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NUCLEAR POWER THROUGH THE LENS OF AN AUSTRALIAN TRADE UNION

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Key Points

- The CFMMEU Mining & Energy Division of Victoria (the Union) supports Victoria's transition to low-carbon power generation sources. It urges that energy decisions be made with system reliability, economic viability, and Victorians' jobs in mind.

- The Union is concerned by the approach of using only non-dispatchable renewable energy sources, supplemented by hydro and battery storage, for Victoria's energy transition. It believes that this will lead to major blackouts, unaffordable electricity and the future economic shutdown of Victoria's industry, resulting in massive job losses and a decline in citizen wealth.

- Coal plant workers and their communities demand a 'Just Transition' of their industry, a transition where their livelihoods are not unwittingly destroyed by the rush to reduce emissions.

- Nuclear power is a proven choice of a dispatchable and economically viable, zero greenhouse gas emission power generation technology, that is available today. The nuclear prohibition in Victoria should be lifted to allow sufficient time to replace existing generation with nuclear reactors.

- The guarantee of a Just Transition should also provide the essential social licence to satisfy any concerns in local communities about the safe operation of the nuclear industry.

Executive Summary

The State of Victoria has committed to a very challenging target of achieving net zero greenhouse gas emissions by the year 2050. This goal mandates a move away from our traditional coal- and gas-fired electricity generation. Replacement by renewables, in the form of wind and solar generation, is problematic in that they are non-dispatchable and too variable and unpredictable to guarantee the essential electricity supplies that are needed for Victorians. Hydro-electric power resources, despite being the “Rolls Royce” of renewable choices, are also quite limited because of our flat and dry continent.

While technical solutions can mitigate some detriments of renewables, these solutions, including energy storage, tend to be very complex and add extreme costs to the power grid, while still not completely overcoming the no wind - no sun scenario. Despite this reality, decisions are being made by the Australian Electricity Market Operator (AEMO) and State governments that appear to support a very costly and disastrous future transition to wind, solar, hydroelectric, battery and pumped hydro storage. Presumably these decisions are being influenced by academics, green activists, and so-called electricity policy ‘experts’ all of whom not only appear biased but also lack the real world practical knowledge of the power grid.

The Construction, Forestry, Maritime, Mining and Energy Union, Mining & Energy Division of Victoria (CFMMEU M&E Vic) is very concerned about the renewables-only approach because we believe that it will lead to major blackouts, unaffordable electricity and the future economic shutdown of Victoria’s industry; resulting in massive job losses and citizen wealth decline. A disastrous transition of the Victoria’s electricity grid can be avoided, but only if Victoria transitions to a mix of dispatchable power supplemented by renewables rather than relying on renewables alone.

Nuclear power is a proven dispatchable and economically viable, zero greenhouse gas emission power generation technology that is used around the world in about 30 countries. Another possible zero greenhouse gas emissions technology option is High Efficiency Low Emission (HELE) coal fired power stations, fitted with 100% Carbon Capture and Storage (CCS). This technology is currently in commercial use overseas and would become more viable if a major Brown Coal to Hydrogen industry were to establish itself in the Latrobe Valley, adjacent to Australia’s best carbon sink in Bass Strait. CCS would also help to increase Victoria’s oil and gas production further benefiting Victoria’s economy. HELE Coal with CCS is the CFMMEU M&E Vic’s preferred option; however, given the Victorian Parliament's 2020 Inquiry into Nuclear Prohibition in Victoria, this paper focuses solely on the nuclear alternative.

Most of the world’s advanced and competitive economies employ substantial amounts of nuclear power for their dispatchable electricity needs, i.e. France, United Kingdom, USA, Germany, Russia, Japan and China. Most of these countries are also transitioning towards zero greenhouse gas emissions by supplementing their nuclear power plants with renewables to replace their fossil fuel generators.

There are currently 449 operable nuclear reactors (394 GW) in the world that are used to generate electricity, with another 58 reactors (63 GW) under construction and 154 (157 GW) reactors planned. Australia's National Electricity Market (NEM) is only about 20 GW in capacity and all of Australia's coal and gas power stations could be replaced by as few as 20 nuclear reactors. Despite this, nuclear power to date has largely been overlooked in Australia, presumably because of the prohibition on nuclear power under the Nuclear Activities (Prohibitions) Act 1983.

