

National Bulletin

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Nuclear Energy or Not for Australia?

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

Date: June 2019

A few weeks ago, I was asked by Martin Thomas (a member of Engineers Australia's Nuclear Engineering Panel (NEP) and the Australian Nuclear Association (ANA)) - as to whether EESA would endorse a "Declaration" by the Australian Nuclear Association. Martin (who I have known for many years) indicated that our (potential) endorsement (as well as those of other organisations) would be included with the Declaration to indicate the broadest possible informed professional support nationwide for repealing laws banning Nuclear energy in Australia.

Martin indicated in his email to me that the "Declaration has but one firm recommendation: namely repeal of those Commonwealth and State laws which currently, but illogically, make nuclear power illegal in Australia, despite exporting 10% of the world's uranium fuel, inter alia assisting recipient nations to generate affordable, reliable emissions free electricity".

The Declaration stated that "Nuclear energy is ready to make a valuable contribution to low emission despatchable generation for Australia. It supplies 10% of the world's electricity safely, reliably, cleanly and economically. Used by 30 nations, over half the world's population, it remains illegal in Australia, although Australia's uranium exports contribute to international power generation and Australia is a world leader in nuclear medicines and technologies".

Given the sensitivity of the issue and the overall principle that EESA has adopted for many years – that being "we are neutral on the types of generation that Australia uses and as an organisation we will provide information to our members on all the attributes associated with all technologies," I asked all the members of the EESA National Council for their views and if they could also get the views of their state chapter committee members on this "sensitive subject."

There was lots of interest in the matter and I received lots of feedback on the subject. The following are some of the comments to give you a "flavour" of the views of some of our members.

Australia has limited its options by the laws that exist and the decisions on this technology should be determined by informed analysis of the current technology, the risks associated with it and the societal benefits;

- EESA's endorsement of this issue may be polarising for many members who may not support this – perhaps it not EESA's place to endorse this formally.
- The declaration is essentially about lifting the legislative ban on nuclear energy. Removing the ban does not mean that Australia would necessarily go ahead with nuclear power but it would allow nuclear to be part of the mix of generation options.
- Lifting the ban would allow a thorough evaluation of nuclear as a fully despatchable generation technology – it would allow testing of the competitive position of nuclear compared to coal, gas and



Jeff Allen
EESA National President

Affiliations



renewable technologies.

- This is a way of putting pressure on governments to make some sensible power system “engineering based” decisions before we totally lose control due to the looming lack of despatchable generation.

I think EESA should endorse the promotion of nuclear power and waste storage, but for the straight-out repeal of the non-nuclear laws, I don't think we should.

Personally, I support the idea of nuclear power for Australia. The technology nowadays means that safety has increased and the risks have been reduced ten or even hundred-fold with modern control systems, etc, since Three-mile Island and Chernobyl. But convincing the Australian public to have one in their backyard remains near impossible.

I find ANA's focus on the 'illegality' of nuclear power a bit odd. They need to first sell the idea to the public and win the 'hearts and minds' with the safety and environmental arguments, etc. Calling for a repeal the laws first seems the wrong way around to me (and what other activities would the repeal of the laws affect? (enrichment, production of weapons, powered submarines, etc)

It is my understanding, based on an overwhelming amount of material that I've read from experts on the topic, that renewables will not get us (Australia and the world) decarbonised enough nor quick enough, regardless of cost, and that we need to be backing all horses.

The Nuclear subject is very political and we must remain and also be visibly neutral particularly on political and other contentious subjects.

The problem is that ANA's declaration will appear pro nuclear with the way it is currently worded and hence if we support it, we will also be seen as being pro-nuclear. Hence, we do not endorse the ANA declaration, but at the same time we do not reject it, more like an “abstaining position” so that we as a Society remain Neutral on the Topic.

If it was only lifting the ban on Nuclear so that Nuclear technologies could be more openly discussed alongside solar, wind, hydro, batteries, etc. that would be a different matter.

EESA should support the general principles of assessing all technologies on their merits. While the wording of the message is in line with this goal, supporting the Australian Nuclear Association, a pro-nuclear lobby group, goes against this principle by implying that EESA explicitly supports nuclear technology.

I think lifting the ban is not advisable without a robust regulatory framework with which to replace it. That being the case, I don't think we should support the move without changing the declaration to be more like the adoption of a more holistic legislative and regulatory framework to facilitate development under acceptable terms.

The overall feedback that I received was that we shouldn't be endorsing the ANA Declaration (for various reasons). There were suggestions such as that with a modified declaration then we could endorse the declaration right through to we should be “agnostic” to the types of energy generation that Australia uses.

As an organisation, EESA has always held the view that EESA should support the general principle of assessing all technologies on their merits. The key objective of EESA is to provide a continuous professional development program to our members and thus provide opportunities for the sharing and transfer of knowledge amongst members involved in the Electric Energy Industry. Being asked by ANA to support its efforts to change Australian laws to allow Nuclear Energy generation in Australia goes well beyond our prime purpose and if we did support the ANA Declaration we would be seen as an organisation that is explicitly lobbying for the change of laws to allow nuclear energy.

Thus, on behalf of all members of EESA I wrote to Martin Thomas stating that EESA would not be supporting ANA's declaration.

Given the significant interest I received back from some of our members, I would like to start a discussion on the technology of nuclear generation.

What are your thoughts on having modern nuclear generation in Australia?

Would you like to understand more about the latest nuclear technologies, their safety and reliability as well as where they fit compared with other forms of energy generation on the LCOE curves?

Please list your comments on the EESA website (using the contact form) and we will work out from the feedback received the sort of information to be provided to members on this subject area in the following months.

Contents

How Long will Electricity Exports into the Grid be Exempt ...	Page 4
Mt Piper Power Station Facing Ongoing Coal Supply Issues	Page 5
Clean Energy from Renewable Gas	Page 6
Australia's Largest Integrated Battery and Solar Farm ...	Page 9
China Claims it Has Faster and Cheaper Way of Extracting ...	Page 10
Loy Yang Outage to Last Seven Months	Page 11
Mini Series "Chernobyl" Does Little To Help Australia's ...	Page 11
International Articles	Page 14
History	Page 19
Humour Corner	Page 20
Cired Paper	Page 21
Updates on Working Groups	Page 21
Event Recaps	Page 23
What's on at EESA	Page 24
Upcoming Events	Page 26

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AUSTRALIAN ARTICLES

How Long will Electricity Exports into the Grid be Exempt from Network Charges?

Author: Terry Miller

Date: June 2019

Source: [Energy Networks Australia](#)

Since 2007 the National Electricity Rules have specifically prohibited network businesses from charging customers who use the system to export electricity. This seemed quite logical at the time and mirrored the arrangement for large generators, who also don't pay to use the grid. The thinking was that solar generation would reduce network costs and therefore, network charges. Those days are gone!

The following article from Energy Networks Australia's Jill Cainey explains the current debate on this issue: **Is the sun setting on the electricity export charging ban?**; author: Jill Cainey; date: 23 May 2019.

6.1.4, it looks like a footy score gone wrong, but it's actually an important part of the rules that govern how our electricity system runs. Clause 6.1.4 prohibits electricity distribution network businesses from charging customers who export electricity into the grid. Why are some consumer groups continuing to call for its removal?

What you pay for

Electricity distribution network businesses charge us for using their system, the critical infrastructure that gets electricity from generators to you. However, these "use of system" charges only apply to the electricity we import into our homes to meet our demand. They do not apply to any electricity that we might send back into the grid via our solar panels or batteries.

If you have rooftop solar panels, the amount of electricity you import has likely gone down, reducing the amount you pay not only for the energy you buy from a retailer, but for using the electricity system. This is because when the sun is shining the electricity that is made can be used directly by you and this "self-consumption" minimises the amount of electricity you import and the costs you pay.

But it's unlikely that you can "self-consume" all the electricity the solar panels produce, particularly at noon on a summer's day. This means any "excess" generation is exported out on to the distribution network. This export, or reverse power flow, means that our networks are now having to operate in the opposite direction – a task for which they were not designed. We've talked before about the impact these reverse power flows can have on quality and reliability of power supplies (read more here). When electricity is exported to the network, that export is clearly using the system.

What 6.1.4 does

Clause 6.1.4 explicitly bars electricity distribution network businesses from charging customers who use the system to export electricity.

The clause was first inserted as part of the National Electricity (Economic Regulation of Distribution Services) Amendment Rules 2007, agreed by the Ministerial Council on Energy. The logic was pretty simple – once connected, large generators don't pay to use the grid, so neither should customers in the new household solar sector.

Back in 2007, nobody had heard of the phrase "solar saturation". The idea that significant solar export was imposing costs on the system was still years away. The thinking was that solar would reduce network charges. Clause 6.1.4 was part of a package that also included provisions to ensure that customers with microgeneration captured the benefits of their energy savings in reduced network charges.

Free ride for some, higher charges for others

Let's think about this a little bit more... The prohibition on charging for using the system to export electricity is a bit like paying to catch the train home from work each afternoon (import), but getting a free ride for the journey to the office (export). In this scenario, all the costs of running the train system have to be levied on those who catch the train home. The situation in our electricity system is like catching the train to work but then walking or cycling home in the evening, avoiding the train fare. You get the benefits of a free trip into work, with the bonus of exercise, but you've not paid to use the train system. Those without a realistic cycling or walking option have no choice but to catch the train both ways and end up paying for the costs of everyone to use the system. This fails a basic equity test.

It is noteworthy that in telecommunications, we are used to paying for the download (import) and upload (export) of data. Typically, most of us would download more than we upload (sending an attachment in an email, posting). We pay for what we download and for what we upload, as both count towards the total amount of data we consume. This is because we are using the system for either action. If telecommunication companies had clause 6.1.4, they would only be able to charge for downloads and not uploads.

