really is embracing nuclear, renewables are literally being deployed at 100 times faster. Now, I'll just finish by saying, that is capacity. So 370 gigawatts of capacity of renewables, 3.9 gigawatts. Now 3.9 gigawatts is 390% of what they did in the last five years. They did 1 gigawatt a year of nuclear.

Now a nuclear power plant runs 80% of the time, a solar plant in China runs 15% of the time, a wind plant runs 25% of the time. So you can't compare exactly apples for apples, but at the end of the day, it's still 20 to 30 to one, what China is doing in nuclear versus renewables. Nuclear is a rounding error, and by the way, the Chinese can do it at a third of the time we would take to do it, if we could find the workers. China has 15,000 workers per nuclear power plant. And Ted O'Brien's plan is to build 7 nuclear power plants at a go. So we're going to have to find almost 100,000 skilled nuclear workers. And by the way, they're going to have to start immediately to deliver on Danny Price's nuclear strategy or Ted O'Brien's strategy. It's just a nuclear fantasy.

Professor Ian Lowe: The last 20 years, China has built 49 nuclear power stations. Total build for the rest of the world in the last 20 years, -51. In other words, Chinas "huge build of nuclear" doesn't quite replace the closing down of nuclear in the rest of the world. Last year, the world installed 660 gigawatts of renewables. Solar, wind, hydro and biomass, 4.3 gigawatts of nuclear. So it's just a bare-faced lie to say that the world is

embracing nuclear. Ted O'Brien and Peter Dutton say we are the only one of the 20 largest economies that doesn't use nuclear power. Another bare faced lie. Six of the G20 countries, Germany, Italy, Saudi Arabia, Indonesia, Turkey and Australia do not have nuclear power stations. The only one moving towards it - which is Ted O'Brien's weasel phrase - is Turkey, which is building a nuclear power station, for reasons which make its neighbours very suspicious. So, the world is not embracing nuclear. It was 17% of world electricity 40 years ago. It is 9.1% today and the percentage is shrinking every year, as the world is voting in its chequebook for solar and wind.

Francine Wiig: The next question moves off nuclear and **on to the national vehicle emission standards, which were introduced last year. Are these sufficiently robust to impact our net zero targets and if not, what else could or should be done?**

Professor Ian Lowe: Well, for a start, we at least have standards. For a long time, we were the only country in the civilised world that didn't have them, 40 years after most European countries introduced them. Mr Dutton has said that he will repeal the vehicle emission standards, if we were so unfortunate or stupid to elect the coalition government. So the inadequate vehicle efficiency standards, which are way off world's best practice, are at least better than nothing, but they should be toughened up. We shouldn't be accelerating the move away from petroleum fuels because electricity is the easy bit. But that's only about a third of our emissions, as Tim pointed out. Another third is transport, the other third is gas and agriculture and manufacturing. If we're serious about getting to net zero, we need to be setting targets now, beyond which we will not allow petroleum fuel vehicles. And most countries in Western Europe have done that, recognising that the average life of vehicles is about 15 years. I think the Netherlands have set this year as the last year in which you can buy a new petroleum fuel vehicle and I think 2028, last year when you buy a hybrid vehicle.

Responsible European countries are setting target dates for phasing out petroleum fuel vehicles, phasing in first hybrid and then totally electric. And if we're going to get to net zero, we need to be accelerating down that path, not watering down the inadequate standard.

Francine Wiig: Thanks lan, Steve?

Professor Steve Turton: I can add to lan's comment that there is another issue with petroleum vehicles, and that includes diesel obviously, and petrol. It's actually air pollution in our cities, the photochemical smog. And that's an issue in our bigger cities, more of a summer problem, but definitely is a....Look at Los Angeles. It's famous for that. And that's one of the reasons that's, there's the health reasons for it. And I think you know, it's also important. And also another concern is that the first outcome could be, if our emission standards are lower, that they get the dumping of vehicles from other countries in Australia, these big gas guzzling American V8 things being dumped here

because they have much stricter emission controls standards in the United States. That might be good for some people who want to buy a big V8 ute, but it doesn't particularly attract me, I must say.