A 'Just Transition' of coal fired power station workers and their communities towards a modern nuclear industry is realistically achievable, whereas CFMMEU M&E Vic believes a 'Just Transition' to renewables is not. More importantly, a 'Just Transition' to nuclear power could provide the essential social licence for this proven technology to overcome lingering public concerns surrounding its safe operation in local communities.

The SA Royal Commission found that nuclear power is safe and should not be discounted, especially if we are to decarbonize the electricity sector in an economic manner. Australia's dry, geologically stable, and unpopulated interior has also conveniently been identified as a world class nuclear waste storage location, with an opportunity to generate an estimated $100 billion of net income for Australia through storage of the world's nuclear waste.

Australia certainly has the skilled people and stable government to run a first class nuclear power industry; all that is needed is the green light. Bearing in mind that a 10 year lead time will be required to build replacements for our existing aging coal fired power stations, then that green light needs to be given sooner rather than later if Victoria is to avoid a major shortfall of dispatchable electricity generation, bringing uncontrolled electricity price rises and customer blackouts.

Nuclear power is acknowledged around the world as an essential technology towards meeting net zero greenhouse emissions, is cost effective and reliable, and modern designs are safe. Therefore, CFMMEU M&E Vic believes it would be sheer madness not to include nuclear power in Victoria's energy mix, especially if we are to remain a globally competitive economy and have increased future capacity to electrify transport and grow industry and employment.

Introduction

This paper considers the potential benefits to Victoria in removing the prohibitions enacted by the Nuclear Activities (Prohibitions) Act 1983, particularly in relation to Victoria meeting its target commitment of achieving zero net greenhouse gas emissions by 2050. Currently, all the focus on greenhouse gas reductions in Victoria has been within the electricity generation sector, where a transition is under way from coal and gas fired electricity generation towards 'renewable' power generation.

As the major representative of power station workers within Victoria; and having significant real world electricity generation system knowledge, CFMMEU M&E Vic is well positioned to provide insight on the potential benefits of nuclear power for Victoria, especially in achieving the goal of zero net greenhouse gas emissions by 2050 without any disastrous impacts on our economy.

While CFMMEU M&E Vic fully supports the inclusion of 'renewable' power generation within the National Electricity Market (NEM), we do so only on the basis that it makes technical and economic sense; and further, that it benefits Victorians. Unfortunately, the technical and economic characteristics of wind and solar power, when properly considered, come up short in a number of areas, not the least of which is their non-dispatchability, asynchronous nature and variability. This is not a large apparent issue when 'renewables' are simply being used in limited quantities to supplement other dispatchable electricity generators, but it does become a major problem if they are to form the future basis of our primary electricity supply.

The western world runs on energy, so it is vitally important for Victoria that any transition to net zero greenhouse gas emissions proceeds without electricity becoming unaffordable, our businesses losing their global competitiveness, the Victorian public experiencing blackouts or our local coal communities experiencing economic devastation through workers bearing the full cost of this transition by losing their livelihoods. The CFMMEU M&E Vic believes that a zero emissions transition of the NEM is technically feasible without any economic harm but only if the current coal and gas generators are replaced by either nuclear power and/or HELE coal fired power stations fitted with 100% CCS. The focus of this paper is to examine nuclear power in relation to other energy alternatives and inherent characteristics, given the Victorian Parliament's Inquiry into Nuclear Prohibition in Victoria.

Renewable Generation

Wind Turbines

Wind turbines are non-dispatchable because their output is solely dependent on the prevailing wind. Therefore, they have a fixed output at any point in time and AEMO cannot dispatch the wind turbine's generation up or down to meet the required system power demand to control system frequency. In any electricity grid, it is vital for power system security that at any instant in time power supply and demand are matched to maintain a frequency of 50 Hz. Small deviations are permissible but Automatic Load Shedding (ALS) or 'brownouts' will occur if power system frequency falls to 49 Hz and a complete 'system black' will occur if the system frequency falls to 47.5 Hz; a point where electrical protection systems operate.

Wind turbines are asynchronous because their speed is not matched to the electricity system frequency and they synchronize to the system electronically. This means that wind turbines provide zero synchronous inertia. Synchronous inertia is vitally important for electricity grid stability because it slows any drop in system frequency due to demand exceeding supply so that generator governor response or ALS has time to operate so they can restore system frequency back to 50 Hz. Insufficient synchronous inertia was the main cause of the South Australia 'system black' on 28 September 2016, after transmission lines failed in a storm.

