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Cover Image: Melbourne’s RayGen Resources has opened a pilot facility in Newbridge, central Victoria, demonstrating its high-efficiency concentrated solar PV technology. Turn to page 26.

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As Tesla’s founder Elon Musk speaks of his vision to use affordable storage to take “a critical step in [the] mission to enable zero emission power generation”, Australian renewable energy policy is taking a step in the opposite direction.

After an 18 month saga, the original renewable energy target of 41,000 GWh is set to be cut by one third. While any deal will be better than the continuation of a multi-billion-dollar investment freeze, the cut to the RET makes Australia not just the only country in the world to repeal a price on carbon, but also the only country that is reducing rather than increasing its renewable energy ambitions.

Meanwhile, the first Emissions Reduction Fund auction has taken place. As the Climate Institute’s John Connor observed, the auction represents a decision to shift the responsibility for emissions reduction from the polluter to the taxpayer. The auction spent more than a quarter of the fund’s $2.55 billion budget on 47 million tonnes of carbon abatement, and it’s unclear what will happen if the fund is exhausted before its emissions goals are met.

It’s also unclear if the scheme’s Safeguard Mechanism – designed to set a baseline for polluters - will be robust enough to actually achieve its purpose of curbing emissions growth.

In the absence of leadership at the Federal level, Australia’s states and territories have agreed to work together on climate change. Representatives from seven jurisdictions met in Adelaide in May to discuss collaboration, and large-scale renewable energy projects in particular. They also received a briefing from the Executive Secretary of the United Nations Framework Convention on Climate Change, Christiana Figueres, who highlighted that both OECD and developing countries are committing to ambitious emissions reductions targets ahead of the Paris Climate Conference in 2015.

The Government is expected to submit its proposed target in July. Will it take on the Climate Change Authority’s recommendation to commit to a 2025 target of 30 per cent below 2000 emissions levels, or continue to buck the global trend? The renewable energy industry will not be holding its breath.

Lucy Rochlin
Editor
CCA Recommends 30 Per Cent Emissions Target

The Climate Change Authority (CCA) has released the first draft of its Special Review report, Australia's Future Emissions Reduction Targets, recommending a national 2025 target of 30 per cent below 2000 emissions levels. The Special Review was requested by the Minister for the Environment to advise the Federal Government's emissions reduction target negotiations. The Government is expected to announce Australia's targets by mid-2015, in preparation for international climate change discussions in Paris in December 2015.

Countries that have already announced their emissions reductions targets are the United States (28 per cent reduction at 2025, relative to 2005) and the European Union (40 per cent reduction 2030, relative to 1990). China has also announced its target - that emissions will stop increasing by 2030.

First Emissions Reduction Fund Reverse Auction

The first Emissions Reduction Fund (ERF) auction for Carbon Abatement Contracts was held on Wednesday 15 and Thursday 16 April 2015. 107 Carbon Abatement Contracts were awarded, committing to deliver a total of over 47 million tonnes of abatement. The total value of contracts awarded was $660 million, representing over a quarter of the ERF’s $2.55 billion budget. The average price per tonne of abatement was $13.95.

The Carbon Abatement Contracts were awarded to 43 contractors covering 144 projects. The majority applied under sequestration methods, and landfill and alternative waste treatment methods.

Tesla Enters The Storage Market

Electric car maker Tesla has made a bold foray into the energy storage market, unveiling a range of batteries for homes, businesses, and utilities that it says will “help wean the world off fossil fuels.”

The products, which include a low-cost domestic system called Powerwall, were launched by company founder and tech mogul Elon Musk in California on April 30. The Powerwall is a lithium-ion battery designed to be mounted inside a garage or an outside wall, and is available in both a 7 kWh model (optimised for daily use applications) and a 10 kWh model (optimised for backup applications). Both models can be “stacked” in a series of up to eight units for those with greater power needs, and come with a guarantee of ten years. A 100 kWh product for utility scale systems called ‘Powerpack’ was also announced. Designed to help utilities smooth their supply of renewable energy, as well as create a more efficient, resilient energy grid, Tesla said that the system can be grouped to scale from 500 kWh to 10 MWh or more.

Wind Farms For Queensland, South Australia and Victoria

A proposed wind farm in the Atherton Tablelands in Far North Queensland has received state government approval, following more than four years of delays and dispute. The 225 megawatt (MW) Mount Emerald Wind Farm near Mareeba would be the biggest wind farm in the state, with the potential to power around 75,000 homes for over 20 years.

The 63-turbine development is a joint venture between RATCH Australia and Port Bajool Pty Ltd. While the project remains subject to further approval, including from Federal Environment Minister Greg Hunt, the Palaszczuk Government is confident it will deliver benefits for the state. Meanwhile, three new wind farms will be built in Victoria and South Australia as a result of the ACT Government’s wind energy reverse auction.

The three winning projects were:
- The Ararat Wind Farm, an 80.5 MW wind farm to be developed by RES Australia west of Ballarat, Victoria
- The Cooerne Bridge Wind Farm, a 19.4 MW wind farm to be developed by Canberra company Windlab Limited west of Bendigo, Victoria
- The Hornsdale Wind Farm, a 100 MW wind farm to be developed by Neoen south-east of Port Augusta in South Australia.

Arena Announces R&D Grants

In April, the Australian Renewable Energy Agency (ARENA) announced up to $20 million for a new research and development (R&D) round dedicated to industry-partnered projects that seek to develop and commercialise renewable energy technologies.

“This round will support industry and research partnerships to deliver R&D projects with practical applications and commercially-oriented outcomes that integrate renewable energy into networks, buildings and industrial processes,” Mr Frischknecht said.

Projects must address one or more of the following four key technology focus areas:
- Balance of System (BoS) cost reduction (either on-grid or off-grid)
- Integration and high penetration of renewables into networks (either on-grid, off-grid or mini-grids)
- Integration of renewable energy for industrial process (excluding electricity generation)
- Integration of renewable energy into buildings or building materials.

Up to $20 million is available, and grants are typically $500,000 – $5 million, with no individual grant to exceed $10 million. Expressions of interest are open until 3 July 2015.
**CLEAN ENERGY MARKET WRAP**

The glorious start to the year in the LGC Certificates market was expected to continue across March with the spot price remaining still circa 1m STCs being held by scheme participants that were not surrendered. The 1m deficit had not been reached by late April.

The extent of the Clearing House outcome was long, with several having incorrectly done so on close to half a dozen times over the years. Yet April 2015 finally saw the event take place in the lead up to Q1 2015 compliance. By month’s end, not only had the immensely patient (or perhaps forgetful) legion of individuals waiting in the queue been cleared, the Clearing House moved into its final position by midyear. The ESC market continued across March with the spot price generally confined to the $17.00-$17.50 range. By late April, with the final date for surrender for 2014 underway, the scheme’s shortfall penalty to just shy of $30 per annum out to 2018. An increase to the scheme’s shortfall penalty to just shy of $30 was also proposed. Participants had less than a month to respond to the options paper, with the government to hand down its final position by midyear.

**DOMESTIC**

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**ENERGY EFFICIENCY MARKET**

Across March and April in the Victorian Energy Efficiency Certificate (VEEC) market, a pricing differential for 2014 and 2015 VEECs was present in the spot market, with the 2014 vintage generally attracting circa $0.50 more than the 2015 certificates, until 2014 buyers disappeared in mid-April. With surrender for 2014 underway, the scheme administrator further outlined its plans for consultation on the expansion of the scheme beyond 2015. As part of this process it modelled several target scenarios including 5.8m for the period 2014-2016, 6.2m for the period 2016-18 and 5.8m for the period 2014–2018, 6.2m for the period 2016–18 and 5.8m for the period 2016–18 and 5.8m for the period 2016–20. While it remains unclear whether any of the above targets will be adopted, the scenarios were viewed as a generally positive sign for the future of the industry in Victoria. By late April, the spot VEEC market sat at $19.20.

**LARGE-SCALE GENERATION CERTIFICATE (STC) MARKET**

The softening spot price came as the first of the year in the LGC market. In the STC market the list of pundits that had predicted the clearing of the Clearing House is long, with several having incorrectly done so on close to half a dozen times over the years. Yet April 2015 finally saw the event take place in the lead up to Q1 2015 compliance. By month’s end, not only had the immensely patient (or perhaps forgetful) legion of individuals waiting in the queue been cleared, the Clearing House moved into its final position by midyear. The ESC market continued across March with the spot price generally confined to the $17.00-$17.50 range. By late April, with the final date for surrender for 2014 underway, the scheme’s shortfall penalty to just shy of $30 per annum out to 2018. An increase to the scheme’s shortfall penalty to just shy of $30 was also proposed. Participants had less than a month to respond to the options paper, with the government to hand down its final position by midyear.

**NEW SOUTH WALES’ ENERGY SAVINGS CERTIFICATE MARKET**

New South Wales’ Energy Savings Certificate market also received some much anticipated news, with the release of the Baird Government’s scheme review.

Marco Stella is Senior Broker, Environmental Markets at TFS Green Australia. The TFS Green Australia team provides project and transactional environmental market brokerage and data services across all domestic and international renewable energy, energy efficiency and carbon markets. This information has been provided by TFS Green and relates, unless otherwise indicated, to the spot prices in Australian dollars, as of 27 April 2015.
Once completed, the DeGrussa Solar Project will be one of the largest integrated off-grid solar power systems in the world. *EcoGeneration* talks to juwi Managing Director Andrew Drager about the challenges of constructing a remote hybrid energy system in Australia.

Earlier this year, juwi Australia signed an agreement with Sandfire Resources to construct a 10.6 MW solar power station at Sandfire’s DeGrussa Copper Mine in Western Australia. The agreement will be structured to maximise the consumption of lower cost solar power, and therefore reduce reliance on diesel.

The innovative $40 million project – which will involve construction of the largest integrated off-grid solar power system in Australia and the world – has the potential to establish DeGrussa as an industry leader in the use of renewable power for mining and processing operations.

The solar power station will utilise a 10.6 MW solar array, comprising 34,080 solar PV panels that track the sun and a 6 MW battery. It will be constructed on 20 hectares of land near the site of the current underground mine and a 1.5 MMt/a concentrator.

Additionally, it will be fully integrated with the existing 20 MW diesel-fired power station at DeGrussa, meaning the diesel power station will continue to provide base-load power to the DeGrussa mine, so it has sufficient minimum load to ensure it can respond quickly to meet the power requirements of the process plant and underground mine.

Mr Drager says juwi Australia is excited to work with Sandfire Resources NL and Kalgoorlie Power Systems to supply low-cost renewable energy to the mine. 

---

**DEGRUSSA SOLAR PROJECT TO TRANSFORM HYBRID POWER GENERATION**

*Image: The open pit at the DeGrussa Mine.*

**DOUBLE-Glass Module DIAMOND CS6K-255/260P-PG**

Canadian Solar’s Diamond module is a double-glass module. By replacing the traditional polymer back sheet with heat-strengthened glass, the Diamond module has less annual power degradation and is more reliable and durable during its lifetime. What’s more, the Diamond module has no metal frame and is Potential Induced Degradation (PID) free because it requires no module level grounding, which eliminates the cause of PID. To discover how you too can enjoy the benefits of solar power visit www.canadiansolar.com.
“Sandfire Resources is an innovative company in its approach to the discovery, production and sale of copper. Fortunately for the industry, it is also focused on minimising its environmental impact, which makes the project a prime candidate for such an innovative renewable energy system,” Mr Drager says.

He explains that the two key aspects of project negotiations were to ensure there was no risk to the mine operation and to provide a sufficient commercial benefit to Sandfire.

“juwi will undertake the construction and operation of the 10.6 MW solar plus 6 MW battery facility, allowing Sandfire to remain focused on their core business of developing and operating high-quality resource assets. The solar PV system will provide the majority of daytime electricity to substantially reduce the mine’s dependence on imported diesel.”

