ENERGY EDUCATION

Mauri mahi, mauri ora

ENERGY NEWS FROM THE REGION, COUNTRY AND WORLD | DECEMBER 2021

WITT NEWS

WITT builds relationships with Ara Ake, Victoria University and University of Canterbury

Over the last two months WITT has entered into Memorandum of Understandings (MOU's) with three strategic partners. These are Victoria University, University of Canterbury, and Ara Ake, the national new energy development centre.

Ara Ake and the Western Institute of Technology in Taranaki (WITT), are pleased to announce their MoU to enable the acceleration to a sustainable future in Aotearoa New Zealand.

WITT is focused on improving its footprint in the clean energy Technology space.

As a result of the agreement, WITT will be focusing on developing the renewable energy workforce and will initially deliver a programme in 2022 to upskill electricians in solar panel installation. WITT will also deliver energy courses for third year Bachelor of Engineering Technology students. Ara Ake will offer several scholarships to students taking energy related

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courses and who are well connected to their community to use their learnings to make a difference.

Ara Ake and WITT will collaboratively develop internships and mentorships at Ara Ake headquarters in New Plymouth. WITT employees will have access to space within Ara Ake's headquarters to teach energy related micro-credentials.

Increased opportunities

"We are delighted to announce our MoU with WITT," says Ara Ake Chief Executive, Dr Cristiano Marantes.

"With the combination of not only our skills, knowledge, and expertise, but the shared recognition of the importance of accelerating low emissions energy in Aotearoa, I am certain this agreement will strengthen the opportunities for students and the region's transition," Marantes concludes.

Testbed sites in Taranaki

The two organisations will work collaboratively to develop technology demonstration sites, also known as 'testbeds' for the projects that Ara Ake is working on with Singapore-based EcoLabs Centre.

This will enable WITT engineering students to learn from innovators and get beyond the front gate on projects.

WITT has recently advertised joint appointments with the University of Wellington to develop the capability and outreach in the transitional energy sector and the University of Canterbury to support civil engineering in relation to new energy development and improve accessibility to education in Taranaki.

"Our aim is to also support Venture Taranaki's regional economic development plan launched in 2017-2018", says WITT Chief Executive John Snook.

"We are focused on providing education that supports a workforce transition to a net-zero future and I am delighted to be aligned with Ara Ake under our new agreement."

John Snook (left), Chief Executive of WITT, and Cristiano Marantes (Chief Executive of Ara Ake

Education is in Transition to build the future workforce by Dr Ellie Khaghani

Higher education follows technology changes. Technology disruption is necessary to meet the climate change targets.

It affects the nature of employment and employability, so does what it takes for a graduate to be 'work-ready'. There is a need for new strategies in education and industry to achieve a competent future workforce.

The Government is implementing the Reform of Vocational Education (RoVE) to respond to the New Zealand Productivity Commission's report on technological change, the future of work, and the need for an agile and adaptable workforce. The RoVE has established the Workforce Development Council (WDC), Regional Skills Leadership Groups (RSLG) and New Zealand Institute of Skills and Technology (NZIST or Te Pūkenga).

The Workforce Development Council acts as an industry voice across the vocational education and training system, develops qualifications, sets skills standards and advises the Tertiary Education Commission on investment priorities. The Regional Skills Leadership Groups identify and supports future skills needs in the regions and cities. Te Pūkenga brings the 16 polytechnics together into a single national entity to create programmes with nationwide consistency.

The collaboration of Workforce Development Council, the Regional Skills Leadership Groups and Te Pūkenga will play a significant role in shaping the future workforce and could eliminate duplications with sharing resources.

The Western Institute of Technology at Taranaki can provide the alliance opportunity within the region by establishing the Energy Centre of Excellence.

Education opportunities come from job losses in specific existing sectors and new sectors. A forecast of the type of skills and the number of qualified professionals can provide evidence that skills must be developed and can result in a gap analysis showing where intervention should be targeted. However, a green jobs mapping study in Malaysia reports potential challenges in developing a greener economy with green jobs at the country level.

