The 2022 Energy Crisis & Market Failure in Australia

by

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Photo credit - The Guardian (29 Aug 2022): Energy Crisis put politics in a radically different light

A Failure of Market Economics

As professor John Quiggin has observed: "The national electricity market is a failed 1990s experiment. It's time the grid returned to public hands." (Quiggin, The Conversation, 22 June, 2022). Other energy experts have reached similar conclusions. For example, Dr Roger Dargaville, Deputy Director of the Monash Energy Institute, stated that due to privatisation, "the actual focus of the industry is not to be efficient but to maximise shareholder profit (which may involve being more streamlined, but not necessarily). And so the primary role of the energy sector to provide general benefits to Australian residents and businesses has been lost." (Dargaville, The Mandarin, 16 Jun 2022). Dargaville went on to outline five policy decisions in recent history that led to the 2022 energy crisis. He states these are:

- Privatisation of the electricity sector, starting with the Kennett Government in Victoria,
- The construction of the LNG export terminals in Gladstone and locking domestic gas prices to international prices,
- Axing of the carbon price and reducing the Renewable Energy Target,
- Stopping wind farm development in Victoria with draconian development restrictions,
- Lack of planning and investment in transmission infrastructure.

While the articles above provide some history and insight into this failed experiment, neither article provides full hard evidence of privatisation's failure. This article offers a more in-depth critique of this neo-liberal experiment. It examines the privatisation of the electricity market in terms of its failure to reduce costs to end-users, and failure to improve reliability and customer service. It analyses the factors that contributed to these failures. Privatisation has impacted adversely all major formerly public services such health, energy and water supply, nationally and internationally (Mazzucato, 2019). Also considered are issues around the need to improve oil supply security, reduce oil demand and decarbonised the transport sector, by electrifying our road and rail transport. The overall context of converging factors such as globalised markets and supply chain failures, the climate crisis, pandemic and war in the Ukraine are also considered. Finally, some solutions are provided, including a shift back to a different form of public ownership.

The provision of energy is considered a social 'good' and an essential service. Access to safe, clean, affordable energy should be considered a basic human right. It was for many years a key role of government to provide it as a public service. The neo-liberal "free market" ideology of the 1980s promoted the deregulation and privatisation of the energy systems in many countries, based on the belief that the market outcomes would provide energy more cheaply and reliably, and with better service to end users, compared to public ownership. Both Liberal and Labor governments in Australia actively implemented these changes. But recent events in the electricity (and gas and oil) markets in Australia have shown again the failure of a market based system to meet any of these outcomes. In fact, the reverse has been the case.

The first major critique of the results of deregulation and privatisation of the electricity sector was undertaken by Professor Sharon Beder of Wollongong University. In her 2003 book "Power Play", she explored the battles between private and public ownership of the electricity industry in the USA, UK, Australia and New Zealand and the flow-on effects in developing countries such as Brazil and India. Powerful private companies sought to "swindle the public in dozens of countries out of rightful control over an essential public service". The rorting by ENRON was a classic example. (Beder, 2003:164).