**PROJECT CONSIDERATIONS**

With construction on DeGrussa due to commence shortly, juwi faced many technical challenges that were unique to designing a utility scale renewable energy system with a full diesel-off mode capability for a remote mine.

**CHALLENGES OF HYBRID ENERGY SYSTEMS**

Mr Drager says Australia has always been a world leader in hybrid energy systems, although there are a few obstacles that have hindered its widespread adoption in Australia. According to him, these issues include:

- Equipment costs – batteries, solar panels, and inverters
- Installation costs – construction procedures and processes
- Low-cost financing – non-recourse debt
- Fossil fuel subsidies – diesel (SO 38/kWh fuel tax rebate) versus renewable energy (taxed equipment and labour)
- Sustainability focus – CO2 emissions and social responsibility.

“Many of these aspects are now improving, thereby making renewable off-grid solar power systems more commercially and environmentally viable,” Mr Drager says.
Mr Drager says juwi had to take into account the following considerations:

• A short-term power purchase agreement to match the minimum mine life
• High installation and logistical costs for a site 150 km from the nearest town
• 20 per cent fall in the Australian dollar since the process began
• The fact that a high portion of solar production is curtailed to ensure grid stability
• Extremely hard soil and rock throughout the project site.

SYMBIOTIC RELATIONSHIP BETWEEN RENEWABLE ENERGY AND RESOURCES

All in all, the DeGrussa Solar Project is an important milestone in the integration of renewable energy and the resources industry, particularly in remote locations such as the DeGrussa Copper Mine, which is located some 900 km north east of Perth.

Sandfire Managing Director Karl Simich said the company had been working on the solar power initiative since 2013, with the project representing an attractive opportunity to participate in a low-risk renewable energy project with a minimal capital requirement.

“Funding is being coordinated by juwi, which will own and operate the facility, with Sandfire’s cash contribution to the project totaling less than $1 million.

“This is a very manageable project which, importantly, will not impact on the efficiency or safety of our existing operations, while allowing Sandfire to make a solid contribution to the broader challenge of reducing CO₂ emissions and potentially reducing our operating costs in the long run.

“It has the capacity to significantly reduce our medium and long-term power costs, especially with further extensions of the mine life of the DeGrussa Project.”

The project is expected to achieve significant savings of five million litres of diesel fuel per annum and reduce the DeGrussa Copper Mine’s CO₂ emissions by an estimated 12,000 tonnes per year. Mr Simich is confident the project will help to promote the use of renewable energy in the resources industry, and potentially streamline and improve the technology to make a bigger contribution to powering mine sites in the future.

“This project is entirely consistent with our ongoing efforts to optimise and enhance our operations at DeGrussa and reduce costs wherever possible.”

– KARL SIMICH, SANDFIRE RESOURCES

Construction of the project will commence in the second quarter of the 2015 calendar year, with completion expected by the end of 2015 and commissioning in the first quarter of the 2016 calendar year.

“Commercial Solar that means business

Superior project economics. Increased energy harvest. Higher system availability. Lower material and labour costs.
IT Power (ITP) has been using battery energy storage to optimise the design of remote PV diesel hybrid mini grids for many years. These batteries are used for a range of purposes. Small installations are used for maintaining power quality, while larger systems are used for peak shaving and bulk energy storage.

For decades lead-acid technology has been the industry standard, however, competing technologies are appearing on the market, especially lithium-ion batteries. Given recent reductions in the cost of lithium-ion batteries and the significant advantages the technology offers (according to the manufacturers, at least), we believe now may be the time to transition to this new storage technology.

A significant barrier, however, is that energy system designers and end users are reluctant to transition to new technologies, especially for remote applications where reliability is critical. In part, this reticence is due to a long-history of over-stated manufacturers’ claims, which are often underpinned largely by lab-based tests lacking independent verification.

Our project, therefore, aims to independently test the performance of six major lithium-ion battery brands, an ‘advanced’ lead-acid battery and a conventional lead-acid battery side by side. The testing will include hot daytime and cool overnight temperatures, similar to real-world conditions.

A three-year battery trial aimed at improving investor confidence in new battery technologies will compare the performance of lithium-ion batteries and lead-acid batteries, explains IT Power Managing Director and EcoGeneration Editorial Board Member Simon Troman.
Several battery types have already been shortlisted on the basis that they are both commercially available and cover a spectrum of prices and battery chemistry variants within the lithium-ion family.

Lithium-ion battery manufacturers claim the technology has a number of benefits compared to lead-acid batteries. These include:

- Higher efficiency - a typical lead-acid battery will deliver 75-80 per cent of the energy that was input during charging, compared to around 95 per cent for a lithium-ion battery.
- They can be more completely discharged, lead-acid batteries should not be regularly discharged more than about 30 per cent, compared to 80 per cent for lithium-ion batteries.
- Longer lifetimes (measured in charge/discharge cycles)
- Higher tolerance to high temperatures
- Lower risk of gas explosions, since no hydrogen is produced
- Lighter and more compact for the same energy capacity (a feature that is highly relevant for remote installations)

While lithium-ion batteries currently have a higher upfront capital cost than lead-acid technology, our analysis indicates that the longer battery lifetime and better performance in hot conditions can result in lower overall project costs, and therefore, a lower overall project costs, and therefore, a lower system levelised cost of energy (LCOE).

It is also notable that the capital cost of lithium-ion technology is likely to decrease as production volume increases. Lead-acid battery technology, by contrast, is a mature technology with stable prices.

ADVANCED LEAD-ACID BATTERIES
We also plan to include an ‘advanced’ lead-acid battery in the trial. These refer mainly to lead-carbon batteries, a technology that retains the working principles and components of traditional lead-acid batteries, but incorporates an ultracapacitor to improve performance. Though energy density remains the same, developers claim the addition of the ultracapacitor allows for high-rate capability, reduced sulfation, and tolerance of partial state of charge operation, with little increase in manufacturing cost. These features could make the technology well suited to stationary storage applications, including high penetration renewable integration.

A LACK OF INVESTOR CONFIDENCE
Despite the claimed benefits of both lithium-ion and advanced lead-acid batteries, there are very significant barriers impeding the up-take of the technology. These barriers include:

- A lack of reference projects and independent performance trials.
- A high degree of trust in conventional lead-acid technology (despite its limitations) because of its very long (more than 100 year) track-record.
- The relatively high upfront capital cost compared to lead-acid technology.
- A lack of standardisation of lithium-ion batteries (at this time), meaning that batteries must be carefully matched with chargers/inverters.
- A lack of standards for installation and use.

THE BATTERY TEST
The battery test will take place at the Sustainable Training Hub at the Canberra Institute of Technology, and is supported by a $450,000 Australian Renewable Energy Agency Emerging Renewables Program grant.

Several battery types have already been shortlisted on the basis that they are both commercially available and cover a spectrum of prices and battery chemistry variants within the lithium-ion family.

Each battery will be cycled (charged and discharged) several times per day, albeit within the manufacturer’s specifications, in order to produce informative test results within three years. This will be achieved by using a battery management system (BMS) that ensures that battery cells are being evenly charged and discharged. The BMS also controls the change rates and target levels to prevent overheating and damaging the batteries.

The main objective of the testing is to measure the batteries’ decrease in storage capacity over time. As the batteries are cycled they lose the ability to store as much energy as when they are new.

INFORMATION TO BE PUBLISHED
The central objective of the battery test is to create critical knowledge for future energy storage investors. ITP will therefore publish detailed analysis of the data every six months over the three years of the test. The detailed analysis reports will address:

- The technical performance and cost-effectiveness of each battery type/brand compared to each other and the conventional lead-acid batteries.
- How actual performance compares to the manufacturers’ claims.
- Why some batteries may be performing better or worse than expected and whether this may or may not be expected in real world applications.
- Lessons that can be drawn about the hypothetical investment for a range of on-grid and off-grid applications.

If the battery trial successfully demonstrates that lithium-ion and or advanced lead-acid technology is both reliable and cost-effective compared to traditional lead-acid batteries, then there will be three outcomes:

First, future off-grid systems that would have used conventional lead-acid battery storage may use lithium-ion or advance lead-acid technology instead. Depending on how much cheaper the new storage technology proves to be, the amount of storage will be increased. This in turn will facilitate the installation of larger renewable energy systems and ensure that renewable energy makes a larger contribution to the system’s total energy output.

Second, some off-grid systems that would not have used any conventional lead-acid battery storage will instead opt for some battery storage, again facilitating an increase in the reliance on renewable energy.

Finally, network utilities operating loss-making sections of the main grid will seriously consider renewable energy-based hybrid mini-grids, supported by battery storage.

All cases will have the effect of increasing the overall contribution that renewable energy makes to a remote mini-grid, and/or reducing the LCOE of the renewable energy component of the system.
The Australian Storage Industry Roadmap will help develop the foundation to deliver the technology’s full potential through collaboration with industry, regulators and careful strategic planning, said CEC CEO Kane Thornton.

In addition to the road map, the CEC is inviting stakeholders who are active or looking to learn more about the Australian storage industry to sign up to the new Energy Storage Network, so that they can be kept up-to-date on the latest industry developments and progress on the roadmap.

The CEC is also establishing a new Storage Advisory Group, and is inviting leading companies interested in storage to join. The work of the Advisory Group will complement the Council’s ongoing work on technical standards and safety issues.

Mr Thornton said that the roadmap brings to light work that the CEC has been doing behind the scenes on energy storage, and sets the course for the hard work that still needs to be done on standards, regulations and removing barriers.

“Energy storage technologies are a game changer for the Australian energy...”

To download the roadmap and sign up to receive updates through the Energy Storage Network, visit cleanenergycouncil.org.au/storage.

To download the roadmap and sign up to receive updates through the Energy Storage Network, visit cleanenergycouncil.org.au/storage.
The roadmap focuses on five key objectives for the sector, and outlines actions that the CEC intends to undertake to address these objectives.

Objective 1: Analyse and monitor the growth of the storage sector.
Action: The CEC will undertake an annual Australian storage industry survey to gauge actual levels of deployment in 2014 and expectations for 2015. It will also work with key regulators and utilities to seek new ways to gather key data on storage deployment and monitor the sector’s development.

Objective 2: Ensure the development of standards and integrity of the storage sector.
Action: Complete a comprehensive storage safety performance study which will advise on international best practice for battery installations, maintenance and disposal.
Action: Develop guidelines for the installation of residential- and commercial-scale storage technology, and establish a robust accreditation regime to ensure these guidelines are followed by Australian installers.
Action: Work with Australian Battery Recycling Initiative to establish an agreed approach to the safe disposal of battery technology.
Action: Work with Standards Australia to establish standards for storage technology and develop a listing of products approved for installation in Australia.

Objective 3: Ensure effective regulation and policy to support the uptake and implementation of storage technology.
Action: The CEC will identify and advocate policy solutions that overcome the barriers to storage investment, through the ‘Future-Proofing in Australia’s Electricity Distribution Industry’ project.
Action: Ensure electricity tariffs don’t discriminate against the use of storage.
Action: The CEC will continue its policy and advocacy work on indirect barriers to investment in storage systems.
Action: Complete an assessment of the direct and indirect policy measures that are available to support energy storage.

Objective 4: Co-ordinate the emerging sector, raising awareness about best practice implementation and engagement in policy and regulatory issues.
Action: Establish the Energy Storage Network to share information, host webinars, networking and other events to facilitate local and international knowledge sharing and investment.
Action: Work with relevant international partners and countries and share best practice and international experience with the emerging Australian storage sector.

Objective 5: Promote storage technology and its potential to consumers, policy makers and regulators.
Action: Develop and promote a Consumer Guide for Battery Storage Installations to build consumer awareness and demand for energy storage.
Action: Develop and promote a guide to improving electricly use for business - demand-side management solutions to build awareness among small-to-medium-sized enterprises about the range of options available - including storage.
Action: Provide a strong voice for storage and promote the technology through the CEC’s extensive networks. This will include industry reports, media outreach, storage events, including the Clean Energy Council Australian Clean Energy Summit in July, All-Energy Australia in partnership with the Clean Energy Council in October, and other key events.

