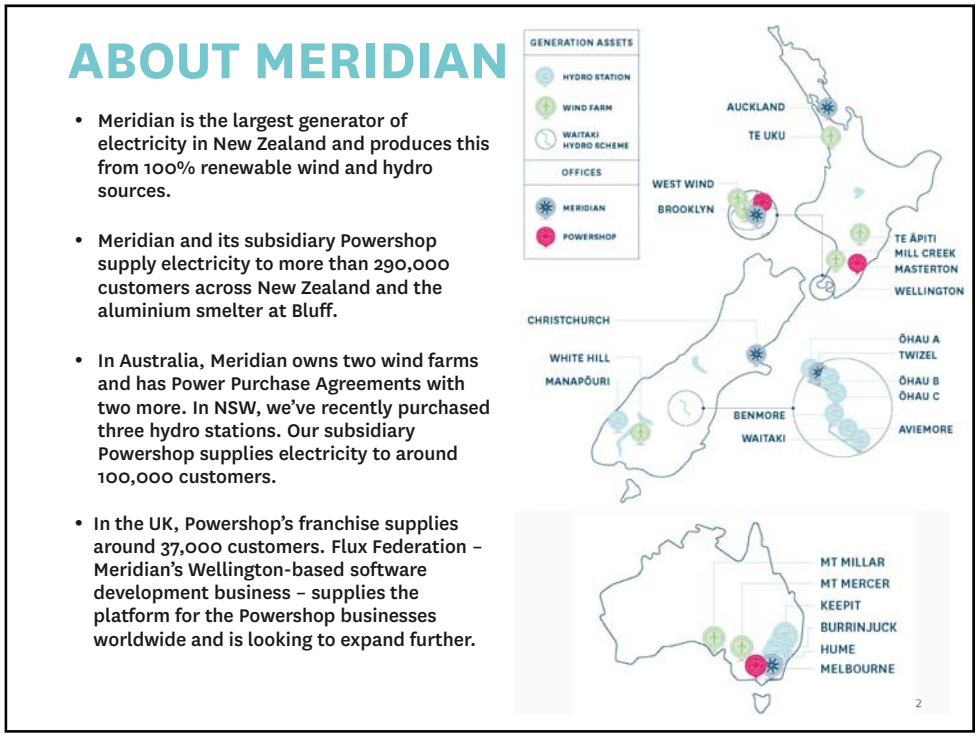
CLIMATE ACTION: MAKING IT OUR BUSINESS.