Tim Buckley: Another thought, from a finance perspective or an economic perspective. Australia imports about 50-60 billion dollars a year of oil. Petrol. If we move, when there's no if - when we move through electrification of our vehicle fleet, it's inevitable. I'll come to that in a minute. We would save as a nation \$60 billion a year that we're currently relying on from the Middle East. Why would we use high emissions, expensive, imported fuel when we could actually charge from our rooftop solar, our entire electricity system? I would also add that much as Ian talked about what Europe's doing, I spend most of my time studying what China is doing, because if you want to know where we are going to be in five or ten years time, have a look at what China is doing right now. And in the first two months of this year, 54% of all vehicle sales in China were new energy vehicles, either hybrids or EVs. 54%. In the first few months of this year, China's new energy vehicle sales were up 35% year on year. It is just staggering and BYD - you've probably heard of them? You're going to see a lot more of them. Their sales in the first quarter of this year were up 90% in Australia. Globally they were up 60%. The biggest EV company in the world, and their sales are growing at 60% year on year. So Ford, Toyota, they're all going to be left in their fossil fuel past.

China has made a strategic bet that they want to dominate all the industries of the future. EVs are one of them. The quality of those vehicles is unbelievable. The quality of the batteries is unbelievable, and those are really just batteries on wheels. I mentioned batteries are the biggest disruption in 2025 in the energy markets, but they are going to be a core part of how we decarbonise our entire economy, because we're all going be driving around in batteries on wheels. But for 95% of the time, they'll be parked and when they're parked you will be paid thousands of dollars a year for your retailer to access your car. So rather than paying \$5000 a year on average to fuel your car, you'll be paid thousands of dollars for your retailer to use your battery. And by the way, before you worry about the battery running out, the new BYD CATL batteries have warranties of 15-20 years.

Francine Wiig: We've got a lot to get through and I keen to be able to get to the floor this evening, so I might just move on. So this is a summary question of many – about a dozen questions that were submitted from people - the common thread about the need to be open and honest about any negative impacts across the life cycle of renewable energy systems, including with respect to land clearing, agricultural enterprise, minerals extraction for solar panels and end-of-life waste or recycling. Can the panel please talk to these - and I can repeat any of them because it was a list – are these genuine concerns deserving of consideration?

Narelle McCarthy: We certainly need to look at where the drivers of the emissions are and unfortunately, a very poor track record for Queensland, we are a deforestation hotspot. So that is a big sector, so an average of about 400,000 hectares are cleared in Queensland each year, largely for grazing. So that is a big contributor to emissions, deforestation and land clearing. Renewable energy for clearing, and this is back to my earlier point about sighting renewable projects in the right places. So no more clearing of wet tropics for wind farms, or in World Heritage areas. That was a consequence of very poor planning frameworks, so when the acceleration of solar projects for example, and wind projects, the planning frameworks weren't adequate to deal with those parts of projects and they were largely left to the local councils to try and manage them. So there has been a lot of work to actually improve the wind code, which is the state code 23 to make sure that there's much more rigour around where renewable projects such as wind, particularly, are sighted. The clearing on aggregate amount - and any loss of habitat, any loss of vegetation is not to be dismissed by any means - but when we're looking at the proportion of deforestation, renewables are responsible for around about 1%. So, not for a moment dismissing that's still habitat and vegetation or good quality agricultural land, for example, corridors. But deforestation is one of the largest contributors to that. When we actually weigh up that also not transitioning to renewables and the impacts on biodiversity from climate change and probably increases of emissions, and that's where we really need to be realistic, that we need to have the projects assessed rigorously, have First Nations people at the centre of what happens on their land and sea country, and make sure the renewables are done well and that they're transparently assessed and have these appropriate environmental credentials. Thank you.

Professor Ian Lowe: That's exactly right. I tackled the BFL side that nuclear power is zero emissions. We need to be honest and accept that solar and wind farms aren't zero emissions either. Any technology requires energy inputs. So, the first and most important target of decarbonising is to improve the efficiency of using energy. Amory Lovins famously said "people don't want energy, they want hot showers and cold beer." And our appliance efficiency standards are way off world best practice. Appliances that can't be sold in Western Europe are being dumped in Australia, some of them using twice as much energy as they should to keep the beer cold and stop the butter melting.

There was a report given to the Howard government in 2003, The National Framework for Energy Efficiency. It estimated, based on the technology then, 22 years ago, that we could reduce our emissions by 30% using cost effective existing technology that pays for itself in less than 4 years. There's a summary on the board behind me of what we've done to implement those recommendations.

By far the most cost effective way to reduce emissions is to improve the efficiency of using energy. So whatever technology we use, solar, wind, it's sensible to use it more

efficiently and less wastefully. And we also need, as Narelle said. We should always assess every project, however desirable, to make sure that it's in the right place and it doesn't contribute to other environmental problems. I was involved in the campaign to stop the Tully North Stream hydroelectric project, because it would have flooded hundreds of hectares of wet tropical rainforest and probably caused more environmental harm than burning coal. We have to be honest, there is no zero emissions technology. We should always assess any project to make sure it's in the right place. But the critical point, is to use our energy more efficiently, less wastefully.