Wind turbines also provide more power than the system demands at times and this will cause the system frequency to go high. Other dispatchable generators are then required to reduce their generation to compensate for this high frequency caused by wind turbines. Again all power generators in the grid will trip on electrical protection if system frequency rises to 52.5 Hz, which would also lead to a complete 'system black'.

Wind turbines have an average capacity of approximately 28% for onshore turbines and up to 43% for offshore turbines compared to their installed capacity. Their median capacity (most frequent operating point), however, is much lower than this at around approximately 20% for onshore and perhaps 30% for off-shore. Wind turbine generation will fall to zero if the wind is too weak or if it is too strong, where they shutdown. This means at times they provide no electrical power at all. A low level of wind output is common across South Australia and Victoria in autumn.

Other technical issues with wind turbines are that they provide no power factor correction for capacitive or inductive loading in order to sustain system voltage and are often located on long, lower voltage transmission lines that experience greater line losses and voltage fluctuations.

A large downside of wind turbines is variable generation leading to major transmission lines infrastructure under-utilisation and increased transmission cost. For example, two 1,000 MW nuclear reactors would fully utilise a 2,000 MW, 500 kV transmission line for 95% of the time but an offshore wind turbine system (such as the proposed 2,000 MW 'Star of the South') would require the same 2,000 MW transmission line (to cater for its full capacity); however, on average would only supply 860 MW and most frequently 600 MW. Wind farms are also geographically disaggregated which leads to increased transmission lines being required. In effect, wind farms lead to increased transmission line infrastructure in the order of 2.5 to 3.0 times that of other dispatchable generators or 2.5 to 3.0 times the cost. This cost is very significant and must be passed on to the end users of electricity.

<u>Solar Power</u>

Solar power is non-dispatchable because it is solely dependent on the prevailing sun, so it has a fixed output at any point in time and AEMO cannot dispatch it up or down to match the system's power demand to control system frequency.

Like wind turbines, solar power is asynchronous, and it provides no synchronous inertia to help maintain power system frequency. Another problem with household photovoltaic (PV) systems is that they act as a net generator during the middle of the day but as a net load the rest of the time. This characteristic can defeat ALS systems because it may trip an area off in the middle of the day making the power system frequency worse, rather than improving it. AEMO also cannot see household PV output but rather sees it only as a reduced power demand. This makes it much harder to manage or predict.

Solar power generally has an average capacity of around 20% compared to its installed capacity. It is also important to keep in mind that solar power provides zero output at night and a reduced output in cloudy conditions.

Other technical issues with grid scale solar include that it provides no correction for capacitive or inductive loading to sustain system voltage. Also, grid scale solar is often located on long, lower voltage transmission lines, which leads to greater line losses and voltage fluctuations. Again, like wind turbines, grid scale solar under-utilises transmission line assets, especially at night, when they are not utilised at all.

Hydroelectricity

Hydroelectricity is dispatchable by AEMO and can ramp up or down as required to help control power system frequency. Hydroelectricity also has massive synchronous inertia to slow frequency deviations caused by supply/demand imbalances. Therefore, from a power grid system perspective, hydroelectric power is the 'Rolls Royce' of 'renewable' energy generation.

Additionally, hydroelectric governors can respond to frequency deviation, their excitation systems can correct for capacitive or inductive loading to sustain system voltage, they have quick start-up, they can act as 'spinning reserve' and they are generally located on high voltage (HV) transmission lines with high system strength.

The major shortcoming of hydroelectric generation in Australia is that there are limited opportunities to build them because our continent is so flat and dry. Water releases are also often limited and controlled to meet the needs of other end users downstream, such as releases for irrigation or drinking water. For example, the Snowy Mountains Hydro Scheme has an installed capacity of 4,100 MW but only delivers about 4,500 GWh of electricity per annum or 12.5% of its capacity on average each year.

Fossil Fuel Generation

Coal-Fired Power

Brown coal-fired power generation is currently the 'primary' supplier of dispatchable power in Victoria. With an estimated 33 billion tonnes of easily accessible coal reserves, brown coal is very cheap because it cannot be economically exported. Brown coal has a mined cost of around $5 -$10 per tonne. This makes brown coal power stations extremely cheap generators of electricity but brown coal's high moisture content (60% by weight) also means it is a high greenhouse gas emitter (1.1 to 1.2 tCO^2e/MWh) compared to black coal (0.8 tCO^2e/MWh).