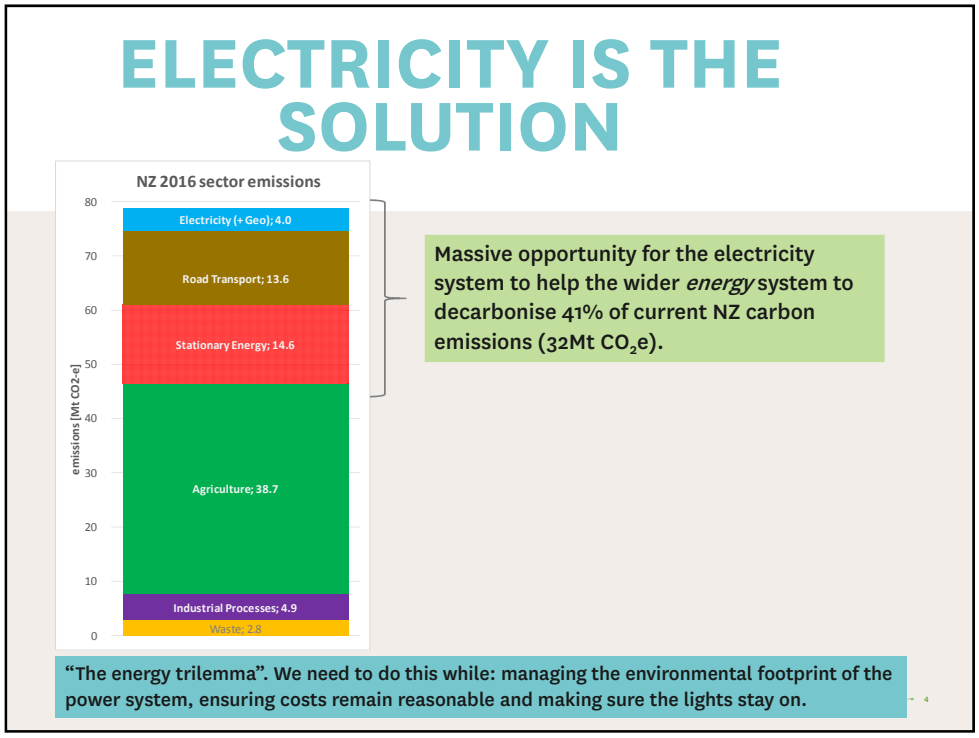
meridian



- Meridian is the largest electricity generator in the country and we made a commitment to do that only from renewable sources more than 15 years ago – before it was trendy.
- Through our Meridian and Powershop brands we retail electricity to around 290,000 New Zealand homes and businesses. And our largest customer is the aluminium smelter at Bluff which takes around 14% of total electricity consumed in NZ.
- We are also building a strong business in Australia under our Powershop brand. We have a number of wind and hydro power stations and we service around 100,000 customers. And the really cool thing about that is we service those customers from our Powershop call centre in Masterton. We bucked the trend and created an opportunity to export call centre capability rather than import it.
- I'm hoping some of you are Powershop customers and if you are you'll will appreciate that we do offer a unique customer experience for buying your electricity and it is starting to catch attention internationally. We built the Powershop customer service IT environment from scratch. And we are now licencing the brand and the platform to one of the large retailers in UK. They launched Powershop UK earlier this year and already have 37,000 customers. We are only just starting to tap in the global opportunity to export our innovative kiwi technology. Our software development company FLUX Federation is based in Wellington and has a software development crew of over 120 good humans. So it is of comparable size to Trademe and Xero. Most importantly, we are 50 % owned by the govt and around 35% by mum and dad Nzers. We are a proud NZ company and always will be. So we've got a lot going on and it's an exciting place to be.

- Climate change is the single biggest issue facing us all. As the PM has said "It is our nuclear free moment". Everything I read suggests the globe is at defcon 5 right now.
- We're already living in a 1 degree warmer world, and we're seeing floods, hurricanes, droughts – our climate has changed! At Meridian we use hydro inflow data i.e. how much it has rained for each of the last 86 years to help us predict the future. And we are finding the weather patterns are changing, so much so that we put far greater weighting on the more recent rain records than 30, 50 or 80 years ago.
- The overwhelming weight of scientific research and evidence tells us that what we do over the next two decades will determine whether we live in a 2 degree warmer world (the aim of the Paris Agreement), or an even warmer world than that.
- And the sobering, no horrifying news is that a 4 degree warmer world can probably only support 1 billion people. We don't talk about that much because I don't think we accept it could be true because the war and suffering that would cull the human race to say 1 billion people is unimaginable. It is far easier to think about going to Mars.
- There is a school of thought that suggests that given NZs total emissions are very small in a global context (i.e. they make up less than 0.2% of global emissions), why bother. But I'm sure most of us get that New Zealand's size does not justify inaction. Around 30% of global emissions come from small emitters – collectively, small economies do matter and a global, concerted effort by all is needed to solve this issue.
- There is an opportunity to show some real leadership that could shame or encourage other countries to work harder.
- And if you want to be hard core economically rationale, the real cost of carbon will start to

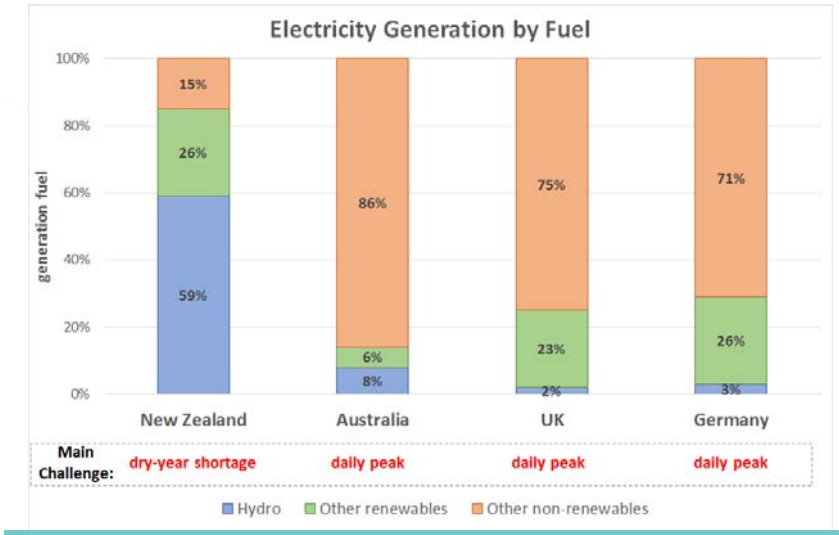
emerge as an impost on economies and I think NZ's ability to transform to a low or NO carbon economy will ultimately become a source of competitive advantage. We can bury our heads in the sand, and we'll probably get away with it but we'll also become less and less competitive in a global context.



