EESA
Electric Energy Society of Australia

NATIONAL BULLETIN

Bulletin 9 | 2021

NSW on track to become the place to buy and sell EVs

By Jeff Allen, National President of the Electric Energy Society of Australia | September 2021

The NSW Government recently released its Electric Vehicle Strategy which sets out key actions to make New South Wales the easiest place to buy and use an EV in Australia. It is interesting to note that all state and territory governments across Australia have developed similar EV policies and strategies all aimed at encouraging EV take up.

Currently, battery EVs make up only about 0.68% of new car sales in New South Wales. This compares to international market leader, Norway, where battery EVs made up 55% of new vehicle sales in 2020 and plug-in hybrid and battery EV sales combined, made up 75% of sales.

According to the International Energy Agency, global demand for EVs increased by 43% in 2020 compared to 2019, with slightly over three million new EVs registered in 2020. Forecast sales for 2021 are over six million. The increase in demand is driven in large part by new EV policies in international jurisdictions. Examples of these EV policies are:

- The US under President Biden plans to spend $174 billion to drive EV uptake and upgrade its fleet of 640,000 vehicles to EVs
- Norway plans to end sales of new petrol and diesel vehicles by 2025
- The UK plans to ban the sale of new petrol and diesel vehicles by 2030
- Sweden offers a grant for up to 25% of the purchase price of low emissions vehicles and a grant of 50% of the price for home charging points
- Japan plans to end the sale of petrol and diesel cars by the mid-2030s
- France will spend €1.3 billion to drive the uptake of EVs before prohibiting the sale of petrol and diesel vehicles by 2040
- Germany plans to put 10 million EVs on the road and install 1 million charging stations by 2030
- China requires all automakers and car importers to manufacture or import at least 12% EVs
- Canada will spend CAD$600 million to incentivise the uptake of EVs and develop a coast-to-coast fast charging network
- Singapore has a plan to ensure all vehicles in the country are low-emissions or zero emissions vehicles by 2040
- New Zealand plans to invest NZ$300 million in electric vehicles and upgrade its government fleet to be emission-free by 2025-26

The NSW Government's recently released EV Strategy is expected to increase EV sales to 52% of the market by 2030-31 and see the vast majority of new car sales being EVs by 2035.

The EV strategy document indicates that the transport sector in NSW is a significant and growing source of greenhouse gas emissions. In 2019, transport was responsible 20% of NSW emissions, with almost 50% of those from passenger vehicles. Increasing the number of EVs on NSW roads and powering them with renewable energy will help to reduce emissions across the transport sector, contributing towards NSW's objective to achieve net zero emissions by 2050.

According to the NSW Government report, the top three barriers to the widespread uptake of EVs are:

- Upfront costs: Currently, the average EV sold into the NSW market is about $28,000 more expensive than the average petrol or diesel car. While the average price of an EV is expected to fall, with many categories reaching price parity by 2027, helping to reduce upfront costs in the next few years will help to increase EV sales.
- Range anxiety: NSW EV drivers currently have access to around 450 public chargers across the State; however, many of these are located too far apart or charge at slow rates. Rolling out an ultra-fast charging network will give motorists confidence that they can quickly recharge their car when and where they need to.
- Model availability: There are currently only around 30 plug-in hybrid and battery EV models for sale in New South Wales, many of which are relatively expensive, luxury models. This compares to more than 75 EV models available in the UK. Bringing more affordable EV models into the NSW market will be a key part of helping more people purchase EVs.

The NSW Government Strategy sets out the following five areas for action:

1. Helping drivers buy an electric vehicle - To help reduce the upfront cost of buying an EV, the NSW Government will remove stamp duty on EVs, offer rebates, provide fleet incentives, and use the NSW Government vehicle fleet to bring a range of cheaper EV models into the State.
2. Building a world-class electric vehicle charging network - by investing $171 million over the next four years to ensure widespread, world-class EV charging coverage. This will include 350kW "Ultra-fast chargers" which can recharge between 200 and 400km in no more than 15 minutes and "Destination chargers" (with a capacity of between 7 kW and 25 kW) and can recharge between 40 km and 140 km per hour). Interestingly, there was a recent announcement that Ausgrid and JOLT (an Australian EV Charger manufacturer) have transformed an existing Ausgrid streetside kiosk substation into a state-of- the-art EV charging station. JOLT have announced plans to rollout 500 charging kiosks across the Ausgrid network.
3. Making it easy to drive an electric vehicle – by allowing EV drivers to use transit lanes to encourage the uptake of EVs and having carparks allow priority parking spots for EVs to recharge.
4. Creating jobs and growing the economy – by maximising the employment and economic benefits from the increasing uptake of EVs in the State.
5. Keeping road funding fair and sustainable – by reforming the road taxation system by phasing out stamp duty on EVs and introducing a distance-based road user charge for EVs.

The NSW Government expects this strategy will increase EV sales to 52% of all vehicles by 2030-31 and see the majority of new car sales being EVs by 2035.

We are indeed going to see more and more "electrification" across Australia over the next few years. A great time to be involved in the ever-growing electric energy area!

Jeff Allen, National President of the Electric Energy Society of Australia

You are Invited to EECON 2021

By Russell Ellen, EECON 2021 Chair

EECON 2201 has invited the WA Minster for Energy Hon Bill Johnston MLA and WA Minister for Hydrogen Industry Hon Allannah MacTIERNAN MLA. to speak at our conference.

The conference will cover energy network challenges and opportunities, the future energy map, and whether our regulations will drive a better, affordable, sustainable, Australia.

Perth is the place to see leading technologies and investment plans.

Here are three significant projects that are happening in WA that will be discussed at EECON2021

1. Horizon Power's first significant project to prove the "off the grid", shift to a distributed renewable grid. The Western Australia Pilbara town of Onslow, says its solar and battery microgrid is already helping to deliver "more reliable" and cleaner power – at levels of up to 90 per cent renewables.
2. ARENA has approved $1.5 million in funding for a $3.3 million project to trial the production, storage and use of renewable hydrogen to energise a commercial-scale microgrid for ATCO Clean Energy Innovation Hub.
3. The world's biggest renewable energy hub – comprising an astonishing 50 gigawatts of wind and solar capacity – has been proposed for the southern coast of Western Australia to create millions of tonnes of green hydrogen for use in Australia and for export. The scale of the $100 billion project – to be known as the Western Green Energy Hub – is unprecedented. It would rank as one of Australia's biggest ever projects of any kind, and not far short of the size of the country's main grid.

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LOCAL NEWS

Commission confirms five-minute settlement to commence on 1 October 2021

Australian Energy Market Company | 9 September 2021 | Source: AEMC

The AEMC has today published a final determination confirming that no delay is needed to the implementation of five minute settlement (5MS) and that it will begin as scheduled on 1 October 2021.

The determination was on a precautionary rule change request submitted by the Australian Energy Market Operator (AEMO). AEMO sought to delay 5MS if an issue occurred that it could not manage for the successful start of the reform on 1 October 2021.

In making its decision, the Commission considered AEMO's readiness assessment published on 1 September that recommended no delay and stakeholder submissions agreed.

The Commission's decision to make no rule ensures the benefits of 5MS will be realised as early as possible. It also means no delay will be needed to other regulatory reforms (e.g. global settlements and wholesale demand response) and consequently their benefits will also be realised as quickly as possible.

Visit the project page for more information and contact details.

Editor's note: As reported in Renew Economy , the switch to 5-minute settlement is likely to help spur new investment in large-scale battery storage projects that will be well placed to respond to short term fluctuations in electricity supply and demand.

Putting some momentum in inertia

Ben Skinner | 2 September 2021 | Source: Australian Energy Council

The Australian Energy Council is pleased to publish a new report by MarketWise Solutions on the introduction of an Inertia Market into the National Electricity Market (NEM).

The industry has been aware for some time of the need for a mechanism to recruit inertia to support the NEM as it transitions. It is sometimes described as a "missing market". This was also recognised by the Energy Security Board (ESB) that included it as one of the necessary future developments in Essential System Services (ESS).

However ESS efforts are presently focussed on other important and technically challenging areas, such as primary frequency control, system strength and unit commitments for security.

The AEC has a members' working group dedicated to frequency control matters which contemplated how this missing market could be filled. Members presented some interesting ideas, and the group engaged MarketWise to draw that thinking into a clear proposal. Read the full article...

LOCAL NEWS

A minimum requirement: Managing the demand drop

Carl Kitchen | 2 September 2021 | Source: Australian Energy Council

The challenge posed by falling minimum demand was again in the spotlight this week with the release of the latest supply assessment by the Australian Energy Market Operator (AEMO).

The 2021 Electricity Statement of Opportunities (ESOO) highlights the major impact the increasing amount of distributed PV, particularly solar systems going on household rooftops is having on managing the grid. In its central scenario the market operator expects to see nearly 9GW of PV installed within the next four years, on top of 14GW of capacity already installed.

One outcome of this continuous growth is that each mainland National Electricity Market (NEM) region can expect to see minimum demand occur in the middle of day from now on. This has become increasingly evident since 2018-19 when around 75 per cent of minimum demand events in these regions occurred between midday and 2:30pm.

Individual states have already had to contend with the challenge of increasing periods of minimum demand with South Australia leading the way – that state has achieved periods of up to 78 per cent of underlying demand being met by rooftop solar and the market operator expects that under some scenarios distributed solar could be supplying 100 per cent of underlying demand at times as early as this spring. In other states distributed PV has met up to 42 per cent underlying demand in Victoria, 38 per cent in Queensland, and 32 per cent in New South Wales. required with its present operational toolkit. Read the full article...

Unplanned outages impact a solid year of low wholesale energy prices

Australian Energy Regulator | 13 August 2021 | Source: Australian Energy Regulator

The National Electricity Market experienced a five-year low in wholesale electricity prices during the financial year 2020/21, with all regions recording prices lower than $75/MWh for the first time since 2014/15.

