Submission No 6

SUSTAINABILITY OF ENERGY SUPPLY AND RESOURCES IN NSW

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Submission to the inquiry on

Sustainability of energy supply and resources in NSW

A list of renewable energy sources

Solar PV – House rooftop > Solar PV – factory rooftop & carpark rooftop > Solar PV – Solar farms.

Wind Turbines – Onshore > Wind Turbines – Offshore.

Concentrating Solar Tower [thermal] has 8 hours of storage > Solar Thermal Parabolic trough.

Microgrids > including Community based power generation [eg: Enova, Byron Bay]

Demand response – from large industrial businesses.

Virtual Power Plants – power from behind the meter – household

Pumped hydro > Battery storage – house > Battery storage – utility scale.

Hydrogen [using an electrolizer powered by renewable energy]

Hydrogen powered vehicles and trucks.

Electric powered vehicles and trucks.

The above sources of renewable energy supply and storage will be connected and controlled by block-chain type computer technology allowing its source, use and sale to be tracked, monitored and recorded. It is distributed and its source is often physically close to where the power is being used. It is not centralised like the old grid. With solar and wind the fuel is free, safe and non-polluting, unlike coal and gas.

The storage [batteries:- house – utility scale / virtual power plants / pumped hydro / electric vehicles & trucks, hydrogen vehicles & trucks] are used to firm up the renewable energy infrastructure ensuring that the system operates within the desired range and is reliable.

Worldwide over the next 30 years the renewable energy transition will develop to become a multi-trillion dollar industry. Those countries or states slow to embrace this unstoppable transition, will miss out on the early massive financial benefits and will be left far behind the uncompromised trail blazers.

Where does the LNP federal government stand regarding energy policy?

The federal coalition is pro-coal and pro coal-fired generation. In 2017 Prime Minister Morrison who was then Treasurer held up a lump of lacquered coal in parliament and said, "Don't be afraid, don't be scared, it won't hurt you. It's coal." Members of the federal coalition set up the "Monash Forum" to promote coal. They did not approve the National Energy Guarantee [NEG], nor accept the advice given by Chief Scientist Alan Finkel as a result of his enquiry. The coalition government claim that they want new coal-fired generation built in Queensland. Before the last election the coalition set up the Underwriting New Generation Investments Scheme [UNGI] which many suspect may be a vehicle to allow them to promote, support, and push through coal energy projects.

Where does the federal Labor opposition stand regarding energy policy?

The federal Labor party talked big on taking "climate action" and supporting and promoting renewable energy during the federal election campaign. However, during the last two weeks of the campaign Bill Shorten announced that if elected Labor would fund a $1.5 billion pipeline to move fracked gas across Queensland, Northern Territory, Western Australia and NSW., Fracked gas uses enormous quantities of water, risks permanently contaminating groundwater and produces large volumes of waste salt and fugitive methane gas. No doubt, the fact that the Queensland Labor government has many thousands of coal seam gas wells and the Northern Territory Labor government is in the process of allowing fracking in the NT., influenced their decision to fund the pipeline to carry fracked gas.

Donations

The coal and gas lobby donate extremely large sums of money to the federal Liberal, National and Labor parties. The same lobby groups employ retired politicians as advisers or lobbyists and federal political staffers and fossil fuel industry lobby staff move seamlessly between jobs in the two separate areas.

As a result the fossil fuel lobbyists have a very strong advantage and control of any government and opposition in promoting their products. And that is the reason the present federal LNP are so pro-coal and gas and anti-renewables. They spruik terms such as "clean coal" and 'baseload" and they attempt to blame any faults or breakdowns in the NEM [grid] on renewable sources of energy that they wrongly claim are not up to the job. Coal-fired generators break down very frequently during the hot days of summer, but they don't talk about that.

So the problem is not political "ideology" - it is political "compromise".

What is happening at a state and territory level?

South Australia under former Premier Jay Weatherill transitioned to renewables via solar and wind farms and supported the construction of the Tesla Big Battery at the Hornsdale Power Reserve. Mr Weatherill also wanted to introduce fracking into South Australia.

The Liberal state government that replaced the Weatherill Labor government in South Australia have embraced renewable energy and are moving ahead with the transition in leaps and bounds.

The Labor state government in Queensland support the fracking of the state but are also embracing renewable energy via solar and wind farms.

The NSW LNP government has supported and is pushing for the approval of the Santos Narrabri Gas project [fracking / unconventional gas] which stands on top of the recharge area for the Great Artesian Basin.

So it appears that state and territory leaders can't say "No" to fossil fuel projects; pushed by their donors, as they will bring money to treasury and create jobs. It is also payback to their donars for the financial support given to their political party.

They should not be saying "Yes" to such projects, but should consider renewables instead, and they should examine the evidence and science and approve the projects that are best for Australia. The best projects are renewable energy projects that are non-polluting, job creating and which are actually cheaper to build than the fossil fuel alternatives. The cost of the renewable energy power to the consumer is also cheaper.

Terms of Reference 1

The capacity and economic opportunities of renewable energy

The renewable energy revolution can't be stopped :-

The Australian Renewable Energy Agency [ARENA] and the Clean Energy Finance Corporation [CEFC] have been on the front foot supporting the transition to renewable energy.

Audrey Zibelman the CEO at the Australian Energy Market Operator [AEMO], in regard to the energy transition said, "The fact of the matter is, it's happening really fast. Everyone's predictions around solar uptake, even the most aggressive ones, were below what it actually is."

She also said, "… We need to make sure it's an orderly transition. This is a critical industry .. **If we get energy right, then our economy prospers. If we get it wrong, it suffers."**

CEO Zibelman calls the *"democratisation"* of the grid – one of the **four Ds** that will shape the future NEM, alongside *decentralisation, digitalisation* and *decarbonisation.* **[1]**

AEMO is drawing up an **Integrated System Plan (ISP),** rather than an integrated grid plan, to reflect that over time, the ISP will by necessity consider a wide spectrum of interconnected infrastructure and energy developments including transmission, generation, gas pipelines, and distributed energy resources.

The June 2018 ISP is not the end of the process, but rather the first of many steps, with updates in future years to reflect the dynamically changing nature of the power system and the need to continually innovate and evolve strategies for the future. **[2 & 3]**

The Australian Energy Market Operator and Energy Networks Australia revealed on Monday they are studying – with the help of the CSIRO – a new complex model that will divide responsibilities between the operator and network owners for the monitoring and management of distributed energy resources.

These resources, which encompass technologies such as rooftop solar, batteries and EVs, will play a growing and critical in a future grid that will not just shift from polluting fossil fuels to renewable energy, but also from a predominantly centralised system to one where half the capacity and resources are distributed.

AEMO chief executive Audrey Zibelman describes it as a "once-in-a-lifetime" opportunity for Australia to move to a two-way system for electricity production and distribution. "AEMO can see a future where consumers' controllable devices will have a marketplace to supply not just energy, but system and network services that reduce overall energy costs and help maintain system security. **[4]**

How will the various sources of renewable energy be pulled together?

Large industries rely on gas for power and prices are through the roof ! :-

Gas prices are high because the gas producers export most of our gas and buyers in Australia therefore have to pay the export price. **[5]**

Can renewables solve the problem for industry? :-

UK Billionaire steel magnate Sanjeev Gupta of GFG Alliance purchased the steelworks in Wyalla, SA., and is doing a $600 million upgrade so that it can produce 10 million tonnes per year. The expansion of the existing steel plant, alone, is expected to create 2,500 jobs. And it is all underpinned by renewable energy.

A MOU was signed between Mr Gupta's GFG Alliance, its energy off-shoot Simec Zen and French renewable energy developer Neoen and it was witnessed by Prime Minister - Malcolm Turnbull and visiting French President - Emmanuel Macron. The president of French energy company Neoen; Xavier Barbaro said, "The switch from fossil fuels to renewable energy is the revolution of this century, transforming our economics and our impact on the environment. We believe renewable energy is a game-changer and (these) agreements reflect a shared commitment to deliver low-cost

sustainable energy solutions to the market."

Mr Gupta said, "Renewable energy is at the heart of our Greensteel and GreenAluminium strategies, designed to make metal production and engineering competitive again in developed countries. We see Australia with its incomparable energy resource – as the natural home for expansion of energy-intensive industry, with renewables to play an integral role." **[6] & [7]**

Powering the mining sector :-

An average size off grid mine with a 30MW power plant will likely burn about $1.4 billion of diesel fuel over a 20-year period, at current prices. That's about one third of the total cost of the mine.

At the Energy and Mines conference in Perth, WA., there was consensus among the 300 strong people in attendance that more than 50% renewable share at Australian mine sites should now be considered the norm and 100% renewables will follow soon enough.

ARENA CEO Darren Miller, in announcing support for two ground-breaking projects combining wind, solar and batteries at the Agnew gold mine and the GMA garnet mine near Kalbarri, says the cost reductions in renewables are game changing. He said, "It is not a case of whether we replace fossil fuels with renewables, but how we integrate them." And he says the opportunity goes beyond stationary energy, thanks to the emergence of batteries and hydrogen, and into transport as well.

An electric mining dumper made by Kuhn Schweiz AG smashes any such preconceptions, and not only in its enormous 111 tonne bulk. The specifications of the converted Komatsu eDumper to make it fully electric include a massive 600kWh battery that alone weighs 4.5 tonnes. Capable of transporting up to 65 tonnes of lime at a time, the mining vehicle uses the battery to get up the uphill leg, and like other electric vehicles uses regenerative braking to recover energy on its downwards leg. Each eDumper can save the mining industry up to 50,000 tonnes of diesel each year and can also reduce CO2 emissions by 1.3 million kg every year.

Low cost renewable electricity means mining companies will no longer just shovel ore into shipping containers to export it for value-adding overseas, they will now look at establishing refining, processing and smelting industries considered impossible up to now. "I think there is a huge opportunity for industry, and for the refining and processing of copper, lead, zinc, and manganese. says Justin Brown, the executive director of Element 25, which is looking to source a minimum 50 per cent and up to 90 per cent renewables for the 100MW supply needed at it Butcherbird manganese project in the Pilbara. **[8]**

Kuhn Schweiz AG has built an electric mining dumper that weighs 11 tonne. The specifications of the converted Komatsu eDumper to make it fully electric include a massive 600kWh battery that alone weighs 4.5 tonnes. Capable of transporting up to 65 tonnes of lime at a time, the mining vehicle uses the battery to get up the uphill leg,

and like other electric vehicles uses regenerative braking to recover energy on its downwards leg. **[9]**

Mining giant BHP has put its electricity contracts for its operations on Australia's main grid and in Chile out to tender, and expects that offers including renewable energy could present the cheapest and most efficient options. BHP consumes about 6 terawatt-hours in Chile, around seven per cent of that country's annual electricity demand, and it has a 300MW requirement for the operations on Australia's National Electricity Market, including for the power-hungry operations at Olympic Dam in South Australia. "We are in market in both Chile and Australia for significant amounts of energy," the head of low emissions technology at BHP, Kirsten Rose, said at the Energy and Mines conference in Perth this week.