- Now the more positive news is our electricity sector is exceptionally well-placed to support NZs transition to a low carbon economy. Around 85% percent of our electricity is generated from renewable or low emission sources. And the consensus view is that percentage is trending to increase to exceed 90% within the next 15 years or so. So emissions from electricity generation, which are already relative small, will naturally get smaller as new renewable generation gets built.
- If we put agriculture to the side, the bulk of NZs remaining emissions come form the energy sector mostly transport and stationary energy like industrial heat processes that are typically fuelled by coal and gas boilers. And that creates the really exciting opportunity for us. We can remove up to 32MT of CO2e from the wider energy system through increased electrification, largely powered by renewable energy.
- Transport contributes around 20% of total emissions and there are viable technologies now to drastically reduce those emissions. I'll talk more about EVs later but whether the petrol heads out there like it or not the global R&D going into Electric vehicles is immense - the available models and travel range will exponentially increase over the next decade. And it makes so much sense for NZ, with our renewable electricity sector, to not embrace the technology.
- Likewise industrial heat and stationary energy lends itself naturally to electrification which is many times more efficient than fossil fuelled base processes. And we are at a point renewable electricity is becoming much more cost comparative and that makes it interesting from a consumer perspective.
- So the opportunity is there. To take advantage of it we need to ensure the Energy Trilema of the environmental footprint, reliability of the system and affordability of energy is managed in a balanced fashion.

- We start from a position of strength. The combination of the foresight of those who have gone before us, the huge renewable resources available to us in NZ and the skill and commitment of the women and men working in the industry today, means the New Zealand electricity market is recognised as a world-leading success story. As a result our system is almost purpose built to facilitate decarbonisation of the wider energy sector – Almost!
- The key is that we have an awesome back bone of hydro generation that makes up between 50% and 60% of total electricity generation today. Hydro, is our 'super' renewable foundation. What makes it super is that it can ramp up and down swiftly and seamlessly to enable our system to accommodate large amounts of 'intermittent' renewables that, for example, only generate when the wind blows or the sun shines. Hydro can fill in the gaps quickly and get out of the way quickly when not needed. As a result the cost of integrating intermittent generation like wind and solar into the electricity system in NZ is about 1/5th of what it costs other countries like Europe and Australia.
- We also have a mature wholesale market that gives efficient price signals for new renewable technologies without government subsidies and a regulatory framework that aims to encourage competition, a huge number of retail brands (that's 40!) for consumers to choose from.
- It is probably not widely understood that we've gone from 65% renewable electricity to 85% in just the last decade without missing a beat. And that is because of our great renewable resources, our flexible hydro-base and our market structure.
- And as I said before our current projections are that renewable electricity will grow into the mid-90%s within the next decade. In contrast, Australia is decades and trillions of dollars behind us in regards to their pathway to being able to achieve highly renewable electricity system.
- So our foundation is really strong.

