Smart Energy

AN OFFICIAL SMART ENERGY COUNCIL PUBLICATION

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Advances in green hydrogen
Queensland's sunny state
2020 Smart Energy Conference

500 PER CENT RENEWABLES

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Contents

Summer 2019 Volume 39 Issue 156

Front cover:
500 per cent renewables, see page 8

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@SmartEnergyCncl
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SMART ENERGY COUNCIL

SMART ENERGY COUNCIL

CHIEF EXECUTIVE
John Grimes
PO Box 231, Mawson ACT 2607
admin@smartenergy.org.au
1300 768 204

SUBSCRIPTION & MEMBERSHIP
Luke Shavak
Membership Sales Manager
0499 345 013
luke@smartenergy.org.au

ADVERTISING ENQUIRIES
Brett Thompson
Sales Manager
0402 181 250
brett@smartenergy.org.au

SMART ENERGY EDITOR
Nicola Card
editor@smartenergy.org.au
nicola@smartenergy.org.au

CONTRIBUTORS
Blakers, Stock and Baldwin *(The Conversation)*, Penny Parle, Oliver Yates, Anne Watson

COVER DESIGN & IMAGE
Leanne Tattersall

MAGAZINE DESIGN & PRODUCTION
Mitzi Mann

Smart Energy was first published in 1980 as *Solar Progress*. The magazine aims to provide readers with an in-depth review of technologies, policies and progress towards a society which sources energy from the sun rather than fossil fuels.

Except where specifically stated, the opinions and material published in this magazine are not necessarily those of the Smart Energy Council. Although every effort is made to check the authenticity and accuracy of articles, neither the Smart Energy Council nor the editors are responsible for any inaccuracy.

Smart Energy is published quarterly.

Smart Energy Council

Renewable energy dynamics

News and views

The Market in action

Industry innovation and inspiration

Products and services

Newsmakers and events

Welcome

John Grimes, Chief Executive, Smart Energy Council

A NEW BREED of climate leaders has emerged – forward thinking Australian companies.

Big companies are acting for a range of reasons. First, corporate regulators such as ASIC and the ACCC have made it clear that directors face personal liability if they do not consider the implications of climate risk or if they fail to protect shareholders.

Second, consumers are increasingly demanding climate action from their suppliers. Inaction equals customer risk, and that increasingly puts profit at risk.

Third, there is money to be made in switching to low carbon energy. Increasingly the 'cost of action' is actually a net benefit to the bottom line.

These are the themes of the National Smart Energy Summit in Sydney on December 10.

Opened by New South Wales Energy Minister Matt Kean, Summit speakers include former Prime Minister Malcolm Turnbull, AEMO Chief Executive Audrey Zibelman, John Dee of RE100, QBE Group CEO Pat Regan, CBUS CIO Christian Fork, Telstra Energy Executive Director Ben Burge, CEFC CEO Ian Learmonth and many others who will be telling this exciting story.

Major Australian businesses from across all sectors will attend to learn about the benefits of slashing emissions and saving money with smart energy.

A wide range of experts will present case studies and facilitate discussions to demonstrate what is possible today.

If you are interested in how smart energy boosts profits and reduces risk, this is the event for you.

Come along to support companies doing the right thing, and help us tell a positive story that all leading Australian businesses can support.

For more information about the Summit see page 27 or visit www.smartenergy.org.au/summit.

In my view …

Business is taking the lead on renewables

JUST ONE YEAR after its local launch, RE100 is driving demand for renewable energy in Australia.

ANZ, Bank Australia, Commonwealth Bank, Macquarie, NAB and Westpac have all joined RE100. Together they've made a commitment to use 100 per cent renewable electricity. By doing so, Australia's banking sector is demonstrating that renewables are a good business decision.

Led by The Climate Group in partnership with CDP, RE100 is the go-to renewable energy initiative for the world's most influential companies.

Apple, BMW Group, Facebook, Google, IKEA, Lego, Mars, Nike and Unilever are among the 200 plus companies that have signed up. Other Australian companies to come on board include Atlassian and QBE, with many more set to follow.

Companies joining RE100 set a public goal to source 100 per cent of their global electricity consumption from renewable sources by a specified year (most Australian companies have chosen 2025 as their target date). They then disclose their electricity data annually and RE100 reports publicly on their progress.

Jon Dee, RE100 Australia Coordinator, Managing Director of DoSomething Foundation

Dozens of RE100 members have already met – or are close to meeting – their 100 per cent renewables target. The results are showing that a transition to renewables is happening far quicker than many businesses realise.

As many companies have found, implementing energy efficiency, rooftop solar and renewable energy Power Purchase Agreements benefit the business bottom line.

Indeed, the business case for 100 per cent renewable energy has become strong. As Energetics has pointed out, "a well negotiated PPA can potentially provide savings between 15-47 per cent on the energy component of a typical electricity bill expected in 2020."

Simply put, renewable energy is good for business.

As Mike Cannon-Brookes, co-CEO of Atlassian, says of joining RE100, "It's the right thing to do. We want other Australian companies to follow suit. It can save your business money and do a bunch of other positive things at the same time."

For more information about RE100, visit TheRE100.org or email RE100@DoSomething.net.au

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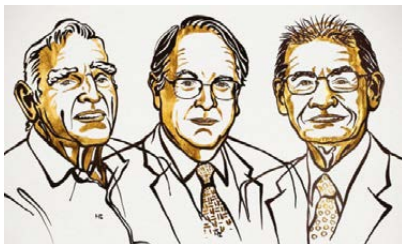
LOCAL and GLOBAL NEWS



NOBLE WORK John B Goodenough, M Stanley Whittingham and Akira Yoshino are the Nobel laureates in chemistry for 2019; awarded for their work on lithium-ion batteries and "sparking a portable technology revolution". Goodenough said he hoped the technology would continue to evolve to make electric cars more feasible and that "We need to find a way to emancipate ourselves from dependence on burning fossil fuels." Aged 97, he is the oldest laureate to receive a Nobel prize in any discipline. Lithium-ion batteries have been described "One of the most influential pieces of materials science that influence the modern life of everyone on the planet" and pivotal in the development of the high-tech world. The Nobel Academy stated lithium-ion batteries have laid the foundation of a wireless, fossil fuel-free society, and are of the greatest benefit to humankind.

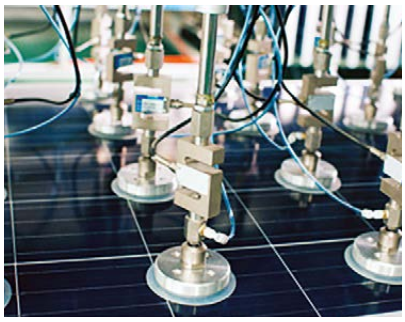
THE INAUGURAL NATIONAL RENEWABLES IN AGRICULTURE CONFERENCE AND EXPO held in Wagga in mid November discussed the role of renewable energy in building drought resilience and cutting emissions. The conference, which had the support of groups including Farmers for Climate Action, aligns with National Farmers Federation's target of 50 per cent on-farm energy to be renewable by 2030.

Sheep farmer Charlie Prell of FCA said hosting wind turbines on his farm also provided a much-needed secondary income stream and helped him through the tough years.

SOLAR CUTTERS has crowned Dunsborough Centrepoint Shopping Centre the Best Large Commercial Solar Installation of 2019. The 440 kW solar carpark structure project, completed by Infinite Energy, is the largest solar installation in the town lying north of the Margaret River. The system has an anticipated annual energy output of 705,624 kWh and will cover almost all the daytime energy needs of the centre and is expected to pay for itself in just seven years.

Aidan Jenkins of Infinite Energy affirmed "Solar power is an excellent option for businesses looking to reduce their daytime electricity overheads."

SHANGHAI-BASED MODULE GIANT JINKO SOLAR has become first solar manufacturer to pledge 100 per cent renewable energy by committing to source 70 per cent of its energy from renewables by 2023 before hitting the 100 per cent target in 2025. Jinko is also the world's first solar manufacturer to be both a member of RE100 and energy productivity pledge EP100.



ZERO EMISSIONS SHIPPING will become commercial reality by the end of the next decade, according to a move by shipping giants, including Maersk and Shell, to 'Getting to Zero Coalition'. The move towards decarbonisation of shipping which produces 2-3 per cent of annual global emissions involves a shift in propulsion technologies powered by clean fuels including biomass and hydrogen produced from renewable electricity, supported by adequate ports, finance and policy incentives. In the absence of such a transition, emissions in the shipping sector will soar by around 250 per cent by 2050.

11,000+ SCIENTISTS HAVE DECLARED THE GRIP OF THE GLOBAL CLIMATE EMERGENCY is accelerating faster than previously expected and will lead to untold suffering. They have urged the replacement of fossil fuels with clean renewables and leaving remaining stocks of fossil fuels in the ground.

Also to eliminate subsidies to fossil fuel companies; and impose carbon fees that are high enough to restrain the use of fossil fuels.

NATIONAL SMART ENERGY SUMMIT, SYDNEY DECEMBER 10 Come and hear what Audrey Zibelman, Jon Dee, Malcolm Turnbull, Clover Moore, Telstra and others have to say.

www.smartenergy.org.au/summit

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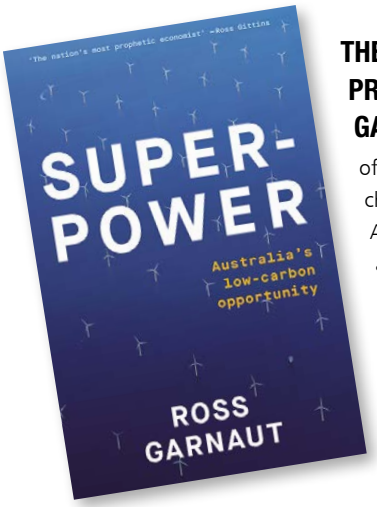

THE NATION'S 'MOST PROPHETIC ECONOMIST' ROSS GARNAUT has declared 'The fog of Australian politics on climate change has obscured a fateful reality: Australia has the potential to be an economic superpower of the future post-carbon world.' His new book *Superpower: Australia's Low Carbon Economy* presents a road map for Australia, covering energy, transport, agriculture, the international scene and more.

An energy policy thought leader, Garnaut argues Australia could be the natural home for an increasing proportion of global renewable energy industry, saying "Climate change will not be stopped by ending development. The challenge is to change the relationship between economic growth and emissions of the greenhouse gases that cause climate change."

IN A SIMILAR VEIN, CLIMATE THINK-TANK BEYOND ZERO EMISSIONS states ambitious policy for zero-carbon industry could make Australia the first country in the world to produce coal-free steel. "We already have technology that lets us make steel using hydrogen instead of metallurgical coal, and [other] countries are developing pilot plants to make fossil-free steel at scale," chief executive Vanessa Petrie said. "But Australia has more iron ore than anywhere else in the world, and more than enough wind and sunshine to power our steelmaking and other industries. With the right investments, we could become a top exporter of zero-carbon steel and renewable hydrogen, while re-employing coal workers in these sunrise industries."

DELTA ELECTRONICS, NISSAN AND CSIRO are trialling solar smart technology electric vehicle chargers that are compatible with all electric vehicles currently on the market to help boost the next generation electric vehicle charging systems, which also include battery storage, in real-world applications.

The trials will test both fast and slow charging scenarios relevant to a range of electricity grid and environmental conditions.

A GROUP IN WALES, UK, is calling for all new housing estates to be built with electric car charging points and warns a lack of public chargers would see the network struggle with a surge in electric car sales. (Currently there are 547 public charging points in Wales, of which 60 are rapid chargers, while England boasts 12,763, with 2,022 rapid points.)

THE UK HAS COMMITTED TO END COAL USE by 2050 and achieve zero net carbon emissions.

AUSTRALIA? THUMBS DOWN to federal energy and emission reductions minister Angus Taylor who believes that the 20 per cent or so wind and solar energy in the network is too much. In December the first meeting in nine months of the 'policy leadership' Council of Australian Governments' (COAG) Energy Council takes place. However objectives fail to refer to emissions cuts or environmental outcomes.

THE OVERSEAS DEVELOPMENT INSTITUTE reports investment in fossil fuel exploration, extraction and electricity production in Australia is supported by an average of $5 billion in national subsidies annually.

UP TO 62 PER CENT OF AUSTRALIANS support a levy on fossil fuel exports to help fund local adaptation to climate change and 64 per cent of Australians think there should be a national target for net zero emissions by 2050. In other findings in the annual *Climate of the Nation* report produced by The Australia Institute, 81 per cent of Australians are concerned that climate change will result in more droughts and flooding and 78 per cent are concerned climate change will lead to water shortages in cities.

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Powering up Australia *and its neighbours*

MORE THAN A DECADE AGO renewable energy visionaries Mark Diesendorf and Andrew Blakers had the audacity to suggest Australia could aspire to 100 per cent renewable energy and beyond. To create a super grid capable of generating massive amounts of energy from its abundant solar, wind and other renewable resources, and export the excess via a physical high voltage connection to Asia. The concept was far reaching, mind-boggling.

About the same time, Greenpeace released its report *Energy [r] evolution: A Sustainable Energy Australia Outlook*, tracking how Australia could produce 40 per cent of its energy through renewable energy by 2020. At the time this represented a quantum leap from the two per cent of the day.

During 2010, Beyond Zero Emissions launched its popular *Stationary Energy Plan* that demonstrated how Australia could transition to 100 per cent renewable energy within a decade. The report proposed Australia build 12 massive 3500 MW solar power plants to generate 60 per cent of electricity, with the balance generated primarily from thousands of 7.5 MW wind turbines.

It was big picture thinking. At that stage renewable energy in Australia was in its infancy. Although utility-scale wind farms were taking off, among them the 104 MW Emu Downs Wind Farm in WA and 140 MW Capital Wind Farm in NSW, the largest solar plant back in 2010 was the 1.283 MW system at Adelaide Airport Terminal.

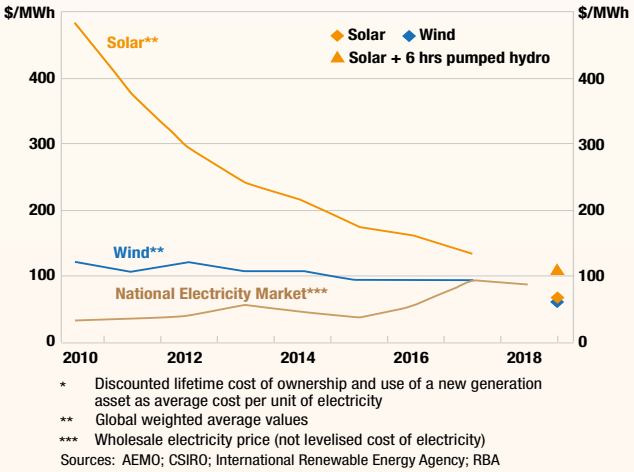
In 2011-2012, renewable sources provided just one-tenth of Australia's electricity generation in 2011–12, half of that from hydro power, and a quarter from wind power. However, growth in the sector found new support with the $1.5 billion Solar Flagships Program that ran from 2009 to 2015. The program aimed to catalyse the construction and demonstration of eight large-scale 250 MW grid-connected solar power stations in Australia – four solar PV and four solar thermal.