What are consumer groups saying?

The AEMC floated the idea of removing 6.1.4 as part of its Distribution Market Model review in 2017. This was supported by the St Vincent de Paul Society and SACOSS, which have been jointly on the record multiple times making the case that 6.1.4 is a barrier to efficient pricing for distribution services, resulting in increased cross subsidies.

The other angle referred to is that 6.1.4 undermines a smooth transition to the new transforming energy market. As solar penetration increases to levels that cause network problems, the 6.1.4 prohibition on charging for exports leaves distributors with only two options: 1) build more network or 2) ban exports for new solar connections. Would providing a network congestion price signal be a fairer and more efficient option?

In December 2018, Renew and the Total Environment Centre appeared to have some sympathy for this case: "there may be times and locations in the network where it would be useful to signal that DER export will have a cost impact and failing to signal this through export tariffs means consumers pay for inefficient investment."

It's also worth noting that removing 6.1.4 would align with reforms to ensure fairer access and congestion signalling for large generators, such as firm access and dynamic regional pricing.

The challenge remains

Our electricity system is changing rapidly and some of the rules that worked in the past may not work now. Clause 6.1.4 was introduced when distributed energy resources were in their infancy and few foresaw the mass scale integration challenges we are now facing. At present some people, often those least able to afford it, end up paying more than those who can take advantage of new and exciting technologies to reduce their bills.

This is why cost-reflective charging and resolving little clauses like 6.1.4 in our rules is critical to ensuring that everyone can benefit from the exciting transformation of our electricity system.

Mt Piper Power Station Facing Ongoing Coal Supply Issues

Author: Peter Hannam

Date: 20 June 2019

Source: [Sydney Morning Herald](#)

EnergyAustralia's Mt Piper plant near Lithgow, which supplies as much as 15 per cent of NSW's electricity, is mostly supplied by Centennial Coal's nearby Springvale mine. That mine, though, has hit "geological issues", with the operator extracting coal of lower quality and quantity than expected.

"We have faced significant disruptions to our operations due to coal supply issues over recent months which have directly impacted our ability to generate into the electricity market," an EnergyAustralia spokesman said, noting Mt Piper's output so far this year is down 42 per cent from the same period in 2018.

Centennial has asked the Berejiklian government for approval to increase the amount of coal it can truck to the 1400-megawatt power plant from its Clarence Colliery, also near Lithgow.

It wants to be able to increase tonnage trucked by 60 per cent to a total of 500,000 tonnes a year, up to the end of 2020. Daily truck movements would increase from 25 to 40, each way.

"If left unmitigated, onsite stockpiles at [Mt Piper] will continue to decline with potential impacts to the efficient operation [of the plant] and the supply of electricity to NSW," a statement from Centennial said.

Deputy Premier John Barilaro said a plan to increase trucked coal from the Clarence mine by 100,000 tonnes a year is open for public comment until June 20.

"Any short-term and long-term coal supply options to supply coal to the power station would require planning approval, and be subject to a comprehensive environmental assessment against the triple bottom line in accordance with existing government legislation, policy and guidelines," he said.

The NSW Nature Conservation Council said it was "very concerned about the impact of heavy diesel truck movements, mining and coal-fired power on air pollution and the health of residents in Lithgow and surrounding areas".

"In comparable regions such as Muswellbrook and Singleton, near the Bayswater and Liddell coal-fired power stations and Hunter coal mines, or Stockton at the Port of Newcastle, publicly available data shows these areas regularly breach national air-quality standards for fine particles," it said.

Any approval of the additional trucking should be accompanied by the installation of at least two continuous air-quality monitoring stations in the Lithgow area, the council said.

A spokeswoman for Centennial said the trucking extension to the end of next year should "be sufficient" to meet the coal shortfall.

"We will also be seeking other ways, at our other sites, to provide future supply flexibility," she said. EnergyAustralia said sourcing coal from the Lithgow region for its plant was the "preferred option". Still, with the coal supply difficulties, the company needed to consider alternative supplies.

"We are exploring long-term approaches, including a rail uploader at Mt Piper to enable transporting coal from other regions in NSW," the EnergyAustralia spokesman, said.

Coal transport by road would avoid the town of Lithgow itself.

Clean Energy from Renewable Gas

Author: Dr Dennis Van Puyvelde

Date: 9 May 2019

Sources: [Energy Networks Australia](#)

Natural gas is essential to our economy and modern lifestyles. Gas delivers 44 per cent of Australia's household energy to provide cooking, hot water and heating during the colder months. Gas is an essential part of our fuel mix as Australia makes the transformation to a clean energy future.

Renewable electricity is a critical part of this future and credible scenarios demonstrate that installed electricity capacity will need to be significantly augmented to ensure energy security. This creates opportunities for renewable gas options that can be used to balance and support electricity networks.

Renewable gas is a broad descriptor of a range of fuels that can be used to complement or replace natural gas, without the associated greenhouse gas emissions. It can provide clean energy and short- and long-term energy storage opportunities, while continuing to offer customers fuel choice.

Biogas

Biogas is produced from a biological process, for example in landfill[1] or in an anaerobic digester[2]. The gas produced contains mostly bio-methane, carbon dioxide and water vapour, so needs to be cleaned up before injecting into networks to be used as a complement to natural gas.

Most biogas produced in Australia is used to generate electricity. This is driven by the Renewable Energy Target (RET), which provides financial incentives for producing renewable electricity. Seven percent[3] of Australia's renewable electricity is provided from biogas and the RET has driven investments at landfill sites to collect the emissions from landfill and generate renewable electricity from that.

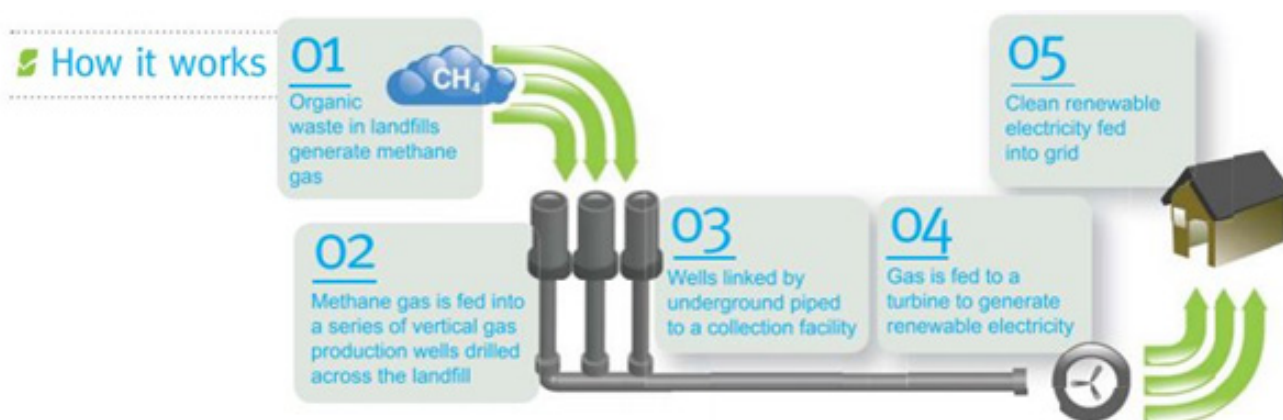


Figure 1: Landfill gas used in renewable electricity production

Technology is available to improve the quality of the biogas, but this is not happening in Australia as there are no incentives to do so. Countries such as France, Germany, Denmark and the UK have incentives in place that have resulted in bio-methane injection into their local gas grids. This bio-methane is fully compatible with natural gas in appliances, networks and gas turbines, so no modifications are required.

Hydrogen

Hydrogen is the rarest of energy policy beasts – it has bipartisan support. Both major political parties are committed to developing a hydrogen industry. Work is underway under the guidance of Chief Scientist Alan Finkel on a National Hydrogen Strategy.

Hydrogen can be produced in many ways. The renewable, zero-emission pathway is via electrolysis. This process uses renewable electricity to split water into its base components of hydrogen and oxygen. This renewable hydrogen is produced at very high purity (>99.99%) and can be used in many applications, for example fuel cells in vehicles.

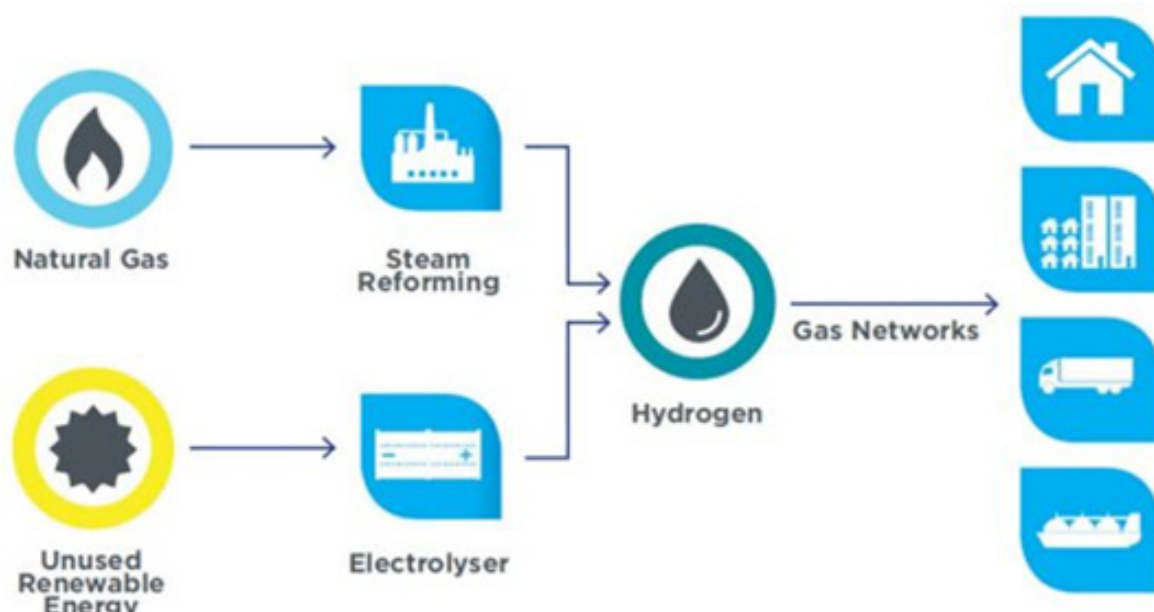


Figure 2: Hydrogen production pathways (Source: Gas Vision 2050)

Existing networks and appliances can still operate effectively with small amounts of hydrogen, but as the hydrogen content increases, appliance modifications will be required as hydrogen and natural gas behave differently when burnt. Modern gas distribution networks, however, should be able to transport large proportions of hydrogen safely.