Tasmania led the way on lower prices, recording an average financial year price of $45/MWh, down from $56/MWh in the previous year. New South Wales (NSW) was the highest at $72/MWh, down from $79/MWh in the previous year.

The latest Wholesale Markets Quarterly released today by the Australian Energy Regulator (AER) reveals the average wholesale electricity prices in the 2020/21 financial year fell in all regions except Queensland, despite some significant price increases in the last quarter of the financial year (Q2 2021).

AER Chair Clare Savage said the report shows wholesale electricity prices in Queensland reached their highest Q2 level ever ($141/MWh), while prices in NSW reached their highest Q2 level since 2007 ($129/MWh). Read the full article...

LOCAL NEWS

Banning new gas connections cold comfort for customers and climate

Dr Dennis van Puyvelde | 16 September 2021 | Source: 2021 Energy Insider

The Victorian government is considering the future of gas through its consultation on a Natural Gas Substitution Roadmap[i].

Many local councils and community groups have made submissions calling to electrify households and to ban new gas connections. The main arguments they cite are to reduce emissions and save money. Similarly, the ACT government is considering legislation to prevent new gas mains network connections to future residential developments[ii].

The UK was also considering banning gas boilers in new homes from 2025 and their purchase overall by 2035 but is now considering pushing this back to 2040 citing concerns over the cost for heat pump replacements[iii]. So does banning new gas connections actually make sense?

Customer choice
Gas is a fuel of choice. Customers continue to choose gas for heating and cooking and about 100,000 new homes are connected to the gas networks in Australia each year. Each household contains 2.6 people[iv], so that means that every year, an extra 260,000 people get the benefits of gas.

Banning gas connections removes this choice from customers. Read the full article...

Storage battery production to create renewable energy solution and jobs in Sydney's west

Cecilia Connell | 10 September 2021 | Source: ABC News

As the uptake of renewable energy increases, a new storage battery that can operate under extreme stress conditions is being touted as a game-changer.

The 'Gelion' battery, which uses a specialised zinc-bromide gel technology, is designed to overcome the limitations of traditional lithium ion and lead acid batteries.

Its inventor, Professor Thomas Maschmeyer, said it aims to do this by addressing supply, capacity and safety constraints.

"The zinc-bromide battery chemistry differs from conventional ones by being able to charge to 100 per cent and discharge to zero over a long duration," he said.

"We are able to run at a high temperature — 50 degrees not a problem without cooling, and never catch fire. In fact, the inside of the batteries help to put fires out." Read the full article...

LOCAL NEWS

Australia's breakthrough solar tech has eye on rooftop and mega-project markets

Giles Parkinson | 15 September 2021 | Source: Renew Economy

The Australian start up that has achieved a major new benchmark for solar cell efficiency says it hopes to target the rooftop solar market first and then expand into some of the mega, multi-gigawatt scale projects proposed in the north and west of Australia.

SunDrive, a solar start-up founded six years ago in a Sydney garage by two UNSW graduates, last week claimed a world record of 25.54 per cent for commercial size silicon solar cell efficiency, from testing carried out by Germany's Institute for Solar Energy Research at Hamelin.

The significance of this, however, was not so much the record in itself – impressive as it was – it was the fact that it was achieved using a new breed of solar cells that rely on more abundant and cheaper copper rather than the silver traditionally used in solar cells.

The switch from silver to more abundant and lower cost copper is the principal aim of SunDrive, and the goal when graduates and flatmates Vince Allen and David Hu set up operations in a Sydney suburban garage in 2015, with the backing of solar industry luminary Zhengrong Shi, the founder of Suntech. Read the full article...

Ausgrid and Jolt open first of 500 "free" EV charging sites in Sydney's north

Petra Stock | 13 September 2021 | Source: The Driven

Electric vehicle owners in Mona Vale can now get a free charge after network owner Ausgrid and EV-charging company Jolt opening their first charging station in a converted streetside power kiosk.

First announced in October last year, Ausgrid and Jolt are partnering to convert existing green power boxes to double as electric vehicle chargers. The initiative is expected to grow to more than 500 sites across Sydney.

"We're using existing, essential electrical infrastructure on the street to provide a free service for the community and hopefully help accelerate the transition to electric vehicles in Australia," Ausgrid chief executive Rob Amphlett Lewis said.

Electric vehicle owners in Mona Vale can now access up to 7kWh daily charge for free (equivalent to about 15 minutes of charging, or 45 kilometres of range) via the Jolt app.

Those needing more than 7kWh can pay for additional electricity through the app. Read the full article...

LOCAL NEWS

"Backward step:" Industry warns VPPs could be killed by AEMO metering changes

Giles Parkinson | 25 August 2021 | Source: Renew Economy

Australian energy companies and new technology providers have lined up overwhelmingly against a new proposal by the Australian Energy Market Operator that they say could effectively kill the market for "virtual power plants".

VPPs aggregate household assets such as solar, batteries and electric vehicles, and are considered an essential part of any future grid that does away with centralised fossil fuel assets.

The division is centred around AEMO's draft decision on amendments to what is known as the Market Ancillary Service Specification, a key ruling that will shape the development of VPPs around the country.

AEMO, and most in the market, predict a critical role for VPPs in a transitioning grid because of their ability to marshall and pool distributed resources that will play a critical role in the management of power supplies and grid services.

But most in the industry warn that the AEMO proposals are unworkable, will cost too much, and will end up killing a market that is only now starting to develop.

It is an incredibly complex and technical argument – the Tesla submission alone is more than 80 pages – but if it can be boiled down to one major issue it is the proposed requirement of high speed metering (down to 50 milliseconds) to be installed in thousands of individual locations, rather than for one aggregated input.

Some, such as the normally conservative Australian Energy Council, say that the cost of this will render the VPPs unviable. "It will create the opposite of what they intend, which is to create visibility over system security, and over the millions of solar and battery installations across the grid, over which they currently have little or no control," says James Sturch, from SolarEdge, the world's biggest inverter supplier.

Opponents of AEMO's draft – which make up the overwhelming majority of existing energy players, inverter suppliers, battery makers and software companies – suggest that AEMO should rely on one fast meter for every VPP, or lift the metering speed to 100 milliseconds, or 200ms, which some think could be met by most inverters and deliver the system security that AEMO craves.

There is a lot at stake, including the country's ability to quickly and cheaply arrive at or near 100 per cent renewables – as early as 2025 at various moments, if not for long periods – which will depend heavily on the amount of energy produced and stored and managed at homes and businesses.

Tesla notes that AEMO's new assumptions for its 20-year blueprint, the Integrated System Plan (ISP),assumes between 30 and 39GW of installed distributed PV generation in Australia by 2030 – which equates to 150% of the current coal capacity. Read the full article...

LOCAL NEWS

Closure of Lane Cove Testing Station - Update

13 September 2021

Ai Group and Engineers Australia (EA) provided an update to stakeholders earlier this year in relation to the announcement of PLUS ES that it would close the Lane Cove Test Station (LCTS). Many members contacted both groups to express concern over the impact on their business that the loss of such a critical piece of infrastructure.

Many Australian manufacturers who support the transport, energy, infrastructure, defence, mining, and heavy industry sectors require this unique facility for equipment testing. The facility is the only one of its kind in the southern hemisphere. Should these services cease to be available there are likely to be far-reaching implications for Australia's manufacturing industry, and flow-on effects for Australia's manufacturing sovereignty, strength of supply chains and the safety and operations of critical infrastructure.

A working group chaired by Geoff Lillis and supported by EA and Ai Group has been exploring options to maintain operations in the short term, but also to develop a more sustainable long-term solution. This included discussions with PLUS ES about what arrangements could be pursued to keep the LCTS running.

At the same time, we have continued our efforts to build awareness and seek support from the NSW and Commonwealth governments to keep the station operating.

It now seems it will not be possible to keep the facility at Lane Cove in continuous operation. The industry consortium has not been able to secure sufficient interest in the conditions specified by PLUS ES as being necessary for an interim arrangement to be agreed upon. The group is now concentrating on discussions between the Commonwealth, the NSW Government and key industry stakeholders to find a solution to maintain a sovereign high current testing capability.

Options being explored include government procurement of the site and facility with operation conducted with a government agency such as the National Measurement Institute.

For further information please do not hesitate to contact Geoff Lillis, Consortium Chair on geoff@lillis@gmail.com; Jane MacMaster, Chief Engineer, Engineers Australia on jmacmaster@engineersaustralia.org.au; or Peter Burn, Chief Policy Advisor, Ai Group on peter.burn@aigroup.com.au.

ELECTRIC VEHICLE UPDATE

Researchers say new zinc-ion battery chemistry could be cheaper and safer

By Joshua Hill | 31 August 2021 | Source: Renew Economy

"A new electrolyte and electrode combination can improve zinc-ion battery performance, which may make zinc-ion batteries more attractive than their lithium-ion counterparts. © 2021 KAUST; Veronica Moraru"

Researchers in Saudi Arabia say they have developed a new zinc-ion battery chemistry that they hope will deliver large-scale energy storage that is cheaper, safer, and more environmentally friendly than the commonly used lithium-ion batteries.

The dominant battery technology currently in use across the globe is lithium-ion – which is used in everything from mobile phones and laptop computers all the way up to electric vehicles and large-scale standalone energy storage.

However, lithium-ion are reliant upon several key minerals which can be either in short supply, or expensive – such as cobalt, lithium, nickel, and copper.

The hunt is on, then, to develop new battery chemistries that make use of more abundant elements, and which also increase battery charge rates, stability, storage, and safety.

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The hunt is on, then, to develop new battery chemistries that make use of more abundant elements, and which also increase battery charge rates, stability, storage, and safety.