The job estimation challenges are as follows:

1. Lack of data of actual job estimates or potential to generate green jobs.
2. Data disaggregation.

Dr Ellie Khaghani
Ellie Khaghani joined the Western Institute of Technology at Taranaki (WITT) in 2019. She currently teaches engineering courses at WITT and acts as Energy Lead.

3. Lack of information on what has been implemented on the ground.
4. How to deal with job estimates of "short-term green projects." (e.g., projects such as tree planting on a certain piece of land which could generate temporary green jobs).

https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-angkok/documents/publication/wcms_239640.pdf

Education transformation

Higher education providers can help students reach their academic and professional potential through three actions and help solve their unemployment.

https://wedocs.unep.org/handle/20.500.11822/35070

Promoting lifelong learning

Knowledge enhancement and continuous learning is a career necessity.

Environmental sustainability and learning outcomes related to growing an inclusive green workforce and economy should be included in all majors and degrees curricula.

Demand is increasing for continuous development, and education should provide a learning model that is self-directed, affordable, accessible, and time-critical.

Adequate preparation at secondary school in Physics, Mathematics and Chemistry (STEM), and ICT concepts is a priority. Instructors should also undergo retraining programs the same way as industry professionals do.

Skills and competency development

The key theme is targeting competency through a gap analysis, curriculum development, job training and reassessment. For educators, it is through enhanced professional development, and for students it is through curricular updates in vocational education and higher education.

The education model requires case-based teaching, experiential learning and alternative training, with students spending 50% of their time in the industry with access to real industry data and commercial software.

A variety of learning approaches can develop interdisciplinary knowledge. It may include peer-to-peer learning, experiential learning, digital learning, industrial experiences in other sectors, and the opportunity to develop a broad range of professional skills. The co-creation methodology has proven successful records in universities.

https://pure.tue.nl/ws/portalfiles/portal/53837516/EvaluationReportExpeditionEnergyTransition_final2.pdf

https://teamfast.nl/about-us/

Job opportunities

Education providers can link potential employers to students by gaining employers' input for curricular updates and increasing job placements.

The Future of Work in Technology

The Deloitte Insights report on "Human Capital Trends" refer to transformation in work, workforce, and workplace to shape the future of work in technology. It will be radically different, mainly driven by new technologies.

Automation is one of the areas that will affect all energy sectors in the future, including renewable technologies. The advantages of digitalisation include increasing the share of energy sources, providing a new business model with a future decentralised energy system, enhancing the efficiency of energy generation, distribution, and consumption, all the while ensuring a reliable, cost-competitive, and secure energy supply for end-users.

It has drawbacks such as cyber-security risks, the shortage of skilled workers. There is the need for substantial investment which will continue to drive high energy costs to end-users because of the need to bring a return on investment. There may be resistance to change from workers. The digital evolution of the sector will also limit some job creation.

Workforce transformation and options

Companies will want to know who can do the work and what are the required skills for the work?

Employers should know more about transferable skills to adopt the potential of existing expertise in other sectors. There is interest in the

types of jobs emerging renewable technologies could create and whether there is scope for workers from the oil, gas or coal sectors to fill these jobs.

There is confidence that this could happen as the technologies in oil and gas production can be transferred in exploring and producing alternative energies such as geothermal, hydrogen and carbon sequestration and storage.

Here are more details on transferable technologies.

http://chinookpetroleum.com/

Geothermal: the developed technologies from oil and gas that can be useful in geothermal include horizontal drilling, software-assisted geosteering, 3D and 4D seismic interpretation, precision reservoir mapping, magnetic ranging, under-balanced drilling, high-efficiency mud systems, re-completions of existing deep wells, re-purposing of existing pipeline network, many other technologies and workflows.

Hydrogen: Hydrogen can be transported to some extent in existing natural gas pipelines but needs new infrastructure for large scale transportation, distribution and consumption in all New Zealand. Eco-gas is looking at a feasibility study with First gas. This study investigates whether it is possible to enhance the value of the biogas to biomethane. The project involves taking raw methane (containing 35% CO2), stripping the CO2, and injecting it into the pipeline as a certified green

The Energy Quarterly Sept 2021

Main highlights for this quarter

The renewable share was 83.6% up from 77.4% this time last year.