The CEC is establishing a new Storage Advisory Group, and is inviting leading companies interested in storage to join.

To download the roadmap, visit www.cleanenergycouncil.org.au/storage
To join the Energy Storage Network, or express interest in joining the Storage Advisory Group, contact storage@cleanenergycouncil.org.au
Even in the hyperbolic world of marketing and PR, saying you have developed “the world’s lowest-cost energy solution” is no small assertion. And yet this is exactly the claim made by Melbourne-based tech company RayGen Resources. The company specialises in highly efficient, utility-scale concentrated solar photovoltaic (CSPV) systems. And though it may be too soon to make a call on the promotional claims – the company only recently cut the ribbon on its pilot facility in Newbridge, central Victoria – the technology is certainly turning heads, with investors queuing to get a piece of the action, and a $60 million deal already in place to supply CSPV technology into China. It’s impressive stuff for a five-year-old company. And as it turns out, it’s all done with mirrors.

As with other CSPV systems, RayGen’s technology relies on an array of heliostat (sun-tracking) mirrors that bounce sunlight onto a central receiver tower. The computer-controlled heliostats locate themselves and the tower with GPS, automatically tracking the sun’s progress and keeping the maximum amount of sunlight directed at the receiver. The solar receiver then transfers both heat and electricity into a power centre on the ground, which provides a compressed air storage system and power delivery on demand. “RayGen’s CSPV technology uses an array of 56 heliostat mirrors,” says Ivor Frischknecht, CEO of the Australian Renewable Energy Agency (ARENA), which provided $17 million funding for the Newbridge project. “The receiver efficiently converts a high proportion of sunlight to power while an advanced cooling system keeps it from overheating.”

However, the real wizardry of RayGen’s system lies in the receiver itself. Powered by advanced semiconductor devices produced in Melbourne, and based on technology originally designed to power spacecraft, RayGen’s receiver boasts some of the best efficiencies yet seen in solar PV. According to RayGen, their PV cells – which are composed of several layers of gallium, each tuned to capture a different part of the sun’s light spectrum – are twice as efficient as traditional silicon-based solar panels. In fact, the company recently set a world record, in collaboration with the UNSW, for the conversion of sunlight into electricity. At more than 40 per cent system efficiency, the result put solar ahead of fossil fuels for the first time.
RayGen recently set a world record for the conversion of sunlight into electricity, putting solar ahead of fossil fuels for the first time.

**TOTAL CONCENTRATION**
For RayGen CEO Robert Cart, the result was an exciting milestone in enabling utility-scale solar power to become a more viable alternative to fossil fuels. “It means we move one step closer to a world where sunlight is our primary form of electricity generation,” he said.

And it gets better. Dr John Lasich, RayGen’s Chief Technology Officer and world-renowned solar technology innovator, said: “we expect to achieve close to 45 per cent system efficiency in the next few years”.

All this innovation has not gone unnoticed, or unrewarded. Last September, RayGen won the Energy Technology Award and the People’s Choice Award at the Australian Technology Competition. In December, it scooped the Grand Prize in the 2014 Global CleanTech Cluster Association Awards in Switzerland, beating a field of more than 10,000 of the world’s most innovative clean-tech companies.

The big money is also taking note. Last April RayGen signed a $60 million distribution deal with Intense Solar to supply its technology into China, with a target to secure global exports beyond $1 billion by 2020. The deal included a $2 million investment in RayGen. At the launch of its pilot facility, the firm also signed an agreement with commercial partner Juye Solar for an additional capital investment of $6 million, with a further $15 million promised for the development of RayGen’s offering in China.

However, while RayGen’s plans for world domination are evidently well advanced, so far its CSPV system has only been installed in one facility, in Newbridge, as well as at a test facility in Bayswater, Melbourne (funded by the Victorian Government), where much of the testing and fine tuning took place. The 200 kilowatt (kW), grid-connected CSPV station at Newbridge took 18 months to build, at a cost of $3.6 million. It features 56 self-powered heliostats, a wireless mesh network for heliostat control and a central inverter, with AC output feeding the farm network to displace mains grid metered consumption.

The location in central Victoria was considered ideal for the pilot facility, says Mr Cart, because “the Loddon shire area offers substantially more sunlight over the course of a year compared to Melbourne, yet it’s only a 90-minute drive from our Melbourne headquarters. In addition, we’ve partnered with local agricultural business, Scato Plus, which is buying all the power (behind the meter).”

**PROOF OF CONCEPT**
For RayGen – and for its backers – Newbridge is all about proving the technology, in preparation for the rollout of larger, utility-scale CSPV stations across the globe. “The pilot plant is providing data on performance, reliability, operations and maintenance that can be used for the development of a commercial scale CSPV system,” says Mr Frischknecht. “These outcomes will be shared with the broader energy industry.”

So far, the project has been an unqualified success. There were no major delays during construction, and, since going online in March, the station has hit all its targets for output and reliability.

“The project is supported by ARENA,” says Mr Cart, “and we have successfully...”
met all the technical milestones, including the power requirement, and we’re in the process of delivering a final wrap-up report to complete the program. The process of testing and optimising the system will take a further two to three months before an official ‘handover’ from engineering to operations, after which our focus will turn to uptime and the collection of ‘bankable’ data.”

THINKING LOCAL

Of course, supplying 200 kW to a single compost farm in regional Victoria may not seem like a great stride towards solving the world’s energy needs, but part of the beauty of RayGen’s system is that it can be scaled very rapidly.

A key reason for this is that much of the manufacturing and assembly of the system can be done locally. The main bulk of a CSPV power station is the heliostat array, which is made primarily of steel and mirrors. Unlike solar PV cells, these can be produced cheaply and easily almost anywhere in the world, and, because the heliostats do not require any field electrical or controls trenching, installation is quick and easy. As a result, RayGen only has to provide the high-tech components and the software from Melbourne, while everything else can be subcontracted to local partners.

Scaling up is the obvious next step, and as part of its deal with Intense Solar, RayGen already has an order for a 1 MW demonstration power station in Zhangiakou, China, to be deployed early 2016. This will be followed by a 10 MW power station in Qinghai, China, made up of 40 heliostat arrays each rated at 250 kW (due for completion in 2016-17). RayGen is close to announcing a memorandum of understanding for a larger project in China with a large state-owned enterprise to follow on from this,” adds Mr Cart. “In addition, we’re in discussions with a large Indian company for a similar arrangement to China and we’re developing a ‘utility scale’ project in Australia.”

Clearly, these megawatt projects are in a different league from Newbridge. The Qinghai facility alone will boast 2,560 heliostats, compared to the 56 deployed in Newbridge. That’s a lot of mirrors, and it raises the question of how much land area is required for such developments. But, Dr Lasich is quick to point out, the amount of land mass required for RayGen’s technology is actually smaller than for other solar technologies.

“The energy for RayGen’s CSPV output is about 20 per cent higher than PV for a given land area,” he says, “and over 30 per cent higher in areas of high Direct Normal Irradiation (DNI).” Again, this is a factor that should drive down the cost of the technology, especially at scale.

WHAT’S THE CATCH?

Predictably, it’s not all roses in the world of CSPV, and there are some barriers to the development of the technology in Australia.

“The key barriers to utility-scale PV projects in Australia are low wholesale prices and uncertainty surrounding the RET that makes project financing difficult,” says Mr Cart. “Given the cut to the RET proposed..."
by CEC and others, it is unlikely that there will be significant utility-scale solar deployment in Australia in the short term because wind technology is more mature and presently lower cost than PV in Australia. As a result, it’s likely to dominate any reduced RET scenario.” Mr Frischknecht notes that there are inherent costs and risks associated with any new technologies, including “higher interest rates, higher supply chain costs and big construction contingency margins.” He also points out that renewable energy systems like CSPV must be successfully tested in the grid to prove that they can operate reliably without causing network disruptions. He adds, significantly, that “CSPV is an emerging technology and is not yet cost competitive with other sources of power generation.”

And this, ultimately, is the catch (for now at least). Because, while RayGen’s technology is undeniably impressive, it has yet to prove its claim that it can provide the world’s lowest-cost energy technology solution. The pilot facility at Newbridge cost $3.6 million for 200 kW, and it’s yet to be seen how this price will come down with scale.

RayGen, however, remains bullish. “With scale, CSPV could be half the cost of PV,” says Mr Cart, “because it is 2.5 times more efficient, contains 50 per cent less mass (i.e. essentially uses 50 per cent less steel and glass), has no collector field wiring and is cheaper to manufacture.” He adds that, according to the best forecasts, the costs of concentrated PV systems will fall faster than traditional PV, thanks to ongoing cell efficiency improvements and – in particular – reductions in heliostat cost.

Time will tell if such factors make CSPV viable for wider deployment in Australia. But if you can believe the hype, and plans for a global rollout of CSPV do come to fruition, this little company from Melbourne could soon be at the centre of something very big indeed.

“The key barriers to utility-scale PV projects in Australia are low wholesale prices and uncertainty surrounding the RET that makes project financing difficult.”

- RAYGEN CEO ROBERT CART

I LIKE TO MOVE IT

There’s another, less obvious, advantage to RayGen’s technology, one that the company has been pitching to the Australian mining industry. That is, because of the modular nature of the system, you can actually pick it up and relocate it if required. This could be particularly appealing for remote, off-grid mining operations or other remote applications where circumstances are highly changeable.
For global logistics company DB Schenker, solar power makes a lot of sense – both for the company’s bottom line, and its commitment to sustainability. EcoGeneration spoke with DB Schenker Australia CEO Ron Koehler and Epho Managing Director Oliver Hartley about two commercial scale projects in New South Wales and Queensland.

Globally, DB Schenker is the world’s second largest transportation and logistics services provider (based on revenues and performance), and has a presence in some 140 countries around the world. Driven by an ambition to become the world’s most environmentally sustainable logistics provider, DB Schenker’s commitment to sustainability is part of the company’s overall business strategy.

DB Schenker Australia provides a range of international air and sea freight forwarding and logistics services from its 18 logistics and freight forwarding sites in Australia. The large amount of roof space available to the company, coupled with its energy profile, mean that solar presents a valuable opportunity.

Last year the Australian arm of the company engaged commercial solar power specialist company Epho to complete two commercial-scale installations: 51.75 kW at a warehouse facility in Eagle Farm, near Brisbane Airport, and 100 kW at its Australian Head Office in Alexandria, eastern Sydney.

THE TARGETS
Currently, approximately 15 per cent of all energy consumed worldwide by DB Schenker’s stations and warehouses is derived from renewable energy. It plans to increase that percentage in order to reach its 2020 emissions reduction target of 20 per cent. Other strategies include using fuel efficient vehicles, smarter route planning, and increasing the rail component of full container load freight (rail can be up to 70 per cent more efficient than a semitrailer for distance trips).

GLOBAL LOGISTICS COMPANY CHOOSES SOLAR
Electricity generation from solar power is also part of the emissions target reduction game plan. “Solar energy is an extremely viable way to achieve lower consumption because of the vast and unobstructed roof spaces available to warehousing facilities. The business case is simple as there are very few variables involved. For us it means an investment with almost zero risk and very few internal resources required to set it up,” says Mr Koehler.

According to DB Schenker, solar PV can account for 12 per cent and 20 per cent, depending on the facility location and whether it is cooled or contains testing labs for the electronics vertical market. “The newest PV system installed in Alexandria accounts for 16 per cent of the total consumption, producing 135,000 kWh of electricity over a year.”