One of those potential battery chemistries is zinc-ion, which have the potential to yield higher capacity, lower costs, and reduce potential toxicity.

Another added benefit of zinc-ion batteries is the fact that many of the manufacturing processes in use for lithium-ion batteries can be used to make zinc-ion batteries, reducing the need for separate manufacturing facilities. Read the full article...

ELECTRIC VEHICLE UPDATE

Australian researchers say dose of sugar could be key to long distance batteries

By Michael Mazengarb | 13 September 2021 | Source: The Driven

THE MONASH ENERGY INSTITUTE TEAM (L-R): MAHDOKHT SHAIBANI, MAINAK MAJUMDER, MATTHEW HILL, YINGYI HUANG. (SUPPLIED)

Australian researchers say a dose of sugar could be the key to unlocking longer-lasting next generation lithium-sulfur batteries, which could deliver much longer range for electric cars and improve the base for batteries in heavy transport such as buses and trucks.

The research, undertaken by scientists from Monash University, has been published in the journal Nature Communications, and details how the Australian research team used a glucose-based additive to significantly improve the durability of the innovative lithium-sulfur batteries.

The researchers expect that the advances being achieved in next generation lithium-sulfur batteries could see them deployed in applications where minimising weight is a key priority, thanks to their ability to store a much larger amount of energy in a smaller battery.

"In less than a decade, this technology could lead to vehicles including electric buses and trucks that can travel from Melbourne to Sydney without recharging. It could also enable innovation in delivery and agricultural drones where light

ELECTRIC VEHICLE UPDATE

weight is paramount," lead author professor Mainak Majumder said.

The researchers say that lithium-sulfur batteries could have the potential to store as much as two to five times as much energy compared to conventional lithium-ion batteries for the same amount of weight.

A key challenge for the lithium-sulfur batteries has been the durability of electrodes, which have been prone to deterioration when in use. This was caused by significant expansion and contraction of electrode materials during the use of lithium-sulfur batteries, as well as cross-contamination of sulfur compounds.

However, the Monash University researchers found that the addition of glucose, sourced from sugar, that the battery electrodes could be protected from contamination from the sulfur compounds within the battery.

The researchers said that they had been inspired by a geochemistry report, published back in 1988, which described now sugar based substances had the ability to resist degradation in sediments when they formed chemical bonds with sulfides.

By also adapting battery designs to accommodate the expansion of the electrodes, the researchers say that they have been able to significantly reduce the degradation of the electrodes.

The research team said that they had tested the new lithium-sulfur battery prototypes, finding that they managed to out-perform lithium-ion equivalents across at least 1,000 charge-discharge cycles.

"Each charge lasts longer, extending the battery's life," first author and PhD student Yingyi Huang said. "And manufacturing the batteries doesn't require exotic, toxic, and expensive materials."

Research co-author Dr Mahdokht Shaibani said that there still remained key challenges that need to be overcome before lithium-sulfur batteries are likely to see large-scale commercial production.

"While many of the challenges on the cathode side of the battery has been solved by our team, there is still need for further innovation into the protection of the lithium metal anode to enable large-scale uptake of this promising technology – innovations that may be right around the corner," Shaibani said.

The research has been supported by the Australian subsidiary of the Thailand-based Enserv Group, which hopes to eventually manufacturer the lithium-sulfur batteries in Australia.

"We would be looking to use the technology to enter the growing market for electric vehicles and electronic devices," managing director of Enserv Australia, Mark Gustowski, said. "We plan to make the first lithium-sulfur batteries in Australia using Australian lithium within about five years."

The Monash University research team has focused on improving the durability of lithium-sulfur batteries, and have previously suggested the new battery chemistry could ultimately lead to electric vehicles with more than 1,000 km of range on a single charge.

ELECTRIC VEHICLE UPDATE

Tesla plans to invest $8 billion into EV battery plant next to Giga Berlin

By Bridie Schmidt | 7 September 2021 | Source: The Driven

Tesla will invest up to 5 billion euros ($A8 billion) in a lithium-ion battery plant at "Giga Berlin", with a decision on whether the German government will tip in 1 billion towards it expected by the end of 2021.

German media stories say that a new publication by the Federal Ministry of Economics (BMWi) provides new information on the costs of the battery factory that Tesla is planning on the site of its Gigafactory in Grünheide near Berlin.

Tesla CEO and co-founder Elon Musk flagged the Berlin battery factory at a conference in 2020, saying it would eventually be one of the largest battery plants in the world with 250GWh capacity.

The Germany ministry of economic reportedly gave the EV maker the green light to start making preparations in early 2021, with the project ruled eligible for the European Union's 2.9 billion euro ($A4.58 billion) European Battery Innovation project. Read the article...

Why the price of Tesla electric cars could fall by half in just a few years

By Giles Parkinson | 5 September 2021 | Source: The Driven

The big question for the electric vehicle industry and the legacy ICE (internal combustion engine) car makers – and their customers – is when price parity between EVs and petrol and diesel cars might be achieved.

Some experts say it may be in just a few years, others suggest the second half of the decade. Many still scratch their head as to why there is even a big difference now between the price of EV models and the fossil fuel equivalents.

Perhaps one reason is that the EV makers can get away with it. Subsidies, or taxes, are bringing the prices into line in those countries, or states, where electric cars are now mass market items. In other markets where buyers are mostly "early adopters", they can get away with a premium because the customers want them so much.

Tesla, which produces the best selling EVs in most markets across the world, has only recently started posting profits from its operations, but that disguises the fact that its margins per unit are high, and steadily growing. Much of its money goes into R&D.

Morgan Stanley estimates those margins to be getting close to 20 per cent, near the luxury end of the auto market, even though its Fremont plant in California is regarded as the highest cost car manufacturing plant on the planet. Read the full article...

ELECTRIC VEHICLE UPDATE

AusMV strikes deal to bring 19,000 all-electric utes with 800km range to Australia

By Bridie Schmidt | 6 September 2021 | Source: The Driven

Nearly 20,000 all-electric utes have been secured for the Australian market, through a deal between EV startup Atlis Motors and Australian Manufactured Vehicles (AusMV).

AusMV, which remanufactures vehicles like the Ford F-150 for the Australian market, has a number of electric utes – such as the F-150 Lightning – in its sights, but this is the first confirmed deal to date.

Slated for arrival on Australian roads in 2023, the Atlis XT promises a full swag of features fit for any tradesperson, off-road adventurer or weekend warrior.

And going by the specifications on the company's website, this is a seriously heavy-duty vehicle.

Specs include capacity to tow 15-tonne trailers on a gooseneck, a bed up to 8-feet long, either single or dual motor set up with up to 447kW (600hp) peak power, more than 16,000Nm torque, 0-100km/hr in under 5 seconds and a maximum 250kWh battery with up to 800km claimed driving range.

"Many traditional automakers have overlooked Australia when launching new EVs for a variety of reasons, but we see things differently. Our long-range, fast-charging electric work trucks are ideal for this market,"said Mark Hanchett, CEO and founder of Atlis in a statement.

"We don't need legislative imperatives and other incentives to ship vehicles to Australia and AusMV knows how to get them into owners' hands."

The ute is planned for production in 2022 by US-based Atlis Motors, which in July secured a $US300 million capital commitment from Luxembourg investment group Gem Global Yield and will make its own batteries at a facility in Arizona able to charge in 15 minutes using a proprietary 1.5 megawatts charger.

For the Australian market, the electric ute will be partially manufactured in Queensland, says AusMV's Eddie Kocwa. Kocwa tells The Driven that, "this will be the first real electric pickup truck in Australia that's not a remanufactured ICE (internal combustion engine) vehicle."

Instead, AusMV will receive the Atlis XT with no steering wheel and connection to the drivetrain, and will finish assembling the vehicle to comply with Australian standards.

"It's a step in the direction," he says. "We're expecting some out on the road next year testing. If we eventually start making vehicles here wouldn't that be great for Australia." Read the full article...

RETROSPECT

APPLIED GEOMETRY 3700 YEARS AGO

By NSW University Academic Excellence Bulletin | undated, circa mid 2021 | Source: Inside UNSW

A UNSW mathematician has revealed the origins of applied geometry on a 3700-year-old clay tablet that has been hiding in plain sight in a museum in Istanbul for over a century.

[Click here to read the full, animated version of this story on the UNSW Newsroom.]

The tablet – known as Si.427 – was discovered in the late 19th century in what is now central Iraq, but its significance was unknown until the UNSW scientist's detective work was revealed today.

Most excitingly, Si.427 is thought to be the oldest known example of applied geometry – and in the study released today in Foundations of Science, the research also reveals a compelling human story of land surveying.

"Si.427 dates from the Old Babylonian (OB) period – 1900 to 1600 BCE," says lead researcher Dr Daniel Mansfield, from UNSW Science's School of Mathematics and Statistics.

A UNSW Sydney mathematician reveals world's oldest example of applied geometry.

"It's the only known example of a cadastral document from the OB period, which is a plan used by surveyors to define land boundaries. In this case, it tells us legal and geometric details about a field that's split after some of it was sold off."

This is a significant object because the surveyor uses what are now known as "Pythagorean triples" to make accurate right angles.

"The discovery and analysis of the tablet have important implications for the history of mathematics," Dr Mansfield says. "For instance, this is over a thousand years before Pythagoras was born."

Hot on the heels of another world-first find

In 2017, Dr Mansfield conjectured that another fascinating artefact from the same period, known as Plimpton 322, was a unique kind of trigonometric table.

"It is generally accepted that trigonometry – the branch of maths that is concerned with the study of triangles – was developed by the ancient Greeks studying the night sky in the second century BCE," says Dr Mansfield.

"But the Babylonians developed their own alternative 'proto-trigonometry' to solve problems related to measuring the ground, not the sky."