National Electricity Market - Structure

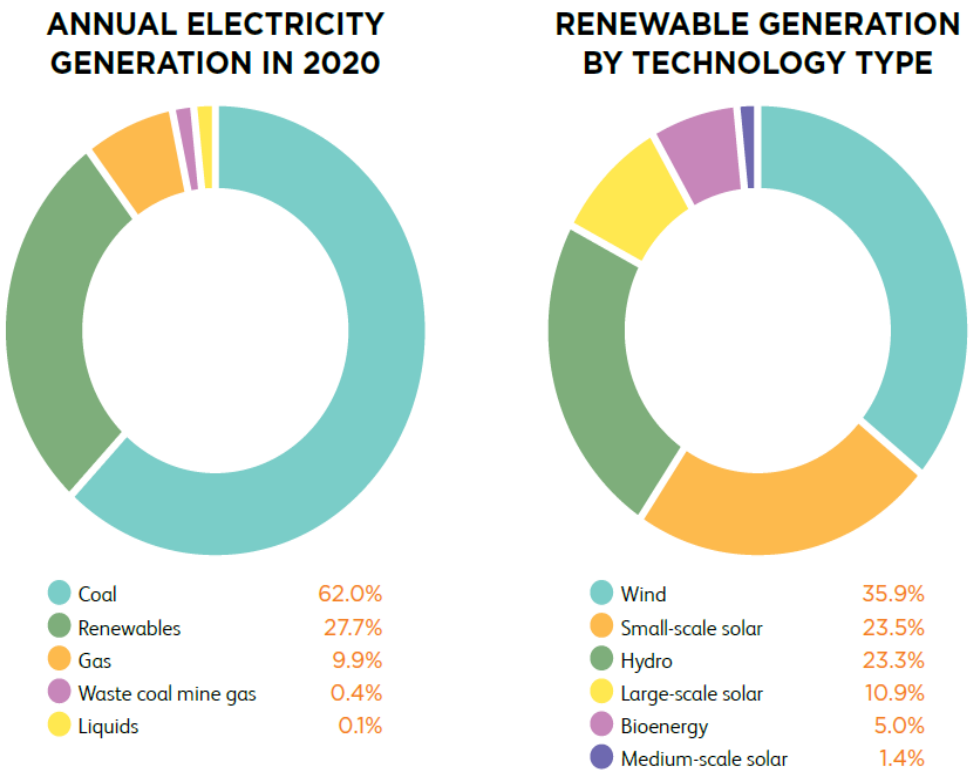
Up until around 2000, the structure of the electricity system was made up of large generators (coal, gas, hydro and biomass plants) feeding power to the long distance, high voltage transmission system. This energy was then fed to a lower voltage distribution system to supply homes and businesses within towns and cities. Government owned distribution companies then metered and sold this energy to the end-users. This system gradually changed as privatisation policies were introduced, initially in Victoria and later in other States to varying degrees. This system is now known as the National Electricity Market (NEM) on the east coast, extending from Port Douglas in Queensland to Port Lincoln in South Australia. Like reticulated water and gas supply systems, the electricity system was considered to be, in part, a natural monopoly, particularly for the long distance transmission lines and local "poles and wires" distribution system in towns and cities. Both transmission and distribution parts have remained fully State owned in only two states, Queensland and Tasmania, but privatised in other eastern States. Privatisation has also been applied to the generators (coal, gas, diesel, hydro, biomass, and now small, medium and large solar and wind), and the retail (contracts and billing) end. Not all generators were privatised as some States retained ownership of some large generators. These State owned generators were corporatized, so that they were required to make a profit (for State governments). Competition at the generator (supply) end and the retail (demand) end was meant to achieve the neo-liberal market-lead outcomes outlined above. Some generators are vertically integrated and hence have their own retail section. This includes the three largest companies, Origin Energy, AGL and Energy Australia, often referred to as "gen-tailers". (Wikipedia – National Energy Market)

An additional feature of the NEM since 2000 has been the installation of roof-top solar on homes and businesses across Australia. These are privately owned generators embedded in the distribution (demand) end of the system. They make the flow of electricity a bi-directional process across much of the local electricity distribution system (often called the grid), exporting excess solar power to their neighbourhoods during the day and drawing power as needed from the grid at night. Over three million homes and businesses in Australia now have solar electric systems, and the growth in sales is still very high. In addition, many large scale solar farms are now in operation. In 2020, nearly 31 percent of total electricity supplied to the NEM came from renewable energy generators. This is increasing annually. As well, about 23.5 percent of renewable power comes from small roof-top systems on homes and businesses. Renewable energy generators, even with battery storage, now provide the cheapest electricity on the NEM, when compared using Levelized Cost of Energy (LCOE). This method measures lifetime costs divided by energy production and calculates the present value of the total cost of building and operating a power plant over its lifetime.

The increase in the contribution of renewable energy, particularly from variable supply sources such as wind and solar, was always going to require careful long term planning, supportive policy and cooperation across government and the private sector. This is because both wind and solar sources are classified as non-dispatchable as their output varies with resource variation, although this can be curtailed when required at high levels of penetration. As the percentage of instantaneous renewable power increases, wind and solar systems must be combined with sufficient energy storage, and/or gas peaking plant, demand management, and synchronous generation to provide system wide voltage and frequency stability. This allows the instantaneous supply of power to follow the varying power demand over each day.