Professor Steve Turton: There's enormous opportunities as well for co-benefits in the landscape with renewable projects. So, for example, a lot of our farmers, graziers and so on, they're looking for other options for off-farm ?impact? You know, because often they're dealing with things like droughts and floods, and so on, increasingly so because of climate change. So there's great opportunities for co-benefits. So, for example, farmers are being paid for having wind farms on their property with grazing underneath, for example. Or to have solar panels with various activities going on underneath, such as grazing, and potentially even growing crops like coffee. The imagination is all it needs to think about what we can do in terms of co-benefits off the landscape. Not necessarily clearing that land, if you're looking for places, as Narelle indicated, that have already been degraded. You would not put these in areas that are of enormous biodiversity value or sensitive ecosystems such as upland areas where you've got all the biodiversity. But in the right parts of the landscape, farmers are looking for different sources of income and this is a great way to get some extra income coming in.

Tim Buckley: Building on Steve's point, one of the biggest problems we've had is that a lot of the farmers who actually have wind turbines on their site have signed a nondisclosure agreement, and that has actually backfired because they're really, really happy about it in the main, because they've been paid 20, 25, 35 \$45,000 per turbine per year for 25 to 30 years. It is the best drought-proofing of any farm you can have. The division, a lot of the time, comes from the neighbour who looks at the turbine and has financial jealousy because they're not getting compensated. And I say that in all respect. We should actually allow the neighbour to actually get a share of that as well, and that's what NSW finally did last year. We need to have the money re-invested in the whole community, not just the land-owner. The land-owner obviously gets impacted, but there's a massive benefit for everyone.

On a different topic -recycling. I was a Pacific Dunlop analyst 30/40 years ago, if anyone's old enough to remember Pacific Dunlop. It was one of the biggest lead acid battery manufacturers in the world, and I was the analyst covering them. I mentioned that because batteries have, globally, a 95% recycling rate. You just need the regulations there. Why did we regulate lead acid batteries? Because the acid is dangerous and the lead is valuable. So when I talk to the biggest battery manufacturer in the World, CATL in China, and I was speaking to them yesterday, I was speaking to them last week. They actually would disagree with Steve. In 15 or 20 years time, they do not expect to need any critical minerals from Australia. Their number one strategy is to diversify away from Australia to embrace recycling of batteries. Batteries have a 15-20 year life. They're aiming to within 15 or 20 years, not need any new material from Australia. That is their explicit, publicly stated strategy. So, we have a 10 to 15 year window of opportunity, but that's how serious they are about recycling. We need to recycle. I'm 100% for a circular economy. We need government regulation. Every solar module should be recycled. But we should be recycling everything.

Narelle McCarthy: The first solar panel recycling facility was opened in Brisbane in 2024, so they can actually process about 240,000 solar panels annually. Obviously that's a smaller proportion of what panels are actually going to be coming on after their life-span in about 20-30 years or so. So it is going to be a huge issue. However, that's the incentive to, to upscale and invest in recycling and the manufacturing and the skills that are required for that area of recycling, because it's going to happen - and that doesn't negate the need for better solar panels - but also to be prepared for it and understand what's needed and how it actually can be recycled and repurposed.

Francine Wiig: Thank-you. Our next question is a really important one and I think it speaks to, even though we have a lot of information that says we need to transition into renewables, and we need to quickly; **how can we ensure that that transition to renewable energy system is just, and ensures that the communities and workers depending on fossil fuels are supported through this transition?**

Professor Ian Lowe: Germany closed down its coal industry with no social disruption, with a strategy that had three legs, generous retirement packages for older workers in the coal industry, genuine retraining packages for younger workers to equip them with the skills for the new jobs in the new energy technologies, strategic location of the new energy technologies in the regions that are losing jobs.

It's not rocket surgery, you know, it's pretty bloody obvious what you need to do. There needs to be a just transition. We are phasing out the mining and export of coal for the good of the planet, and we need to look after the people who are dependent on those industries by the same sort of approach they had in Germany: proper retraining and strategic location of the new industries.

Tim Buckley: I think Ian left out a very key point there. Angela Merkel started 25 years ago.

