



Used batteries in demand

Try getting a second-hand electric vehicle battery and you might appreciate some of the issues the industry has been grappling with.

Until now, they've been nigh on impossible to obtain. That's mainly because of international shipping conventions – particularly around air transport of lithium-ion batteries which are Class 9 dangerous goods.

One company involved in battery refurbishment has to rely on EV wrecking to get any, which nowhere near meets demand.

EV dealers here are keen to get a guaranteed supply so they can provide back-up in the unlikely event an EV they've sold has a battery problem.

Issues around second-hand lithium battery imports for EVs have been tackled by the Imported Motor Vehicle Industry Association (VIA).

The Government hasn't been able to do much about it because the problem has mainly been centred on international conventions. However, various government departments have been helping to get the matter sorted.



Dr Daniel Myall

"Some of our members who came to us (VIA) said they wanted to do this to give a decent warranty and be able to provide a refurbished second-hand battery," VIA chief executive officer **David Vinsen** says.

"So, I went to various government departments like Customs and the Ministry of Transport to get them together with shipping company representatives and brokers and work out how to deal with it."

Vinsen says systems and protocols are now in place so anyone contemplating getting second-hand EV batteries from overseas should first approach

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EV etiquette – it pays to be polite

Christmas means thinking of others – and that can extend to your next visit to a public charging station.

When charging an electric vehicle, you don't want to offend others and provoke what is known in the United States as "charge rage".

"What are the dos and don'ts?"

EV owners often ask, usually via social media.

EV etiquette advice is offered by a number of charging networks, such as ChargeNet NZ.

It's actually doing a podcast on EV etiquette on December 30.

The main rules include leaving a note on your car letting people know when it's OK to unplug, only using the charging carpark while your car is being charged (unplug and move when completed), and never unplugging another's hybrid as it has a back-up gasoline engine.

Don't charge if you don't need to – in other words, park elsewhere, leave your charge port door open if you want to be plugged in, and when you unplug, check whether other EVs have their charge port open and plug them in.

If the charging station is already being used and you can park close enough, leave a note on the vehicle

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They call it MeloYelo
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At the Apec workshop are, from left, Lloyd Robinson from Mitsubishi Motors NZ, the AA's Mark Stockdale, VIA chief executive and ITS NZ chairman David Vinsen and Toyota New Zealand's Spencer Morris.

Hydrogen – fuel for thought

Hydrogen offers an “integrated solution” as a power source compatible with electric vehicles.

An APEC electric vehicle and hydrogen technology policy workshop in Wellington on November 21 explored the subject and learned about progress in developing hydrogen fuel cells.

Far from writing off hydrogen, as suggested in an IDTechEx overview report, *Electric Vehicles 2018-2038: Forecasts, Analysis and Opportunities* which predicts fuel cell and non-plug-in vehicles will be sidelined, the workshop found some automakers and others continuing to work on the fuel.

Experts at the workshop talked about a “hydrogen economy” and outlined progress in the fuel’s development.

They also covered the benefits and pitfalls of using hydrogen fuel cells in transport, finding it especially useful for long-range heavy transport.

Hydrogen can come from various

sources, mostly natural gas (methane) although it can be produced from rubbish (biomass).

It can even be made from cannabis, legal in California from January 1 next year. Workshop speaker **Chris White** from the California Fuel Cell partnership dubbed it “high-drogen”.



Pierpaolo Cazzola

She drives a fuel cell Honda Clarity (a plug-in hybrid is due out soon) and says California has about 100 hydrogen fuel stations with 30 more being developed.

Electrolysis is one “green” way of producing hydrogen and is growing in popularity. But the costs of making hydrogen from renewable sources are high so much of the development is concentrating on lowering those costs.

Hydrogen fuel stations and associated infrastructure such as storage are needed, probably suited for current service stations, but again the costs are high.

They need to be lower to increase demand, International Energy

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Job offer ends Uniquad journey

Simon Hartley's just finished about five and a half years working on the UniQuad – and he's landed a job out of it.

He's leaving the Unitec Institute of Technology in Mt Albert, Auckland, where the electric and hydrogen-powered four-wheel vehicle has been developed, to work for the company that supplied the UniQuad's hydrogen fuel cell.

Hartley takes up his position with Arcola Energy in North London at the end of January and will be working on vehicle development and prototype maintenance.

The engineer has been everything from a student to a lecturer, technician, research assistant and project manager at Unitec.

The UniQuad (named after Unitec) will remain on display in the institute's new multimillion-dollar trades, engineering and construction facility called Mataaho.



Simon Hartley and the UniQuad.

Designed as a farm tool and suitable for mining, hunting and recreational activities, the UniQuad has a 100km range on battery alone and around 600-700km combined range adding the hydrogen.

Hartley says it can reach a top speed of nearly 200kmh but has been governed to about 60kmh for safety.

He wanted to develop a more user-friendly farm vehicle to help stop the deaths associated with quads, with an average of about five people killed and 850 injured on the farm every year.

It's expected the licence and technology to make the UniQuad might eventually be sold elsewhere.

The UniQuad was mentioned in two separate talks at the APEC electric vehicle and hydrogen technology workshop in Wellington in November. ■

Hydrogen – fuel for thought

Continued from page 3

Agency senior energy and transport analyst **Pierpaolo Cazzola** says.

High-volume manufacturing could be one way of bringing costs down, he says.

"A move to hydrogen should be across the whole energy system."

Cazzola says hydrogen is especially suitable for long-haul heavy transport.

Hiringa (Maori for perseverance, energy) Energy

managing director **Catherine Clennett** aims to create a zero-emission hydrogen energy future for New Zealand – and provide the infrastructure for it.

She says Taranaki is a good base with a port, natural gas supplies and a farming community close by (hydrogen helps make ammonia for fertiliser).

Like some other speakers, Clennett believes hydrogen would make a good export

product.

New Zealand FCEV Consortium director **Dr Linda Wright** considers hydrogen ideal for New Zealand's southern regions where there's high rainfall (to make it), global tourist destinations and heavy passenger transport and maritime vessels that could use it.

In addition, the area has extensive agriculture.

"We have an opportunity to export renewable hydro-

gen," she says.

Markets might include islands where other energy forms are difficult to generate or provide.

Wright describes hydrogen as an "integrated solution" rather than a separate energy source.

Others say hydrogen is an alternative to power forms such as batteries and that it's better not to rely entirely on one form of EV energy.

Converging technologies could also open new pathways for hydrogen use. ■

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One man's vision: Tesla taxis

If you want to do something about climate change and sustainability, just do it.

That's **Bernard Bromell's** philosophy and the reason he started the One Hundred Percent Electric Company (OHPEC) in October.

It could be described as "Tesla taxis".

He's mortgaged his Auckland home, borrowed and scraped to put the company together to provide a sustainable transport service for Auckland, with expansion planned.

OHPEC now has six Tesla Model X electric vehicles with two more due shortly, some of which provide a premium service while others offer a commuter service.

Bromell is keen to add many more to his fleet but is finding the road to an all-electric sustainable future far from smooth.

The Tesla charging infrastructure – particularly superchargers – won't allow him to add the many more Teslas he intends getting, just yet.

He'd like to get a stand at Auckland airport – or at least a button on the i-Site counter there – so people can book a Tesla almost immediately.

And he feels lip service is being paid to encouraging EVs on New Zealand roads, with various authorities yet to allow them to use special transit lanes or provide other incentives.

Bromell's also hoping to get more financial backing to fulfil his aim of being "Auckland's largest small service passenger operator – and one of the cheapest".

But he's not one to sit back and wait for things to happen.

He's putting in long hours to make his dream reality. Just like his cars, he's fully charged and ready to go.

OHPEC's only been going a few weeks so has yet to become well known on the Auckland scene.

But that could soon change with a Tesla taxi ride from downtown Auckland to the airport at \$60 – and pos-

basis, how many people they are prepared to share with, which people they prefer, which seat they prefer, etc, Bromell says.

The system will aggregate passengers from a common origin going to a common destination. It will drive directly from the pickup to the destination as a door-to-door service.



Bernard Bromell and Tesla NZ delivery operation specialist Ange Taylor.

sibly even lower.

"We can make it cheaper and quicker, more comfortable and more convenient than travelling now," Bromell says.

Services offered at this stage include pre-booked, on-demand and chauffeur-driven.

Fees are usually set, with no mileage, surge, peak, booking, holiday, per passenger, airport or flag fall fees included.

At various times the service can even be cheaper than Uber, Bromell says. For instance, next year he's planning a shared ride service that will see passengers using an app to hail a ride in a six or seven-seater.

Passengers will specify the rides they require, which could be on a repeated

The cost will be split between the passengers. What would have cost \$60 for a 20-minute trip if travelling alone will cost about \$10 if shared with five other people.

Again, Bromell has hit a few road blocks with that service around rules using the third row of seats because of access and egress issues. It's something he's working hard to resolve and quickly.

He's also seeking to use the service on bus lanes and expects in a few years it could be close to fully autonomous, especially if Tesla produces a driverless mini-bus.

A door-to-door electric autonomous minibus service travelling in convoy would be one of the cheapest, fastest

and most convenient ways of getting around, Bromell believes.

He says commuters would probably no longer use full size buses or passenger trains, perhaps making the passenger rail infrastructure virtually redundant.

Street parking will be replaced with drop-off and pick-up lanes. Separated cycle lanes will be on most streets. Excess road space will be reclaimed for public space. Our cities will be quieter, less polluted, more accessible and safer, Bromell says.

But he believes the organisations responsible for planning our transport systems are not doing enough about this future.

"They are investing billions of dollars in projects which will be mostly idle in 10 years."

With all the battles Bromell's had, anyone else probably would have given up in frustration. But he's one of those who believes the cause is worth fighting for.

Raised in Papatotetoe and living in east Auckland for 22 years, Bromell was studying nuclear physics but left in his third year to do computer programming.

Self-employed, he's put everything he has into this venture, setting up OHPEC as a normal limited company but running it as a non-profit organisation with any money being reinvested during the next years.

He even welcomes others worldwide copying what he does and he's prepared to help them if necessary – he's that passionate about making a difference.

Visit www.ohpec.com for more information. ■

Disruption the name of the EV game

"Chief disruptor" is the title on **Tony Seba's** business card.

And that disruption is bigger and coming faster than many expect, says the United States instructor in entrepreneurship, disruption and clean energy at Stanford University's Continuing Studies Programme.

The disruption will be so great, cities will need to be redesigned because of transport changes, particularly around electric vehicles, driverless technology and the way we will use transport as a service (TaaS).

The keynote speaker at the APEC electric vehicle and hydrogen technology workshop in Wellington, Seba told about 200 delegates that TaaS changes – especially in relation to autonomous electric vehicles (AEVs) and a decline in car ownership – will see cities change too.

