ENERGY EDUCATION

Mauri mahi, mauri ora

ENERGY NEWS FROM THE REGION, COUNTRY AND WORLD | JUNE/JULY 2022

New Zealand nziht School of Engineering, Energy and Infrastructure

VICTORIA UNIVERSITY OF WELLINGTON TE HERENGA WAKA

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

Nikita – Inspired into engineering

Engineering is in the blood for WITT scholarship student Nikita Greiner.

The 18-year-old's grandfather was a locomotive engineer for Kiwi Railways and she found inspiration after growing up around him.

"He was my biggest inspiration to want a career in this industry," she said.

That influenced Nikita to apply for the E2EE Engineering course at WITT in her last year of high school. The former New Plymouth Girls' High School student is also one of seven students awarded a School Leaver Scholarship at WITT for 2021.

With a value of $7,500 each, Nikita said it provided her with the confidence, motivation and drive to succeed.

"I am committed to achieve the best possible results, so I can make myself and mum proud, and hopefully it will give others the confidence to take the same journey," she said.

Continued on page 2.

ENERGY EDUCATION
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WITT's Solar Energy Course (6-8 September 2022)

- **Grid-connected PV Systems: Design & Install (Microcredential Course 6-8 September / NPL).**
- **Grid-connected Battery Storage Systems: Design & Install (Microcredential course - date to be confirmed).**
- **Stand-alone Power Systems: Design & Install (Microcredential course - date to be confirmed).**

New solar energy training courses to help equip New Zealand for the transition into clean energy are now being offered at WITT. Targeted at qualified electricians throughout New Zealand, these 10-credit NZQA approved micro-credentials solar energy courses will be delivered in blocks (three to four days face-to-face) in New Plymouth with the remaining learning taking place either side of the block learning. Participants will learn from an industry expert with more than 30 years of experience as an electrician including 15 years in the installation, design and training of solar systems throughout Australia.

Send all registered enquiries to info@witt.ac.nz or phone 0800 948 869. We will register your details and be in touch with confirmed start dates and further details for the remaining courses.

Enquire here now

WITT | Te Pūkenga | New Zealand nziht School of Engineering, Energy and Infrastructure

Nikita said the three-year bachelor's degree in civil engineering involves hard work, commitment and always putting a consistent amount of time and effort into her studies.

During the course, there are four subjects in each semester, three compulsory classes that both mechanical and civil engineering students take.

"In my first semester I'm taking mechanics, computing and engineering maths. The fourth class differs depending on which specialty you have enrolled into."

She loves the content and Nikita is now in her second year and is about to complete 1.5 years of her degree with 1.5 years to go.

"There is nothing easy about engineering. From the early days, problem solving was something I craved during my time at school and wanted a career that could stimulate my mind and challenge my thinking all the time."

Not only will Nikita finish with a degree, but will also come out with a substantial mix of theoretical and practical skills that will be beneficial in the workplace.

Studying with a diverse group of people ensures she learns so many valuable skills that she will take with her after finishing the course, she said.

"We receive an amazing amount of support from all the tutors and the engineering department," she added.

After completing her degree, Nikita hopes to work as a civil engineer in Taranaki to give back to the community. She also hopes to mentor other students.

"I hope to be an inspiration to young women and men; that if you work hard, you can achieve anything you put your mind to."

NZ's Energy Mix

The Ministry for the Environment says "The Government's 2050 vision for energy and industry is for Aotearoa New Zealand to have a highly renewable, sustainable and efficient energy system supporting a low-emissions economy."

- Energy will be accessible and affordable and will support the wellbeing of all New Zealanders.
- Energy supply will be secure, reliable and resilient, including in the face of global shocks.
- Energy systems will support economic development and an equitable transition to a low-emissions economy.

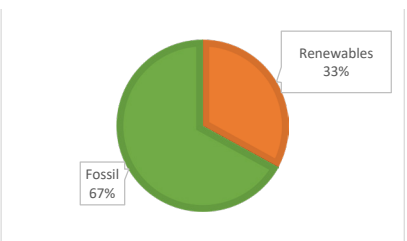
A well planned transition

The Ministry for the Environment says:

"A well-planned transition can help reduce energy costs for businesses and New Zealanders, increase energy independence and create high-wage jobs in areas such as hydrogen, bioenergy and electrification. It can also be an opportunity to improve our productivity as we adopt clean technologies and improve energy efficiency."

A hefty task

It is a hefty task when according to Government figures * 67% of New Zealand's energy is coming from diesel, petrol, coal, natural gas, fuel oil and aviation fuel; with the remaining 33% of its total energy coming from renewable sources. Replacing that 67% needs a 200% increase in the renewables currently providing energy to the NZ economy and then it needs to be the right sort of energy at a cost relative to the one it replaces. This will take time, scale and ongoing innovation, not only in fuels but in the technology that uses them.



* Interpreted from EECA Energy end-use database information

NZ'S ENERGY MIX

New Zealand Report

With its unique resource base, New Zealand is taking steps towards carbon neutrality by 2050. The country is a success story for the development of renewable energy, including hydro-power and geothermal energy, without government subsidies.

New Zealand's current pledge under the Paris Agreement is to cut emissions by 30% below 2005 levels by 2030.