"We are really interested to see what happens, but we fully expect there will be a significant renewable component to that…. and that for us could be game changing." Recent tenders held by corporates and utilities have underlined the cheaper cost of wind and solar, including the cost of "firming" to ensure consistent supply. **[10]**

Terms of Reference 2

Emerging trends in energy supply and exports, including investment and other financial arrangements

Microgrids

I believe that microgrids whether connected to the grid or not, are the next big thing. They are perfect for towns located at the end of the grid and for communities not connected to the grid. Such isolated communities presently often rely on very expensive and very polluting diesel for power generation. A microgrid means a diesel generator would only be used as backup reducing the cost of diesel. It also eliminates the need to build and maintain expensive power transmission lines.

Community based renewable energy producers such as Enova Energy in Byron Bay will grow in size and number. People will be attracted to buying their energy from a community source which is basically a microgrid.

Lisa Cohn wrote an article in Microgrid Knowledge, 01.02.2019, titled, "Microgrids Can Protect Public Health. So Why Aren't We Using More That Way". She referenced a report by Justin Gundlach, project manager, policy development team, New York State Energy & Research Development Authority (NYSERDA) "Microgrids and Resilience to Climate-Driven Impacts on Public Health." The article highlighted the public-health effects of 'Superstorm Sandy' and the fact that outages knocked out power at medical facilities as well as pump stations and wastewater treatment facilities, leading to the release of 11 billion gallons of partially treated

sewage into waterways. Outages also disabled elevators and plumbing, leaving sick and elderly people stranded without food, water, medication or the ability to flush toilets. Other threats to the energy system are through floods and wildfires. **[11]**

Microgrids are being used extensively in the off grid mining sector and their use will expand greatly in our city and regional areas, because they make sense and save money and continue working when the NEM grid goes down.

What big renewable projects are in the pipeline? :-

'Star of the South' offshore wind farm

The proposal is for an $8 billion, 2GW, 250 turbine project off the coast of Gippsland in Victoria's east. It is expected to deliver around 8,000GWh of electricity per year, which is around 18 per cent of the state's current power usage, or enough to power 1.2 million homes.

The proposed site is also neatly located alongside existing transmission infrastructure in the Latrobe Valley, where the Hazelwood coal-fired power station has just been closed down. Although under-sea cabling will need to be installed to connect the wind farm to the network. **[12]**

The Federal coalition in March, 2019 approved a deed of licence to allow the proponents to undertake resource exploration for the wind farm off the Gippsland coast. **[13]**

In July, 2019, it was announced that a labor market study is being undertaken by Atlas Professionals an HR service provider to assess the skills and workforce requirements needed to complete the project. **[14]**

Asian Renewable Energy Hub in the Pilbara region of Western Australia

A consortium plans to build 9GW of solar and wind farms in the Pilbara, WA., The mooted addition of 3 GW will take the potential cost of the project –which envisages exporting cheap wind and solar to Asian customers via subsea cables – to around $20 billion. The scale of the project is phenomenal. That amount of capacity will generate around 33TWh of wind and solar a year – exactly the amount of wind and solar that is targeted for the whole country by 2020 under the federal renewable energy target.

It would also be the biggest wind-solar hybrid project in the world, could include battery storage, and would likely provide jobs for 3,000 people in the construction phase and 400 people over the long-term operations.

The AREH consortium – which includes global wind turbine manufacturer Vestas, Australia's CWP Renewables, and Intercontinental Energy – says the extra capacity will allow mine expansions, and the addition of upscale value-added processing.

The 9GW of generation capacity will likely comprise around 6GW of wind generation and 3GW of solar PV generation, and could also include hydrogen storage facilities for domestic use and export.

Dickson said the project could almost be seen in two components: the export side depending on contracts overseas; but the domestic component could potentially be a stand-alone project, or a precursor, given the cost advantage of renewables over gas. **[15]**

'Australia-Singapore Power Link' – Tennant Creek, NT

The Northern Territory government is supporting plans by Sun Cable to develop a 10 GW solar farm and 20-30GWh storage facility costing $20 billion, near Tennant Creek.

As we have reported, the ASPL aims to supply renewable electricity to Darwin and Singapore via a high voltage direct current transmission – a plan first outlined by Beyond Zero Emissions last month, and which quickly attracted the attention of investment heavyweights including Mike Cannon-Brookes' Grok Ventures.

The project has the potential to create 1000 jobs during the construction phase, and 300 ongoing operational jobs. **[16]**

Hydrogen - produced using renewable sources of energy
[aka Renewable hydrogen or Green hydrogen]

A new study led by chief scientist Alan Finkel has underlined Australia's role as a leader in the household battery storage sector, and says Australia can, and should, be a leader of energy storage of all types, including renewable hydrogen as an export opportunity.

Finkel's new report Taking Charge: The Energy Storage Opportunity for Australia is a 9-page summary and update of a detailed report on energy storage by the Australian Council of Learned Academies (ACOLA) released in November 2017.

"Renewable hydrogen made by using solar or wind electricity to split water into hydrogen and oxygen is a logical choice," it says. "The only by-product in production is oxygen. During use, the exact same quantity of oxygen is consumed to produce heat or electricity, and the only by-product is water vapour.

"Japan has made hydrogen a national priority to power heavy industry and drive the hydrogen fuel-cell cars produced by its carmakers such as Toyota and Honda. "Australia is well positioned to be 'shipping sunshine' in the form of exported hydrogen. Hydrogen gas can be cooled to a liquid state or converted to ammonia for shipment by sea." **[17]**

The Australian Renewable Energy Agency (ARENA) has formally announced a $20 million funding round to encourage early stage research and development into hydrogen and the export of renewable energy such as "solar fuels".

Many in the industry see hydrogen, or other carriers such as ammonia, as an avenue for Australia to duplicate its lucrative energy exports, but with solar and other renewable fuels rather than LNG or thermal coal.

The idea is to use excess wind and solar, and take advantage of its continued cost falls, to use electrolysis to convert electrical energy into hydrogen, and then ship this to markets in north Asia or other countries hungry for low carbon fuels.

"Australia exports approximately three quarters of the energy it produces, in the form of coal and gas," says CEO Ivor Frischknecht.

"Having some of the best solar and wind power resources in the world, Australia could become a superpower in exports of renewable energy, globally, leveraging existing relationships and growing global low carbon energy demand in countries such as Japan, South Korea and China."

He is not the only person to believe this. Professor Ross Garnaut and former Clean Energy Finance Corp CEO Oliver Yates have both pointed to Australia's potential to emerge as a green energy superpower. **[18]**

The South Australia government has announced funding for what will be Australia's first renewable-hydrogen electrolyser plant – a 15MW facility to be built near the end of the grid at Port Lincoln on the Eyre Peninsula.

The "green hydrogen" plant – to be built by Hydrogen Utility (H2U), working with Germany's thyssenkrupp – will include a 10MW hydrogen-fired gas turbine, fuelled by local wind and solar power, and a 5MW hydrogen fuel cell.

Both will supply power to the grid, will support two new solar farms and a local micro-grid, and will also include "distributed ammonia" that can be used as an industrial fertiliser for farmers and aquaculture operators.

The $117.5 million project, which will receive a $4.7 million grant and a $7.5 million loan from South Australia's Renewable Technology Fund, is being described as a "globally-significant demonstrator project" for the emerging hydrogen energy sector. **[19]**

A green hydrogen power plant facility in South Australia is a step closer to completion with announcement of a generator supplier. Australian hydrogen infrastructure developer H2U confirmed today that it will use Baker Hughes NovaLT gas turbine generators at its South Australian Renewable Hydrogen and Ammonia Supply Chain Demonstrator in Port Lincoln. H2U won the AUD$117.5 million greentech project a year ago in partnership with German-based thyssenkrupp. **[20]**

South Australia is set to host its second hydrogen production and distribution facility, with the construction of a 1.25MW Siemens electrolyser that will produce hydrogen using electricity from the grid and potentially on-site solar.

The $11.4 million project, announced on Wednesday by the Australian Gas Infrastructure Group (AGIG), will be built at the Tonsely Innovation District in Adelaide – the industrial suburb built around the former Mitsubishi car manufacturing plant. **[21]**

The state Labor government has announced plans to provide initial funding, and ultimately a loan, to help French renewable energy developer Neoen build a 50MW hydrogen "electrolyser" that would be powered by a new wind and solar complex at Crystal Brook, north of Adelaide.

The complex will combine a new wind and solar production facility totalling 300MW, along with a significant amount of battery storage, and lay the foundations to export large quantities of "renewable hydrogen" to Asia, competing as a green alternative to LNG.

This new development, at the proposed Crystal Brook energy park , just south of Port Pirie in the state's mid north, and about 40kms from the Hornsdale complex which houses its 315MW wind farm and the 100MW/129MWh Tesla battery, is of another scale.

It would include 150MW of solar, about 150MW of wind, as well as up to 50MW hydrogen plant along with up to 400MWh of battery storage, again most likely with Tesla. **[22]**

The Australian Renewable Energy Agency has announced funding for a $3.3 million "green hydrogen" innovation hub in Western Australia. The latest announcement from ARENA is for $1.5 million in funding for a $3.3 million project to trial the production, storage and use of renewable hydrogen to energise a commercial-scale microgrid.

The "green hydrogen" in this instance will be produced from 300kW of on-site solar, and 400kWh of batteries that will time shift electricity and power an electrolyser, which in turn will fuel a range of gas appliances and will blend hydrogen into the natural gas pipeline. **[23]**

How quickly will the coal industry decline?

No doubt the members of the Lower House Enquiry will have all the up to date predictions from the professional firms engaged in economic analysis from around the world on the timeline for the demise of the coal industry.

My assessment is that the demise of the coal industry will happen a lot faster than what they predict. WHY?

+ Renewables are non-polluting, they are not a threat to health or to the environment and are cheaper.

+ People are adopting renewables and will keep adopting them, no matter which political party is in power.

+ People like Sanjeev Gupta building steel and renewable energy empires

+ People like Elon Musk building electric vehicle, rooftop solar and battery storage empires

+ Ordinary people installing rooftop solar and home batteries and only buying electric vehicles.

  [On this point, when EVs are in the price range of $20,000 to $30,000, which will be very, very soon, no person, I mean absolutely no person will buy an ICE vehicle. The ICE vehicle industry will collapse over night. It is being reported now that people are not buying new cars. That's true but its not the economy causing it; people are holding onto their present car until the price of EVs come down and then they will BUY an EV ! Save on petrol and repairs and no pollution]

+ All previous predictions on the expansion of renewables have always been far short of what actually occurs in the real world.

+ Super funds, universities etc., divesting from fossil fuels

+ Insurance companies refusing to cover fossil fuel projects.

+ Multi-national companies converting their energy supply to renewable sources

+ Energy dependent large scale industry abandoning expensive gas fuel and diesel and obtaining their energy from renewable sources supplied by companies like Simec Zen.

+ The mining sector converting to renewables, electric vehicles & trucks

All of the above actions are economically self driven. The climate emergency is becoming more evident to everyone every day. People are fed up with the double talk from compromised politicians. People will seek to purchase their electricity from clean energy suppliers and those that can afford it will buy solar panels, home batteries and electric vehicles.

What can be done for all the workers in the coal and gas industry?