Areas now used for parking will become available for other uses, and extensive EV charging networks won't be needed because ride share and other transport services will have their own high-capacity charging systems, he says.

Authorities are therefore "wasting money" on expensive highway projects, transport infrastructure and more parking, he says.

He likens the change from fossil fuel vehicles to electric to the demise of the horse and carriage – overtaken by petrol-powered cars within 13 years – the smartphone

revolution and the digital camera age.

"It's called technology disruption – when a new product or service helps create a new market."

In the automotive indus-



Tony Seba. Photo: Mark Tantrum Photography

try's situation especially, it's a case of technology convergence, Seba says.

Many businesses will change or disappear, and households and businesses will become more energy independent – especially with growing solar power use and storage as costs drop.

"Every house, business, shopping centre – everywhere – will be solar."

So why do smart people and smart organisations consistently fail to predict disruption and when does the tipping point occur? Seba thinks it's because forecasters tend to follow each other, often failing to plot exponential growth such as the doubling of a product's sales every two years.

Solar uptake, for example, has been doubling every two years since 1994.

He's even written a book about it, an Amazon bestseller called **Clean Disruption of Energy and Transportation**, so he can add author, Silicon Valley entrepreneur and more to his business card – if there's room.

Battery technology is improving rapidly too, and the cost is also dropping and making EVs more affordable.

EVs are ten times cheaper to charge than fuelling internal combustion engine (ICE) vehicles and are cheaper to maintain too with about 18 moving parts compared to 2000 in a conventional vehicle.

Seba says EVs can last for about 800,000km and that's likely to be extended.

"EVs are also more powerful than ICE vehicles. In two years, EVs will be cheaper than ICE vehicles to buy. And you'll be getting a Buick price for a Porsche performance."

By 2025, Seba predicts there will be no new ICE vehicles – "every new vehicle will be electric".

Autonomous vehicle development will be even more disruptive, he says.

Level five or full autonomy could be achieved by 2019 with a "winner takes all" business case that will leave few survivors.

The way we use transport will change dramatically, with vehicle ownership declining and more people using ride services.

"AEVs will be available on

demand and be owned by fleets – not individuals," Seba says.

He expects traditional vehicle sales to collapse by 2024 and the US vehicle fleet to shrink by 80% by 2030 with about 95% of passenger miles done in driverless vehicles.

"Individual ownership of cars will go. In the US, 200 million vehicles will be useless."

Seba expects oil will reach peak demand by 2020 at around 100 million barrels daily, then drop to 70 million barrels daily by 2030.

"Parking will be obsolete with 80% of carparks vacant."

And he reckons households will save about US\$5600 annually as a result of the changes.

Increased mobility will be available for the elderly and people with disabilities, and there will be about an 80% decrease in the evening commute and a 90% decrease in CO₂ emissions, he says.

"This will be the first time in a hundred years that we have a chance to redevelop our cities for humans, such as reusing parking spaces."

International Energy Agency senior energy and transport analyst **Pierpaolo Cazzola** is more conservative around disruption timeframes, telling the workshop government policies, such as those around EV incentives, could dictate them.

Many countries had set goals around low or zero

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Niu leading the scooter revolution

A smart electric scooter designed by a Kiwi is taking the world by storm.

The Niu e-scooter was created by **Joseph Nelson** of Howick, Auckland, while he was working in Shanghai on automotive projects.

A motorcycle enthusiast, he did some research on two-wheelers and learned that Chinese man Token Hu had designed and built his own e-scooter.

Nelson emailed Hu and the two eventually met about six months later to discuss a joint project – the beginnings of Niu.

A technology entrepreneur helped fund them and within a year the Niu N1 was launched in Beijing with the e-scooters produced at a Changzhou factory.

It's making more than 20,000 units a month now and at least 330,000 have been sold worldwide.

They are so popular that Niu groups for community rides have been formed in cities throughout China.

Now they are in New Zealand, available through Niu agent Scootling based in Grey Lynn, Auckland, after owner/director **Andreas Vaioleti** had one ridden to his doorstep to check out.

"I thought it was a good scooter and looked at the specs, got hold of Joseph and it went from there," he says.

Since launching Niu just a few weeks ago, Vaioleti says



The Niu electric scooter.

interest and pre-orders have been "phenomenal".

The first container-load was mostly pre-sold after the Niu was advertised at three shows, including eworld nz and Big Boys Toys.

Vaioleti says the e-scooter is made to a quality and standard expected by western markets.

The customer attraction is

not only due to the e-scooter's award-winning design but its smartphone connectivity – including a dedicated app, GPS enabled system and more.

Niu has a global connectivity agreement with Vodafone, and the e-scooters are pre-installed in Vodafone IoT Sim cards and one-year pre-paid data contracts.

Riders can view their vehicle's status relating to battery charge and journey range. Additionally, security alerts will send a text message to the owner's phone if the scooter is moved without authorisation.

Regular updates of the vehicle's software can be provided too.

The tubular steel frame with aluminium and titanium alloys makes for a high-strength, low-weight scooter featuring leading battery and motor technologies.

LED lighting is included and accessories come with a choice of helmets, a rear carry rack, a storage box and a handlebar-mounted

smartphone holder, plus a wide range of clothing from rain jackets to gloves.

The 1.74kWh Panasonic battery (a 60V, 29AH unit pack) is removable for recharging if required, has a range of up to 80km on a single charge and can be fully charged in six hours from flat, which costs about 50 cents in power.

Up to two more battery packs can be added to the scooter if required.

The Niu N1S model is for sale around \$4499, while the smaller, lighter and more compact M1 Pro sells for about \$4199.

Pop-out foot-pegs allow the N1 to carry a pillion too.

A two-year warranty is provided with the Niu e-scooter.

Just a driver's licence is needed to operate it as the Niu is classed as a moped here and the e-scooter is limited to a 50kmh top speed to comply.

Scootling also rents, sells and repairs scooters, providing parts and accessories as well.

Vaioleti has been riding since the age of 17 and started his business in 2003.

He expects the Niu will help revolutionise electric scootering in New Zealand, where it's ideally suited for urban transport.

Visit www.scootling.co.nz for more information. ■

New Niu has Aaron buzzing

Aaron Skudder bought the first Niu electric scooter in New Zealand. Here's his view:

The decision to be the first in New Zealand to buy a Niu electric scooter was not an easy one.

My Ducati Monster400 had a top speed of 170kmh - the Niu has a top speed of just 60kmh.

However, when I con-

sider the savings in maintenance costs as well as fuel, the trade-off is well worth it.

The Nissan Leaf costs about 2c per kilometre for electricity. I estimate the Niu's battery capacity is about 1/10th of the Nissan,

therefore the cost is about 0.2c per kilometre.

The trip to work and back for a week costs me 40c on the Niu, as against \$20 on the Ducati.

For years, I would sit at the lights revving the Ducati's engine. On the Niu

there is no engine to rev. It's completely silent.

I have been so used to the roar of the Ducati that I find pulling away from the lights in silence almost spooky.

I find the Niu fast enough

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Used batteries in demand

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the VIA and then their shipping agency or others involved to work it through.

"It's typical of what happens within our industry," Vinsen says.

"People come to us with a problem and we research it and introduce standard operating procedures. If it were easy, everyone would be doing it."

Problems such as the battery issue create opportunities, he says.

Carl Barlev, who founded Blue Cars in Auckland about four years ago, has been working on battery refurbishment for the past 18 months and sources replacement cells or modules from wrecked EVs.

"There's not enough so there's a large demand for the batteries," he says.

An electrical engineer who has

worked on power projects around the world, Barlev managed the installation of Tesla's first supercharger stations in Norway and helped with its European expansion programme.

Passionate about sustainability, Barlev says rebalancing battery cells can add two to four years to the life of an EV.

Rebalancing a single cell can cost around \$800-\$900 but loss of battery capacity cannot be fixed other than by topping up the whole battery pack.

Refurbishing an EV battery could cost between \$2000 and \$5000.

Newer EVs have better batteries so it's not such an issue for them.

"We use batteries that are already in the country and as supplies increase then so will demand," Barlev says.

Putting new batteries in older model EVs might take some pressure off, especially if battery costs drop, he says.

Motor Industry Association (MIA) chief executive **David Crawford** says the new vehicle sector is investigating a process for servicing and refurbishing batteries and he hopes to have some idea around its commercial viability by the middle of next year.

EV batteries are generally lasting well in New Zealand, a Flip the Fleet citizen science coalition of electric and plug-in vehicles has found.

Its statistician **Dr Daniel Myall** says one of the most common EVs on our roads, the Nissan Leaf, has an average 2% to 4% loss of range each year.

Flip the Fleet says there's no evidence battery capacity is greatly affected by distance travelled or how many fast charges the EV has had. ■

EV etiquette – it pays to be polite

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being charged to ask if the driver/owner can plug in yours when they've finished.

Wind the charging cord up neatly and place it where no one can trip over it.

If the charging spot is "ICEd" (a fossil fuel vehicle has parked there – a big no-no) don't lose your rag.

Just leave a polite note on the ICE (internal combustion engine) vehicle because it could be an oversight. After reading your note they should be convinced not to do it again.

It's OK for a plug-in vehicle owner to unplug another car if it has clearly finished charging. Try to contact the person before unplugging and leave a note explaining why it was unplugged.

If charging at someone else's house, offer to pay for the power you use. If the resident doesn't have an EV, then seeing how little it costs to charge one might convince them to join the EVolution.

Most EV etiquette is common sense and it doesn't hurt to be polite at all times – not just at Christmas. ■



Disruption the name of the EV game

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emissions so that about 30% of their country's vehicles would transition by 2030, Cazzola says.

"About 95% of global EV sales in 2016 were in ten countries and new EV registrations reached 750,000 units."

A diesel ban in Paris,

where Cazzola lives, has already seen diesel ownership fall with on-selling difficult.

FDG Electric Vehicles (Hangzhou Changjiang Automobile Co) deputy general manager **Steven Yao** told the delegates China is leading the charge with the sale of ICE vehicles due to end there by 2030.

Different regions have different policies but incentives are encouraging changes in heavily congested and polluted urban areas, he says.

And with EV costs dropping, the subsidies for them would reduce considerably.

Incentives are also in place in Japan, with the

Government also encouraging standardisation of charging. Ministry of Economy, Trade and Industry natural resources and energy research director **Tomio Harada** says.

The APEC workshop also covered hydrogen as a fuel, featured in a separate story in this issue. ■

Turners making itself EV-friendly

Electric vehicles are becoming more prevalent in New Zealand's fleet and Turners Group is turning its attention to the changes they will bring.

That includes installing chargers at its Auckland, Wellington and Christchurch sites for private and public use.