The Climate Change Response (Zero Carbon) Amendment Act 2019 sets out a framework to reduce net GHG emissions to zero by 2050 (except biogenic methane, which has a target of 24-47% below 2017 levels).

New Zealand will be reforming its emissions trading system to deliver on its targets, guided by an independent Climate Change Commission, setting a clear long-term signal for a range of energy and economic policies.

Outside of its largely low-carbon power sector, managing the economy's energy intensity and greenhouse gas emissions while still remaining a competitive and growing economy remains a challenge. The 2017 IEA review highlighted technology opportunities for renewable energy and energy efficiency in buildings, industrial heat, transport and more importantly agriculture. New Zealand is currently considering options for 100% renewables electricity generation, backed up by its large hydro storage capacity.

https://www.iea.org/countries/new-zealand.
Last updated 16 December 2021

New Zealand needs 118,500 construction workers in 2024

New Zealand's first long-term infrastructure strategy sets a vision for how New Zealand's infrastructure can lay a foundation for the people, places and businesses of the country to thrive for generations.

Te Waihanga Chief Executive Ross Copland says it identifies some of the most pressing issues New Zealand is facing, and the changes needed to overcome them.

Rautaki Hanganga o Aotearoa - New Zealand Infrastructure Strategy 2022-2052 is the culmination of two years' independent investigation, and incorporates feedback from over 20,000 New Zealanders, over 700 consultation submissions, and meetings and workshops with stakeholders from all over New Zealand.

"Infrastructure is critical to our national objectives and wellbeing, whether that be the sustained effort needed to meet net zero carbon commitments, ramping up housing supply, easing congestion in our cities, or meeting the expectations for drinking water that is fresh and clean," Copland says.

Electricity generation capacity needs to increase by some 170% to meet our net zero carbon goals; while it will cost about $90 billion to fix New Zealand's water networks. Some $5 billion of local government infrastructure is vulnerable to sea level rise. These challenges come at a time when construction costs are rising 60% faster than prices elsewhere in the economy and we expect a shortfall of 118,500 construction workers in 2024," Copland says.

https://www.tewaihanga.govt.nz/news/commission-news/new-zealands-first-infrastructure-strategy-sets-a-path-for-a-thriving-aotearoa/

Global electric car sales continue to break records, but mineral supply constraints are looming

Totalling more than 9% of global car sales, the electric car fleet is expanding quickly.

Ambitious policy announcements have been critical in stimulating the electric mobility transition in major vehicle markets.

Electric car sales are accelerating, with China and Europe setting new records.

Sales of electric cars reached another record high in 2021 despite the Covid-19 pandemic and supply chain challenges, including semiconductor chip shortages.

> **Looking back, about 120,000 electric cars were sold worldwide in 2012. In 2021, that many were sold in a week.**

EV markets are expanding quickly. Electric car sales accounted for 9% of the global car market in 2021 – four times their market share in 2019. All the net growth in global car sales in 2021 came from electric cars. Sales were highest in China, where they tripled relative to 2020 to 3.3 million after several years of relative stagnation, and in Europe, where they increased by two-thirds year-on-year to 2.3 million. Together, China and Europe accounted for more than 85% of global electric car sales in 2021, followed by the United States (10%), where they more than doubled from 2020 to reach 630,000.

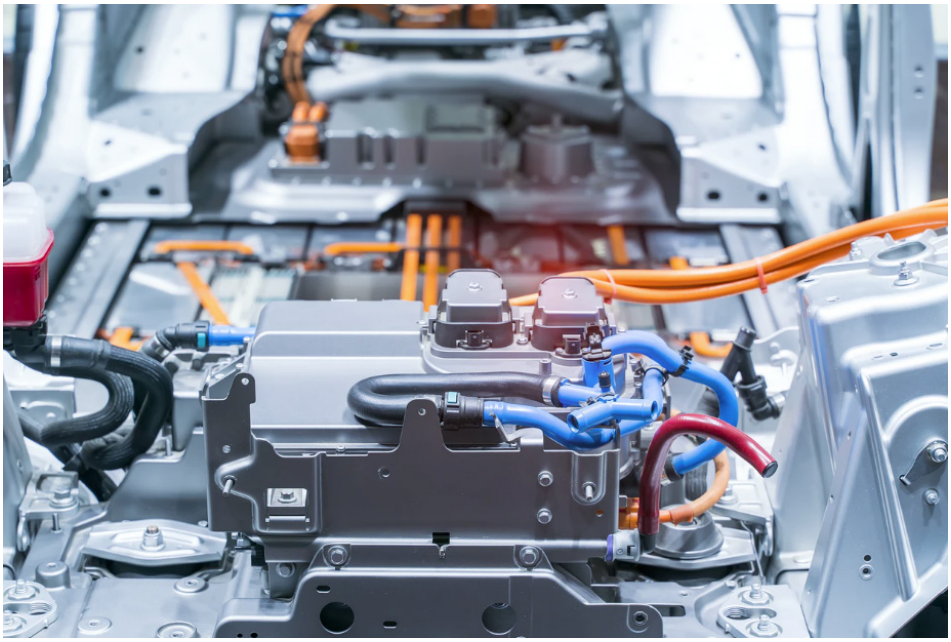
https://www.iea.org/fuels-and-technologies/electric-vehicles

Battery manufacturing has increased, but must accelerate to meet net zero goals.