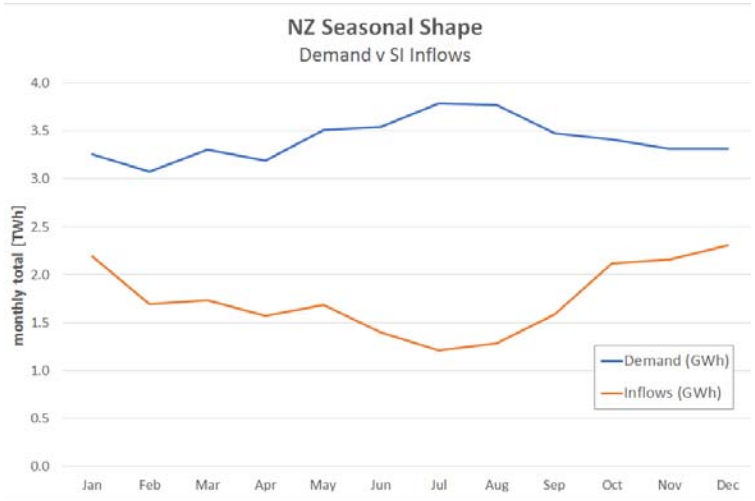
NZ'S ELECTRICITY MARKET IS UNIQUE



Hydro domination creates seasonal, not daily, risks

- So here is the almost bit. We are relatively unique and the risk we need to manage are different from many other countries.
- As you can see from this graph, NZ is far more heavily renewables based than most other countries and I've just called out Aussie, the UK and Germany for comparison.
- On the whole that is a great advantage for us but it also means we face quite a different challenge to managing our system than other countries. In most fossil fuel based systems, their biggest issue is managing daily peaks, usually high air conditioning loads in summer on stinking hot days.
- We on the other hand have a good transmission system and plenty of flexible hydro so we can meet peak demand quite effectively and that isn't such a problem for us. But we have limited hydro storage i.e. all the hydro lakes in NZ hold about **10%** of average annual demand. Now that usually works out ok because it rains reasonably frequently, particularly in the Southern Alps and Fiordland where our large hydro lakes are and they are constantly being topped up. But sometimes it doesn't rain and so our issue is not a daily peak but a prolonged dry period over several months.

NZ'S WINTER HYDRO STORAGE IS TOO SMALL TO MANAGE DROUGHT



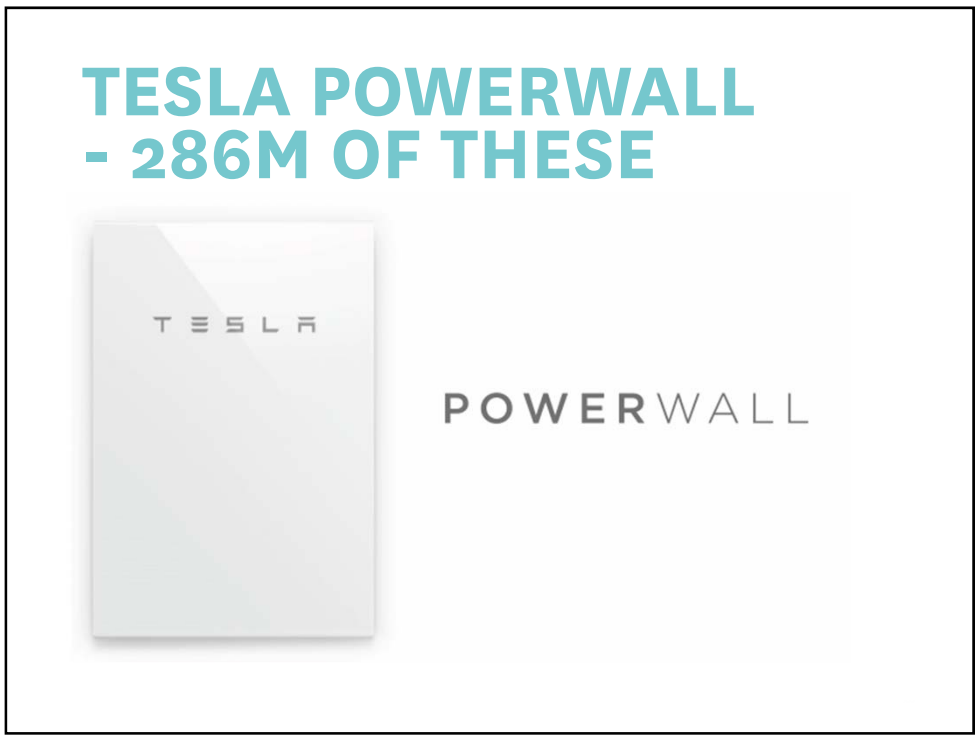
- This graph illustrate the challenge. The top line represent electricity usage through the year and the bottom graph show the shape of water inflows in the hydro lakes. Short story is when demand is at its peak into winter we typically receive the least amount of hydro fuel. And that graph is average inflows, we can get significantly less than average rain fall then that orange line can drop quit significantly.
- So the NZ electricity system needs a certain amount of, what we call "deep storage". Where large quantities of fuel are stored and available to get us through a very dry winter whilst keeping the lights on.
- As an industry we've been quite successful in managing this challenge as I think the last time NZ faced energy shortages was in 1992 and we have had periods of lower rainfall since then. Along with the hydro storage we do have we have also traditionally relied on a large stockpile of coal at Huntly that can be burned when the lakes are low and also various sources of gas storage.
- Deep fuel storage is hard to establish and can be very expensive. To give you an idea of what it would take to drive the electricity sector to be 100% renewable (even in a normal hydrology year) and totally remove coal and gas generation and fuel storage from the NZ systems.

