Energy news from the region, country and world

May 2023

Energy Education

Mauri mahi, mauri ora

New Executive Directors welcomed in Taranaki

This week WITT | Te Pūkenga welcomed Olivia Hall (Ngāti Rārua, Rangitane, Ngāti Kuia) and Mark Oldershaw to Taranaki as the recently appointed Tumu Whenua ā-Rohe 3 | Executive Directors, Region 3.

"The appointment of Olivia and Mark as co-leads for our region, signifies a new huarahi for this kura that has been part of the Taranaki landscape for 50 years. While there are challenges uniting 26 entities into one, those challenges are well worth the opportunities this community and employers will gain," says WITT Te Pūkenga Deputy Chief Executive Allie Hemara-Wahanui.

The four-day Taranaki stop included meeting with Taranaki-based Te Pūkenga kaimahi including those at New Plymouth and Hāwera campuses.

While Olivia is based in Nelson and Mark in Wellington, the pair have day-to-day relationships with Te Pūkenga kaimahi in Taranaki. They also expect to spend time working at campuses across the region, including WITT | Te Pūkenga.

"I know Olivia and Mark are looking forward to many more trips up our way and working with the wider Taranaki community who have supported this kura over the past 50 years," says Allie Hemara-Wahanui.

Olivia was previously Executive Director for NMIT (Nelson Marlborough Institute of Technology) | Te Pūkenga, while Mark was Executive Director at Whitireia and WelTec (Wellington Institute of Technology) | Te Pūkenga.

"Together Olivia and Mark will lead their region's kaimahi to transform the way vocational education and training is delivered. They will build partnerships with Hapū, Iwi, employers, local communities and stakeholders, including Regional Skills Leadership Groups," says Te Pūkenga Pourangi Ako | DCE Ako Delivery Gus Gilmore.

"To begin with they'll be responsible for online and on-campus delivery, but they'll work closely with the WBL Managing Director and our rohe 3 work-based learning kaimahi.

"Te Pūkenga has four operational regions and will have regional co-leads in each. These roles are a key way we will put into action the partnership between Māori and Te Pūkenga."

Rohe 3 | Region 3 includes Taranaki, Manawatū-Whanganui, Te Whanganui-a-Tara Wellington and Te Tauihu-o-te-Waka a Māui Top of the South Island.

Continued on page 3

New Executive Directors Olivia Hall (Ngāti Rārua, Rangitane, Ngāti Kuia) and Mark Oldershaw

Contents

VICTORIA UNIVERSITY OF WELLINGTON TE HERENGA WAKA

UC UNIVERSITY OF CANTERBURY Te Whare Wānanga o Waitaha CHRISTCHURCH NEW ZEALAND

A Centre of Excellence in Energy & Engineering will:

- Support the growth of excellent vocational education with a focus on teaching, learning and research.
- Support the development and sharing of high-quality curriculum and programme design.
- Be a consortium with expert representation from industry, the wider sector, and a range of other areas, for example iwi and vocational education representatives.
- Have a national focus.
- Be hosted by a regional campus of Te Pūkenga.
- Address issues and opportunities with a significant strategic impact, ideally with wide-reaching benefits across the sector.
- Solve real problems and grasp viable opportunities.

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For over nine years, Olivia has dedicated her time and energy to the success of NMIT kaimahi and ākonga, including roles as Academic Staff Member, Curriculum Manager, Director Māori and Executive Director. Olivia is also the Board Chair of Te Rūnanga o Ngāti Rārua, and the Mātauranga Iwi Leaders Group of the National Iwi Chairs Forum. Olivia has a Bachelor of Arts degree in Māori, Graduate Diploma of Teaching and Learning and a Master of Business Administration from Massey University.

"I am confident Mark and I will provide a strong voice for the needs of Te Tauihu, Te Whanganui-ā-Tara, Whanganui, Horowhenua and Taranaki. I am also really looking forward to crossing the strait regularly to visit our campuses in Rohe 3 and to spend time with the kaimahi who make such a difference to our ākonga and communities," says Olivia Hall.

Mark joined Whitireia and WelTec in 2020. Prior to becoming Chief Executive at Whitireia and WelTec, he held a range of chief executive and senior leadership roles across the public, private and tertiary sectors, including Chief Executive of the Industry Training Federation and Deputy Chief Executive, Acting Chief Executive of Eastern Institute of Technology (EIT). He has a postgraduate degree in economics from Te Herenga Waka | Victoria University and a master's degree in Public Administration through the Australia New Zealand School of Government.

"Olivia and I are excited to get to know our regional kaimahi, and deepen our relationships with Te Tiriti partners, regional employers, and education leaders. As a community, we can enable greater access for ākonga to undertake their learning as they balance life, work and study," says Mark Oldershaw.

Both Olivia and Mark have deep sector experience and are well-connected with iwi.

Wharehoka Wano was on the appointments panel on behalf of Taranaki iwi and joined other iwi and Te Pūkenga leadership in the appointment of Olivia and Mark.

Preparing for the future

The skills your organisation needs can be gained at WITT Te Pūkenga

Welcome to another issue of Energy Education News.

We recently welcomed our new Te Pūkenga Regional Co-Leads to campus. Both Olivia and Mark are from an ITP background, so we enjoyed showing them the programmes that make us different and what we can contribute to Te Pūkenga nationally.

The Certificate in Energy Process Operations is one of those programmes unique to Taranaki. This industry-driven process operations certificate is back for its second intake of the year. The six-month training programme was developed by the energy industry in conjunction with WITT Te Pūkenga and focuses heavily on work placements. Remember, the qualification is suitable for both those new to the industry and those who are looking to upskill and work in an operator role in electricity, geothermal, chemical processing, oil and gas production, energy and chemical plant and dairy production plants. So, if you have any staff interested get them to head to our website to find out more about what's involved.