Automotive battery production reached 160 GWh in 2020 (up 33% from 2019) and the average cost of batteries declined 13% to a global average price of USD 137/kWh per battery pack. Battery production continues to be dominated by China, which holds over 70% of global cell production capacity and produces about half of all batteries for light-duty vehicles.

China also accounts for the largest share of demand at almost 80 GWh, but in 2020 Europe had the greatest increase (+110%) to reach 52 GWh. The Net Zero Scenario projects battery manufacturing scaling up rapidly, as current announced production capacity for 2030 would cover only 50% of required demand in that year. Furthermore, next-generation (i.e. solid-state) battery technologies need to become commercially available between 2025 and 2030.

https://www.iea.org/fuels-and-technologies/electric-vehicles



China accounts for 95% of new registrations of electric two- and three-wheeler vehicles and 90% of new electric bus and truck registrations worldwide.

Electric two- and three-wheeler vehicles now account for half of China's sales.

A joint programme between WITT & Victoria University unlocks an exciting future

Te Kura Matatini o Taranaki, Western Institute of Technology at Taranaki (WITT) is very excited to be partnering with the Te Herenga Waka, Victoria University Wellington (VUW) to create opportunities for our rangatahi to stay in Taranaki and study while pathwaying to an exciting degree programme at Victoria University.

With doing the first year of your Engineering Degree at WITT you will enable pathways to VUW in the following:

- **Joint BEng (Hons) Programme** (see right)
- **Joint BSc Programme** (see right)

Scholarships

WITT has scholarships available to study fulltime 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 and engineering and associated fields then WITT 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.

GNS SCIENCE TE PŪ AO

Ara Ake
Future Energy Development

Joint BEng (Hons) Programme

First year WITT, years 2-4 Victoria

- Software Engineering
- Cyber Security Engineering
- Electrical and Electronic Engineering

Joint BSc Programme

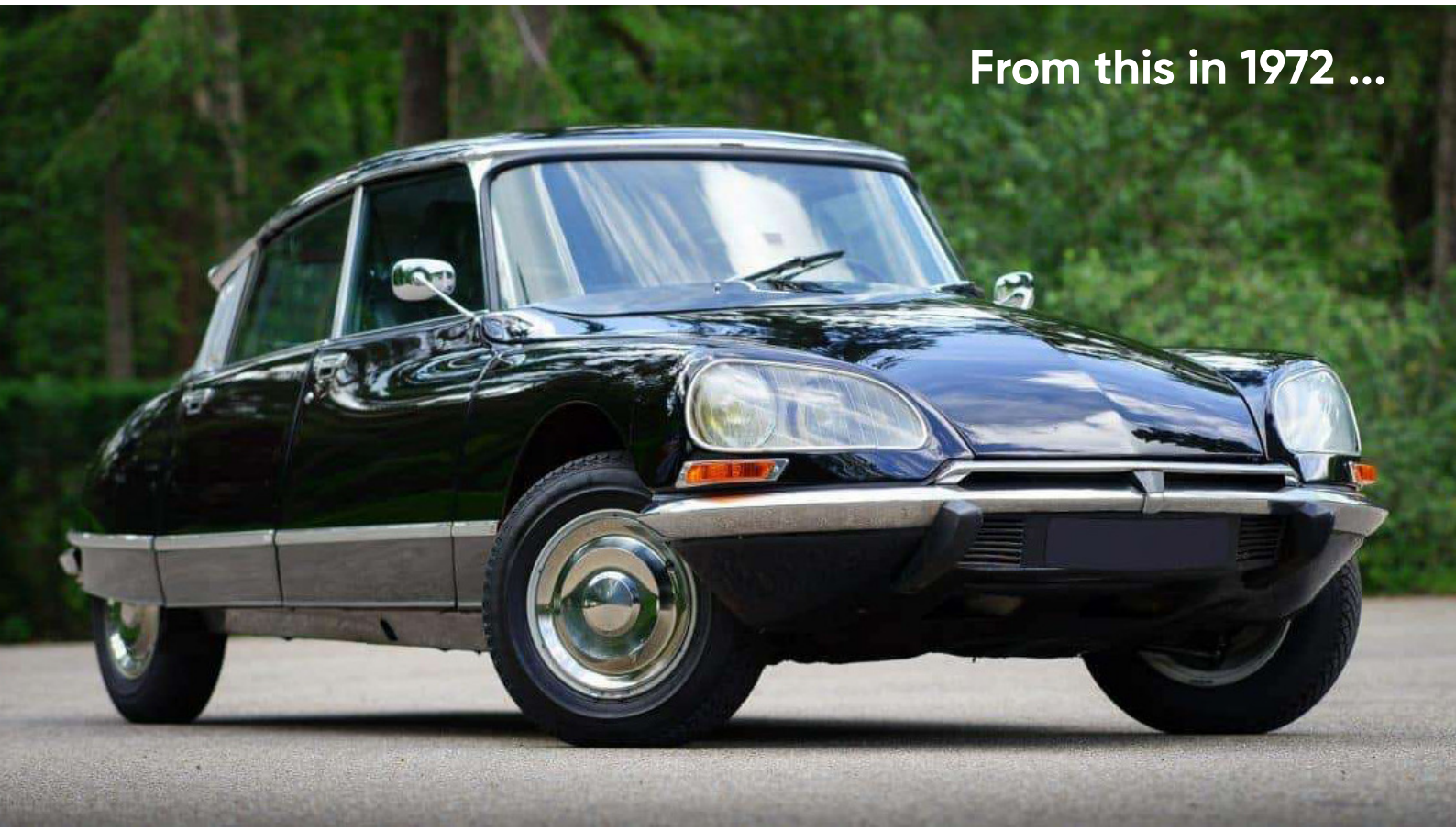
First year WITT, years 2-3 Victoria

- Computer Science
- Computer Graphics
- Games or Artificial Intelligence

Citroen : The grand evolution of design

At one time in my life, our family owned five Citroens all at once. I was the proud owner of a 1954 Light 15. When I sold it, I reaped a 500% increase on what I paid for it, but probably broke even on what it cost me.