We would need at least one but probably two more of these.

That is Lake Pukaki. It is NZs largest hydro storage lake and contains about 1/2 of our total hydro storage. The lake has an operating range between the top and bottom of it's consented lake level of 17m. By contrast Lake Taupo has an operating range of about a **metre**. It is a big highly flexible body or water in the middle of the McKenzie country.

Or we could build 10 more of these. Not to meet future demand but just to ensure we can manage today's level of demand.

That is Meridian's wind farm on the South Makara coast here in Wellington. 62 turbines and an absolute thing of beauty in my mind but maybe not everyone's cup of tea.



Or we could buy 286m Tesla Powerwall batteries at a cool 4 trillion dollars on todays rate.

I've included the tesla because you I often hear commentators talking about solar and batteries being the future solution. Batteries will no doubt have a part to play in managing peak usage ensuring that the electricity grid works efficiently. But they will never even remotely be a part of a possible solution to the deep storage need our systems needs which is the real challenge to manage.

The point I am making is:

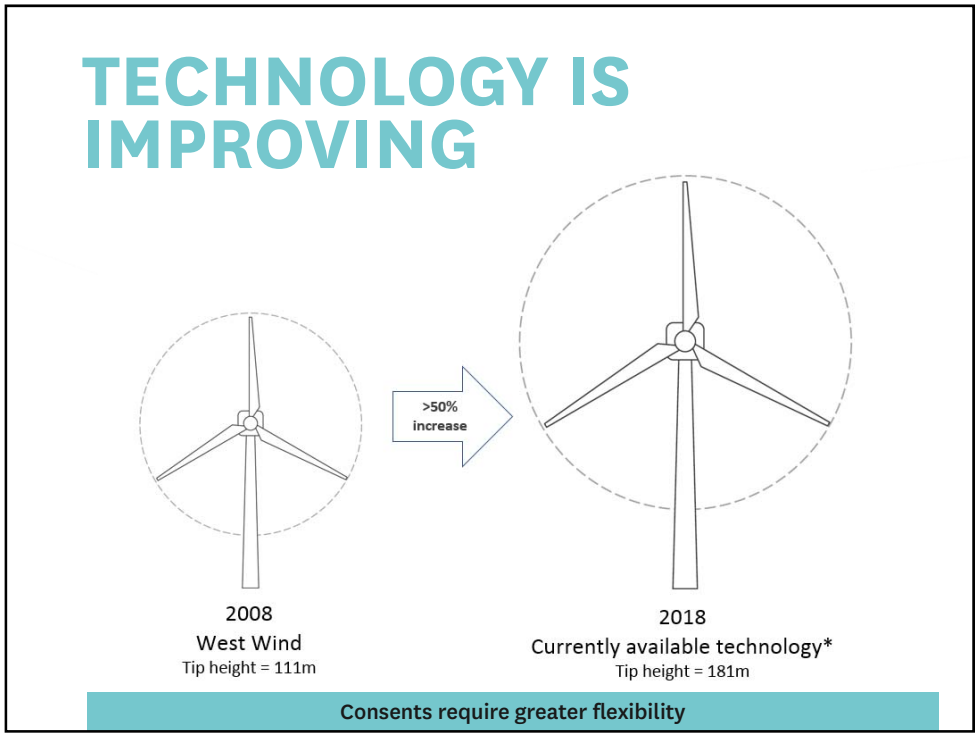
- Deep storage is very expensive and, even if renewable, would have environmental consequences.
- So we are likely to require some fossil fuel electricity generation for the foreseeable future. We are absolutely need to transition off coal in my view as coal emissions are twice as harmful as gas. But keeping some level of gas storage and generation in the system is likely to be the most sensible answer. And I reckon that is ok if it allows us to keep costs down and system reliability up and that will provide the right incentives for the rest of the energy sector to convert to electric – which is the really big prize we are after.