But that doesn't mean the company is expecting petrol and diesel vehicles to disappear anytime soon.

Turners Group chief executive **Greg Hedgepeth**, who leads the company's used

vehicle operation, including Buy Right Cars, says it sells less than 100 EVs a year.

"It's a very small part of our base currently.

"EVs are coming to New Zealand and are gathering momentum, with Government ambitions around how many they want on the roads in years to come.

"But as it currently stands there's more opportunity in the used EV space than the new space.

"Some OEMs aren't even supporting core models because they can't make the

prices work because there's no subsidies."

Hedgepeth says Turners is "assessing the situation" as new models with better range are released.

Some older EVs have a range of just 150km, which puts some buyers off, but that will change as newer models which can travel longer distances are released, he says. Used EV imports out of



Greg Hedgepeth

Japan and the United Kingdom, which have potentially had a government subsidy applied, are part of the equation, Hedgepeth says.



However, Turners also sees the New Zealand-new used market as an opportunity as its fleet customers upgrade to newer models.

"That's why we've put in some charging stations around the country so we can deal with those cars and make ourselves EV friendly in the years to come.

"Corporates seem to be

Continued on page 17

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 meridian	Electric Car Plan: Super-low night rates that start at the earlier time of 9pm, until 7am daily. Available for your entire home's electricity needs. Guaranteed for 3 years and includes 15% PPD.	Auckland Wellington Christchurch	\$4.49 \$3.79 \$2.55
Contact Energy	Freedom plan: Excellent night rates, no fixed term, 20% PPD has been included, check if the matching daytime kWh rate will affect your overall bill.	Auckland Wellington Christchurch	\$5.33 \$4.44 \$3.10
Ecotricity	Low Solar: Low Usage plan for EVs & can buy back solar energy, no fixed term	Auckland Wellington Christchurch	\$5.65 \$3.85 \$4.98
Electric Kiwi	One Plan with Hour of Power: Free hour of off-peak power daily – included and calculated to be 2 kWh for charging at 8 amps. Note: this could be different depending on your designated Hour of Power.	Auckland Wellington Christchurch	\$5.82 \$5.85 \$6.05
Flick Electric	Wholesale rates plus their Flick Fee: No fixed term, EV rate in Wellington. Calculated using an average spot price of 5.7c per kWh.	Auckland Wellington Christchurch	\$5.21 # \$3.16 # \$3.57 #
Genesis Energy	Classic plan: Excellent night rates, no fixed term, 10% PPD has been included, check if the matching daytime kWh rate will affect your overall bill.	Auckland Wellington Christchurch	\$5.78 \$3.57 \$3.15
Paua to the People	Cheap As Plan with EV night rates: No fixed term. Calculated using an average spot price of 5.7c per kWh	Wellington	\$2.96 #

*Approximate cost for a full charge of a 24kWh LEAF in the 3 largest centres of NZ.

Please note that rates vary around New Zealand – the above costs were from Mt Wellington in Auckland, Northland in Wellington and Linwood in Christchurch. They can also depend on your meter type & the company you use. Prices vary at the different times of the day eg charging during the day may have higher costs. Flick Electric in Christchurch has higher daytime rates in Winter due to variable pricing from the lines company. The rates we have used above were calculated in July 2017 using a low user cost, overnight rates, includes prompt payment discounts (PPD) if available and GST, excludes daily charge. Please note that prices were correct at time of publishing and are subject to change. Please contact us if you would like any clarification.

Spot prices can go up and down as they are affected by demand in energy and weather conditions. We have calculated these prices using the average spot price of 5.7c per kWh at night over the last 7 years, however this is no guarantee of current or future prices.

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NEW EV CAR TYPES

MAKE	MODEL	TYPE	PRICING RRP est.	APPROX RANGE KMS
Tesla	Model S	BEV	\$121,395	450 - 570 km
	Model X	BEV	\$129,145	415 - 540 km
Renault	Zoe 22 kwh	BEV	\$68,900	220 km
	Zoe 40 kWh	BEV	\$68,900	300 km
	Kangoo van	BEV	\$74,990	160 km
Hyundai	Ioniq	BEV	\$59,990	220 km
	Ioniq Elite	BEV	\$65,990	220 km
Volkswagen	e-Golf	BEV	\$61,990	220 km
BMW	i3 Full Electric	BEV	\$75,700	200 km
	i3 - Range Extender	PHEV	\$86,900	200 km + 150 km
	i8	PHEV	\$281,200	37 km + 400 km
	225xe	PHEV	\$69,800	41 km + 550 km
	330e	PHEV	\$91,600	40 km + 550 km
	530e	PHEV	\$136,400	50 km + 600 km
	740e	PHEV	\$202,700	48 km + 550 km
	X5 xDrive40e	PHEV	\$152,700	30 km + 800 km
Mini	Countryman	PHEV	\$59,900	30km + 500 km
Mitsubishi	Outlander	PHEV	\$60,990	50 km + 500 km
Audi	A3 Sportback e-tron	PHEV	\$69,900	45 km + 600 km
	Q7 e-tron	PHEV	\$158,400	54 km + 800 km
Mercedes Benz	C350 e Sedan	PHEV	\$96,400	31 km + 700 km
	C350 e Estate	PHEV	\$99,400	31 km + 700 km
	E350 e Sedan	PHEV	\$143,500	30 km + 600 km
	GLE500 e	PHEV	\$149,900	30 km + 700 km
	S500 e	PHEV	\$255,000	30 km + 700 km
Porsche	Cayenne S e-hybrid	PHEV	\$177,800	20 km + 750 km
	Panamera Turbo S e-hybrid	PHEV	\$428,400	30 km + 750 km
Volvo	XC90 T8	PHEV	\$134,900	44 km + 600 km
	XC60	PHEV	\$94,900	45 km + 600 km

BEV - Battery Electric Vehicle
PHEV - Plug-in Hybrid Electric Vehicle

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USED EV CAR TYPES

MAKE	MODEL	TYPE	PRICING RRP EST.	APPROX RANGE KMS
Nissan	LEAF Generation 1	BEV	\$8k - \$15k	120 km
	LEAF Gen 2 - 24 kWh battery	BEV	\$15.5k - \$28k	135 km
	LEAF Gen 2 - 30 kWh battery	BEV	\$25k - \$44k	180 km
	e-NV200 van	BEV	\$18.5k - \$32k	140 km
BMW	i3 Full Electric	BEV	\$38k - \$43k	200 km
Mitsubishi	i-Miev	BEV	\$9.5k - \$15k	100 km
	B-Miev Van	BEV	\$12k	100 km
Renault	Zoe 22 kWh	BEV	\$24k - \$38k	220 km
	Zoe 40 kWh	BEV	\$40k - \$45k	300 km
Hyundai	Ioniq	BEV	\$53k - \$57k	220 km
	Ioniq Elite	BEV	\$51k - \$66k	220 km
Kia	Soul EV	BEV	\$35k - \$38k	150 km
Volkswagon	e-Golf (2017)	BEV	\$62k	200 km
Tesla	S P85	BEV	\$115k	350 km
	S 90D	BEV	\$169k	420 km
	X 90D	BEV	\$170k	410 km
	Fortwo	BEV	\$18k - \$20k	100 km
Mercedes Benz	B250 e	BEV	\$50k	140 km
	C350 e Sedan	PHEV	\$65k	31 km + 700 km
	GLE500	PHEV	\$120k	30 km + 700 km
	E350 e	PHEV	\$120k	30 km + 600 km
	S500 e	PHEV	\$135k	30 km + 700 km
	S500 e	PHEV	\$135k	30 km + 700 km
Toyota	Plug-in Prius	PHEV	\$17k - \$37k	26 km + 800 km
Audi	A3 Sportback E-Tron	PHEV	\$60k - \$65k	45 km + 600 km
	Q7 e-tron	PHEV	\$148k	54 km + 800 km
	Countryman Cooper SE	PHEV	\$69k	30km + 500 km
BMW	i3 REX	PHEV	\$40k - \$68k	200 km + 150 km
	225xe	PHEV	\$55k	41 km + 550 km
	330e	PHEV	\$60k	37 km + 550 km
	X5 xDrive40e	PHEV	\$140k	30 km + 800 km
	i8	PHEV	\$148k	37 km + 400 km
Mitsubishi	Outlander	PHEV	\$31k - \$68k	50 km + 500 km
Volvo	XC90 T8	PHEV	\$130k	44 km + 600 km

BEV - Battery Electric Vehicle
PHEV - Plug-in Hybrid Electric Vehicle

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Harwood Cars 027 492 2218 www.harwoodcars.com	Auckland
PlugN Drive NZ	Auckland
Volt Vehicles	Auckland
Farmer Auto Village	Tauranga
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Drive EV	Taupo
The Car Man	New Plymouth
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Cooper Auto Company 04 586 2295 sales@cooperauto.co.nz	Wellington
The Car Company Nelson	Nelson
HVS Motors	Timaru
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MICRO EVS



Getting mellow on a MeloYelo

"They call me Mellow Yellow – quite rightly," the Donovan song goes. And the last verse about "electrical banana... bound to be the very next phase" could apply to electric bikes too.

MeloYelo e-bike sales were founded to help fund EVelocity, a project-based learning programme where student teams design, build and race two to four-wheel electric vehicles.

A wide range of his and hers e-bikes are offered, from the all-terrain The Cross and the fat-tired FAT20 to urban cruisers and folding bikes.

They're made in China under specification from carefully selected brand-name components, with 4amp chargers topping up the frame-mounted Samsung battery cells in around two hours.

MeloYelo contracts an independent company of e-bike experts to inspect and test ride the bikes at the factory before shipping them to New Zealand, where they are again checked and tested. Free after-sales service checks are done at two weeks and a year.

So, you're getting a good, reliable ride for a good cause.

We did our own test on The Cross.

Powered by a rear-hub Bafang 36-volt motor with a 300Watt output, it was zippy on the tarmac.

Its speed is governed to around 32kmh, although The Cross seems capable of much more.

Pedal assist on this goes up to nine so you can use all the muscle power you want or opt for an easy cruise – handy into head winds and on hills. And there's a thumb throttle for an extra boost when needed.

Disc brakes front and rear ensure plenty of stopping power and using them cuts out the motor (like most e-bikes) so the rider is not pulling against the power assist.

Front suspension forks provide a smooth ride.

An easy-to-read display unit gives you all the gen on battery level, speed, distance and more.

The front LED headlight running off the main battery is nice and bright and a bright rear light runs from its own battery.

The bike's owner/distributor, **Colin Lunt** of Tauranga (distributors are called "associates" – usually retired or semi-retired people looking for a part-time income) had been riding the bike for a couple of weeks and loved every moment.