Syngas (or renewable methane)

Syngas describes a wide group of gases that are synthetically made from their components.

Renewable methane (the same material as bio-methane) can be produced by reacting renewable hydrogen with carbon dioxide from a natural source, such as a biogas facility. This process produces a gas that is fully compatible with existing appliances and networks, but without the associated greenhouse gas emissions. Research is underway to improve the process and efficiency for producing renewable methane.

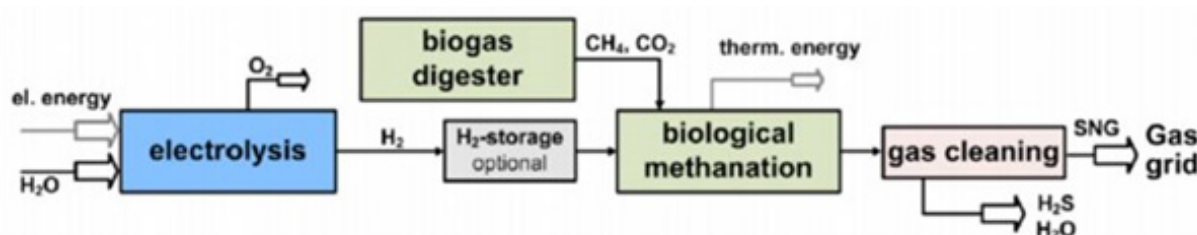


Figure 3: Production of renewable methane⁵

Applications

Replacing natural gas with the gases described above may require some modifications, summarised below. Using hydrogen may require more appliance upgrades compared with renewable methane or biogas, but those gases require additional processing to be injected into the network. At the moment, there is merit in pursuing all renewable gas options and as with everything in the energy world, exploring a wide portfolio of options will allow the best options to emerge over the medium to long term.

	Biogas	Renewable hydrogen	Renewable methane
Feedstock limitations	Availability of biomass	Availability of unused renewable electricity	Availability of biomass and unused renewable electricity
Quality of produced gas	Requires cleanup	OK	Requires cleanup
Household appliances (up to approx. 10%)	OK	OK	OK
Household appliances (100%)	OK	May require modifications	OK
Joints, valves, pumps	OK	May require modifications	OK
Gas distribution networks	OK	OK	OK
Transmission pipelines	OK	May require modifications	OK
Export as liquid fuel	Similar to LNG	May require new carrier, eg ammonia	Similar to LNG

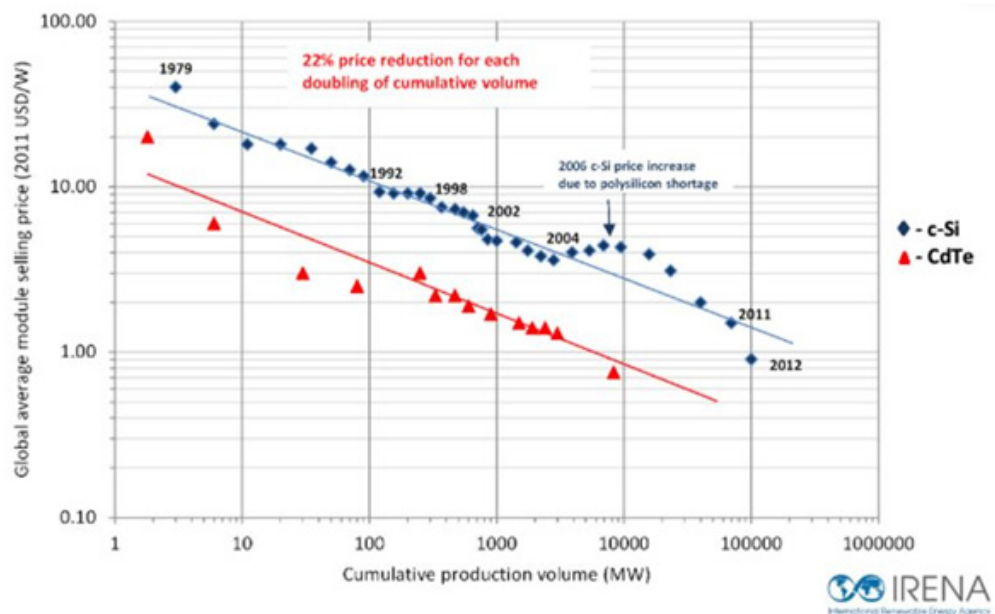
Table 1: Summary of interchangeability of renewable gas for natural gas (Source: Energy Networks Analysis, 2019)

Policy

Technologies for producing renewable gases are commercially available. Ongoing support for RD&D, such as through the Future Fuels Cooperative Research Centre^[6], will deliver process efficiencies and lower costs. As demonstrated with other renewable energy technologies, major cost reductions will occur as more capacity is installed. For example, the International Renewable Energy Agency (IRENA) chart below shows a 22 per cent price reduction for each doubling of cumulative production of solar PV modules. Similar scale cost reductions can be expected for renewable -gases as more capacity is installed.

Figure 4: Cost reductions with cumulative production volume for solar PV cells⁷

A range of policy incentives are required to support the injection of renewable gases into networks. These incentives could use a similar framework as those applied for renewable electricity, where a market is created (for example through targets) and supported by a financial incentive to minimise impacts on customer bills, while the technology matures commercially. Renewable gas provides real opportunities to decarbonise half the energy used in Australian homes while in parallel, the electricity sector decarbonises with renewable electricity. This parallel approach to provide clean energy will maximise Australia's chances of achieving its internationally agreed emissions targets.



[1] For example, Mugga Lane landfill in Canberra, <http://serree.org.au/projects/renewable-energy-trail/mugga-lane-landfill-gas/>

[2] For example, Richgro BioGass facility in Manjurah, WA, <https://www.richgro.com.au/waste-to-clean-energy-in-a-southern-hemisphere-first/>

[3] Clean Energy Council Report 2019 shows that 7.09% of renewable energy is from bioenergy, which includes bio-gas and bagasse.

[4] https://www.greenpower.gov.au/Homes/Common-Questions/~/_media/4602DFB0AED841C8A048241E1CA1A3A8.pdf

[5] Source: http://www.neocarbonenergy.fi/wp-content/uploads/2016/02/06_Tynjala.pdf

[6] <https://www.futurefuelscrc.com/>

[7] Source: IRENA, <https://www.irena.org/costs/Charts/Solar-photovoltaic>.

Australia's Largest Integrated Battery and Solar Farm is Officially Open

Date: 17 June 2019

Sources: [Energy Career](#)

A 50-megawatt battery system near the Victorian town of Kerang can store 100 per cent renewable energy and feed directly into the state's electricity grid. Victoria's Energy Minister, Lily D'Ambrosio, said it is a big step towards a low-carbon future.

"It's producing clean, renewable energy from a really important natural resource that exists in north-western Victoria, and that is the sun," Ms D'Ambrosio said.

The integrated system has actually been running since the end of last year, and Minister D'Ambrosio says it has already helped during recent heatwaves when older energy sources, like the Loy Yang power station in the Latrobe Valley, struggled.

"Everyone will remember that in January we had record extreme



temperatures, especially in north-western Victoria where there were temperatures of 49 degrees," she said.

"This battery was still producing and providing electricity during those really extreme heat temperatures."

Edify Energy chief John Cole said the high-tech battery is unlike anything else in Victoria's energy network.

"The battery can be used to provide strengthening to the network when required, it can store power, and it responds to network issues in milliseconds rather than minutes," he said.

China Claims it Has Faster and Cheaper Way of Extracting Lithium - May Impact Value of Australian Deposits

Author: Terry Miller

Date: June 2019

Sources: [Which Car](#)

Following recent EESA Bulletin articles about heightened interest in lithium deposits and forecasts of higher prices for this metal, China has announced a new development which may see the price nosedive, which would lower the price of electric cars and the value of Australia's lithium deposits.

This is the result of a 15-year research program led by the Chinese Academy of Sciences to figure out how lithium extraction can be improved.

An essential ingredient for batteries used in electric vehicles, the metal is extracted from lithium-containing salar brines but the current process is complex and very costly. However, the Chinese Government reports that the academy has found a new cost-effective method which will see the price of lithium drop to around \$3400 per tonne.



According to Australian car website Which Car, the Chinese are reticent to detail exactly how the new process works, but the financial repercussions of streamlining the extraction process are easy to quantify. Industry reports suggest the spot price is currently between \$17,000 and \$29,000 per tonne, indicating a potentially huge reduction in the material costs to build batteries.