Citroen were famed for their sleek aerodynamic style, designed in wind tunnels before any other car was, with pneumatic suspension that only now do other cars boast. Being so far ahead in their complex concepts and engineering meant inevitably they were called a "rich man's car" or in the case of our family also a "rich woman's car" because the maintenance costs were so high. Obviously Citroen's evolved over time and have many different models. The 2022 Ami, (bottom right), had lost all the sleekness of the Citroen of the 70s and 80s and probably belies the fact that moving around



congested cities means form gives way to function and that "cool" is just as appealing to some as "class."

The Ami is being hailed as a game-changer for those looking to commute to the office for a small fee. For just £20 a month in the UK, in addition to a deposit, drivers will be able to take advantage of the zero-emission Ami quadricycle - a four-wheeled "microcar". It features a 6kW electric motor, reaching a top speed of 45 kph. A 5.5kWh battery gives it a range of over 76 km, with Citroen banking on it being used for inner-city commutes.

The all-electric quadricycle measures just 2.4 metres long and 1.4 metres wide, with no boot or bonnet. It does, however, come with enough space in front of the passenger seat for an airline carry-on. (compiled by Jonathan Young, former Citroen owner).

... to this in 2022

What are the different types of EV?

'EV' stands for electric vehicle. EVs are plug-in vehicles powered at least partly by electricity.

This includes battery electric vehicles, (BEVs), plug-in hybrid electric vehicles (PHEVs) and fuel cell electric vehicles (FCEVs). The term 'EV' doesn't just cover cars – heavy transport, marine transport, planes, scooters, bicycles and motorcycles can all be powered by electric motors!

EVs are rapidly gaining popularity because they have a myriad of advantages in comparison to internal combustion engine vehicles (ICEVs). Thousands of studies have proven EVs to be better for the environment and human health.

With no clutch or gears EVs can accelerate smoothly and quickly; they often feel like you're driving a sports car. A fully electric car has fewer moving parts, so they come with less ongoing maintenance costs. In fact, there are about 20 moving parts in an electric engine, compared to nearly 2,000 in an ICEV!

EVs are very cheap to run because they do not rely on petrol or diesel – both of which are skyrocketing in price in New Zealand. Running an electric vehicle is equivalent to paying 24-40c/litre of petrol or diesel!

Cost of an EV

Electric vehicle technology is younger and more sophisticated than that of traditional fossil fuel powered vehicles. So, the upfront cost of an EV remains relatively high. However, you will soon pay off the cost difference between an EV and a petrol car, because electric vehicles are significantly cheaper to run and maintain. The long-term savings definitely outweigh the initial price tag! Most EV drivers save over $2,000 per year in petrol bills.

Also, New Zealand has implemented a raft of discount policies to reduce the upfront cost of electric vehicles. If you are registering a new or used plug-in electric or hybrid vehicle in NZ for the first time, you are eligible for a substantial rebate. EV users are also exempt from Road User Charges until 2024.

Clean Car Discounts

The Clean Car Discount Scheme is a Governmental initiative to make low emissions vehicles more affordable for New Zealanders and accelerate the decarbonisation of our transport sector.

The discount scheme is based on CO2 emission values; low emission vehicles registered for the first time in New Zealand after 1 April 2022 are eligible for a rebate, and high emissions vehicles will incur a fee.

Current discount programmes.

The fastest electric car.

From stop to the speed limit in 1.69 seconds!

The Owl is an electric hypercar from Japanese company Aspark. A run of 50 vehicles was planned ahead of the car's European debut in 2020. The Aspark uses four electric motors and a compact 64kWh battery to launch from rest to 100kmh in a claimed 1.69 seconds, putting it at the top of the leader-board. Aspark also claims a 300kmh time of 10.9 seconds and a top speed of 400kmh.

Range is a claimed 450 kilometres, but we have to wonder just how gently the Owl needs to be driven to make its small battery go that far on a single charge. We suspect the slippery body with a roof-line lower than a Ford GT40 may have something to do with it.

Aspark Owl

Chase Zero – Foiling on water with fuel from water

Chase Zero has been progressing through a highly measured and stringent commissioning process with every element of the hydrogen powered boat tested independently and collectively before bringing it up to foiling flight mode with the ETNZ developed autopilot in control of the ride height.

It is the same harbour that in late August 2012 saw Emirates Team New Zealand first introduce foiling to the world of the America's Cup in their AC72 catamaran yacht, which changed the face of sail racing globally. And now, just under 10 years later the team is introducing hydrogen powered foiling chase boats to the America's Cup also. The common theme is obviously foiling.