We're proud to have gained SEANZ (Sustainable Energy Association of New Zealand) endorsement of the Level 4 NZQA-approved micro-credentials including our Grid-connected PV Systems, Design and Install, Grid-connected Battery Storage, Design and Install and Stand-alone Power System, Design and Install, as well as Grid-connected PV Systems, Design only, Grid-connected Battery Storage, Design only and Stand-alone Power System, Design only.

We are excited to have Tim Anderson Associate Professor – Transitional Energy in our team. Tim shared a very interesting overview of his research as part of WITT's staff Lunchtime Research Kōrero sessions. In his presentation Tim spoke about his recent research on solar energy at the energy-water-food nexus. In this, he shared his insights into increasing the production of freshwater in solar stills. Further, he showed how the findings of this might translate to energy efficient solar greenhouses for growing crops. Finally, Tim highlighted the opportunities that exist for interdisciplinary collaboration, both within WITT and also in the wider community. It's great having him in the team and sharing his expertise across the organisation.

Jill Warner – Acting Director NZIHT School of Engineering, Energy & Infrastructure

Ramping up a renewable energy course tailored for Taranaki

Anna McMullen is employed by WITT Te Pūkenga as part of a joint partnership that was established between the engineering departments at WITT and the University of Canterbury (UC), with an emphasis on course delivery in the area of renewable energy.

Anna has been doing a feasibility study for a renewable energy course to be taught through the University of Canterbury, but offered locally from WITT in Taranaki.

The purpose of this is to ensure that the local workforce is equipped to meet the changing needs of industry, given the current transition and growth of renewable energy within the region.

Anna undertook meetings with industry experts from multiple energy and engineering related companies within the Taranaki region. She gained feedback on a range of questions to determine what a new course should look like in terms of course content, timeframe and pre-requisites, in order to be most beneficial to local industry.

The items listed below describe key content that Anna says people from industry see as important topics to include in a new tertiary level course.

The big picture of the renewable energy transition in Aotearoa

- Learning to think holistically. We need to consider power demand, not only power supply. How can we optimise physical characteristics, monetary flares, and behaviours of both corporate businesses and humans?

Anna McMullen
Joint appointment in the engineering department between WITT Te Pūkenga and the University of Canterbury

- Understanding the broad topics that influence decision making, such as Te Ao Māori, emission reduction targets and New Zealand policy and regulations. Students need the tool kit to challenge the regime, to think outside the square and question the current rules.
- Students should be able to use knowledge and realism to think about the whole future of energy in New Zealand, and not only be able to crunch the numbers.

Commercial viability of renewable energy projects

- Understanding the economics around how much money a project will bring in and therefore is it commercially viable yet? What is the practical implementation?
- In general, industry currently has technical staff and commercial staff, but not many people who are skilled in both areas. This would be seen as a very powerful combination.

Inclusion of local Iwi and stakeholder engagement

- Understanding how to engage with local Iwi and hapu and how to apply Māori thinking and culture to the bigger renewable energy picture.
- We are a maritime nation with lots of renewables and we have an indigenous culture that have been using these for a long time, such as geothermal for cooking and wind for transport. We need to fuse these ideas throughout the whole course and make it unique to Aotearoa.
- At the more technical level of the renewable energy sector, there is a disproportionately low number of Māori involved, such as, as project managers and electrical engineers. We need to aim for high Māori student numbers, so that they can be a part of the energy transition process. This would bring a different mindset to the use, electricity code and regulatory environment that we have.

Technical content

- Offshore wind is seen as a technical field where skills in NZ could be increased. Globally almost no seismic design has been undertaken for offshore wind turbines. Given the proposed offshore wind farms in the Taranaki region, and NZ's unique seismic knowledge, this is thought to be an important part of a course and could set it aside from other countries.
- Modules on power to X, smart electrical grids, and energy storage.

Energy companies joining together to power change

A group of New Zealand energy companies have made a joint commitment to help reduce emissions and build a more sustainable future for all Kiwis.

Together they have formed 'Powering Change', an initiative that sets out progress on New Zealand's climate change goals and details the collective action of members, who represent a broad cross section of electricity and gas companies.

"The energy sector will play a key role in helping New Zealand achieve our climate change goals," Powering Change spokesperson Bridget Abernethy said.

"The Powering Change website is a way for the energy sector to tell our story so the public can have confidence that change is occurring.

"But it's more than that, it also represents our pledge that we can and will achieve our goals.

"We're continuing to make our energy systems smarter and provide innovative solutions for customers, finding better ways to generate, store and use our energy, as well as developing technology to get more out of our infrastructure."

Ms Abernethy said creating the Powering Change platform – www.poweringchange.nz – was just a first step.

Electricity Retailers' Association chief executive officer Bridget Abernethy, Minister of Energy and Resources Megan Woods and Electricity Networks Aotearoa chief executive Graeme Peters.

"We're working on further detailing our collective action, including developing targets to evaluate our progress," she said.

> **Powering Change members have agreed on six key principles to help guide their actions, focusing on choice, innovation, affordability, reliability, collaboration and care for the environment.**

Ms Abernethy said transitioning to a low carbon economy requires significant investment - 'Powering Change' demonstrates the energy sector is already making progress.

Powering Change members are: Contact Energy, Firstgas Group, Genesis Energy, Mercury, Meridian Energy, Nova Energy, Orion, Transpower, Unison, Vector, Powerco, Electricity Networks Aotearoa, the Electricity Retailers' Association, Business NZ Energy Council and the Independent Electricity Generators Association.

Click on the Powering Change logo below to access their website.

POWERING CHANGE

Joint appointment between WITT Te Pūkenga and Victoria University

Dr Tim Anderson recently started at WITT Te Pūkenga in New Plymouth as Associate Professor Transitional Energy.

This is a joint appointment with Victoria University of Wellington. Prior to joining WITT, Tim was an Associate Professor in Mechanical Engineering at Auckland University of Technology.

Tim brings over two decades experience working on renewable energy technologies to his new job, with a particular emphasis on solar technologies. He is keen to see Taranaki become a hub for new energy developments, and to engage with industries looking to work in or transition to the use of renewable energy.