The tablet revealed today is thought to have existed even before Plimpton 322 – in fact, surveying problems likely inspired Plimpton 322.

RETROSPECT

"There is a whole zoo of right triangles with different shapes. But only a very small handful can be used by Babylonian surveyors. Plimpton 322 is a systematic study of this zoo to discover the useful shapes," says Dr Mansfield.

Tablet purpose revealed: surveying land

Back in 2017, the team speculated about the purpose of the Plimpton 322, hypothesizing that it was likely to have had some practical purpose, possibly used to construct palaces and temples, build canals or survey fields.

"With this new tablet, we can actually see for the first time why they were interested in geometry: to lay down precise land boundaries," Dr Mansfield says.

"This is from a period where land is starting to become private – people started thinking about land in terms of 'my land and your land', wanting to establish a proper boundary to have positive neighbourly relationships. And this is what this tablet immediately says. It's a field being split, and new boundaries are made."

There are even clues hidden on other tablets from that time period about the stories behind these boundaries.

"Another tablet refers to a dispute between Sin-bel-apli – a prominent individual mentioned on many tablets including Si.427 – and a wealthy female landowner," Dr Mansfield says.

"The dispute is over valuable date palms on the border between their two properties. The local administrator agrees to send out a surveyor to resolve the dispute. It is easy to see how accuracy was important in resolving disputes between such powerful individuals."

Dr Mansfield says the way these boundaries are made reveals real geometric understanding.

"Nobody expected that the Babylonians were using Pythagorean triples in this way," Dr Mansfield says. "It is more akin to pure mathematics, inspired by the practical problems of the time."

Creating right angles – easier said than done

One simple way to make an accurate right angle is to make a rectangle with sides 3 and 4, and diagonal 5. These special numbers form the 3-4-5 "Pythagorean triple" and a rectangle with these measurements has mathematically perfect right angles. This is important to ancient surveyors and still used today.

"The ancient surveyors who made Si.427 did something even better: they used a variety of different Pythagorean triples, both as rectangles and right triangles, to construct accurate right angles," Dr Mansfield says.

However, it is difficult to work with prime numbers bigger than 5 in the base 60 Babylonian number system.
"This raises a very particular issue – their unique base 60 number system means that only some Pythagorean shapes can be used," Dr Mansfield says.

RETROSPECT

"It seems that the author of Plimpton 322 went through all these Pythagorean shapes to find these useful ones.
"This deep and highly numerical understanding of the practical use of rectangles earns the name 'proto-trigonometry' but it is completely different to our modern trigonometry involving sin, cos, and tan."

Hunting down Si.427

Dr Mansfield first learned about Si.427 when reading about it in excavation records – the tablet was dug up during the Sippar expedition of 1894, in what is the Baghdad province in Iraq today.

"It was a real challenge to trace the tablet from these records and physically find it – the report said that the tablet had gone to the Imperial Museum of Constantinople, a place that obviously doesn't exist anymore.

"Using that piece of information, I went on a quest to track it down, speaking to many people at Turkish government ministries and museums, until one day in mid 2018 a photo of Si.427 finally landed in my inbox.

"That's when I learned that it was actually on display at the museum. Even after locating the object it still took months to fully understand just how significant it is, and so it's really satisfying to finally be able to share that story."

Next, Dr Mansfield hopes to find what other applications the Babylonians had for their proto-trigonometry.

There's just one mystery left that Dr Mansfield hasn't unlocked: on the back of the tablet, at the very bottom, it lists the sexagesimal number '25:29' in big font – think of it as 25 minutes and 29 seconds.

"I can't figure out what these numbers mean – it's an absolute enigma. I'm keen to discuss any leads with historians or mathematicians who might have a hunch as to what these numbers trying to tell us!"

RETROSPECT

1936: ONE MEMBERS VIEW ON ELECTRICAL SAFETY PRE WWII

By Terry Miller | 18 September 2021 | Source: ESEA Annual Conference Papers 1936

Here is the view of member A. Clayton on the relative safety of electricity in 1936.

Electric shock fatalities totalled 31, quite high by today's standards given the relative infancy of the electricity industry at that time, with 4 million consumers. But air transport at 20, machinery at 50, tramways at 43,railways at 139 and automobiles at 921 are stark reminders of where we have come from in 85 years in industrial and public safety.

UNIVERSAL SAFETY

By A. Clayton (Member).

In the Commonwealth of Australia, according to the latest statistical returns, there is a population of 6,629,839 persons, in addition to this the Commonwealth contains 83 ostriches, and 14,493 donkeys or mules.

Of the human population approximately 4,000,000 of our people are using, directly or indirectly, ELECTRICITY every day. This power is available 24 hours each day of the year in unlimited quantity and the output of

ELECTRICITY was valued at £9,560,729.

For the same period the

GAS output was valued at £4,666,460.

Is this 9½ million pounds worth of Electricity

SAFE

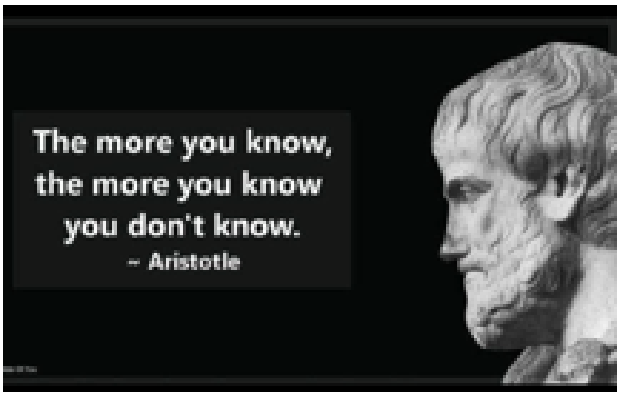
to those who use it in a thousand ways?

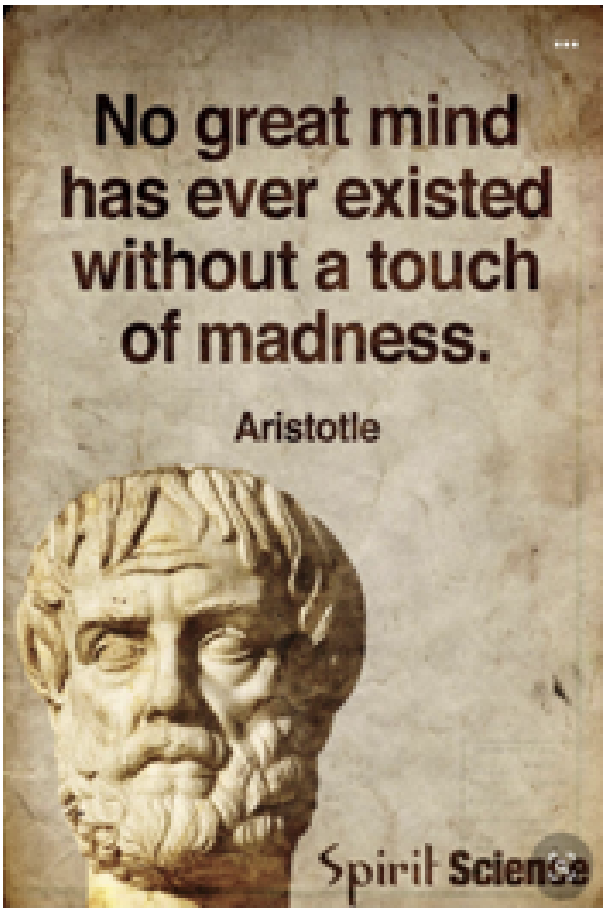
To answer the question, I supply a few of the available official returns which provide some interesting truths upon the vital question, SAFETY, and to my readers I hand over the task of providing the answer, each one to their respective likes or dislikes.

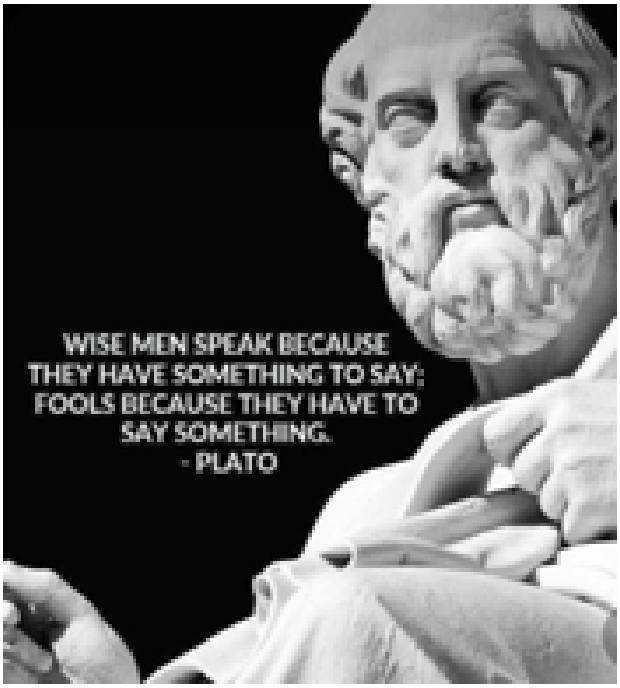
Violent Deaths Within the Commonwealth Per Annum.