Car makers have to date been bullish, with BMW locking in long-term deals to secure costs before increased electric car demand, which they have forecast would push prices higher.

"The aim is to secure the supply [of lithium] all the way down to the level of the mine, for 10 years. The contracts are ready to be signed," said BMW's Head of Supply, Markus Duesmann in 2018.

Speaking with Wheels, Volvo vice president of product and launch, Anders H. Gustavsson agreed that the cost of batteries was tipped to head north.

"You cannot just say the battery quality and chemistry will not be developed. Of course, it will be developed. We will find new ways to find the unique methods to produce a battery," he said.

"Will the price go down? That I doubt. But that's my personal reflection. I think the cost will be a difficult one, a very difficult one. With suppliers we are working with now they see a very high cost base."

However, according to Which Car, this latest Chinese-led breakthrough could tip the scales. Chinese company Qinghai Lithium Industries is already using the new method to produce cheaper lithium. With batteries the most expensive part of an electric vehicle at a cost of around \$25,000 for a 90kWh pack, cheaper lithium will be a key ingredient to cheaper EVs.

But that may not be the full story. A commentator on the above article in Which Car noted:

"A Tesla model S contains about 20 pounds of Lithium. At present prices, that's \$300. This is not that big a deal, and will have minimal impact on car prices."

According to [Golden Dragon Capital](#), Australia holds about 10% of the world's lithium reserves. The Australian deposits are hard rock reserves, with a large proportion of the world's reserves contained in brine type deposits in Chile, China and Argentina.

The new method of extraction developed by China is associated with lithium in brine deposits. According to [SAMCO](#), manufacturers of purification and separation equipment, while mineral ore deposits are often richer in lithium content than salar brines, they are costly to access since they must be mined from hard rock deposits.. This can be twice as costly as brine recovery. We shall watch developments with interest.

Loy Yang Outage to Last Seven Months

Author: Terry Miller

Date: June 2019

Sources: [AGL media release](#)

On 7 June, AGL Energy Limited (AGL) announced that it that day completed an assessment of the extent and impact of an outage at Unit 2 at the Loy Yang A power station (the Unit) in the Latrobe Valley.

AGL now believes this outage may extend seven months and, as a result, have a material impact on its financial results in FY20.

The Unit has been out of service since 18 May 2019 following an electrical short internal to the generator, which caused consequential damage to the stator and rotor components. AGL's initial expectation was that it would take between two to four months to return the Unit to service pending results of internal generator inspections.

Following rotor removal and cleaning, further technical assessments revealed a more extensive level of damage than was previously assessed, the full impact of which has now been determined. AGL now expects it may take until December 2019 to return the Unit to service and ensure its ongoing reliability. This duration of repair reflects the unique original technical design specifications of the Unit and the extent of damage.

AGL does not expect any material impact on its results for FY19 from this outage.

However, while AGL is seeking to mitigate impacts to portfolio availability and cost of the outage, AGL currently expects its extended nature to lead to a reduction in potential Underlying Profit after tax in FY20 of between \$60 million and \$100 million. Detailed assessment of the required repair process and likely financial impact is continuing.

According to [Renew Economy](#), the outage is unlikely to lead to higher wholesale price outcomes on its own. But it will make the southern region of the National Electricity Market more vulnerable – further outages (planned or otherwise) will reduce available capacity below normal operating levels.

A further unit trip could lead to flat load prices rising on average by over A\$7/MWh over the next couple of quarters.

Mini Series "Chernobyl" Does Little To Help Australia's Nuclear Energy Debate

Author: Terry Miller

Date: June 2019

Sources: [Michael Shellenberger writing in Forbes Magazine](#)

Shellenberger writes: "Since the start of [HBO's mini-series](#) about the 1986 nuclear disaster, "Chernobyl," journalists have praised the series for getting the facts of the event right, even if its creators took some creative liberties.

"The first thing to understand about the HBO mini-series "Chernobyl," wrote a reporter for The New York Times, "is that a lot of it is made up. But here's the second, and more important, thing: It doesn't really matter."

The reporter notes a similar inaccuracy [I wrote about](#) last month: "radiation victims are often covered in blood for some reason."

But HBO "gets a basic truth right," he writes, which is that Chernobyl was "more about lies, deceit and a rotting political system than... whether nuclear power is inherently good or bad."

This is a point that the creator of "Chernobyl," Craig Mazin, has stressed. "The lesson of Chernobyl isn't that modern nuclear power is

dangerous," he tweeted. "The lesson is that lying, arrogance, and suppression of criticism are dangerous."

Representatives of the nuclear industry agree. "Viewers might see the Hollywood treatment and wonder what the relevance is outside the USSR," [writes](#) the Nuclear Energy Institute. "The short answer is: not much."

Shellenberger goes on to note that despite this, the series has terrified millions of people, particularly in America.

Despite the show creator having insisted that his mini-series would stick to the facts, Shellenberger points out a large number of factual errors, including:

- Three characters dramatically volunteering to sacrifice their lives to drain radioactive water, but no such event occurred. (The control room operators on duty merely received order by telephone from the reactor shop manager to open the valves)."
- Radiation from the melted reactor contributed to the crash of a helicopter. (There was a helicopter crash but it took place six months later and had nothing to do with radiation. One of the helicopter's blades [hit a chain](#) dangling from a construction crane.)
- The depiction of radiation as contagious, like a virus. The scientist-hero played by Emily Watson physically drags away the pregnant wife of a Chernobyl firefighter dying from Acute Radiation Syndrome (ARS), as though every second the woman is with her husband she is poisoning her baby. (Radiation is [not contagious](#). Once someone has removed their clothes and been washed, as the firefighters were in real life, and in "Chernobyl," the radioactivity is internalized.)

Shellenberger goes on to note that there is no good evidence that Chernobyl radiation killed a baby nor that it caused any increase in birth defects.

"We've now had a chance to observe all the children that have been born close to Chernobyl," [reported](#) UCLA physician Robert Gale in 1987, and "none of them, at birth, at least, has had any detectable abnormalities."

Indeed, the only public health impact beyond the deaths of the first responders was [20,000 documented cases](#) of thyroid cancer in those aged under 18 at the time of the accident.

The [United Nations](#) in 2017 concluded that only 25%, 5,000, can be attributed to Chernobyl radiation ([paragraphs A-C](#)). In earlier studies, the UN estimated there could be up to 16,000 cases attributable to Chernobyl radiation.

Since thyroid cancer has a mortality rate of just one percent, that means the expected deaths from thyroid cancers caused by Chernobyl will be 50 to 160 over an 80-year lifespan.

At the end of the show, HBO claims there was "a dramatic spike in cancer rates across Ukraine and Belarus," but this too is wrong.

Residents of those two countries were "exposed to doses slightly above natural background radiation levels," [according](#) to the World Health Organization. If there are additional cancer deaths they will be "about 0.6% of the cancer deaths expected in this population due to other causes."

Radiation is not the super-potent toxin "Chernobyl" depicts. In episode one, high doses of radiation make workers bleed, and in episode two, a nurse who merely touches a firefighter sees her hand turn bright red, as though burned. Neither thing occurred or is possible.

"Chernobyl" ominously depicts people gathered on a bridge watching the Chernobyl fire. At the end of the series, HBO claims, "it has been reported that none survived. It is now known as the "Bridge of Death."

But the "Bridge of Death" is a sensational urban legend and there is no good evidence to support it.

Shellenberger concludes that "Chernobyl" is as misleading for what it leaves out. It gives the impression that all Chernobyl first responders who suffered Acute Radiation Syndrome (ARS) died. In reality, 80 percent of those with ARS [survived](#).

The [full article](#) is worth reading.

AEMO Update: Benefits of Interconnection and Economics of Coal Fired Power Station Closures

Author: Terry Miller

Date: June 2019

Sources: [AEMO](#)

AEMO has released two independent, supplementary analysis reports that investigated two core components of its 2018 Integrated System Plan (ISP).

This release followed on a national industry in Sydney on Monday, 3 June to test and discuss preliminary forecasting and planning scenarios to be used for the 2019-20 ISP.

AEMO presented a number of scenarios during this workshop, from a central scenario incorporating current federal and state energy policies, to slow and fast change scenarios that factor in lower/higher than expected uptake of distributed energy resources and large-scale renewable investment. Also presented were scenarios based on very high uptake of distributed energy resources, and a significant 'step change' that represents strong action on climate and acceleration of technology. Feedback from all scenarios will be taken into account as AEMO looks to finalise its forecasting and planning scenarios by the end of June 2019.

The two reports recently released were developed by Aurora Energy Research (Aurora):

Aurora's first report analyses the potential reduction in power bills the implementation of the ISP could provide to Australian energy consumers through increases in competition and market efficiency through additional interconnection investment.

The second report provides independent economic analysis on whether AEMO's coal closure timeline (based on either advice of closure or expected end of technical life in the ISP plan period) requires adjustment because of changing earnings in an evolving market environment.

Summary of the first report (benefits of interconnection):

AEMO's 2018 ISP estimates that the additional transmission investment proposed would conservatively deliver market benefits of around \$1.2 billion across the energy system on a net present value (NPV) basis, compared to the case where no new transmission is built to increase network capabilities between regions (in the modelled Neutral case).

Aurora has provided independent validation of this market benefit assessment, as well as producing an alternative quantification to estimate the full cost savings to consumers from the additional interconnector capacity envisaged in the ISP. This analysis is based on Aurora's market-based NEM dispatch model (AER-NEM) and the ISP's plant cost and capacity mix assumptions.