+ Educate and retrain workers to equip them to use their skills to work in the renewable energy sector. Involve any relevant unions heavily in this commitment.

+ Tap into the experience of the "contracting companies" that presently supply the tradie workforce that do the maintenance and repairs on the coal mine equipment and infrastructure. They would be highly qualified to predict what additional training would be needed and could also predict the type of problems or challenges that could arise.

+ As with the item above, tap into the experience of the "contracting companies" that presently build the solar farms and wind farms. What skill sets do they require? How big will the new workforce need to be. How long will any new employment last. Solar farms and Wind farms will not require anything like the amount of maintenance and repair that coal mine equipment and infrastructure does!

+ The construction of solar and wind farms will require the new workforce to travel away from where they reside to those worksites; quite possibly away from districts and areas where they live. The worksites could be hundreds of kilometres away or even interstate.

+ Seek advice from the unions in the coal and gas industry in an effort to plan the transition away from building and maintaining coal infrastructure to doing the same with renewable energy infrastructure.

+ Seek advice from successful businessmen like Sanjeev Gupta who is a giant in the steel and renewable energy sector. Mr Gupta is a billionaire, so he's successful and his staff are administering companies that have already overcome the issues and challenges posed by the transition away from fossil fuels to embracing renewable energy.

+ Seek advice from a respected person like Ross Garnaut an economist whose career has been built around the analysis of and practice of policy connected to development, economic policy and international relations in Australia, Asia and the Pacific. He has held senior roles in universities, business, government and other Australian and international institutions. Mr Garnaut became Chairman of SIMEC ZEN Energy Technologies Pty Ltd in 2015. In October 2017, ZEN Energy formed a strategic partnership with global company GFG Alliance [owned by Sanjeev Gupta] and Professor Garnaut became President of SIMEC ZEN Energy.

  Mr Garnaut's views and advice on all the issues being examined by the Lower House Enquiry would be invaluable.

+ Lessons could be learnt from Germany who has closed down it black coal industry and to maintain the communities from which the miners came retrained workers and built new transport infrastructure and universities, waterways rehabilitated mine sites and coking plants converted into parks, exhibition areas and museums. Many old employees work to rehabilitate the landscape and maintain the pumps that keep the regions poisoned groundwater below ground. They intend to close the brown coal industry by 2038.
  Ref: The Sydney Morning Herald, 14.07.2019 by Nick O'Malley.
  https://www.smh.com.au/environment/climate-change/how-germany-closed-its-coal-industry-without-sacking-a-single-miner-20190711-p526ez.html

Conclusion:-

Coal and other fossil fuel energy sources are terminally ill and will die. Killed off by much better renewable energy sources.

Renewable sources of energy are the best, cheapest, safest and most liked by ordinary people. Now and into the future renewables will be the dominant new build energy infrastructure.

The New South Wales government in regard to renewables should **praise them,** embrace them, promote them, build them and reap the new jobs created and bank the massive financial rewards.

Adrian Ingleby
24th July, 2019

References

[Note the full articles are not shown. Please go to the link for the full article]

Sustainability of energy supply and resources in NSW

[1]

Audrey Zibelman - CEO – Australian Energy Market Operator [AEMO]

Ref: Renew Economy 12.06.2019 – by Sophie Vorrath
https://reneweconomy.com.au/australia-has-to-look-forward-on-energy-says-zibelman-we-have-no-choice-20176

Australia's exit from coal and transition to a renewable grid is tracking not only ahead of most of the rest of the world, but is coming faster than almost all of us would have predicted, the head of the Australian Energy Market Operator has warned. "We have to look forward, we have no choice in Australia," AEMO chief Audrey Zibelman told the audience at Australian Energy Week 2019, in Melbourne on Wednesday.

But Zibelman, who rarely wades into the quagmire of energy politics in Australia, likes to stick to the known knowns – namely that coal is on the way out, and a completely different grid to that we have known for the past century is on the way in. It's just a matter, now, of how quickly and neatly this transition plays out.

"The fact of the matter is, it's happening really fast," Zibelman said. "Everyone's predictions around solar uptake, even the most aggressive ones, were below what it actually is." "I think even all of our predictions around storage, and the changing price of storage, I think we're probably all shy of where it's going to be."

"And so thinking about that means that… we have to assume that it's going to be faster than we anticipate. At the same time, we need to make sure it's an orderly transition," she said. "This is a critical industry. …**If we get energy right, then our economy prospers. If we get it wrong, it suffers."**

"So it's very important that we take a measured approach and we have a way of exiting the existing technology."

Zibelman was particularly keen to stress how quickly the energy market is changing at the consumer level – as households and businesses take up ever cheaper solar and battery storage at a break-neck speed, and in turn set the pace and the direction for the rest of the grid.

This, Zibelman calls the **"democratisation"** of the grid – one of the **four Ds** that will shape the future NEM, alongside **decentralisation, digitalisation** and **decarbonisation.**

"We talk about the (NEM becoming) decentralised, which is true .. and we're seeing that in Australia at a very rapid pace. But the point is that for the first time in this industry, consumers have a real vote.

"It's not just simply, do I want to pick this supplier or that supplier? It's actually how much energy do I want to buy? Do I even want to buy it at all, or do I want to produce it myself? "And that really needs to change the nature of how we in the industry think about consumers. We can't take them for granted any more. "And that, in some ways, could be threatening, but in other ways is a real opportunity to do things better."

[2]

Ref: Renew Economy 17.07.2018 by Giles Parkinson
https://reneweconomy.com.au/bad-news-for-coal-huggers-renewables-at-50-by-2030-2030

Bad news for coal-huggers : Renewables at 50% by 2030

"King coal to rule for 20 more years" screamed the front page lead headline in The Australian, following the release of the Australian Energy Market Operator's 20-year blueprint for the future of energy, known as its Integrated System Plan.

Hate to say this guys, but that's not what the AEMO report says. Here's the thing: **AEMO's blueprint** makes it absolutely clear that even if current climate and emissions and policies are not changed, then the shift in generation is going to happen anyway, and quickly.

CHART

This graph above shows that by 2030, based on the Coalition government's existing policy and the various state targets in Victoria and Queensland, black and brown coal contribute barely 100,000GWh, and the share of renewable energy will be nearly 50 per cent by 2030.

But contrary to the claims of conservative commentators, it does not recommend they be kept open for longer. That's because the combination of wind, solar and storage will be cheaper, as AGL has highlighted.

So, by 2030, out of the system have gone Liddell (2022) and Vales Point, both in NSW, and Gladstone in Queensland. It does not rule out this happening earlier, either due to the inability of the coal generators to make money, or catastrophic failure of their machinery.

In the 2030s, Yallourn, Eraring, Bayswater, Tarong and Callide are gone. By 2040, the "rule" of King Coal is but a memory.

(Please listen to our Energy Insiders Podcast interview with Zibelman recorded today. either below or here).

But there's more.

Like the National Energy Guarantee and the Australian Competition and Consumer Commission report, the central scenario of AEMO **gives no regard to climate change policies, the need to accelerate targets to ensure that Australia does its bit to meet the Paris climate target.**

CHART

Where it does, the outlook is even bleaker for "king coal". **Renewables have a much greater share of generation – going towards 60 per cent.**

This graph above shows the "fast change scenario, and shows that the combination of black and brown coal and gas generators account for less than 100,000GWh out of total grid demand of around 250,000GWh.

And that "fast change" scenario is further complicated by other factors thrown into the mix – the assumption that consumption grows faster than the neutral scenario, that EV uptake is greater, less demand management, and the roll-out of rooftop solar is not co-ordinated.

So the end result could be even more bleak for the coal-huggers. A fast-change scenario that dials in appropriate climate change policies, co-ordinates distributed energy, promotes demand management could actually see more coal out of the system earlier.

But that detailed modelling would just be too scary for some – best to keep it in the adults-only section. Or not to publish it at all.

Update: Little wonder that **Labor's Mark Butler** was impressed, saying in a later statement that the IPS "vindicates Labor's renewable vision" for Australia's energy future.

"The AEMO report confirms that the future of energy in this country is renewables," he said in a statement.

"It confirms that coal will stay in the mix – as we have always said it would – until it is phased out and replaced by cheaper renewable energy, and it confirms that there should be no new investment in coal.

"In contrast to claims being made by members of the Turnbull Government, AEMO do not advocate for the extension of coal power plants past their technical or design life, and in particular, they do not call for the extension of the Liddell or any other coal power station."

"Just like Labor, the energy industry, experts and the Australian public, AEMO understand that the energy future of Australia lies with renewables.

"This is placed beyond any doubt by AEMO modelling, which shows renewables making up 46 per cent of NEM generation by 2030 in their Neutral scenario, and 61 per cent of generation by 2030 in their Fast Change scenario.

"This modelling confirms Labor's 50 per cent renewable energy target is both achievable and responsible."

[3]

Ref: Renew Economy 12.03.2018 by David Leitch

http://reneweconomy.com.au/know-your-nem-time-to-focus-on-isp-and-dump-the-neg-16689

David Leitch is principal at ITK, specialising in analysis of electricity, gas and decarbonisation drawn from 33 years experience in stockbroking research & analysis for UBS, JPMorgan and predecessor firms.

Know your NEM: Time to focus on ISP, and dump the NEG

What's interesting this week:

- AEMO's Integrated System Plan [ISP]
- Distributed Energy Resources [DER] development

These two topics cover one of the main debates, one that many don't even see as a debate – namely:

Are grid delivered and behind the meter electricity in competition, or in Co-Opetition ?

Every kilowatt hour (KWh of behind the meter investment is a KWh that won't be delivered by the grid.

Every KWh of household battery is a KWh taken away from peak pricing available to grid suppliers.

At the same time it's laughable to suggest that a developed economy can or should be entirely or even largely behind the meter.

What is a microgrid? Where are its boundaries?

At a recent **DER forum** attended by many knowledgeable people it was clear to me that DER is **a technology and software rich market** that is offering tremendous opportunity for some business.

I must have spoken to two or three company owners that have seen employee numbers go from 15-30 and from 30-60 in 12-18 months.

The scale of the problems being tackled is increasing. It's not just a household PV and a battery but keeping medium size businesses with mission critical power supplies running, sometimes at the end of long grid lines.

Cities and towns are starting to think what they can do to progress their electricity ecosystems and, as electric vehicle penetration grows, this will become more of an issue.

We still think town councils and city mayors could do more to speed EV uptake than just about anyone through parking concessions.

In any event, getting back to the **ISP,** Here is a reminder from AEMO's website of what it is, and what it is supposed to achieve:

*"AEMO is calling this an **Integrated System Plan (ISP),** rather than an **integrated grid plan**, to reflect that over time, the ISP will by necessity **consider a wide spectrum of interconnected infrastructure** and energy developments including transmission, generation, gas pipelines, and distributed energy resources.*

*The June 2018 ISP is not the end of the process, **but rather the first of many steps,** with updates in future years to reflect **the dynamically changing nature of the power system** and the need to continually innovate and evolve strategies for the future.*

The first ISP in June 2018 will deliver a strategic infrastructure development plan, based on sound engineering and economics, which can facilitate an orderly energy system transition under a range of scenarios. This ISP will particularly consider:

- ***What makes a successful renewable energy zone (REZ)** and, if REZs are identified, how to develop them.*
- *Transmission development options."*

Comments on this plan are now closed at the AEMO site but we continue to enthusiastically wait for news including, hopefully, publication of comments and submissions.