Narelle McCarthy: The traditional fossil fuel region, such as Gladstone, for example, and Mackay, those transition conversations have been happening for years, because

those communities have known that those industries and the coal mines are going to be phasing out. So this is obviously across Australia in other coal mining areas, but if we're looking at a QLD context so, you know, obviously very energy intensive industries, particularly in Gladstone, so looking at how the aluminium smelters you know with the green hydrogen, you know that's taken a little bit of tangent in recent times. However, those conversations have been happening, and it is very good but then they haven't had a certainty either, because of changes in policy, changes in investment, changes in direction of renewable transition. So it's been a bit stop start, so that's been unfair for a lot of the industries and workers there, but the opportunities and the understanding it is very clear now and there's been a lot of engagement in this in more recent times, which has been ongoing, so that those communities are prepared. But there is going to be a transition, that's why - you know - it's called that. But the opportunities for the skills and the new industries are very real, and there is a lot of excitement in there. It's not across the board, it's a big change. But those communities are prepared, and they understand the global transition.

Professor Steve Turton: If you want to bring investment into regions, governments need to lead from the front and provide the policy mechanisms so that you get industry investment in, for example, in these transition economies. Every time there's a change of government we're getting this split bopping. We don't have this bipartisan support from the major parties, but this is a reality check - it needs to happen. And I know there's been some modelling done in terms if you do follow Ted's nuclear dream - that actually won't generate enough energy, enough electricity, for all of the industry that we might need. That hasn't really been discussed either, and maybe Tim knows something about that, but I think – I'm just talking to my colleague here, Max (Professor Max Standage). There'll actually be a shortfall in capacity with that based on that model.

So, I don't know if you wanted to comment? (directed at Max), but I just think governments need to provide clear signals to the private sector so they will come in and invest in Australia. Either Australian companies or international companies, you need to have that surety for long term projects, such as green hydrogen, steel or. That's just an example. Or solar hydrogen. Yes. Sorry, green hydrogen. I'll leave it at that. I think you need to have those signals there from the government.

Francine Wiig: Thanks, Steve. That leads nicely into the next question too, which is directed at Tim. With your background in finance and investing, what are the economic opportunities that we aren't capitalising on? And the second part of the question is: How do we secure the necessary investment for Australia's transition to net zero? I'll stop there, there's a third part but we'll start with that.

Tim Buckley: I'll talk to two topics there. One is what's just happened in Gladstone in the last 12 months. So Gladstone has an aluminium refinery and Rio Tinto, one of the biggest mining companies in the world, 12 months ago signed the biggest power

purchase agreement in Australian history with the wind farm. A month later, they signed the biggest power purchase agreement in Australian history for a solar farm. And then last month, they signed one of the biggest power purchase agreements from a solar and battery project, all of which is about decarbonizing the aluminium smelter at Gladstone, so it's going to be producing green aluminium for export for the next 30,40, 50 years, and it is an amazing situation that Rio has moved that far and is actually signing 20 year PPAs - power purchase agreements. Rio's never signed long term agreements because they like coming back to the government every two or three years, threatening to close the business down so they can get some more subsidies. They've actually committed to Gladstone for 20 years. So the workers, the community, and industry all have the certainty for decades to come, and I'm just waiting for them to do the same thing in Tomago in NSW, because that one refinery takes 10% of all of the NSW electricity. The one refinery in Gladstone takes 10% of all of Queensland's electricity. So it's three of the biggest 3 announcements in de-carbonisation in Australia and they've all been done in Queensland by Rio Tinto. So a shout out for a company that is moving.

Francine Wiig: Narelle, are there any specific economic opportunities for the Sunshine Coast that we're not currently taking advantage of in the transition?

The Sunshine Coast has really demonstrated that we've been leaders with innovation for quite a long time, you know, we we've had clean tech industries, there's been incubators at UDFC for example. And just private businesses themselves have really established themselves. Lots of start-ups on the Sunshine Coast. There is certainly more opportunity, as I mentioned before, around the community distributed batteries, the roof-top solar for example, and also good design. It's imperative that the Sunshine Coast has climate responsive design, and that goes down to reducing the intensity of the energy use as well, and also that resilience within the community as well. So in terms of the technologies, some of them are more based in attitude and also regulations and commitment to good, sustainable design, and we're having this population pressure we are experiencing, you know, arguably unsustainable population growth, so it's about, you know, if you're adding more people how do we reduce our carbon footprint? So we need to be innovative in the way that we actually manage that. If we're having densification within our urban centres, then we need to incorporate good design. It's not just turnkey, where it's a poor design that needs air conditioning. It has to be climate- responsive, where you've got passive design as well as orientation, so you're able to take advantage of the of the climate that we're fortunate to enjoy here as well. Introducing much more biodiversity, you know, cooling our streets, cooling our suburbs, shade trees, introducing water- sensitive urban design, reducing the amount of concrete and hard surfaces, so all of these things are critical for the Sunshine Coast as we densify in the right places, in the right way. It doesn't need to be high-rise, nor should it be high-rise, it's about having good design, good setbacks so that you've got green

spaces, public realm and you're also able to have reduced electricity costs because you haven't got a cookie-cutter box that needs air conditioning.