- The climate action debate has suggested that we should drive to 100% renewable electricity system by 2035. Hopefully you are getting the point that target may in fact be counter productive. So in my view, NZ needs a renewable energy target not a renewable electricity target.
- And the last point is, the hydro storage we have today is incredibly valuable and does provide the foundation for reducing energy emissions in NZ. We need to be very careful about, in anyway, reducing the quantum or flexibility of the storage we do have.
- We all know we have a serious fresh water quality issue in NZ. There are some folk who think that dilution may be a solution for pollution. But every time a hydro operator spills water down a river systems to flush away the effects of pollution down stream (typically as a result of land use intensification) we increase carbon emissions from electricity generation. So there is a trade-off and we just need to ensure the debate balanced. We currently have a National Policy Statement on renewables electricity that expressly excludes water and hydro operations. And the NPS on fresh water may not be supportive of hydro as it could be. So I think stronger and more balanced policy support is needed.

- To meet growth potential we are not short of renewable options and companies like Meridian are actively looking for options to build new grid scale renewable generation to meet future demand.
- At Meridian we have specific expertise in developing wind farms and we are the premier developer of wind generation in NZ. The costs of wind globally have come down massively in the last decade and with NZs great wind resource it means wind is now the cheapest form of new generation in NZ. I think it is also widely acknowledged that Wind will largely underpin growth in the demand for electricity for the next couple or three decade.
- There is also still a large geothermal resource in the North Island that can be further tapped into. Geothermal does emit carbon but much lower rates than gas or coal so it will undoubtedly help reduce energy emissions over time.
- I think the key thing is, we have plenty of new renewables electricity options available and the technological advances we've seen and we expect to see in the coming decades means I am not seeing a massive upward pressure on the cost of generating electricity in this country to meet growing demand. Quite the opposite in fact.
- Also, I think in the future we will see New Zealanders being provided with the right incentives to better insulate their homes (and rental properties) and heat them more efficiently, as well as access to new technology that will further improve all our lifestyles. It is actually happening already, electricity demand in the average home is reducing.

Wind development

- But depending on your view of demand, NZ will need between 1 and 3 mid sized wind farms to be built every year over the next 30 odd years and that is going to change the nature of our landscape. If we want to move towards a zero carbon energy future, we need to start having conversations on how we achieve this, and what the trade-offs might need to be.
- I do think we need a more flexible consent regime to allow this to happen in an efficient and environmentally friendly way. And I think ultimately we will need to get over NIMBYism.
- Having said that, companies like Meridian still need to be very focussed on ensuring we build respectful and enduring relationships with communities to ensure they also benefit from having a power station in their area. We can always be looking to lift our game in this regard.
- Consent longevity is also starting to emerge as an issue. The graph above shows the number of new generation options currently consented in NZ and when those consents expire. There are enough option actually consented today to meet at least the next 20 years of expected demand growth. But as you can see, by 2026 most consents expire so if you are a RMA lawyer – good times await.



- Also technology enhancements means that many of the existing consents are not anywhere near what can optimally be done today.
- Meridian's best consented wind site was consented for a turbine with an 82mtr diameter similar to the ones out at our West Wind farm South of Makara. But the new more efficient machines with a rotor diameter of 115m to 120m will make the option far more economically attractive.
- This is great for customers as it means new generation costs are not increasing but it does also mean many of the existing consents out there require some level variation – not an insignificant or quick task.
- If I had one plea to the policy makers it would be to get ahead of this issue with stronger national direction under the RMA to enable renewable energy developments.