Dr Tim Anderson
t.anderson@witt.ac.nz

Mikayla Mathys receives first Ara Ake scholarship

Mikayla Mathys recently received an Ara Ake scholarship to assist her in her third year of the Bachelor of Engineering Technology - Mechanical at WITT-Te Pūkenga.

Mikayla is a student leader and whakapapa's to Te Atiawa. She has just completed a summer internship at First Gas in Bell Block.

"We're thrilled to announce Mikayla Mathys as the first recipient of the Ara Ake Scholarship. Mikayla's a very passionate student, and her goal to encourage greater participation of Māori and females in STEM pathways impressed us," says Ara Ake chief executive, Dr Cristiano Marantes.

From left to right: Dr Will Edwards (Director, Ara Ake), Nita Hutchinson (Academic Director WITT Te Pūkenga), Jill Warner (Acting Director - NZIHT School of Energy, Engineering and Infrastructure), Mikayla Mathys (WITT Te Pūkenga), Caroline Lepper (Ara Ake), Dr Cristiano Marantes (CE of Ara Ake).

Jeffrey Ireland and the opportunity to become an Operator Technician with Todd Energy

Former fitter-welder Jeffrey Ireland used the opportunity to retrain as a process operator at WITT Te Pūkenga as an opportunity to return to his hometown of Taranaki and get a job in the energy sector.

"I was a FIFO worker in the mines in Western Australia and my partner spotted the course and saw it as a way to get us home and into a good job," says WITT Te Pūkenga graduate Jeffrey Ireland.

Ireland studied the process operations course in 2020 and took every opportunity that was offered on the programme to try things, ask questions and connect with others.

He was promptly offered work as an Operator Technician with Todd Energy at the Kapuni site at the end of the programme.

> **"It's a great industry, the money is good, there are plenty of good people, a chance to keep learning on the job - I enjoy every aspect of the role."**

"Taking six to eight months off work was a bit of a gamble but what came from it made it worth it."

Ireland says the change has been worth it and he is enjoying the energy industry and being back in New Zealand.

The six-month training programme was developed by the energy industry in conjunction with WITT Te Pūkenga and features work placements. The qualification develops students' knowledge and skills for entry-level employment as process operators and people can transition into various energy-related industries such as electricity, geothermal, chemical processing, oil and gas production, energy and chemical plant and dairy production plants.

The next intake for the Certificate in Energy Process Operations starts on 7 August 2023 (successful applicants are required to attend a three-day health and safety course at WITT prior to the course).

‘Renewable Energy: Enabling a just transition in Aotearoa New Zealand.’

The Journal of the Royal Society of New Zealand calls for papers for a 2024 Special Issue

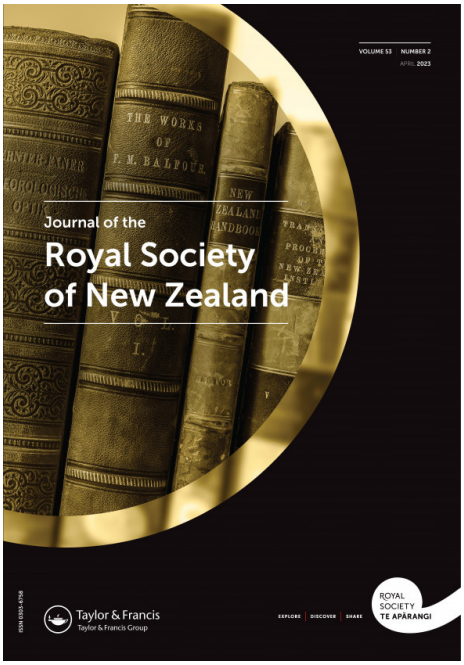
The global transition to more effectively utilise renewable energy resources has gained significant momentum, driven by the need to mitigate climate change and reduce dependence on fossil fuels.

Renewable energy technologies and systems have seen significant growth and investment, and are now increasingly considered economically competitive with traditional, non-renewable resources. The continued growth of renewable energy is critical to achieving global climate targets and ensuring sustainable development.

Aotearoa New Zealand has made significant progress towards achieving its goal of 100% renewable electricity by 2030, with renewables now accounting for over 82% of its electricity generation on an annual basis – putting the country ahead of the global average of nearly 29% in 2021.

However, MBIE reports that the share of energy supply from renewables was just over 40%, which highlights the challenge of decarbonising the entire energy sector in the face of climate change and with projected growth in demand.

Addressing this challenge requires further research and development in renewable energy technologies and systems, considering technical factors such as the variability of non-dispatchable renewable energy sources, the economics of distributed and utility-scale energy storage solutions, and complex grid integration requirements, to name a few. The necessary societal behavioural changes, the impact of the required transition, and



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Continued from previous page | Royal Society of New Zealand calls for papers for a 2024 Special Issue

supporting regulatory and policy frameworks are other significant issues that need further investigation.

Royal Society Te Apārangi recognises the need to provide a comprehensive overview of the latest advancements in renewable energy technologies and systems, with a focus on their integration into modern energy systems, which this special issue of the Journal of the Royal Society of New Zealand focusses on – to be published in late 2024. The geographical focus is mostly Aotearoa New Zealand, but can include papers on the South Pacific or other nearby regions. The Journal is seeking to publish around 10 papers in total in the special issue.

Submissions are invited with original contributions to fundamental and applied research related to renewable energy.

The special issue will be compiled into the following themes:

- Technological innovations.
- Systems modelling and analyses.
- Social and economic implications.

According to the themes, potential topics of papers in the special issue may include (but are not limited to) the following:

- The impact of renewable energy systems on society, the economy, and environments.
- Behavioural change to support the uptake of renewable energy systems.
- Demand-side management, demand response, and energy efficiency.
- Optimisation of integrated renewable energy technologies with storage options to meet future demand, including the use of advanced artificial intelligence and machine learning techniques.
- Analyses of the required technical system transformations to support renewable energy uptake, including applications of Blockchain and IoT for secure and efficient communications in smart grid.
- New renewable energy technologies and systems for future applications.
- Renewable energy policies and regulations.
- Application of the principles of mātauranga Māori to renewable energy systems.