Well maintained coal-fired power stations have average capacity factors around 95% of their installed capacity, they can flexibly ramp up or down at 10 MW/minute to meet AEMO requirements, their governor responds to restore system frequency, they have substantial synchronous inertia, their excitation system can correct for capacitive or inductive loading to sustain system voltage and they are generally located on HV transmission lines with high system strength.

A limiting factor for brown coal power stations is that they can only ramp down to about 40% of their installed capacity before requiring expensive support energy in the form of oil or gas to maintain flame stability (black coal power stations can ramp down to zero) and they take many hours to start up if offline. Most are aging and nearing their end of design life, while some have been poorly maintained by their private owners since privatisation.

Gas Turbines

Gas turbines are dispatchable and provide significant sychronous inertia. Open Cycle Gas Turbines (OCGT) run on natural gas but with a normal conversion efficiency of between 20 - 32% depending on design. This means that a significant amount of energy is wasted when compared to burning natural gas directly in the home or business. All current installed gas turbine power stations in Victoria are OCGT designs and operate primarily to provide 'peaking' power during peak electricity demand. They emit around 0.53 – 0.76 tCO^2e/MWh and are expensive to run due to high gas prices.

Combined Cycle Gas Turbine (CCGT) power stations are the same as OCGT except that they include a heat recovery boiler to generate steam for a steam turbine/generator and have a much higher conversion efficiency (almost double) and lower emissions (almost half). No CCGT plants are currently installed in Victoria due to their higher capital cost and reduced suitability for 'peaking' power operation. CCGT are the gas turbines of choice where continuous running is required due to their higher conversion efficiency and lower running costs.

OCGT are used for 'peaking' power which means that they generally run for less than 10% of the time, they are quick to start-up (< 10 mins to full load), their governor can respond to restore system frequency, their excitation system can correct for capacitive or inductive loading to sustain system voltage, and they are generally located on HV transmission lines with high system strength.

Electricity Storage

Because it is a fundamental requirement for power system electricity supply to match demand at every given instance (for frequency to remain under control at 50 Hz), if there is a shortfall in supply then utilising stored energy would be ideal to supplement it. The problem is that it is very difficult to store substantial quantities of electricity in meaningful quantities that are useful for the electricity grid.

Grid Battery Storage

Victoria has two large grid scale batteries installed with power capacities of 30 MWh each. At maximum power demand in Victoria (10,000 MW), these two batteries could only supply that electricity grid total demand for approximately 20 seconds; if the batteries are fully charged. Even the world's largest battery in South Australia could only supply this demand for about 60 seconds. Realistically, battery electricity storage is insignificant when compared to the scale of electricity grid.

However, despite not having significant energy storage, these batteries can assist the electricity grid by smoothing out very short duration electrical supply/demand imbalances, albeit very expensively. These batteries are very large net users of electricity when charging and have a limited number of charge/discharge cycles over their relatively short design life of around 10 years. Battery disposal/recycling is also likely to be a significant future issue that has not yet been addressed.

Pumped Hydro Storage

Pumped hydro storage is not a direct storage mechanism for electricity but rather a store of water with potential energy to be released to a hydro generator and discharged to a lower reservoir. After use, the water is pumped back up to the higher reservoir with the hydro generator acting in reverse as a motor and pump, rather than a turbine and generator.

While large amounts of energy can be stored in this way, there is still limited storage capacity. For example: Snowy Hydro 2 will be designed to supply 2,000 MW of pumped storage for up to 7 days before it is required to pump back up again to restore the upper reservoir water level. When pumping back up, Snowy Hydro 2 will actually be consuming 2,200 MW for 7 days, making it a substantial net user of electricity. Snowy Hydro 2, although very useful, will be very expensive electricity storage at a reported contract price of $5.1 billion, excluding the cost of over 1,000 km of 500 kV transmission line upgrades and a transmission line to western Victoria, which could easily add another $5 billion.

Nuclear Power

Nuclear power utilizes a nuclear reactor instead of a coal fired boiler to generate heat to turn water into steam, driving conventional steam turbines to generate electricity. A single nuclear reactor can generate up to 1,500 MW of dispatchable electricity, while 20 nuclear reactors could easily replace all the coal and gas fired generators combined in Australia's NEM in less than a twenty year period. This pace of build would be required to keep pace with the current planned closures of Australia's major coal fired power stations.