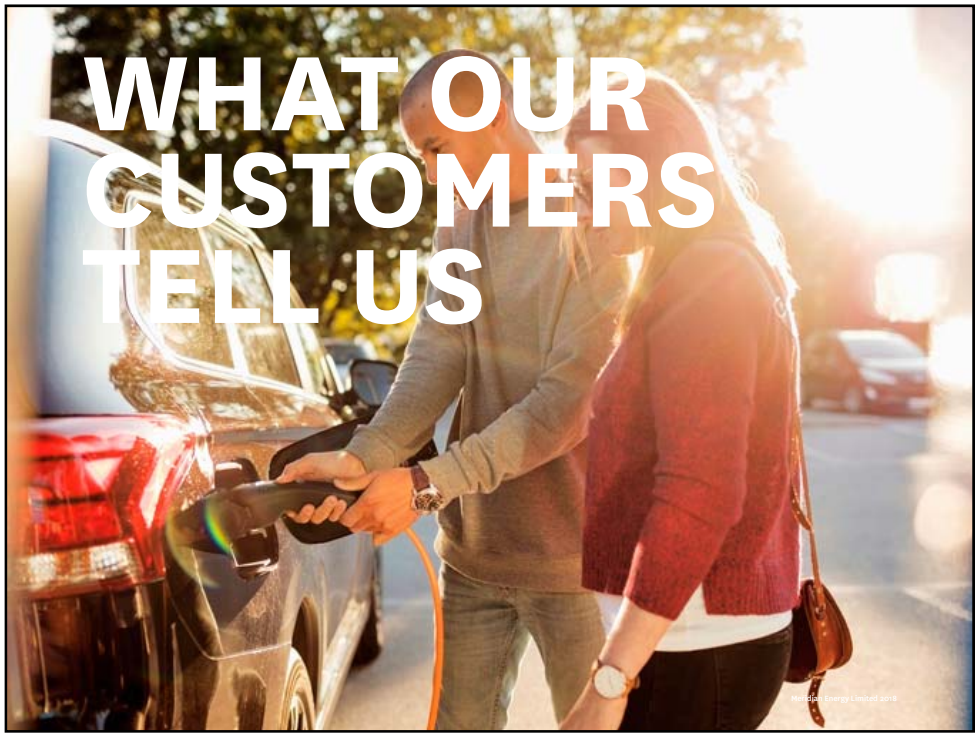
Electric vehicles

- As mentioned, it is widely acknowledged that electric vehicles, and the electrification of our transport sector, just makes so much sense for NZ. Contrast with Australia where most of their electricity come from dirty brown which is twice as bad as black coal and 4 times as bad as gas. For them the opportunity is less clear. But for us it is an absolute no brainer.
- We've introduced EV pricing plans market-leading overnight rates. Here in Wellington if you are on a Meridian EV plan you can charge your car (and anything else for that matter) overnight for the equivalent cost of around 24 c per ltr.
- For us, as a business we've already found the business case for EVs stacks up. The fuel and maintenance cost and resale value advantages make them a better economic decision already and we've converted 50% of our vehicle fleet to full electric, with a new goal of converting 90% of our fleet to electric by 2020. Clearly travel range and vehicle versatility (e.g. we need a ute option) is not quite there for all our transport needs but we'll continue to go electric as options expand.
- Business leaders have an important role to play in encouraging the uptake of electric vehicles. We need to start building a second hand fleet so average kiwis can get access to affordable EVs. But you can do it the smart way or not. If you are interested, and I think you need to be we have a team who can help you be smart about.

LARGE SCALE SOLAR

Commercial solar

- Economically solar is not as strong in NZ as say it is in Australia as we are further away from the equator and certainly grid scale solar is difficult because there are potentially more valuable uses of our land. Also in NZ, when we need power most i.e. those cold nights in July the sun tends not to be shining.
- But again the costs are falling dramatically we are finding for some large commercial building where the electricity demand tends to align with daytime hours e.g. Malls and warehouses the economics of roof top solar look good. We are working with a number of large corporate's – such as Kiwi Property, Mainfreight, who are installing solar large scale solar to help supplement their energy use while reducing costs and emissions.
- In Australia, solar makes a lot more financial sense at the residential level. So it is an important part of our Powershop customer proposition. Powershop Australia continues to be the only electricity company certified 100% carbon neutral by the Australian Government. And Greenpeace has ranked us the greenest power company in Australia for three consecutive years.