The guest editorial team includes Prof. Alan Brent (VUW), Prof. Patrick Hu (Auckland), Dr. Anna Berka (Massey) and Prof. Dan Zhao (Canterbury).

If you're affiliated with any of the 42 universities in Australia and Aotearoa New Zealand, you may publish your articles Open Access at no cost to yourself in the Journal of the Royal Society of New Zealand. Find out if you're eligible.

Submission information

Please email a preliminary title, list of potential authors and a short descriptive paragraph outlining the scope of your proposed manuscript by **30 Pipiri June 2023** to the lead guest editor **Professor Alan Brent** at alan.brent@vuw.ac.nz.

The guest editors will make a decision on which manuscripts to invite for the special issue. Authors will be notified by 17 July 2023.

The anticipated date of publication is December 2024 and the anticipated manuscript submission deadline is 29 Huitanguru February 2024.

Note that an invitation to submit does not guarantee acceptance for publication; this will depend on the outcome of the peer-review process and authors meeting critical time schedules. Please direct queries to the Guest Editors or to the Publishing Team of Royal Society Te Apārangi.

Tackling transport emissions through innovation

Energy innovation a key component to reducing transport emissions

Transporting New Zealand recently launched their "Green Compact" which is the road transport's commitment and strategy to reduce emissions in their industry,

The launch was in Auckland in late February this year.

Transporting NZ said "Transport makes up around 20% of New Zealand's emissions, and heavy vehicle emissions make up around a quarter of that amount. We know that green freight technology is going to accelerate quickly, however full decarbonisation could still be decades away.

"That is why our Green Compact emphasises practical, immediate methods to lower emissions – the 'low hanging fruit.' These enduring principles will guide our industry on its policy approach to officials and successive Governments."

The Chief Executive of Transporting New Zealand said the industry is determined to demonstrate to their customers, their commitment to reduce road transport emissions.

> **"It is critical for the road freight sector to demonstrate to its customers and the wider public how the industry is reducing emissions and is committed to sustainability."**

Collectively, light commercial vehicles and heavy vehicles constitute 19% of all vehicles, but they contribute 49% of road transport emissions, with cars contributing 51%.

The six pillars of the compact are:

1. Using alternative fuels
2. Efficient logisitics
3. Collective mobility
4. Efficient vehicles
5. Driver training
6. Green infrastructure.

Experience with efficient vehicles has shown that having larger, but less trucks on the road contributes a substantial reduction in both congestion and emissions.
Based on a 200 pallet frieght load, three large truck and trailer units can carry the same volume as 17 average size trucks, with close to one-third less emissions per pallet.

https://www.transporting.nz/news/transport-industry-launches-green-compact-how-to-decarbonise-and-build-better-roads

Progress is happening

NZ Post's zero emission fuel-cell truck reduces emissions to the equivalent of 100 cars being taken off the road. In support of that the Government has committed $30 million in Budget 2023 for a Clean Truck Discount programme.

https://evsandbeyond.co.nz/nz-post-gets-hydrogen-truck/

The Green Compact framework is available here.

https://www.transporting.nz/news/transporting-new-zealands-green-compact-our-decarbonisation-framework

Electric vehicle (EV) growth in New Zealand surging.

"With over 100,000 rebates granted since the scheme came into effect in 2021, we currently have one of the fastest uptakes of EVs in the world."

Beehive website. Michael Wood, Minister of Transport (May 2023)

Wood also said "the Clean Car programme will reduce 50 percent more emissions than originally estimated by 2035, and 230 percent more by 2025. It is forecast to save New Zealand from importing 1.4 billion litres of petrol. At current prices the economy will save an average of $325 million a year on fuel."

The scheme is exceeding industry and government projections, with 20 percent of all new passenger car sales being electric in 2022. A substantial increase from eight percent in 2021.

Despite the resounding success of the scheme, some changes are on their way to the clean car discounts as from 1 July 2023.

The scheme will be targeting rebates for new and used imports emitting less than 100 grams of CO_2 per kilometre compared to 146 grams under the original scheme. This will include battery electric vehicles, and plug-in hybrids.

> **The rebate for used EV imports will also increase, meaning New Zealanders will save up to $3,507 per vehicle, helping many low and middle income New Zealanders get into lower emitting vehicles they otherwise couldn't afford.**

Wood also said "To fund the changes to make it easier for New Zealanders to purchase cleaner imports, we're adjusting charges on high emissions vehicles. This includes vehicles like utes which are amongst the highest emitting vehicles within our fleet."