Hydro generation has increased 25% since last quarter and 8.2% on the same quarter last year, having had a dryer than usual past year.

Reflecting the improved hydro storage situation, we saw a 28% drop in non-renewable generation from this time last year. This was a result of a 27% drop in gas use, and 31% drop in coal use for electricity generation.

COVID related restrictions caused significant decreases in liquid fuel use for domestic transport, with petrol consumption decreasing by 23%, Diesel by 11% and JetA1 by 22%, compared to June Quarter 2021. These changes reflect similar decreases in greenhouse gas emissions from transport.

Retail prices for regular petrol have risen 7% over this time. Higher crude oil prices account for half of this increase at the pump. The rest can be attributed to higher Emissions Trading Scheme (ETS) costs, GST and importer margin. The average price for retail diesel increased by 9%, and 12% for commercial diesel.

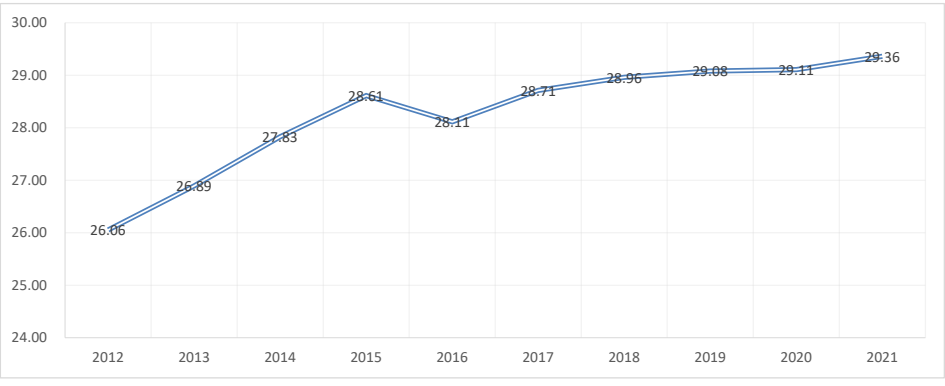
Offshore Future Energy Forum shows strong support inTaranaki

The Offshore Future Energy Forum took place in New Plymouth on the 25th and 26th November with 180 people attending both online and in-person. Topics covered included offshore wind renewable energy, legislative framework, green hydrogen, energy storage, ocean wave energy, Iwi perspective.

Worldwide, wind power is growing exponentially. Today, there is now 743 GW of wind power capacity worldwide, helping to avoid over 1.1 billion tonnes of CO2 globally – equivalent to the annual carbon emissions of South America.

743 GW of wind power capacity is about 80 times more than all of NZ's electricity generation capacity.

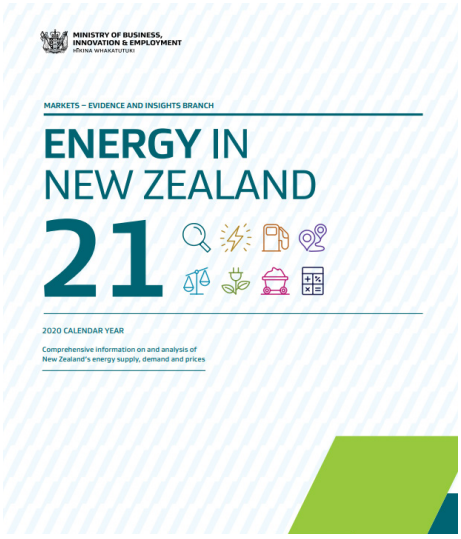
Residential Electricity costs (cents a Kwh) Source MBIE



MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

Energy Quarterly - Sept 2021

Beehive.govt.nz
The official website of the New Zealand Government



gas. The existing pipeline from Reporoa to anywhere in the North Island makes the potential outcome of the project interesting.

Carbon sequestration and storage: Large energy projects produce associated greenhouse gases. It emerged as a solution in offsetting emissions and, in some cases, in Enhanced Oil Recovery (EOR) strategies.