Technology improvements via smart inverters and battery storage are removing the need for conventional generators to provide these technical services. As well, major transmission lines need upgrading to allow the transfer for large amounts of renewables power across the NEM. All the technologies to manage the NEM power flow are now available and at times, solar and wind penetration in parts of the NEM reaches 100 percent. But much more needs to be done across the whole NEM to ensure a lower cost, reliable system that is carbon neutral.

Figure 1 - Annual Contribution to Energy Generation on the NEM for 2020
Source: Clean Energy Council annual report 2021

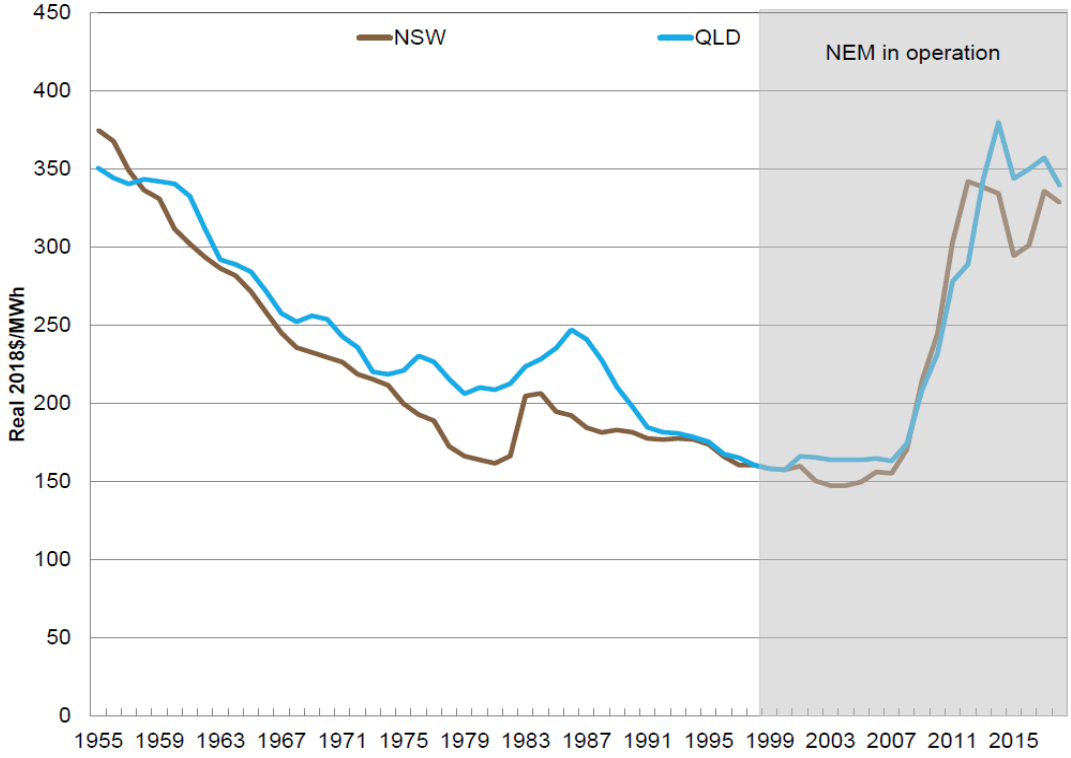


Historical Trends – Privatisation of the NEM

What happened to costs?

So what has happened to electricity costs since the mid-1950s? During this period of public ownership and rapid industrialisation, demand for electricity grew. Economies of scale were achieved through building large centralised coal and hydro plant. This, together with low fuel costs, and no profit motive, saw residential electricity prices progressively fall over the first 45 years. Figure 2 shows the results. External costs of pollution from fossil fuel mining and use were ignored. But since about 1998, when privatisation and corporatisation took hold State by State to varying degrees, residential electricity prices initially levelled off. Then post 2008, prices started going up and did so for most years. The recent energy crisis has seen a rapid rise again, but is not shown in figure 2.