Travelling at 50 knots on the water requires a lot of power, and so foiling, like in sailing, was an obvious choice for us to reduce drag and therefore help to extend the range to around 180km on one fill of hydrogen which is stored on four tanks onboard, two in each hull.

The green hydrogen is stored in gas form at a maximum pressure of 350bar. The tanks are made from a plastic liner, wrapped in carbon fibre for the required strength. Each is capable of holding 8kg, giving a total capacity of 32kg when full.

Australian firms in for the running to build the world's largest green hydrogen plant in Southland

Australian companies Woodside Energy and Fortescue Future Industries are counter-parties in final stage negotiations to become lead developer of the prospective world's largest green hydrogen plant in Southland.

It is proposed Contact and Meridian Energy will select the lead developer for the Southern Green Hydrogen project after more detailed proposals, due by late-August. A green hydrogen plant in Southland would use renewable electricity, primarily from Meridian's Manapouri hydro scheme, to split water into hydrogen and oxygen, with the hydrogen used as a fuel. The project could create 5000 direct and indirect jobs.

Meridian Energy chief executive Neal Barclay said both counter-parties were in discussions with customers about buying the large volumes that the Southland plant would produce. Contact Energy chief executive Mike Fuge said Woodside Energy and Fortescue Future Industries demonstrated the technical capability needed to develop the project in time to capture 'early mover advantage in emerging global markets.'

"The final two counter-parties have the capability, experience and motivation to make this project happen at pace. Importantly they have both mapped realistic pathways for taking this project to commercial operation," Fuge said.

Europe's largest green hydrogen plant

WITT's collaborations are building momentum in the energy province

What does Victoria University, Canterbury University, Ara Ake and the Government's Crown Research Institute GNS, have in common?

They all have memorandums of understanding with WITT.

WITT understands that energy and engineering are inextricably linked and to be the best, you need to be connected to the best. With this in mind, WITT has established strong links and working relationships with some of the best institutions in the country when it comes to energy.

Victoria University and Canterbury University are two institutions which WITT has agreed to work with in a mutually supportive way. Students can begin a degree at WITT and then complete it at either Victoria or Canterbury. Both universities have agreed to help create development pathways which will enable WITT students to receive the best of both worlds; being in the energy province where learning is very much a part of the energy industry; and also receiving learning from the centres of proven excellence in academic achievement in renewable energy, engineering and business in the country. It creates an amazing opportunity for Taranaki students.

Added to this academic collaboration is the support of both GNS and Ara Ake.

The Institute of Geological and Nuclear Sciences (GNS - a Crown Research Institute), and Ara Ake (National new energy development centre) offer scholarships to WITT students.

GNS focuses on capability development to train engineers, scientists, and technicians to provide the workforce for a future green hydrogen industry in New Zealand.

Ara Ake will provide scholarships for Bachelor of Engineering Technology students who take energy related courses and who are well connected to their community and will use their learnings to make a difference.

Both GNS's and Ara Ake's scholarship offerings cover two students each for two years.

Ara Ake and WITT have also agreed to commit to developing an internship / mentoring programme based at Ara Ake's premises at 8 Young Street, New Plymouth. The collaborative space at Ara Ake' headquarters is available for WITT staff and joint appointments between WITT and the universities, for teaching their energy sector micro-credentials.

Growing an Energy Centre of Vocational Excellence

Taranaki is experiencing the emergence of alternative energy industries and usages that have the potential to create a range of new career pathways that WITT is preparing to support.

WITT is positively connected to many industries which will lead the transition, enabling WITT's curriculum to maintain a level of relevancy and responsiveness to those industry needs, which many other academic and vocational institutions will struggle to have.

Some of the areas that are anticipated to emerge include electric vehicles; hydrogen fuel technology; renewable generation technologies (hydro, wind, solar, geothermal, wave, tidal etc.).

WITT is supporting the energy industry by developing a Centre of Excellence in Energy and Engineering, to provide work-ready graduates who are skilled in the latest technologies.

Strategic Collaborations

WITT's collaborations with Victoria University, Canterbury University and Ara Ake, the national new energy development centre, creates strong relationships to ensure WITT is connected to other leading organisations in the energy field.

A Centre of Excellence must:

- 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.

WITT Partners with Ecolabs (Singapore) and Ara Ake in an emissions reduction testbed

New Zealand and Singapore's energy innovation partnership has been strengthened with the announcement of an energy innovation testbed at WITT, in New Plymouth.

The project is a collaboration between WITT, Ara Ake, and EcoLabs Centre of Innovation for Energy, Singapore.

John Snook (CE of WITT) and Cristiano Marantes, (CE Ara Ake) presented to Ms Low Yen Ling, Minister of State for the Ministry of Trade and Industry (Singapore), the project about the launch of a real-world demonstration site at WITT, now open to energy innovators from both Aotearoa New Zealand and Singapore.

WITT is looking to transition one of its main buildings at the Bell Street campus to 100% renewable energy sources and to reduce energy consumption by up to 50% by 2025. By attracting the best innovators from New Zealand, Singapore and beyond, WITT is one step closer to achieving these objectives. They are partnering with EcoLabs Centre of Innovation for Energy, which has successfully deployed real world testbeds across Singapore and in the Asia Pacific region.