THE TENDER

When engaging a partner for the installation of the two PV projects, DB Schenker Australia’s followed its standard tendering process for medium to large investments, requiring a minimum of three proposals. “In fact, a larger number of proposals were sought for this project. We wanted to get a feel for the market, an understanding of the players out there, the quality of the systems and workmanship. Our national environmental lead is a PV engineer, which was a great advantage in steering us in the right direction,” says Mr Koehler. Mr Koehler attributes Epho’s success in winning the tenders to strong communication, competitive pricing, system quality and technical expertise. “Epho works closely and flexibly with us to enhance the value of our solar installations and demonstrate our commitment to sustainability;” says Mr Koehler.

“Satisfying our clients’ sustainability needs is equally as important as our 2020 target. This is a key reason why we value Epho as a supplier. Innovative features such as a monitor that displays real time energy production help to demonstrate the impact we are making and educates the broader community. This involvement, together with a strong technical base, have enabled us to form a valuable and collaborative relationship.”

THE PROPOSAL

For Epho, the solar business case for the Alexandria project was reasonably straightforward, as electricity rates and interval data were readily available for modelling purposes. Epho was able to forecast the detailed power output predictions and translate the kWh produced into actual predictions of dollar savings. →
The Brisbane project required a more complex set of calculations, because the installation was to be located on a brand new site. “While the power output of the system could be accurately predicted, the electricity rates and usage patterns were not yet established, so we needed to make some assumptions,” explains Mr Hartley.

Drawing on its expertise in these types of projects, Epho was able to prove a valid business case and payback period, “without just being hopeful on the figures,” says Mr Hartley.

THE INSTALLATION

Each project posed its own challenges during installation.

The Brisbane system was installed on a newly constructed building, located on a construction site that was still active. Mr Hartley says that fitting in with the timings of the builder meant planning had to be spot on. “In addition, the document specifying the work, health and safety requirements was as thick as a book. Luckily, Epho has a great focus on process and project management, and all the necessary documentation was available.”

The installation was otherwise straightforward, says Mr Hartley. A scissor lift was used for materials and personnel, and ample roof space meant there were few design constraints.

The Alexandria location posed more of a challenge, due to access restrictions and electrical upgrade requirements. “Crane access was required, and there was also narrow road access for that crane. While there was ample roof space, the building had very wide purlin spacing, meaning there was only really one rail system that was suitable from an engineering perspective,” Mr Hartley notes.

Epho was also required to obtain independent structural engineering signoff, as part of the Compliant Development Certificate process, which is mandatory in NSW for any systems over 10 kW. Due to the long distance between the inverters and the main switchboard, a sub board was used, which necessitated a major upgrade to the main switch board. Last but not least, being in an Ausgrid area meant that network protection was required, a hardware/software solution requiring independent testing.

OLIVER HARTLEY’S ADVICE ON WINNING COMMERCIAL TENDERS

Be an advisor, not just a quote-giver

Clients sometimes know what they want, but in many cases there is still some limitation to their knowledge. A typical example is system size. A customer often wants a larger system than will fit on their roof, or than their consumption will accommodate, so sometimes there is a fine line between answering a tender’s request for information, and agreeing with what’s been requested.

Credibility matters

Epho is a highly technically focused company, and while this may seem geeky to some, it serves customers. There are a lot of factors that come into play with larger solar systems, and many companies just wing it. We need to explain why our focus on engineering matters. Many customers focus on payback period and return on investment, but if you consider the lifespan of the system and what is needed in order to have it working at year five or 10 or 25, often the lowest price is no longer credible.

The challenge is to make clients realise that we focus on these things because we share a common goal: the long term financial performance of the system. Epho has just been accredited for ISO 9001, ISO 4801 and ISO 14001, which demonstrates our level of seriousness in relation to quality results for the customer.

Pick your battles

There are many opportunities to tender. It is important to choose those that match your skillset and area of expertise. Considering the time and expense involved in responding to a tender, it is important to be selective.

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The transition to a smarter, more data-driven electricity grid is considered essential for the smooth integration of renewables. The revolution is well underway in Australia – and it goes way beyond smart meters.

The idea of a modernised electricity grid – or so-called ‘smart grid’, which communicates and gathers information as well as just transmitting power – is one that seems obvious in retrospect. While all around us other technologies have changed beyond recognition, including monolithic infrastructures like telephony, the electricity grid still works much the way it did 50 or 100 years ago. But a major transformation is underway. In many parts of the world, not least Australia, the grid is being upgraded to a smarter, less centralised and more dynamic, electrical grid. And while there are many compelling reasons for this shift, one of the main drivers is the inexorable rise of renewable power.

According to Paul Budde, founder and CEO of industry body Smart Grid Australia (SGA), the global push towards renewables is creating massive upheaval in the electricity sector. “A fundamental shift has taken place in environmental policies since 2007, and this is having a huge effect on the market,” says Mr Budde. “Smart grids, smart meters, electric vehicles and solar panels now are all well and truly part of new government policies and industry initiatives, all aimed at saving energy and moving to cleaner energy sources.”

The old grid was not designed with such technologies in mind. It was built for centralised, one-way distribution, whereas small-scale solar and other ‘distributed’ power technologies are moving us towards a more dynamic, internet-like system. Equally, where the old grid was built on predictable, controllable energy sources, renewables like solar and wind are by nature intermittent and unpredictable, meaning more control is required to integrate them smoothly.

Clearly, the old grid is no longer up to the task.

“The electricity industry has finally woken up to the challenges ahead of them,” says Mr Budde. “And they’ve realised that the old infrastructure is no longer able to cope with these changes. Massive investment projects have since been commenced, with much more to come.”

Globally, he puts the cost of retooling the grid at a colossal $200 billion over 20 years, adding that “an essential element of this transformation will be the use of smart technologies”.

GETTING SMART

So what are these technologies? So far, the main example to be rolled out is smart meters – domestic and commercial electricity meters that measure and record electricity usage every 15 or 30 minutes, and send this information back to the supplier. The advantages to the supplier are many, says Mr Budde. Smart meters can be read remotely, thus doing away with the operational costs of manual meter reading. They allow suppliers to detect outages more promptly and accurately, allowing faster restoration of service. And they register the time of day that electricity is being used, enabling the development of new tariffs that offer financial incentives for people to avoid non-essential electricity use during peak periods.

“Well with the introduction of smart meters, consumers can play a larger role in reducing peak usage,” says Mr Budde, “while also minimising their electricity bill.”

This last point, which comes under the general heading of ‘demand side management’ (DSM), has been emphasised more strongly in other countries than it has so far in Australia. In the UK, where more than a million smart meters have been installed, every domestic smart meter comes with a hand-held display unit that allows householders to monitor and manage their energy usage. This is not the case in Australia, but Mr Budde insists that the future of customer interaction lies in apps (for mobile phones and tablets), rather than display-based customer interfaces.

Either way, the aim is to empower the customer to reduce their energy usage, especially at times of peak demand. “The goal of DSM is to encourage the consumer to use less energy during peak hours, or to move the time of energy use to off-peak times such as night-time and weekends,” says Mr Budde. “Peak demand management does not necessarily decrease total energy consumption, but could be expected to reduce the need for investment in networks and/or power plants.”

PLAYING CATCH-UP

Initially, Australia was slow on the uptake with smart energy technologies. Developments in the area have been going on “for decades” says Mr Budde, but the first major Australian rollout – which took place in Victoria – only got underway in 2009.

“Initially there were problems, but in 2012 the project turned the corner and Victoria is now seen as one of the global leaders in smart grid/smart meter developments.”

The Victorian project is now approaching completion, with almost 2.8 million meters installed across the state. There has been resistance in some quarters, with fear campaigns such as Stop Smart Meters →
Globally, Mr Budde puts the cost of retooling the grid at a colossal $200 billion over 20 years.

Australia citing a variety of health, privacy, and safety issues. However, as of 1 April 2015, anyone in Victoria who still refuses to have a smart meter installed may be charged a so-called ‘manual meter fee’ – a penalty payment by which ‘electricity distributors will be able to recover the costs associated with running a separate meter reading service’ (details at www.smartmeters.vic.gov.au). The Victorian Government has speciﬁed a level for the fee, only that it must ‘reﬂect the cost of continuing to provide manual meter reading services’. The efficacy of this fee is yet to be seen, but it shows that shifting to the smart grid is no longer optional.

With the installation phase effectively complete, the Victorian Government is now reviewing the beneﬁts of the smart meter network (known as Advanced Metering Infrastructure or AMI). SGA was invited to contribute to the AMI review, and it found a range of beneﬁts that went far beyond mere automated meter reading. These included some unexpected safety beneﬁts arising from mass of data ﬂowing back to suppliers. SGA president Judy Anderson explains that by which “electricity distributors will be able to recover the costs associated with running a separate meter reading service”. The efﬁcacy of this fee is yet to be seen, but it shows that shifting to the smart grid is no longer optional.

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SMART GRID DEVELOPMENTS IN EUROPE

Smart grid investment in pilot projects has been booming over the last decade, exceeding €3 billion in Europe alone. However, key questions remain unanswered: who are the players conducting research into smart grids, and how will smart grid pilot projects translate to real-world scenarios? The European Union’s Joint Research Centre is conducting research to find out.

OVERVIEW OF SMART GRID PROJECTS IN EUROPE

Smart electricity grids open the door to new applications with far-reaching impacts: providing the capacity to safely integrate more renewable energy sources, electric vehicles and distributed generators into the network; delivering power more efficiently and reliably through demand response and comprehensive control and monitoring capabilities; using automatic grid reconfiguration to prevent or restore outages; and enabling consumers to have greater control over their electricity consumption and to actively participate in the electricity market.

All these capabilities are being tested in smart grid pilot projects around the world, shedding light on how to move forward in the transition towards the electricity system of the future. A significant number of such projects are situated within the European Union (EU), probably making it the world’s most active area for smart grid testing and development. Spread across the 28 EU member countries, there are currently 459 different projects in Europe, divided between research and development; and demonstration and deployment. About 63 per cent of these projects are being developed in a single country, which emphasises the importance of individual players in the testing and development phase of new solutions for the generation and distribution of electrical energy.

Cities such as Paris, London and Rome have a high concentration of projects and investments in smart grids, with total allocated resources that exceed €100 million. Investments mainly focus on applications like the integration of distributed generation into the grid, as well as the integration of large scale renewable energy and smart network management, with the goal of improving the observability and controllability of the network through substation automation, grid monitoring and remote grid control.

THE JOINT RESEARCH CENTRE’S SMART GRID INITIATIVES

The European Commission’s Joint Research Centre (JRC) is an in-house science service employing scientists to carry out research to provide independent scientific advice and support to EU policy. Its latest work in smart grids seeks to better understand how research and innovation in this area can help achieve the EU targets of secure, sustainable, competitive and affordable energy.

A number of smart grid research projects are underway, including:

SMART GRID LABORATORIES INVENTORY

In order to obtain a better picture of the ongoing smart grid developments, JRC launched an online survey for organisations owning or running smart grid laboratory facilities in 2014. The main objective of the survey is to publish aggregated information on a regular basis in order to provide an overview of the current facilities, to highlight trends in research and investments and to identify existing gaps. 26 organisations completed the survey and the information provided has been analysed in an anonymous and aggregated way.

View the survey results via ses.jrc.ec.europa.eu/smart-grid-laboratories-inventory

A SMART GRID FOR THE CITY OF ROME

In collaboration with one of Italy’s biggest distribution system operators, ACEA, JRC conducted a study that looked into the merits of scaling up smart grid technologies from pilot projects to the context of a big city like Rome, which hosts more than one million electricity users.

The pilot project used in the study, the ‘Malagrotta ACEA Smart Grid Pilot Project’, tests novel automation, monitoring and remote control solutions on different sections and voltage levels of the distribution grid.

Scaling the project up to the city of Rome would entail expanding the impact area from the two high voltage/medium voltage (HV/MV) primary substations covered by the pilot project to the whole set of 70 HV/MV primary substations operated by ACEA in the city of Rome.