Test rider *EVtalk* editor **Geoff Dobson** wore high visibility reflector road bike gear and was trialling a Livall smart

helmet, which includes flashing rear lights (even indicators) – see separate review.

The Cross comes in either grey or red (as in this case) and at 27.5 inches has 2.1-inch wide off-road tyres, which do make some road noise, and mudguards over both wheels.

Weighing about 21kg, the bike feels heavy but stable – useful for trail riding.

This one had seven gears. More might be handy but these seem sufficient for the task.

Lunt has used the bike off-road around Papamoa in Tauranga and swears by its trail rideability.

Our aim was to test it on Riverhead or Woodhill forest bike trails north-west of Auckland but miserable Labour Weekend weather put paid to that.

The saddle supplied was wide and comfortable but riders used to narrower racing-style seats could find an hour on the wider one a little tiresome.

Its pedals didn't have clip-ins either, although these can be fitted if you want to save some pedalling energy.

A drink bottle holder wasn't fitted

to the test bike but these can be easily added, either behind the saddle or – using cable ties – to the frame.

Over a 23km one-way run from downtown Auckland to Swanson in West Auckland, mainly via the north-western cycleway, The Cross could fairly fly in the higher pedal assist range.

Our week-long test added 95km to the 107km already on its clock and it only needed charging twice during that week – doing nearly 70km on one charge.

If anything breaks it should be covered by a two-year warranty on all parts.

"The Cross is one of the most popular of the 90 e-bikes recently delivered," Lunt says.

"We've been selling them consistently and expect sales to increase closer to Christmas.

"Many couples are buying in pairs – a Cross for him and an ST (Step Through) for her or the recently-arrived STX a 26-inch upgraded all-terrain step-through."

Prices start at \$2166, with the entire range – including two folding bikes – all coming in at under \$2500.

The e-bikes include a fast 4amp charger and tool kit and a remote-controlled alarm is also available for about \$35.

Its battery should last around seven years if looked after and charged up about twice a week, and can be recycled at the end of its life.

Lunt says he got in as a MeloYelo associate because he believes in what EVelocity does and that e-bikes are great for commuting as well as for having fun.

"I love them, it's not cheating – it's controlled exercise."

He regularly does about 30km trips on both the road and tracks between Papamoa and Mt Maunganui.

Lunt says e-bikes are "not just bikes – there's a lot of sophisticated electronic equipment behind them".

And if you don't want to buy a new e-bike, you can get your existing road bike upgraded to an e-bike for around \$1700.

Visit www.meloyelo.nz for more information. □



EVtalk editor Geoff Dobson tries all-terrain e-bike MeloYelo's The Cross around the Viaduct Harbour in Auckland.



MICRO EVS



The Magnum's an electric bullet

Breezing down the bike paths on an electric Magnum Metro Plus commuter bicycle is the best way to get to and from work.

Especially with summer here.

Like its name, the Magnum goes like a bullet, if you want to crank it up.

The pedal assist ranges from 0 (all pedal and no power assist) to 6 – the latter getting into flying territory.

I prefer around 4 or 5, so you get some exercise while still breezing up the hills. Even in that range I was getting between 35-40kmh, dropping to around 20kmh on the steeper hills.

A thumb throttle gives an extra boost when needed. Front and rear disc brakes provide plenty of stopping power.

You can wear your work clobber on it if you want, though I prefer to change into cycling gear, even on something that can do most of the work for you.

Testing the battery range. I found the Magnum commuter did more than 70km on a single charge. Even when the battery had dropped from five bars to one (and that was flashing on and off towards the ride's end) I could get

home by dropping pedal assist to 1 or even 0.

Despite being a heavy bike at about 25kg, just using the pedals without power assist wasn't as hard as I expected. It's not the sort of bike you can easily lift (my road bike is carbon fibre and can be picked up with one hand).

As a commuter bike, it comes with full mudguards front and back, a comfortable leather seat, nice leather-wrapped handlebar grips, a rear carrier (which can be fitted to any other Magnum), a front light and rear battery light, and standard road tyres.

The handlebar height and reach can be easily adjusted for upright comfort without tools, using a lockdown lever on the stem.

Front fork suspension takes the jolt out of bumps.

It has eight gears, although other Magnums offer more, and has a 350Watt rear hub motor.

Magnum supplier Electrify NZ has a range of other brand e-bikes which include some with central hub or mid-drive motors providing improved torque.

The Magnum Metro and Metro Plus

bikes are priced around \$2799 – and you can get a \$250 discount if you are a Mercury customer.

Mountain bike-style Magnums such as the Mi5 (21 gears) and Ui5 are proving very popular for urban and well as trail use. They're also cheaper at around \$2599. The Mi5, for instance, was ranked in Electric Bike Report's best electric bikes 2015-16.

Warranties, such as two years on Magnum Metro Plus parts, are offered.

Electrify NZ, which has a warehouse and demo centre in Hamilton and stores around the country in Dunedin, Tauranga and Auckland's Freeman's Bay and on the North Shore, also sells Bottecchai, Gepida and Stromer brands.

You can get folding e-bikes, tandems and bike parts and accessories such as saddlebags too.

Visit www.electrify.nz for more information. ■



EVTalk editor Geoff Dobson finds the Magnum commuter e-bike an easy ride.

MICRO EVS



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"A really open mind" – Vinsen on ITS

Huge change is coming, new Intelligent Transport Systems (ITS) New Zealand board chairman **David Vinsen** says.

"There will be a series of tipping points. We don't know what the full impact will be on New Zealand when it happens. It might happen more quickly than anyone thinks."

The Imported Motor Vehicle Industry Association (VIA) chief executive, Vinsen has more than 40 years' automotive industry experience and says New Zealand's fleet has a unique make-up with so many new vehicles that will have some impact on EV uptake.

Then there's the possibility of retrofitting EVs "quite cheaply", Vinsen says.

"We have a really open mind what might happen. We're just trying to understand the possibilities."

ITS has to be careful that it's not just talking to people with similar views, he says.

His extensive governance experience is considered invaluable for driving the organisation's commitment to advocate for transport technology solutions which save lives and make transport more sustainable and efficient.

He also brings extensive connections to the vehicle industry.

"I'm very pleased to have the unanimous support of the board to lead this exciting organisation," he says.

"I feel that my experience in governance and understanding of the vehicle supply chain complements the

other board members which represent the varied aspects of the ITS eco-system."

Vinsen says a disruption of transport is underway, led by innovators creating solutions designed to enhance the experience of transport users and operators.

"New Zealand is not immune to some of the challenges this transformation may create."

The "overwhelmingly positive" feedback from members returning from the recent ITS World Congress in Montreal is encouraging, he says.

"New Zealand is leading the world. We have a supportive and forward-looking transport ministry, progressive national and regional governments and New Zealand has fewer regulatory and operational obstacles that will set back the benefits of emerging technology.

"That is particularly advantageous for local innovators, and international companies looking for a test bed."

Vinsen has been VIA chief executive since 2003. The association represents the interests of the businesses involved in importing, preparing, wholesaling and retailing most of the used vehicles imported from Japan, Singapore and other jurisdictions.

VIA members include importers, wholesalers, Japanese auction companies and exporters, shipping

companies, New Zealand government-contracted inspection agencies, ports companies, compliance shops and other service providers to the trade.

Vinsen's industry experience ranges from retail sales in family-owned busi-

nesses through to being the founding chief executive of an international e-commerce auction company.

He is a past president of the Motor Vehicle Dealers Institute and was

the longest-serving trustee of its statutory fidelity fund.

Vinsen has recently been appointed to the Government's Electric Vehicles Leadership Group and chairs the Parnell Community Trust, a not-for-profit service organisation with more than 80 staff.

VIA's policy analyst **Kit Wilkerson** already represents New Zealand in various international transport technology forums. However, Vinsen is the only board member drawn from the vehicle trade.

"Through our increased involvement with ITS New Zealand, we aim to improve our understanding of the coming disruptions to our industry and the challenges and opportunities that these will bring," Vinsen says.

ITS encompasses the emerging technologies of autonomous vehicles (AVs), shared mobility and mobility as a service (MaaS) and technology systems and infrastructure that help monitor, manage and collect data

across all transport modes.

HMI Technologies Group founder and chairman **Mohammed Hikmet** has been re-confirmed as ITSNZ's president and continues to lead international activities as New Zealand's representative on the ITS Asia-Pacific Board and the ITS World Congress organising committee.

ITS New Zealand provides leadership in the promotion, development and facilitation of ITS in New Zealand to achieve a sustainable, effective, efficient, safe and environmentally friendly transportation system.

It holds informative and educational events and supports New Zealand organisations to build international relationships that benefit the country.

The new board is focused on developing its forward events schedule and business plan.

Events it arranges feature leading international and local experts, with the organisation hoping to inspire, educate and generate informed discussion.

Upcoming events feature analysts from the International Transport Forum, a Dutch transport futurist and the head of ITS Norway.

Board members include vice-president **Andrew Gurr** (Fusion Networks), **Deryk Whyte** (DWG Consulting), **Mike Rudge** (Stantec), **Stephen Hewett** (Beca), **Lee McKenzie** (Ministry of Transport), **Blair Monk** (Aurecon) and **Peter Filbey** (Auckland Transport).

Visit ITSNZ.org for more information. ■



David Vinsen

Designers dig deep with video camera



DeepLens is Amazon Web Services' (AWS) first fully programmable, deep learning-enabled wireless video camera designed for developers.

It was revealed during AWS chief executive **Andy Jassy's** keynote address at its annual re:Invent conference in Las Vegas.

AWS and Intel collaborated on the DeepLens camera to provide builders of all skill levels with the optimal tools needed to design and create artificial intelligence (AI) and machine learning products.

AI and machine learning are poised to power a new generation of smart industries, including smart homes, smart retail, smart industrial and many others, making

lives easier through intelligent interactions with devices.

The collaboration reinforces Intel's commitment to providing developers with tools to create AI and machine learning products, and follows the recent introduction of the *Intel® Speech Enabling Developer Kit*.

It provides a complete audio front-end solution for far-field voice control and makes it easier for third-party developers to accelerate the design of consumer products integrating Alexa Voice Service.

DeepLens combines high amounts of processing power with an easy-to-learn user interface to support the training and deployment of models in the cloud.

Powered by an **Intel Atom X5 processor** with embedded graphics that support object detection and recognition, DeepLens uses Intel-optimised deep learning software tools and libraries to run real-time computer vision models directly on the device for reduced cost and real-time responsiveness.

"We are seeing a new wave of innovation throughout the smart home, trig-

gered by advancements in artificial intelligence and machine learning," Intel Smart Home Group general manager **Miles Kingston** says.

"DeepLens brings together the full range of Intel's hardware and software expertise to give developers a powerful tool to create new experiences, providing limitless potential for smart home integrations."