In our view the ISP and not the NEG is the plan COAG should focus on. If COAG gets behind the ISP Australia may yet manage the transition to a low carbon economy in a way that we can be proud of.

Design of the NEG, or in any event policies for reliability and carbon emissions, in our opinion logically comes after the ISP is agreed – and not before. It's amazing to me that the ESB doesn't even seem to know about the ISP. Same with AEMC. Come on guys, where's the love?

Clearly one part of the plan will be thinking about DER's fit with the grid in a more systematic manner. DER is very disruptive and its getting bigger not smaller.

[4]

Ref: Renew Economy 22.07.2019 by Giles Parkinson

https://reneweconomy.com.au/who-is-going-to-manage-and-control-rooftop-solar-batteries-and-electric-vehicles-22938

Who is going to manage and control rooftop solar, batteries and electric vehicles?

Australia's grid operator and the principal network lobby are now looking at a "hybrid" model as they search for an optimum system to fully "integrate" the growing amounts of rooftop solar and battery storage, and ultimately electric vehicles, into the country's grids.

The Australian Energy Market Operator and Energy Networks Australia revealed on Monday they are studying – with the help of the CSIRO – a new complex model that will divide responsibilities between the operator and network owners for the monitoring and management of distributed energy resources.

These resources, which encompass technologies such as rooftop solar, batteries and EVs, will play a growing and critical in a future grid that will not just shift from polluting fossil fuels to renewable energy, but also from a predominantly centralised system to one where half the capacity and resources are distributed.

CHART

Forecasts for the uptake of solar, batteries and EVs vary wildly, which is one of the reasons cited for difficulty in finding an agreed approach and to analyse the cost-benefits of the various options.

The headline figure looks like this – (see graph above) and the forecast switch to a "hyper-decentralised" grid that will see Australia lead the world in the switch away from the traditional centralised system, based around large coal and gas plants in Australia.

The predictions for the uptake for battery storage and EVs vary more. For the EVs, certainly in the early years, the fast uptake looks out of range, but the CSIRO is predicting that between two thirds and virtually 100 per cent of all vehicles will be electric by 2050. Household batteries storage could vary by a factor of 10 in the medium to long term.

The challenge, say AEMO and the networks, is getting visibility over what is installed and where, identify potential limit and constraints, and devise a way into how those resources can be "optimised" and managed.

Exactly how to do that – without annoying the hell out of consumers – is the challenge at hand.

Three potential models for the creation of what is known as a "distributed market operator" (as opposed to a wholesale market operator), and a "distributed system operator" have been canvassed since the OpEN program was launched last year. After feedback, the two bodies are now looking at a "hybrid" system that will share responsibilities.

The solution, the new report says, consists of four principals: Knowing and monitoring what is installed; setting parameters for system limits (to be called operating envelopes), improving communications; and creating a market signal.

There is a sense of urgency in the works, because South Australia (at the end of the grid), and Western Australia (all by itself in the west) are approaching penetration levels where the AEMO sees difficulties if it continues, and there are numerous individual regions in other states seen to be at or nearing their limits.

In W.A., where RenewEconomy recently visited and had extensive discussions with key players, there is talk of things like “export limits”, but the smarter thinking is in terms of imposing this only in “season”, such as the spring or autumn days when the skies are clear but the temperature is mild. Distributed storage, particularly at a “community” level, will also ease the burden on two way flows in an elongated grid.

The final part of this challenge for AEMO and ENA is market signals. Here, the two bodies are particularly interested not just in tariff structure and grid services, but also the operations of “virtual power plants”, and how these are managed.

But then it comes down to who gets to do all this, and how it is managed. As a result of the feedback, particularly around the complexity of having an “independent” Distributed System Operator, and the potential conflict of interest of having networks act as a technical and market operator, the hybrid model was proposed.

AEMO chief executive Audrey Zibelman describes it as a “once-in-a-lifetime” opportunity for Australia to move to a two-way system for electricity production and distribution.

“The world is looking to Australia as the leader in installing rooftop solar and batteries to incentivise and integrate these customer resources to benefit all,” Zibelman said in a statement.

“AEMO can see a future where consumers’ controllable devices will have a marketplace to supply not just energy, but system and network services that reduce overall energy costs and help maintain system security.

“Through this process with Energy Networks Australia, the vast majority of stakeholders agree that actions are needed to be taken to build capabilities and trial new market mechanisms to ensure the final design delivers the benefits at the lowest cost.”

[5]

Ref: The Sydney Morning Herald – 16.03.2017 - by Waleed Aly
https://www.smh.com.au/opinion/phoney-energy-crisis-merely-a-ploy-to-access-offlimits-gas-20170316-guz8pb.html

Phoney energy crisis merely a ploy to access off-limits gas

"It is not acceptable for Australia – shortly to become the world's largest exporter of liquefied natural gas – to not have enough gas for its own families and its own businesses," boomed Malcolm Turnbull ahead of the meeting. And he was right. What

was far less clear was why this arrangement had been so perfectly acceptable for so long.

Let's be clear: there is no gas shortage. Not in Australia, and not around the world. In fact, there's the opposite: a global glut of the stuff. BHP has already admitted there's enough gas in Bass Strait to supply the east coast "indefinitely". And globally, by the end of 2015 the gas industry was capable of producing about 25 per cent more liquefied gas than the world wanted to import.

By 2020, production capacity looks set to increase another 30 per cent. Even if demand is increasing – and that's not absolutely clear – it's not keeping pace with that. The world's biggest importer, Japan, has been reducing its demand for several years, and according to its own government, will be buying 30 per cent less gas by 2030 as it turns its focus to renewables.

What there is, then, is a monstrous failure of policy. If Australia's soon to be out of gas, it's only because we keep shipping it overseas. This has been happening for years under the noses of governments of both persuasions, and none of them has cared to do anything about it.

Perhaps that's because of a prevailing wisdom that such decisions should be left to the market. But here's the problem: the gas industry isn't really a market. It's an oligopoly. It has very few providers, operating under very little regulation. They can charge who they want whatever they want, safe in the knowledge there's no meaningful competition to challenge them, and no meaningful government policy to control them. Where there is some competition – that is, overseas – gas prices are lower. That's why we have the bizarre situation that you can buy Australian gas in Asia for something like two-thirds the price you can buy the same gas here.

No one else does this. Americans pay a third of what we do for their own gas. Qataris pay even less. That's because they either have properly functioning markets, better regulation, or ensure they keep enough gas for themselves.

Here, only the West Australian government figured it should do something similar, imposing a requirement that a certain amount of gas be reserved for domestic use. And our gas companies have simply abused this. They refused to offer Australian companies gas prices for the long term, so businesses had no idea how much they'd be paying – a policy that caused some companies to set up elsewhere.

When they did offer gas prices, they made them exorbitant and refused to negotiate. We know this because the ACCC identified it last year, saying Australian industry had received "few, if any, real offers for gas". The result is an entirely artificial "shortage", triggering an equally artificial crisis. This, frankly, is a rort.

So it was all very encouraging to hear Turnbull boasting this week about the size of his constitutional stick. "We have a responsibility – which we do not shirk from"; the industry understands the gravity of its "social licence" to operate. Et cetera. But the government has steadfastly refused to use that stick previously. And when you have gas companies slugging Australians record prices while charging their Asian

customers record low prices, it's a little hard to believe they stay awake at night worrying about the terms of their "social licence".

What's much easier to believe, though, **is that the gas industry is desperate to get its hands on gas supplies that are off limits** – especially controversial ones like, say, **coal seam gas.** And if they have to offer a little more domestic supply to do it – at a time when global demand is slowing anyway – then it's hardly a sacrifice. Oh, and as it happens, that's exactly what Turnbull would like to offer them, hence his condemnation of the states' bans on further gas extraction.

It's a neat trick, really. Take a country with enough gas to supply itself "indefinitely", send the vast majority of it overseas, refuse to sell locally at a fair price, create a domestic shortage, **then demand access to some of our most environmentally sensitive resources as though it's an emergency measure.**

And if you're going to pull a trick like that, this is the government to pull it on. Sure, Turnbull announced some useful initiatives to increase transparency in the market. But the Turnbull government's energy wars have led it to the point that it simply cannot resist any opportunity to turn this back on the (Labor) states. It's only too happy to paint this as a problem of Victoria or South Australia's creation, as though gas companies have been passive observers, buffeted by market forces rather than subverting them. Well, now those companies can passively observe as the political campaign revs up to give them much of what they want. That's their carrot. Sticks, it seems, are only for political foes.

[6]

Ref: Renew Economy – 10.12.2018 by Sophie Vorrath

https://reneweconomy.com.au/gupta-doubles-down-on-green-industrial-plans-for-whyalla-powered-by-cheap-renewables-24759

Billionaire steel magnate Sanjeev Gupta has unveiled more sensational details of his plans to transform Whyalla into a green industrial hub, powered by hundreds of megawatts of solar and storage.

In a “big reveal” that drew Australia’s top politicians (including our coal-loving PM, Scott Morrison), the visionary chief of the GFG Alliance revealed plans to give the existing steelworks a $600 million upgrade, and investigate the feasibility of building a massive new steelworks in the city. This would boost the steel production capacity of the existing plant to a maximum of 1.8 million tonnes, and potentially another 10 million tonnes from the new plant.

“Our cutting-edge transformation plans for our existing steel plant are just the beginning of what GFG Alliance has in store for the region,” Gupta said in a statement on Monday. “Utilising almost perfect local conditions – our own infrastructure including a deep-sea port; rich local resources; and unrivalled community passion – we now plan to build a new steel plant, one of the world’s largest, right here in Whyalla.

"'Liberty Next-Gen Steel' will be the largest in the Western world, capable of producing 10 million tonnes per year, with the ability and infrastructure to double capacity in time."

On top of this, Gupta has revealed that a $45 million four-star hotel will be built in Whyalla, and two other new major businesses established, including a China-backed $145 million horticulture operation, and a $6 million organics recycling business.

So, as we noted around this time last year: Whyalla is not a ghost town at all – even despite the closure of the nearby coal generator that was forecast to destroy industry in the state. In fact, it's about as far away from it as you can get – the expansion of the existing steel plant, alone, is expected to create 2500 jobs. And it's all underpinned by renewable energy.

Powering the soon-to-be-expanded steel plant will be Gupta's 280MW Cultana solar farm, which is due to begin formal construction early next year following a ground-breaking ceremony in August.

"Today's event is symbolic of our desire to develop and invest in new-generation energy assets that will bring down Australia's electricity prices to competitive levels again, as well as our commitment to local and regional Australia," Gupta said at the time.

[7]

Ref: Renew Economy – 02.05.2018 by Giles Parkinson

https://reneweconomy.com.au/gupta-signs-up-solar-farm-to-power-victoria-steelworks-38761

UK "green steel" billionaire Sanjeev Gupta has signed a 15-year deal to take power from the soon-to-be built Numurkah solar farm in northern Victoria, to help power his newly acquired Laverton steel works in Victoria and reduce electricity costs.