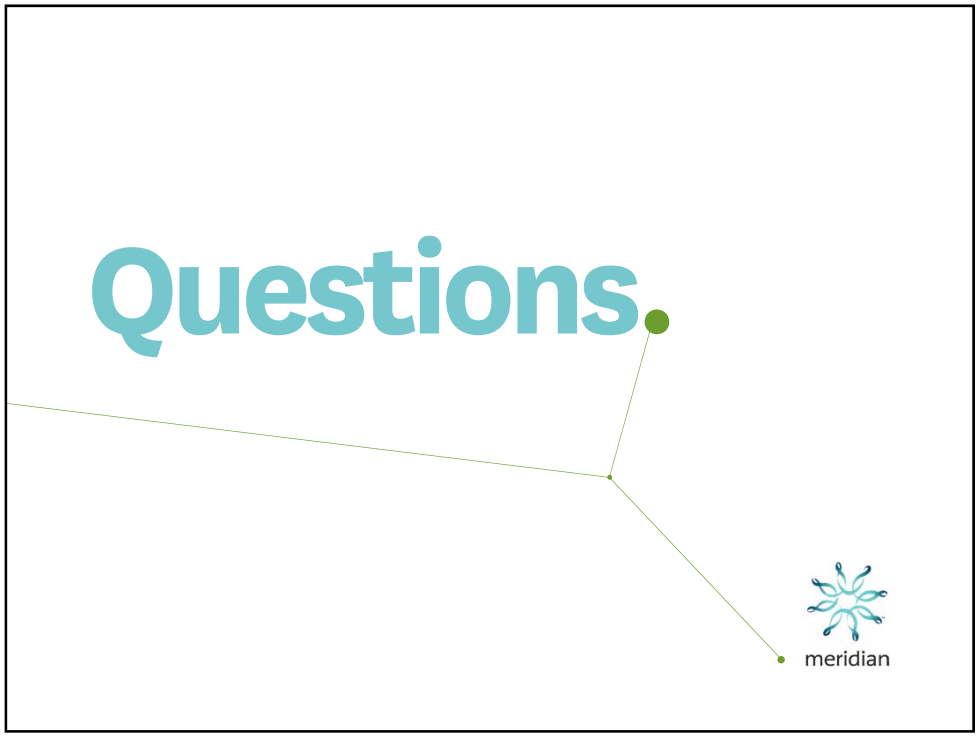


- Our customers expect Meridian to take a stand and to lead by example when it comes to climate action. Our position as a leader in sustainability has allowed us to attract and retain customers who are deeply concerned about the environment but this also means that they have an expectation of us to continue to lead not only the debate, but also action of climate change.
- And so we've committed to being Zero Carbon now. We have an internal purpose statement – Clean Energy for a Fairer and Healthier World. We don't think we can be true to that purpose whilst having an emissions profile, we also have quite a low footprint and so it makes sense for us to just get on with it. So we'll continue to work to drive down our internal emissions but from 1 July we have commenced a programme to procure credits to offset our emissions. And starting this summer we will kick off a multi year indigenous tree planting programme to grow our own credits, mostly on our own land.
- Beyond that we see ourselves as an enabler for customers to adopt new technology in ways that reduce their demand for energy. But the real challenge in my view is ensuring those members of our society who are most vulnerable and least likely to be able to afford well insulated housing with up to date energy efficient appliances, solar on the roof and all that good stuff, don't get left behind in the dash to the future. There is a lot more for us as an industry and as a society we need to do to ensure a fair and healthy outcome for all kiwis.

So just to finish up I have a few closing thoughts:

1. Electricity will play a huge role in decarbonising NZ and the demand for new forms of energy will be massive. Could be up to half of current energy use now (i.e. up to 20 TWh in the next 30 years) or a lot more depending on what scenarios you look at.
2. And it will always be critical that we keep costs down and ensure we offer a reliable product to enable the electrification of other sectors and the most effective economy wide emissions reductions. The transition to zero carbon needs to be managed sensibly and each part of the energy trilemma of affordability, security and environmental sustainability needs to be equally supported.

I hope our 2050 target gets bi-partisan political support as it gives business leaders certainty of where we need to get to. And my feeling is that business leaders in this country are overwhelmingly getting with the programme.


Questions.
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