Developers can start designing and creating AI and machine learning products in a matter of minutes using the preconfigured frameworks already on the device.

Apache MXNet is supported now and Tensorflow and Caffe2 will be supported in the first quarter of next year. ■



DeepLens – a deep learning-enabled wireless video camera.

Turners making itself EV-friendly

Continued from page 10
getting into EVs more than the retail public. It's about sustainability and linking that to their brand imagery.

"That's where the initial

opportunity is."

Hedgepeth is also interested to see how the new Government will influence the EV market locally.

"Previously, there was a lot

of talk about getting more EVs on the road, but not the willingness to subsidise them.

"It will be interesting to see how that changes under

the new Government and how they might turn it on its head.

"Whenever you have subsidies on EVs, they take off." ■

New Niu has Aaron buzzing

Continued from page 8
for commuting. A 50cc scooter pulled up next to me at the lights. I could accelerate at twice its speed.

But the scooter was able to overtake me on a downhill stretch because the Niu is speed limited to 50kmh to comply with regulations that class it as a moped.

The advantage of a mo-

ped classification is that you do not need a full motorcycle licence to ride it.

The Niu has a built-in GPS and alarm, plus a smartphone app for iPhone and Android for tracking the bike should it ever be stolen.

It also has a 10kg removable battery. I'm able to charge the battery in

a standard 10amp power socket at work. A full charge lasts about 80km.

The Niu will take three batteries, extending its range to about 240km.

What are the downsides of the Niu over moped-classed petrol scooters? None that I can think of. The Niu is better in every respect.

It is reasonably priced at \$4500. I would save that amount over a few years compared with owning the Ducati.

The only downside for me in owning a moped class of vehicle is the inability to ride on the motorway.

I could not find a faster electric bike for sale in New Zealand. It seems that New Zealand is behind other developed countries in adopting this technology. ■

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The AV uses computers or printed circuit boards linked to GPS, Lidar (light detection and ranging - a remote sensing method using a pulsed laser to measure distances), cameras (perhaps including infra-red) and other devices to gauge its surroundings and any obstacles.

The first AVs are expected to be driverless shuttles operating within a closed circuit such as an airport, providing a transition between various transport hubs such as rental car yards, public transport stops and the like.

Many might carry only a small number of people - four to eight - in the early stages, depending on demand.

The first could be operating next year.

Kiwi company HMI Technologies' Ohmio Automation expects to have its first four Ohmio self-drive vehicle (SDV) prototypes ready by early next year, and some overseas projects like the Fisker Orbit shuttle are likely to be providing them before the end of 2018.

Ohmio shuttles have self-mapping and draw on artificial intelligence (AI) so once they've completed a route they can self-drive it repeatedly.

HMI, Ohmio's parent company, has been holding SDV trials in Christchurch, Sydney and Melbourne. It

Many examples of issues for autonomous vehicles peculiar to one area are being found during a world tour by a Mercedes-Benz test AV.

It's been learning to deal with kangaroos in Australia before finding out what New Zealand has in store from December. Its tour ends in

by about 2025-30 more people will switch to ride-sharing and other transport forms, rather than own their own vehicle.

The years 2020-23 are widely seen as the tipping point for AVs, likely to be taken up by ride-hailing services, public transport providers and others.

Some of the key drivers for this include an aging population, congestion, transport choices and the fact that vehicles are only used for 2%-5% of their life.

If you can summon your driverless ride from a pool area using your smartphone then who needs garages and parking buildings, vehicle maintenance, insurance, road police, traffic infringements?

The list goes on.

Authorities will have to think about transport-related infrastructure, including signs and intersection signals - perhaps only needed for pedestrians and e-cyclists.

Neighbourhoods might even have a vehicle pool to share, no doubt some of them autonomous.

The cheaper cost of transport will appeal to people in all walks of life. Some say poorer sectors might even switch to it en masse first.

Driving your own car could eventually become a hobby - or even a luxury.

In fact, will you even need a driver's licence? ■



The Ohmio LIFT driverless shuttle could be ready in New Zealand early next year.

launched its own SDV technology (Ohmio) on September 12.

Passengers can access AV shuttles using a smart card like Auckland Transport's Hop card.

Using AVs on public roads is another step up. New cars already have some form of autonomy, such as cruise control, self-parking, pedestrian and cyclist warning systems, blind spot detection, lane keeping assist and more.

But they have to read a changing environment too, particularly road signs which can instantly alter their messages.

the United States in January.

Countries are looking at rules and regulations around autonomous driving too, because they present a whole new chapter, particularly for insurance purposes.

AVs are expected to be safer than human drivers - more than 90% of motor accidents are caused by human error. But who's at fault if there's a crash involving an AV?

Plenty of chances to test that will probably come in the next few years when AVs start sharing the roads with more conventional vehicles and semi-autonomous ones.

Many pundits predict that



Autonomous driving the biggest game changer

BY INTEL CORPORATION CHIEF EXECUTIVE BRIAN KRZANICH

So much of the discussion around autonomous driving has naturally focused on the car as a mode of transportation.

But as driverless cars become a reality, we must start thinking of the automobile as a new type of consumer space.

In fact, we have barely scratched the surface in thinking about the way cars will be designed, the interaction among passengers and how passengers will spend time while they are riding and not driving.

In this respect, autonomous driving is today's biggest game changer, offering a new platform for innovation from in-cabin design and entertainment to life-saving safety systems.

Advancing what's possible in autonomous driving, at the Los Angeles Auto Show Intel announced a collaboration with entertainment company Warner Bros to develop in-cabin, immersive experiences in autonomous vehicle (AV) settings.

Called the AV Entertainment Experience, we are creating a first-of-its-kind proof-of-concept car to demonstrate what entertainment in the vehicle could look like in the future.

A member of the Intel 100-car test fleet, the vehicle will showcase the potential for entertainment in an autonomous driving world.

The rise of the AV industry

will create one of the greatest expansions of consumer time available for entertainment we've seen in a long while.

As passengers shift from being drivers to riders, their connected-device time, including video viewing, will increase. In fact, recent transportation surveys indicate the average American spends more than 300 hours a year behind the wheel.

With this expansion of available time, Warner Bros and Intel imagine significant possibilities inside the AV space. Not only do we see passengers consuming content ranging from movies and television programming, we imagine riders enjoying immersive experiences never seen before, courtesy of in-cabin virtual reality (VR) and augmented reality (AR) innovations.

For example, a fan of the superhero Batman could enjoy riding in the Batmobile through the streets of Gotham City while AR capabilities render the car a literal lens to the outside world, enabling passengers to view advertising and other discovery experiences.

Although the possibilities of in-cabin entertainment are fun to imagine, the ultimate test for the future of autonomous cars is going to be winning over passengers.

The technology will not matter if there are no riders who trust and feel comfortable using it.

We believe the technology Intel is bringing to market is

not simply about enjoying the ride – it is about saving lives. In fact, autonomous systems are the logical extension of seat belts, air bags and anti-lock braking systems.

And the Mobileye ADAS (advanced driver assistance system) technology on the road today is already saving lives. Current ADAS products from Mobileye have proven to reduce accidents by 30%, saved 1400 lives, prevented 450,000 crashes and saved US\$10 billion in economic losses.

However, we cannot stop there. Our long-term goal has to be zero driving-related fatalities.

To reach it, we need standards and solutions that will enable mass production and adoption of autonomous vehicles.

For the long period when autonomous vehicles share the road with human drivers, the industry will need standards that definitively assign fault when collisions occur.

To this end, Intel is collaborating with the industry and policymakers on how safety performance is measured and interpreted for autonomous cars.

Setting clear rules for fault in advance will bolster public confidence and clarify liability risks for consumers and the automotive and insurance industries.

Already, Intel and Mobileye have proposed a formal mathematical model called Responsibility-Sensitive Safety (RSS) to ensure, from a

planning and decision-making perspective, the autonomous vehicle system will not issue a command leading to an accident.

And finally, safety systems of the future will rely on technologies with maximum efficiencies to handle the enormous amount of data-processing required for artificial intelligence.

Earlier this year, we closed our deal with Mobileye, the world's leader in ADAS and creator of algorithms that can reach better-than-human-eye perception through a camera.

Now, with the combination of the Mobileye "eyes" and the Intel microprocessor "brain," we can deliver more than twice the deep learning performance efficiency than the competition.

That's a huge difference and one that matters. More than two times the deep learning efficiency leads to better fuel economy and less expensive cooling solutions.

From entertainment to safety systems, we view the autonomous vehicle as one of the most exciting platforms today and just the beginning of a renaissance for the automotive industry.

The single most important factor driving our autonomous future is data – how to process, manage, move, share, store, analyse and learn from it.

The Intel advantage is a consistent architecture the industry can work with that scales from a developer's laptop to the data centre. ■

Off-grid is the future

BY IDTECHEX CHAIRMAN
DR PETER HARROP

The extension of national grids is nowhere near to keeping up with population growth in Africa and some other places.

Even in the United States, the sheer cost of upgrading the national grid – with its vulnerability to terrorism and natural disasters – is leading to a successful search for alternatives.

The new IDTechEx report *Off-grid Zero-emission Electricity: New Markets, New Technology Roadmap 2018-2038* reveals the market drivers and the changing technologies involved.

It concerns rapid expansion of clean distributed energy as micro-grids and mini-grids of 0.5kW- 1MW.

There are detailed forecasts and technology roadmaps. The introduction explains off-grid history, definitions, comparison of the ten energy harvesting technologies, the fringe topic geothermal and nature, challenges of off-grid batteries and electricity cost comparisons.

A chapter on progress and opportunities worldwide profiles continents and 21 countries.

The report compares technologies in more detail than earlier. The emphasis is on what is new and important for the future: this is seen in the drill-down chapter on electricity from light and infrared scoping perovskites etc, building integrated photovoltaics (BIPV), solar versus piezo roads and "Silent City".

That leads to a chapter on electricity from wind, including a close look at the newly

commercial aerial wind energy (AWE) and such things as piezo and photovoltaic sails as multi-mode harvesting becomes important.

Off-grid electricity from water is then revealed with a detailed look at off-grid battery technologies at the end of the report.

The presentation is compact with detailed infograms and forecasts, and a creative, critical approach by the

There are detailed forecasts and technology roadmaps. The introduction explains off-grid history, definitions, comparison of the ten energy harvesting technologies, the fringe topic geothermal and nature, challenges of off-grid batteries and electricity cost comparisons.

many PhD level analysts who have toured the world to gain information using local languages for technical interviews.

It is shown that the biggest markets are on the mainland, initially, mainly in developing countries, but mini-grids are popular in island states – both developed and developing.