Nuclear power stations reportedly have average capacity factors of around 95% of installed capacity, they can ramp up or down to meet AEMO requirements, their governor can respond to restore system frequency, they have huge synchronous inertia, their excitation system can correct for capacitive or inductive loadings to sustain system voltage, and they would generally be located on HV transmission lines with high system strength.

A limit of large nuclear reactors is that they can only ramp down to about 40% of their installed capacity rating before the nuclear reaction begins to die off. However, one of the new advents is small modular nuclear reactors, which are scalable and fail-safe. They are ideal for Australia's small-capacity grid in that you can size a generator to suit the grid. These new nuclear plants are also designed with greater ramping capabilities, similar to gas plants.

Nuclear power stations are so similar in power system characteristics to brown coal-fired power stations, that they appear to be their ideal replacements, especially given their zero greenhouse gas emissions. Unfortunately, nuclear power has not even been considered to date presumably because of the prohibition mandated under the Nuclear Activities (Prohibitions) Act 1983 (Victoria). There is a similar prohibition under Commonwealth law. In order to meet Victoria's electricity transition goals, this needs to change.

Victoria's Electricity Grid Transition

There are a number of ways that the Victorian power grid could be transformed to achieve zero net greenhouse gas emissions by the year 2050; however, for Victoria to remain globally competitive, the most economic plan must be deployed. This planning is very challenging because privatisation of the NEM power generators and transmission assets has created many competing interests whose priority is not necessarily the overall Victorian economy or the public good.

The current policy approach is novel and unproven complex. It relies on using subsidised wind, solar, batteries, synchronous condensers, additional transmission lines and government-funded pumped hydro storage for back-up.

Proponents of wind and solar tend to ignore all of the additional overall system costs because of self-interest and generally refer to 'levelised cost' rather than total cost. Certainly, however, all additional system costs will be borne by Victorian electricity consumers.

The consultancy RepuTex recently considered the case of renewables replacing the 1460 MW Yallourn brown coal-fired power station in the Latrobe Valley. The RepuTex study estimated the cost of renewables as in the order of $5 to $7 billion in upfront capital costs compared to a more straightforward solution of replacing Yallourn with a dispatchable, 800 MW CCGT power station for around $1.2 billion. It is also extremely doubtful that a battery storage system as proposed by Reputex could store enough energy during low wind periods and at night in order to maintain Victoria's power supply without disruption.

Replacing Yallourn with some demand side management and a CCGT option is more likely to realistically meet future power supply requirements.

Although a CCGT power station might be one option to replace Yallourn, it would still emit about 0.3 – 0.4 tCO^2e/MWh, and would not satisfy Victoria's aim for the achievement of net zero greenhouse emissions by 2050.

Another option would be to replace Yallourn with a single 1,000 MW nuclear reactor, if that were to be allowed. This would achieve the desired net zero greenhouse gas emissions and guarantee supply through a dispatchable power station build. There would also be little additional infrastructure costs incurred because the existing 220 kV and 500 kV transmission lines could be utilized, along with existing cooling water infrastructure and water allocations.

According to the Australian Nuclear Association (ANA), the capital cost of this option would cost approximately $6,241/kW or $6.241 billion. While this may seem quite expensive, it is to be borne in mind that this option would have a 60 year design life as compared to the renewables option with battery design lives of about 10 years and wind or solar design lives of 20 years. It is estimated that the continuing capital replacements of the renewables option would add additional costs over an equivalent 60 year design life as follows:

- 600 MW Grid Scale Batteries: 5 x $854M = $4.27 billion
- 560 MW Behind Meter Batteries: 5 x $1.1 billion = $5.5 billion
- 280 MW Virtual Power Plant (VPP) Batteries: 5 x $420M = $2.1 billion
- 280 MW VPP Solar: 2 x $420M = 0.84 billion

The total additional capital costs for a 60 year design life would be an $12.71 billion, so a fair cost comparison then would be:

> 1000 MW Nuclear replacement option (60 year life) = $6.241 billion with power supply guaranteed.
>
> 800 MW Renewables replacement option (60 year life) = $18.86 billion with reliable power supply not guaranteed.