A cost-benefit analysis (CBA) was conducted, assessing the outcomes for both the private investor and wider society. JRC also completed a comprehensive sensitivity analysis to test the robustness of the results to variations.

JRC concluded that the study had “overall positive outcomes” for the extension of the smart grid project to the city of Rome, both in the private investor/financial CBA and the societal/economic CBA, whereas the smart grid pilot alone faces the typical challenges of a demonstrator leading to generating moderate losses.

Details of the JCR’s comprehensive cost benefit analysis can be accessed via ses.jrc.ec.europa.eu/smart-grid-city-rome

Cities such as Paris, London and Rome have a high concentration of projects and investments in smart grids, with total allocated resources that exceed €100 million.

This is an edited excerpt from the JRC’s Science and Policy Report: Costs and benefits of Smart Grid pilot installations and scalability options, published in 2015. The full report can be accessed via the JRC website: ses.jrc.ec.europa.eu
YESTERDAY’S PERMIT, TODAY’S TECHNOLOGY

As uncertainty in the policy environment hampers the progress of wind projects in Australia, EcoGeneration talks to Acciona Energy Business Development Manager Ben McInnes to chart the way forward for existing and new wind farm developments.

DISCONNECT BETWEEN PLANNING RESTRICTIONS AND TECHNOLOGY

Generally, state planning authorities require wind farm developers to demonstrate compliance with conditions during the planning process, well before the planning permit is obtained and prior to the construction of the wind farm.

“This will often involve the developer having to stipulate the key dimensions of the proposed wind turbine, such as the tower height, the blade length and the tip height – or some combination of these three,” Mr McInnes says.

As a consequence of this process, Mr McInnes says there are hardcoded conditions in the permit that stipulate the dimensions of the wind turbine.

“This effectively locks the developer into a particular choice of wind turbine, or limits the choice to models smaller than the dimensions prescribed in the permit,” Mr McInnes says.

Mr McInnes says these prescriptive conditions are reasonable in the normal course of events, but become problematic where planning approvals lag.

“When a developer expects to commence the construction of a project within one or two years of receiving planning approval, the developer will select a wind turbine incorporating current technology and features.

“In Australia however, where many projects have been held up in the planning phase for five or more years, the prescriptive planning permits are creating issues because they are forcing developers to select wind turbines on the basis of design dimensions that apply to outdated wind turbine models,” Mr McInnes says.

Mr McInnes uses the example of a permit issued prior to 2010, which is likely
to insist that the maximum wind turbine tower height should be between 80 m and 100 m, with the prescribed maximum blade length between 40 m and 50 m. He contrasts this to wind turbine models now, which have tower heights between 100 m and 120 m, and blades over 60 m in length.

**BENEFITS OF NEW WIND TURBINE TECHNOLOGY**

Mr McInnes says the newer, larger wind turbines generate more energy per installed MW at a lower cost of energy generation – giving developers a commercial incentive to upgrade a site by using a larger wind turbine design.

In most cases, this will involve reducing the total number of turbines to accommodate the larger blade diameter.

According to Mr McInnes, the ease of a project being updated to capitalise on new technology depends on the wording in its original planning permit.

**LUCK OF THE DRAW**

Mr McInnes says restrictive permits are more pronounced in Victoria because of historical changes in the planning guidelines for wind farms in the state.

“The anticipation of more restrictive planning laws inspired a rush of projects to reach consented status prior to 2010, followed by no planning approvals since, as the new guidelines took hold.”

The pre-2010 wind farm projects are essentially “frozen in time.” Unfortunately however, Mr McInnes says there are few examples of authorities amending planning permits to allow projects to be upgraded.

“There are no clear guidelines on assessing the size of wind turbines and it is commonly assumed that bigger turbines equal to more impact. This incorrect assumption leads to uncertainty as to whether the upgrade will be approved and reluctance to incur costs in testing this through the planning amendment process.”

**LESIONS FOR NEW WIND FARM DEVELOPERS**

Mr McInnes says new wind farm developers can learn from lessons of the past by anticipating the direction of future wind turbine technology, and then incorporating this into their planning permits, rather than referring to the existing generation of wind turbines.

“While there remains uncertainty in the Australian large-scale renewables sector, and developers are forced to continually delay construction commencement, changing technology will be a constant trend.”

Wind farm developers can then embrace the change and focus on the innumerable benefits new wind farm technology provides, instead of its many inherent challenges. ...
The wind energy regulatory environment has been constritive in the past few years, not least of all in Victoria. EcoGeneration gets the lowdown from Jacobs Groups’ Phillip Burn on tips wind energy proponents should follow to advance wind energy projects in the state – advice that can be extrapolated to other jurisdictions across the country.

CURRENT WIND ENERGY LANDSCAPE IN VICTORIA

According to Mr Burn, all but four of Victoria’s permitted wind energy projects were approved before 2010. With operating wind farms in Victoria, on the other hand, all but Chepstow Wind Farm were approved before 2010.

“Between 2011 and 2014, the development of wind energy projects came to a standstill with the notable exceptions of the Chepstow, Coonooer Bridge and Cherry Tree wind farms.

“The policy changes introduced in August 2011 terminated a number of projects in the development pipeline that had not secured approvals and made the process of developing wind energy projects, or making changes to existing approvals, extremely difficult.”

As a 2014 pre-election commitment, the Victorian Labor Government said it was committed to “leading the world in wind energy” – promising to reduce the mandatory wind turbine setbacks to dwellings from 2 km to 1 km, and to reinstate the Minister for Planning as the approval authority for all wind energy projects.

These commitments were met in early April 2015, and Victoria Planning Provisions were changed.

APPROVAL AUTHORITY CHANGE

“The implications of the former Victorian Coalition Government’s decision to make local councils the approval authority for all wind projects was not great. This is mainly because the planning restrictions also introduced were so restrictive that only three wind energy projects ended up being considered by a council,” Mr Burn says.

“These were the Coonooer Bridge Wind Farm (approved by Buloke Shire), the Cherry Tree Wind Farm (assessed by Mitchell Shire and approved by the Victorian Civil and Administrative Tribunal), and the Bulgana Wind Farm (approved by the Northern Grampians Shire).

Mr Burn says the Labor Government’s decision to make the Minister of Planning the new approval authority underlines the fact that renewable energy is a matter of state significance that requires a state-wide approach.

“Accordingly, many proponents had to seek to extend the life of their existing approvals at a time when land use planning controls were hostile.”

Mr Burn says this has led to difficulties in securing power offtake agreements and finance, which has subsequently resulted in many projects being unable to move from approval into the construction phase.

“As such, the Minister of Planning is now the responsible authority for determining wind energy projects, with local government having an opportunity to input into the assessment processes and retaining the responsibility for enforcing the conditions of approvals.”

Although state government is often better resourced to consider complex project approvals, Mr Burn says that local government remains a critical stakeholder in the assessment of wind projects.

CURRENT ISSUES

Despite recent planning changes signalling a spot of good news for the wind energy sector in Victoria, there are a number of issues that continue to threaten the future development of wind energy projects.

Mr Burn says many of the problems currently experienced by proponents are the direct result of the policy environment over the last five years.

“In addition to restrictive land use planning controls, the policy environment for wind energy has also been characterised by falling electricity demand and renewable energy controls, the policy environment for wind energy has also been characterised by falling electricity demand and renewable energy target (RET) issues – lag from phantom renewable energy certificates (RECs) - bi-annual review cycle and current uncertainty.”

According to Mr Burn, the difficulty in extending permits resulted in a number of projects commencing early works in order to keep their projects alive until more favourable investment conditions occur.
However, as highlighted by Acciona Business Development Manager Ben McInnes on page 46, wind turbine technology regularly outpaces the rigid conditions of wind farm planning permits.

“Significant advancements have occurred to wind turbine technology since the majority of Victoria’s wind farms were approved,” Mr Burn concedes.

While 3 MW turbines with tip heights of around 160 m are now common worldwide, 1.5-2 MW turbines with a height of 130 m were the norm when many planning permits in Victoria were issued.

“As many wind farm approvals remain dormant, encroachment from rural dwellings adjacent to approved – but yet to be constructed – wind farm sites has also occurred. This can create compliance and incompatibility problems if such matters can’t be resolved by the time the project is operational.”

ENGAGING AND STAYING INFORMED IS CRUCIAL

Early engagement with regulators is vital, according to Mr Burn.

“Proponents and their consultants should aim to develop working relationships early, not just when there’s a statutory requirement or if something goes wrong.

“They should strive to create regulatory ‘ownership’ and their early work with regulators should lead to a shared view of success.”

Mr Burn says it is also critical for wind energy proponents to continually review and remain up-to-date with the dynamic policy and regulatory environment – from a Commonwealth, state and local perspective.

“Often, seemingly unrelated planning or regulatory changes may have significant impacts on a specific project or potential projects,” Mr Burn says.

“It is also critical to monitor developments with Commonwealth policies, such as continuing deliberations around revising the renewable energy target,” he adds.

Apart from that, information about the issues associated with wind projects should be front-of-mind for wind energy proponents. Equally important, according to Mr Burn, is for wind energy proponents to contribute to policy and regulatory outcomes through periodic discussions with governments and by submitting to reviews or inquiriers.

WHAT THE FUTURE HOLDS

Mr Burn expects to see proponents try to extend the expiry dates on their approvals and seek approval for the larger, more modern turbines in the next year or so.

Meanwhile, projects that were successful in ACT’s 200 MW wind auction - Ararat and Coonooer Bridge wind farms, among others - will soon progress to the construction phase. Ultimately, Mr Burn says it is the outcome of policy deliberations that will drive the next wave of wind farm construction.

“The construction of wind projects will be largely determined by the outcome of RET deliberations.

“This is why it is so important for proponents to have the approvals for their projects ready to go and not be encumbered by short permit expiries, conditions restricting the application of latest in turbine technology, or other impediments.”

While it is important to understand the details of each state’s planning system, Mr Burn says the fundamental strategy to advance wind farm projects remains the same regardless of where one is located.

“Ensure that you focus on stakeholder and relationship management, understand what is required for efficient and profitable wind energy projects, and employ excellent project management skills.”

5 PIECES OF ADVICE FOR WIND ENERGY PROPONENTS

Develop an effective stakeholder and relationship management strategy – A successful wind energy project’s approval strategy will revolve around this.

Have sound knowledge of the planning system – Understand how it all works, know the detail and its relationship to other legislation, and be able to balance this understanding with what is required for efficient and profitable wind energy projects.

Keep the process moving and create a sense of inevitability about the project’s success and development – Lodge applications for assessment when they are ready to be lodged. Be proactive in agency engagement and respond to further information requests and enquiries from regulators quickly, while working with them to set appropriate timeframes.

Aim for flexibility – Envision what your project will look like in five years. Aim for expiry dates far in the future for wind farms and associated infrastructure. Ensure you have the ability to cater to a variety of turbines - tower heights and rotors diameters - and the flexibility to change the internal layout to optimise projects.

Advocate for an improved policy environment but work with the policy you have – Cherry Tree and Coonooer Bridge wind farms were approved during Victoria’s regime of restrictive planning regulations. If Coonooer Bridge had waited for a more opportune time, they would not have been in a position to win the ACT’s recent wind auction.

“Proponents and their consultants should aim to develop working relationships early, not just when there’s a statutory requirement or if something goes wrong.”
The phenomenon known as ‘wind turbine syndrome’, where people living near wind turbines experience deleterious effects to their health, has gained currency in recent years. The alleged condition was coined by Dr Nina Pierpont in 2009 in a self-published book by the same name. Health problems purportedly caused by wind turbines include sleep disturbance, headaches, nausea, tinnitus, ear pressure, vertigo or dizziness, visual blurring, irritability, memory and concentration problems, panic episodes, tachycardia and body vibration.