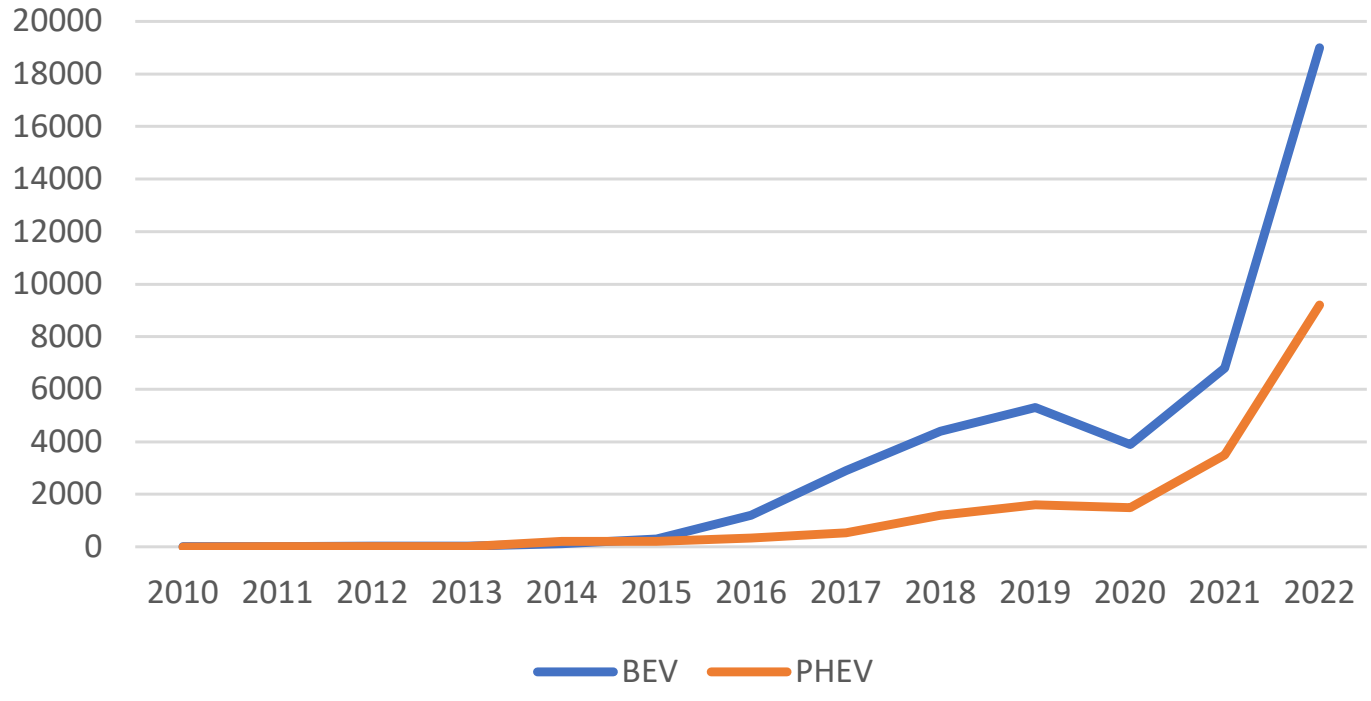
"The threshold vehicles will be subject to charges will reduce from 192 grams of CO_2 per kilometre to 150 grams, and charges will increase. New and used imports that meet or exceed the threshold will attract charges."

Another change is on its way too. According to the Ministry of Transport one of the incentives to purchase an EV will be removed within the next 12 months. That is the road user charges exemption for light electric vehicles due to come off on 31 March 2024.

This is the time when the government expect the electric vehicles to make up two percent of the fleet. The purpose of the exemption is to encourage the uptake of electric vehicles given New Zealand's climate change obligations. Increasing the uptake of zero emission vehicles will play an important part in reducing emissions from light vehicles in New Zealand. From 31 March 2024, owners of light electric vehicles will need to pre-purchase road user charges like other road users.

https://www.transport.govt.nz/area-of-interest/environment-

New Zealand growth in the purchase of electric vehicles



Source: International Energy Agency

The New Zealand Report

International Energy Agency Executive Summary (May 2023)

New Zealand has a diversified energy mix, with significant production of both hydropower and geothermal.

As the country embarks on an ambitious energy transition, it has many natural advantages, including an enviable renewable resource base. The key challenge will be to decarbonise end-use sectors through clean power and support investments in new technologies to achieve deeper emissions cuts across all sectors in the most economically efficient way.

New Zealand has set ambitious targets for reducing greenhouse gas (GHG) emissions, including achieving net zero emissions by 2050. New Zealand already has a low-emissions electricity system, with over 80% of electricity coming from renewable sources in 2021. And this share could easily reach over 90% based on existing policies.

Elsewhere, the country has more work to do to decarbonise economic sectors beyond electricity. Notably, the transport sector accounts for the highest share of emissions and is almost entirely dependent on oil as a fuel source. Industry is also a major contributor to New Zealand's GHG emissions and is heavily reliant on fossil fuels.

> **New Zealand has an attractive opportunity to leverage its clean electricity sector to advance electrification as a decarbonisation strategy in other sectors.**

This will require not only sizeable technological investments to support electrification in transport and industry but will also necessitate a sizeable buildout of additional renewables generation capacity to meet accelerated load growth, along with additional grid and storage investments. New Zealand should weigh its aspiration to achieve 100% renewable electricity by 2030 against the potentially considerable costs associated with achieving the last 2-5% of the target.

New Zealand does not yet have a long-term energy strategy in place. While work is underway on a strategy, it is not due for release until the end of 2024. A lack of clarity surrounding the pathways to meeting ambitious climate targets (including the roles that various fuels and technologies will play) creates an uncertain policy environment, hampering the significant investment required to meet the government's 2030 targets.

Overall, New Zealand has the potential to reach its emissions reduction and energy targets based on its natural resources and policy levers. But the time frames to meet the targets are very ambitious. If the targets are to be met, the energy

sector will need a viable policy road map as soon as possible. Delays in providing policy clarity will likely result in the targets being met much further into the future.

Overview

New Zealand's updated climate target under the Paris Agreement is to reduce net GHG emissions by 50% from gross 2005 levels by 2030. The most recent domestic legislation is the Climate Change Response (Zero Carbon) Amendment Act 2019, which sets a net zero GHG emissions target (exempting biogenic methane, mostly from cattle) by 2050. It also includes a target to reduce biogenic methane emissions by 10% from 2017 levels by 2030 and by 25-47% by 2050.

The Act also established a Climate Change Commission to provide independent, evidence-based advice on the actions the government needs to take to address climate change. In addition, the Act requires emissions budgets and emissions reduction plans (along with national adaptation plans). New Zealand's emissions budgets cover five year periods and are set 10-15 years in advance, after considering the recommendations of the Climate Change Commission. The first three emissions budgets were set in May 2022 for the periods 2022-2025, 2026-2030 and 2031-2035.

Each emissions budget must be supported by an emissions reduction plan (ERP) that contains policies and strategies for meeting the emissions budget. New Zealand's first ERP was published in May 2022.