The signing of an MOU between Gupta's GFG Alliance, its energy offshoot SIMEC ZEN and French renewable energy developer Neoen was witnessed by prime minister Malcolm Turnbull and visiting French president Emmanuel Macron at a ceremony in Sydney on Wednesday.

The message about cheap renewables and its ability to guarantee the future of Australia's manufacturing industry with dramatically lower electricity costs should not have been lost on either leader. "The switch from fossil fuels to renewable energy is the revolution of this century, transforming our economics and our impact on the environment," said Neoen president Xavier Barbaro. "We believe renewable energy is a game-changer and (these) agreements reflect a shared commitment to deliver low-cost sustainable energy solutions to the market."

Those plans – with include a 120MW battery storage facility, bigger than the so-called Tesla big battery near Neon's Hornsdale wind farm – will cut the steel-works costs by 40 per cent, and Gupta is planning on achieving similar reductions with his steel assets in Victoria and NSW.

"Renewable energy is at the heart of our Greensteel and GreenAluminium strategies, designed to make metal production and engineering competitive again in developed countries," Gupta said. "We see Australia with its incomparable energy resource – as the natural home for expansion of energy-intensive industry, with renewables to play an integral role."

Gupta joins a growing list of big industrial consumers switching to renewables to lower costs and underpin future development.

As we reported on Tuesday, Sun Metals is soon to commission its 124MW solar farm that will power 30 per cent of its electricity needs at its north Queensland zinc refinery, and pave the way for a $300 million expansion.

Nectar Farms will use a Neoen wind farm and another Tesla battery to power its new greenhouse near Stawell in Victoria – a $550 million project that would have gone overseas were it not for the cheaper renewable energy option.

Corporates such as Telstra, Westpac, CUB, ANZ, CC Amatil, and any number of shopping centre owners and building developers are also turning to renewables, and solar and storage in particular, to slash their electricity costs.

The Numurkah deal will see GFG Alliance take most of the output of the 100MW (AC) solar farm for 15 years to help its Laverton steel mill, and will enable Neoen to triple the size of the facility, as it had hoped.

It had already planned a 38MW facility after it landed a contract to supply large scale renewable energy certificates (LGCs) to the Victoria government tram network and as part of its plans to to source 40 per cent renewables by 2025.

The signing ceremony may well have taken place at Kirribilli House, the formal residence of the Australian PM, but the federal government can claim no hand in the deal.

Franck Woitiez, the head of Neoen Australia, said the role of the Victoria government was critical for the Numurkah solar farm, and the broader contract with GFG Alliance that followed.

"Full credit to Victoria energy minister Lily D'Ambrosio and the government policy. Their role was crucial and it shows the benefits of providing some support and letting the market do the rest," Woitiez told RenewEconomy. He said Victoria would now reap the benefits of the original initiative and its state policy.

"State based schemes are crucial and the National Energy Guarantee needs to be more ambitious" to ensure more renewable energy and storage plants are built across the country, he said.

[8]

Ref: Renew Economy 21.06.2019 by Giles Parkinson
https://reneweconomy.com.au/miners-see-50-renewables-as-standard-but-are-aiming-for-100-100/

Consider this statistic. An average size off grid mine with a 30MW power plant will likely burn about $1.4 billion of diesel fuel over a 20-year period, at current prices. That's about one third of the total cost of the mine.

But while the likes of the Minerals Council of Australia spend enormous resources pushing for new coal generators and even nuclear, and promoting these ideas through their close links with the government, the industry itself now find themselves at the forefront of the transition to renewable energy.

Which makes the principal theme at this week's Energy and Mines conference in Perth all the more extraordinary. If there was consensus among the 300-strong people in attendance, it could possibly be best summed this way:

More than 50 per cent renewable share at Australian mine sites should now be considered the norm, and 100 per cent renewables will follow soon enough.

ARENA CEO Darren Miller, in announcing support for two ground-breaking projects combining wind, solar and batteries at the Agnew gold mine and the GMA garnet mine near Kalbarri, says the cost reductions in renewables are game changing.

"It is not a case of whether we replace fossil fuels with renewables, but how we integrate them." And he says the opportunity goes beyond stationary energy, thanks to the emergence of batteries and hydrogen, and into transport as well.

"We will see rapid and ongoing cost reductions in battery costs, and mining companies moving to battery vehicles and hydrogen."

All the more striking was the mood that this was more than just a change in electricity supply. It could preface a fundamental re-think about the nature of mining in australia.

Low cost renewable electricity means mining companies will no longer just shovel ore into shipping containers to export it for value-adding overseas, they will now look at establishing refining, processing and smelting industries considered impossible up to now.

"I think there is a huge opportunity for industry, and for the refining and processing of copper, lead, zinc, and manganese. says Justin Brown, the executive director of Element 25, which is looking to source a minimum 50 per cent and up to 90 per cent renewables for the 100MW supply needed at it Butcherbird manganese project in the Pilbara.

The Butcherbird project is looking to export value-added manganese plate, now that wind and solar has provided cheap power to enable Australian companies to compete with Chinese producers. And the Australian project will have the added advantage of being low-carbon.

“It can be a viable alternative to just shipping the ore out,” Brown says, suggesting that the renewable hydrogen export story should be supplement by the side of exporting zero carbon products such as steel, alumina and others. “Why not?” he asks.

It’s not exactly what I expected when I took the plane in Sydney to cross the Nullabor. The political and mainstream media talk in the eastern states is dominated by scare stories that renewables will be the death of Australia’s economy, kill manufacturing and destroy jobs.

The mining industry here think that sort of talk is just nuts. Luckily for them, they can pretty much ignore the federal government and its neanderthal approach to energy and emissions.

Part of the problem was that miners were not convinced that solar, or wind, could be absorbed easily into an off-grid location without affecting reliability.

Numerous pilot projects have proved this is not the case, and the rapid improvement in battery technologies, integration and control system has now given the confidence that this technology is both cheaper and more reliable than what they have now.

Having recognised the opportunity, the mining industry is unlikely to muck around. After all, on off grid sites, they don’t have to stuff around with policies, and regulators and rule makers can’t get in their way.

Consider the potential. According to Juwi, the global mining industry consumers around 400TWh of electricity a year, about twice the consumption of Australia’s entire grid.

Stephen Hanson, the chief operating officer of Juwi, which built the ground-breaking solar and battery storage facility at the Degrussa copper mine in W.A. says the global mining industry consumes around 400TWh of electricity a year, about twice the consumption of Australia’s entire grid.

Yet, at the moment, just 0.1 per cent of that supply comes from wind and solar, with just 2,240MW of wind and solar PV installed in mining sites. That’s up from just 77MW in 2013, but it remains a tiny fraction of the opportunity.

“I see a tremendous opportunity here,” Hanson says.

Will Rayward-Smith, the general manager of Sunshift, says Australia’s off-grid mining sector’s demand is around 12TWh a year, about six per cent of Australia’s total consumption.

“I think it is realistic to expect that these mines will transition to 50% renewable energy contribution over the next 10 years – similar to the Agnew project that we see being announced today,” Rayward-Smith says.

“This therefore requires more than 6TWh to come from renewable energy. If we were to assume a ratio of wind:solar of 80:20 (in-line with the Agnew project) and capacity

factors of 36 per cent for wind and 23 per cent for solar, then this would require more than 400MW of solar PV and more than 1.6GW of wind.

“That’s likely to be more than $3 billion of capital works to address this market.”

That’s a view supported by EDL, which has been delivering 70 per cent renewables to the off-grid mining town of Coober Pedy in South Australia, and which will build the Agnew mine project with a mix of wind, solar and batteries to provide 60 per cent of its power needs.
“Fifty per cent renewables will be considered the norm, and 100 per cent renewables will be attainable with more battery storage and hydrogen,” says Todd Gordon, the business development manager, renewables, at EDL. And this will be done without the heavy subsidies that supported the initial Coober Pedy project.

It’s not just off grid mines turning to renewables. BHP has put out its energy contracts to tender, including the Olympic Dam mine in South Australia, and expects offers including renewables to “change the game” for its electricity supply.

It is also looking at adding wind and or solar to its W.A. mines, and Alinta has already revealed plans to add 60MW of solar to help power huge mines operated by Gina Rinehart and Fortescue Metals.
And the emergence, after decades of promise, of the so-called hydrogen economy could take things to a different scale altogether.

Warner Priest, a hydrogen expert and head of emerging technologies at Siemens, says at the smaller level, hydrogen storage could be used to take smaller off grid locations to 100 per cent to renewables, and then to use hydrogen for transport fuel – another cost burden for mines and remote communities.

Indeed, electrification of transport, and particularly getting rid of diesel vehicles in underground operations, is a main priority for just about every miner – for cost, health and safety reasons, as well as security of fuel supply.

This takes us back to that 30MW diesel power plant cited at the start of this story. Priest says that is equivalent to around 38c/kWH – or $380/MWh for diesel.

Under a whole different bunch of scenarios that he presented, that remote site could be “hybridised” with around 42MW of wind, say 17MW of solar, and with the excess going into a 12MW/4MWh battery. There was the option of also spilling that excess capacity using an 8.75MW electrolier with 1.5MW of fuel cells to electricity the transport.

Broadly, under a couple of different scenarios using a mix of wind, solar and batteries, or with the hydrogen addition, the cost of power could be slashed to just 23c/kWh.

“Any new greenfield mine in 10-100MW size and greater today would be considering integration of hydrogen in production – because there is so much uncertainty about gas prices and diesel,” Priest says. “There is the potential to go 100% renewables.”

And that is exactly what CWP Renewables, along with Macquarie Group and Vestas, intend to do on another scale, with their 11GW of wind and solar planned for the Pilbara, to underpin local manufacturing and value added industries of the sort planned by Element 25, and also to export "green hydrogen" to Asia.

"Our project will be 2/3 wind and one third solar," CWP's Andrwe Dickson told the conference. "By combining the two and over building cheap generation, we can deliver capacity factor of 70%."

[9]

https://thedriven.io/2019/07/22/worlds-largest-electric-vehicle-with-a-600kwh-battery

THE DRIVEN - Bridie Schmidt – 20190722

An electric mining dumper made by Kuhn Schweiz AG smashes any such preconceptions, and not only in its enormous 111 tonne bulk. The specifications of the converted Komatsu eDumper to make it fully electric include a massive 600kWh battery that alone weighs 4.5 tonnes. Capable of transporting up to 65 tonnes of lime at a time, the mining vehicle uses the battery to get up the uphill leg, and like other electric vehicles uses regenerative braking to recover energy on its downwards leg.

The heavier the load, the more power is recovered. "We had 75 tons of rocks and we went out of here with 90%, went all the way to the top," di Grassi said after a drive uphill from a mine in he eDumper. "We arrived with 80% battery, loaded up and on our way back, we recovered 8% so we came back with 88% — that's actually pretty cool." In an industry that is so behest by diesel emissions and the environmental impacts associated with that, electric mining vehicles are rapidly becoming a thing. Each eDumper can save the mining industry up to 50,000 tonnes of diesel each year and can also reduce CO2 emissions by 1.3 million kg every year.