Francine Wiig: Thank you. I do have more questions here but I am keen to take some questions from the floor, so I'll ask one more of the questions that have been sent in and then start thinking about the questions now if you haven't already, we'll come over to you. So we've talked a lot about a lot of different solutions and answers and possibilities. Just briefly, what do you believe are the most immediate and achievable steps that Australia can take on in the next five years, to get us on track for net zero by 2050?

Professor Ian Lowe: The first and most important step is to set a date beyond which we will no longer export fossil fuels, because by exporting coal and gas we produce overseas emissions that are more than double our total domestic emissions from all energy use, so step one, set a date beyond which we will no longer export fossil fuels. Step 2, set a more ambitious target for emissions reduction and develop a plan that shows how emissions will be reduced not just in the electricity industry, but in transport, in manufacturing, in agriculture, in the applications that now use gas, because at the moment, we just have vague targets. We don't have an action plan, and anybody who's been involved in any sort of community group knows that it's cheap to have broad targets, but to get somewhere you really need an action plan that shows how you're going to get from where you are to where you want to be.

Francine Wiig: Thank you. Steve?

Professor Steve Turton: So I'm going to make a comment that is more in the climate adaptation space. Clearly it needs to be a two pronged approach. We need to be dealing with emissions enhancing sinks for carbon dioxide such as through carbon farming initiatives, et cetera, et cetera. But importantly, we have to think about it back into climate change. We are locked into ongoing warming. We are locked into more frequent and severe extreme weather events. Look at the summer we've just had in Queensland, alone. It's just been one event after another. So we need to be looking into that, allowing for the fact that we will need to adapt whether we like it or not, it's not going to be business as usual going forward. So we do need to have that investment in the research that goes around climate adaptation. We've lost a lot of momentum in that space after nine years of coalition. All the think tanks and universities and the CSIRO, they had a focus on climate adaptation, that's all been pretty-well abandoned. I must admit, Labour haven't resurrected the National Climate Change Adaptation Research Facility. I was involved with that for many years, mainly in the forestry space. So we do need to think about adapting, making our communities more resilient, but also our businesses, our industries and our people as well as our ecosystems. So I'd like to see greater focus on adaptation, but of course we have to really also go very hard on the mitigation side as lan has indicated.

Tim Buckley: I'll just give the Albanese government a shout out for a minute, the future made in Australia is, to me, an absolutely critical strategy for our country. Imagine actually having a plan for that from our government. Now I'm being a little sarcastic there because the LNP, their nuclear fantasies are their plan. But the Albanese government has spent the last three years really trying to rebuild and re-industrialise our nation. To try and get away from being just a straight out dig and ship nation. We dig and ship iron ore. Zero value add. We dig and ship coal, zero value add. We dig up methane, we liquefy it, we ship it off. All zero value add. The future Made in Australia is about reindustrializing. And so where I'll pivot from that is, we talked about the importance of transitioning workers and communities. The Albanese government put \$2.4 billion on the table to save Whyalla. And I know that's a long way from Queensland, but that is the second largest city in South Australia and that entire 22,000 population - the town would have gone to zero if the Whyalla steel works had failed. It had been run into the ground by a charlatan. The money had been stolen. Everything had you know – I'm trying to avoid swearing. But what the Albanese government did was realise when I talked to BHP and Rio, they actually go " there aren't enough skilled workers in Australia." Well, hang on, there are 4 or 5000 workers, 1000 direct and 4000 indirect workers in Whyalla who are all steel workers, and that is a perfect place to rebuild and de-carbonise and reindustrialise our economy. You actually need to invest, and so you can't leave it to the private market if there's no price on carbon. So the government heard that. I've been in Canberra every month for the last two years talking to them, saying we actually need public capital has to actually help fund the transition of our economy and \$2.4 billion allows Whyalla from going from a dinosaur - a blast furnace - one of the highest emissions steel plants in the world, to potentially building exports of magnetite, direct reduced iron, green iron and electric arc furnace steel. So massive decarbonisation and I say that because that steel sector in Australia could help drive 8 billion tonnes per annum emissions reduction globally, so Ian talked about the fact that we're the third largest exporter of fossil fuels. We actually need to pivot to something else. We could de-carbonise the global steel industry. We are the number one supplier of iron ore in the world. We're the number one supplier of coking coal that all goes into the Chinese steel mills. We could de-carbonise. It's the number one, number two, decarbonisation opportunity in the world. Australia could step up and lead the world, rather than being a parasite on all the developing countries as we are now.