Aurora finds that under AEMO's ISP neutral scenario, the net present value (NPV) of consumer benefits through potential bill savings to 2040 to be approximately \$3.8b. For the other ISP scenarios, Aurora forecasts the NPV of consumer benefits to range between \$1-4b to 2040. This analysis does not include other benefits that may be generated from additional interconnection, in particular potential reductions in ancillary service spending and enabling emissions reductions.

Summary of the second report (coal fired generation closures):

One of the key assumptions in the 2018 ISP is the expected sequence and timing of closures of existing coal fired generators. Their exit drives investment in necessary replacement generation capacity. A portfolio of utility-scale renewable generation, storage, distributed energy resources, flexible thermal capacity, and transmission is offering the lowest replacement cost.

To date, AEMO has assumed a 50-year technical life or a published closure date for coal fired generators. To understand whether this assumption needs to be modified, AEMO has commissioned Aurora to assess the financial viability of coal generators as the National Electricity Market (NEM) is expected to evolve in future.

Four key findings emerged from Aurora's analysis:

- *Finding 1:* In AEMO's neutral scenario, Aurora forecasts sufficient revenues such that coal assets are NPV positive and are therefore likely to remain in the NEM for at least as long as AEMO estimates in the ISP.
- *Finding 2:* Although all coal assets are forecast to generate sufficient revenues, Aurora's forecasts highlight significant variability in profitability between coal assets. Some generators may be vulnerable in particular if there is a failure in a critical part of the plant that requires costly repairs.
- *Finding 3:* In Aurora's scenario modelling, there are some scenarios, especially those with lower demand, in which coal assets may exit earlier than AEMO estimates.
- *Finding 4:* The early exit of one coal asset in the NEM would improve the profitability of the remaining coal plants on the system

INTERNATIONAL ARTICLES

Industry Opinion: Bridging the Renewables Gap - What Role can Gas Hybrids Play?

Author: Karim Wazni, Managing Director, Aggreko Microgrid and Storage Solutions

Date: 5 June 2019

While the energy landscape seemed frozen in time for several decades from the 1950s until 2000, we have certainly come out of the ice age and are now headed, perhaps a little too quickly, to much warmer times.

Awareness of the impact of global warming has led to an acceleration of the change to the energy sector, which has been compared to the changes seen in the great industrial revolution of the 18th and 19th centuries.

With this, the advent of intermittent renewables has ushered in a brand-new set of challenges that stakeholders had never faced before. Technologies and sources of energy glorified one day, fall out of grace the next day. Gas power is one of those, but as I will argue, there is a way that we can bring it back into favour: the intelligent deployment of [battery storage](#).



A much cleaner fuel than coal or liquid fossil fuels, gas quickly rose to the top of the energy mix in many countries in the millennium. [Combined-cycle gas turbines](#) became the most popular form of centralised electricity generation, driven by the low cost of gas and their high efficiency. This is borne out in figures from Bloomberg New Energy Finance (BNEF), which shows that between 2008 and 2015, 250 GW of new gas capacity was installed across about 2000 sites worldwide.

However, as the need for flexible generation increased due to rising volume of [solar and wind power installations](#), CCGT got into trouble; although efficient, they are not able to move fast enough to compensate for the variations in supply associated with renewables. So the sector responded with more gas technology: fast-acting open cycle gas turbines (OCGT) came back into fashion.

This presented new challenges when it came to the integration of renewables. Firstly, the marginal cost of renewables production is effectively zero, leading renewables to compete strongly with CCGT on wholesale electricity markets, thereby displacing the cleanest thermal generation of the system. Secondly, the increase in renewables led to an increased demand for fast responding OCGTs, which could keep up with the associated intermittency but were also less efficient than CCGTs.

In short, the most efficient form of gas generation was being displaced by renewables combined with much less efficient OCGT gas turbines.

Surely we can do better?

The answer comes in the form of energy storage. The price of batteries has dropped considerably in the past 10 years – according to BNEF the price of battery cell packs have dropped from almost \$1200 in 2010 to less than \$200 in 2018. Batteries are now a more competitive (and cleaner) alternative to OCGT, which is now being recognised in legislation.

For example, [California's](#) two landmark energy storage bills require California's Investor-Owned Utilities (IOUs) to procure and install nearly 2 GW of storage by 2024. The assessment carried out by the state government of the cost vs benefits of batteries compared with gas turbines has found batteries to be more economical.

Centralised electricity generation seems to have also found its stride. We now have higher levels of renewables than ever before, enabled by grid-scale energy storage and efficient thermal generation thanks to the use of gas as a controllable baseload power.

At Aggreko, we believe the lessons learned from centralised power generation can be applied to distributed generation to provide our customers, wherever they are, with the best balance of clean, cheap and reliable power. Our 'CCGT' is our fleet of gas engines; our storage technology is our new Y.Cube, a fully containerised 1 MW battery; and the grid operator is our smart YQ energy management system.



There are a range of examples where we have seen this work across the world. The Gold Fields Granny Smith gold mine in [Western Australia](#) is set to install one of the world's largest renewable energy microgrids. It will be powered by a combination of gas generators and 20,000 solar panels and supported by the Y.Cube battery system. The use of battery storage will enable the mine operators to use more solar while also running gas engines more economically.

Gold Fields is just the beginning. In many off-grid locations the right combination of gas, batteries and solar is already the most economically attractive technology mix.

Gas-battery hybrids have an even wider application than remote off-grid projects. Access to reliable power can also be an issue in countries with a reliable electricity system. Data centres for example are often built faster than the grid can keep up with; on top of that the computers in each centre are also extremely sensitive to power quality and can require very sudden spikes in demand.

We have helped our customers who run data centres to meet this challenge by supplying one such centre in [Ireland](#) with gas generators and a battery, guaranteeing both a stable energy supply and the highest possible power quality. It also provides an easy-to-implement and reliable solution to keep the business running.

Huge strides have been made in the past few years to establish greener power solutions as a source of energy. However, the energy transition is far from complete. New technologies keep emerging, and there is still little knowledge of what the end point will look like and how long it will take to reach it.

But despite all the uncertainty there are some things we do know. One is that combining batteries with gas will go a long way to making cheaper, cleaner and more reliable power more accessible.

Most Detailed X-Ray Image of Batteries Yet to Reveal Why They Still Aren't Good Enough

Author: Purdue University

Date: 4 June 2019

Source: [R&D Magazine](#)

Electric cars rely on the same lithium-ion battery technology that's in smartphones, laptops and virtually everything electronic.

But the technology has been extremely slow to improve. While electric cars can more than handle the average American's daily commute, the average gas-powered car can still go farther on a full tank of gas, charging stations are scarce and it takes significantly longer to

charge a battery than to fill a tank.

To improve charging capacity in lithium-ion batteries and increase adoption of electric cars, the industry will have to return to the basic science of how batteries wear out over time.

A multi-institute team of researchers has developed the most comprehensive view yet of lithium-ion battery electrodes, where most damage typically occurs from charging them repeatedly. Manufacturers could use this information to design batteries for your smartphone or car that are both more reliable and longer-lasting, the researchers say.

"The creation of knowledge is sometimes more valuable than solving the problem of battery electrode damage," said Kejie Zhao, an assistant professor of mechanical engineering at Purdue University. "Before, people didn't have the techniques or theory to understand this problem."

The technique, explained in the journals *Advanced Energy Materials* and the *Journal of the Mechanics and Physics of Solids*, is essentially an X-ray tool driven by artificial intelligence. It can automatically scan thousands of particles in a lithium-ion battery electrode at once - all the way down to the atoms that make up the particles themselves - using machine-learning algorithms.

Granted, there are actually millions of particles in a battery electrode. But researchers can now analyze them more thoroughly than they could before - and at the various operating conditions that we use commercial batteries in the real world, such as their voltage window and how quickly they charge.

"Most work had been focused on the single particle level and using that analysis to understand the whole battery. But there's obviously a gap there; a lot differs between a single particle at a micron scale and the whole battery at a much larger scale," said Zhao, whose lab studies the fundamental science of how the mechanical and electrochemical aspects of a battery affect each other.

Every time that a battery charges, lithium ions travel back and forth between a positive electrode and a negative electrode. These ions interact with particles in electrodes, causing them to crack and degrade over time. Electrode damage reduces a battery's charging capacity.

It's hard for a battery to have a high capacity and be reliable at the same time, Zhao says. Increasing a battery's capacity often means sacrificing its reliability.

The researchers' work to map out damage in lithium-ion batteries started with their finding that degradation in battery particles doesn't happen at the same time or in the same location; some particles fail more quickly than others.

But to truly study this in more detail, the team needed to create a new technique altogether; existing methods wouldn't entirely capture damage in battery electrodes. A YouTube video is available at <https://www.youtube.com/watch?v=cdskb57St8s>.

The researchers turned to massive, miles-long facilities called synchrotrons at the European Synchrotron Radiation Facility (ESRF) and the Stanford Synchrotron Radiation Lightsource (SSRL) of SLAC National Laboratory. These facilities host particles traveling at almost the speed of light, giving off radiation that is used to create images called synchrotron X-rays.

Virginia Tech researchers manufactured the materials and batteries for testing - ranging from the pouch cell batteries in smartphones to the coin cells in watches. Researchers at ESRF and SSRL created the ability to scan as many electrode particles in these batteries as possible in a single go, then produce these X-ray images for analysis. Maps of particle cracking and degradation at the surfaces of particles, called "interfacial debonding," can now serve as a reference tools for knowing ranging degrees of damage in battery electrodes.

To understand how these cracks impact battery performance, Zhao's team at Purdue developed theories and computational tools. They found, for example, that because particles near where lithium ions shuttle back and forth, called the "separator," are more used than particles near the bottom of electrode materials, they fail more quickly.

This variability in electrode particle damage, or "heterogeneous degradation," is more severe in thicker electrodes and during fast-charging conditions.