Opportunity for WITT students

This project will also provide the opportunity for students to get involved with the deployment of innovative energy solutions, supporting the development of the skills that will be needed in a low carbon future.

Blocks A & B, which will form the centre of the energy innovation testbed.

International research collaboration with the Indian Institute of Technology, Delhi.

Investigation is underway to determine the feasibility of an international research project between the Western Institute of Technology in Taranaki (WITT), Victoria University in Wellington and the Indian Institute of Technology Delhi.

The government of India implemented the Green Ammonia Policy and is expected to make it available due to surplus hydrogen and ammonia. The ammonia can also be utilized in spark-ignition engines for power generation. The generated power can be used for an in-house plant as well meeting peak load power demand.

Storing hydrogen in ammonia is a cost effective compared to other storage medium (gas, liquid and hydride).

Both India and NZ are exploring hydrogen (H_2) to reduce reliance on fossil fuels. The project will be developing the utilisation of ammonia in a spark-ignition engine.

Both India and NZ have committed to carbon-neutral status and ammonia could enable this transition.

The Taranaki economy has been based upon methane extraction. The drive for a just transition to carbon neutrality is underway, with the establishment of sustainable energy research.

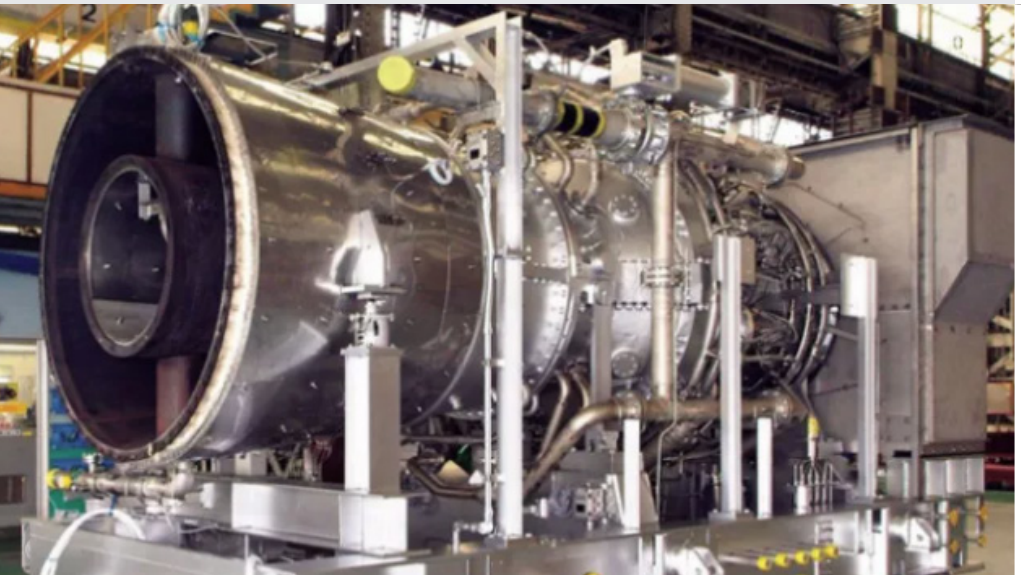
WITT formed an alliance with Ara Ake, a government-funded sustainable energy development centre, and both are working to develop a testbed at WITT with Ecolabs, Singapore.

WITT has a Memorandum of Understanding with VUW for VUW to engage in testbed research in the Taranaki region and international collaborations are part of both WITT's and VUW's education strategies for training a high-value skilled workforce for future energy development and deployment.

The intention of the work-stream is to explore the subject area related to Indian and NZ needs and to identify opportunities for fuel substitution of carbon-based fuels with NH3 in heavy vehicles and stationary engines. This will include identifying the perceived technical and design challenges which would result if NH3 were to be used as a fuel.

The ultimate outcome will be a technical feasibility study of the opportunity to use NH3 rather than, or in combination with, H2 as a fuel in heavy vehicles. This could piggyback on the existing New Zealand plans to implement a H2 fueling network by 2025.

H-25 Series gas turbine MITSUBISHI HEAVY INDUSTRIES, LTD.

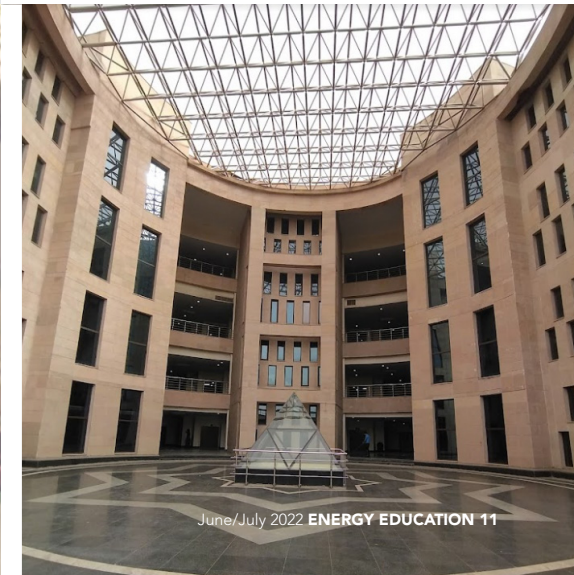


Who is the Indian Institute of Technology Delhi?

The Indian Institute of Technology Delhi is one of 23 IITs created to be Centres of Excellence for training, research and development in science, engineering and technology in India.