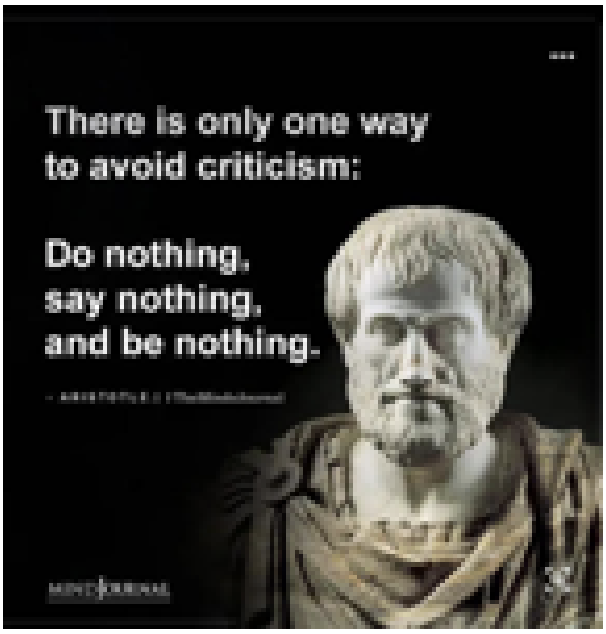
1. Automobiles	921
2. Suicide	826
3. Drowning	453
4. Falls	441
5. Burns	202
6. Other Crushings	202
7. Other Accidents	191
8. Other Vehicles	185
9. Railways	139
10. Firearms	99
11. Heat	63
12. Machinery	50
13. Tramways	43
14. Electric Shocks	31
15. Poisoning	31
16. By Animals	30
17. Mechanical Suffocation	28
18. Cataclysm	27
19. Gas Poisoning	21
20. Air Transport	20
21. Food Poisoning	16
22. Water Transport	14
23. Cutting or Piercing Instruments	13
24. War Wounds	12
25. Poisoning by Venomous Animals (Snakes, etc.)	11
26. Conflagration	11
27. Lightning	7
28. Cold	6
29. Starvation, Thirst, Fatigue	3
Total violent deaths, including homicide	4204

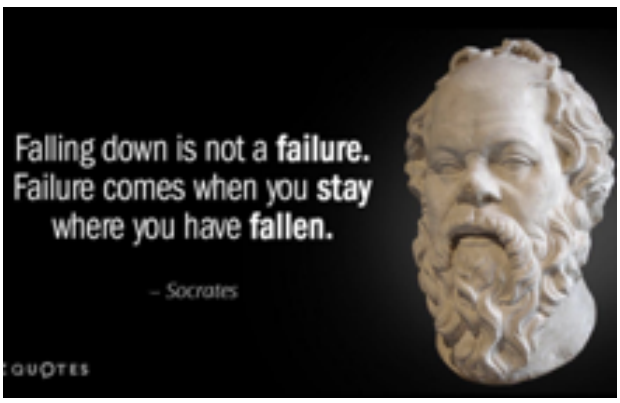
QUOTABLE QUOTES











INTERNATIONAL NEWS

How Ofgem will support the rollout of electric vehicles across Britain

By Nicholas Nhede | 6 September 2021 | Source: Smart Energy International

Ofgem has announced its electric vehicles (EVs) rollout strategy comprising of measures to support EV adoption across Britain.

Ofgem states that the rollout of 14 million electric vehicles across Britain by 2030 from just 500,000 in 2021, as predicted by the Committee on Climate Change's Sixth Carbon Budget Balanced Pathway, must be beneficial to consumers and the environment.

To ensure the uptake of EVs is expedited, Ofgem will:

- Prepare the grid for an increase in the use of EVs by ensuring that there is adequate energy capacity and infrastructure to support the revolution to smart mobility. With £300 million ($414.9 million) in funding already approved by Ofgem for network upgrades to support EV infrastructure development in May 2021, the regulator plans to ensure more funding is available for grid modernisation.
- Simplify the integration of EV charging stations with the grid by reducing the costs associated with making the connections. This will help ensure more charging stations are installed and connected to the grid so that a greater number of people have access to charge points where they need them.
- Encourage smart charging to prevent EV charging from straining the grid. Ofgem will partner with utilities and technology firms to ensure EV owners charge during times when demand on the grid is low and tariffs are cheaper as well.
- Support vehicle-to-grid technology development and use to enable the use of EVs as mobile batteries that can be used to support the reliability of grid networks whilst providing EV owners with new revenue streams. Vehicle-to-grid will help reduce the amount of electricity generation needed at peak times and can reduce peak demand equivalent to the generation capacity of up to ten large nuclear power stations, according to the National Grid ESO's Future Energy Scenarios 2021 (FES) publication. Ofgem states that the business case has the potential to reduce consumer bills as well, even those without EVs.
- Ofgem will work with energy suppliers and innovators to make sure there are a range of products, services and tariffs for UK energy consumers to take advantage of to make the switch to EVs simpler and faster.

Neil Kenward, Ofgem's director of strategy and decarbonisation, said: "Electric vehicles will revolutionise the way we use energy and provide consumers with new opportunities, through smart products, to engage in the energy market to keep their costs as low as possible.

"Our electric vehicle priorities not only provide a way to meet our climate change targets but importantly offers ways to protect consumers from rising bills, through a three-prong approach of increased use of electric vehicles, smart charging and vehicle-to-grid technology, which together can help drive down costs for all GB bill payers."

INTERNATIONAL NEWS

EPRI Develops AI Model to Reduce Wind Turbine Operations Costs

By Raja V. Pulikollu and Jeremy Renshaw | 9 September 2021 | Source: T&D World

Wind turbine gearbox replacement cost can be as much as US$350,000. But EPRI's physics-based AI early damage detection model, tested on WEC Energy Group, Southern Company and other utility's wind fleets, may reduce repair cost to US$15,000-US$70,000.

As utilities work to support decarbonization goals, and incorporate or maintain more renewables into their portfolios, the reliability of those sources becomes vital to grid sustainability. So, when a major wind turbine component - like a gearbox - prematurely fails, production is lost, downtime can be prolonged and utilities' operation and maintenance (O&M) costs increase.

In 2020, wind energy generation worldwide was 730 GW. It is predicted to reach 1455 GW by 2030 and 2434 GW by 2050, according to the 2020 International Renewable Energy Agency Global Renewables Outlook: Energy Transformation 2050.

With deployment of more wind turbines worldwide, R&D activities are increasingly important to ensuring the long-term reliability of turbine components, including the wind turbine gearbox. The gearbox converts low-speed rotations received from blades into higher speeds required by generators for electricity production (Figure 1). Read the full article...

Residential electric panels represent a nearly $100B 'roadblock' to full electrification, report finds

By Robert Walton | 31 August 2021 | Source: Utility Dive

Dive Brief:

- Electric panels in up to 48 million U.S. single-family homes will need to be upgraded to fully transition away from fossil fuels and use electricity for space and water heating, cooking, vehicle charging and other applications, according to new research from residential electricity research group Pecan Street.
- With an average cost of $2,000 for an upgraded panel, that represents a nearly "$100 billion impediment to residential electrification," the group said in a report issued Aug. 23.
- It is also an energy transition equity issue, with lower-income customers often unable to make that investment. But utilities can play a role in helping make upgrades possible through rebates or incentives, said Pecan Street CEO Suzanne Russo.

Dive Insight:

After Pecan Street issued its report, said Russo, the group heard of fossil fuel interests using its findings to portray electrification as too expensive. She later wrote a blog post calling that conclusion a misrepresentation and clarifying that "we support full residential electrification." Read the full article...

INTERNATIONAL NEWS

Battery Storage in the United States: An Update on Market Trends

18 August 2021 | Source: T&D World

The regional patterns play a pivotal role in influencing the nation-wide battery storage market structure.

Electric power markets in the United States are undergoing significant structural change that we believe, based on planning data we collect, will result in the installation of the ability of large-scale battery storage to contribute 10,000 MW to the grid between 2021 and 2023—10 times the capacity in 2019.

Energy storage plays a pivotal role in enabling power grids to function with more flexibility and resilience. In this report, we provide data on trends in battery storage capacity installations in the United States through 2019, including information on installation size, type, location, applications, costs, and market and policy drivers. The report then briefly describes other types of energy storage.

This report focuses on data from EIA survey respondents and does not attempt to provide rigorous economic or scenario analysis of the reasons for, or impacts of, the growth in large-scale battery storage. Read the full article...

New Tools in the Fight to Reduce Wildfire Ignition

By John Mead and Eric Schoenman | 19 August 2021 | Source: T&D World

PG&E uses distribution fault anticipation technology to detect low-current events, like series arcing, that conventional systems do not detect.

The grid — and the environment in which the grid operates — is changing. This is especially true in California, where an increasing threat of wildfire and intensifying drought cycle have created an environment requiring new approaches to best reduce risk and build resilience.

What is DFA technology?
Distribution fault anticipation (DFA) technology detects line conditions based on current transformer (CT) and potential transformer (PT) signals. DFA uses one 19-inch (483-mm) rack-mount monitoring device per circuit, mounted at the substation. It continuously digitizes CT and PT signals with high fidelity, uses sensitive triggering to detect even small electrical anomalies, applies signal process and other software to recognize so-called fingerprints of line conditions and sends summary reports to a central master station server for access by personnel.

DFA was developed by the school of engineering at Texas A&M University with funding from the Electric Power Research Institute Inc. (EPRI), electric utilities and the state of Texas. The technology is based on data from real circuits during routine operations. Read the full article...

INTERNATIONAL NEWS

Is fake data good news?

By Victoria Woollaston | 17 August 2021 | Source: Engineering & Technology

Synthetic data promises to remove bias from AI, bolster data privacy and improve our lives, but can something fake ever create real impact?

Fake news. Fake reviews. Deep-fake videos. Technology has made it easier than ever to generate content with the aim of obfuscating. 'Fake' has always had inherently negative connotations, yet there is a rising genre of fake content that is altogether more positive. It's still algorithmically generated, it's still created with the purpose of disguising the truth, but it has potential to make the world fairer, more open, and safer. At least, that's what advocates of synthetic data are on a mission to prove as the technology gets set to enter the mainstream.

Technically, the concept of synthetic data has been around for decades. Using a computer to generate code to build datasets that wouldn't exist without it formed the basis of early algorithms. Music synthesisers use a form of synthetic data, for instance. So do flight simulators. Any program in which the output is true-to-life, but is generated by machines, uses synthetic data.