Dr Renzo Tonin is the Managing Director of Renzo Tonin & Associates, a group of consulting engineers specialising in acoustics, vibration and structural dynamics, and was recently appointed by the NSW Department of Planning to conduct an independent audit of wind farms at Capital, Culleen Range and Woodlawn. He says a majority of academics conclude that there is no direct psychological link between wind turbine infrasound and health issues. Rather, health concerns expressed in response to wind turbines are better explained by what is known as the ‘nocebo’ effect.

THE NOCEBO EFFECT

In contrast to a placebo, Dr Tonin says a nocebo is a negative reaction from exposure to an innocuous substance due to expectations of harm. “The nocebo effect is psychogenic in nature and is a reaction to a patient’s expectation and perceptions of how exposure to a substance will affect them.”

Dr Tonin draws upon the research of Professor of Public Health at the University of Sydney, Simon Chapman, who said wind turbine syndrome is a →
“communicated disease” and found a strong correlation between anti-wind farm groups’ campaigning and reported symptoms. In Australia, Dr Tonin says the syndrome has become the central focus of anti-wind farm organisations such as the Waubra Foundation, a prominent anti-wind farm lobby association.

However, biomedical and acoustic engineer Professor Peter Seligman and acoustics consultant Geoff Leventhall claim that the infrasound generated by normal bodily functions, such as heartbeat and breathing, generate more infrasound in the ear than wind turbines do — thereby meaning wind turbines are unlikely to have any effect.

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Similarly, Dr Tonin adds: “A more recent study at the Waterloo Wind Farm in South Australia found that whilst a number of nearby residents had complained of symptoms including dizziness, nausea and headaches, which they attributed to wind turbines, the sound level of the infrasound blade pass frequency component was found to be at a level significantly below the accepted perception threshold of 85 dB(G).”

INFORMATION IS KEY
The lack of scientific studies corroborating the safety of wind turbines is a problem, according to Dr Tonin.

“In my opinion, the solution will be resolved in time, provided there is adequate funding of good quality studies and the results of those studies are communicated to stakeholders.”

Parallels can be drawn between the wind turbine industry and the telecommunications industry, where cancer scare campaigns associated with mobile towers’ radiation subsided in the face of scientific evidence that showed that the effects were insignificant.

Dr Tonin advises policymakers to be sceptical of evidence presented to them which has not been peer-reviewed.

“They must remember that experts can present biased or erroneous conclusions irrespective of their assertion that they present an independent view.”

THE WAY FORWARD
While high-quality research will ensure that infrasound is not the cause of widely reported health symptoms, Dr Tonin says the 2 km wind farming buffer zones — currently being proposed in NSW but which was recently reduced to 1 km in Victoria — is an important criterion.

“I believe the buffer will serve to minimise complaints from landowners who would otherwise not be compensated for loss of their amenities. If I were a landowner neighbouring a wind farm, I would naturally feel offended that my neighbour is reaping rewards at my expense.”

He says wind energy proponents should accept that the 2 km buffer is simply a cost of doing business, and says it will reduce the groundswell of opposition that wind farms face in certain parts.

Dr Tonin says it is only a matter of time before the wind energy industry gains a widely sanctioned social licence to operate.

“High-quality scientific studies are imminent. The National Health and Medical Research Council has allocated $2.5 million to a Targeted Cell for Research into Wind Farms and Human Health. The findings should be available in the next three years. It is only a matter of time for the community to be appraised of high-quality information.”

CASE STUDY: CRICHTON EXPERIMENT
Fiona Crichton, PhD candidate in psychological medicine at University of Auckland, was the first to test the nocebo hypothesis in the wind energy sphere by subjecting a group of 54 participants to either real or ‘sham’ infrasound. She made half of the participants watch a video on the health effects of wind turbine noise, with the video designed to increase their expectations of harm, while the other half were made to watch a video designed to play down their expectations of harm.

The experiment found that participants exposed to material designed to increase their concern about the effects of wind turbine infrasound were more likely to report symptoms, even when in the ‘sham’ group.

The results were consistent with the nocebo hypothesis.

Dr Tonin repeated the experiment with 72 participants in Sydney, using a purpose-made pneumatic headphone apparatus to generate the infrasound at a frequency of 0.8 Hz with harmonics and at a level of 92 dB peak, higher than any measured level reported in literature. His conclusions were consistent with those of Crichton.
With more than 30 speakers and eight technical sessions, the event gave industry professionals the chance to update their knowledge and expertise, network with industry peers and hear the latest technological innovations and policy developments in wind – both in Australia and overseas.

The event covered multiple wind industry disciplines, from planning, grid connection and maintenance to acoustics and wind monitoring innovations.

Speakers included the likes of Acciona Energy Business Development Manager Ben McInnes, who spoke on the constraints planning permits place on the adoption of new wind technology (turn to page 46 to read more about this), and acoustics specialist Renzo Tonin, who spoke on the lack of scientific evidence to corroborate the widely-contested ‘wind turbine syndrome’ (turn to page 54 to learn more).

Although Australia’s wind industry has been through a rocky period in the last 12 months due to the political uncertainty surrounding the Federal Government’s review of the Renewable Energy Target (RET), CEC Chief Executive Kane Thornton expressed confidence in his welcome address that the industry will emerge on the other side ready to start building for the future.

“Wind energy is already playing a vital role in energy matters right across the world, and there is no doubt that it has a bright future here in Australia.”

In the meantime, he called upon wind industry professionals to keep themselves up-to-date with the world’s best practice in technical areas; from grid integration and noise to operation and maintenance.

“This will ensure that Australia’s wind farms can continue to be built to the highest possible standards of quality, efficiency and safety, and at the lowest cost,”...
THE ROAD TO PARIS

This December, world leaders will descend on Paris for the latest round of UN climate talks. Many are predicting another exercise in frustration, but former climate advisor Nick Rowley is convinced this time will be different.

With only six months to go before the most important international meeting on climate change since Copenhagen in 2009, what are the chances of success at this year’s Paris talks? What might ‘success’ mean? And can the mistakes and challenges that have beset previous meetings be avoided and tackled?

To help address these questions, let’s first dispense with three pervasive myths that continue to make the task of achieving an adequate global response to climate change harder.

MYTH 1: THE INTERNATIONAL CLIMATE NEGOTIATIONS HAVE FAILED

There is a widespread belief that more than 20 years of international climate negotiations have been a waste of time. They haven’t. Developing methods to account for atmospheric greenhouse gas emissions, awarding funding for taking these measurements, reporting and verifying emissions reductions, and, in the case of the Kyoto Protocol, fashioning one of the most ambitious agreements in international law – none of this would have happened without the negotiating process provided by the United Nations Framework Convention on Climate Change (UNFCCC).

Although the 1997 Kyoto agreement proved flawed, it led directly to multistate policy responses such as the European emissions trading scheme and to national carbon-budgeting legislation such as Britain’s Climate Change Act, not to mention a plethora of policies and incentives to promote renewable technologies and infrastructure. The frustration is not that the international process has failed, so much as that the success so far has been only partial, and nowhere near what is needed to reduce the risks of climate change effectively.

MYTH 2: IT’S MAINLY ABOUT JUST GETTING COUNTRIES TO SIGN UP

Despite the climate problem having been defined by the media and many environmental groups as essentially binary (either you advocate climate action, or you don’t), it isn’t. The world has never had to address a problem of this magnitude – one that knows no boundaries and has causes that are closely linked to the post-industrial infrastructure that has done so much to drive economic growth and human betterment. Let’s be grown-up about the magnitude of the task we need to change our energy, electricity and transport systems at an unprecedented scale and with unprecedented speed, globally.

The change required in electricity generation, distribution and use is very much like the transformation in digital communications over the past 20 years. But there is one important difference. Unlike the world of possibilities opened up by the digital revolution, the amenity most of us enjoy from electricity will, at best, remain unchanged. To the end-user; the electricity created by solar cells or wind doesn’t feel, work, smell or look better than that generated by coal. If it were just about agreeing to ever more ambitious targets and replacing ‘evil’ fossil fuels with nice clean ones, success would be easy. But it’s not. Effective climate policies have to do more than just price carbon; they have to change the way we develop our cities and land; ensure we value and preserve forests; and allow us to generate clean electricity and transport ourselves and all the things we buy and enjoy, in ways that no longer involve the combustion of fossil fuels.

Some countries are going to have to continue using coal for a considerable time yet; there remain significant technological challenges to using renewables for more than electricity generation (such as in making concrete, steel and aluminium), and notwithstanding the appeal of electric vehicles, the shift away from oil as the primary fuel for transport requires a lot more than changes to the private car fleet. Transport isn’t just about moving people; everything on the table in front of you was made somewhere else and fossil fuels were burned to get it to you.

MYTH 3: WE JUST NEED COUNTRIES TO ‘SEE THE LIGHT’

There remains a misplaced hope among many advocates of ambitious climate policy that there will come a point when shards of truth and light and wisdom suddenly begin to cascade through a major international...
meeting. These hopes were first pinned on the Kyoto summit, then it was Montreal; then Bali, then famously Copenhagen, and now Paris. I’ve described this view as a myth, but really it is a woefully naïve understanding of how political power operates and international agreements are secured. Given the complexity of the challenge – and frustrating as it is, given the risks posed to our climate – progressive incremental change is all that can be achieved.

It didn’t feel like it at the time, but it was fortunate to observe US President Barack Obama in Copenhagen. His performance as a negotiator to salvage some modicum of agreement out of what others had let become a train wreck, was almost chilling in its effectiveness. This was hard work, and doubly so when all that he could achieve was avoiding complete failure. Much has changed in the five years since Copenhagen. The toxic conflict of domestic climate policy in countries such as Australia should not blind us to these important, and largely positive, developments.

It is continuous. Last year was the world’s hottest on record, and the past month has brought us Cyclone Pam, one of the strongest cyclones ever recorded, and seen California spend another US$1 billion on trying to tackle its drought. China, Brazil, Indonesia and other rapidly developing countries no longer need convincing of the need to make big emissions cuts. They all see the benefits in a global deal that they can contribute to through adopting a low-carbon growth path.

The Stern Review on the Economics of Climate Change showed that the trade-offs between high- and low-carbon economic growth paths are meaningless: to be sustainable, economic growth must be low-carbon. Nine years after the review, and with abundant work revealing the tangible benefits of transforming the global economy while weaning ourselves off fossil fuels, the debates are now less about the need to reduce emissions at scale, and more about how to do it most effectively.

The second reason for optimism is that, unlike at Copenhagen, many countries see an effective climate agreement as more than an end in itself: it is also a vital means to address other global challenges. There is a growing, pragmatic appreciation of the relationship between effective climate policy and efforts to reduce further long-term environmental, societal, economic and security risks. US President Barack Obama’s new National Security Strategy has listed climate change as a security risk on a par with factors like a catastrophic attack on the United States, or the proliferation of weapons of mass destruction. The Pentagon’s positioning of the issue of emissions reductions as crucial to future health and security greatly enhances the likelihood of a global diplomatic agreement.

A third reason for optimism is that Obama, the President of the United States, is so far it. Relations with our international allies have never been so strong. While the US executive has its own reservations about the direction of events, this administration wants a climate agreement.

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The International Energy Agency estimates that we need to close around a quarter of all the world’s least efficient coal-fired power stations over the coming five years. It is perfectly possible to do this through internationally monitored domestic policy. It is here that the divestment movement is particularly helpful, in building the impetus required to make these policy decisions more palatable.

SEEING THE WOOD FOR THE TREES

The second real chance of a breakthrough in Paris hinges on forests. Globally, the pace of forest destruction, both for agriculture and for timber, pulp and paper, is staggering. The World Resources Institute estimates that almost 13 million hectares of forest – an area roughly the size of England – was lost every year between 2000 and 2010. With trees playing such a vital role in the global carbon cycle, we need to keep all the forests we have. Paris could help make sourcing any paper, packaging or tissue from exploited tropical forests unthinkable for any company.