[10]

Ref: Renew Economy 21.06.2019 by Giles Parkinson
https://reneweconomy.com.au/bhp-energy-tender-could-deliver-game-changing-shift-to-renewables-96107

Mining giant BHP has put its electricity contracts for its operations on Australia's main grid and in Chile out to tender, and expects that offers including renewable energy could present the cheapest and most efficient options.

BHP consumes about 6 terawatt-hours in Chile, around seven per cent of that country's annual electricity demand, and it has a 300MW requirement for the operations on Australia's National Electricity Market, including for the power-hungry operations at Olympic Dam in South Australia.

"We are in market in both Chile and Australia for significant amounts of energy," the head of low emissions technology at BHP, Kirsten Rose, said at the Energy and Mines conference in Perth this week.

"The ability to use BHP's purchasing power in this way is significant… these are technology agnostic tenders by the way, but we encourage innovation and to bring value to the table.

"We are really interested to see what happens, but we fully expect there will be a significant renewable component to that…. and that for us could be game changing."

Recent tenders held by corporates and utilities have underlined the cheaper cost of wind and solar, including the cost of "firming" to ensure consistent supply.

Zinc refiner Sun Metals has turned to solar in Queensland to underpin the expansion of its refinery near Townsville, while Sanjeev Gupta is looking to solar and battery and pumped hydro storage to lock in lower costs for the Whyalla steelworks.

Other major companies are slashing their costs, too, through long-term wind and solar contracts, and Infigen Energy recently tied up new customers with deals of around $60/MWh or less – significantly lower than existing wholesale prices.

Rose says the BHP tender would evaluate cost, reliability and emissions, but she notes that for the first time BHP is putting a strong emphasis on the carbon content of its electricity supply contracts. "We are certainly turning the evaluation on its head from what we have done in the past."

The Minerals Council of Australia, with both its previous CEO and deputy CEO now lodged within the inner advisory sanctum of prime minister Scott Morrison, is pushing for new investment in coal-fired generators, and even nuclear power.

Most of the mining industry, however, is looking the other way, conscious of the extremely high cost of new coal generation and nuclear, and the plunging cost of wind and solar, and the development of storage solutions and integration.

The Energy and Mines conference in Perth this week heard numerous examples of major mining companies looking to reduce diesel and gas consumption, and new projects are looking to use at least 50 per cent renewable energy share, to keep costs low, to conform with customer requests for low-carbon supplies, and to get some certainty about future energy costs.

Rose says BHP is also looking at renewable energy options for its major mining operations in W.A., which mostly centre around iron ore in the Pilbara. Alinta Energy is planning to build a new transmission line, and a 60MW solar farm, to supply big mines owned by Gina Rinehart and Fortescue Metals.

[11]

https://microgridknowledge.com/microgrids-can-protect-public-health/

MICROGRID KNOWLEDGE
Lisa Cohn - 20190201

Microgrids Can Protect Public Health. So Why Aren't We Using More that Way?

Microgrids can protect public health during power outages by keeping the water clean, ensuring medical facilities are running, and keeping people cool during dangerous heat waves.

But a number of challenges must be overcome, especially at the policy level, in order to realize these benefits. Both public-health and electricity industry stakeholders need to work on the problem, says **Justin Gundlach**, project manager, policy development team, **New York State Energy & Research Development Authority (NYSERDA)** in a report, "Microgrids and Resilience to Climate-Driven Impacts on Public Health."

Gundlach provides a number of recommendations aimed at protecting public health during power outages. Policymakers, especially at the state level, need to anticipate severe electricity disruptions and place a value on the benefits of resilience, he says in the report. **They also need to address the legal, regulatory and utility challenges to microgrid deployment.**

Part of the challenge is that different stakeholders in the public health and electricity sectors **stress different resilience objectives** related to their own missions, the report says.

"Fostering resilience means **anticipating** severe disruptions as well as **planning, investing,** and **designing** so that such disruptions, which are certain to occur, are made shallower in depth and shorter in duration," says the report, which Gundlach **wrote as a staff attorney at the Sabin Center for Climate Change Law.**

Microgrid developers handcuffed

In his report, he cites the public-health effects of **Superstorm Sandy** as an example. **Outages knocked out** power at medical facilities as well as pump stations and wastewater treatment facilities, leading to the release of 11 billion gallons of partially treated sewage into waterways, says the report. Outages also disabled elevators and plumbing, leaving sick and elderly people stranded without food, water, medication or the ability to flush toilets.

Such examples demonstrate that in order to protect public health during storms, floods, heat waves and other emergencies, **it's critical to maintain electricity services that support wastewater and drinking water treatment plants, health care facilities and communications infrastructure, the report says.**

Generally, utilities respond to outages by **"handing off" the problem to others**, says the report.

"Grid power fails, and a small constellation of backup generators maintained independently by individual campuses, facilities, or individual structures switch on, or fail to switch on, or were never purchased **and so leave the location dark and its equipment inoperative,"** says the report.

Microgrids can solve this problem — but microgrid owners and developers are often **handcuffed by legal and policy constraints, the report says.** The report aims to **encourage the development** of public-health and electricity policies that promote microgrid siting, design and operation.

Barriers to developing "technically viable, cost-effective microgrids" include **laws and regulations at the federal, state and local levels,** including grid interconnection, metering, and performance requirements, says the report.

The report calls for policymakers to identify the benefits of resilience and figure out how to allocate the costs of microgrids, as well as allocate their benefits.

Right now, there's no established value stream for resilience, the report says. **What's needed is guidance about how to measure resilience.**

Making public health microgrids a national priority

"States are capable of devising the sort of analytical protocols called for here — **New York, for instance,** developed a tool for microgrids that **seeks to capture their costs and benefits** — but this solution would be most efficiently devised and promulgated from the national level with federal support," says the report.

Such tools could be created by a National Academies of Sciences panel or a group of experts convened by the Department of Energy or White House Council on Environmental Quality, the report says.

States also need to identify **potential dangers — flooding or wildfires**, for example — that could result from climate change, as well as areas that are vulnerable to such dangers, says the report.

Connecticut has done this, and suggested hardening, redesigning and relocating some critical facilities such as drinking water infrastructure, says the report.

Information created by assessments like Connecticut's **about future risks, needs and options** will help identify the costs and benefits needed for microgrid siting and design, the report says.

Otherwise, microgrid developers might have to rely on guesswork to make important decisions, says the report.

NY and Puerto Rico as models

In addition, the report calls for states to create replicable models for microgrid development and operation.

Puerto Rico, for example, has a plan that proposes several regulatory classifications for microgrids and creates fees for microgrids' use of facilities owned by the island-wide utility, the report says.

Not only should states look to Puerto Rico for examples; they should also "imitate and improve on" the NY Prize competition, says the report.

The NY Prize competition aims to help communities develop microgrids **that can operate independently of the grid during power outages.**

"The value of a microgrid to public health and that microgrid's contribution to local resilience — as defined not only by the electricity community but also the public health community — can only be fully realized **if its design and development is part of a larger process,"** concludes the report.

Explore how microgrids can protect public health and other issues relevant to distributed energy at Microgrid 2019, May 14-16 in San Diego, Calif.

[12]

Ref: Renew Economy 02.06.2017 by Sophie Vorrath

http://reneweconomy.com.au/8-billion-offshore-wind-farm-proposed-for-victorian-waters-85089

$8 billion offshore wind farm proposed for Victorian waters

Plans for what could be Australia's first offshore wind farm have been unveiled, revealing an ambitious proposal for an $8 billion, 2GW, 250 turbine project off the coast of Gippsland in Victoria's east.

The project, which was being presented to a state government New Energy Technology Roundtable on Friday, is the brainchild of five-year old Melbourne-based renewables outfit, Offshore Energy – headed up by veteran wind energy executive Andy Evans and the former chief of geothermal hopeful Petratherm, Terry Kallis.

Dubbed the Star of the South Energy Project, the wind farm is currently at a very early, pre-feasibility stage – and the feasibility, alone, will be a three-year process. But it appears to have the state government on side. In a statement on Friday, energy and environment minister Lily D'Ambrosio said the government had welcomed the plans and was working with Offshore Energy to progress them.

In terms of the resource, preliminary analysis of the proposed site off the coast of Gippsland shows high-capacity for reliable power generation. If built, the Star of the South is expected to deliver around 8,000GWh of electricity per year, which is around 18 per cent of the state's current power usage, or enough to power 1.2 million homes.

The proposed site is also neatly located alongside existing transmission infrastructure in the Latrobe Valley, where the Hazelwood coal-fired power station has just been closed down. Although under-sea cabling will need to be installed to connect the wind farm to the network.

Offshore Energy managing director Andy Evans – who in his former role at Acciona helped build the Waubra wind farm – said that offshore wind's natural high capacity factor and more constant generation made it a potentially important ingredient in Australia's transition away from fossil fuels.

On the subject of community consultation, Evans said that he would be drawing on his experience building onshore wind farms with Acciona. He said one of the company's main jobs was to educate the community, this being the first such project proposed for the state.

On the upside for locals, the offshore wind farm is expected to generate investment of around $8 billion, create 12,000 jobs during the construction phase and 300 ongoing operational and maintenance jobs.

[13]

Ref: Renew Economy 29.03.2019 by Sophie Vorrath

https://reneweconomy.com.au/coalition-grants-permit-for-australias-first-offshore-wind-farm-26073

The federal Coalition said on Friday afternoon, after months of delay, that it had approved a deed of licence to allow the $8 billion project's developers, Offshore Energy, to undertake resource exploration for the wind farm off the Gippsland coast.

In December 2017, Melbourne-based Offshore Energy announced they had entered into a partnership with Danish outfit Copenhagen Infrastructure Partners, to progress development of the project.

Since then, however, the plans have stalled, prompting accusations last month from the Maritime Union of Australia that the Star of the South – which promised to create

thousands of jobs – had fallen victim to ideological opposition within the Morrison government ranks. Hardly an outrageous claim, considering energy minister Angus Taylor's own well-aired antipathy to wind farms.

At the time, it was revealed in a Senate Estimates hearing that a federal government evaluation of the project had been completed, a plan for an exploration licence developed, and a briefing and recommendations provided to energy Minister Angus Taylor.

MUA deputy national secretary Will Tracey said the exploration licence did not allow construction to start and was simply about allowing the use of floating buoys and platforms off the Gippsland coast to gather wind and wave observations,' the Gippsland Times reported. "We have a major wind project that would create thousands of jobs and provide clean, reliable energy for more than a million Australian households, but because of their ideological hatred of renewable energy the Morrison government appears to be actively stalling its development," he said.

[14]

Ref: Renew Economy 08.07.2019 by Michael Mazengarb
https://reneweconomy.com.au/australias-first-offshore-wind-project-moves-forward-with-labour-market-study-33139

The wind farm is expected to produce roughly the same amount of energy each year as the now de-commissioned Hazelwood brown-coal power station.

In undertaking the labour market study, the project will examine the skills and workforce requirements needed to complete the project, including the availability of specialised vessels required to provide both construction and maintenance services to the offshore wind turbines.