Yet the rise of deep neural networks has elevated synthetic data beyond the hobbyist. Highly advanced algorithms can now build entire datasets that look like the real thing, act like the real thing, yet are fake. And the benefits are as multifaceted as the datasets themselves. Read the full article...

Research Provided Insight into Unexplained Line Outages

10 September 2021 | Source: IMNR

Pollution flashovers of insulator strings have been one of the main causes of line outages under normal operating conditions. In fact, this was a relatively common occurrence years ago across many countries suffering from heavy industrial pollution. The situation began to improve over the past two decades and the main pollution sources impacting overhead lines these days have become mostly natural – either of the marine or desert type. While industrial pollution remains a problem in some developing countries, it typically impacts sections of lines closest to heavy industry. Fortunately, there is already a vast body of international experience on polluted insulators. Therefore, it is fair to say that the problem of pollution and its impact on line insulators is well understood as are the measures by which it can be combated.

Bird-induced line outages have also become more and more an issue in recent years. However, as is the case of pollution, there is now quite a body of knowledge on how these can best be minimized.

By contrast, there seem a high proportion of outages that cannot easily be attributed to either pollution or birds – or indeed any specific cause. One can describe the same typical scenario for these outages, including affecting clean or only lightly polluted insulators and occurring most often in the early morning, in the presence of dew. Similarly, these outages tend to be single phase rather than three–phase with no evidence of pollution during visual inspection after successful re-closing. Read the full article...

INTERNATIONAL NEWS

Closing the 'last mile' on distribution automation

By Cisco | 10 August 2021 | Source: Smart Energy International

The utility industry is evolving rapidly in size and complexity. Grid modernisation and new field services are underway to improve efficiency and productivity in a system with increasing penetration of intermittent renewable generation and small scale distributed energy resources.

In increasing numbers, advanced metering infrastructure (AMI), grid sensors, and distributed energy resources are being installed across the networks. Distribution automation enabled by these edge devices, is key for the system operator to maintain the grid's integrity.

The challenge for grid modernisation is that it is a long term phased implementation utilising the technologies of the day. Commonly, technologies are based on a plethora of different standards – DLMS, G3-PLC, LTE, Wi-SUN to name a few – and backed by a slew of different types of communications networks from private to public and fibre to PLC to wireless.

Distribution automation

Multiple-use cases offer wide-ranging potential benefits for operational reliability, efficiency and system performance, as well as customer engagement and the enablement of prosumer participation in the market.

To increase safety, reliability, customer satisfaction and profitability, utilities are automating meter reads, power quality sensing and customer load profiles through automated two-way communication with the AMI.

Management of power quality throughout distribution systems is being automated with volt/var optimisation. Power restoration is automated with fault, location, isolation and service restoration (FLISR) technologies.

To integrate grids with other energy resources, distribution automation and the Internet of Things (IoT) is used to connect to distributed energy resources such as solar power generators, wind farms and microgrids.

Each of these energy resources has its own set of sensors and specialised substations, which are bringing growing volumes of data to manage and process both from their number and the read frequency as the grid management requirements have moved closer to real-time.

Utility Field Area Networking

This grid modernisation is driving intense focus in wireless Field Area Networking (FAN). Despite the aim for a single FAN, no one technology can support all of the use cases and utilities will have a variety of grid modernisation FANs, adding costs and complexities to their operations.

To simplify operations and to drive convergence within the FAN, new technologies pioneered by connectivity provider Cisco enable all of these technologies to be consolidated onto a single multi-service platform for monitoring and control of distribution networks. Read the full article...

INTERNATIONAL NEWS

HYBRID POWER

By Perry Sioshansi | September 2021 | Source: September issue of EEnergy Informer

Perry Sioshansi in the September edition of EEnergy Informer discusses a recent report from the Lawrence Berkeley National Laboratory (LBL) which points out that the falling battery prices and the growth of variable renewable generation are driving a surge of interest in hybrid power plants – namely plants that combine, for example, wind or solar generation co-located with storage.

While most of the current interest involves pairing photovoltaic (PV) plants with batteries, other types of hybrid or co-located plants with a wide-range of configurations are also appearing with increased frequency.

The LBL report tracks the existing and planned hybrid or co-located plants across the US by examining data from power purchase agreements (PPAs) and generation interconnection queues (visual) including hybrid plants that pair two or more generators and/or pair generation with storage at a single point of interconnection, and also full hybrids that feature co-location and co-control. The report covers projects larger than 1 MW. It notes that smaller behind-the-meter hybrid projects are also common but are not included in the report.

Based on the examined data, there were at least 226 co-located hybrid plants of >1 MW operating in the US at the end of 2020 representing more than 30 GW of capacity with the most common configuration being a PV + storage, totaling 73 projects with 992 MW of PV and 250 MW of storage.

Next are different fossil hybrid categories – such as 34 fossil + PV, 29 fossil + hydro, and 21 fossil + storage plants each dominated by the fossil component and 14 wind + storage plants with 1,425 MW of wind and 198 MW of storage. There are roughly a dozen other configurations including wind + PV, wind + PV + storage, biomass + hydro, geothermal + PV, and so on. Hybrid plants, in other words, are common and come in all forms, shapes and sizes.

https://emp.lbl.gov/publications/hybrid-power-plants-status-0

EESA

CIGRE UPDATE

Electric performance of new non-SF6 gases and gas mixtures for gas- insulated systems - CIGRE Future Connections vol 7

By Christian Franck, Convenor of WG D1.67 | 6 September 2021

Introduction

Insulation gases are applied in electrical equipment such as Gas Insulated Switchgear (GIS) and Lines (GIL), high- and medium-voltage circuit breakers and switches. Sulfur hexafluoride (SF6) is widely used for decades as insulation medium in electrical equipment. However, SF6 is also a strong greenhouse gas with a global warming potential (GWP) of 23,500 (i.e. one kg of SF6 released to the atmosphere contributes to global warming as 23.5t of CO2would do). Its use and handling is thus strongly regulated in most countries, and revisions of the legislation in some countries are even aiming at phasing out the use of SF6 in electric power equipment completely in the coming years to decade. Several alternative insulation technologies exist, such as air insulation, solid insulation, liquid insulation, or gas insulation with natural- origin and/or new molecules.

The technical properties of gaseous insulation based on natural-origin gases and mixtures as CO2 and pressurized air were already investigated within CIGRE WG D1.51 [TB 730]. But recently, new gases or gas mixtures, based on fluorinated molecules, were identified for their good electric properties and potential to be used in electrical equipment in real operating conditions. They combine lower global warming potential in the range of <1 up to 700, with an electric strength up to that of SF6. Many recent individual activities in the non-SF6switchgear field are promoted by manufacturers, increasing the interest from vendors and customers. However, it is still difficult to compare the different solutions: a comparative technical assessment of the new F-gas proposals is needed, which was the main motivation for the creation of CIGRE WG D1.67. The employers of the selected and active Working Group members represent a mix of manufacturers, research institutions and (few) utilities. Geographically, the Working Group members represent three different continents, with a majority from Europe.

Scope and Methodology

The first task of the Working Group was to summarize the state-of-the-art know-how of insulation gas mixtures using novel fluorinated compounds. Based on this summary, it was confirmed that an insufficient amount of independent and publicly available data is available, which would allow to perform an independent technical assessment of the new gas mixtures. Even worse, not even an agreement on the means and metrics to do this was found. The Working Group thus decided to actively work on this topic and go beyond the state-of-the-art by collecting information on what needs to be known for designing gaseous insulation systems in practice, by proposing a set of tests and test procedures that can serve as the basis for a more holistic comparison and finally also by performing and evaluating a large number of tests in a round-robin test campaign.

CIGRE UPDATE

Tests according to this proposal have been performed by some Working Group members in 14 different laboratories. A first evaluation of these tests is given in this brochure. In addition, the data is made publicly available so that other interested persons, companies and groups can continue to use this unique set of results.

Similar activities are done with respect to gas analysis. The novel mixtures usually contain approx. 5% of a fluorinated gas with excellent electrical properties, and the electric strength of these mixtures is sensitive to small variations of the mixing ratio. A second comparative test campaign was thus performed in different laboratories with different measurement techniques to assess the accuracy and precision with which these mixing ratios can be determined today.

Structure and Content of the Technical Brochure

The brochure is structured in 11 chapters with chapter 1 being this executive summary and chapter 11 a summary and conclusion. Depending on the reader's prime interest in reading this brochure, she/he may directly go to one of the chapters:

1. those interested in understanding the processes, performance and characterisations of novel insulation gas mixtures who will read the state-of-the- art summaries in Chapters 2-5 and 8,
2. those interested in studying the electrical insulation strength of novel gas mixtures who will read the test result analysis in Chapter 9,

- those interested in studying the gas mixture analysis of novel gas mixtures who will read the test result analysis in Chapter 10, and
- those interested in investigating novel gas mixtures who will read the newly proposed test methods and procedure described in Chapters 6 and 7. Further tests beyond the ones conducted in this Working Group with the proposed gases can be performed, but also a full set of tests on further gas mixtures not treated in this Working Group at all.

Thematic priority and delimitation

The present Working Group focused on the technical properties of new insulation gas mixtures for the purpose of pure electrical insulation. The arc quenching performance and its specific requirements are not discussed in this report, it is the task of CIGRE WG A3.41. Other alternative insulation technologies, such as pressurized air (which was treated by CIGRE WG D1.51) and solid or fluid insulation, are not considered in this work either. Another CIGRE Working Group: B3.45 “Application of non- SF6 gases or gas-mixtures in medium and high-voltage gas-insulated switchgear” investigated various aspects of non-SF6 gases use in substations [TB 802], e.g. ageing, gas handling procedures and health, safety and environmental aspects.