Francine Wiig: Thank you to everybody who sent your questions in for that section of this evening. I'm sorry I didn't get to all of them. We may be able to send them to the panellists and if you have time, I know you're all very busy, but maybe draft a few dot-point responses and we can make that available on our website for those questions that I haven't got to. But now, to the floor. Does anybody have any questions?

Now, before we do this actually, I do have to say just a few rules. If we can keep the questions succinct and be respectful, and you will have to just come up to the stage to use the microphones because they're all on cords. That's OK. So.

Question 1: You were curious about what Ted O'Brien's smoking? I think I might know, and I don't think you'll want it. It's a \$100 bill provided by the Mineral Councils of Australia. To my question, thank you. Since the election's been called, or sometime before, neither Dutton nor O'Brien have made any public comment about nuclear power. Why is that?

Professor Ian Lowe: Sidney Chapman who runs the Marcoola Community Group, said that she had offered Ted O'Brien the opportunity to debate the issue of nuclear power, and he said that he agreed to that, but in the last three weeks, all of her emails and phone calls have gone unanswered. I think probably what's happened is that he's realised that it's unwise to try and cross swords with somebody when all you have is a plastic toy. I think the coalition polling has probably indicated that their nuclear proposition is going down like a lead balloon, and they're hoping people will forget it.

Question 2: Hi, my question may not touch any areas of your expertise, so please just tell me if it doesn't. But in these uncertain political times, I'm concerned about Australia's ability to prosper in a world where we can't rely on America and the global shipping lanes may be disrupted. So could you comment on how we should move forward to make Australia more resilient if we have to only rely on ourselves or our near neighbours?

Francine Wiig: Before we answer that, I'm sorry. If two more people would like to line up behind the gentleman in the dark shirt there?

Tim Buckley: When you study energy, you realise energy and energy security, national security and geopolitics all go hand in hand. I think the silver lining to the question is that we have been way too reliant on America, as has the rest of the world, as they have been a global superpower, they will remain a superpower. But to me, the world will be a hell of a lot better and safer when we actually have multipolar say and that is where we're moving towards. So China is going to be a world power. India - It's gonna be a world power. Europe is still a world power and this is gonna make Europe stand on their own two feet a bit more and therefore act in their national interest. And as America has walked off the playing field, that leaves the rest of the world particularly led by China, to actually have a global collective race to the top. So, I was really heartened to see last week China, Japan and Korea had a high-level climate negotiation. And they all realised, three of the most affected by Trump's tariffs. And so China is now working with Japan and Korea. Today, France put out a statement - a France China climate statement. Last week, England and China put out a climate statement. So I'm actually hoping the silver lining is the rest of the world sees America's walked off the field, let's

all work together and actually redefine the global landscape. And it's worth bearing in mind even India, and I've studied India for a decade, India's number one trade partner today, is China. And if you go back four years ago there was the quad which was Japan, India, Australia and America. And all of a sudden, Japan is working with China. India is working with China. Who's Australia's number one trade partner? China. So maybe we're actually having a reality check and we should be actually thinking we live in the Asian century. All of the growth is coming from the Asian superpowers that are emerging, and we're actually ideally positioned. So let's actually look to our trade partners, Japan, China, Korea, India, the global south - we live on the Indian Ocean. Let's actually think about how do we leverage the Asian century.

Professor Steve Turton: Just following on from Tim's comments The United States is currently 20% of the world's gross domestic product. So yes, it's a big player, but it's not you know 20% and all the markets, there will be a realignment, as Tim has indicated and Australia is very well placed to be part of that realignment and there's a lot of doom and gloom at the moment because stock exchanges have been pretty unhappy, but once it all settles down, I think most economists are saying it's going to be quite a rosy future. We just need to build those new relationships. That's all.

Francine Wiig: Thanks Steve. Would you like to add anything to that?