"The capacity of batteries doesn't depend on how many particles are in the battery; what matters is how the lithium ions are used," Zhao said.

The goal for the project is not for every researcher and industry player to use the technique itself - especially given that there are only a handful of synchrotrons in the U.S. - but for these groups to use the knowledge generated from the technique. The researchers plan to continue using the technique to document how damage happens and affects performance in commercial batteries.

Pairing Solar + Storage Challenges Gas Peakers

Author: Perry Sioshansi

Date: June 2019

Source: EEnergy informer, June issue

Perry Sioshansi in the latest edition of EEnergy Informer writes that batteries can firm variable renewable generation, making it so much more valuable as peakers have been around even before the recent rise of renewables made them even more indispensable. How else could grid operators fill in the void created by the vanishing solar generation when the sun sets at the end of the day or when wind stops spinning the wind turbines' blades? And with natural gas plentiful and cheap – especially in the US – their place in the energy mix appeared safe. Rapid advances in energy storage technologies and equally rapid fall in prices, however, are beginning to change the economics of natural gas peakers.

While evidence to date is anecdotal and details tend to be sketchy, two recent trends stand out:

- **Renewables – solar in particular but also wind – are increasingly paired and co-located with on- site storage; and**
- **The cost of storage – in particular batteries – is plummeting while their performance continues to improve.**

This has prompted a number of utilities in the US and elsewhere to invest in ever-larger solar plus storage projects co-located and paired to optimize their synergies. Batteries, while still expensive, are reportedly performing much better than gas-fired peakers by following critical ramping and frequency requirements coveted by grid operators much more accurately and instantaneously. This means that, everything else being equal, they are increasingly preferred by the grid operators.

The new Manatee Energy Storage Center, which will be co-located at an existing FPL solar plant in southwest Florida, will have 409 MW of storage capacity and able to provide 900 MWh of electricity – enough to serve over 300,000 homes for up to 2 hours. In announcing the project, Eric Silagy, CEO of FPL said, "Replacing a large, aging fossil fuel plant with a mega battery that's adjacent to a large solar plant is another world-first accomplishment and while I'm very pleased of that fact, what I'm most proud of is that our team remained committed to developing this clean energy breakthrough while saving customers money and keeping their bills among the lowest in the nation." FPL believes the project will save customers over US\$100 million and eliminate more than 1 million tonnes of CO2 emissions.

Los Angeles is replacing aging plants with a virtual one. The combination of solar plus batteries is gaining ground. When the Mayor of Los Angeles, Eric Garcetti, vowed not to repower 3 aging and polluting natural gas fired plants if given a cleaner alternative, SunRun, a company which serves 250,000 customers with rooftop solar panels, saw an opportunity. It offered to replace the physical plants with a virtual power plant (VPP) consisting of 150,000 homes and 500 apartment buildings with rooftop solar panels plus storage. To make the scheme practical when the sun goes down, SunRun is offering to pay each homeowner \$4,000 to install a battery in their home provided they agree to allow its capacity to be dispatched at critical periods. According the SunRun's CEO, Lynn Jurich, the combination of rooftop solar plus storage could successfully replace the retiring gas plants and be cheaper. Similar schemes are being tested around the world with promising results.

In all such paired applications, storage essentially "firms" or "smooths" the otherwise variable output of solar or wind generation – making the renewable output so much more valuable. Assuming that such paired and co-located schemes perform as expected and can be economically

scaled up, they stand to challenge the traditional role of gas peakers, which historically provided rapid ramping, frequency and similar critical services. The future prospects for solar or wind + storage will be further strengthened as the performance of batteries improve while their cost continues to plummet as supported by the cost reduction projections of Bloomberg New Energy Finance (BNEF) and others. BNEF's latest figures for the levelised cost of electricity (LCOE) for lithium-ion batteries dropped 35% in 2018 to \$187/MWh.

The trend towards pairing is most noticeable in places with high renewable penetration such as Hawaii, aiming to become 100% renewable. In early April, Hawaii's Public Utilities Commission (HPUC) approved funding for 6 grid-scale solar and battery storage projects – 3 on the island of Oahu, 1 on Maui, and 2 on the big island of Hawaii. Together, they will amount to 247 MW of solar capacity and roughly 1 GWh of battery storage – and eliminating over 48 million gallons of imported fossil fuels annually. According to the HPUC, the cost will be "significantly" lower than the cost of fossil fuel generation in the mainland US, which is around 15 cents/kWh. Retail prices in Hawaii are among the highest in the US, averaging around 40-50 cents/kWh, depending on the island. Hawaii, which used to be nearly 100% dependent on imported diesel fuel is rapidly progressing towards a 100% renewable future.

One wonders why it took the Hawaiian politicians so long to arrive at a sensible solution considering the abundance of domestic renewable energy – the sun, the wind, geothermal, tidal, biomass and hydro.

ABB and Siemens Test Subsea Power Grids

Author: Perry Sioshansi

Date: June 2019

Source: EEnergy informer, June issue

Slowly but surely, oil- and gas-drilling technology is migrating from floating platforms to the seafloor. Pumps moved down there decades ago. More recently, compressors (which boost pressure in a well to keep gas flowing) and separators (which isolate oil from water and silt) have relocated to the murky depths.

Putting this equipment closer to wells makes them more productive and energy efficient. Some oil and gas companies even aspire to build subsea factories that extract and process oil and natural gas directly on the seafloor. These factories would be safe from hazards such as icebergs and hurricanes. They would be controlled remotely, reducing labor costs. Eventually, some believe, offshore platforms could be phased out entirely.



Photo: Siemens

However, all of this sunken gear requires electricity. Today, operators typically string power lines from power plants or diesel generators aboard nearby oil rigs to every piece of subsea equipment they install. That works for a few machines, but it's impractical to string dozens of umbilicals, as they're known, to the ocean floor.

Industry suppliers ABB and Siemens are now putting the finishing touches on competing versions of the world's first subsea power-distribution stations. Once installed, these stations would connect via a single line to a "topside" (maritime parlance for above water) generator, wind turbine, or power plant, and redistribute electricity to underwater equipment. "Our technology is an enabling technology for the subsea factory," says Bjørn Rasch, head of subsea power for Siemens.

Submersion: Siemens performed a shallow-water test for its subsea power-distribution system off the coast of Trondheim, Norway.

Both projects have been in the works for more than five years. ABB will complete its final round of testing in June and expects to install its first subsea power system in 2020. Siemens tested its version in shallow water in Norway last November and is now talking with clients about putting its first unit in the field. "We're getting close to where we're actually deploying this technology in a real project," Rasch says.

Siemens's model, which the company calls its Subsea Power Grid, consists of a transformer, a medium-voltage switchgear, and a variable-speed drive. Its distribution voltage is around 30 kilovolts, while its variable-speed drive puts out 6.6 kV. The system can provide electricity to devices with power ratings between 1 and 15 megawatts. The umbilical that hooks it to a generation station also includes an embedded fiber-optic cable so operators can run everything from afar.

One of the hardest parts of building the station, Rasch says, was ensuring it could withstand the high water pressure of the seafloor. Instead of encasing all the equipment in a pressurized chamber, engineers flooded the electronics with a synthetic fluid called Midel. This biodegradable fluid inside the equipment maintains the same pressure as the seawater, which alleviates stress. The fluid also passively cools the device by transferring heat from equipment to the chilly seawater.

Chevron, Eni Norge, Equinor, and ExxonMobile have all worked with Siemens to get the company's project this far. The next step for both ABB and Siemens will be to deliver the first model for installation at an active production site.

Brian Skeels, professor of subsea engineering at the University of Houston and director of emerging technology for the offshore design and consulting firm TechnipFMC, has seen many attempts to "marinize" technologies to work underwater. Dealing with heat is a common stumbling block. If water can't flow freely around a device, the heat it generates prompts marine life to grow on the equipment, which shortens its life-span. And, Skeels cautions, "what may work in shallow water may not work at deeper depths."

Both systems are expected to work at depths of up to 3,000 meters and operate for 30 years with minimal maintenance. At the end of their lives, the units can be removed from the seafloor.

A power-distribution center would be just one piece of any future subsea factory—a vision that has captivated the industry for more than

a decade. Skeels says the future of subsea processing will depend largely on whether such projects can add more value to the industry than they drain in expense. Investment into subsea processing dried up when oil prices crashed in 2014. Looking ahead, Skeels thinks the technology holds the most potential for remote wells more than 160 kilometers from other facilities.

Hani Elshahawi, digitalization lead for deepwater technologies at Shell, says there are clear benefits to having power readily available on the seafloor. But he doesn't think subsea factories will supplant all platform activities, or replace any of them in the near future. "It will require decades, in my view," he says. "We foresee a more gradual and lengthy transition."

To Rasch at Siemens, though, the industry's vision of subsea factories does not seem as far out as it once did. "There are many technologies in many companies that are in place or close to being in place," he says. "This can be realized in the close future, that's for sure."

HISTORY

Voltages in the Prospect County Council District. The Basis for Control of Distribution.

Author: Tony Patterson

Date: June 2019

Paper: Voltages in the Prospect County Council District. The Basis for Control of Distribution.

Author: L.A. Chappell

Date: February 1967

The supply of correct voltage to a customer is critical. I have always maintained that the industry sells voltage, but makes its revenue out of current.

There are many variables in the supply of correct voltage in the electricity supply system and the management of these is critical. The historical paper presented in this bulletin identifies the process adopted by Prospect County Council. This is a very detailed paper by an excellent engineer. It goes to great length to describe a system of voltage management and all the factors that influence it. The paper is regarded by many as a text book on the subject.