CIGRE UPDATE

CIGRE Australia Award Recipients

CIGRE Medal: Every Session year, the "**CIGRE Medal"** is granted to maximum two members of CIGRE, in recognition of an outstanding contribution to the development of CIGRE (either administrative or technical).

This Session Year, **Richard Bevan** (ex CIGRE Australia Chairman and Global CIGRE Treasurer) has been recognised with the prestigious CIGRE Medal award.

Richard has received the award in recognition of a long term commitment to CIGRE in a number of Roles, however the contribution that he has made whilst he was on the Administrative Council, Steering Committee and his substantial contribution to the CIGRE organisational restructure laid a firm and reliable foundation which has enabled CIGRE to further grow continue to provide a service to the global industry and stakeholders.

[Well done again Richard from all of us at EESA]

Technical Council Awards 2021
This Award is granted to a few CIGRE Members as a reward for their active participation in the activities of the technical work of the Study Committees.

- C5 Electricity markets and regulation - David BOWKER
- D2 Information systems and telecommunication - Victor TAN

CIGRE Pioneer 2020 e-session Achievement Award
CIGRE Pioneer e-session Achievement award is a special award created to recognise the outstanding efforts of the SC members who contributed to the achievement of the 2020 e-session and/or of the 2021 Session.

- A1 Rotating electrical machines – Peter Wiehe
- A3 Transmission and distribution equipment – Wayne Pepper
- B1 Insulated cables - Russell Wheatland
- B4 DC systems and power electronics - Les Brand
- C4 Power system technical performance – Andrew Halley
- C5 Electricity markets and regulation - David Bowker
- D2 Information systems and telecommunication – Victor Tan

CIRED UPDATE

Distributed Storage and Solar Study

CIRED Paper 0081 | Madrid June 2019

ABSTRACT: Growing levels of photovoltaic (PV) penetration on the low voltage (LV) electricity network are increasingly causing reverse power flows and voltage rise issues. Battery energy storage systems (BESS) may not only provide a solution for such issues but also for those associated with the expected increase in evening peak load caused by the electrification of heat and transport. Distributed Storage and Solar Study (DS3) explores the potential for aggregator-controlled behind-the-meter BESS to address these issues by limiting reverse power flows and providing peak-shaving capability. 40 BESS have been installed in 36 homes as part of a 2 year long trial that assesses the impact they have on the network. Analysis to date shows that in general BESS have the capability to address these issues, however the extent to which they are able to do so depends on their mode of operation.

DOWNLOAD PAPER

CIRED Workshop - Porto Portugal - June 2 & 3 2022 "E-mobility and power distribution systems"

CIRED workshops on specific topics are organized in Europe every two years between CIRED main conferences. In 2022, the workshop will address "**E-mobility and power distribution systems**". It will be organised on 2-3 June 2022 in Porto, Portugal.

A call for papers will welcome **abstracts until 12 November 2021.**

MENTORING PROGRAM UPDATE

Get to know our 2021 Mentors

By Aditi Sachdeva, EESA National Council Young Professional Member & Mentoring Program Coordinator | September 2021

EESA's second National Mentoring Program kicked off in August this year, committed to empowering 40 young and upcoming Electrical Engineers through mentoring provided by 9 well-established and highly experienced Engineers across the industry. This program comprises of three sessions with the last one due to be held on 29th September 2021.
We got up & close with our Mentors working in different roles around Australia's Electric Energy industry about their experiences. Find out below what they had to say!

John Wright-Smith

Regional Manager Statcoms, Harmonic Filters & Rectifier Transformers, South East Asia, AMSC

Q What do you find most rewarding about the work you do?	Q What skills are important for the work you do?	Q How have you found the transition to working online and the change in your work-life balance?	Q What is the most interesting project you are/have worked on?	Q Have you started any new hobbies/interests over the last few months?
Every day is a new case study, so I've never been bored.	Interpersonal skills, managing all levels within my company, and all levels with my customer companies.	I have been doing this for 15 years now, so seamless. Get the best desk, the best largest wide screen, the best mouse and keyboard, the best printer, and the best sound system possible. Subscribe to Spotify, etc.	Bulgana Wind Farm connection process with AEMO.	Woodworking, chess, gardening.
Q Who/what inspires you?	**Q How do you relieve stress on busy days?**	**Q If you could learn a new skill in an instant, what would it be?**	**Q Have you read/heard any great books/podcasts lately?**	**Q Do you have any advice for current students looking to enter your field?**
Aditi Sachdeva	Walking the dog.	I would like to be fluent in French.	The Dry, Jane Harper Shardlake Series Outlander, Diana Gabaldon	Get an Industry Mentor.

MENTORING PROGRAM UPDATE

Luke Koedijk

Senior Engineering Manager, AGL Energy

Q What do you find most rewarding about the work you do?	Q What skills are important for the work you do?	Q How have you found the transition to working online and the change in your work-life balance?	Q What is the most interesting project you are/have worked on?	Q Have you started any new hobbies/interests over the last few months?
Collaborating with diverse people and teams to achieve real world benefits for customers & the community while simultaneously facilitating mutual learning & professional development. (In my current position, I have the benefit of also working closely with peers who are on the leading edge of distributed energy resource (DER) orchestration and virtual power plants).	Communication, Care and Problem Solving and most importantly Team Collaboration.	Both challenging and rewarding. I miss working face to face with the team but have enjoyed and valued spending with my toddler and learning to parent.	Every project has its own interesting idiosyncrasies. The first grid connected energy storage project I worked on will always hold a fond memories. Link: https://www.ausnetservices.com.au/-/media/Files/AusNet/Innovation/Grid-Energy-Storage-System.ashx?la=en	Nothing new but have doubled down on my reading - I'm heavily invested in working through The Prize by Daniel Yergin, would recommend!
Q Who/what inspires you?	**Q How do you relieve stress on busy days?**	**Q If you could learn a new skill in an instant, what would it be?**	**Q Have you read/heard any great books/podcasts lately?**	**Q Do you have any advice for current students looking to enter your field?**
My Opa - he was a worldly individual with strong family values.	I'm a regular user of the Headspace app	(This question reminds me of the scene in The Matrix where Neo receives Matrix training modules - "I know Kung-Fu".) Something that I could use to entertain other people - maybe painting.	I'm a big listener of podcasts that focus on Energy Transition - including Energy Insiders, The Energy Gang, The Interchange, Redefining Energy.	Take every opportunity presented with you and be involved with as many student and community groups as you can. These groups provide you the opportunities to exercise your communication, collaboration and problem-solving skills which will complement your 'classroom' skills.

MENTORING PROGRAM UPDATE

Raj Dhunlall

Business Development Manager, EATON

Q What do you find most rewarding about the work you do?	Q What skills are important for the work you do?	Q How have you found the transition to working online and the change in your work-life balance?	Q What is the most interesting project you are/have worked on?	Q Have you started any new hobbies/interests over the last few months?
Being involved in projects from feasibility to ultimately commissioning and handover. Seeing a solution develop across its entire lifecycle.	Resourcefulness, Innovative, Listening, Patience, Perseverance	It has been relatively easy for me. I have worked remotely for the year prior to Covid, albeit from customer premises and coffee shops, etc. The positive change to my work-life balance is a reduced commute time.	There have been several over the course of my career. Each project has its own interesting aspects depending on the problems one must overcome.	Not so much new hobbies but have taken to baking - something I've always enjoyed; and haven't had time in recent years to do. The reduced commute time to visit customers and project sites means I have a little more time.
Q Who/what inspires you?	**Q How do you relieve stress on busy days?**	**Q If you could learn a new skill in an instant, what would it be?**	**Q Have you read/heard any great books/podcasts lately?**	**Q Do you have any advice for current students looking to enter your field?**
I draw upon so many people for inspiration, almost too many to mention. Notably is Nelson Mandela, who said that "it's always impossible, until it's done". Irrespective of the problem that needs to be solved, or how tough it may appear, perseverance will yield results.	Making sure that I take time out to go on a walk, step away from the laptop, put away the mobile (especially at night).	Learning a new language.	Currently reading "Think Big - Take small steps and build the future you want", by Grace Lordan. It's well written and provides actionable items that one can adopt daily in achieving goals.	Head down, focus on the base principles and concepts and know them well. These will come to your rescue time and time again. Enjoy the ride!

CALL FOR NOMINATIONS

CALLING FOR NOMINATIONS FOR THE 2022 EESA NATIONAL COUNCIL

The Electric Energy Society of Australia is calling for nominations from EESA members to fill the following positions on the 2022 EESA National Council:

- Two popularly elected positions
- One position representing Young Professional Members

Learn more about National Council roles and responsibilities

The 2022 EESA National Council election will operate in accordance with the EESA constitution which was updated in September 2019. As part of the constitution update, there were changes to the make-up of the National Council and eligibility of EESA members to hold office on the National Council and vote in the National Council election.

Also, a new National Council position for a person under the age of 35 years old was created. It is called the Young Professional Member and the position is appointed by the National Council. Learn more about this position in the National Council Roles section of the Determination of the EESA National Council Membership document.

MAKE UP OF THE 2022 EESA NATIONAL COUNCIL

- All Chapter Chairs (or their representatives) – elected by the chapter committees at their recent 2021 AGM's
- Two popularly elected members – elected by the EESA membership
- The current National President – elected by the 2020 National Council in November 2019 for a 3-year term
- Vice President – to be elected by the 2022 National Council from the 2021 National Council members
- The current Honorary Treasurer - appointed by the 2020 National Council in November 2019 for a 3-year term
- Secretary - appointed by the National Council (non-voting)
- Young Professional Member - to be appointed by the 2022 National Council from the nominations received
- Corresponding Members - from time to time the National Council may have corresponding members who are appointed by the National Council (These positions are non-voting)

CALL FOR NOMINATIONS

HOW TO NOMINATE OR BE NOMINATED

Complete the relevant online nomination form for the position that you wish to be considered for.