> **The country's primary emissions pricing tool is the New Zealand Emissions Trading Scheme (NZ ETS). The point of obligation is upstream, so the impact is mainly felt through fuel prices.**

The government will align the NZ ETS cap with decreasing emissions budgets. The NZ ETS has comprehensive coverage across the entire economy, except for the agricultural sector and a portion of the waste sector.

To address carbon leakage, free allocation of allowances is provided to eligible industries that are emissions-intensive and trade-exposed. These allocations are planned to be phased out in the coming decades.

Climate change policies

New Zealand does not have a long-term energy strategy. In its May 2022 ERP, the government committed to developing such a strategy to achieve its vision for the energy and industry sectors. The energy strategy will drive New Zealand's pathways away from fossil fuels and towards greater levels of renewable electricity and other low-emissions alternatives. A scoping of what the new Energy Strategy could look like is underway. The government is working with energy system stakeholders to develop the Energy Strategy by the end of 2024.

Simultaneously, the government is developing several sectoral strategies that will serve as key inputs to the long-term Energy Strategy. These include: a Gas Transition Plan (GTP), expected to be completed by the end of 2023, which will establish the pathway for phasing out natural gas in New Zealand's energy system in line with climate targets; an updated New Zealand Energy Efficiency and Conservation Strategy to replace the existing strategy (that expired in mid-2022) and better align with the government's climate goals; and a

renewable energy work programme, which will establish plans for expanding the role of renewables in New Zealand's energy system.

Energy strategy

New Zealand's electricity system is the cornerstone of the government's strategy for decarbonising the energy sector. The government plans to promote the electrification of end-use sectors such as buildings, transport and industry, leveraging a renewables-based electricity system.

The New Zealand Energy Strategy 2011-2021 set a target for 90% renewable electricity by 2025. Subsequently, the government set an aspirational goal of 100% renewable electricity by 2030. Moreover, the first ERP built on the government's aspirational goal in electricity and set a target of 50% of total final energy consumption from renewables by 2035. Making the electricity system fit-for-purpose is a top priority for the government.

New Zealand is fortunate to already have a high proportion of renewable electricity, which is currently over 80% of electricity production. However, due to the electricity system's heavy reliance on hydropower, its key challenge is coping with a "dry year", when hydro inflows are low.

When a "dry year" occurs, and existing hydropower catchments do not receive enough rainfall, backup is currently provided by fossil fuel generation. This issue will become increasingly salient as the country strives to achieve a 100% renewables-based power grid and relies more on electricity to meet its decarbonisation targets.

In response, the government launched the NZ Battery Project

in 2020. The project will provide comprehensive advice on the technical, environmental and commercial feasibility of potential energy storage projects, including, but not limited to, the Lake Onslow pumped hydro project. Feasibility studies for the project are expected to be completed early in 2023 and solutions to be in place in the 2030s.

Reaching the aspirational 100% target for renewables in electricity by 2030 and the 50% economy-wide renewables target by 2035 will require a massive buildout of new renewables generation capacity.

> **Given limited options for large new hydro capacity and modest volumes of economically feasible geothermal, a sizeable share of the required new capacity will need to come from wind and solar.**

In New Zealand, the Resource Management Act 1991 (RMA) plays a major role in determining the type of electricity generation that gets consented. While the RMA sets national direction on avoiding, remedying and mitigating the adverse effects of activities on the environment, it allows communities to decide how to manage their own environment through regional and district resource management plans. The government plans to repeal the RMA and replace it with three new pieces of legislation. The objectives of this reform are to better meet environmental protections, climate adaptation needs and Māori protections while also improving the efficiency of siting and reducing permitting complexity. Following public consultations, the aim is for the main reforms to be passed into law before the 2023 central government election.

There is considerable potential in other areas of renewables development, like offshore wind electricity generation. There is currently no targeted regulatory

framework for offshore wind, and the country does not yet have any offshore wind sites or developments. However, a specific offshore energy regulatory regime is under development and is expected to be in place by 2024. Offshore energy development will be considered as part of the 2022-2024 process of creating a long-term Energy Strategy.

Electricity in the energy transition

As a step towards addressing climate change and creating a sustainable future for New Zealand, in April 2018, the government announced that no additional offshore oil and gas exploration permits would be granted.

New Zealand's more ambitious climate targets will require lower emissions from fossil fuels driven by substantial declines in consumption. Emissions reductions are likely to occur through both reduced demand (for example, greater energy efficiency and electrification) and lower carbon intensity (for example, blending in renewable gases or biofuels).

A major part of this strategy will be enacted through the Government Investment in Decarbonising Industry (GIDI) Fund, which was established in 2020 as part of the government's Covid Response and Recovery Fund. The aim was to accelerate the decarbonisation of industrial process heat and contribute to the Covid-19 recovery by stimulating the domestic economy and supporting employment. In addition to the previous GIDI Fund targeted at industrial process heat projects, funding will now also include support for replacing inefficient industrial and commercial equipment and help replace fossil fuels in commercial space and water heating with renewable energy.

The government is especially working to reduce the demand for coal for process heat and electricity generation. In addition to GIDI-backed projects, this includes investigating options to manage the dry-year risk through the New Zealand Battery Project (to displace backup fossil generation), a proposed ban on new low- and medium-temperature coal boilers, as well as phasing out all existing coal boilers by 2037.

> **Currently, natural gas plays an important role in the electricity sector alongside coal-fired generation in firming or backing up hydro and variable renewable generation. The pace for phasing out natural gas and the "end-state" of the electricity sector is currently uncertain.**

They are dependent on a range of factors, such as emissions pricing, technological adaptation and other economic factors. The GTP will help to establish transition pathways for decarbonising the gas sector in line with the first three emissions budgets defined in the ERP.

To address oil demand, New Zealand also has a number of policies to increase vehicle efficiency and promote the penetration of electric vehicles (EVs) into its transport mix.

Wind and solar generated record 20% of EU electricity in 2022. More than gas, nuclear, hydro, coal

Wind and solar supplied more of the EU's electricity than any other power source for the first time ever in 2022, new analysis finds.