Star of the South says there is likely to be a need to facilitate the training of local workers in the skills required to deploy and maintain offshore wind turbines, given it is the first of its type for the country. Likewise, the study will identify the need to procure new dedicated vessels that may be required to support the project.

The study will be completed by Atlas Professionals, an HR service provider with previous experience in advising the delivery of offshore projects through Europe.

Progress for the project comes as an AEMO report highlights the "unprecedented change" underway in the Victorian energy system, as the State's generation base shifts from east to west, as large brown coal generators in the Latrobe Valley reach the end of their operating life, and the development of renewable energy projects occurs in the west.

[15]

Ref: Renew Economy 04.05.2018 by Giles Parkinson
https://reneweconomy.com.au/pilbara-renewables-hub-adds-3gw-wind-and-solar-to-20bn-plan-86697

Pilbara renewables hub adds 3GW wind and solar to $20bn plan

The consortium behind an ambitious plan to create an Asian Renewable Energy Hub in the Pilbara region of Western Australia have unveiled plans to add another 3GW of wind and solar to the project to help meet domestic as well as international needs.

The mooted addition will take the potential cost of the project –which envisages exporting cheap wind and solar to Asian customers via subsea cables – to around $20 billion.

The addition of the 3GW of wind and solar will take total generation capacity to around 9GW – with the added capacity targeted at large energy users in the Pilbara, who currently depend on expensive gas and diesel supplies.

The scale of the project is phenomenal. That amount of capacity will generate around 33TWh of wind and solar a year – exactly the amount of wind and solar that is targeted for the whole country by 2020 under the federal renewable energy target.

It would also be the biggest wind-solar hybrid project in the world, could include battery storage, and would likely provide jobs for 3,000 people in the construction phase and 400 people over the long-term operations.

The AREH consortium – which includes global wind turbine manufacturer Vestas, Australia's CWP Renewables, and Intercontinental Energy – says the extra capacity will allow mine expansions, and the addition of upscale value-added processing.

The 9GW of generation capacity will likely comprise around 6GW of wind generation and 3GW of solar PV generation, and could also include hydrogen storage facilities for domestic use and export.

Dickson said the project could almost be seen in two components: the **export side** depending on contracts overseas; **but the domestic component could potentially be a stand-alone project**, or a precursor, given the cost advantage of renewables over gas.

That idea has been embraced by the Pilbara Development Commission, whose chairman Brendan Hammond said the addition of a domestic energy component meant that local business could capitalise on the Pilbara's natural wind and solar assets.

"It is an exciting opportunity to boost the business competitiveness of the Pilbara by significantly lowering the cost of energy," Hammond said in a statement.

"Such an outcome will result in the extension of existing mineral and oil/gas reserves, bring new opportunities into play, and allow a diversified downstream economy that

is ultimately independent of natural resource exploitation to be built both regionally and state-wide."

AREH Project Director Alex Tancock said increases in wind turbine size and capacity had led to the decision to add the extra capacity.

"The large scale of our project, together with excellent and complementary wind and solar resources, will allow us to generate clean electricity very cost competitively, day and night.

The consortium says the project, ambitious as it is, is gathering momentum with the completion of onshore site ecology surveys, the completion of the nearshore seabed surveys for the subsea cable, and the lodgement of referrals to the WA and Commonwealth governments.

It has also opened a consortium office in Jakarta, and expects to submit its Environmental Impact Assessment to the WA state government in mid-2018.

It says financial close for the project is anticipated in 2020/21, and the construction is anticipated to commence in 2023.

[16]

Ref: Renew Economy 20.07.2019 by Sophie Vorrath and Giles Parkinson
https://reneweconomy.com.au/nt-government-backs-10gw-solar-and-storage-plant-biggest-in-world-71012

NT government backs 10GW solar and storage plant, biggest in world

Plans to build the world's largest solar plant in the Australia desert, and use it to help power Singapore, have taken a significant step forward after winning Major Project Status from the Northern Territory government.

NT chief minister Michael Gunner said on Saturday that his government would begin negotiations on a Project Development Agreement with developer Sun Cable, to kickstart development of the proposed 10GW solar farm and 20-30GWh storage facility near Tennant Creek.

Gunner said the PDA would provide the framework for Sun Cable and the NT government to progress the $20 billion Australia-Singapore Power Link through the required approvals processes – starting with an Environmental Impact Statement and a Territory Benefit Plan.

As we have reported, the ASPL aims to supply renewable electricity to Darwin and Singapore via a high voltage direct current transmission – a plan first outlined by Beyond Zero Emissions last month, and which quickly attracted the attention of investment heavyweights including Mike Cannon-Brookes' Grok Ventures.

See The 10GW solar vision that could turn Northern Territory into economic powerhouse and listen to our Energy Insiders Podcast with BZE's Eytan Lenko.

The NT government says integrating the huge solar farm into the developing ASEAN power grid will also be assessed in the detail during the development phase. There are also hopes that the resource can underpin local manafacturing and industry.

It says the project has the potential to create 1000 jobs during the construction phase, and 300 ongoing operational jobs.

“Major Project Status for Sun Cable is an important step towards making this vision a reality,” Gunner said in a statement.

“The Sun Cable project is a game changer for the Territory and will further our reputation around the world as a place to do business and invest.

“Not only does it announce the Territory as a major world player for renewable energy exports, but also a future where clean, cheap, reliable energy creates local jobs in industries right across the Territory.

“We look forward to continuing to work with Sun Cable to make this project a reality.”

Sun Cable said it is excited to enter the next phase of the development process for the Australia-Singapore Power Link.

“The Northern Territory is proving to be a great jurisdiction to work in. We look forward to advancing the project with the Northern Territory Government’s support.”

[17]

Ref: Renew Economy 06.07.2018 by Giles Parkinson

https://reneweconomy.com.au/finkel-says-australia-can-and-should-be-world-leader-in-energy-storage-91277

Finkel says Australia can, and should, be world leader in energy storage

A new study led by chief scientist Alan Finkel has underlined Australia’s role as a leader in the household battery storage sector, and says Australia can, and should, be a leader of energy storage of all types, including renewable hydrogen as an export opportunity.

Finkel’s new report Taking Charge: The Energy Storage Opportunity for Australia is a 9-page summary and update of a detailed report on energy storage by the Australian Council of Learned Academies (ACOLA) released in November 2017.

Readers may remember that report highlighted how little additional storage was needed – even with up to 35 per cent to 50 per cent wind and solar in the system, but also how critical it would be to a modern, decarbonised grid. Its conclusions were immediately attacked by conservatives as “eco-evangelism”.

The latest report includes updated data – such as the 21,000 battery storage systems estimated to have been installed in Australian homes in 2017.

More importantly, it includes much detail about the opportunities ahead, and comes at an important time as Australia's political debate once again resolves, sometimes crazily, around the level of wind and solar that can be incorporated into the grid.

"We are entering an era of rapid technological transformation in electricity generation and usage," Dr Finkel said in a statement.

"Energy storage technologies can not only help us benefit from the transition but to prosper through the creation of new industries, new jobs and opening up export markets."

CHART

The latest report notes the challenge for policy makers is to put storage at the heart of a smarter electricity grid, and deploy it at a grand scale: "supporting the transition to renewable generation sources, helping to match energy supply to energy demand, and empowering consumers to manage their costs."

It noted that batteries are modular and can be initially installed as small units then scaled up as needs and funds arise.

"Further, they can be installed close to where they are needed, making the transmission costs either small or non-existent. In some cases, batteries can save investment costs by avoiding the need to upgrade distribution lines in cities," it noted.

It noted the opportunities for pumped hydro, for Australia's mineral resources – such as nickel and cobalt – in the coming energy storage boom, and also pointed – in a small chapter titled "sipping sunshine" to the opportunities of exporting "renewable hydrogen" to countries such as Japan and Korea.

"Renewable hydrogen made by using solar or wind electricity to split water into hydrogen and oxygen is a logical choice," it says.

"The only by-product in production is oxygen. During use, the exact same quantity of oxygen is consumed to produce heat or electricity, and the only by-product is water vapour.

"Japan has made hydrogen a national priority to power heavy industry and drive the hydrogen fuel-cell cars produced by its carmakers such as Toyota and Honda.

"Australia is well positioned to be 'shipping sunshine' in the form of exported hydrogen. Hydrogen gas can be cooled to a liquid state or converted to ammonia for shipment by sea."

Renewable hydrogen has long been seen as a huge opportunity for Australia to use its fantastic wind and solar resource to create a "green LNG" export industry of the same size as the fossil fuel based one now.

However, most money has so far gone into a scheme to create hydrogen from Victoria's brown coal resources. An astonishing $500 million will be invested to deliver just three tonnes of brown coal hydrogen under a scheme co-sponsored by the Japanese government.

[18]

Ref: Renew Economy 20.12.2017 by Giles Parkinson

http://reneweconomy.com.au/arena-says-renewables-australias-next-great-export-70505

ARENA says renewables could be Australia's next great export

The Australian Renewable Energy Agency (ARENA) has formally announced a $20 million funding round **to encourage early stage research and development into hydrogen and the export of renewable energy such as "solar fuels".**

The funding round marks ARENA's first step into the so-called **"hydrogen economy",** and comes after it sought feedback in September to get an idea of what idea were in the market and what sort of funding would be needed.

Many in the industry see hydrogen, **or other carriers such as ammonia**, as an avenue for Australia to duplicate its lucrative energy exports, **but with solar and other renewable fuels** rather than LNG or thermal coal.

The idea is to use excess wind and solar, and take advantage of its continued cost falls, **to use electrolysis to convert electrical energy into hydrogen**, and then ship this to markets in north Asia or other countries hungry for low carbon fuels.

"Australia exports approximately three quarters of the energy it produces, in the form of coal and gas," says CEO Ivor Frischknecht.

"Having some of the best solar and wind power resources in the world, Australia could become a superpower in exports of renewable energy, globally, leveraging existing relationships and growing global low carbon energy demand in countries such as Japan, South Korea and China."

He is not the only person to believe this. **Professor Ross Garnaut** and former Clean Energy Finance Corp **CEO Oliver Yates have both pointed to Australia's potential to emerge as a green energy superpower.**

South Australia is already toying with the idea of renewable energy exports and using the hydrogen economy to mop up excess output from its wind and solar farms, both planned and present.

The ACT has also extracted $180 million in investments in the hydrogen economy as part of its reverse auction scheme that will take it to the equivalent of 100 per cent renewable energy for its electricity needs by 2020.

The ACT scheme is focused on **the domestic use of hydrogen**, either as a storage for clean gas that can be used in the **electricity grid**, or in **the gas mains network.**

ARENA also says this so called "power-to-gas" technology can be used within Australia and effectively **"time-shift" excess renewable energy for later use.**

ARENA says it received 45 responses from its request for information in September, including on renewable energy projects, hydrogen fuel carriers and supply chains in Australia that make use of a carrier material such as ammonia **to transport renewable fuel.**

"Exporting renewable energy is one of ARENA's priorities for investment and this RFI illustrates there is great potential," Frischknecht said.

"Hydrogen is set to play a much larger role in the renewable energy space not only in Australia, but globally as the world moves to a low carbon economy.