While the paper was very relevant in 1967, is it relevant today? The significant growth in residential solar PV has added another dimension in voltage influence to the network. Not only does the voltage vary in magnitude, but also in wave form. To answer the question posed, I suppose that the paper is still relevant after sunset.

Sunrise raises another issue. Perhaps the paper now needs an addendum to deal with the issue of over voltage where residential solar penetration is high and particularly where it is approaching solar saturation. Is the fabricated wave from the inverter adequate to meet the power quality needs of the customer?

Perhaps one of our members who has current experience with these modern voltage management issues could prepare a short paper for the benefit of all our members.

Download Paper

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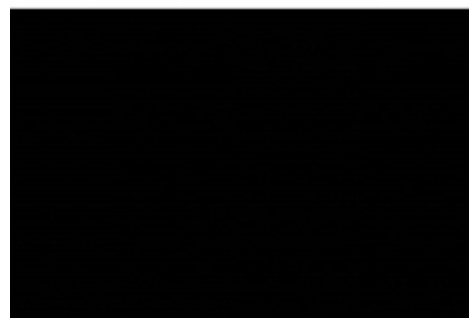
Communication Engineers



Aeronautical Engineers



Electrical Engineers



CIREP PAPER

Lablink – a Novel Co-Simulation Tool for the Evaluation of Large-Scale EV Penetration Focusing on Local Energy Communities

Paper 465 from the Ljubljana CIREP Workshop held on 7-8 June 2018.

Abstract

The rising penetration of distributed generation, electric energy storage and battery electric vehicles (BEVs) leads to new challenges and opportunities in the energy system. Local intelligences such as home energy management systems (HEMS) are a possible solution for the synergies between these distributed actors. In order to evaluate the large-scale deployment of these approaches, sophisticated test systems are needed. This paper presents a novel co-simulation middleware called Lablink which is used to test the large-scale deployment of HEMS and BEVs in a low-voltage distribution grid. Photovoltaic (PV) generation as well as controllable storage is also included. Two examples of HEMS implementations are evaluated with respect to their grid sustainability. The results show that the combination of HEMS with distributed storage systems can mitigate voltage magnitude issues.

[Download Paper](#)

UPDATES ON WORKING GROUPS

STANDARDS AUSTRALIA

Standards Australia New Distribution Agreement

Update from Grant Watt, Operations Manager Learned Society, Professional Standards and Practice, Engineers Australia
Date: June 2019

Standards Australia has entered into a new distribution agreement with Techstreet, a Clarivate Analytics company, to deliver greater access to Australian Standards. Under the new agreement, Techstreet will become an additional distributor of Standards Australia's content, including Australian Standards and other technical documents such as ISO and IEC materials. This is a significant step in progressing greater diversity and competition in standards distribution arrangements, which also include the existing arrangements through SAI Global.

Users will soon be able to get easy, immediate access to Standards Australia content through a new webstore and through a subscription service to Techstreet Enterprise, Techstreet's standards management platform. Specific details of the changes as a result of this announcement will be outlined in coming weeks, including how to access the new webstore. In the meantime, Sales enquiries for subscription customers should be directed to Andrew O'Brien, Head of Sales, Australia.

Under the new arrangements both the reach and relevance of Standards content is likely to become much greater. Some key issues include: rights to distribute core content; balance between exclusivity and innovation; how to track customer use and impact of standards in a devolved distribution model; managing perceived/actual conflicts of interest; and, pathways to greater affordability of standards within a sustainable business model.

Information will be provided to EA members as the details of the new arrangements become clear over the coming weeks.

CIGRE

WG B2.53 - MANAGEMENT GUIDELINES FOR BALANCING IN HOUSE AND OUTSOURCED OVERHEAD TRANSMISSION LINE TECHNICAL EXPERTISE.

A new technical brochure "TB 744" has been developed by Working Group B2.53 to assist owners of power networks with outsourcing transmission line project management and acquiring expertise to supplement in-house technical resources. Whilst the focus relates to transmission line practices, the principles are applicable to all disciplines associated with power network development and operation. This TB describes the benefits and risks of the outsourcing as well as the criteria that can be used to achieve successful outcomes.

The increasing business focus on financial targets may lead to a lower priority being placed on the retention of sustainable levels of in-house capability. TB 744 provides a historical context, and includes a survey, which examined the nature of services required by Asset Owners, as well as the criteria that have achieved successful outcomes with engagement of external specialists. Major themes identified are to ensure the scope of work is adequately defined and good communications are maintained. These are essential elements irrespective of whether the work is undertaken by internal resources or external technical expertise.

Outsourcing benefits and risks is a key topic. These depend on a number of factors including business relationships, appropriate knowledge/expertise, delineation of roles and expectations, quality of information and so on. Usually, risks are associated with a negative outcome that inevitably will cause suffering of both parties.

Significant benefits for an asset owner are the means to access specialised expertise not held within the organization, especially for introduction of new technology; and consequent transfer of skills to in-house personnel. In return, benefits for the service provider (not identified in the TB) are the opportunities for their team to obtain direct site construction experience and gain awareness of sustainable asset management concepts.

Of particular interest are the business challenges associated with unplanned/emergency events that cause major disruption to the network. Rapid response is highly dependent on knowledge of the system and response strategies. Asset Owners need to retain "institutional knowledge", including guidelines and generic designs to manage unplanned line failure events. When such events occur, access to very particular skills, expertise and manpower is required at short notice. The maintenance of adequately skilled design engineering personnel can be further complicated if there is total reliance on external service providers rather than in-house expertise.

Globalisation has invited the presence of service providers with a comparatively poor understanding of the Asset Owner's needs and interests, and also less interest in specifically addressing those needs and interests because they have very little dependency on any one Asset Owner. This includes little understanding about local design practice and asset reliability expectations, as well as lack of knowledge of relevant industry standards and local legislation, particularly safety legislation and work practices. Unless an asset owner has significant purchasing power, it can be difficult to change the behaviour of its new service provider. Furthermore, cultural differences can impede communication of expectations & intent for both parties.

The Technical Brochure (TB) 744 can be viewed on e-CIGRE and is free to members. The cost to non-members is €130.

EVENT RECAPS

Successfully Managing Change in the Electric Energy Industry - insight from Jeff Allen and Mike Schulzer

Author: Terry Miller

Date: June 2019



Jeff and Mike at the Canberra presentation

A cold and blustery Canberra May evening didn't prevent the rollup of dedicated engineers and professionals to listen to EESA National president, Jeff Allen and AMC Canberra Chapter Chair, Mike Schulzer talk about Successfully Managing Change in the Electric Energy Industry. With his vast experience in the electricity industry, Jeff kept his audience spellbound as he recalled the changing conditions throughout his decades of service, from the typing pool to artificial intelligence and smart networks. Both speakers emphasised that effective asset management was the key ingredient to the success and sustainability of electricity networks, and Mike talked about the requirements to develop and maintain an effective asset management system.

Audience interest was sustained during question time and beyond. The event was hosted, as usual, by Engineers Australia in Engineering House in Canberra. Their dedicated staff provided

refreshments and ensured all the facilities worked.

The event, on the 29th May, was the second of several being held around the country, including Port Macquarie (28th May) and Adelaide (12th June).

The presentation highlighted the many changes in the electric energy area over the past 50 years and emphasised that the change is continuing but at an even faster pace. These changes cover technical, market, and management issues and the customer interface. It is crucial that infrastructure managers update their knowledge, attitude and overall approach to succeed in the new business environment.

Some of the many changes affecting all industry, and society in general, included the demise of the typing pool, the obsolescence of slide rules and log tables, and the digital age which saw the introduction of mobile phones, personal computers and the internet. More specific changes in the electric energy field include indoor switchgear, pole top reclosers, SCADA, digital mapping, asset management and work management systems, sophisticated protection and control systems and ADMS.

The industry has evolved from the development of large power stations in the 1960s and the accompanying east coast transmission grid, through the massive structural changes of the 1990s followed by privatisation, and the current focus on energy/demand management services and the "Smart Grid".

The future challenges include rapid deployment of large- and small-scale renewable generation and other distributed energy resources. These are encouraging greater power system interdependence as well as independence, and will require new methods for managing system security (i.e. frequency, stability etc) and voltages.

In addition, the increasingly dynamic behaviour of the distribution system provides new challenges for effective transmission and distribution network planning as well as its operation.

Jeff described his vision of the future role of network operators in this new world. It will be exciting, challenging and growing!

Following this scene setting and historical overview, the presentation covered in detail a diversity of topics including intelligent networks and markets, power system security, the capability and skills required of engineers in the future, and the importance of rigorous asset management systems with an integrated approach across a whole of business model. The speakers drew on their extensive experience with advice on implementation of successful systems including support from top management, information system requirements and the need for dedicated long term commitment.

An interesting case study, highlighting how things can go wrong even in a very successful and well managed organisation, covered the

Auckland power failure in 1998. This affected most of the city including the CBD and lasted five weeks.

A very enlightening and professional presentation overall and a credit to the experience and skills of Jeff and Mike.

The full slide presentation can be viewed on the EESA website.

[Click Here](#)

WHAT'S ON AT EESA

EECON 2019 – Call for Papers and Save the Dates

The banner for EECON 2019 features a collage of images including wind turbines, a city skyline at sunset, and a smart home interface. The text 'EECON 2019' is prominently displayed in large, bold letters, with 'EE' in blue and 'CON' in red. Below it, the text 'A technical training initiative of the Electric Energy Society of Australia' is written in a smaller, italicized font. To the right, the dates '26-27 NOVEMBER 2019' and the location 'International Convention Centre Sydney' are listed. A blue bar at the bottom of the banner contains the text 'Earlybird pricing \$850pp available until the 17th of September, 2019'. Below the banner, a red bar contains the text 'REGISTER NOW' and the website 'www.eecon2019.com.au'.