They together provided a record one-fifth of the EU's electricity in 2022 – a larger share than gas or nuclear, according to a report by the climate thinktank Ember.

Record additions of new wind and solar in 2022 helped Europe survive a "triple crisis" created by restrictions on Russian gas supplies, a dip in hydro caused by drought and unexpected nuclear outages, the analysis says.

Around 83% of the dip in hydro and nuclear power was met by wind and solar – and falling electricity demand. The rest was met by coal.

Solar generation across the EU rose by a record 24% in 2022, helping to avoid €10bn in gas costs, according to the findings. Some 20 EU nations sourced a record share of their power from solar, including the Netherlands, Spain and Germany.

2023 outlook

The growth of wind and solar is projected to continue this year, according to industry estimates, the report says.

At the same time, both hydro and nuclear power are expected to recover – with EDF forecasting that many of its French nuclear plants will come back online in 2023.

As a result of these factors, fossil fuel power generation could drop by an unprecedented 20% in 2023 – double the previous record observed in 2020, the analysis projects. The report says:

"Coal generation will fall, but gas generation, which is expected to remain more expensive than coal until at least 2025, will fall the fastest."

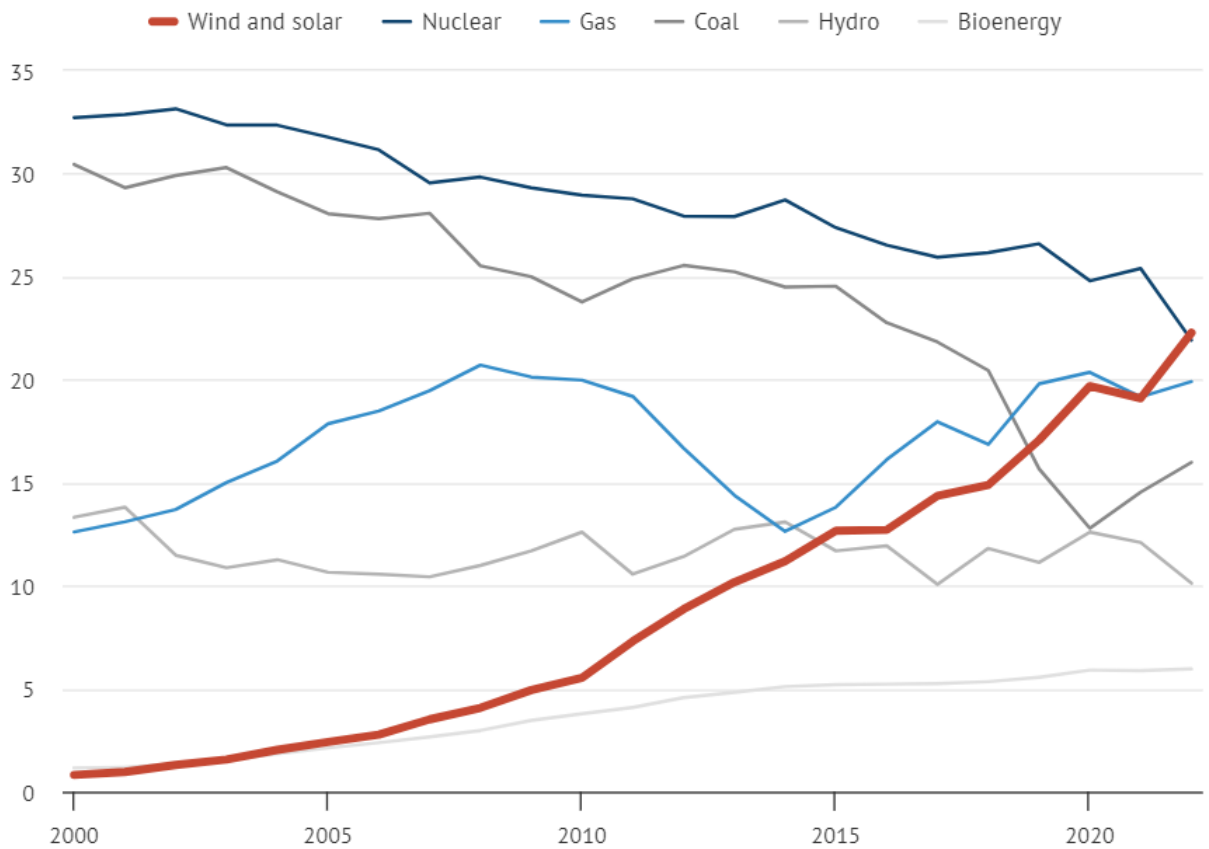
International Energy Agency forecasts strong growth or renewables

The IEA has raised its 2027 forecasts for total renewables additions iWn its main scenario to 2,383GW – around the total power capacity of China.

That's a 28% increase on the previous estimate and up 76% from two years ago, explains Josh Gabbatiss at Carbon Brief who summarises the IEA's latest forecasts. Globally, solar power will overtake gas by installed capacity in 2026 and coal in 2027. There are two main drivers for this acceleration. High fossil fuel and electricity prices caused by the global energy crisis have made renewables much more economically attractive, and, secondly, Russia's invasion of Ukraine has caused fossil fuel importers, especially in Europe, to prioritise energy security via renewable energy.

The most consequential growth policies have been implemented in the EU, US, China and India. Hence, renewables share of electricity globally should rise from 28.7% in 2021 to 38% by 2027. But that's still not enough to reach net-zero by 2050, according to the IEA.

To do that, the 2022-2027 period needs an additional 1,394GW of renewable capacity to be constructed, bringing the total to 3,777GW. Policy, regulatory, permitting and financing are the main challenges.



The power behind self-driving vehicles

Will the computing power needed for self-driving vehicles create a carbon emissions problem akin to data centres?

Few predicted, in their early days, that the scale-up of data centres would result in them having a measurable impact on global energy consumption.