These cost estimates appear to be consistent with overseas commercial experience, where nuclear power has been shown to be cost competitive against black coal. CFMMEU M&E Vic is not aware of any other country in the world utilising grid scale batteries for its power systems. Retail electricity prices in countries that run substantial percentages of nuclear power generally have lower electricity prices. Some examples include:

	Nuclear Mix	Household	Industry
France	71.7%	17.65c/kWh	10.24c/kWh
Hungry	50.6%	11.20c/kWh	9.70c/kWh
United Kingdom	17.7%	21.22c/kWh	15.17c/kWh
Spain	20.4%	22.96c/kWh	11.48c/kWh
Ukraine	53.0%	4.42c/kWh	6.56c/kWh
Belgium	39.0%	28.39c/kWh	11.47c/kWh
Sweden	40.3%	20.15c/kWh	7.38c/kWh

Note: Prices quoted are in Euro cents per kWh

Source: ANA

This is also the case in the USA where average electricity prices are:

	Nuclear Mix	Household	Industry
United States - Average	19.3%	12.84c/kWh	10.74c/kWh

Note: Price quoted is in US cents per kWh.

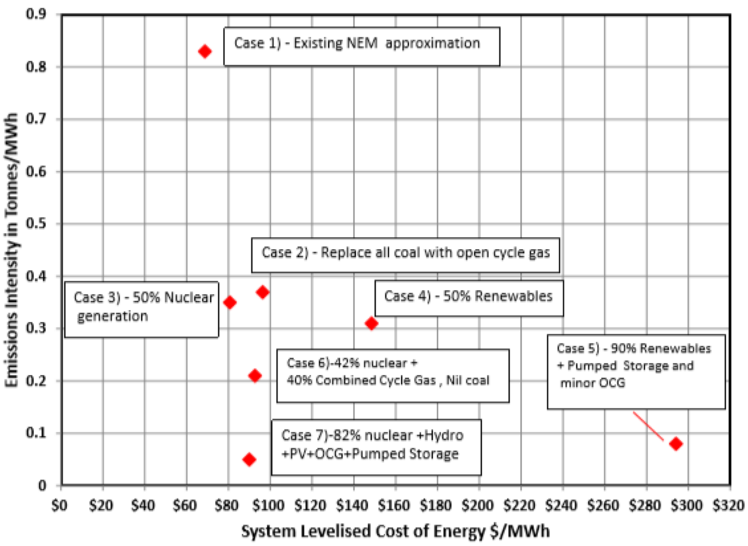
Source: ANA

By way of comparison, **Australia is currently paying some of the highest household retail prices in the developed world, between 31c/kWh to 40c/kWh**, with Victoria's median household retail price at 33c/kWh according to the Australian Energy Regulator, and still rising. Victoria's median industry price is difficult to find for comparison, but if it is in proportion to household prices, it may be much higher than most developed countries.

CFMMEU M&E Vic predicts that retail electricity prices will continue to rise unabated if Victoria continues along its current path and ignores the evidence, i.e. every time a dispatchable coal-fired power station closes down, the wholesale electricity price jumps up. If increasing renewable capacity were really cheaper than coal, then this should not be the case; however, this outcome occurs because the reduction in dispatchable power within the NEM leads to higher dispatchable prices within the bid stack, which then sets higher wholesale spot prices overall.

Modelling provided by the ANA shown in the figure below, also supports the view that nuclear energy supplemented by some renewables (Case 7) is far cheaper than the current model of renewables supplemented with storage and OCGT (Case 5), i.e. $90/MWh **(9c/kWh) for the nuclear mix compared to $295/MWh (29.5c/kWh) for the renewables mix**. These costs are levelised wholesale costs of electricity but do not include transmission asset costs if variable renewables were the main source of supply and transmission assets were significantly under-utilised or additional construction were required purely to connect remotely located wind and solar farms.

Modelled range of National Electricity Market energy schemes versus carbon emissions (6%DR)



The overall greenhouse gas emissions is also superior for the nuclear mix (0.05t CO^2e/MWh) when compared to the renewable mix (0.08t CO^2e/MWh). This is because there are considerable more greenhouse gas emissions generated in the additional materials to construct renewables, with wind material emission 7 times and solar material emissions 11 times than that of nuclear power.

Perhaps the elephant in the room and the real blocker to nuclear energy, is safety concerns, which have been fuelled by some very public disasters at the Chernobyl and Fukushima nuclear power plants. These past nuclear disasters appear to have much to do with older technology and poor design, whereas the latest generation of nuclear reactors are much safer and are able to contain failures, with the advent of inbuilt passive safety features.