Offshore Wind Energy: Transferrable foundation skills are offshore installation vessels, offshore platforms, operating and maintaining offshore infrastructure under the environmental challenges. The maritime workers also have transferable skills for the offshore wind industry. The blue economy cooperative research centre has published a study to point out a preliminary occupational match between offshore oil and gas and offshore wind energy.

https://www.actu.org.au/media/1449639/becrc_owe-in-aus-project-report_p320007_v2_e190721-1.pdf

Workplace transformation and readiness: How are work practices reshaping considering new commutation tools and high-performance culture? The workplace requires a change in work culture, aligning the mindset, and adding flexibility and speed while ensuring high staff efficiency.

Dr Ellie Khaghani presented this as a keynote address to the Net Zero New Zealand : Emissions Workshop, recently held in Wellington on 2 December. The Emissions Workshop was an intensive one-day forum for leaders to learn about how the drive to lower emissions will affect their organisation. The Interim Climate Change Committee (ICCC) also presented. The workshop provided insights into emissions management, energy efficiency and sustainability measures for medium- to large-organisations in the private and public sectors.

Inventiveness?

Is there a balance between individual creativity and collective effort?

My son's favourite toy was a little red robot, which I've kept, though I'm not sure if I did it for him or me. Probably the latter!

One thing that sets humankind apart is our ability to augment our lives with technology. Its pretty difficult to find any other species who come anywhere close. Our inventiveness is a combination of individual creativity and collective effort. We have geniuses but then we all stand on the shoulders of those that went before us. Both is how we accelerate innovation, development and the human race.

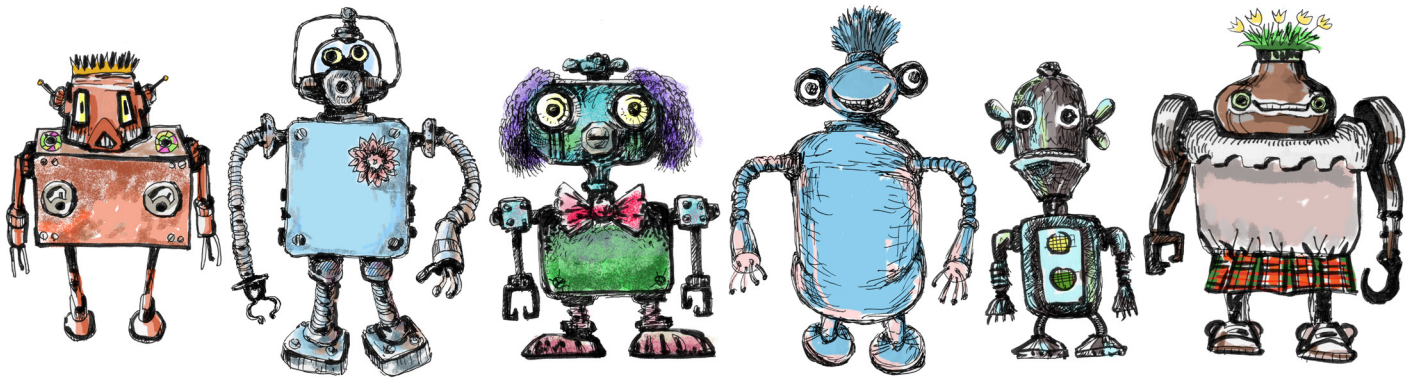
How we work collectively is important. Collaboration is important but we also need to be wary of duplicating other's ideas, even with a slight variances else we can run into patent issues. One may ask who had the original idea of a robot - a mechanical device to either take the effort out of work or amplify that effort to give higher output. And now our world is full of devices that do just that.

Patent systems are helpful to protect the interests of the inventor, but also to encourage wider innovation.

"A patent is a right that is granted for an invention. After the grant of your patent, in exchange for your exclusive rights, the patent description is published to encourage innovation." (NZ Intellectual Property Office).

Searching patents helps you discover how technology has evolved over time and if your work is unique or you are duplicating the work of others. The wheel has been reinvented a million times I'm sure! Sometimes inventiveness is applying existing technology in new ways or bringing a combination of technologies together that achieve new and different results. Inventiveness is something to be cherished and nurtured.