Today they contribute 0.3% of global emissions. That's a big enough number to put it on the global radar and for the IEA to be monitoring it.

Will the wide scale take-up of autonomous vehicles have the same effect? Yes, explains Adam Zewe at MIT who describes new research from there. In summary, one billion autonomous vehicles, each driving for only one hour per day would consume enough energy to generate the same emissions as data centres currently do.

Each car's "deep neural network" will be processing high-resolution inputs from as many as 20 cameras with high frame rates, in real time, simultaneously.

The conclusion is to start designing the hardware now that is tailored to squeeze the maximum efficiency from that consumption, says the research. The lesson is that any new causes of energy consumption likely to have exponential growth must bake its emissions reductions strategy into that journey right from the start.

https://energypost.eu/
https://news.mit.edu/2023/autonomous-vehicles-carbon-emissions-0113

What is an autonomous vehicle?

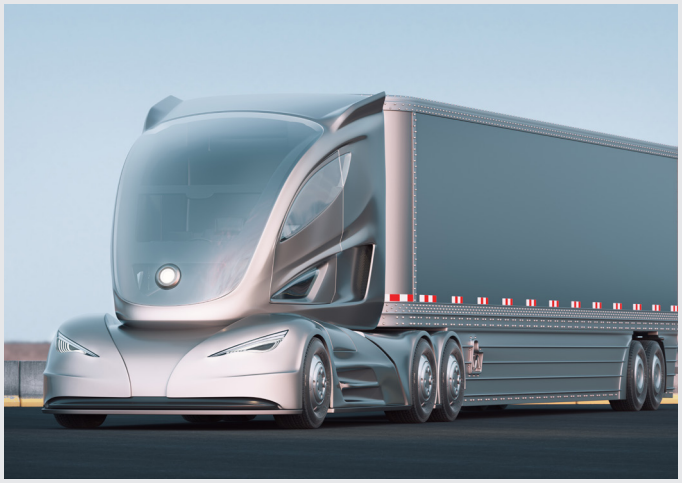
An autonomous car is a vehicle capable of sensing its environment and operating without human involvement. A human passenger is not required to take control of the vehicle at any time, nor is a human passenger required to be present in the vehicle at all. An autonomous car can go anywhere a traditional car goes and do everything that an experienced human driver does.

https://www.synopsys.com/automotive/what-is-autonomous-car.html

Self-drive trucks, are they just around the corner?

Investors.com say "Autonomous trucks are barreling ahead, but robot big rigs face a bumpy road."

One factor in the impetus for self-drive trucks in the USA is a shortage of drivers. The freight industry estimates the current shortage of U.S. truck drivers at 105,000. The American Trucking Associations trade group predicts the shortage will grow to 160,000 by 2030.



Autonomous mining trucks

Mining plays an important role in the world economy. With the pursuit of zero casualties and entering of an era of skilled workers shortage in developed countries, it was estimated that by 2020, 50% of the major mining companies in Australia, Europe and the Americas would be using the autonomous products, and some mines have decided to adopt autonomous mining equipment wholly. Artificial intelligence, machine learning, and autonomous technologies in the mining industry started more than a decade ago with autonomous mining trucks (AMT) or autonomous haulage systems (AHS). Their applications improve the technological, economic and environmental outlook of the mining industry.

An exciting future

A joint programme between WITT Te Pūkenga and Victoria University unlocks new pathways

WITT Te Pūkenga is pleased to be partnering with Te Herenga Waka, Victoria University Wellington (VUW) to create opportunities for rangatahi to stay in Taranaki and study then pathway to an exciting degree programme at Victoria University.

Study the first year of your engineering degree at WITT Te Pūkenga, then pathway to Victoria University.

- Joint BEng (Hons) Programme
- Joint BSc Programme

Scholarships

WITT Te Pūkenga has scholarships available to study full-time engineering in New Plymouth, either at diploma or degree level and welcomes enquiries regarding these.

If a student has a preference to focus on computer software, engineering and associated fields, then WITT Te Pūkenga can now help you on that journey and better prepare you for life at university.

These scholarships are proudly sponsored by Ara Ake and GNS.

Ara Ake
Future Energy Development

GNS SCIENCE
TE PŪ AO

Discover our renewable energy courses

Get accredited at the WITT Te Pūkenga Infrastructure Training Park in New Plymouth

Stand Alone Power Systems: Design and Installation

Domestic: $1,200 International: $3,500

The course Stand Alone Power Systems: Design and Installation is ideal for busy tradespeople who want to learn about designing and installing reliable off-grid power systems.

The course covers topics such as site assessment, energy yield calculation, battery technologies, system design and installation, commissioning, and fault-finding.

Grid-connected Battery Storage Systems: Design and Installation

Domestic: $600 International: $1,750

This course is designed for electrical workers who want to learn how to design and install safe and effective grid-connected battery storage systems, with a focus on those integrated with grid-connected photovoltaic systems.

Topics covered include battery chemistries and characteristics, battery charging, system design and yield calculations, and hazards associated with batteries and grid-connected battery storage systems.

Assessment

- Pre-course online learning (100 hours),
- Three-day in-person course (24 hours)
- Post-course assignment (16 hours).

Who should attend?

- Electricians
- Electrical Engineers
- Electrical Inspectors

All applicants must be registered electrical workers and hold a current practicing licence.

Our presenter

Tim Francis is a trainer for PV training courses at WITT Te Pūkenga, NZIHT, and is supported by SEANZ.

He has 26 years of experience as an electrician, with a background in industrial control systems and renewable energy as a designer/installer.

Tim holds advanced diplomas in Electrical Engineering (Control) and Renewable Energy, and CEC Accreditation as a designer and installer for both grid-connected PV and stand-alone power systems with both micro-hydro and small wind endorsements.

witt.ac.nz/nziht/solar-energy-training/

N.B. Completion of Grid-Connected PV Systems: Design and Installation is a prerequisite for both courses. Courses run subject to numbers.

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