Established as College of Engineering in 1961, the institute was later declared as an Institution of National Importance under the "Institutes of Technology (Amendment) Act, 1963" and was renamed as the 'Indian Institute of Technology Delhi.' It was then accorded the status of a Deemed University with powers to decide its own academic policy, to conduct its own examinations, and to award its own degrees.

Since its inception, over 48,000 students have graduated from IIT Delhi in various disciplines including Engineering, Physical Sciences, Management and Humanities and Social Sciences. Of these, nearly 5,070 received Ph.D. degrees. The number of students who graduated with B.Tech. degree is over 15,738. The rest obtained Master's Degree in engineering, sciences and business administration.



Engineered soil microbe can convert CO_2 20 times faster than natural photosynthesis

New research led by the U.S. Department of Energy's SLAC National Accelerator Laboratory and the Max Planck Institute for Terrestrial Microbiology in Germany has shown how a bacterial enzyme found in the soil can be made to convert carbon dioxide into carbon compounds 20 times faster than plant enzymes do during natural photosynthesis.

Plants rely on a process called carbon fixation – turning carbon dioxide from the air into carbon-rich biomolecules – for their very existence. That's the whole point of photosynthesis, and a cornerstone of the vast interlocking system that cycles carbon through plants, animals, microbes and the atmosphere to sustain life on earth.

But the carbon fixing champs are not plants, but soil bacteria. Some bacterial enzymes carry out a key step in carbon fixation 20 times faster than plant enzymes do, and figuring out how they do this could help scientists develop forms of artificial photosynthesis to convert the greenhouse gas into fuels, fertilisers, antibiotics and other products.

https://energypost.eu/engineered-soil-microbe-can-convert-co2-20-times-faster-than-natural-photosynthesis/

Next-gen solar farms that work at night, in the rain, and self-clean

With the worldwide roll-out of solar, raising the efficiency of energy conversion isn't just about the materials science of PV cells. Douglas Broom, writing for the World Economic Forum, runs through three 'add-on' innovations. Researchers have found a way to generate electricity in the dark as panels cool during the night. A low-cost thermoelectric generator works using the temperature difference between the cooling solar panels and the surrounding air. Next, friction generated by raindrops landing on and running off solar panels can create electricity using a triboelectric nanogenerator. Finally, automated robots trundle across acres of panels to clean them of the dust, water, sand and moss accumulating on the surface: dirty panels can reduce the output of solar panels by as much as 85%.

Solar panels can traditionally only produce power when the sun shines, but new developments are changing that. Scientists have developed solar panels that can work in the dark and be powered by rain.

These innovations could transform solar into a 24-hour power source, helping with the world's transition to net-zero emissions.

The biggest problem with solar power is that the sun doesn't always shine. If solar panels can't produce power at night, or when it's cloudy, how can we rely on them as a round-the-clock source of electricity?

This is a problem scientists around the world have been wrestling with, and some are now developing innovative ways to overcome the issue.

Solar energy has been recognised as one of the best ways to provide power to some of the world's poorest people, with the price of panels down by 80% over the past decade. The World Economic Forum's 2021 Energy Transition Index highlighted the potential of solar power to improve the lives of people in sub-Saharan Africa, where it says 44% of the population have no access to electricity.

Solar energy that usually escapes earth overnight can now be captured, say scientists

The world is one step closer to night-time solar power after a breakthrough discovery by Australian scientists.

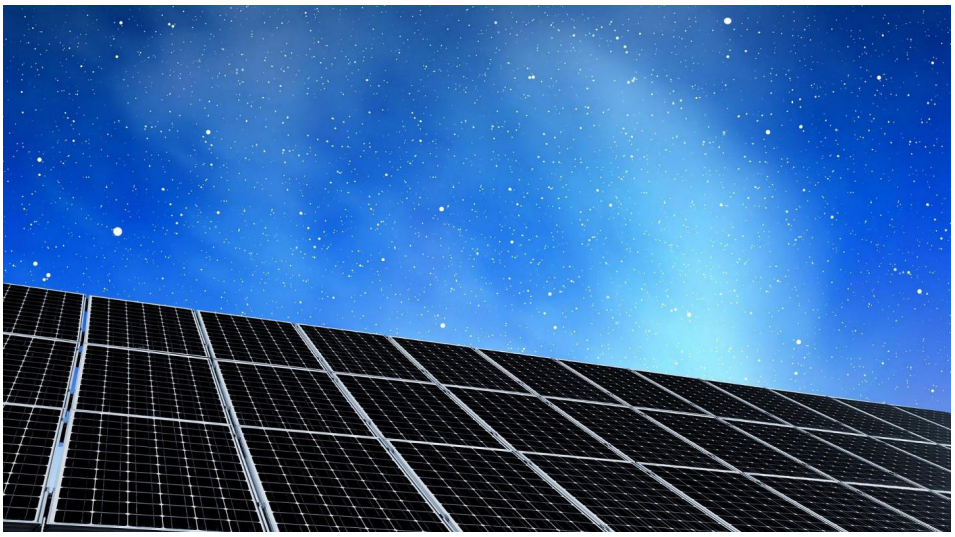
University of New South Wales (UNSW) scientists have found a way to 'catch' energy that flows out of the earth at night.