"That was the first stick in the ground basically for large scale solar – the first landmark – accompanied by a similar amount of money spent on the carbon capture and storage that was not money well spent," Smart Energy Council President Steve Blume said.

Although the Solar Flagships Program was introduced by the Federal Government, it encouraged both state and local government involvement and sparked their interest in what other initiatives they could undertake and the flow-on benefits.

Australia's first utility-scale PV project, the 10 MW Greenough River Solar Farm then took shape near Geraldton in Western Australia in 2012.

Levelised Cost of Electricity*



* Discounted lifetime cost of ownership and use of a new generation asset as average cost per unit of electricity
** Global weighted average values
*** Wholesale electricity price (not levelised cost of electricity)
Sources: AEMO; CSIRO; International Renewable Energy Agency; RBA

At 10 MW this was big, ten times larger than its nearest rival, the developers declared, adding with prescience "this highlights the immense potential of utility-scale solar to assist Australia in transitioning to a renewable energy future."

Hockey stick trajectory

Commissioned in 2014, the 20 MW Royalla plant in the ACT was the next leap forward for utility-scale solar. Twice the size of Greenough.

In the intervening years, ARENA combined forces with the Clean Energy Finance Corporation and kicked off a $100 million large scale solar PV funding program with the main objective of driving down the cost of solar PV and improving the economics with scale. This initiative resulted in $1 billion worth of new energy infrastructure being built and was unprecedented in ensuring the industry shared knowledge, and that regulatory hurdles were overcome.

Steep decline in the cost of solar energy: Over the years the cost of building new large-scale solar energy generation in Australia has fallen dramatically. When ARENA launched its first auction in 2015 the cost of utility-scale solar was around $135/MWh, now it sits at around the $50/MWh mark, or $1/W.

Today the capacity of renewable energy in Australia comes in at more than 50 GWh, comprising more than 23 per cent of Australia's energy supplies. *(We track the rise and rise of renewable energy in the following story.)*

"Let's build our economy, our jobs and value add to our minerals and our renewable power here. It is both sensible due to the efficiencies gained and environmentally sound.

Impressive it sounds, but is this just the start of the next wave, the next phase of development which could see a quantum leap with the proposed 15 GW Asian Renewable Energy Hub in the Pilbara and the Sun Cable project for the Northern Territory, both contributing to the export of energy to Asia.

These are projects of a scale that Oliver Yates can identify with. The man who helped drive extraordinary investment in the renewables sector while at the helm of the CEFC is on a mission to fire up ambition across the nation and set us on a path to generating 500 per cent renewable energy.

This is neither unattainable nor fanciful, he says. Rather, what are we waiting for?

Here he maps out how Australia can develop into an energy exporting superpower.

WA's first co-located wind and solar farm at Emu Downs. Image ARENA

Australia industrialised and exporting >500 per cent renewables

***Oliver Yates** questions why we are talking about 100 per cent renewables when Australia has the opportunity to be an Industrialised Clean Super Power generating more than 500 per cent. What's holding us back?*

Australia stands in front of a nation-changing opportunity. We have the chance to build a strong industrialised exporting country harnessing the global competitive advantage we have resulting from the low cost of renewable power from the natural resources of wind and solar that we are blessed with. Australia can be 'Industrialised and Exporting'.

Why isn't it already doing so?

For years now, our power system has suffered from what many regard as visionless planning at a Federal level aided by visionless authorities unprepared to establish an energy system deigned for the change the science of climate change requires. It is time this all changed.

The proposed Coordination of generation and transmission investment (COGATI) review completed in December 2018 and subsequent proposed rules seem to 'ration' transmission again and are yet another example of the regulator failing to understand that additional transmission investment is vital.

For years now hiding in RIT-T tests with flawed discount rates and assumptions these authorities have sought to restrict investment in major interconnecting transmission infrastructure limiting competition across Australia. The proposed COGATI rule seem to focus again on limiting new generation in the best renewable areas and rewarding existing generators who can't compete with the arrival of renewables for sitting idle. Let's not forget the SENE rules that the AEMC proposed and then inexplicably dumped that would have allowed renewable generators to link together and underwrite additional transmission investment.

Given the lack of federal leadership in the energy industry now and on the horizon, it is time States locked on to the opportunity to take the lead and set out to establish industrial zones powered with long term Power Purchase Agreements from renewable energy generators.

We need to expand transmission rapidly, not ration it, as Australia will need to move power across the nation at an unprecedented scale.

Ramping up renewables

Any idea that Australia will be just 100 per cent renewable is now laughable. Currently I am spending considerable time working in the

> ***States need to take the next step in the PPA revolution and sign up power contracts for strategic industrial zones, so they can attract global industrial partners with long term clean power price certainty.***

green ammonia space. We are looking at replacing Australia's imported ammonia with domestically produced ammonia using renewable energy. Just replacing our imports will require the construction of 2.3 GW of additional renewable projects.

If we replaced current domestically produced ammonia, which is a major emissions contributor typically produced using natural gas, we will need 12 GW extra capacity. All that additional generation must be built before we start to consider exports and given as a nation we only achieve about 30 per cent renewables the idea that rationing transmission makes sense is nonsensical.

Gazumped!

Lots of excitement exists at the moment about exporting power in the form of hydrogen. I am delighted that my 500 per cent renewable target was recently gazumped by the Chief Scientist Alan Finkel and the head of ARENA Darren Miller who have started to talk about 800 per cent or more renewable energy.

We certainly need to aspire to greater heights.

Japan, a nation with limited space and resources and which relies heavily on imported energy is gearing up to import renewable energy. Much of this discussion has been on hydrogen however that is switching rapidly. The Japan Green Ammonia consortium is up and running and the path is looking clear. Ammonia carries more hydrogen per cubic metre on a ship than liquified hydrogen. Ammonia has been transported around the world for years with established safety standards. But there are no such standards for hydrogen as yet.

Ammonia can be co-fired into existing coal fired power stations at a 20 per cent ratio immediately dropping the CO_2 emissions created from the world's existing coal fleet; ammonia operates as well in fuel cells as hydrogen; and the global shipping fleet can move to ammonia readily with commercial shipping engines available shortly.

Hopefully Japan's Government will soon issue an open contract for the supply of ammonia at a set price and that will enable the private sector to accelerate supply.

But before we get to exports of renewable energy let's recognise that it will be more economical, environmentally sound and sensible to bring heavy power using industrial processes to Australia from offshore. Yes Australia could 'onshore' these businesses! It is inefficient to move the power. It is better to move the products of the power and onshore the processing.

To attract billions of dollars of investment and jobs to our country, State Governments should establish PPA fixed power price zones right now and get on the road to attract/'onshore' new facilities that could benefit from a 20-year fixed power price of A$50-55 MWh that is globally highly competitive. State Governments successfully mobilised investment in generation, now they must mobilise investment in new facilities to use this power.

Sun Cable project in the Northern Territory (Image courtesy of Sun Cable)

Regional hubs

South Australia should lead with Whyalla, the future home of Green Steel or with Cape Hardy a new deep-water port. Both Industrial Zones should be permitted to develop their own transmission lines to collect the over 20 GW of unused world class renewable resources on the Eyre. By developing their own lines, it will significantly reduce transmission costs.

Both Townsville and Gladstone are ideal sites for **Queensland** to launch with. Townsville, a city that three years ago cried poor for power, today has so much energy it is now in a renewable energy development freeze. Without significant new transmission investment or load though this Industrial Zone future development will be constrained. Gladstone is

currently Queensland's bright light with all the ingredients co-located in an existing Industrial Zone.

Western Australia is home to the Maitland Industrial Estate near Port Headland. Maitland benefits from the massive renewable energy resource located at the Asian Renewable Energy Hub. It is a region of well-matched, complementary wind and solar resources, in common with North Queensland

New South Wales would lead with Newcastle, and **Victoria** with Geelong, the landing point for the unnecessarily delayed Second Bass Strait Interconnector and the hub for the western region wind zones. Even the Northern Territory with the Sun Cable project could establish Darwin as the site for the construction and operation of new chemical facilities.

Today new industrial facilities can be built to manage the variability of renewable energy. Most will have demand management feature, storage and product buffering/batching to allow them to manage variable renewable energy supply.

Leap of faith

Australia can be 'Industrialised and Exporting' with the support of both environmental groups and industry but we need to act and grasp the opportunity. I am excited about the discussion of exporting our renewable energy, but we must remember that exporting power that would subsequently be used overseas is vastly less efficient than using it in Australia. Therefore, it makes both economic and environmental sense that Australia establishes large-scale industrial hubs here.

Let's build our economy, our jobs and value add to our minerals and our renewable power here. It is both sensible due to the efficiencies gained and environmentally sound.

Oliver Yates was executive director with Macquarie Capital before being appointed inaugural chief executive of the Clean Energy Finance Corporation. He is Director of Bronze Boar Investments.

Building a better energy system

Smart Energy President Steve Blume says there are many issues at stake with the level of renewable energy Australia may achieve and the subsequent export of energy.

"One is the current situation with electricity generation and the transition from coal, and the massive impact on demand by building solar and wind plants. Add a transmission line linking the west with the east and you reap the benefit of the time difference.

"Weather patterns are different and complementary so there are many advantages. It's a no brainier for me," Blume said

"This helps address the current electricity system and what we can do to improve the input of solar and wind resources by multiplying the amount of solar around.

"If you over generate electricity that is valuable, as you then have a massive solar resource to manufacture hydrogen cheaply through electrolysis plants."

A low cost of energy input to electrolysis makes green hydrogen more viable, he said.

"If the costs go below 2c/kWh then it really starts to stack up.

"What we have got is the capacity in Australia to manufacture low cost hydrogen and it can be used in all sorts of manufacturing … it is all about cost."

He explained that given the high cost of compressing hydrogen the best thing to do is to use it to create ammonia as it is easily transportable and is the precursor for many other chemicals and downstream products.

"For example transmission lines are effectively highways … in simple terms AEMC wants to establish a congestion price, whereas a highway should have open access.

"The issues we are facing are shortages and reliability and the irony is it is the ageing fossil fuel plants that are impeding reliability."

Both Western Australia and Queensland have massive amounts of generation capacity, there is no real shortage of supply, we just need the transmission lines in the right place, he said

"The trouble is under current programs you are talking about a ten year build cycle on top of the years of planning," he said, also referencing the need for a doubling in size of Tasmania's interconnector to 1.5 GW to enable the state to export more energy including wind from the new 2 GW wind farm being built.

"Otherwise there will be nowhere to send the electricity!"

Back to the prospect of exporting power.

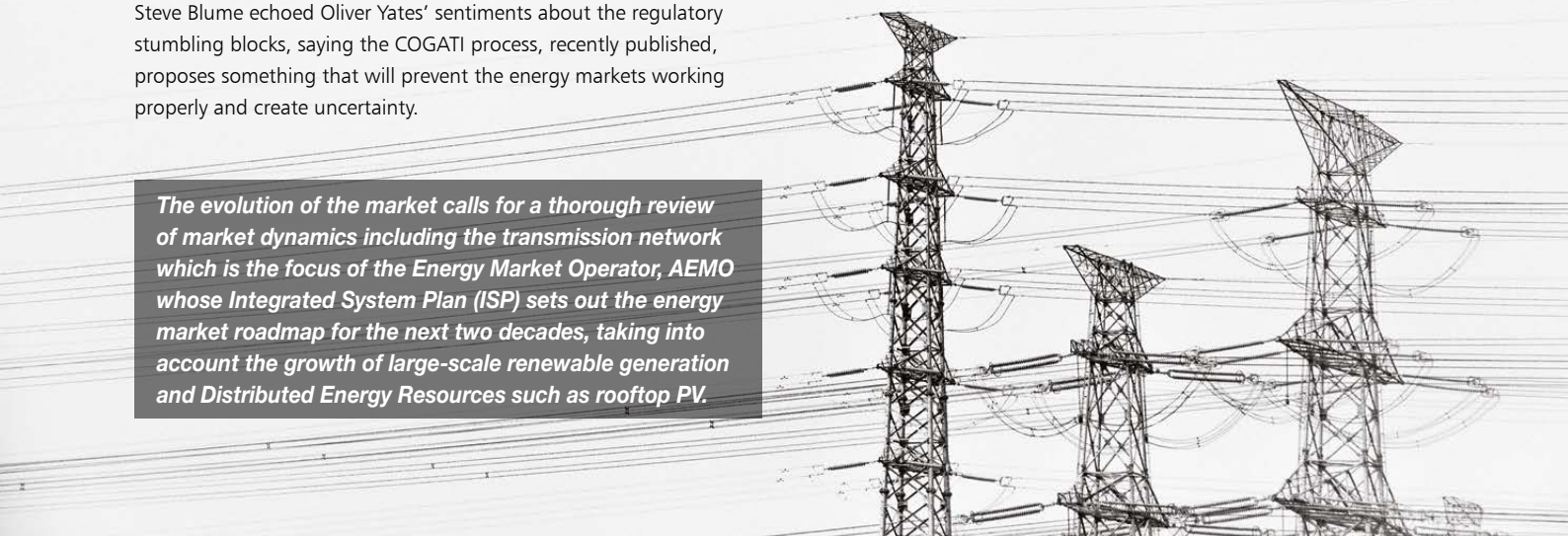
"Generating 500 per cent or more renewable energy might sound crazy to investors but it is all based around selling kilowatt hours. We are significantly increasing the volume of clean energy that is generated yet there is no plan that enables us to create and commission enough firm renewable energy to replace every coal fired power plant before it closes, and that is what we need to do.

"Someone has to intervene to progress all this, it's not just a finance and market issue but a policy issue and the Coalition government is ignoring it."

Rear vision thinking

Steve Blume echoed Oliver Yates' sentiments about the regulatory stumbling blocks, saying the COGATI process, recently published, proposes something that will prevent the energy markets working properly and create uncertainty.

The evolution of the market calls for a thorough review of market dynamics including the transmission network which is the focus of the Energy Market Operator, AEMO whose Integrated System Plan (ISP) sets out the energy market roadmap for the next two decades, taking into account the growth of large-scale renewable generation and Distributed Energy Resources such as rooftop PV.



The path to exporting renewable energy

Scientifically thinking

Chief Scientist Alan Finkel has frequently aired his views on Australia's renewable energy generation and export potential, saying if we were to make as much energy in hydrogen for export as for LNG we would need to be producing eight times the electricity we produce each year in Australia.

It is one bold plan but not too far fetched, he says. "It takes 900 gigawatts of solar farms… 18,000 square kilometres, which you can look at and say, my god that's a monstrous area, but actually, that's only three-quarters of the size of our largest cattle farm. So we can do it. It's big, it's tough, but it's doable." he says.