"The potential for hydrogen to be a carrier of renewable energy is substantial, which is why ARENA will be looking to fund projects from the production of hydrogen all the way to transporting and end-use.

" The capability to supply renewable hydrogen at a competitive price is likely to lead to investment throughout the rest of the supply chain, including dedicated renewables for export ."

[19]

Ref: Renew Economy 12.02.2018 by Giles Parkinson

http://reneweconomy.com.au/s-a-to-host-australias-first-green-hydrogen-power-plant-89447

The South Australia government has announced funding for what will be Australia's first renewable-hydrogen electrolyser plant – a 15MW facility to be built near the end of the grid at Port Lincoln on the Eyre Peninsula.

The "green hydrogen" plant – to be built by Hydrogen Utility (H2U), working with Germany's thyssenkrupp – will include a 10MW hydrogen-fired gas turbine, fuelled by local wind and solar power, and a 5MW hydrogen fuel cell.

Both will supply power to the grid, will support two new solar farms and a local micro-grid, and will also include "distributed ammonia" that can be used as an industrial fertiliser for farmers and aquaculture operators.

The $117.5 million project, which will receive a $4.7 million grant and a $7.5 million loan from South Australia's Renewable Technology Fund, is being described as a "globally-significant demonstrator project" for the emerging hydrogen energy sector.

It is the second biggest facility of its type, will boast the biggest hydrogen-supported turbine, and will also be the largest supplier of "green ammonia" in the world.

Hydrogen has often been dismissed as a viable technology because of the recent gains of electric vehicles and battery storage, but its proponents believe that it can create export industries to rival that of natural gas, and its added value chain can make it extremely valuable in the domestic market.

“More renewable energy means cheaper power and the ability to store renewables means the benefits of that cheap power can be experienced around the clock,” energy minister Tom Koutsantonis said in a statement.

“Hydrogen also offers an opportunity to create a new industry in South Australia where we can export our sun and wind resources to the world.”

The announcement continues a late rush of pre-election funding initiatives by the Labor government in the last few weeks, including for microgrids, virtual power plants, more grid-scale batteries, and five potential pumped hydro projects, scaling the range of storage options.

South Australia, which goes to the polls in little more than four weeks, already sources half of its electricity needs from wind and solar and will soon source even more as new projects come on-line, and hydrogen is seen as a major new opportunity.

“South Australia is at the global forefront of a broad range of storage technology, from big batteries, to virtual power plants to pumped hydro – now we will also be home to one of the largest hydrogen production facilities in the world as well,” Koutsantonis said.

H2U chief executive Dr Attilio Pigneri said the hydrogen gas plant and fuel cell will be able to provide balancing services to the national transmission grid, as well as fast frequency response support for new solar plants under development in the Eyre Peninsula.

Pigneri told RenewEconomy the electrolyser itself will provide fast response in the range of milliseconds, while the gas turbine and the fuel cell can put power into the grid.

He sees hydrogen as a viable competitor to battery storage for “end-of-grid” solutions, particularly from its ability to generate additional income streams such as ammonia.

Asked about the skepticism surround hydrogen technologies, Pigneri said there was a “lot of momentum for batteries, but hydrogen technology is quite robust .. it may provide a more effective option than batteries, because you can store as much as you want.”

The Port Lincoln facility will store 10 tonnes of hydrogen, equivalent to 200MWh.

It will support two new solar farms and a 5MW micro-grid to be built by a local tuna operator – many of which have been frustrated by recent blackouts, and the failure of the ageing diesel generators.

It will also supply green ammonia and other chemicals to local farmers and aquaculture operators.

“The project will provide the perfect training ground for a new wave of green hydrogen professionals,” Pigneri said in a statement.

“We are very lucky to be able to work with local academic institutions, such as the University of Adelaide, and the local energy market regulator, towards the

establishment of training programs for certified operators, technicians and professionals that can support the growth of the industry."

The project is supported by the local industry and community, including Regional Development Australia Whyalla and Eyre Peninsula (RDAWEP), the transmission network operator ElectraNet, and the South Australia No-Till Farmers Association (SANTFA).

RDAWEP Chief Executive Dion Forward said innovative thinking like hydrogen storage would help provide pathways for addressing regional challenges in the reliability and quality of electricity supply.

"This project represents the things that we do best, collaborating to share innovation across many industries including energy, transport, education, farming, fishing and food production to be more sustainable and globally competitive," Forward in a statement.

"Power firming initiatives are vital to improving liveability and strengthening the competitiveness of our existing industries.

"This project addresses these issues and offers so much more, the establishment of new supply chain capabilities will help the region to further diversify and prosper from the opportunities associated with growth in the green hydrogen economy."

[20]

Ref: Renew Economy 07.02.2019 by Jim Plouffe [The Lead SA]
https://reneweconomy.com.au/renewable-hydrogen-power-plant-step-closer-in-port-lincoln-67209/

A green hydrogen power plant facility in South Australia is a step closer to completion with announcement of a generator supplier.

Australian hydrogen infrastructure developer H2U confirmed today that it will use Baker Hughes NovaLT gas turbine generators at its South Australian Renewable Hydrogen and Ammonia Supply Chain Demonstrator in Port Lincoln.

H2U won the AUD$117.5 million greentech project a year ago in partnership with German-based thyssenkrupp.

Partially funded by $4.7M in grants and $7.5M in loans from the South Australian Government's Renewable Technology Fund, the project will integrate new hydrogen technologies, including a 15MW electrolyser plant, a distributed ammonia production facility, and a 10MW hydrogen-fired gas turbine and a 5MW hydrogen fuel cell, which will both supply power to the grid.

H2U CEO Dr Attilio Pigneri said NovaLT generators were chosen for the green hydrogen power plant facility because they could operate on 100 per cent hydrogen at all times.

"The annular combustor design and dual-shaft configuration will enable the unit to deliver a best-in-class black-start capability while still operating on 100 per cent hydrogen," Dr Pigneri said.

"We are impressed by the operating flexibility of the platform and its ability to operate at a low to no-load capacity, then ramp-up very quickly to full load.

"This means we can use the units to support critical loads within the Port Lincoln facility, while also contributing generation to the grid during periods of low wind or solar output. The hydrogen is also produced by the electrolysis plant on site, so we have a truly self-contained solution to firming renewable energy supply within the South Australia grid."

Dr Pigneri said the cost of hydrogen generated from electrolysis using cheap wind and solar energy was now comparable with the cost of natural gas in South Australia.

The project is due for completion in 2020 and will be one of the first commercial plants to produce carbon dioxide-free green ammonia from intermittent renewable resources.

[21]

Ref: Renew Economy 21.02.2018 by Sophie Vorrath

http://reneweconomy.com.au/sa-backs-second-renewables-gas-hydrogen-plant-tonsley-53911

South Australia is set to host its second hydrogen production and distribution facility, with the construction of a 1.25MW Siemens electrolyser that will produce hydrogen using electricity from the grid and potentially on-site solar.

The $11.4 million project, announced on Wednesday by the Australian Gas Infrastructure Group (AGIG), will be built at the Tonsely Innovation Disctrict in Adelaide – the industrial suburb built around the former Mitsubishi car manufacturing plant.

The news of the SA Tonsley project coincides with a separate announcement from Carnegie Clean Energy, of its own plans to transform the former Adelaide General Motors Holden factory into a solar and battery storage microgrid, with backing from the SA government.

The hydrogen produced by the Tonsley-based power-to-gas demonstration plant – to be known as Hydrogen Park SA (HyP SA) – will be injected into AGIG's local gas network. intially to power the Tonsley Innovation District – but with the ability to supply a proposed residential development in the area and other remote customers through tube and trailer facilities.

Like the newly announced microgrid at the former Holden plant, the Hydrogen Park project has been awarded grant funding from the South Australian government – in this case, $4.9 million from the $150 million Renewable Technology Fund.

[22]

Ref: Renew Economy 07.03.2018 by Giles Parkinson
http://reneweconomy.com.au/neoen-plans-worlds-biggest-solar-wind-powered-hydrogen-hub-in-s-a-53674/

Neoen plans world's biggest solar + wind powered hydrogen hub in South Australia

South Australia is laying claim to another "world's biggest" storage project, this time with wind and solar-powered hydrogen storage to add to its world's biggest lithium-ion battery storage installation (the Tesla big battery), and the world's biggest virtual power plant (Tesla again).

The state Labor government has announced plans to provide initial funding, and ultimately a loan, to help French renewable energy developer Neoen build a 50MW hydrogen "electrolyser" that would be powered by a new wind and solar complex at Crystal Brook, north of Adelaide.

The complex will combine a new wind and solar production facility totalling 300MW, along with a significant amount of battery storage, and lay the foundations to export large quantities of "renewable hydrogen" to Asia, competing as a green alternative to LNG.

Neoen, of course, is the operator of the Hornsdale Power Reserve, the official name of the Tesla big battery, and also has another wind project with battery storage in the pipeline for Nectar Farms, (and again with Tesla) providing 100 per cent renewable energy for the country's biggest greenhouse.

This new development, at the proposed Crystal Brook energy park , just south of Port Pirie in the state's mid north, and about 40kms from the Hornsdale complex which houses its 315MW wind farm and the 100MW/129MWh Tesla battery, is of another scale.

It would include 150MW of solar, about 150MW of wind, as well as up to 50MW hydrogen plant along with up to 400MWh of battery storage, again most likely with Tesla.

South Australia will provide a $1 million grant to help Neoen complete its feasibility study for the so-called Hydrogen Superhub, and would then provide a further $4 million grant, and a $20 million loan should the $600 million project go ahead.

[23]

Ref: Renew Economy 03.07.2018 by Giles Parkinson
https://reneweconomy.com.au/solar-battery-hydrogen-hub-planned-w-micro-grid-61787

Solar and battery "hydrogen hub" planned for WA., micro-grid

The Australian Renewable Energy Agency has announced funding for a $3.3 million "green hydrogen" innovation hub in Western Australia, adding to the growing list of renewable hydrogen projects across the country.

The latest announcement from ARENA is for $1.5 million in funding for a $3.3 million project to trial the production, storage and use of renewable hydrogen to energise a commercial-scale microgrid.

It will also assess the practicalities of replacing natural gas with hydrogen at a city-wide scale across a municipality.

The "green hydrogen" in this instance will be produced from 300kW of on-site solar, and 400kWh of batteries that will time shift electricity and power an electrolyser, which in turn will fuel a range of gas appliances and will blend hydrogen into the natural gas pipeline.

ARENA says the project will also build upon a distributed energy hybrid energy system trial called "GasSola" which includes the installation of rooftop solar with battery storage and standby natural gas generation for nine residential sites in Western Australia's south west.

The development of hydrogen is being embraced by gas network owners, who fear holding stranded assets if the price of gas continues to rise, or the commodity is sidelined by the development of cheaper wind and solar and the emergence of battery storage.

Sure enough, this project is being managed by Canadian-owned gas network operator ATCO. ATCO says it believes the gas network will "play a key role" in the future energy mix. "The project has many exciting elements, but what truly sets it apart is the use of excess renewable energy, which would typically be lost to the system, to produce hydrogen," managing director and COO Pat Creaghan said in a statement.