Jonathan Young is the Head of Policy, Research & Insights at Ara Ake, the national new energy development centre.



New Postgraduate Programme in Renewable Energy at Victoria University, Wellington

New postgraduate programme in renewable energy at Te Herenga Waka–Victoria University of Wellington

Various alternative energy technologies and vectors have become affordable and disruptive to our traditional mode of centralised energy generation and production, transmission and distribution. These disruptions are necessary to enable a global transition to address climate change challenges. To this end, the Aotearoa–New Zealand government has set an aspirational goal of a just transition to a net zero carbon economy by 2050, through the recently enforced Climate Change Response (Zero Carbon) Amendment Act. Industry and government have subsequently indicated that a vast number of additional broad and diverse skills and capacity will be required to enable the (energy) transition across the various sectors of the economy. A particular focus is the (just) transition in terms of improving the resilience of communities in current and future energy value chains and addressing the energy trilemma – security, equity and environmental sustainability.

In response, Te Herenga Waka–Victoria University of Wellington aims to introduce a new postgraduate programme that is focussed on Renewable Energy, with different qualifications – A Master of Renewable Energy, and a postgraduate certificate, postgraduate diploma, Bachelor of Science (Honours) and Master of Science in Renewable Energy with two specialisation streams: Renewable Energy Systems Engineering (i.e. a technical stream); and Renewable Energy Systems Analysis (i.e. a non-technical stream).

The new programme aims to address the skills and capacity requirements and will build on expertise in renewable energy currently in Te Wāhanga Ahunui Pūkaha–Wellington Faculty of Engineering, as well as expertise in sustainability sciences in Te Wāhanga Pūtaiao–Wellington Faculty of Science and other Faculties at Te Herenga Waka–Victoria University of Wellington.

The degree is aligned with the strategic focus of the University on sustainability, specifically to meet current and future challenges, by taking an inter-disciplinary approach, and engaging with partners across society in trans-disciplinary ways.

While the postgraduate programme is being developed, all stakeholders are invited to provide feedback and suggestions to tailor the programme to the needs of Aotearoa New Zealand.

Responses can be emailed directly to Alan Brent.

Professor Alan Brent
Alan Brent, Professor of Sustainable Energy Systems
School of Engineering and Computer Science

What is Transition Engineering and how do we do it?

Transition Engineering is a new engineering trans-discipline that is emerging in response to the mega-issues of global climate change, the inevitable and necessary decline in the world's supply of oil, scarcity of key industrial minerals and local environmental constraints.

These sustainability issues underpin today's so-called wicked problems and pose strategy challenges for organizations, businesses and communities. The unsustainability in incumbent energy and material systems pose risks. Transition Engineering is like other risk management disciplines in that it has a straight-forward method, practical tools and a socially responsible ethos.

Energy transition is the realistic approach to mitigating the most destructive climate impacts by arresting the increase of greenhouse gas concentrations. Energy transition projects are about changing existing complex systems to radically lower energy and material use while preserving essential functions and benefits. However, changing incumbent systems nearly always poses wicked problems.

Professor Susan Krumdieck, together with professional engineers around the world, pioneered the interdisciplinary transition innovation, management and engineering (InTIME©) approach while in the Mechanical Engineering Department at the University of Canterbury as a strategic framework for tackling wicked problems. The InTIME© approach uses a 7-step method of discovery journey with stakeholders to innovate effective projects. It involves studying the historical context of the activity system under consideration and looking at how the system developed to this point, and examining data to understand the current energy use, policy, economic, environmental conditions and impacts of the activity system. It seeks to answer the following questions. What does the future look like if current trends continue? What does a desirable future look like for this activity system? What triggers may cause a change in the business-as-usual? What shift-projects can be implemented to deliver change and provide resilience and regenerative benefits now?

Responding to the large international requirement for all engineers to tool up for transition, the University of Canterbury is offering professional development courses in the form of micro-credentials that are online and largely self-paced.