"It's a big requirement – but we're used to thinking on that scale; and phased over thirty years, it's absolutely conceivable.

"Australia knows how to build an energy industry at a large scale. It takes time, but it doesn't mean you don't get started. The longer it takes the quicker you should start something."

Addressing a conference in Washington, Dr Finkel enthused "If you're excited by scale, Australia is excited by scale – because if any country is blessed with buckets of sunshine and years of producer experience, it's Australia."

And later on, discussing "cracking the tough nut of moving hydrogen around the world" he said "Yes, we can build pipelines, but we can't easily build a 6000 kilometre pipeline under the ocean from Darwin, Australia to Tokyo, Japan. We need ships.

"Now I'd be delighted if a big investor would wake up tomorrow morning and decide to drop US$10 billion on a hydrogen port and liquefaction facility in Australia. And maybe throw in another US$50 billion for 200 liquid hydrogen tankers to improve on the current global total of zero… not going to happen.

"But what we can do today is make and ship ammonia. So we can start there, where regulators and investors have experience; and gradually open up the pathways for global trade."

ARENA's Darren Miller agrees Australia has a "fantastic opportunity" to develop an export market in renewable hydrogen that would match the current LNG market. "If we try to make of hydrogen the same kind of opportunity as we have now for LNG, we probably need 700 GW of wind and solar to produce that amount of hydrogen," Miller says.

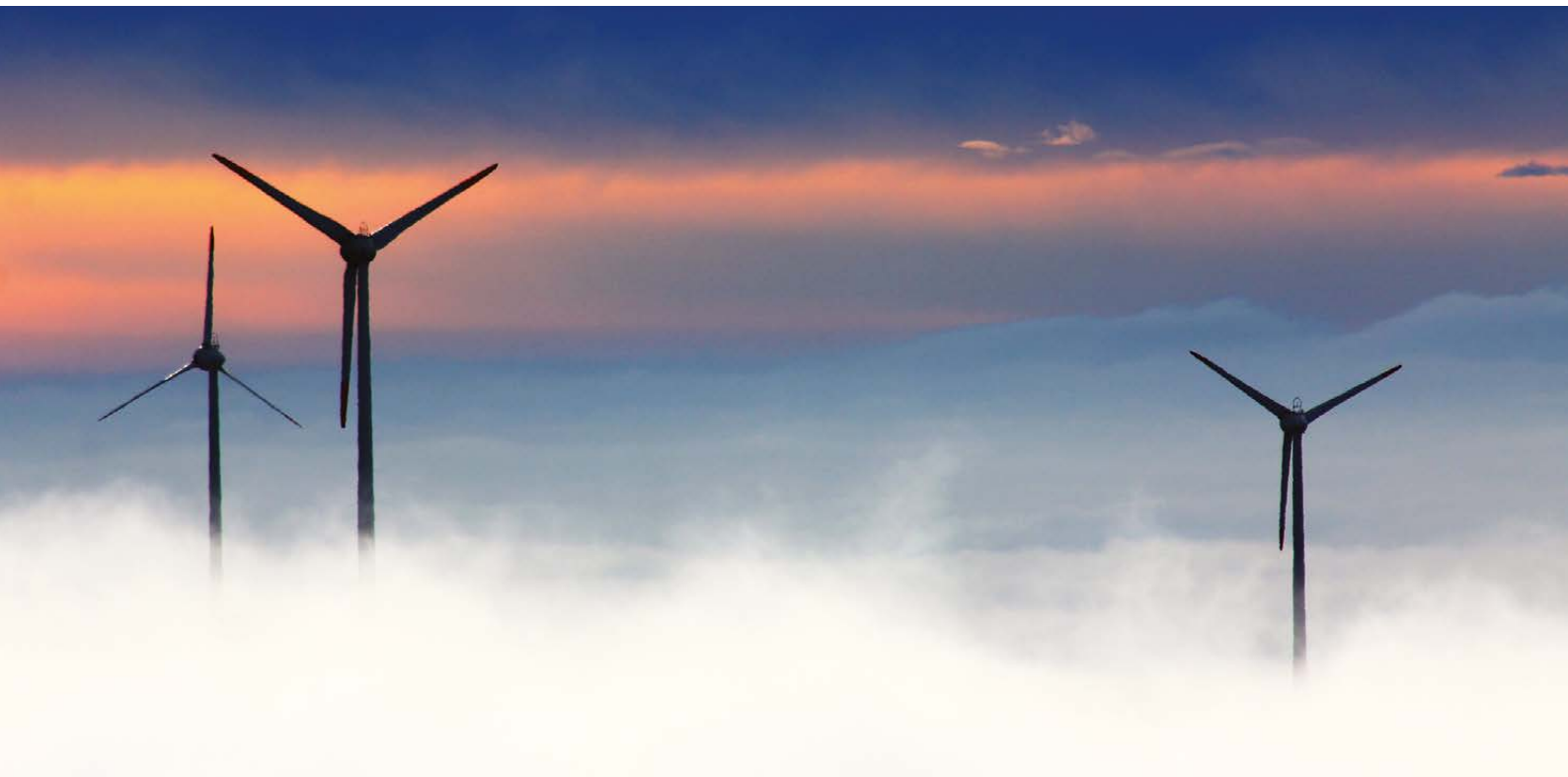
Dyno Nobel will assess the feasibility of creating the world's largest renewable ammonia plant at their Moranbah facility in the heart of the coal-rich Bowen Basin. Photo: ARENA

"This idea of not having enough renewable energy will just be a weird concept that we had in the 2010s … 200 per cent renewables is too small. It could be six to seven times what we have in the National Energy Market."

ClimateWorks Australia chief executive Anna Skarbek has joined the chorus, saying Australia can aim for 700 per cent renewable energy production.

"There is a tremendous opportunity for us to be a supplier of zero emissions energy to the world. It is a 700 GW volume of solar and wind to produce hydrogen," Skarbek says. "A 700 per cent increase on the current large scale renewable energy supply…

"That's exponential thinking."



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2020: the rise before the fall and into the void

Next year marks the end of the Renewable Energy Target… what does the future hold for large-scale renewable energy in Australia after its meteoric rise of recent years?

The rise and rise of renewable energy

AIDED BY THE RENEWABLE ENERGY TARGET that incentivises renewable energy development, the growth in the sector has been rapid and extensive in recent years.

Back in 2012 renewable electricity contributed just 10 per cent of Australia's energy mix. Of that, large-scale solar contributed just 0.147 per cent, in stark contrast to hydroelectricity which represented 57.8 per cent, wind 26 per cent, bioenergy 8.1 per cent, solar PV 8 per cent, geothermal 0.002 per cent and marine 0.001 per cent.

But the tide was already turning, with the development of some groundbreaking projects heralding the way forward. Early 2015 marked a quantum leap for solar energy with the development of the 102 MW Nyngan Solar Plant followed a few months later by its sister plant, the 53 MW the Broken Hill Solar Plant.

By 2017 renewable contributed 17 per cent of Australia's electricity generation, and by 2018 on the back of 2.3 GW of new renewable energy grid capacity, input had soared to about 21.3 per cent (>48 GWh) of all electricity generated, led by hydro generation which accounted for 7.5 per cent of Australia's energy, followed by wind at 7.1 per cent.

In all, 28 large-scale solar projects were completed last year and by the end of 2018, 59 more large-scale solar projects were committed or under construction. Wind farm capacity was boosted by more than 850 MW and by year's end 24 wind farms with a collective capacity of 5.69 GW were under construction or financially committed.

Together this represented more than $8 billion in investments. During the year, rooftop PV added a record breaking 1.55 GW in new capacity.

A break-up of renewable energy contributions in 2018 reveals large-scale solar at 4 per cent, eclipsed by solar PV at 20 per cent, hydroelectricity 35 per cent, wind 33 per cent, and bioenergy 7 per cent. Solar accounted for a phenomenal 5.2 per cent (or 11.7 TWh) of Australia's total electrical energy production of 227.8 TWh in 2018.

2019: a year of exponential growth

This year has seen record development across Australia. In all, 59 large utility solar PV projects with a combined capacity of 2,881 MW were either under construction, constructed or due to start construction having reached financial closure. Wind projects continue to scale up.

Among the largest projects are Queensland's 452 MW Coopers Gap Wind Farm, 130 MW Haughton Solar Farm and 126 MW Lilyvale Solar Farm, and in NSW the 175 MW Finley Solar Farm and 110 MW Beryl Solar Farm.

Victoria has seen the rise of the 144 MW Yendon Wind Farm and 128 MW Numurkah Solar plant as well as the first stage of the Murra Warra Wind Farm, with an installed capacity of 225 MW.

South Australia is now home to the 212 MW LGWF-Wind farm and 127 MW Tailem Bend Solar plant, and over in the west is the 154 MW Badgingarra Wind & Solar Facility.

As of March 2019, Australia's more than two million solar PV installations had a combined capacity greater than 12 MW, of which one third (4 MW) was installed in the preceding 12 months.

This, combined with the output from utility scale wind and solar plants and the Snowy Hydro Scheme have helped Australia meet ahead of time the 2020 renewable energy target of 33 terrawatt-hours, bringing the total share of renewable energy to about 23.5 per cent.

End of the RET, Game over?

What happens when there are no incentives to drive or support further development of renewable energy, or any policies to drive down Australia's carbon emissions?

AS JOHN GRIMES SAYS, the Federal Government has made it clear there will be no policy mechanisms to protect or facilitate renewable energy beyond when the large-scale RET ends in 2020 and basically we have now reached that point.

"So now the market that will emerge is driven on one of pure economics," he said.

"There are a range of considerations; economics and engineering mean wind and solar renewable energy is the cheapest form of delivering dispatchable energy now and in the future, and the further we go the more compelling that case becomes.

"Large-scale renewables have also made electricity generation cleaner and created thousands of jobs. However, what we have developed in Australia is an energy system that protects the incumbents with millions of dollars in subsidies to the coal mining industry, and I don't foresee any dramatic changes in that direction."

Substantial government interventions are needed in the market as it transitions from one form of energy to another, said John Grimes who presents an analogy of moving from combustion engine cars to electric vehicles while driving.

"This is something you cannot do in a piecemeal way as difficulties will arise, instead you need to build new infrastructure along with the existing infrastructure and build ahead of the change so when the time comes you can switch over and there is no disruption, instead, propulsion continues."

The development of the infrastructure requires a vision on where we want to get to, the cleanest most affordable, most secure and reliable energy system we can envisage, he said.

"The problem is that will require vision, leadership and a plan.

"And the problem in the absence of that is the transition that will occur will be more expensive and disruptive than it needs to be."

The Federal Government is not open to a genuine plan to transition the energy sector, John Grimes said, reiterating the Coalition's intent to protect the fossil fuel incumbents. "Then this is going to be a bumpy ride. And the losers will be the Australian economy and Australian electricity consumers."

But will the renewable energy sector continue to grow? Absolutely.

"Will there be a short-term drop? Yes, we will go from high numbers of activity to a drop. But if you take a longer-term view of this over three to five years, you will see this as a dip and a disruption."

The economics will propel the transition forward in any event, he says, calling for transmission infrastructure and storage technologies to facilitate renewables growth, shore up distributed energy delivery and reliability.

States and territories lead the charge

Several states have developed renewable energy support schemes and all states in the east coast's National Electricity Market have committed to net zero emissions by 2050.

John Grimes applauds the action by states such as Victoria and Queensland that have pledged investment and resources in transmission infrastructure. University of Melbourne researcher Dylan McConnell agrees and says that the states are attempting to fill the federal policy gap.

However, the reduction in investment is a worrying trend for the renewable energy industry, and for climate action more broadly and we can expect a drop-off in new additions in capacity in line with the decline in investment, he says.

Competing with coal

"Renewable energy may now be the lowest-cost source of new electricity supply. But it is competing against assets such as coal-fired power stations with sunk costs, meaning that new renewables projects are essentially competing only with a coal plant's fuel costs. Without a price on carbon or similar policy, coal assets are allowed to pollute the atmosphere for free," McConnell says.

"Unless emissions-intensive generation closes or renewable energy support is reintroduced, renewable energy expansion in Australia is unlikely to proceed at the pace required to meet the Paris targets. Keeping the global average temperature rise well below 2°C requires 'rapid and profound near-term decarbonisation of energy supply' and strong upscaling of renewables."

Climate Council Senior Researcher Tim Baxter says it seems likely that the renewable electricity industry is now sustainable in Australia without support, but there are serious questions over whether these record levels of growth will continue, and that "The most important question is what happens post-2020 given the Federal Government won't extend the target or develop credible climate and energy policy to provide greater certainty for any investment in the renewables sector.

RET's turbulent times

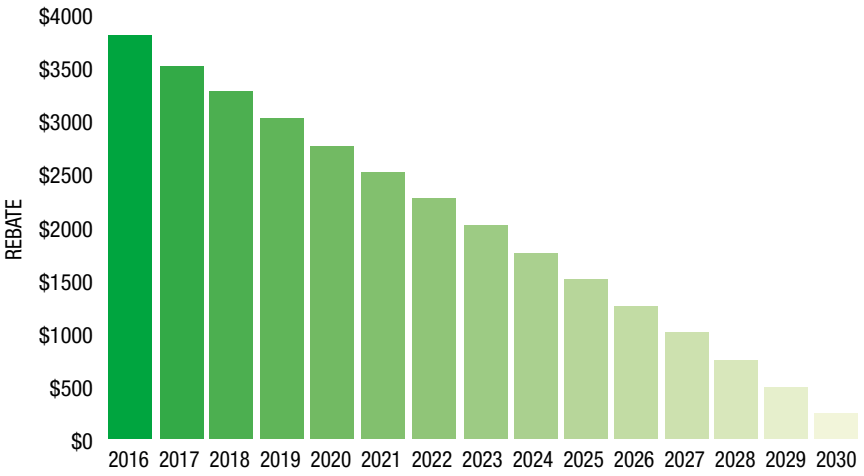
IN 2001 then Coalition Prime Minister John Howard introduced the Renewable Energy Target (RET) in a bid to reduce emissions of greenhouse gases in the electricity sector and encourage the generation of electricity from renewable sources.

The financial incentive for new or expanded renewable energy power stations, such as wind and solar plants, comes in the form of large-scale generation certificates that can be sold and traded to offset the cost of the investment and make projects more financially viable.

In 2010, under the Labor government, the mandatory renewable energy target was increased to 41,000 gigawatt-hours of renewable generation from power stations by 2020.

It's been a turbulent time since with successive Coalition governments threatening to scrap the target leading to a series of reviews and hard fought campaigns by industry to preserve the target, while facing uncertainty in the sector.

Small scale solar rebate phase out



The target in 2015 was slashed 20 per cent, from 41,000 GWh to 33,000 GWh by the then Abbott government which had also scrapped the carbon tax, and threatened closure of the CEFC and ARENA, demonstrating scorn for renewable energy while strengthening support for the fossil fuel industry.