The NSW/ACT Chapter of the Electric Energy Society of Australia (EESA) will be hosting the 2-day National Electric Energy Conference – EECON at the International Convention Centre in Sydney on **26th and 27th of November 2019**. The theme of EECON 2019 is **"Engineering leadership providing sustainable, customer-centric electric energy solutions through the interactive grid"**.

The EECON 2019 Conference Organising committee is putting together a really interesting program that will give attendees a good understanding of the “threats and opportunities” they are likely to see in this rapidly changing industry over the coming years.

As someone who has been involved as an engineer working in many different roles in the electric energy area for over 50 years, I have seen many changes – and these changes are continuing at an even faster pace. Some of the changes I have seen in my engineering career:

- The demise of the typing pool
- No need for slide rules to calculate outcomes
- Introduction of mobile phones (early 1980's), personal computers (mid 1980's) and the internet (late 1980's),
- Indoor switchgear, pole top reclosers
- SCADA
- Electronic Protection Relays
- Mapping Systems, Asset Management and Work Management systems collecting data and turning this into information to improve the overall management of network assets.
- Move to an energy market (mid 1990's)
- The development of the “Smart Grid”!



What are the opportunities in the “Grid of the Future?”:

- Digital transformation of energy management and automation is making major advances – We need to keep pace with this innovation for a competitive edge
- The growing Digital transformation will create a significant increase in energy consumption (By 2025 it is estimated that 21% of electric power will be consumed by IT)
- Digital is the new normal – 50 billion devices world-wide by 2020
- These days – the world is in our hands (via a smart phone)
- Change is not about improving what we are already doing – it's about new ideas/products/services that customers need. You need “People and Vision” – to achieve the changes necessary for future success.
- My view is that the key issues for successfully managing an electricity network business of tomorrow are:
 - Good Network Knowledge (the right people and good information systems)
 - Good Asset Management Processes (and the supporting Information Systems providing timely, accurate data)
 - Timely actions by well trained, focused and motivated people under the leadership of competent managers who are creating the right culture
 - Regular reviews/audits/modelling

Thus, engineers need to understand the details as well as the “big picture” overview of the changes that are occurring and the impact of these changes on the transmission and distribution system so that they can successfully make the transition to this much more complicated world.

[Submit an abstract](#) for an opportunity to present your ideas/learnings on key areas in the changing energy landscape amongst a gathering of leaders, policy-makers, buyers, sellers and experts from around the country. Abstracts should consist of a topic, presenter profile and contact details, and 100-word abstract of the proposed presentation. **Submissions close Friday, 28 June 2019.** Authors will be notified of acceptance on or before 24 July 2019.

Potential Sponsors, Exhibitors and Attendees – **save the dates of 26th and 27th of November 2019 in your calendar.** You will hear more about EECON 2019 over the coming months

Jeff Allen - NSW/ACT Chapter Chair – The Electric Energy Society of Australia

UPCOMING EVENTS

WEBINAR | Canberra Innovators and Technology: The Reposit Power Story

Wednesday July 3rd, 2019

WEB/ACT

[VIEW EVENT](#)



Overview:

This presentation examines the shifts in consumer behaviour and advances in generation and storage technology that are behind this wave of disruption. It investigates the implications upon the electricity network using the award winning Reposit Canberra Virtual Power Plant as a case study.

Time:

12:30pm - 2pm (AEST)

Venue:

Canberra Auditorium | Webinar Available
11 National Circuit
Barton Canberra ACT

Cost:

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

Patent System and IP basics for Engineers

Tuesday July 9th, 2019

WA

[VIEW EVENT](#)



Overview:

The presentation will provide a brief introduction to intellectual property (IP) and its implications in a practical context. The presentation will cover a broad spectrum of different IP rights and explain how they are created, what they provide and how they can be used, including monetised. Particular attention will be paid to patent protection and two fictitious case studies will be considered to help illustrate the concepts discussed.

Time:

Registration from 5pm
Presentation from 5:30pm until 7pm

Venue:

Engineers Australia Auditorium
712 Murray Street
West Perth WA 6005

Cost:

EESA members: \$0
Non-members: \$30

Keeping up with EESA events

To see an up-to-date list of EESA events, check under **EVENTS** on the EESA website or [CLICK HERE](#)

Missed an event?

Recordings and papers are available under **RESOURCES** on the EESA website or [CLICK HERE](#)

UPCOMING EVENTS

Impact of high solar PV penetrations on distribution network

Wednesday July 10th, 2019

VIC/ACT

[VIEW EVENT](#)



Overview:

This lecture is part of the IEEE Distinguished Lecturer Program (DLP) by PES Victorian Chapter.

This presentation will highlight some key research outcomes in this area.

Time:

Light refreshments from 5.30pm
Presentation from 6pm until 7pm

Venue:

The University of Melbourne
Theatre 1, Alan Gilbert Building, Grattan St
Parkville VIC 3010

Cost:

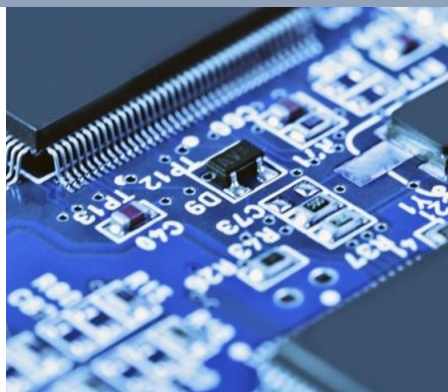
Free

WEBINAR | Embedded Systems Smorgasbord

Wednesday July 10th, 2019

WEB/NSW

[VIEW EVENT](#)



Overview:

This talk will cover the wide array of solutions modern embedded systems can provide and explore the cost and feature advantages of using them over traditional methods.

Time:

6-8pm AEST

Venue:

Engineers Australia Newcastle - WEBINAR
Suite 3, Tonella Commercial Centre, 125
Bull Street (entry via Dickie Street)
Newcastle West NSW

Cost:

EESA/EA members: \$0
Non-members: \$30

WEBINAR | Electrolysis Corrosion Caused by Stray Current

Wednesday, July 24th, 2019 - DATE TBC

WEB

[VIEW EVENT](#)



Overview:

This webinar outlines the characteristics of electrolysis corrosion with an emphasis on stray traction current effects and management strategies.

Time:

11am - 12pm (AEST)

Venue:

Online webinar

Cost:

EESA members: \$0
Non-members: \$30

UPCOMING EVENTS

The Next Generation Technology Project Showcase & Awards

Monday October 28th, 2019

WA

[VIEW EVENT](#)



Overview:

We are calling for entries of project posters related to the electric energy field by students of: Electrical Power Engineering, Electronic Engineering, or Renewable Energy Engineering; from: Murdoch University, Edith Cowan University, University of Western Australia or Curtin University.

Time:

1pm - 4:30pm AWST

Venue:

The University Club
University of Western Australia, Hackett
Entrance #1, Hackett Drive, Crawley
Perth WA

Cost:

Entry is free and refreshments are available.

EECON 2019

November 26th - 27th, 2019

AUS

[VIEW EVENT](#)



Overview:

The Electric Energy Society of Australia (EESA) takes great pleasure in inviting you to EECON 2019 at the International Convention Centre in Sydney on 26th and 27th of November 2019.

The theme of EECON 2019 - our annual national conference - is "Engineering leadership providing sustainable, customer-centric electric energy solutions through the interactive grid".

Time:

8am, 26 Nov - 3:30pm, 27 Nov

Venue:

International Convention Centre Sydney
Level 4, Convention Centre, 14 Darling Drive
Sydney NSW

Cost:

Early-bird fee: \$850
(until 5pm 17 September 2019)
Standard fee: \$1050

Keeping up with EESA events

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THANK YOU



The Electric Energy Society of Australia (EESA) is a non profit Technical Society of Engineers Australia, established to advance interest in the field of Electric Energy. The key objective of EESA is to provide a continuous professional development program to its members.

The successful functioning of EESA is owed to the support of EESA members and especially those who volunteer their time, effort, skills and expertise for the society. We thank our members and volunteers for their contribution.

We thank our corporate members for their support.

Gold Members



Essential Energy

At Essential Energy we look after the poles and wires that deliver electricity to 95 per cent of regional, rural and remote NSW and parts of southern Qld.



Horizon Power

Horizon Power is a State Government-owned, commercially-focused corporation that provides safe and reliable power to about 100,000 residents and 10,000 businesses across Western Australia.



AMSC Australia

AMSC generates the ideas, technologies and solutions that meet the world's demand for smarter, cleaner, better energy.



Western Power

Western Power's vision is to deliver on the changing energy needs of Western Australians, powered by community trust and the passion of our people.

Silver Members



Evoenergy

Evoenergy is owned equally by Icon Water Limited and Jemena Ltd via subsidiary companies. Evoenergy owns and operates the ACT electricity network, and owns the gas networks in the ACT, Queanbeyan, Jerrabomberra, Bungendore and Nowra.



nVent

We are a \$2.1 billion, high-performance electrical company with a dedicated team of 9,000 people and trusted brands. Known for innovation, quality and reliability, our products connect and protect, consistently delivering value to industrial, commercial, residential, energy and infrastructure customers.



APD Engineering

APD Engineering have been providing Specialist Electrical Engineering Design and Consultancy Services to Power Utilities, Local Government Authorities, Land Developers, Mining, Construction and other industries for nearly 20 years.



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Wilson Transformer Company is a leading specialist in the delivery of transformer solutions. In a changing world, organisations are increasingly turning to our specialist skills to meet their technical, safety and environmental challenges.

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