Energy InTIME©

Energy InTIME© is a six-module course that is aimed at engineers, with lectures, short assignments and quizzes. Finally, students conduct their own InTIME© project that puts into practice their newly acquired skills. The second course is a four-week short course Achieve NetZero Applying InTIME© that is aimed at leaders, managers, financial analysts and policy makers and all wondering "How do we meet the targets?"

The course has short lectures and quizzes to help you check your progress. Both courses use the international best-selling book, Transition Engineering, Building a Sustainable Future (2019) CRC Press.

Current Energy InTIME© is open for enrolments with a last date to join 28 February 2022. The four-week short course Achieve NetZero Applying InTIME© is open with an anytime start.

Professor Susan Krumdieck MNZM
Susan is a New Zealand engineering academic. She was an academic from 2000 to 2020, and the first woman appointed to full professor in engineering in 2014 at the University of Canterbury. She is currently Professor and Chair in Energy Transition at Heriot-Watt University, Scotland. In the 2021 New Year Honours, Krumdieck was appointed an honorary Member of the New Zealand Order of Merit, for services to sustainability research and engineering.

Click on the arrow (left) to watch Susand Krumdieck speak on Transition Engineering.

Click on the University of Canterbury logo to take you to the Transition Engineering page where you can find more information on the programmes on offer.

Will this be the decade of Carbon Capture or another false start?

Ten years ago there was a major drive to get carbon capture off the ground. But only 30% of the earmarked $8.5bn worldwide was ever spent. Spending timescales were too short, deadlines were missed, projects were too focussed and too complex, and long-term liability was poorly understood and managed. This time it can be different, says Samantha McCulloch at the IEA who compares that faltering history with the plans now being put in place. New business models have emerged, in particular industrial hubs that allow economies of scale and shared transportation and storage. Policy support is being put in place along with attractive funding. The mass production of low-carbon hydrogen needs it. Net-zero targets demand it, which is why 80% of national long-term low emission development strategies submitted to the UNFCCC include plans for CCUS. The U.S. and Europe are leading the way with policies and investment to match. The coming decade will be crucial as the IEA Roadmap to Net Zero by 2050 needs CCUS to grow to 7.6bn tonnes of CO_2 removed per year by 2050. Today it's little more than 40 $MtCO_2$.

https://energypost.eu/will-this-be-the-decade-of-carbon-capture-or-another-false-start/

Global demand for coal could hit all-time high in 2022

The International Energy Agency (IEA) has said that coal power is on track to hit a new global record this year after an economic rebound that could drive worldwide coal demand to an all-time high in 2022, reports the Guardian. The IEA's report says that the amount of electricity generated from coal power plants has increased by 9% this year after a surge in fossil fuel demand to fuel the recovery from Covid lockdowns, the paper explains, noting that "the global gas supply crunch ... has also helped reignite demand for coal."

https://www.carbonbrief.org/daily-brief/global-demand-for-coal-could-hit-all-time-high-in-2022

Green gas on its way

Firstgas Group and Ecogas are preparing to turn kerbside waste into pipeable renewable gas for New Zealand homes and businesses.

The two companies are developing the country's first large-scale renewable gas project at a central North Island site on land owned by fresh produce giant T&G Fresh.

Firstgas chief executive Paul Goodeve says the scheme will provide enough biomethane to supply the equivalent of 9000 homes and businesses – preventing more than 11,000 tonnes of CO2 production each year.

"Biomethane is chemically identical to natural gas so there is no need to modify pipeline infrastructure or gas appliances," he says.

"We have our sights set on scaling up operations, which will see multiple renewable gas to pipeline sites around the country in the future."

https://www.energynews.co.nz/news/biogas/113502/green-gas-enter-nz-grid-2023?utm_source=newsletter&utm_medium=email&utm_campaign=energy-news-newsletter

Which clean energy innovations are gaining momentum?

In April 2021, the European Patent Office (EPO) and the IEA issued a comprehensive report entitled "Patents and the energy transition" which sought to identify trends in clean energy technologies by examining patent filing data. The report highlights which clean energy technologies appear to be gathering momentum and compares clean energy innovations to those of fossil fuel technologies.