Current energy and emission reductions minister Angus Taylor has advised the Coalition's lack of intent to extend the target. The target comes in two parts: Large-Scale Target and Small-Scale Renewable Energy Scheme to support rooftop solar power and solar hot water.

Small-scale rebate scheme

Small-scale Technology (STC) certificates were introduced in 2011 as part of the Renewable Energy Target and have helped more than two million households install rooftop PV.

The rebate began phasing out from January 2017, and ends on December 31, 2030.

Dramatic price drops in rooftop PV have seen a halving in the cost of a 5 kW system over the past decade and it already makes good economic sense for many households, especially in states such as Victoria and Queensland which provide further rebates to encourage uptake, with paybacks of three to seven years.

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Installer Professional Development

IN 2020 THE ORGANISING PARTNER for the Professional Development stream is Solar Cutters. The Solar Cutters community believes in quality, integrity and unity and is passionate about educating the customer and influencing change within the solar industry. Attendees can look forward to a first-rate program on the latest issues in system install and design.

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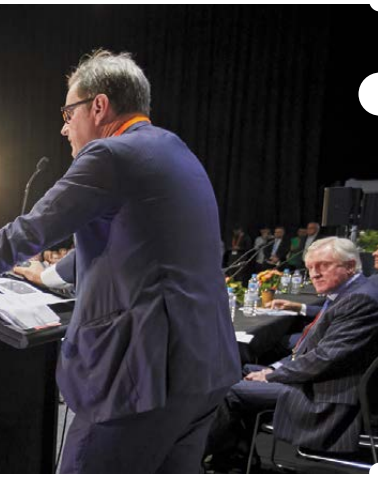

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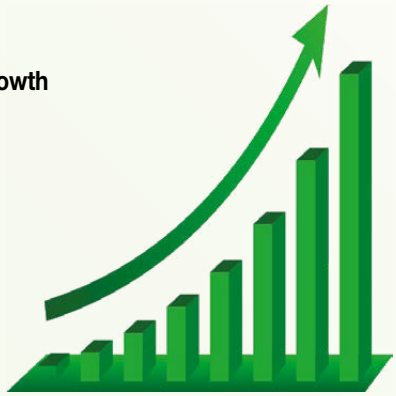
Fast mover

- **10 X** rate of Australian renewables growth per capita compared to world average
- Australian installations 2018 – 2020 **>16 GW OF WIND AND SOLAR**
- **220 WATTS** per person p/a average

Source: ANU's Matthew Stocks. Andrew Blakers and Ken Baldwin



High value green tech companies

- **2013** $8.5 billion combined worth (93 ASX-listed companies in renewable energy and storage)
- **2019** $50.9 billion combined worth
- **3 X** gains compared to broader ASX 200 over five years

Source: Deloitte CleanTech Index

CEFC Investments 2019 financial year

CLEAN ENERGY FINANCE CORP

- **$1.5 BILLION** committed to new clean energy investments
- **30** transactions with total value **$6.3 BILLION**
- **$320 MILLION** in 12 months repayments to CEFC finance
- **$400 MILLION** in finance for **5800** smaller-scale projects

ACT top achiever

- **100%** renewable electricity (first jurisdiction outside of Europe)
- **ZERO NET EMISSIONS** by 2045 (world's most ambitious target)

Powerful vision of the proposed Asian Renewable Energy Hub

- **15 GW** of wind and solar generation
- **50 TWh** of renewable energy p/a
- **1743** wind turbines, 4000 MW
- **2000 MW** solar PV panels
- **12 GW** generation for green hydrogen production
- **4** power-carrying cables to the coast and offshore markets
- **<$US67 PER MWh** power supply to Indonesia
- **<$US90 PER MWh** to Singapore

500%

- Australia could be **500% RENEWABLES** with significant exports

(See full-length feature on page 8)

Oliver Yates, Director of Bronze Boar Investments

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... and across the world

Fossil fuel subsidies

- **$US5 TRILLION P/A** benefits to coal, oil and gas industries
- **$US10 MILLION** a minute

Source: International Monetary Fund

Global mobilisation

- **87 MAJOR COMPANIES** sign UN global compact 'business ambition for 1.5 degrees'
- **$US2.3 TRILLION** ($AUS3.4 trillion) combined market capitalisation
- **73 COAL-FIRED POWER PLANTS** annual direct emissions equivalent

Source: Atlassian and mainstream media

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- Airports

Noted press of problems with other solar companies:

"More than 700 Solar Installation Companies have gone bankrupt or stopped trading in the past 8 years"
The Daily Telegraph, 15 Sept 2019

"Thousands of Aussies unable to get help with Orphan Systems"
The Daily Telegraph, 15 Sept 2019

"A quarter of Residential Installations are faulty"
Clean Energy Regulator, 2019

Our brands

Panels: Trinasolar, solaredge, LG

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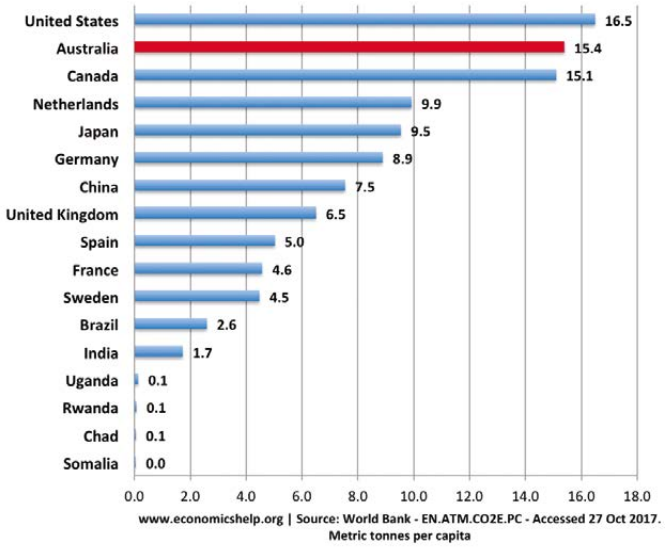
The trouble with emissions

A look at the scale and impact of greenhouse gas emissions in Australia with international comparisons.

CO_2 emissions per capita



Highest total CO_2 emissions by country (kT)

1	China	10,291,926
2	United States	5,254,279
3	India	2,238,377
4	Russia	1,705,345
5	Japan	1,214,048
6	Germany	719,883
7	Iran	649,480
8	Saudi Arabia	601,046
9	Korea, Rep.	587,156
10	Canada	537,193
11	Brazil	529,808
12	South Africa	489,771
13	Mexico	480,270
14	Indonesia	464,176
15	United Kingdom	419,820
16	Australia	361,261
17	Turkey	345,981
18	Italy	320,411

Variations in CO_2 emissions per capita include:

- **Levels of GDP** (more industrialised nations use more petrol and industrial production which causes pollution).
- **Economic focus of the economy**, eg oil rich nations in the Middle East have the highest levels of CO_2 per capita.
- **Transport policy**: Countries with highest levels of (combustion engine) car use create more CO_2 emissions.
- **Policies to reduce CO_2 emissions** eg carbon tax and regulations to stem pollution.
- **Modes of power generation** ie burning of fossil fuels through coal-powered stations.

Eight suggestions on how to rein in the fossil fuel industry

Put climate on the ballot paper. Politicians need to feel this is a priority for the electorate.

End fossil fuel subsidies. The coal, oil and gas industries benefit from $5tn dollars a year – $10m a minute – according to the International Monetary Fund. UN secretary general António Guterres attacked the incentives saying: "What we are doing is using taxpayers' money to destroy the world."

Put a price on carbon. The idea of putting a price on carbon has been around since the early 1990s and a cap-and-trade system was incorporated into the 1997 Kyoto protocol.

Scale back demand for fossil fuels. The only way to cut emissions from oil in the long term is to stop using oil. Reducing demand is driven by government regulation and by technological development (also driven by regulation), such as cheaper solar panels, offshore windfarms, electric cars and improved public transport.

Stop flaring. If oil and gas are to be extracted, the least oil companies can do is extract efficiently. The World Bank wants an end to routine flaring globally by 2030 – yet in 2018 it increased.

Roll out large-scale carbon capture and storage. Trapping and burying the CO_2 from fossil fuel burning is possible but not yet deployed at scale. Oil companies have the expertise to roll out CCS but say that without a price on carbon emissions there is no commercial incentive.

Halt investment in fossil fuels. Green investing must be regulated to ensure it really is green.

Establish market metrics on climate change. Nearly three years after the Paris agreement, world markets still have no mandatory, comparable data to measure the risks posed by the climate crisis at a company level.

By Jonathan Watts, The Guardian's global environment editor. (Abbreviated version)

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In November 2017, the Australian Solar Council & Energy Storage Council became the Smart Energy Council

SMART ENERGY COUNCIL

DECEMBER diary notable events

DER Register

At the start of December 2019 AEMO is launching Australia's first Distributed Energy Resources database, which will include all forms of small grid-connected generation and storage.

The plan is to improve knowledge and visibility of DER to enable AEMO to better manage the grid and "ensure that consumer-led energy investments can deliver their expected value to consumers and the energy system".

Installers will be asked to confirm information, rather than enter it.

Within a decade, distributed energy resources will be the largest installed capacity of any generation technology in Australia.

Updated draft of AEMO's Integrated Systems Plan

AEMO chief executive Audrey Zibelman is a key speaker at the Smart Energy Summit in Sydney on December 10

AEMO is currently developing the 2020 Integrated System Plan (ISP) which will provide an actionable roadmap for navigating Australia's secure and reliable energy future. The 2020 ISP due for release mid-2020.

The next instalment of the ISP is the draft due for release in December 2019.

Chief executive Audrey Zibelman says the core objectives of the AEMO 2020 ISP are to maximise value to energy customers by designing a future-oriented system that minimises total system-cost, enhances optionality to manage key risks and uncertainties and to adapt to possible policy choices.

Months of consultation and workshops began in January to define the inputs, assumptions, and scenarios on which the modelling for the 2020 ISP would be based.

Developing a national hydrogen strategy: the COAG Energy Council Hydrogen Working Group

The Council of Australian Governments Energy Council established the Hydrogen Working Group to develop a national strategy to build a clean, innovative and competitive hydrogen industry and position Australia's hydrogen industry as a major global player by 2030.

Chaired by Australia's Chief Scientist, Alan Finkel, the working group is developing the national strategy coordinating the approach to projects that support hydrogen industry development.

Meanwhile over in the US:

US energy secretary stepping down

US energy secretary Rick Perry who has facilitated President Trump's policy of American "energy dominance" and increased the exports of US fossil fuels to Ukraine and elsewhere, is stepping down in December.

Under his watch the US saw a large rise in the production of fossil fuels including what Perry called "freedom gas".

He also attempted to create federal bailouts for struggling coal and nuclear power plants.

And in the UK:

Power shift!

Britain is preparing to phase out its last coal-fired power plants by 2025 to reduce carbon emissions.

Earlier this year the UK made history by going two weeks without using fossil fuel coal for electricity, the first time since 1880.

The UK's National Grid says coal is "quickly becoming an irrelevance" in Britain, which earlier this year became the first major global economy to adopt a net zero target and declare an end to its contribution to global warming by 2050.

Conservative Prime Minister Boris Johnson says the target would ensure the UK "will no longer make any contribution whatsoever to the destruction of our precious planet".

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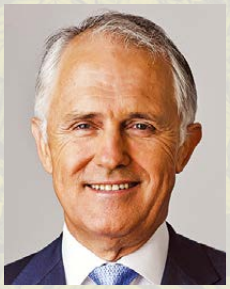
10 DECEMBER. **HILTON.** **SYDNEY.**
FULL DAY EVENT: 9am - 5pm

ACTIONS AND WORDS



"The failure to have a coherent national energy policy is a major problem but it is founded on this rock of climate denialism inside the Liberal Party and inside the media… There is nothing conservative [in] denying the science of climate change. That's not a conservative position. That is just, well, that is just denying reality. You might as well deny gravity."

Former Prime Minister Malcolm Turnbull (talking to *The Australian* newspaper)

Hear more from Malcolm at the National Smart Energy Summit in Sydney on December 10.

"Entire ecosystems are collapsing. We are in the beginning of a mass extinction. This is not political views or my opinions. This is science. I want you to listen to the scientists and then I want you to take action."

Teen climate activist Greta Thunberg

"My generation has been committed to a planet that is collapsing."

17yo climate change activist

"When I speak to young people around the world, frankly there is a rising rage that our generation has failed to step up to the plate; Greta Thunberg represents 'the anger of that generation' and does so effectively."

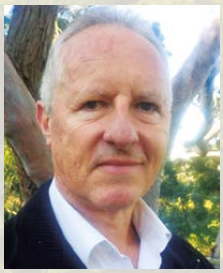
Former PM Kevin Rudd

"I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that."

Thomas Edison (c. 1888)

"Australia is seen by other countries as denying the severity of the problem [of climate change] and in engaging in 'greenwashing' by using accounting tricks to meet targets while actual emissions increased."

Richie Merzian, The Australia Institute



"I watch northern NSW and Queensland burn, facing bush fire danger conditions that have never been recorded in history, Somebody's got to wake up somewhere, and that somewhere's Canberra."

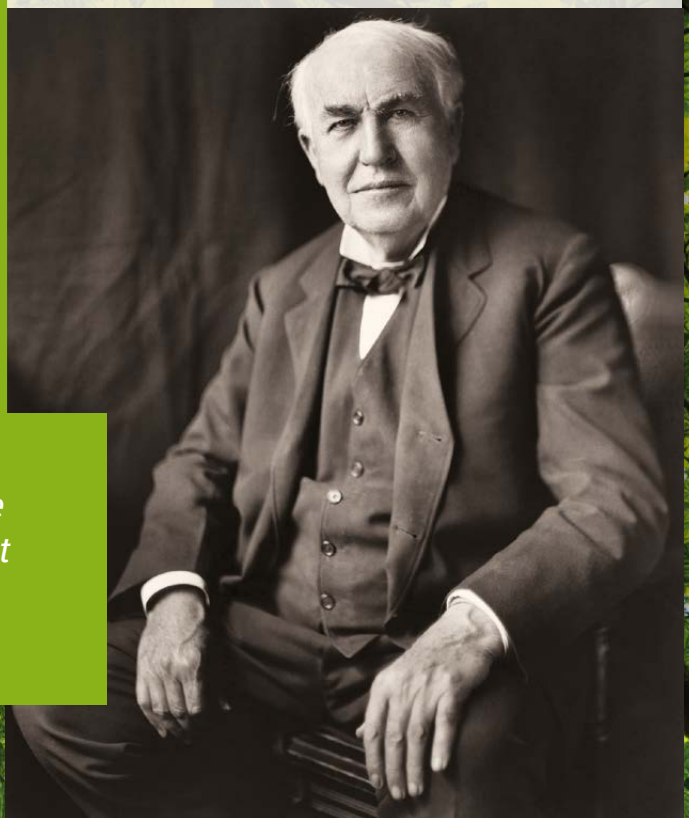
Greg Mullins, Climate Council

"We need a climate change royal commission ... a review of the evidence in which everyone is required to tell the truth."