Third, the degree of commitment to addressing the climate problem will be communicated through climate finance. The Green Climate Fund already has more than US$10 billion to spend on new low-emissions technology and infrastructure in developing economies. These, and any extra funds agreed in Paris, need to be used creatively: helping reduce emissions and achieve human betterment through new infrastructure in the rapidly developing cities of Africa and Southeast Asia.

These specific projects won’t be announced in Paris, but the meeting needs to be clear about the sort of improvements that this money can help to deliver. We face a transformative, not a transactional problem: the headlines and political statements coming out of Paris need to be clear about what is going to change as a result of them.

The world simply cannot afford another perceived fiasco like Copenhagen. Success in Paris will be hard to achieve, but the outcome of the meeting must, and I believe can, be a driver to further tangible business, investment and policy decisions that will reduce emissions – and with it, the potentially catastrophic risks of climate change. —

This is an edited version of a series of articles that originally appeared on The Conversation. Read the full original articles at www.thecommunity.com/profiles/nick-rowley/10185/articles.
ALL-ENERGY AUSTRALIA SET TO BE BIGGER THAN EVER IN 2015

The All-Energy Australia Exhibition and Conference is set to return to Melbourne in 2015 bigger and better than ever before.

Thanks to an important strategic partnership with the Clean Energy Council, the 2015 show will provide the Australian renewable energy sector with the scale and quality information it needs during uncertain times with the renewable energy target (RET) under fire.

“As the industry faces uncertainty with the RET review, a partnership seemed the obvious way forward to ensure the same business opportunities are available without the pressure on the industry,” said All-Energy Australia Director Anthony Reed.

After a strong showing in 2014, with visitors attending from over 1,850 companies across 22 countries, the expo has taken on industry feedback in order to provide a specialised conference that caters to the specific needs and interests of attendees. This includes free solar sessions that will contribute to continual professional development (CPD) for solar installers, provided by the Clean Energy Council. These sessions will allow attendees to earn up to 100 points towards their CPD.

Headlining the conference this year will be the Right Hon. John Gummer, Lord Deben, the UK’s longest serving Secretary of State for the Environment. His experience as an international negotiator has earned him worldwide respect both in the business community and among environmentalists.

With such a big name speaker on the cards and more to be announced soon, All-Energy sets a high standard for the quality of its conference program, and continues to impress with sessions headed by industry experts and leading businesses including Greg Steele, Enphase Senior Vice President for Engineering; Raghu Belur, Enphase Co-founder; Westinghouse Plasma Corporation; Krannich Solar; and DNV GL.

All-Energy has also confirmed that this year’s show will mark the return of the legal and contractual session, last featured in 2013, which will help attendees explore the basics of power purchase agreements and other financing models. New sessions this year will include The internet of things, a stream that will look at the latest technology in big data and how it is expected to revolutionise the industry.

Running alongside the conference sessions will be an impressive exhibition showcasing renewable energy, clean energy, sustainable transport and energy efficiency. With over 100 exhibitors expected to be on display, this provides an unparalleled opportunity for members of the industry to meet suppliers and facilitate the business that will help the renewable energy sector of Australia move towards a bigger and brighter future.

“All-Energy Australia prides itself on gathering the largest number of clean energy professionals and investors in Australia. This combined industry conference and exhibition will continue to help the industry grow and develop. Together with the Clean Energy Council, we want to support the industry by providing all the benefits of both events in one,” said Mr Reed.

The industry couldn’t agree more. “It is exciting to join forces with All-Energy to deliver the sector’s largest event, and we are committed to helping the 2015 event to be a massive success. This will allow the industry to do business and celebrate their successes in one place,” said CEC Chief Executive Kane Thornton.

All-Energy Australia 2015 will be running from the 7-8 October 2015 at the Melbourne Convention & Exhibition Centre, alongside Waste Expo as a part of Australian Sustainability Week. Registration opens in June. For more information visit www.all-energy.com.au
LEADING THE ENERGY TRANSFORMATION

THE CLEAN ENERGY COUNCIL’S AUSTRALIAN CLEAN ENERGY SUMMIT

The Clean Energy Council will host its premier industry event, the Australian Clean Energy Summit 2015, at the Hilton Sydney from 15 - 16 July.

This year’s Summit, themed Leading the Energy Transformation, will gather industry decision-makers and key players to discuss the latest political, financial, business and technology developments in the renewable energy sector.

“The Australian Clean Energy Summit will be Australia’s largest gathering of major players in the clean energy market this year, and I am excited about the discussions we will have and the progress we will make in Sydney in July,” said CEC CEO Kane Thornton.

“For more than a year the clean energy industry has been impacted by the review of the Renewable Energy Target, with investment in large-scale projects plummeting 90 cent over the last 12 months. “With global investment in renewable energy continuing to climb year-on-year, that’s a trend that can’t continue. The Australian Clean Energy Summit will allow the industry to get together and discuss our shared vision for a strong future for renewables, as well as how to leap over the significant hurdles we will encounter along the way.”

WHAT’S ON THE AGENDA?
The 2015 Summit will include technology briefings and streamed sessions focusing on innovation, new funding models, enhanced technology and emerging business models as the nation transitions to a renewable energy economy.

There will be ample networking opportunities at the Senvion Welcome Reception, VIP Drinks, as well as the prestigious Gala Dinner.

WHO WILL BE THERE?
The event attracts senior-level decision makers and key players from diverse sectors of the renewable energy industry, as well as manufacturers and distributors, bankers, power generators, service providers and many others.

More than 400 delegates from approximately 300 organisations are expected to attend.

LOOKING FOR ATRAA AND PD DAY?
Those who came to love the ATRAA Solar PV events of Clean Energy Week will find them for free this year at All-Energy, at the Melbourne Convention and Exhibition Centre, from 7-8 October 2015.

This year, the Clean Energy Council has formed a strategic partnership with All-Energy Australia to bring you Australia’s most highly anticipated clean energy event, including the ATRAA national solar conference. Solar installers will be able to get their CPD points for the year at no cost by attending sessions at the All-Energy event.

As well as the digital edition, you subscription to EcoGeneration includes:

» 6 editions of Australia’s leading clean energy business magazine per year
» Company listing in the online Australian Clean Energy Directory
» Invitations and offers on clean energy industry networking functions, training seminars and clean energy conferences
» Access to the online archives of EcoGeneration magazine - including hundreds of articles from industry experts
» Industry guides.

Renew your EcoGeneration subscription today
These projects range from small projects, like the three-turbine wind farm in Chepstowe, Western Victoria, to large commercial power plants, such as the 23-turbine Portland Wind Energy Project (Stage 4), the 52-turbine Bald Hills Wind Farm in South Gippsland, and the 64-turbine Mt Mercer Wind Farm, which will produce enough electricity to power every home in nearby Ballarat.

Underpinning Senvion Australia’s approach to each of these projects is a firm commitment to developing tailored solutions that meet the particular needs of each client. As a starting point, Senvion Australia has a broad suite of technologies that utilise proven German technology and suit a range of different wind farm regimes around the world. The product range includes turbines specifically designed to perform in the temperature extremes that can be found in Australia. Senvion Australia is much more than just an equipment provider, and selecting the right turbine is just one component of the company’s full life-cycle approach to delivering projects.

In Australia, there are over 90 highly trained employees who each have a critical role to play in delivering and operating wind power plants. In the design phase, wind and site engineers develop wind farm solutions to maximise energy output, while electrical engineers provide specific design advice about connecting the wind farm to the network. In the construction phase, Senvion Australia provides key project management, procurement and engineering skills and expertise to deliver wind farms under various commercial models according to customer needs. The company prides itself on its proven capability to deliver complete turnkey solutions for clean power plants.

In what has been a tough year for the clean energy industry, Senvion Australia has been hard at work delivering over 290 megawatts of new power-generating capacity across four wind farms in Victoria.
In the operations phase, local and dedicated service teams are established at each site, supported by an operations and control centre at the company’s head office in Melbourne.

Senvion Australia Chief Executive and Managing Director Chris Judd is proud that the company has achieved a unique combination of advanced technology and capabilities to build and operate wind farms in Australia.

“We have been operating in the Australian market for over a decade, and our people can draw on the experience of delivering around a third of the wind generating capacity installed nationwide to date,” Mr Judd says.

He adds that Senvion Australia has a very effective team of people with a detailed understanding of what is needed to deliver high-quality power plants.

“Our approach is customer-focused in that we work with wind farm owners from a very early stage to tailor our solutions to get the best out of each project, and continue to apply our knowledge and expertise throughout the life of a wind farm,” Mr Judd says.

In addition to servicing the local market, Senvion Australia is ideally placed to realise emerging opportunities across Asia. The company is responsible for developing the Japanese wind market where it has supplied and maintains 115 MW of installed capacity across 16 wind farms.

With the climate negotiations in Paris scheduled for later this year, there is renewed interest in the important role that renewable energy will play in decarbonising our energy systems. Wind energy is a mature and competitive technology that will make a significant contribution to greenhouse abatement goals.

Globally, the future for wind energy is bright, and Senvion Australia is the right partner to continue delivering high-performing power plants that are also good for the planet.

### BALD HILLS WIND FARM
- **Contract type**: Engineering, procurement and construction (EPC)
- **Location of project**: 10 km south east of Tarwin Lower in South Gippsland, Victoria
- **Capacity**: 106.6 MW
- **Number of turbines**: 52 x MM92
- **Owner**: Mitsui & Co. (Australia) Ltd

### CHEPSTOWE WIND FARM
- **Contract type**: Supply & Install
- **Location of project**: 35 km west of Ballarat, Victoria
- **Capacity**: 6.15 MW
- **Number of turbines**: 3 x MM92
- **Owner**: Chepstowe Wind Farm Pty Ltd

### MT MERCER WIND FARM
- **Contract type**: Supply & Install
- **Location of project**: 30 km south of Ballarat, Victoria
- **Capacity**: 131.2 MW
- **Number of turbines**: 64 x MM92
- **Owner**: Meridian Energy Ltd

### PORTLAND WIND ENERGY PROJECT – STAGE 4
- **Contract type**: Supply & Install
- **Location of project**: Across two sites at Cape Nelson North and Cape Sir William Grant, near Portland, Victoria
- **Capacity**: 47 MW
- **Number of turbines**: 23 (10 x MM82, 13 x MM92)
- **Owner**: Pacific Hydro

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Image: The 52-turbine Bald Hills Wind Farm covers approximately 1750 ha of largely cleared cattle and sheep grazing farmland.
Solar Storage: A Commercial Imperative?

Rob Campbell, head of storage manufacturer Vulcan Energy (owner of the Sun-Sink brand), talks about the future of solar storage, and why he thinks electric cars will drive the storage revolution.

I can see a time when energy will be bought from the grid at fractions of a cent per kilowatt hour and collected by storage owners.

How do you see power storage developing in the next few years?
Storage will continue to deploy slowly. At present, grid connected solar returns approximately 12-14 per cent for an absentee owner (someone who locks up the house and goes to work each day). The addition of storage, while a great concept, reduces that return on investment (ROI) down to 6-8 per cent. However, the development of storage for the purposes of charging electric cars will lead to a consequential fast drop in storage prices and the ROI will swing back into favour. A lot does depend on government policy though.

What are the main barriers facing the storage industry in Australia?
Lack of forward planning and adaptation by the incumbents. Most utilities hide legitimately behind legislation that insists on a certain level of reliability. The problem is, they decide how that reliability is achieved, and are guaranteed an income based on the amount they spend achieving that outcome. Naturally, if you are guaranteed to receive an ROI of about 15 per cent on whatever you spend, you are going to find ways to spend it, and reducing the size of the network by encouraging storage isn’t one of them.

Could you explain how the Sun-Sink storage system works?
Our Sun-Sink unit is unique in that it takes power directly from the solar arrays. By using its own maximum power point tracking (MPPT) and buck-boost circuitry, it stores electricity at voltages identical to the modules, therefore is compatible with almost all existing PV systems.