Professor Ian Lowe: Just one comment. When Donald Horne wrote The Lucky Country 60 years ago, he said we still behaved as if we were a European country that had been shifted by plate tectonic forces that we didn't understand, and he said we really need to recognise that we're permanent inhabitants of this part of the world and engage seriously with our Asian neighbours because that's our future. And picking up on Tim's other point it, it seems entirely rational to aim at being much more self sufficient. Rather than shipping minerals to China, and assuming that we have to buy from them the things we're not clever enough to make, like T-shirts and sand shoes.

We used to manufacture most of the things we needed, fifty years ago. We've steadily run down our manufacturing, but in an unstable world, being dependent on international trade has a very precarious future. So we really should have a strategic aim of making Australia much more self-sufficient.

Question 3: Hi, I'd like to talk about Australia's diesel usage. There's a huge vehicle fleet out there and just putting new electrified vehicles in there even if we do everything today, it's just going to be too late. **What can the federal government do to reduce the diesel usage or our carbon footprint impact of our current fleets, whether it be efficiency or renewable fuels or biofuels?**

Professor Ian Lowe: Alan Finkel's quarterly essay five years ago, said if you look 10 years ahead, all personal transport, all personal cars will be electric and all long distance freight will be green hydrogen. I think that makes sense. If you can't store

enough electricity to drive a truck from Perth to Sydney. So we should have a long term strategy of phasing out diesel as rapidly as possible, both because of the fossil fuel and because, as Steve reminded us, air pollution from the exhaust of diesel vehicles was a serious issue in our urban areas. So we should set those long term goals of phasing out diesel, replacing it with green hydrogen for long distance and then back to the electric for short distance.

Tim Buckley: We've found one point I'll disagree with you on, Ian. I think Alan did write that five years ago, and I have worked very closely with Alan over the last five years, and he drives one of the only two hydrogen fuel cell vehicles in Australia. I was down at Port Kembla on Monday and they pointed out a hydrogen refuelling centre for trucks, and they said they've never seen a single truck using it. It was built with Australian taxpayer money, but batteries have won the race, so coming to your question, I would say battery electric vehicles are going to absolutely dominate road transport and passenger vehicles. The number one thing I would do, and I would do it immediately, we have a \$46 billion subsidy for diesel in the forward estimates in our budget that was handed down two weeks ago. We subsidise 11 or \$12 billion a year for the use of diesel in our country. If we removed that immediately we could then give it very rapidly, out. Now that's off road. That's not trucks. That's well, there is a subsidy for trucks as well, but most of it's off, but that actually prevents us using batteries, wind and solar for all of our mining sites, all of our mining haulage equipment. BHP gets a \$500 million per year subsidy not to electrify their mining equipment. Rio gets a \$450 million per year subsidy, Fortescue gets a \$400 million subsidy every year to not electrify. And when you electrify, for the next 100 years, that vehicle is going to run on solar and wind, so as for your comment about 15 years we are going to bake it in. That's not correct, we will replace one 15th of every car of the entire car fleet every year. So in 15 years time we could be 100% electric vehicles. And by the way, the cars will get better every single year. The batteries will get better every year. We just saw BYD announce that fast charging, you can charge 400 kilometres in 5 minutes, that's the biggest EV company in the world, a 1000 kilowatt charger and then a week later, another Chinese company gazumped them by 20%. You can now do 1200 kilowatt charges. And so that technology is coming, so I think we need to embrace battery electric vehicles and get off our imported high emissions diesel addiction.

Question 4: Hello. I am a high school science teacher. These are fantastic ideas. **How** do you plan to engage our young people in them, because they're quite apathetic?

Francine Wiig: That's a great question. Thank you. Narelle, would you like to start with that one?

Narelle McCarthy: It could be a combination of really demonstrating what an alternative future could be, and this future is actually unfolding now. If there's younger people, they can be engaged. If there's something that they can tangibly see and do –

and I know that you're the expert in the field, being the teacher – but even just on ground projects and things, re-vegetation projects connected with community organisations, seeing different opportunities for them as well and. So there's different opportunities when it comes to innovation, how they actually can put their ideas forward. They need to feel part of the conversation, they actually have that platform rather than being talked at, or in a language that it doesn't resonate with them, it's not the way that they communicate. So, there's no one single way, because it is huge in terms of what's happening ecologically and also socially as well, and technology as well. You need them connecting with fellow youth, and there's a number of fantastic programs on the Sunshine Coast. Getting out of the classroom sometimes but also giving an opportunity to put their ideas forward as well. So it's not easy or quick, I understand that, but there's as well.