Alan Kohler

"Climate Lawsuits – an existential risk to fossil fuel firms?"

Michael Liebreich, Bloomberg New Energy Finance

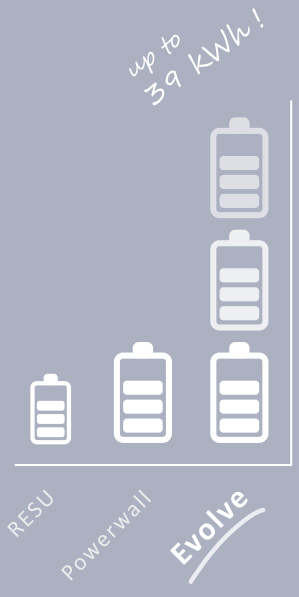


Demands evolve.

Evolve

Home energy storage

So should your energy storage.



Choosing a home energy storage system to match your energy needs is a wise investment that will secure your energy future well into the next decade. But one size does not fit all, and what if your energy needs change? Buying an electric car? Adding a backyard pool?

Introducing the Eguana Evolve, a fully integrated and expandable home energy storage solution with 5 kW of power, and with storage capacity starting at 13 kWh -- all the way up to 39 kWh! Serious storage for the serious consumer.

Eguana's technologies are embedded in home energy storage systems that are reducing power bills for over 5000 (and growing) owners around the globe. Now integrated with LG Chem's award winning modular lithium battery, Eguana is proud to bring our technology to a broader market with energy storage solutions you can trust.

Our AC coupled solution is the perfect match for retrofit or new grid tied PV, and with integrated backup and black start capability, your power stays on when your grid goes dark.

Learn more at
www.eguanatech.com

Evolve ~~or go~~ and stay home.

LG Chem

EGUANA TECHNOLOGIES

HYDROGEN: the Netflix of the energy sector?

ARENA CHIEF EXECUTIVE Darren Miller says that should we seize the future export opportunity of hydrogen, the scale of renewable energy projects we will need to build is "simply staggering".

We will need to produce six or seven times as much electricity as we currently consume throughout our entire domestic electricity system, requiring hundreds of gigawatts of solar and wind farms throughout regional and remote Australia, and many large electrolysis plants closer to the coast with easy access to seawater and shipping.

"At this scale, Australia's hydrogen exports to the likes of Japan and South Korea could be worth tens of billions of dollars a year in the decades to come," he says, relaying the good news about the prospect of renewable hydrogen being cost-competitive within a few years, should the cost of electrolysers and the wind and solar energy to power them decline.

"We will need to increase the scale at which we manufacture and install electrolysers and we will need the price of renewable electricity to continue to fall. We think we can achieve this because we've done it before with other renewable energy technology," Darren Miller says.

"An example is large-scale solar, which now costs a tenth of what it did a decade ago, thanks in part to funding from ARENA.

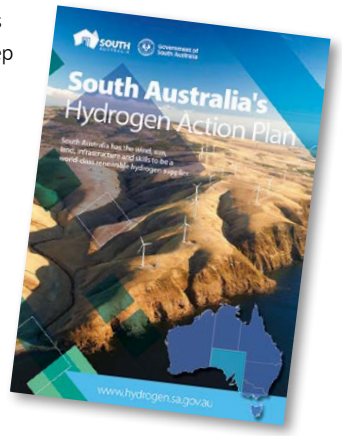
"That's why hydrogen could be the Netflix of the energy sector. Just as Netflix transformed the way we consume television and movies by providing a cheaper, more convenient service that leveraged the invention of high-speed broadband in our homes, hydrogen has the potential to be a game-changer for energy as a versatile emissions-free fuel with many end uses that leverages low-cost renewable electricity."

As well as allowing Australia to ship our solar and wind to the world, it can deliver us reliable, low cost, low emissions energy and electricity, Darren Miller says.

South Australian advances

In late September South Australia released its Hydrogen Action Plan. South Australia Premier Steven Marshall said new interconnection and storage technologies such as hydrogen will support South Australia in becoming a net 100 per cent renewable energy generator during the 2030s.

"Beginning with Australia's largest electrolyser coming online in 2020 in metropolitan Adelaide, we are determined to unlock South Australia's renewable hydrogen potential," he says "The hydrogen economy is a further step in the transition of South Australia's energy system as we integrate renewable energy into the grid."



The Premier expects that during the 2030s, South Australia will generate more clean power than required for local use, enabling the state to become a national and global force in clean energy.

"Now is the time to step up the development of a hydrogen economy and the State has a first mover advantage," Premier Marshall says.

"We believe we can deliver green hydrogen to our trading partners to meet their ambitious plans … international investors already regard South Australia as an attractive investment destination.

H2 number crunching

For those looking for a good read, check out US based Rocky Mountain Institute paper *The Truth About Hydrogen*.

The report details the scale of development in hydrogen production, which has increased from around 40 million tons in 2005 to the approximate 60 million tons produced today.

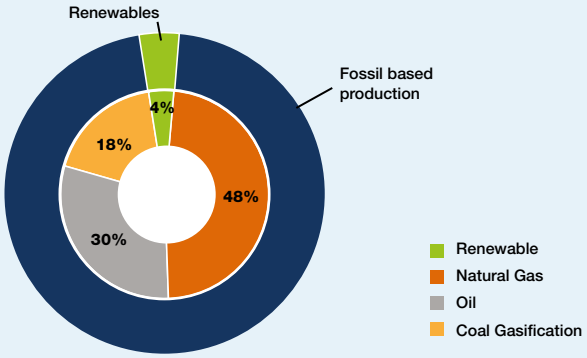
The RMI reports that two years ago, in 2017, the global hydrogen production market was estimated at $US103 billion and is expected to double by 2026 to $US207 billion, with a compound annual growth rate of 8.1 per cent or a market of approximately 121 million metric tons.

New interest in hydrogen is now coming from the mobility, freight, shipping, power, and industrial processing sectors as they strive to move toward a decarbonised future, and hydrogen can be made without emitting CO_2. The solution is electrolysis powered by renewable energy… the only non-fossil fuel means of hydrogen production," the report states.

Given these dynamics, the Energy Transition Commission suggests that by 2050 the hydrogen market could be in the region of 425–650 million tons per year.

Artist's impression of Hydrogen Park South Australia, a 1.25 MW electrolyser, blending equipment and tube and trailer facility. Image: SA Government

Hydrogen Production as percentage of Total Metric Tonnes



Source data from Balat, M. "Potential importance of hydrogen as a future solution to environmental and transportation problems" International Journal of Hydrogen Energy,

Hydrogen vs coke in steelmaking

Despite claims by some in the mining community that carbon-rich coke, a form of coal, is one of the key irreplaceable inputs for the production of steel, a rival looms on the horizon.

According to Bloomberg New Energy Finance, within about thirty years hydrogen could replace coke in 10 to 50 per cent of all steelmaking, provided the "right" carbon pricing is in place.

The replacement of coke with hydrogen ("direct reduction") would significantly reduce levels of carbon emissions from steel mills, which currently account for approximately 9 per cent of all carbon emissions, according to data collected by the World Steel Association.

It would mark a quantum shift in the production of steel, which has used the same process for well over a century.

"Hydrogen technologies offer a viable pathway to slash the emissions from making steel," says Kobad Bhavnagri of Bloomberg NEF.

[Better still] "No big R&D breakthroughs are necessary. If [carbon] policy was in place, the world could start producing green steel within a decade. Hydrogen can do everything coal does in the steel-making process, and the technology to make fossil-free steel is already currently operating with natural gas in many parts of the world."

Bloomberg NEF forecasts that hydrogen technology will be competitive with high-cost, coal-based plants once the cost of renewable hydrogen falls below $2.20 per kilogram.

HYDROGEN AUSTRALIA
A DIVISION OF THE SMART ENERGY COUNCIL

Introduction to H2: Hydrogen's role in the economy

Hydrogen Australia recently staged its first webinar to outline the role of hydrogen, how we can use it, and the massive benefits that this zero-emissions fuel can deliver for Australia.

The webinar was chaired by **Steve Blume, President of the Smart Energy Council and Hydrogen Australia**, who commented that green hydrogen now played a major role in the smart energy industry.

Turning the clock back to the 1990s, Presenter **Stephanie Moroz of Davanz** reported how hydrogen had at that stage fallen out of favour due to stricter engine regulations, developments in battery technology and the challenges of hydrogen storage.

Today's focus on decarbonisation is driving renewed interest, along with distributed renewable energy, liquid fuel security and improvements in hydrogen technologies, she said.

Discussing green hydrogen for heat or chemical processes, Stephanie Moroz referenced the feasibility study for a $3.9 million green hydrogen and ammonia project with $1.91 million from ARENA. It is one big step that marks the start of the forward transition.

Warner Priest of Siemens commented on the important role of hydrogen in addressing the energy trilemma and noted that decarbonisation of the global economy by 2100 will require a multifaceted solution set and that policy is forcing worldwide decarbonisation. Going forward we can expect more renewables integration, and in a series of slides Warner Priest demonstrated how that will challenge the energy industry.

However turning to big picture thinking in the field of conversion of renewable energy to chemical gas storage, he said hydrogen drives the convergence between the energy, industry and transport sectors.

And 'green' hydrogen as an alternative to natural gas could be financially viable in the next decade; when Australia can produce hydrogen at scale the costs will decline to around $5.25 per kilogram.

"We are currently way off competing with natural gas but once you add a carbon price then renewable energy and hydrogen based technology are highly credible," he said.

In an Australia first, an $11.4 million hydrogen demonstration plant is being built in Adelaide following a $4.9 million grant from the South Australian government. The hydrogen will be injected into the local gas distribution network.

Ammonia, he says, is the holy grail. The building block of food and energy production. *(Read Oliver Yates' thoughts on page 9.)*

Craig Knight of Horizon Fuel Cell Technologies, the third and final speaker at the Hydrogen Australia webinar, delivered an address outlining the increasingly important role of hydrogen and the massive benefits that this zero-emissions fuel can deliver for Australia.

It is the energy 'vector' that harnesses many other technologies aiding the decarbonising of heating, industrial processes, power generation and transport (the latter delivering great economies of scale in heavy vehicles), he said.

The Webinar can be viewed at www.smartenergy.org.au

Brighte Capital promotes itself as Australia's zero per cent interest payment plan platform for solar, batteries and home improvements

Brighte idea: smashing barriers

Brighte Capital is working with thousands of businesses across Australia to provide on-the-spot finance that enables more homeowners to install rooftop solar PV and batteries for storage.

KATHERINE McCONNELL is something of a trailblazer, an early adopter of solar and batteries and Australia's first woman to establish a finance company. The year was 2016 and with its focus on sustainable solutions Brighte Capital attracted the interest – and financial backing – of 'fair dinkum renewable' energy guru Mike Cannon-Brookes.

Another significant early supporter of Brighte Capital was National Australia Bank which helped shore up the business and act as the springboard for several more funding facilities to come on board in the following months.

Smart Energy spoke to Brighte Capital chief executive Katherine McConnell who says the digital payment platform that connects homeowners and vendors with 'affordable payment solutions' is successfully addressing the sometimes delicate issue of upfront costs.

"Today more consumers understand that solar can bring about energy savings, however for the average Australian the upfront cost of around $8500 is still a barrier," she says.

In fact the 1000 different companies with 4000 sales agents who have used Brighte have identified that finance is a barrier to closing a deal.

Seven in ten Brighte customers say they would have delayed, or not purchased solar at all if they didn't have the option to tap into Brighte finance according to a study conducted by Deloitte Access Economics in August 2019.

"So what we are seeing is Brighte has brought in a product; we really can see that we have helped

Brighte approved finance by year

Brighte approved finance		FY18	FY19	YoY growth
# applications	#'k	6.6	18.5	181%
$ approved	$m	60.0	157.5	163%

**FY ending 30 June*

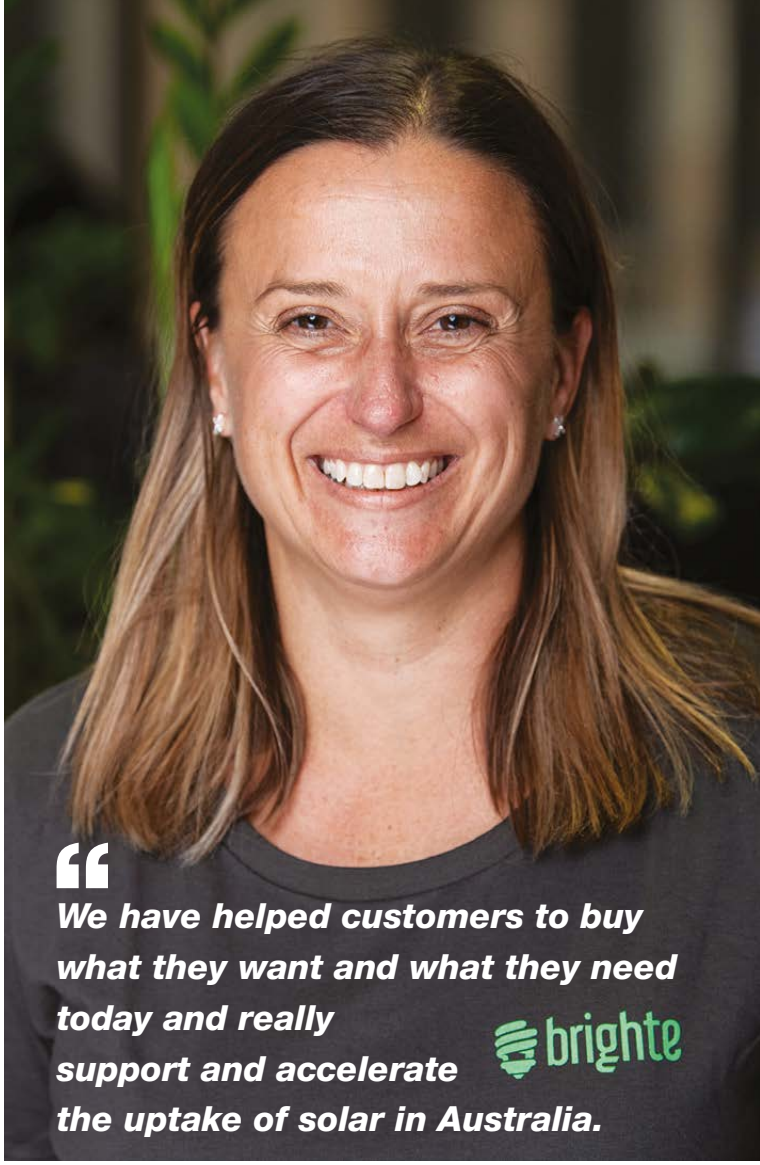
How it works:

Vendors apply via the Brighte Capital website to become accredited.