"This could mean being able to achieve the ultimate dream of renewable energy: power generation uninterrupted by the setting of the sun," the researchers claim.

So how does this sci-fi technology work - and when will it hit the market? Every day, the earth absorbs heat from the sun. At night, this heat escapes the earth in the form of infrared light, and is sucked out into the icy vacuum of space. If it didn't, the planet would quickly become far too hot to sustain life.

UNSW scientists say 'Nighttime solar' power is still in the early stages of development.

https://www.euronews.com/green/2022/05/19/new-technology-can-generate-solar-power-at-night-time-by-catching-earth-s-heat



Energy and Geopolitics

Russia is one of the world's top oil producers and exporters and a giant in natural gas markets.

Russia is a major player in global energy markets. It is one of the world's top three crude producers, vying for the top spot with Saudi Arabia and the United States. Russia relies heavily on revenues from oil and natural gas, which in 2021 made up 45% of Russia's federal budget.

Russia is also the world's second-largest producer of natural gas, behind the United States, and has the world's largest gas reserves. Russia is the world's largest gas exporter. In 2021 the country produced 762 billion cubic metres (bcm) of natural gas, and exported approximately 210 bcm via pipeline.

Russia is one of the world's top oil producers and exporters and a giant in natural gas markets.

Since the start of the crisis, the International Energy Agency (IEA) has been monitoring the implications of Russia's invasion of Ukraine for global energy markets. IEA member countries have agreed on two occasions to take the exceptional step of releasing oil from their emergency reserves to reduce the strains in markets and send a unified message that there will be no shortfall in supplies as a result of Russia's invasion.

In the first collective action following the invasion, agreed on 1 March 2022, IEA member countries committed to release 62.7 million barrels of emergency oil stocks. On 1 April, they agreed to make a further 120 million barrels available from emergency reserves, the largest stock release in the IEA's history, which coincided with the release of additional barrels from the US Strategic Petroleum Reserve. The two coordinated draw-downs in 2022 are the fourth and fifth in the history of the IEA, which was created in 1974. Previous collective actions were taken in 1991, 2005 and 2011.

https://www.iea.org/topics/russia-s-war-on-ukraine

Study options include:

Bachelor of Engineering Technology
(Mechanical/Civil, Level 7)

The Bachelor of Engineering Technology (BEngTech) is a three-year engineering degree, where students develop the capability to analyse and implement solutions to real-life, practical situations. It teaches students to understand and apply engineering science knowledge and provides a pathway into engineering, construction and related manufacturing industries. Students choose to major in civil or mechanical engineering. Graduates meet an industry demand for people who can actively apply engineering knowledge and integrate that knowledge into high level practical situations.

Job prospects for civil engineers
www.careers.govt.nz/jobs-database

Earn $60K-$70K a year
Engineering technicians/draughtspeople with one to four years' experience usually earn $50K-$70K per year. Senior civil engineers usually earn $120K-$180K per year.

Good job opportunities
Chances of getting a job as a civil engineer are good due to a shortage of workers.

Enrolment info@witt.ac.nz
Fees $7,120 (Full time domestic)
$885 (per paper domestic)
Start date 25 July 2022

NZ Certificate in Infrastructure Works
(Level 2 and 3)

The purpose of this qualification is to provide the infrastructure industry with people who have relevant knowledge and skills that can be applied to a range of infrastructure works processes. It is the cornerstone qualification for those graduates wanting to move into an infrastructure career pathway. Graduates of this qualification are able to carry out infrastructure works operations safely and to a quality standard in a variety of infrastructure work contexts. This programme can be studied part-time while you work and full time.

Enrolment info@witt.ac.nz
Fees Fees free (TTAF Funded)
Start date 27 July 2022

Graduate Diploma in Engineering
(Highways, Level 7)

This programme is designed to give those that have engineering qualifications a chance to gain technical knowledge in highway engineering and general knowledge of applied management. The goal is to provide the technical and management skills to function at middle management level.

Enrolment info@witt.ac.nz
Fees $6,784 (Fulltime domestic)
$843 (per paper domestic)
Start date 25 July 2022

NZ Diploma in Engineering
(Mechanical/Civil, Level 6)

This internationally recognised diploma gives students the knowledge and skills required of an engineering technician. You'll learn to apply theoretical and technical knowledge to practical situations and demonstrate the necessary strategies to work safely and effectively with contractors, communities, clients and authorities. Pathways include progressing to Bachelor of Engineering Technology.

Job prospects for engineering technicians
www.careers.govt.nz/jobs-database

Earn $50K-$70K a year
Engineering technicians/draughtspeople with one to four years' experience usually earn $50K-$70K per year.

Good job opportunities
Chances of getting a job as an engineering technician/ draughtsperson are good due to a shortage of workers.

Enrolment info@witt.ac.nz
Fees TTAF Funded until 31 Dec 2022
Start date 25 July 2022

Introduction to Engineering Maths
(Level 3)

Build your mathematic skills and knowledge in an engineering context. This training scheme provides a pathway for students to meet the entry criteria for the NZ Diploma in Engineering.

Enrolment info@witt.ac.nz
Fees Fees free
Start date 25 July 2022

WITT's extensive range of qualifications includes more than 60 options with study pathways that include postgraduate study and bachelor's degrees through to diplomas, certificates and micro-credentials that can be completed part-time or full-time.

Click here for further information