The South Australia Nuclear Fuel Cycle Royal Commission concluded: ***"the Commission has found sufficient evidence of safe operation and improvements such that nuclear power should not be discounted as an energy option on the basis of safety*."**

The Royal Commission also recommended that: ***"in coming decades there will be a need to significantly reduce carbon emissions and as a result to decarbonise Australia's electricity sector. Nuclear power, as a low-carbon energy source comparable with other renewable technologies, may be required as part of a lower carbon electricity system"*** **and** ***"The Commission recommends that the South Australian Government pursue removal at the federal level of existing prohibitions on nuclear power generation to allow it to contribute to a low-carbon electricity system, if required*."**

In terms of managing nuclear waste, there is currently an issue with storage of low grade medical waste being stored in hospital basements, therefore some sort of established purpose-built nuclear waste storage facility is needed in Australia. South Australia has been identified as an ideal location to store nuclear waste because it is dry, geologically stable and many areas are unpopulated. Parts of Western Victoria could presumably present similar opportunities as South Australia for safe waste storage.

The SA Royal Commission found South Australia to be an ideal location for such a facility and identified further economic opportunities: ***"Viability analysis undertaken for the Commission determined that a waste disposal facility could generate more than $100 billion income in excess of expenditure (including a $32 billion reserve fund for facility closure and ongoing monitoring) over the 120-year life of the project (or $51 billion discounted at 4 per cent)."*** This could present a huge spin –off opportunity for the Victoria economy if it were to go nuclear and establish a nuclear waste facility in Victoria, assuming a suitable site could be found.

Nuclear Social Licence

A fair and just transition for coal industry workers and their community, where livelihoods are not destroyed, is unlikely to be facilitated through any full transition to renewable energy. This is because renewables are generally disaggregated, offer fewer jobs, with different skills and comparatively poorer wages. By contrast, nuclear power plants are localised, offer more jobs than coal-fired power stations and are similar to process-type industries that provide equivalent wages. An existing coal-fired power station worker could be trained in six months, part-time, to become a nuclear power plant worker. The direct replacement of coal-fired power stations with nuclear power could ensure a fair and just transition for existing coal workers, their families and communities. This could go far towards overcoming local public resistance to the introduction of nuclear power and overcoming the “not in my back yard” mentality.

Nuclear Power – An Economic As Well As Social Imperative

Victoria will only be able to remain a first world, globally-competitive economy after the decarbonisation of our electricity sector if it includes substantial amounts of nuclear power in its generation mix. If Victoria fails to include nuclear power then CFMMEU M&E Vic believes our electricity will become unaffordable, unreliable and the Victorian economy will lose industrial customers and jobs to countries overseas. The inclusion of dispatchable nuclear power that is cheap, clean and reliable will also do much to enable the future electrification of the transport and industrial sectors, thereby further reducing greenhouse gas emissions in future.

Renewable Over-Reliance Danger Signs

There have been many glaringly national electricity grid events over recent years that should trigger a re-think by rational governments over the rapid and unproven current transition towards 100% renewables. These include: the Tasmania energy crisis caused by drought & failure of Basslink, the South Australia ‘system black’ caused by a storm, the Alice Springs ‘system black’ caused by a cloud and the Victorian 2019 summer ‘brown outs’ caused by insufficient dispatchable generation predicted future grid instability in West Australia caused by excessive solar generation. All these events highlight the critical importance of having sufficient dispatchable power to meet electricity demand and to deliver other vital technically characteristic’s for the electricity system so that it is stable and reliable. CFMMEU M&E Vic urges parliament to heed these obvious warning signs and to review the chosen path forward carefully.

About the Author

Geoff Dyke has worked for 42 years in the electricity industry. He is the Victorian District Branch Secretary of the Mining & Energy Division of the Construction, Forestry, Maritime, Mining & Energy Union. He also works as a control room operator at a major brown coal-fired power station in the Latrobe Valley in the Australian State of Victoria. Geoff holds a bachelor's degree in engineering and bachelor's degree in business from Monash University and has been trained in generator operation, high voltage protection and national electricity market bidding. This paper is based on a written submission and oral evidence that Geoff provided in 2020 to a Victorian Parliamentary Inquiry into the prohibition of nuclear power in Victoria.

This paper represents the views of the author and does not necessarily represent the views of EPIA or any of its members.