The credit team carries out an automated assessment followed by a qualitative test and responds speedily to vendors.

Once agreements are in place they can close sales using Brighte Capital.

As soon as installation is confirmed as complete the business (accredited vendor) gets paid and customers commence fortnightly repayments to Brighte.



Brighte Capital founder and chief executive Katherine McConnell has energised the uptake of solar PV and thousands more homeowners are benefitting

customers to buy what they want and what they need today. We can support and accelerate the uptake of solar in Australia."

Robust figures

To prove the point, McConnell revealed that three years ago the company didn't exist, but momentum kicked in early and 40,000 Australians have since make applications. From a starting point of $30,000 Brighte Capital approvals in the first month of business, the figure had shot up to $18.5 million by August 2019.

"We think that is evidence of consumers' interest in solar and the huge and increasing market for solar," she said.

To keep pace with booming demand, the company now has 100 on the payroll.

"We've experienced very high growth. This business speaks to innovation in Australia and solving the problem of a lack of choice, we filled the void in the market by putting structures in place," said the former Macquarie Bank staffer with a depth of experience in the finance sector.

Those funding structures, however, are not for the faint hearted. They involve a credit scorecard, access to credit responsibility to ensure user repayment collections, managing relationships with users and vendors, and navigating stringent regulations.

"Using different wholesale funders we have definitely set up a scalable funding model," McConnell said.

"The details are complex and sophisticated but enable Brighte to be confident it can meet the interest to complete purchases.

"It's been exciting what our business has been able to do in being an enabler or facilitator and to close the gap between the problems of the vendors" says Katherine McConnell who has drawn heavily on her background in equipment and asset finance and experience in a sales role dealing directly with customers.

Reflections

Smart Energy wondered whether she was a renewables advocate.

"I have strong views that people should have distributed energy generation on their roof," said the woman who in 2012 installed solar PV on her home rooftop and added batteries for energy storage three years later.

"It's just ethical – logical – for homeowners to install solar power systems, it is cost effective and these days most systems can be paid back in just three to five years."

Battery pay-back may not quite make sense yet, she said, but for those who can afford a battery it makes good sense being able to store the energy instead of putting it back into the grid, and in time costs will come down

"I'm a logical person and I do like the fact we can create our own energy, it suits the philosophy that we do the best we can, including composting and recycling, to leave a smaller footprint and to individually make a difference."

What about the impact of state incentives for solar systems? A dip in volume followed the pause in Victoria's solar home schemes in April but there was a pick up in business following the additional allocations that kicked in in September.

"The Victorian government incentive [of around $2225 on a typical PV system] also impacts the size of the loan that Brighte covers. However I do see the overall benefit of the government schemes in all states that advances interest in solar energy and makes it mainstream.

"Government support – let's call it endorsement – also provides greater confidence among the community on the merits of solar power; overall it is positive," she commented.

More offerings

Brighte has expanded its portfolio through finance for home energy efficiency improvements such as air conditioning or insulation and although "it will make sense" to consider branching into electric vehicles, that's not on the radar right now," she said.

But with a view to the future, and being the logical person she is, McConnell relishes the thought of home-generated solar energy stored in batteries to power the family vehicle.

"It would be exciting to think that one day electric vehicles hooked up to a home energy generation supply will become more common, and it makes sense for us to help bridge the gap," she said.

Stay tuned for more.

For more details email insidesales@brighte.com.au
www.brighte.com.au

The Smart Energy Council is pleased to welcome Brighte Capital to its membership, circulation base and industry networks.

> ***"The economics of putting in a residential solar system present such a good business case... If you have $10,000 in the bank you might gain 2 to 3 per cent interest but spend that on a rooftop solar system and you could be getting ten times the return.***

The next phase

Established in 2008 by Renmark local Mark Yates in South Australia's Riverland, Yates Electrical Services has established a winning formula to secure a healthy slice of the renewable energy market. And in trademark fashion the company continues to evolve.

IF DIVERSIFICATION IS THE KEY to success, then Yates Electrical Services has hit the mark. With three branches in the bustling business: residential rooftop PV, small scale solar farms and high voltage work, the team of 50 qualified specialist electricians, apprentices and trade assistants continues to grow.

As Mark Yates says "I think probably for an electrical construction company it is a bit unusual to find a contracting business of our size that will deliver everything. Numerous firms are doing different aspects of the work, whereas we offer a unique service as we can cover off on a range of areas."

Residential rooftop installations formed the core of the business, and over the past 11 years the company has provided more than 1000 homes and businesses across South Australia's sunny Riverland region that lies east of Adelaide.

And today it makes no sense *not* to install rooftop PV, Mark Yates says.

"The economics of putting in a residential solar system make such a good business case, that is one of the key drivers. If you have $10,000 in the bank you might gain 2 to 3 per cent interest, but spend that on a rooftop solar system and you could be getting ten times the return."

According to Mark the average size single phase system comes in at a 5 kW inverter coupled with 6.6 kW panels, but would possibly be larger were it not for the constraints in the market driven by the network that limits the amount that can be exported back to the grid.

The business case for batteries is not as good as for solar alone, uptake is slow, but some homeowners are installing home storage for different reasons, he said.

Drumming up customers for the residential side of the business was primarily conducted by word of mouth until Patrick Broughton joined the team in 2015 to market business services. With a flair for story telling, hype and humour – a powerful combination buoyed by his grip on market nuances – Patrick has become quite an asset to the company. Thanks to his creative talents potential customers better understand the renewable energy market and can make informed decisions.

Happy days.

Redmud Green Energy

Tracking the chronological evolution of Yates Electrical we next encounter Redmud Green Energy, established in early 2016 to help land-owners and growers to "reactivate redundant land parcels and integrate energy generating assets into their business structures".

Namely to install a solar farm sized from 200 kW to 1000 kW and generate income through sales of electricity to the market via the grid.

It's proved a boon: Yates has built 60 of the 130 registered power stations in South Australia which collectively comprise nearly half of the total registered solar farms in South Australia.

"We were early adopters of these small-scale farms and have built a system to allow us to scale up so we are unique and fortunate with our team skills," Mark Yates said.

"Our clients vary from broad-acre farmers to savvy investors in the CBD as well as from overseas, and a lot of our business is based on building relationships and rapport to establish a level of comfort."

Sites over and above 100 kW gain additional benefits by creating large-scale generation certificates for each 1,000 kWh returned to the grid.

"The increasingly dry climate was a key driver kicking us off in this space. We're in an irrigation zone and have seen first-hand and understand the effects of drought and if you can provide the opportunity for a landowner to diversify it presents more opportunities," he explained. "If there is a drought they are not just relying on one income stream."

Generally if transmission or high-voltage structures are in proximity of the property, plant development is achievable, he says, conceding at some time they will reach saturation point in this region.

"It is a first-in first-served scenario, early adopters get in and once capacity is taken up it's up to the next to pay the augmentation cost to connect to the grid and the business case won't be so good," he said.

But with drought gripping large swathes of Australia, Mark Yates recognises that more farmers are looking to capitalise on solar assets and he plans to replicate the business model in other states.

Mark Yates of Yates Electrical Services

Bright sparkies

Next we look at the third lucrative prong of the business – the installation: maintenance of high voltage systems in some of the most progressive and exciting utility-scale renewable energy projects.

Team Yates acts as a second tier contractor to the EPC.

To date the team has been involved with more than 80 high-voltage projects across Australia, including wind farms at Bodangora, Crookwell, Coopers Gap, Silverton and Badgingarra as well as solar farms at Colleambally, Bungala, Bannerton and Albury.

"This is an area we are keen to focus on as High Voltage work presents lots of unique challenges, and it is a niche space, nine out of ten electricians would not have exposure to building a sub-station, it's not something you'd ever get in a standard rooftop PV installation.

"Once you've got a taste of high voltage work you're not likely to hang around locally and participate in general electrical work," he said

But is it high risk? You don't get a second chance in any electrical work!

A bright future

The future is looking good for the company which by the end of November hopes to have its full retail licence.

"We are keen to dive into energy retailing as it will allow us to do something with the energy that the farms [we have converted to mini power plants] are generating rather than sell it back in to spot market.

"With a Small Generation Aggregator's Licence we can act as the retailer for that site and that will be a unique service for the business. It will streamline the Redmud project in that we can offer the full turnkey solution.

"This is what we are working on, selling the energy from the 60 farms that we have converted into energy generators. It puts us at the ground level of a gentailer," Mark said.

"And we will be competitive given our overheads are minimal, just an office and a couch!"

The Smart Energy Council welcomes Yates Electrical Services as a Platinum Member.

Blessed with sunshine

Smart Energy enquired about the advantages or disadvantages of the location in Renmark which lies on the Murray River between Adelaide and Mildura.

"Irradiance maps show it's a pretty good area to install PV, it's a little known fact we get more sunlight here than in Queensland," Marketing and Communications Manager Patrick Broughton says.

"It's strange but we get the weather from Northern Australia and the [Great Australian] Bight that collide and split off so it's very temperate here, hence the high irradiance.

"Where we live is actually the best place in Australia to install solar panels and clearly that has been a major advantage to the business," he explained.

"With the digital age we don't see too many disadvantages either in our location as much of the business is digital and online, distance is not a factor."

Member developments

LONGi Solar strengthens its presence in Australia

LONGi Solar recently selected Melbourne for the regional launch of its new Hi-MO X high-efficiency module which was the first that qualified under new quality material guidelines and accredited for use in Australia.

During his recent visit to Melbourne, LONGi's President Dr Li discussed the future of solar panel efficiencies from his company which is a pioneer in volume manufacturing of mono crystalline solar panels.

He was also here to celebrate the new LONGi Solar office that is now operational in Sydney and demonstrates the company's commitment to expansion of its Australian market share across all key segments.

https://en.longi-solar.com/

Smart Energy Council President Steve Blume with Longi Solar President Dr Li

Q CELLS 25-year warranty

Q CELLS has introduced a 25-year product warranty following results of its research into product innovation and solar technology aimed at meeting Australia's solar needs.

The warranty will be applied to the upcoming product releases of Q.PEAK DUO-G5+ (exclusive to the Australian market) and Q.PEAK DUO-G6+ (most powerful Q CELLS Q.ANTUM DUO solar panels currently available).

Q CELLS Australia Key Account Director Myungsin Shim said "Previously, extended warranties of this kind were only offered by a small group of lesser-produced, high-cost solar module manufacturers."

The Q.PEAK DUO-G5+ and Q.PEAK DUO-G6+ are both engineered in Germany and manufactured in Korea in Q CELLS' Jincheon Smart Factory.

"Since the introduction of Q.ANTUM technology2 in 2011, we have been putting our modules through rigorous testing in both the lab as well as in the field."

Q.PEAK DUO-G5+ is available for dispatch from six warehouses of Q CELLS' nationwide with Q.PEAK DUO-G6+ on pre-sale for December 2019 installations.

www.q-cells.com

Vast Solar's global recognition

"What Vast Solar has achieved through its innovative use of sodium and modular solar arrays is an important step in CSP's evolution."

SolarPACES Chairman Robert Pitz-Paal (left), presents Vast Solar chief executive Craig Wood with the SolarPACES 2019 Technology Innovation Award

Australian concentrated solar thermal power company Vast Solar picked up the Technology Innovation Award at the International Energy Agency conference for its world-first CSP technology that delivers dispatchable energy more efficiently and cost-effectively than traditional methods.

The large-scale thermal storage plant that uses a modular tower system with liquid sodium as the heat transfer fluid to store and dispatch energy provides a critical form of solar power, that Vast Solar chief executive Craig Wood says has the potential to transform energy production across the world.

"We're really starting to kick some goals," said Craig Wood who recently met with some of the industry's bigger players in China.

Vast Solar is now focusing efforts on its reference plant to prove the technology at commercial scale. The company plans to build the 30 MW reference plant as its first commercial plant in Queensland or South Australia.

The pilot plant at Jemalong, which lies west of Orange, will play a key role by facilitating continuous improvements and fine-tuning the technology while showcasing it to international and national stakeholders.

Winners of the SolarPACES Technical Innovation Award have gone on to make significant contributions to global energy markets. SolarPACES is the International Energy Agency's CSP-focused collaborative program.

https://vastsolar.com/

Member developments

sonnen forges ahead

German battery company sonnen has received two industry leading accreditations as a South Australian manufacturer, including the well-known Australian Made badge and recognition from the Office of the Industry Advocate (OIA) as a manufacturer of South Australian products. The milestone comes almost a year after the official opening of the assembly and manufacturing facility at the site of the old Holden factory.

South Australia's Minister for Energy and Mining Dan van Holst Pellekaan welcomed the news, saying "Home batteries are gaining momentum in South Australia as consumers are empowered to generate and store their own electricity, reducing their power bills."

He commended sonnen for creating jobs for South Australians across the sector which is constantly gaining momentum.

On the opening of its factory in November 2018 sonnen employed 39 staff and now has 47. To date sonnen has produced 2,000 batteries at the facility in Elizabeth and as a result of the government's Home

Battery Scheme (HBS) launched in October last year, and has installed over 500 sonnenBatteries under the scheme in the past 12 months.

sonnen Managing Director of Australia, Nathan Dunn said that Australia is going through a significant clean energy transition with more home owners aware of the benefits of home batteries in reducing their bills and being able to rely on the solar energy they have generated during the day.

"As we continue to identify new markets in Asia with export potential for certified Australian Made sonnenBatteries, sonnen will look to increase the manufacturing of our home batteries," Nathan Dunn said.

https://sonnen.com.au/

Trina Solar takes on larger projects

Trina Solar recently showcased its TrinaPro integrated solution that combines high output modules with smart PV controllers and trackers, smart inverters and digital cloud-based operations and maintenance software. Combining these in a single product solution achieves a better levelised cost of energy and simplifies installation, with the patented fast-installation structure enabling modules and trackers to be installed up to three times faster than industry averages, Trina claims.

Trina panels were selected for a shopping centre car park installation in inner city Sydney, a trend that Trina Solar's Govind Kant anticipates will become more common in the retail sector. The solar panels used in the 305 kW phase one of the project are coated in a special clear polymer that protects each 60-cell monocrystalline module from the sun, but also allows light to penetrate through. Phase two, which is due to be completed by year's end, will increase the installation's capacity to around 430 kW.

In other developments, Trina is working with world leading Spanish tracker manufacturer Nclave, which Trina Solar acquired in 2018, and notes that among its other benefits tracker technology can be used to protect solar panels from hailstorms by being angled perpendicular to the ground.

https://www.trinasolar.com

SENEC launches new-generation hybrid solar battery

The SENEC Home V3 Hybrid solar battery has been launched in Australia by SENEC and offers to provide households with up to 90 per cent solar power self-sufficiency. The battery comes with a 20-year warranty which SENEC claims is double the warranty of other batteries on the market. The system features a combined PV inverter and battery inverter, PV over-voltage protection safety as standard, three-tier remote monitoring (every five minutes), unlimited solar recharging cycles and floor rather than wall mounting, with a footprint of just 0.29 square metres.