Nominations for the 2 popularly elected Member positions are open until 11.59 pm AEDT on 25 October 2021.

Nominate for Member of the EESA National Council

Nominate for Young Professional Member of the EESA National Council

Nominations for the Young Professional Member position are open until 11.59 pm AEDT on 11 November 2021.

NOMINATION VALIDITY

For nominations to be valid, the nominator and the nominee must be EESA members* and must have held at least two years of continuous membership up until the time that nominations close.

*Holders of the free student membership are not eligible to nominate or be nominated for National Council positions.

NOMINATION AND ELECTION DATES

- 4 October 2021: Call for National Council election nominations for 2 popularly elected National Council member positions and nominations for the Young Professional position.
- 25 October 2021: Nominations for the 2 positions of popularly elected MEMBER close at 11:59 pm AEDT
- Thursday 28 October 2021 – Mailout to all members notifying them that National Council Voting has opened
- Thursday 4 November 2021: Mailout to all members reminding them that National Council Voting will close on Monday 8 November
- Thursday 11 November 2021: Voting for the 2 positions of popularly elected MEMBER close at 11:59 pm AEDT
- Thursday 11 November 2021: Nominations for position of YOUNG PROFESSIONAL MEMBER close at 11:59 pm AEDT
- Friday 12 November 2021: Election result is determined
- After 12 November 2021: Election result announced by mailout to all members
- Wednesday 24 November 2021: National AGM and formation of New "2022 National Council" and the appointment of the successful nominee for the YOUNG PROFESSIONAL MEMBER

UPCOMING EVENTS

Distributed Energy Resources: Hosting Capacity as a Service + Victorian Chapter AGM

THURSDAY, 30 SEPTEMBER 2021 | VIC | VIEW EVENT

Overview:
Distribution Network Service Providers (DNSP) are evolving network infrastructure to accommodate Distributed Energy Resources (DER) such as solar PV, batteries and EVs. Low voltage networks were not designed for two-way power flows and their visibility has been kept poor by economic choice. Read more.

Time: 5:30 PM - 7 PM AEST

Location: Online

Cost:
EESA members: $0
EA members: $20
Non-members: $30

Assessing the Impacts of Electric Vehicles on Australian Urban and Rural Grids

WEDNESDAY, 6 OCTOBER 2021 | NAT | VIEW EVENT

Overview:
The increasing adoption of electric vehicles (EVs) poses significant technical and economic challenges on the power grid, particularly on the very infrastructure they are connected to - the electricity distribution network. Read more.

Time: 12.30 PM - 1.30 PM AET

Location: Online

Cost: Free

Thought Leaders Series: The Evolving Engineer

WEDNESDAY, 6 OCTOBER 2021 | NAT | VIEW EVENT

Overview:
In a rapidly changing world, how can engineers get on the front foot of their career? What will the needs of the future be and how do engineers need to evolve to succeed?
Join us for a panel discussion that will explore how the world of engineering is changing and what it means for engineering professionals.
Read more.

Time: 12 PM - 1.30 PM AET

Location: Online

Cost: Free

UPCOMING EVENTS

Dissolved Gas Analysis for Power Transformers

WEDNESDAY, 13 OCTOBER 2021 | **WA** | **VIEW EVENT**

Overview:
Power transformer will play a significant role in the future smart grid topologies. Insulation system within power transformers comprises paper and oil that decompose due to the high electrical and thermal stresses. To maintain the transformer within the expected harsh operational environment, reliable and intelligent condition monitoring techniques should be adopted. Read more.

Time: 7.30 PM - 8.30 PM AET

Location: Engineers Australia WA Auditorium, 712 Murray Street, West Perth
Or Online

Cost:
EESA members: $0
EA members: $0
Non-members: $30

Engineers Australia Event: eDinner

THURSDAY, 14 OCTOBER 2021 | **QLD** | **VIEW EVENT**

Overview:
Join the Queensland branches of the Electrical and ITEE College, Queensland chapter of the EESA, IEEE, IET and their partners to celebrate the achievements of the past year and the contributions made by the participants.
This semi-formal event will be hosted at Customs House. Enjoy canapes on arrival with amazing views of the Story Bridge and a three-course meal and beverages. Don't miss out on the opportunity to... Read more.

Time: 6 PM - 10 PM AEST

Location: Customs House
399 Queen Street
Brisbane , Queensland , 4000

Cost:
EESA members: $70.00
EESA members concession: $20.00
EA members: $110.00
Non-members: $150.00

Implementation of IEC 61850 Process Bus at a 132kV substation

MONDAY, 25 OCTOBER 2021 | **NSW ACT** | **VIEW EVENT**

Overview:
In early 2020 Gavin presented to EESA the topic Digital Substation: Overview and Experiences to EESA. In this follow up presentation, the detailed implementation of IEC 61850 based process bus will be explored from the construction site of a greenfield 132kV substation. The presentation will show key features of the substation, the protection and control scheme architectures... Read more.

Time: 11 AM - 12 PM AET

Location: Online

Cost:
EESA members: $0
EA members: $20
Non-members: $30

UPCOMING EVENTS

EESA Technical site visit to Hitachi ABB Power Grids

FRIDAY, 29 SEPTEMBER 2021 | **VIC** | **VIEW EVENT**

Overview:
Hitachi ABB Power Grids are the industry leader in high voltage solutions and products. For decades, the Victorian head office in Lilydale has specialized in power quality products and solutions for the domestic and global markets, manufacturing capacitor banks, capacitor switches, and energy storage solutions to enable its customers, to operate more efficiently and with less environmental impact. Read more.

Time: 9 AM - 12 PM AEST

Location: 88 Beresford Road Lilydale Victoria, 3140

Cost:
EESA members: $0
EA members: $20
Non-members: $30

The Next Generation Technology Project | Showcase & Awards

WEDNESDAY, 24 NOVEMBER 2021 | **WA** | **VIEW EVENT**

Overview:
The WA Chapter of the Electric Energy Society of Australia is calling for entries for the EECON2021 National Poster Project Competition for the 2021 Next Generation Technology Project Showcase & Awards, as part of EECON2021. There are two prize categories: Undergraduate (Bachelor Degree) and Postgraduate (Master's Degree and PhD). Two major sponsors... Read more.

Time: 1 PM - 4.30 PM AWT

Location: Western Power Corporation, 360 Wellington St Perth - Ground Floor Auditorium

Cost:
Free

Engineers Australia Inaugural Climate Smart Engineering Conference

6 - 7 NOVEMBER 2021 | **NSW** | **VIEW EVENT**

Overview:
Engineers Australia will host its inaugural Climate Smart Engineering conference on 16–17 November 2021.
With attendance online or in person at the Hilton in Sydney, this conference will enable engineers to explore the relevant risks and opportunities, to network and to hear first-hand from business, finance, government and engineering leaders.
Engineers will be pivotal... Read more.

Time: Two-day event

Location: Hilton Sydney
488 George St, Sydney NSW 2000
Or Online

Cost:
See prices here.

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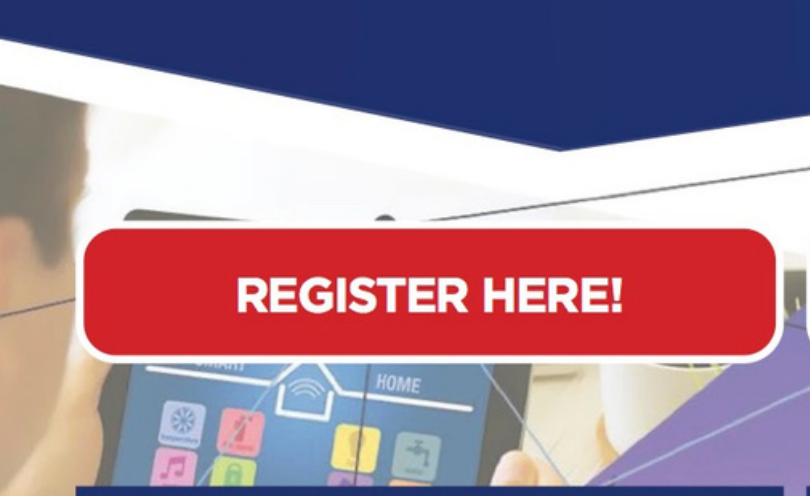
PROGRAM SNAPSHOT



PROGRAM HIGHLIGHT

WA Minster for Energy Hon Bill Johnston MLA is invited to open the Conference.

Violette Mouchaileh, Executive General Manager, Emerging Markets and Services AEMO will deliver the opening keynote address: **Evolution and Challenges in our Electricity Industry.**

TECHNICAL TOURS ANNOUNCED

**Spaces available to full ticket holders only*

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- INTRODUCTION TO QUALITY OF ELECTRICAL SUPPLY
  - 9-10 JUNE 2021
- INTRODUCTION TO PSCAD
  - 16-17 JUNE 2021
- ADVANCED PSCAD TECHNICAL WORKSHOP
  - 7-8 JULY 2021
- RENEWABLE & DISTRIBUTED GENERATION
  - 28-29 JULY 2021
- BATTERY ENERGY STORAGE
  - 4-5 AUGUST 2021
- ADVANCED QUALITY OF ELECTRICAL SUPPLY
  - 18-19 AUGUST 2021
- GENERATOR CONNECTION
  - 8-9 SEPTEMBER 2021
- POWER QUALITY WITH A FOCUS ON RENEWABLE ENERGY
  - 22-23 SEPTEMBER 2021
- SOLAR PV ENERGY SYSTEMS
  - 20-21 OCTOBER 2021
- APPLICATION OF AUSTRALIAN STANDARDS FOR MANAGEMENT OF HARMONICS, UNBALANCE AND FLICKER
  - 3-4 NOVEMBER 2021

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