What trends can you see emerging over the next decade or so?
Eventually, like most technologies, the take-up will overwhelm the resistors and policy will be forced upon the governments rather than controlled by them. I can see a time when networks will be webs rather than hub-and-spoke and will be much smaller in size and higher in reliability.

How much can solar plus storage be scaled up and remain cost-effective?
Excitingly, storage is now a viable option for large users paying demand tariffs, which are one of the biggest barriers to the success of solar PV in commercial applications. Without storage, the entire economic benefit of solar can be destroyed by the occurrence of the monthly demand peak when the sun is not shining. However, a large solar array coupled with storage can provide energy when it’s needed most: not just replacing energy ad hoc, but focusing upon delivering energy to reduce demand peaks. In this way, we can return an additional five per cent in a large installation by using solar and storage with a demand focus over ad hoc solar only.

What about the longer view - what trends can you see developing in the PV markets?
Lack of forward planning and adaptation by the incumbents. Most utilities hide legitimately behind legislation that insists on a certain level of reliability. The problem is, they decide how that reliability is achieved, and are guaranteed an income based on the amount they spend achieving that outcome. Naturally, if you are guaranteed to receive an ROI of about 15 per cent on whatever you spend, you are going to find ways to spend it, and reducing the size of the network by encouraging storage isn’t one of them.

Where else do you see potential growth for storage technologies?
The biggest driver will be charging points for electric cars. Cars such as the GM Volt and Tesla S are ready to take over our streets and highways, and, like CD’s and mp3’s, this evolution will occur at a surprisingly fast rate. Each needs a gutsy electricity supply for fast charging, and this is likely to have a huge effect on power demand.

Electric cars need a gutsy electricity supply for fast charging, and this is likely to have a huge effect on power demand.
SOLAX POWER DELIVERS FOR PGK DISTRIBUTION

Tynan Coles is the General Manager at PGK Distribution, a wholesale distributor of PV panels, inverters and solar mounting systems. He explains why PGK have partnered with inverter manufacturer SolaX Power.

WHAT LED TO YOUR PARTNERSHIP WITH SOLAX POWER?

After various years selling multiple inverter brands, PGK Distribution decided that it needed to find a good, long term, quality inverter manufacturer. Last June, PGK visited SolaX to discuss an exclusive partnership for their single and three phase inverters. After many meetings and negotiations, we were able to come up with an agreement that both parties were happy with. This exclusive arrangement allowed PGK to manage the supply channels of these inverters in the Australian market. Since then, we have been able to sell a considerable number of the X1 and X3 inverters to our customers with an extremely low failure rate to date.

TELL US ABOUT THE COMPANY’S LATEST PRODUCTS FOR THE AUSTRALIAN MARKET.

After gaining significant presence in the Australian market due to its hybrid inverter, SolaX has been able to consolidate its position with a high performing and reliable inverter range. The company is now in the final stages of its second generation inverters for its 3 kW to 5 kW string and hybrid inverter range. Many of the features of these inverters are quite unique, giving SolaX a point of difference to other inverters in the Australian market.

WHAT MAKES THESE PRODUCTS UNIQUE?

Among various additional features, the string inverters will now have reactive power control (RPC) and export limiting capability. This gives the customer more flexibility when restrictions are put on their solar system by the electricity network providers. The RPC is particularly important, as this is a requirement by Ergon and Energex in their networks as of 30 September 2015. The most exciting new feature of the second generation hybrid inverters is the emergency power supply (EPS). If there is a grid outage, the EPS enables the system to still supply power to some important appliances with only a brief interruption to the supply. This has already generated significant interest to our Northern Queensland customers, who have previously been hit severely by cyclones and have had no power for their necessary appliances for multiple days, even weeks.

WHAT SUPPORT SERVICES ARE AVAILABLE FOR USERS OF SOLAIX PRODUCTS IN THE AUSTRALIAN MARKET?

SolaX have multiple support services available depending on the user’s requirements. The company have a local manager based in Melbourne who deals with all SolaX related tasks on a daily basis. Secondly they have a 1300 support number that can handle all user queries instantly. This support center is able to relay information immediately to the R&D department to continually improve the quality of the product. Finally, if any units are confirmed to be faulty, there are a network of technicians that can replace the faulty unit no matter where in Australia it is. This is particularly important, because for many of our customers in remote areas who have previously had faulty units installed, the standard $150 compensation provided by other manufacturers did not cover the total cost incurred.

COULD YOU GIVE US ANY EXAMPLES OF SPECIFIC PROJECTS YOU’VE WORKED ON WITH SOLAX?

SolaX have been actively involved in many commercial projects ranging from 15 kW to 70 kW over the last 9 months with its X3 inverters. Just recently, one of our customers completed a 90 kW solar system for an engineering company in Boronia, Victoria. They were able to commission this system with six SolaX 15 kW X3 inverters. Throughout the application and approval process with the electricity network provider, SolaX had to supply all the required information to satisfy the network requirements. After several months, the inverters were approved for this commercial sized system, allowing our customer to complete the installation. The results have been extremely impressive, leaving our customer and their client excited about the financial savings from this system. It has also led to a couple of referrals for our customers wanting the same quality system they provided for this engineering company.

JA SOLAR MODULES PASS INDUSTRY’S TOUGHEST CORROSION TEST

Solar PV manufacturer JA Solar has achieved an industry first, with its PV modules passing the most stringent salt mist corrosion test in the industry.

Solar modules located in coastal areas are at greater risk of performance degradation and shorter lifespan due to the effect of salt mist. This can obscure glass and corrode components such as frames and junction boxes. JA Solar’s line of modules is ruggedised to withstand harsh coastal weather and minimise power loss. In the TÜV Nord testing, JA modules demonstrated power loss of less than 2 per cent.

Solar modules located in coastal areas are at greater risk of performance degradation and shorter lifespan due to the effect of salt mist.
The emergence of solar power system leases is set to shake up the industry and provide the benefits of solar electricity to a new wave of budget conscious consumers.

Traditionally, those lucky enough to have access to the required cash resources have installed a solar power system to reduce their demand on the electricity grid and to potentially save money over the long term. While outright purchase provides full ownership of the system, it isn’t without some issues. Owners are liable for any maintenance and, should a component fail after the initial warranty period, they could be liable for its replacement.

System owners are also responsible for their own monitoring, ensuring that the system is working as intended and that savings are being realised as initially expected. How many actually conduct this monitoring would be an interesting study. I’m a fan of disruptive technology and innovations that improve existing practice, and this is the reason why I believe that solar leasing is set to herald a new dawn in the uptake of solar PV.

I might be biased, however the SunEdison Energy Plan looks to be the forerunner for leases of residential PV systems.

The reason is simple: SunEdison provides a performance guarantee* on all systems sold under the SunEdison Energy Plan and will compensate consumers if their system fails to perform in accordance with the performance guarantee. How can SunEdison offer this?

The company monitors all systems 24 hours a day, 7 days a week. If something does go wrong with a system, SunEdison will often know about it before the homeowner even realises there is a problem. The issue is then either fixed remotely, or a technician is rapidly dispatched to work on-site.

This rapid resolution is in SunEdison’s best interests, as every day that your system isn’t performing it’s costing a customer money.

That’s an incentive most solar installers cannot offer.

This same performance guarantee also ensures you’re receiving the most reliable products on the market. With SunEdison, homeowners can expect proven technology and brands that have proven reliable over time.

A SunEdison Energy Plan generally requires $0 outlay up-front*. Instead, consumers make a monthly lease payment that can be less than what they would have paid for comparable electricity from the grid. These lease payments are predetermined and stated in the solar rental agreement for the entire term, providing the consumer with price certainty. With the future of electricity pricing uncertain, this is a huge benefit.

The SunEdison Energy Plan provides a performance guarantee, customers are required to enter into a fixed term solar rental agreement with SunEdison, which sets out the terms upon which the performance guarantee applies. This ensures you’re receiving the most reliable products on the market.

The up-front payment is significantly reduced, allowing even more convenient monitoring to APS microinverter end users.

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JINKOSOLAR LOOKS TO GROW

In 2014, JinkoSolar shipped nearly 3 GW of solar products, making it the world’s third largest shipper of solar modules. JinkoSolar Chairman Li Xiande explains the secrets to the company’s success.

JINKOSOLAR’S 2014 FINANCIAL RESULTS SHOWED STEady PERFORMANCE IN MARGINS AND SHARP GROWTH IN SOLAR PANEL SHIPMENTS, GENERATING MORE THAN $100 MILLION IN NET PROFITS. WHAT ENABLED THIS GROWTH?
The key factors are: vertical integration, costs advantage, industry leading technology, proven quality and a wide geographic footprint.

We have established a strong presence, not only in the major markets of China, USA, Europe and Japan, but also in the smaller and faster growing markets of Chile and India. During 2014, the company made sales to 59 countries as well.

In addition to expanding sales operations, JinkoSolar has increased production capacity not only in China, but other countries.

We have now established five production facilities in China, South Africa, Portugal and Southeast Asia in order to better serve local customers to fulfill their demand and their specific product requirements.

As JinkoSolar also continues to strengthen its pipeline of projects, the company anticipates transferring project assets to a yieldco. SunEdison has been extremely anticipates transferring project assets to a yieldco. SunEdison has been extremely experienced partnering with solar PV companies, our finance pool will continue to widen.

WHAT ARE THE COMPANY’S LATEST PRODUCTS FOR THE AUSTRALIAN MARKET?
Our Eagle Series solar panels are the latest products available for the Australian market. Their commercial level maximum output reach up to 280 Watts. The Eagle Series offers the best combined power and product warranty over 25 years.

The panels are designed to deliver consistant, trouble-free energy over a very long lifetime.

WHAT SUPPORT SERVICES ARE AVAILABLE FOR USERS OF YOUR PRODUCT IN THE AUSTRALIAN MARKET?
Our sales and service team are located in Melbourne. We are now looking to widen our distribution channels in Australia.

JinkoSolar is also dramatically deepening its finance pool and lowering its cost of capital, which should give us a huge competitive edge moving forward.

CAN YOU PROVIDE MORE DETAIL ON THESE FINANCING ARRANGEMENTS?
We recently secured $479 million in financing from Minsheng Banking Corporation, which should be a huge help to further develop JinkoSolar’s manufacturing and downstream ambitions.

This follows Minsheng Bank’s agreement to a $161 million deal with JinkoSolar in 2014, which indicates that financial institutions are more than willing to continue increasing investments into solar PV. As financial institutions continue to have positive experiences partnering with solar PV companies, our finance pool will continue to widen.

WHAT SUPPORT SERVICES ARE AVAILABLE FOR USERS OF YOUR PRODUCT IN THE AUSTRALIAN MARKET?

YINGLI SOLAR TACKLES AWKWARD ANGLES ON AUSTRALIAN ROOFTOPS

Yingli Solar has launched its latest product, the PANDA Compact solar panel, specifically designed to use every single square metre of roof space to maximise energy production.

The PANDA Compact solar panel is a 54 cell module designed for roofs where traditional module sizes may not fit.

Yingli Solar is a founding member of the Australian Solar Council’s Positive Quality™ Program and the first solar PV manufacturer to have received the Positive Quality certification.

The PANDA Compact, 250 W will be available through authorised partners.
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Trinasmart combines our award-winning high performance panels with new power conditioning technology that continuously maximises the DC power output from each panel.

In addition, Trinasmart provides panel-level diagnostics, giving system owners unprecedented visibility into panel performance. You can easily monitor your system remotely from your smartphone or tablet at any time.

Trinasmart is the first high quality panel with an integrated “smart” junction box solution. This greatly reduces the complexity and labour costs associated with adding standalone optimisers or microinverters onto a solar panel in the field.

WE CALL THIS SMART THINKING.

Everything included

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