According to SENEC homeowners with rooftop PV may only need to draw 10 per cent of their current usage from the grid, potentially saving thousands of dollars a year.

Noting that just three per cent of Australia's 2.2 million homes with solar PV had batteries, and anticipating a boom in solar PV, SENEC Managing Director Jaron Schächter said people "only had to do their maths and work out that in 10 years, they may have to buy another battery, which would be a major impost on capital expenditure and affect the payback period".

The figures bode well for SENEC which is 100 per cent owned by German-based EnBW, one of the biggest gentailers (generation retailers) in the world. "Home owners will have a huge incentive to buy a battery when they purchase their solar panels," Schächter said.

The new SENEC hybrid solar battery can also be retrofitted to existing solar-powered homes and is 100 per cent designed, engineered and manufactured in Germany.

Approximately 30,000 SENEC batteries have been installed around the world to date.

https://senec.com/au

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POWERING AHEAD: Australia leading the world in renewable energy build rates

IMAGE BY KENUEONE FROM PIXABAY

Matthew Stocks, Ken Baldwin and Andrew Blakers explain why Australia is the runaway leader in worldwide renewable electricity deployment rates.

THE CLEAN ENERGY REGULATOR recently announced that Australia has installed sufficient new large renewable generation to meet the Renewable Energy Target of 33,000 GWh of additional renewable generation. This was achieved with the accreditation of the 148.5 MW Cattle Hill Wind Farm on August 30, 2019.

The Clean Energy Regulator is responsible for keeping track of both large scale and small scale (mostly rooftop solar) renewable energy generation in Australia. We have analysed the Clean Energy Regulator data, including information on financially credible project announcements, to determine that the record high installation rates of 2018 will continue through 2019 and 2020.

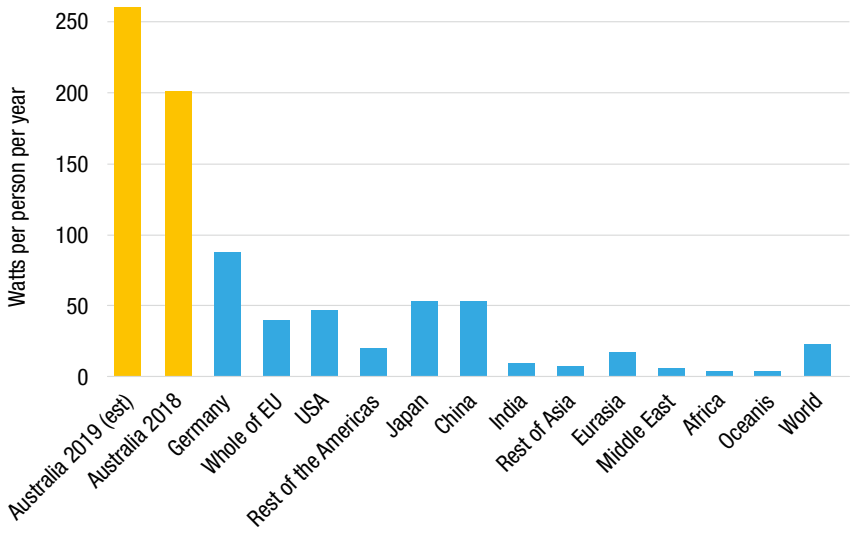


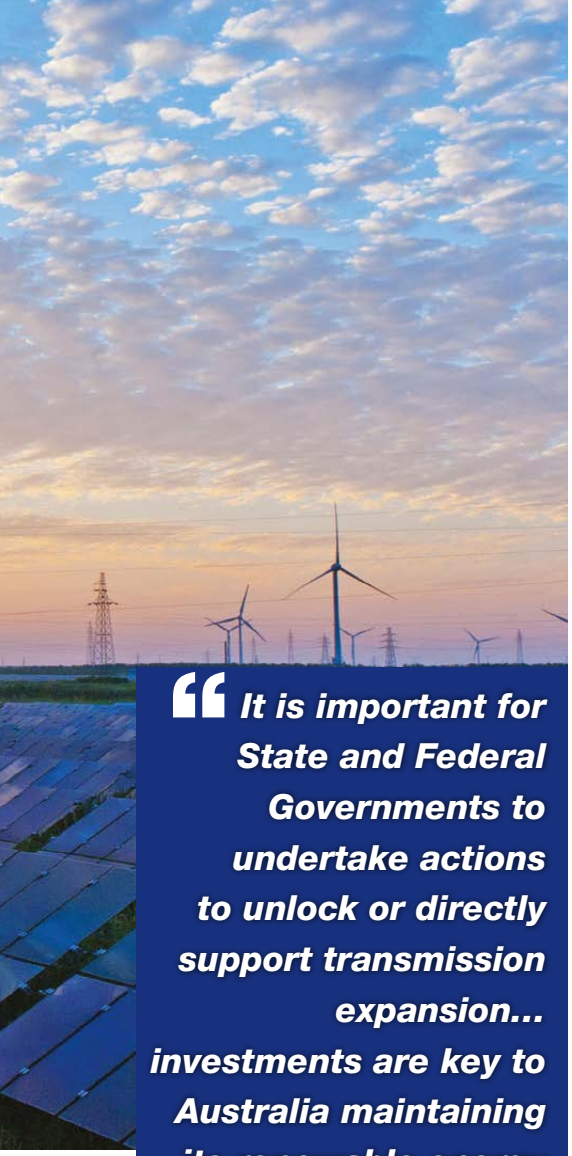
Figure 1. Renewable energy capacity installations per capita. International capacity data for 2018 from the International Renewable Energy Agency. Australian data from the Clean Energy Regulator

Australia leading the world

Australia is installing renewable energy capacity far faster per capita than any other country. Over the three years 2018-20, Australia will install more than 16 Gigawatts of wind and solar photovoltaics (PV – Figure 2), an average rate of 220 Watts per person per year (Figure 1). This is nearly three times faster than the next fastest country, Germany, and is about ten times faster than the world average. This high installation rate is important as Australia is demonstrating to the world how rapidly an industrialised country with a fossil-fuel dominated electricity system can transition towards low carbon, renewable power generation.

Record renewable energy installation rates continuing

Installation rates for wind, large scale and rooftop solar are shown in Figure 2. 2018 was a record year for renewable energy installations



> **“It is important for State and Federal Governments to undertake actions to unlock or directly support transmission expansion... investments are key to Australia maintaining its renewable energy transition leadership into the next decade.**

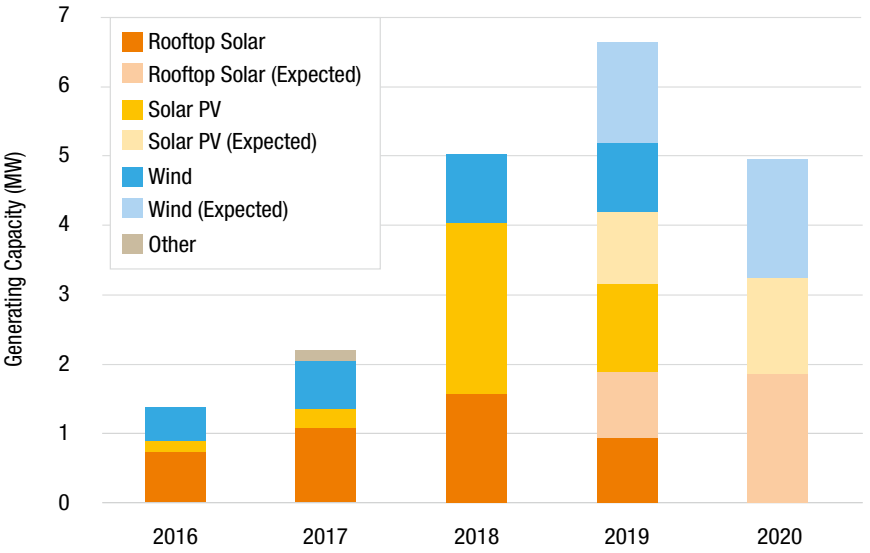


Figure 2. Current and forecast installations of renewable electricity capacity in Australia

with 5.1 GW accredited by the Clean Energy Regulator, far exceeding the previous record of 2.2 GW accredited in 2017. The increase was primarily driven by the dramatic rise of large-scale solar farms, which comprised half of the new build capacity accredited in 2018. There was a ten-fold increase in solar farm construction from the 2017 value of 0.24 GW to 2.4 GW in 2018.

We have projected the remaining builds for 2019 and those for 2020 based on data from the Clean Energy Regulator for public firm announcements for projects. A project is considered firm if it has a power purchase agreement (PPA), has reached financial close or is under construction. We assume six months for financial close and start of construction from PPA and twelve or eighteen months for solar farm or wind farm construction respectively.

2019 is on track to be another record year with 6.5 GW potentially complete by the end of this year. The increase is largely attributable to a significant increase in the number of wind farms approaching completion. Rooftop solar has also increased with current installation rates putting Australia on track for 1900 MW in 2019, also a new record. This is attributed to the continued cost reductions in rooftop solar with system prices, with less than $1000 per kilowatt now considered routine and payback periods of the order of two to seven years.

Looking ahead to 2020, there is almost 6 GW of large-scale projects expected to be completed comprising 2.5 GW of solar farms and 3.5 GW of wind. Around the end of 2020, this additional generation would deliver the old Renewable Energy Target of 41,000 GWh per annum legislated in 2009 by the Rudd Labor Government, which was reduced to 33,000 GWh by the Abbot led Coalition Government in 2015.

Maintaining the pipeline: overcoming transmission bottlenecks

There are strong prospects for continued high installation rates of renewables. Renewable projects are routinely being reported at less than $50/MWh. Quarterly baseload generation futures throughout the NEM out to 2023 are greater than $58/MWh suggesting a strong economic case for continued installations. Wind and solar prices are likely to decline further throughout the 2020s.

State governments' programs are also supporting further renewable electricity growth. The ACT has completed contracts for 100 per cent renewable electricity. Victoria and Queensland both have renewable energy targets of 50 per cent renewable electricity by 2030. South Australia is expecting to reach 100 per cent by 2025.

The primary impediment to continued renewables growth is transmission. Transmission constraints have resulted in bottlenecks in transmitting electricity from some wind and solar farms to cities. Tasmania's strong wind resource requires a further connection to the mainland to unlock more projects. The limitations of the current planning frameworks for the transition were recognised in the Finkel review of the National Electricity Market, with recommendations in chapter 5 aiming to overcome these limitations and, in particular, to strengthen AEMO's role.

It is important for State and Federal Governments to undertake actions to unlock or directly support transmission expansion. For example, the Queensland government has committed to supporting new transmission to unlock solar and wind projects in far north Queensland (including the Genex/Kidston 250 Megawatt pumped hydro storage system), while the NSW government has provided the NSW/SA interconnector with critical infrastructure status. These investments are key to Australia maintaining its renewable energy transition leadership into the next decade.

Matthew Stocks is Research Fellow, ANU College of Engineering and Computer Science. Andrew Blakers, Professor of Engineering, ANU. Ken Baldwin is Director, Energy Change Institute, ANU.

This article originally appeared in 'The Conversation'.

At the frontline: topical matters

Here Smart Energy Council chief executive John Grimes explains some of the issues that have been at the forefront of industry discussions.

Construction of Queensland solar farms

Background: *In late May this year Queensland's Supreme Court determined against the proposed Queensland government legislation to allow only licensed electricians to mount and fix solar panels on projects larger than 100 kW.*

Had the new ruling proceeded, the cost of construction of large scale solar farms would have increased markedly and curtailed development.

John Grimes added: The industry will remember that earlier this year the Queensland government produced regulations that meant non-electricians could no longer install solar panels on farms.

Instead all workers had to be qualified electricians.

The change in the regulation would have sent the construction costs of solar farms skyrocketing.

A legal challenge found that ruling to be unlawful which means skilled labourers and trade assistants can undertake the work, rather than electricians.

The decision is a win for solar farms.

The Smart Energy Council has been working with the Queensland government and other stakeholders including the Electrical Trades Union, Master Electricians and members and the Queensland Electrical Safety Commission to find an appropriate government response to ensure that soar farm safety is paramount, and that projects can continue based on more sound finances.

That discussion is nearing completion and we are pleased with where it is headed… it is in train but not finalised, but we are pleased with that.

Battery standards

Background: *For more than three years the Standards Australia battery installation rules* AS/NZS 5139:2019, Electrical installations – Safety of battery systems for use with power conversion equipment *have been in the process of being drafted to address reliability, safety and consistency.*

In late 2017 the draft standard that would have prevented installation of lithium-ion battery systems inside homes and garages altogether was abandoned due to heightened concern among industry representatives, recognising this would quash the uptake of batteries in Australian homes.

The latest draft however stipulates complicated and costly fire proofing measures such as the use of compressed concrete sheeting on all installations, and prevents placement in proximity of ceilings, doors, stairs, windows and electric appliances.

As John Grimes says, the Smart Energy Council has been involved in all stages of the Standards Australia committee review processes, and along with major battery manufacturers has fought hard to ensure that appropriate risk matrix was applied when it came to batteries.

The final position in our view creates significantly unnecessary expense and lack of demonstrable benefit in terms of safety.

That is very unfortunate.

We have organised for a revision to the Standards to be commenced immediately and the review process which is likely to result in some amendments is underway, however as with all Standards Australia issues it will take time and that is time that the industry can ill afford.

The Smart Energy Council has been running Battery storage master-classes across Australia to explain the implications of the new standard to installers and retailers.

HYDROGEN AUSTRALIA
A DIVISION OF THE SMART ENERGY COUNCIL

Hydrogen Australia

The formation of Hydrogen Australia has been dynamic with 134 foundation members, the first of many webinars (see page 31) and a major conference event next year alongside the 2020 Smart Energy, Smarter Evolution Show. The Hydrogen stream will form an important part of our annual conference.

Lots of people and corporations are onside; we have strong resources and have generated a great deal of momentum with many Hydrogen related activities underway.

Victoria's Solar Homes program

Background: *The Solar Homes Program was paused in mid April this year and reintroduced on July 1 but the monthly rebate quota of 3,333 was snapped up in minutes, leaving hundreds of installers frustrated and angry, and with empty order books. Many faced financial ruin. Their level of discontent was demonstrated at rallies held at Victoria's Parliament House.*

The Smart Energy Council fought to get the Victorian government to the table and the modifications to the scheme agreed and it seems to have cleared the backlog. The pain to consumers and our members and the unnecessary job losses have not gone away. The Smart Energy Council will continue to fight for sensible policies.

John Grimes: We are maintaining a watching brief – the substantial increase in number of rebates has had a positive impact but we continue to present the government with feedback around the streamlining of the process, and reducing the administrative burden to customers and retailers.