It is estimated there are more than 10,000 inhabited islands around the world with an estimated 750 million islanders, and the report profiles many and gives statistics, trends and achievements.

In most cases, renewables are already a cost-effective replacement for their diesel generators and others benefit from solar panels taking much of their load.

The report questions the popular belief that electric vehicles will provide an ongoing increase in demand and funding for grids, arguing that the vehicles and the charging stations where

needed will become micro and mini-grids, not connected to national grids.

For example, Tesla promotes solar bodywork and **Elon Musk** says he will take all of his charging stations off-grid worldwide.

Audi has licensed Hanergy solar body work but Hanergy has already demonstrated its own purely solar cars for launch in 2020.

There is a clear roadmap

to 2.2 million larger vehicles becoming candidates for energy independence in 2028, including the largest ships having zero emission instead of each emitting NOx and particulates of millions of cars.

New forms of wind and solar power will be involved. Indeed, the new solar roads will appear on ships, not just in towns, where they have 2.5 times the available area of building roofing.

The trend is obvious: off-grid is the way to go.

Learn why off-grid is now a prudent diversification for utilities and fossil fuel companies. Indeed, energy company E.ON, Austin Energy and Shell have already invested in AWE.

The report shows how off-grid is a fertile hunting ground for start-ups and everything in between, with many new technologies and applications arriving.

The potential is considerable and for the first time it

has now been fully scoped by this report.

There are actual examples of people coming off-grid and enjoying both lower cost and better continuity of service. Learn how 3MW large ships will become zero emission – a sophisticated travelling island grid.

There is a comprehensive analysis of technologies – systems, energy harvesting and energy storage. Under-



stand the significance of AWE using tethered drones, assess solar roads, electric wave blankets and more.

Many forms of "blue energy" suitable for mini and micro-grids are revealed – magnetostriction, triboelectricity, 6D motion harvesting, hurricane-proof small water turbines and new wind turbines that downscale efficiently for green micro-grids.

Australia and New Zealand are included in the report, available through www.idtechex.com/research/reports/off-grid-zero-emission-electricity-2018-2038-new-markets-new-technology-roadmap-000562.asp

Off-Grid Electric Vehicle Charging: Zero Emission 2018-2038 is a related report.

Visit www.idtechex.com/research/reports/off-grid-electric-vehicle-charging-zero-emission-2018-2038-000569.asp for more information. ■



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Let's talk the same language

I won't sugar coat this. Electric vehicle technology is packed full of technical terminology and it is a very complex and technically demanding field.

While we are all enjoying the warm glow of being in the early adopter stage of this exciting transport and technology revolution, there's no better time to be working hard to get on the same page and using common terms and language.

Here are some terms you might have heard and the correct usage for them:

AC: Electric vehicle (EV) motors are either Alternating Current (AC) or Direct Current (DC).

Amp: An amp or amperage is the level of electric current that is available. The mathematical equation (if you are interested) is: $\text{amp} = \text{watts/volts}$ (an amp equals watts divided by volts).

Battery: Batteries are exactly what you think they are. Batteries store electricity and deliver it to your motor which makes your wheels turn. Very simple really.

BEV (battery electric vehicle): This is a fully electrically powered car. BEV do not have range extender, hybrid or any combustion engine technology. BEV in New Zealand include the Nissan Leaf, Tesla Model S and Roadster, and the Mitsubishi iMiEV. You can also get a full electric BMW i3, however, most BMW i3s you see in New Zealand have a range extender (that means you can put petrol or diesel in and drive it like a normal hybrid or ICE vehicle).

Charging: The act of putting electricity into your car's batteries. It is refueling for EVs.

Charging station: The place where you plug in your car and replenish its store of electricity. There are fast and slow (or trickle) chargers.

Destination charging: When you hear people talking about destination charging, they are talking about the chance to charge at a custom-fitted charging station. There are hundreds of thousands of these chargers throughout the globe. Businesses can choose to offer destination charge points to customers and employees. Some of the most talked-about des-

Dee West, alongside her husband Steve, has been one of the most prominent faces in the EV enthusiast arena, starting the 'Leading The Charge' movement while investing in the ChargeNet NZ private network of charging infrastructure. She is a leading sustainability communicator through her work with communications agency, SolPR, which she owns.



tinuation chargers in New Zealand are those at Sylvia Park mall in Auckland. You can also find charging facilities at several hotels, shopping malls, offices and parking facilities throughout New Zealand.

Fast charging: Fast charging simply refers to charging that delivers 20 or more amps to your vehicle. The Charge Net NZ fast charging units deliver 50amps and will "fill up" an entry-level vehicle from empty to 80% battery capacity in around 20 minutes.

ICE: ICE is a term used widely in EV circles - it's the acronym for internal combustion engine. Traditional cars have these.

Opportunity charging: This refers to EV drivers filling up their batteries in locations that do not have a custom-fit charging station. In a pinch, you can plug in an EV anywhere you can plug in a microwave or hairdryer (provided you have the appropriate cord). Opportunity charging locations can be campgrounds, offices or your friend's kitchen if you safely hang the cord out the window to give your car a charge while you catch up over coffee.

PHEV (plug-in hybrid electric vehicle): PHEV, or P-HEV as some people pronounce it, have some full battery electric range and also have hybrid motors that can be referred to as range extenders. The most popular PHEV in New Zealand right now is the Mitsubishi Outlander. The BMW i8 and i3 are also well known PHEV vehicles in the New Zealand market.

Rapid charging: Just another term used to describe fast charging. Rapid charging is charging that delivers more than 20 amps to your batteries.

Slow charging: Also known as "trickle charging", slow charging delivers anywhere from 7 to 20 amps of electricity to your vehicle's batteries.

A slow (or trickle) charge will take several hours to fill up an entry level vehicle like a Nissan Leaf.

Supercharger: Tesla own rights to the term supercharger (it has trademarked the term) so when you hear the term supercharger or supercharging network, chances are they are talking about the Tesla network of superchargers.

Torque: Torque is the major factor in a car's accelerative ability. A lot of torque (which is delivered cleanly through EV technology direct from the motor to the wheels) means the car's acceleration is very fast. Petrol and diesel engines deliver torque over a curve as revs per minute increase, meaning they have peak power at a given RPM. Electric motors on the other hand deliver maximum torque with no engine revolutions, meaning acceleration from standstill is extremely powerful.

Range: The distance an EV can go on a charge.

Range anxiety: The fear of being caught short and running out of range.

There's a lot more to cover but I think this is a great start.

Don't get overwhelmed or bogged down by terminology. I hope that this article goes some way to helping us all get on the same page when we are talking amongst ourselves or the wider community or to anyone in the general public who might be interested in knowing more about EVs. ■

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Short range vs self-drive

Tesla might be the poster child for semi-autonomous driving but it's not the only player in the space.

Mercedes-Benz arguably offers as much functionality with more stability – and unlike Tesla, it has not turned its systems off for development and changed its offering.

From the launch of the new E-Class, the Mercedes-Benz "DISTRONIC PLUS" system has just worked. And worked well.

And now you can have it in plug-in form.

The E350e takes the excellent E-Class platform, with all its associated technology, and adds a small but useful level of battery-only range. A 6.2kW battery supplies a 60kW electric motor wedged between a 155kW and a nine-speed automatic transmission driving the rear wheels.

Best left in a combined hybrid mode, you can also shift to eDrive mode. Mercedes-Benz claims it will give 33km of electric-only driving.

Expect more like 25. We made it from Mt Wellington to Albany with the air-conditioning on in moderate traffic.

You aren't going to make great trips on EV only but if you live in Auckland's inner suburbs a return trip to the office is likely to be possible.

Mercedes-Benz suggests fuel consumption as low as 2.4 litres per 100km. On our 100km test cycle, starting with a full battery and using air-conditioning, we aver-

aged around 5.6 litres per 100km.

A simple, yet very intelligent, system is used to indicate how much energy is on offer without kicking the petrol engine into life.

The accelerator is "haptic" – it offers more resistance at the point where depressing it more will need the engine. Essentially, you choose if you want to use petrol to accelerate quicker.

A power metre on the all LCD screen dash also shows a line you can go up to.

Charging is through a type-2 port mounted into a slightly awkward location on the rear bumper.

A standard, switchable amperage charging lead is supplied.

A handy storage spot under the boot floor means there's no need to strap a case into the boot space when it is not in use.

Space is already restricted by a slightly raised boot floor to accommodate the battery. When plugged in, pre-conditioning can be scheduled.

The E-Class is a long, low and classically handsome vehicle. It looks just right parked outside a hotel as a courtesy vehicle, where short runs and access to a charging point would make a lot of sense.

Inside are acres of space in the front and to the rear, with high-quality surfaces and comfortable soft leather.

Two huge LCD screens step up as both the dash-



board and infotainment system. The screen immediately in front of you features the usual driving controls, fuel and battery levels, and indicators for the DISTRONIC system. There is also a heads-up display.

The indicator, cruise control stalks and steering column-mounted shifter will be familiar to Tesla drivers – it supplies them to the EV-only brand. Steering wheel controls feature touch-sensitive pads.

The infotainment screen includes Apple CarPlay and Android Auto functionality. Good old-fashioned satellite navigation is also standard. An exceptional 13-speaker Burmester sound system is part of the E350 package.

A panoramic glass sunroof is also standard and comes with an electric roller blind to keep sun levels low.

Safety is well catered for. The car has a total of nine airbags, anti-lock brakes,

electronic stability control and a Pre-Safe package, which in the event of a potential impact prepare it to protect occupants. The E350e is rated five-star ANCAP.

So what's it like to drive? In the large luxury sedan market, it is the comfortable, silky-riding choice up against sportier options.

The ride is super-plush, thanks to air suspension, but it is not too much of a boat. The steering is responsive although it lacks a lot of feel.

The engine combination offers a healthy performance but when the petrol engine kicks in, it's not the most pleasant thing to listen to.

DISTRONIC PLUS is excellent. Get on the motorway or a well-marked highway, pull the cruise control stalk towards you and select your speed. It will maintain a selected distance from the car in front and keep you driving pretty well between the lines.

If you want to change lanes, indicate and the car will do it for you. You need to keep your hands on the wheel and it will struggle when lines are faded or unclear but overall, it's pretty impressive.

We like the E350e. Its range might be short but it's a solid choice if you want a level of "autonomous" driving. Live in the leafier suburbs close to the city and all your driving will be EV-based.

The bill? \$143,500. ■

EV registrations rising fast



Electric vehicle registrations continue to soar in New Zealand, with the 465 registered in November contributing to a total national fleet of 5804.

Used light EVs (332) made up the bulk of last month's registrations, latest Ministry of Transport figures show.

New light EV registrations during October and November were 135 and 131 respectively, the highest in this category over other months in the year.