Professor Steve Turton: Over the years, my impression is that children are very concerned about the future. They hear stuff on TV, they read about things and they are very concerned about climate change. They're very concerned about what that might mean for them when they grow up and have families and so on. They are very concerned. But so they should be. I mean, I know when we were growing up it was probably more about the threat of nuclear war. Well, maybe that's coming back, but now, of course, climate change is an existential threat to the planet, basically. It's one of those existential threats. And children are naturally concerned about it - different age groups. So we need to find ways to empower children that it doesn't have to be all gloom and doom. There are things that they can do, as Narelle has suggested, small things that they can do to contribute to reducing their own carbon footprint, for example. Is one of many things they could do. But also we also need to give children guidance and the surety that there will be a future for them, and it might be in professions that are not even yet developing? Because with this new era we're moving into - this post fossil- fuel era - there will be great opportunities for school children, once they get into high school to go through TAFE pathways, but also through university pathways into employment. So we do need to, I think, as elders, as adults, we do need to reassure children that it's, Yes, it is serious, but we are going to do something about it for you, so you don't inherit the mess. That if we don't do something about it you will inherit the mess that we will leave you. So I think, never underestimate children's ability to comprehend and understand and to participate in the future, just give them..... we don't give them a fair go.

Francine Wiig: Can I just ask one more question? When you said they are apathetic is that in relation specifically to climate change and energy or just generally in engaging? **Audience member who asked question:** That's probably something we need to look at in education you know, how we support teachers to be able to teach creatively and work on that.

Tim Buckley: I think we've got an intergenerational problem. I think we need our Members of Parliament ,and I was privileged enough to be listening to Sophie Scamps and Zahli Steggall, two members of parliament down in the northern beaches of NSW, and they were talking about the intergenerational inequity and the need for an intergenerational equity consideration as a legal requirement for every single act of parliament, because my generation, our generation has benefited from our children's housing crisis, the cost of living crisis, my children will be renting because they can't afford a house in Sydney. That is absolute. We need to actually think about the generational wellbeing. I think they're actually dispirited because they feel disempowered.

Francine Wiig: We are lucky enough to have some amazing young people involved in our campaign, and I don't mean to put you on the spot, Charlotte, but perhaps a young person is the best, the best placed to answer a question like this. Do you feel comfortable speaking to it? If not, that's OK.

Charlotte: I think that, what you say was very true, young people in general are apathetic and not disinterested in politics because we are very interested in politics, but we've seen previously when we've raised our voices and tried to fight for change, particularly around climate change, our voices were ignored and we weren't heard, so I think that kind of response to our own attempts to make a difference have really negatively impacted our confidence in the system. And so I think restoring that confidence in politics and restoring that confidence in politicians, that they actually *will* try to fight for our futures is the most important part of getting young people re-engaged into our own futures.

Francine Wiig: I agree that the solutions have to come from the young people as well, and that re engagement with your voice and encouraging that engagement is something that I'm really committed to in this campaign as well, so thank-you for sharing that and thank-you for the question.

We have time for one more question before we wrap up.

Question 5: Thinking about the economy beyond the end of 21st century, So are we going to be about a post growth economy?

Professor Ian Lowe: The short answer is yes. No, nothing can expand without living in a closed system. The first report of the Club of Rome 50 years ago "The Limits to Growth" pointed out that if we keep growing, we will reach limits, and I think it's already clear to anyone who looks at the science that we have reached limits. Climate change is the most urgent problem, but loss of biodiversity is the most serious problem, because that's irreversible. In principle we could restore a pre-industrial climate in 100 years with purposeful action, but there's nothing we can do that can bring back extinct species or restore degraded ecosystems on the human scale. So, I think the most

fundamental problem that our elected leaders need to face is that the thoughtful ones understand that there are limits to growth, but they hope that we won't reach them in their term of office. But we really need adults who don't kick the can down the road and say : "We need to be thinking now about a smooth transition to a post growth future". Because if there isn't a smooth transition to a post-growth future, there will be a catastrophic collapse, and I think we have a responsibility to future generations to be thinking about how we manage a smooth transition to a future in which we live within the limits of natural systems, rather than hoping nature doesn't come back to bite us.

Francine Wiig: Thank-you. I'll close tonight with just some closing remarks. I really want to thank everybody for being here this evening. Tonight is a real showcase of what community independent politics looks like, and what engagement with our community and how we do politics could look like for the next federal election. So tonight I would like to thank our incredibly articulate and inspiring panellists for their very interesting and authoritative answers to some tricky questions. Thank you for coming and for sharing all your knowledge and experience with us. This type of forum, where we have experts who can come and speak directly with the community a really key way that we can......(end of transmission).