The status of the program (as reported by Solar Victoria in late October):

- 46,000 solar installations completed since the program's launch in August 2018.
- In all, 62,000 rebates for solar panels, solar hot water, solar batteries and no-interest loans secured by Victorian households.
- 42 per cent of rebate applications are secured by households in regional and rural Victoria.
- 640 retailers have secured work through Solar Homes and 5500 new jobs are set to be created in the industry.
- the top retailer securing less than 5 per cent of applications available
- 71 per cent of applications are shared across retailers outside the top 20

According to government, Solar Homes is driving a 46 per cent increase in the uptake of solar panels across the state, with residential installations in 2019 on track to deliver solar panels to 60,000 households, compared to about 41,000 installations in 2018.

For more information visit solar.vic.gov.au

John Grimes being interviewed at the Victorian solar rally. In the background are Finn Peacock (blue jacket), Nigel Morris and Ryan Akers of Solar Cutters

Rebate release numbers for 2019-20

Solar Homes – Solar PV rebate releases for owner-occupier and community housing

Rebate per annum: 63,416* (*Some of this allocation may be withheld for manual allocations)

MONTH	RELEASE 1	RELEASE 2	MONTHLY TOTAL
July 2019	3,333	N/A	3,333
August 2019	3,333	N/A	3,333
September 2019	6,500	3.250	9,750
October 2019	3,250	3,250	6,500
November 2019	3,250	3,250	6,500
December 2019	2,500	2,500	5,000
January 2020	2,000	2,000	4,000
February 2020	2,500	2,500	5,000
March 2020	2,500	2,500	5,000
April 2020	2,500	2,500	5,000
May 2020	2,500	2,500	5,000
June 2020	2,500	2,500	5,000

Sunny state of Queensland

Queensland is on track to hit 20 per cent of its renewable energy target next year and achieve its 50 per cent renewable energy target by 2030.

QUEENSLAND IS POWERING AHEAD in renewable energy and now boasts more than 2370 MW of large-scale renewable energy capacity in operation. Another 250 MW has been committed to or is under construction.

With more large-scale renewable capacity at earlier stages of development, Queensland is moving closer to its renewable energy target of 50 per cent by 2030.

"Together, these projects represent more than $5 billion in capital investment and more than 4500 construction jobs in regional Queensland," said state Energy Minister Dr Lynham who was special guest speaker at the Queensland Smart Energy conference in September.

"More than 560,000 Queensland roofs now sport solar systems and 30 solar farms are now generating across the state," Dr Lynham said. During 2018, a new rooftop PV system was installed every 12 minutes, with one in three Queensland households now equipped with solar, and averaging about three solar panels per person which makes the state a world leader.

Combined, the power generated by rooftop PV and solar farms has passed the 4000 MW milestone for generating capacity, more than twice that of the state's biggest power station at Gladstone with its 1680 MW capacity.

More to come

In late October Queensland's CleanCo commenced trading in the National Energy Market after taking ownership of low and zero emission electricity generation foundation assets including storage hydro power stations.

CleanCo will facilitate 1000 MW of new renewable energy projects by 2025 and drive the Queensland Government's Renewables 400

Queensland Minister for Natural Resources, Mines & Energy Anthony Lynham speaks at the conference

"The opportunities are great, and of great value to Australia." Oliver Yates, director of Bronze Boar Investments

Program designed to deliver up to 400 MW of new renewable energy and storage projects in Queensland.

The publicly owned entity was established by the Queensland government under its $1.16 billion Powering Queensland plan to provide reliable clean energy at a competitive price and help meet the state renewable energy target.

The potential of Future North

During the Queensland Smart Energy Conference Oliver Yates called for a state owned North Queensland Development Corporation to unlock $15 billion in capital investment in the region.

More than 30 large scale renewable energy projects could be developed in Queensland that would create 8000 jobs and long-term economic stability, he says.

The framework for investment in the region is mapped out in his paper *Future North*.

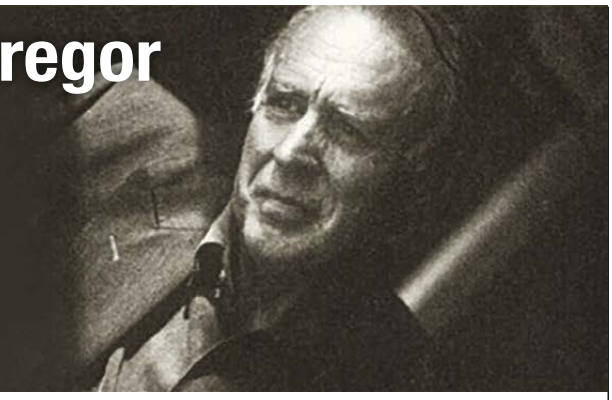
"The transition must get underway … all it needs is a specialised financial team, a state owned North Queensland Development Corporation that can attract other financial institutions and trigger private sector investment in the region," said the director of Bronze Boar Investments.

"The opportunities are great, and of great value to Australia."

The report *Future North* can be viewed at www.smartenergy.org.au

Queensland Smart Energy Conference presentations by thought-leaders including Roger Price of Windlab, Vanessa Sullivan, Attilio Pigneri of The Hydrogen Utility, and Vincent Dwyer of Energy Estate can also be seen on the Smart Energy Council website.

Vale Robert James McGregor



"My philosophy of architecture is of an aesthetic concern with space, structure and materials that produces an organic architecture... integrating material science and engineering efficiency into the design process leads to more 'passive' solutions and far more sustainable buildings, particularly in regard to energy and water use [with] lower energy bills and a more valuable asset."

SOLAR DESIGN ARCHITECT Robert McGregor, a long-time member of ANZSES/AusSES/SEC, passed away unexpectedly a few months ago.

The Sydney University graduate's design studio in Tasmania specialised in passive solar and energy efficient building design. The direction of his work was influenced by the world oil crisis of the mid 1970s when he designed a Solarwall project and became committed to the specialty. Subsequent research projects and housing designs extended his knowledge and fed his enthusiasm.

Here we look at Robert's lifetime achievements through the eyes of Anne Watson, Convener of the Hobart Chapter of the Smart Energy Council:

Robert McGregor moved to Hobart in the 1970s with his young family, after studying architecture at the University of Sydney. In the late 1970s, he worked on the design and construction of the Solarwall Project, two experimental passive solar homes built by the Department of Construction in a Hobart suburb.

These were north facing, and had thermal mass in the form of a Trombe wall in one house and a water wall in the other, but otherwise were standard public housing. This project inspired his career as a designer of solar heated homes.

Robert was a founding member of the Tasmanian branch of ANZSES (later AusSES) in 1982, filling the positions of Chairman, Secretary and Treasurer. He was a passionate advocate for solar passive design and construction, and for public education on the benefits of energy efficiency.

Rob was also a keen bushwalker and the organiser of the first Tasmanian 'Solar House Tour', in winter 1983, to the Central Highlands of Tasmania. This was followed by open homes for many Solar House Days and regular bus tours of solar houses.

His crowning achievement was publication of the Solar Design Series of information pamphlets for cool temperate climates, covering such topics as Glazing, Thermal Mass, Solar Hot Water, etc.

Rob largely funded the graphic design and publication of the pamphlets with successful grant applications. The pamphlets remain very popular with the general public and can be downloaded from www.slt.org.au/warm_homes.

Rob's final activity was organising a series of lunchtime lectures on solar passive design, in conjunction with the University of the Third Age.

Sadly, Rob became ill after delivering the third lecture in mid June, and died that evening. He is survived by his son Iain, daughter Sarah and his grandchildren, and will be sadly missed.

Schneider Electric promotion

Schneider Electric has appointed Mauro DelleMonache Vice President Industry - Pacific.

DelleMonache, who joined Schneider Electric in 2015, said "It is an incredibly challenging but exciting time for the industry. Sustainable and efficient operations are critical to the viability of Schneider Electric, our clients as well as the environment.

"Evolutions in technology are helping to redefine automation, giving companies greater ability to control their business performance in real time."

He said Schneider Electric regards the move to digitisation as key to unlocking untapped benefits.

"Of course, there are risks and challenges such as cyber security, continued need for safe operations and uncertain market conditions. However, I believe Schneider Electric has been able to show how our systems and platforms within our EcoStruxure offering bring tangible, quantifiable positive outcomes to our customers."

www.se.com.au/en

Out and about with the SEC

SMART ENERGY COUNCIL
SOLAR, STORAGE, SMART ENERGY

Pictured clockwise from top left: *Victorians mull over the Solar Homes program; Battery storage masterclass with Steve Blume; Ed Chan of AEMC addresses masterclass; Networking; and Jan Geder of VDE*

Smart Energy Events

Solar Power New York
Albany, New York, USA
12 – 13 December 2019
https://events.solar/newyork

Intersolar North America 2020
San Francisco, California, USA
4 – 6 February 2020
www.intersolar.us

Central Asia Renewable Energy Summit 2020
Astana, Kazakhstan
13 – 14 February 2020
www.renewableasia.org

Global Off-Grid Solar Forum and Expo
Nairobi, Kenya
18 – 20 February 2020
www.offgridsolarforum.org

Middle East Electricity 2020
Dubai, UAE
3 – 5 March 2020
www.middleeastelectricity.com

PV Chengdu 2020
Western China International Solar PV & Energy Storage Technology Exhibition
Chengdu, China
7 – 9 March 2020
www.pvguangzhou.com

Solar Solutions International 2020
North Holland
Netherlands
17 – 19 March 2020
www.solarsolutions.nl

Solartech Indonesia 2020
Jakarta, Indonesia
26 – 28 March 2020
www.solartech-exhibition.net

Smart Energy 2020
Sydney, Australia
7 – 8 April 2020
www.smartenergyexpo.org.au

The Solar Show MENA 2020
Cairo, Egypt
13 – 14 April 2020
www.terrapinn.com/exhibition/solar

Ecoenergy
Sao Paulo, Brazil
14 – 16 April 2020
www.feiraecoenergy.com.br

2nd Annual Solar PV Asset Optimization Forum
Berlin, Germany
28 – 29 April 2020
https://bisgrp.com/event/2nd-annual-solar

Warm Welcome

The Smart Energy Council would like to welcome the following new members:

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MEMBERSHIP QUERIES

If you would like to speak to any of these companies or find out more about membership with the Smart Energy Council please contact Luke Shavak, Membership Sales Manager on 0499 345 013 or email luke@smartenergy.org.au

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About us

The Smart Energy Council is the peak body for the Solar, Storage and Smart Energy Industries.

We are a not for profit, membership based organisation with a proud history tracing back to 1954. Our 1,000 plus members drive our work ensuring that we deliver results for the smart energy industry and the Australian community.

Support the driving force of Smart Energy

The Smart Energy Council:

- Fights hard for smart energy policy
- Provides actionable market intelligence
- Creates valuable networking and introductions
- Delivers high quality training and professional development
- Promotes your business and brand

We represent companies across the Smart Energy spectrum including: solar, solar hot water, storage, energy management, electric vehicles, hydro, wind energy, hydro, bioenergy, ocean energy, geothermal, hydrogen, co- and tri-generation and hybrid and enabling technologies.

We also represent smart energy customers and consumers and provide expert advice to governments and the public.

As the national voice for smart energy the Council is committed to high-quality, long-term smart energy solutions for all Australians.

"We find the industry connections the Smart Energy Council has very valuable for market intelligence and effective lobbying."

– Jamie Allen, LG Chem Australia Pty Ltd.

Become a Member Today

Don't sit on the sidelines. Become a Member and play an active role in driving industry quality, safety, and smart national energy policy.

For further information please contact:

Luke Shavak, Membership Sales
Email: luke@smartenergy.org.au
T: 0499 345 013

Learn more **smartenergy.org.au**

Solar industry Positive Quality™

THE SMART ENERGY COUNCIL'S Positive Quality™ program sets rigorous standards that ensure manufacturers who achieve and maintain high standards are singled out and recognised.

Prominent panel maker **JinkoSolar** meets those high standards and proudly displays the Positive Quality™ logo, a symbol of manufacturing excellence, which sends a signal of confidence to consumers.

Participating manufacturers are fully recognised, consumers enjoy peace of mind and the industry's reputation is strengthened, delivering **Positive Quality™** for all. Australian consumers and businesses can have confidence in the quality of the solar panels they are installing by looking out for the **Positive Quality™**.

POSITIVE QUALITY™
Continuous Quality Assurance

By displaying the Positive Quality™ logo solar companies convey high standards in panel manufacturing to industry and consumers

Solar JinKO
Building Your Trust in Solar

The Smart Energy Council developed the program because the generic appearance of panels makes it difficult to determine good from bad, unless an identification mark denotes otherwise. A logo that signifies superior quality.

The **Positive Quality™** program admits and endorses manufacturers that are independently tested and verified through plant visits. The initial assessment consists of a company's entire manufacturing processes undergoing independent and intensive inspection and testing.

This is carried out by the Smart Energy Council's specially appointed **Positive Quality™** specialists in a three step process: Certification check and compliance with IEC and Australian standards; Factory inspection with a 60-point check; and a Product quality check: appearance, IV, EL, Hi-Pot, and leakage current.

Positive Quality™ participants' premises are then inspected at random every 12 weeks to ensure the continuity of those high standards. All solar PV manufacturers of high quality can participate.

Contact Positive Quality™ Manager Brett Thompson on 0402 181 250, email brett@smartenergy.org.au or visit www.smartenergy.org.au

SUMMER ADVERTISING CONTENT

ADVERTISER	PAGE	WEB ADDRESS
Alpha Technologies	45	www.alpha.com
Aiswei	7	www.aiswei-tech.com
Century Yuasa	17	www.intelepower.com.au/free-engineer
Cobalt Solar	16	www.cobaltsolar.com.au
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Harvey Norman	23	www.harveynormancommercialsolar.com.au
LG Chem	3	www.lgesspartner.com
LONGi Solar	Inside front cover	http://en.longi-solar.com
R&J Batteries	5	www.rjbatt.com.au
REC	36	http://recgroup.com/alpha
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More than meets the eye

At Sungrow we're working relentlessly to make solar energy accessible to all by delivering uncompromising quality at an affordable price, and as the global leading inverter supplier for renewables, this affords us the ability to deliver our customers maximum value. With a workforce of more than 3000, we're proud to employ the word's largest PV inverter R&D team. Having 87 GW+ deployed in more than 60 countries, our products speak for themselves through their performance and reliability. our 22+ year track record of growth and success and more than 15% global market share means we must be doing something right.

Residential

2-10kW single & three phase solar inverters
5kW hybrid inverter
4.8-14.4kWh, residential 48V batteries
With Samsung SDI Li-ion cells

Commercial

15-110kW solar inverters
Covering almost all application fields
50-250kW storage inverters
With battery banks turnkey solution

Utility

250kW world biggest HV string inveter
3.4/6.8MW solar inverter with MV solution
2.5/5MW storage inverter with MV solution

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