That brought the total for all-electric new vehicles to 1207 and new light plug-in hybrids to 1164.

Used light electrics at 2986 comprise the bulk of the 5804 EV fleet.

Total EV registrations this year have reached 3286 – 1170 more than last year's 1516 total.

Auckland (2868) still dominates EV ownership, with Wellington (744) and Canterbury (702) following.

Japan is still the main country of origin for light used EVs with 661 registrations from there. The Nissan

Leaf was the most popular (512 registrations).

Biggest month ever for i3

The BMW i3 hit the top of the new EV market in November with a huge haul of 43 vehicles, many destined for the YooGo shared fleet project in Canterbury.

Hyundai's **Ioniq** was second on 17, followed by the Tesla **Model X** and **S** on 14 each. Seven Volkswagen **eGolf**s were also sold.

In plug-ins, the Mitsubishi **Outlander** led with 20 vehicles. Three each of the

Hyundai **Ioniq** and Mini **Countryman** were also registered.

Over on used yards, the Nissan **Leaf** continues to arrive in astounding volumes – 243 got their number plates in November.

The Nissan **E-NV200** was second most popular battery electric

vehicle on 19, followed by the **BMW i3** on 12.

In plug-ins, the Mitsubishi **Outlander** and Toyota **Prius** tied for top spot on 18. ■

NEW MAKES AND MODELS NOV 2017

Make and Model	Total
ELECTRIC	
BMW i3	43
HYUNDAI IONIQ	17
Tesla Model X	14
Tesla Model S	14
VOLKSWAGEN GOLF	7
PLUG-IN PETROL HYBRID	
MITSUBISHI OUTLANDER	20
HYUNDAI IONIQ	3
MINI COUNTRYMAN	3
AUDI A3	2
VOLVO XC60	2
VOLVO XC90	2
BMW 5 SERIES	1
PLUG-IN DIESEL HYBRID	
AUDI Q7	3

USED IMPORTS NOV 2017

Vehicle Make	Vehicle Model	Total Vehicles
NISSAN	LEAF	243
NISSAN	E-NV200	19
BMW	i3	12
RENAULT	ZOE	9
BMW	i3	4
MITSUBISHI	I-MIEV	2
HYUNDAI	IONIQ	1
KIA	SOUL	1
PLUG-IN HYBRID		
MITSUBISHI	OUTLANDER	18
TOYOTA	PRIUS	18
BMW	i3	6

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EV TALK DIARY

EVtalk New Zealand editor
Geoff Dobson looks at the month
gone by on www.evtalk.co.nz



November 1

Light vehicle training

Changing technology has prompted industry training organisation MITO New Zealand to offer a new programme for light vehicle apprentices.

Providing new unit standards, the programme enables apprentices to meet the complex challenges of servicing vehicles and meeting future needs, such as working safely on electric vehicles.

It includes workplace practical learning and eLearning which allows apprentices to complete theory elements in their own time via mobile phone, tablet or computer.

E-bikes grab spotlight

About 3500 people attended the first NZ Bike Expo, exceeding expectations.

Electric bikes were the outstanding new feature, with many visitors trying them out on the airfield at the Air Force Museum of New Zealand in Christchurch on October 28-29.

"We are absolutely stoked with the response to the expo," event owner Cycling Action Network spokeswoman **Jo Mackay** says.

November 3

Teslas added to rental fleet

Two near-new Tesla Model S cars have been added to MyCarYourRental's fleet.

Owners can rent their vehicles out to make an income and at the same time utilise their cars better for the good of the local community and the environment, the company says.

Recently listed are a Tesla Model S 2017 owned by Darryl in Auckland and another Model S by Carol.

November 8

Mercury fleet 70% electrified

Mercury has transitioned all possible vehicles in its fleet to electric, one year ahead of target.

Its corporate fleet now has more than 70% fully electric or plug-in hybrid vehicles, which represents 80 out of 114 vehicles.

The target was set at the company's annual shareholders' meeting in 2014.

Leaf wins reliability title

The electric Nissan Leaf has topped Consumer's November reliability survey.

It's followed by the Mitsubishi ASX small SUV and the Suzuki SX4 and new generation S Cross (2013 on).

The survey covers 10,350 cars owned by Consumer members. It asked about reliability problems in the past year, ranging from minor faults to serious ones, and how satisfied owners were with their cars and whether they'd recommend them to others.

November 9

New venue for expo

The eworld nz two-day expo will return to Auckland next year but at a different venue and a month earlier.

Conferenz will stage the trade day and following public open day at the ASB Showgrounds in Greenlane on August 10 and 11.

That will allow more room for trade displays and events than the inaugural event at Manukau's Vodafone Events Centre in September.

Greenhouse gas success

A significant milestone will be

set in New Zealand's EV revolution this month.

The country's EVs and plug-in hybrids combined will avoid discharging a million kilograms of greenhouse gas in November.

The estimate is from Flip the Fleet, a citizen science coalition of pure and plug-in hybrid electric vehicle owners who upload data from their vehicles to a communal database each month.

Coventry Cars electricifying

Wellington will have its first electric/hybrid only vehicle sales yard when Coventry Cars opens its dedicated site in Lower Hutt on December 1.

Hutt City mayor Ray Wallace, who's had an EV for more than three years, and Labour list MP Ginny Andersen are among guests invited to the opening.

The company has been selling vehicles for 23 years since it was founded by owner/director **Bruce Stewart**.

Kia Niro on the way

The Kia Niro will join the brand's SUV range here early next year with a plug-in hybrid and a combined petrol engine/electric motor models coming.

Joining the Sportage and Sorento, the Niro PHEV can do about 1.3L/100km on mixed use and regular charging.

The Niro petrol engine/electric motor combination has already set an impressive record for fuel economy.

November 10

Leaf wins innovation award

The new Nissan Leaf has taken top honours at the Consumer Electronics Show annual CES Unveiled ceremony, presented by the Consumer Technology Association.

It won the Best of Innovation Award for 2018, its first major international award, at a gathering of tech industry experts in New York.

The award is for vehicle intelligence and self-driving

technology, particularly for its ProPilot and e-Pedal technologies.

EV transition accelerates

Mercury and Air New Zealand have joined The Climate Group's EV100 campaign, bringing together the world's most influential companies with the aim of helping to shift markets in favour of electric transport by 2030.

Fittingly, the announcement was made on Energy Day at the 23rd United Nations Climate Change Conference (UNFCCC) in Bonn, Germany.

Earlier this year, Air New Zealand transitioned 100% of its light vehicle fleet to EVs and electrified more than half of its heavy airport service vehicles.

November 13

Electric scooter from Vespa

Vespa plans to bring out an electric scooter early next year.

The Vespa Elettrica includes a range extender model, the X, with a petrol generator and three-litre tank boosting the bike's range up to 193km.

Details were announced at the Eicma show in Milan.

Electric bike race a first

What is hailed as probably the first electric bike race in New Zealand was included in the Counties Cycle Classic on November 19.

The Counties Power Electric Bike Race is over 32km.

Funds raised go charities such as the Auckland Cancer Society Research Centre.

November 14

Mayor's car saves money

Auckland mayor **Phil Goff's** electric car, a Hyundai Ioniq, is helping deliver on his promise to run a more frugal office than his predecessor **Len**

Continued on page 27



EV TALK DIARY

EVtalk New Zealand editor
Geoff Dobson looks at the month
gone by on www.evtalk.co.nz



Continued from page 26
Brown.

The mayor is entitled to a car for civic and private use as part of the salary package set by the Remuneration Authority, Radio NZ reports.

Brown preferred black Holden Commodores.

Ioniq claims top prize

The Hyundai Ioniq has been named Supreme Winner at the Women's World Car of the Year.

It was "a clear winner", with the Ioniq EV, Ioniq hybrid and PHEV plug-in hybrid treated as one car for voting purposes.

The Ioniq also won the Green Car category.

November 15

Kiwis get Tesla insurance

Tesla's own insurance programme InsureMyTesla is now available in New Zealand.

It's underwritten by Vero Insurance New Zealand in partnership with Tesla.

About 20 countries already have InsureMyTesla, reported to be designed especially to account for Tesla's advanced safety features and said in theory to mean lower insurance premiums.

November 16

Plugging in to training

Three Toyota Prius plug-in electric hybrids (PHEVs) have been provided for a national driver training programme.

Toyota New Zealand has lent them to the Manfeild-based National Driver Training Centre.

The programme focuses on increasing the number of secondary school students attaining a restricted licence, while providing NCEA credits and a defensive driving qualification to help them get jobs.

November 17

Tesla truck unveiled

The Tesla "Semi" electric truck has been revealed, after some delays and much hype.

It can get to 96.5kmh in five seconds, Tesla chief executive officer Elon Musk said in a live streamed presentation.

Musk says the Semi has a range of 804.6km and looks "like a bullet" to reduce drag.

November 20

Tesla shows off Roadster

Tesla had a surprise unveiling of its new Roadster 2.0 at the Tesla Semi truck launch.

The Roadster is hailed at the world's fastest production car, able to reach nearly 100kmh in 1.9 seconds and get to a top speed of 402kmh. That compares with the world's fastest car's top speed of nearly 447kmh.

A 200kWh battery pack will power the Roadster for a range of almost 1000km.

November 24

Charging for Queenstown

Electric vehicles will soon be able to charge up in central Queenstown.

The Queenstown Lakes District Council has approved a licence to occupy a space in the Athol St car park for Queenstown's first EV fast-charging station.

Initially, one fast-charging station will be installed with two carparking stalls marked for EV charging. It will also provide for a second station and up to six charging stalls, allowing for future expansion.

November 27

Off-peak incentive

A 20% off-peak electricity discount is encouraging more people to charge their electric vehicles between 11pm and 7am.

That's the finding of Mercury data which shows EV drivers responding well to price signals, suggesting there will be sufficient energy capacity to power New Zealand's increasing EV uptake well into the future.

A clear change in electricity consumption patterns can be seen, with customers taking advantage of the discount offered by Mercury, chief marketing officer **Julia Jack** says.

Iveco wins sustainability prize

Commercial vehicle manufacturer Iveco is the winner of a global accolade for sustainability.

The company's new Daily Blue Power range has been voted International Van of the Year by a panel of 25 motor-journalists from across Europe.

The prize was announced at an international road transport trade show in Lyon, France.

November 28

Charging time limit

A 30-minute time limit for using seven Auckland region EV charging stations has been introduced by Vector.

With demand increasing "it's important everyone has a fair chance to charge up," Vector says.

The half-hour restriction applies at BP Connect Pakuranga, McDonald's Constellation Drive, Auckland Airport shopping centre, Takanini Village, New World Kumeu, Kings Plant Barn Silverdale and BP Connect Warkworth.