According to the EPO data, the rise in low carbon energy (LCE) innovations has comfortably outpaced those in fossil fuel technologies with an overall uptrend in patent filings over the period 2000 – 2019. In contrast, filings for fossil fuel technology innovations, whilst having higher overall growth than is observed across all technology areas, have declined for each of the four years from 2016 to 2019. This is the first such decline since the second world war.

https://www.openaccessgovernment.org/transition-clean-energy/123483/

Unlocking innovation to lead in the energy transition: Nine questions for executives

1. Do we have a clear, ambitious target for the size of the growth opportunity through innovation?

2. Do we understand how the energy transition will reshape value pools in our markets (and adjacencies)?

3. Is our view of the future founded in realistic scenarios?

4. Do our business plans create clarity on assumptions and uncertainties?

5. Do we have a risk-adjusted portfolio of initiatives for growth?

6. Are we reallocating resources dynamically?

7. Do we have the right talent in place?

8. Does our company have an 'ambidextrous' operating model?

9. Is our governance creating conditions to take appropriate risk?

https://www.mckinsey.com/business-functions/sustainability/our-insights/sustainability-blog/unlocking-innovation-to-lead-in-the-energy-transition-nine-questions-for-executives

The massive CO_2 emitter you may not know about

Concrete is the most widely used man-made material in existence. It is second only to water as the most-consumed resource on the planet.

But, while cement - the key ingredient in concrete - has shaped much of our built environment, it also has a massive carbon footprint. Cement is the source of about 8% of the world's carbon dioxide (CO_2) emissions, according to think tank Chatham House.

If the cement industry were a country, it would be the third largest emitter in the world - behind China and the US. It contributes more CO_2 than aviation fuel (2.5%) and is not far behind the global agriculture business (12%).

It is these unrivalled attributes of concrete that have helped boost global cement production since the 1950s, with Asia and China accounting for the bulk of growth from the 1990s onwards.

Production has increased more than thirtyfold since 1950 and almost fourfold since 1990. China used more cement between 2011 and 2013 than the US did in the entire 20th Century.

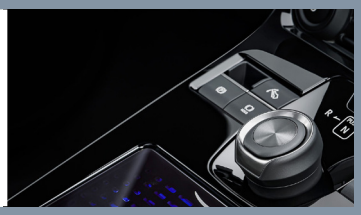
https://www.bbc.com/news/science-environment-46455844

Toyota V. Tesla

Does the V stand for "Versus" or just "Very" good friends?

TOYOTA

Toyota's new electric SUV has a solar roof and a steering yoke like Tesla



There have been rumours for some time that Toyota and Tesla will team up to bring the best of both companies into a joint-venture of masterful technology and mass-production.

TESLA

Above: Tesla S steering yoke and big screen.

Right and below: Elon Musk promises that Tesla's revamped roadstar will be the fastest production car in the world, claiming to do 0-100 kmph in 1.9 seconds. All eyes will be watching when it is due for release in 2023.

The Gulf News (UAE) recently reported that "Tesla is tops in electric vechicle (EV) design, vision-based artificial intelligence (AI) self-driving technology and battery-for-vehicles manufacturing. Toyota is tops in making reliable vehicles by the millions. Toyota made 9.2 million in 2020, Tesla made 520k units. Now try putting them together."

Finer points of the deal had been under discussions since 2020, the report added. It also gave rough outlines of the plan that would combine Toyota's just-in-time manufacturing and engineering know-how with Tesla's expertise in software and control systems for EV powertrains. The goal would be to roll out a new platform that would be used for a smaller SUV.

However the NZ Herald reported in December, that "Toyota will pour US$35 billion (NZ $51.9b) into a shift towards electric vehicles as the world's biggest carmaker sets itself up for direct rivalry with Tesla."

Toyota's latest ambition for zero emissions follows its announcement earlier in December that it would be ready,

from 2035, to only sell vehicles in western Europe that did not emit carbon dioxide. But this was based on the assumption that sufficient renewable energy capacity and electric charging and hydrogen refuelling infrastructures would be in place by then in Europe, which accounts for about 10 per cent of Toyota's global sales.

Regarding the rumour, Gulf News said Toyota dismissed it as "speculation". Tesla is mum on the issue. Still, the rumours won't die.