November 29

EV promotion priorities

Not-for-profit group Drive Electric has outlined five key priorities it is encouraging the new Government to support as New Zealand moves towards an electric vehicle future.

Drive Electric chairman Mark Gilbert says the priorities help identify many of the changes that come with switching to EVs.

"Transitioning New Zealand's fleet to electric vehicles won't happen overnight but the change is already underway with more than 5000 EVs on the road today." ■

NZ EV INDUSTRY NEWS

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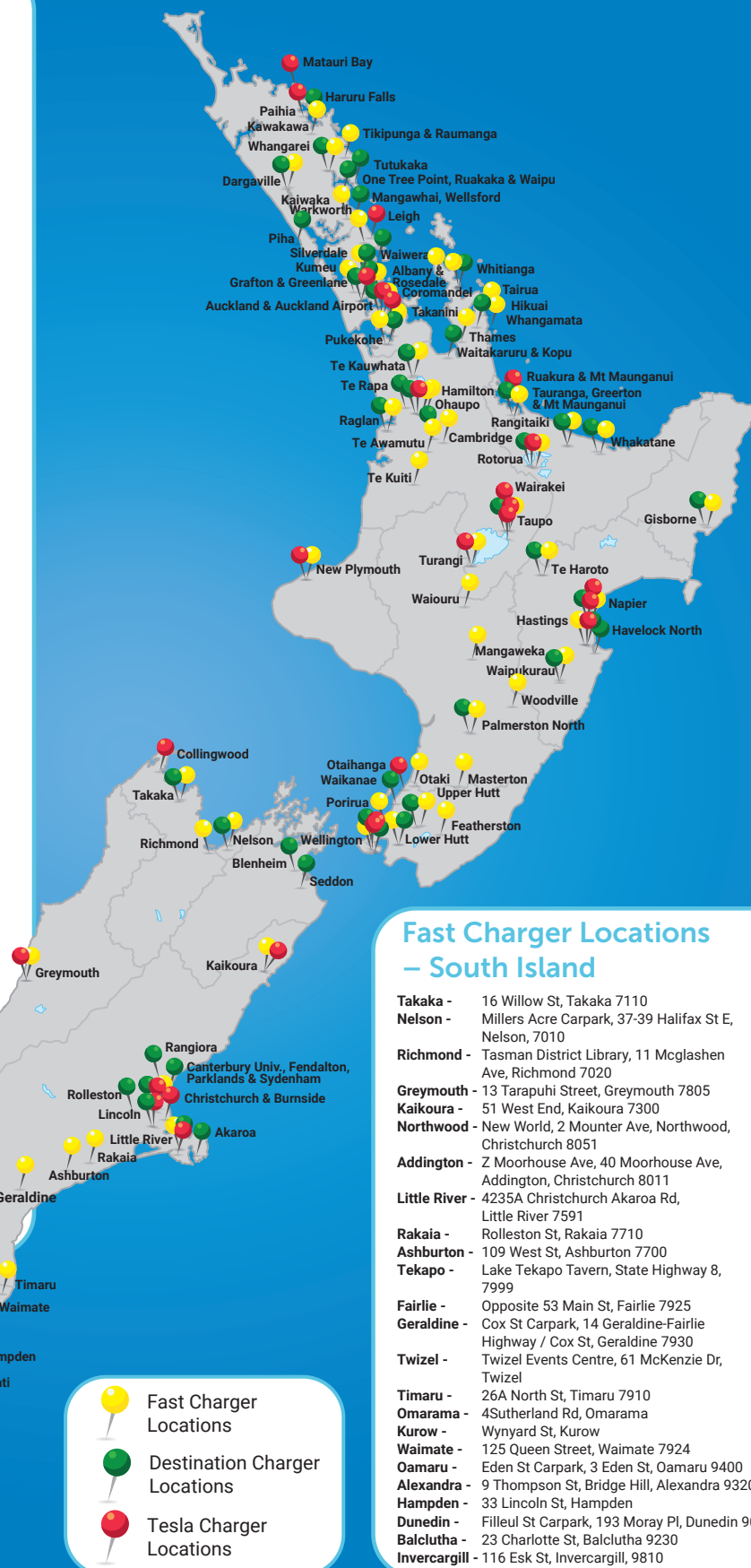
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EV CHARGING LOCATIONS

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FORWARD TOGETHER

Fast Charger Locations – North Island

Kawakawa - 4 State Highway 1, Kawakawa 0210
Tikipunga - Paramount Plaza, 1 Wanaka St, Whangarei 0112
Whangarei - Northpower Substation, 11 Alexander St, Whangarei, 0110
Raumanga - McDonalds, 130 Tauroa St, Raumanga, Whangarei 0110
Dargaville - Totara St Parking, 113 Totara St, Dargaville 0310
Kaiwaka - 1 Kaiwaka-Mangawhai Rd, Kaiwaka 0975
Warkworth - New World, 6 Percy St, Warkworth 0910
Warkworth - BP Warkworth, 67 Auckland Rd (SH1), Warkworth 0910
Silverdale - Kings Plant Barn, 17 Hibiscus Coast Highway, Silverdale 1025
Albany - The Warehouse, 186 Don McKinnon Drive, Albany, Auckland 0632
Rosedale - McDonalds, 14-16 Constellation Dr, Rosedale, Auckland
Kumeu - Kumeu New World, 120 State Highway, Kumeu 0810
Hobson St - 21 Hobson St, Auckland, 1010
Z Beach Rd - 150 Beach Rd, Auckland 1010
Newmarket - 1 Gillies Ave Newmarket, Auckland 1023
Greenlane - McDonald's, 356/320 Great South Rd, Greenlane, Auckland 1051
BP Pakuranga - 322 Pakuranga Rd, Pakuranga Heights, Auckland 2010
Z Botany Downs - 550 Te Irirangi Dr, Botany Downs, Auckland 2013
Airport Shopping Centre - 400 George Bolt Memorial Dr, Auckland Airport 2022
Z Skyway - George Bolt Memorial Dr, Auckland Airport 2022
Takanini Village - 30 Walters Rd, Takanini, Auckland 2112
Coromandel - 44 Woolams Rd, Coromandel 3506
Whitianga - 4 Lee St, Whitianga 3510
Tairua - Tokoroa Rd Carpark, 6 Tokoroa Rd, Tairua 3508
Whangamata - 100 Hetherington Road, Whangamata 3620
Pukekohe - King Street Carpark (Seddon Lane), 56-60 King St, Pukekohe 2120
Pukekohe - Counties Power, 14 Glasgow Rd, Pukekohe 2120 (Business hours only)
Thames - 505 Mackay Street, Thames 3500
Te Kauwhata - 16 Wayside Rd, Te Kauwhata 3782
Te Rapa - WEL Networks, 114 Maui St, Waikato 3200
Hamilton - Tesla (x4), Te Rapa Rd & Warere Dr, Hamilton 3200
Hamilton - Caro St, Hamilton City 3204
Ruakura - Waikato Innovation Park, 9 Melody Ln, Ruakura, Hamilton 3216
Raglan - 43 Bow St, Raglan 3225
Mt Maunganui - Bayfair, 19 Givern Road, Mt Maunganui Rd 3116
Cambridge - 73 Queen Street, Cambridge 3434
Te Awamutu - 10 Scout Lane, Te Awamutu 3800
Whakatane - i-SITE, 30 Quay St, Whakatane 3120
Rotorua - 1134 Haupapa St, Rotorua 3010
Te Kuiti - New World, 39 Rora St, Te Kuiti 3910
Taupo - 1 Kaimanawa St, Taupo
Taupo - Tesla (x4), 1 Kaimanawa St, Taupo
Gisborne - 21 Gladstone Rd, Gisborne, 4010
Rangitaiki - Rangitaiki Lodge Café, 3281 SH5, Rangitaiki
Turangi - 1 Pihanga Rd, Turangi 3334
New Plymouth - 66 Courtenay St, New Plymouth 4310
Te Haroto - Mc Vicar Rd, Napier-Taupo Highway, 4237 SH5, Te Haroto
Waiouru - State Highway One & Hassett Dr, Waiouru 4861
Napier - 206 Dickens St, Napier 4110
Hastings - 100 Queen St W, Hastings, 4122
Mangaweka - 2 Koraenui St, Mangaweka 4797
Waipukurau - 34 Russell St, Waipukurau 4200
Woodville - i-SITE, Vogel St, Woodville
Palmerston North - i-SITE, The Square, Palmerston North, 4410
Otaki - 155-163 Main Hwy, Otaki 5512
Masterton - 3 Dixon St, Masterton 5810
Porirua - 2 Serlby Pl, Porirua 5022
Featherston - SuperValue, 42 Fitzherbert St, Rimutaka Hill, Featherston 5710
Upper Hutt - 24 Queen St, Upper Hutt 5018
Lower Hutt - Dowse Art Museum & Dowse Square, 1 Stevens Grove, Lower Hutt 5010
Z Petone - 60 Hutt Rd, Petone, Lower Hutt 5012
Z Vivian Street - 174 Vivian St, Te Aro, Wellington 6011



Fast Charger Locations – South Island

Takaka - 16 Willow St, Takaka 7110
Nelson - Millers Acre Carpark, 37-39 Halifax St E, Nelson, 7010
Richmond - Tasman District Library, 11 Mcglashen Ave, Richmond 7020
Greymouth - 13 Tarapuhi Street, Greymouth 7805
Kaikoura - 51 West End, Kaikoura 7300
Northwood - New World, 2 Mounter Ave, Northwood, Christchurch 8051
Addington - Z Moorhouse Ave, 40 Moorhouse Ave, Addington, Christchurch 8011
Little River - 4235A Christchurch Akaroa Rd, Little River 7591
Rakaia - Rolleston St, Rakaia 7710
Ashburton - 109 West St, Ashburton 7700
Tekapo - Lake Tekapo Tavern, State Highway 8, 7999
Fairlie - Opposite 53 Main St, Fairlie 7925
Geraldine - Cox St Carpark, 14 Geraldine-Fairlie Highway / Cox St, Geraldine 7930
Twizel - Twizel Events Centre, 61 McKenzie Dr, Twizel
Timaru - 26A North St, Timaru 7910
Omarama - 4Sutherland Rd, Omarama
Kurow - Wynyard St, Kurow
Waimate - 125 Queen Street, Waimate 7924
Oamaru - Eden St Carpark, 3 Eden St, Oamaru 9400
Alexandra - 9 Thompson St, Bridge Hill, Alexandra 9320
Hampden - 33 Lincoln St, Hampden
Dunedin - Filleul St Carpark, 193 Moray Pl, Dunedin 9016
Balclutha - 23 Charlotte St, Balclutha 9230
Invercargill - 116 Esk St, Invercargill, 9810