Figure 2 – Residential electricity prices in NSW and Queensland (1955 – 2018)
Source: Rai & Nelson, 2019.



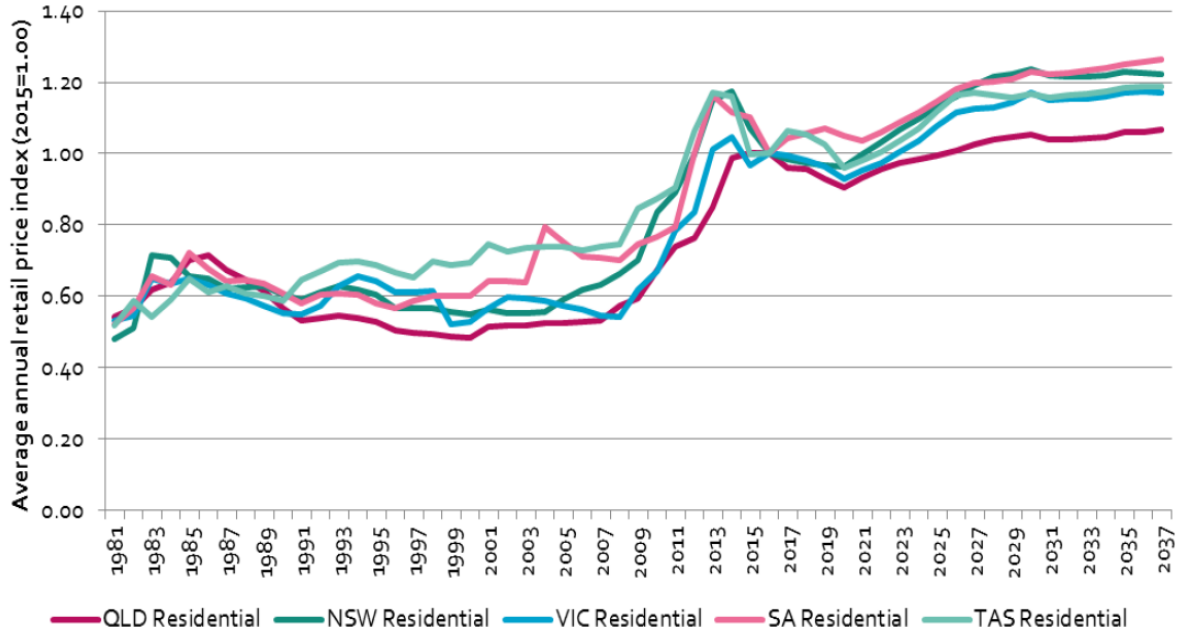
Notes: Shaded area indicates period over which the NEM has been in operation.
Sources: AEMC (2018); Nelson *et al*. (2017); Simshauser (2019); St. Vincent de Paul & Alviss Consulting.

This levelling out of prices from about 1998 to 2008 was interpreted by some as indicative of successful market operation. (Rai et al, 2019:8). Some rationalisation of over-capacity was necessary as there were 5 coal power stations in Queensland alone built between 1996 and 2007 (Wikipedia – List of power stations in Queensland). This rationalisation lead to higher utilisation of existing plant. But the "market success" explanation is more related to the age of available plant, and thorough maintenance regimes by cautious engineers, resulting in high levels of availability of power. Also over-building capacity is inherent in the planning system when building very large plant like Stanwell, which is rated at 1440 megawatts (MW) of peak power output. This is because projections of future electricity demand must be made over 40 years or more of projected plant life. It is guess work at best. Unexpected changes in demand can and do happen. For example, if energy efficiency of appliances improves (as happened), or population projections were wrong, or recessions or pandemics occur, then electricity demand can vary outside of 40 year projections.

Prices began to rise again between 2009 and 2018. This is shown in figure 3 from a report for the Australian Energy Market Operator (AEMO) in 2016. A range of factors contributed, particularly network charges. These charges are the fixed supply charge component of electricity bills and cover the upgrading and maintenance of the electricity transmission and distribution system. There was a period that became known for "gold-plating" of the distribution system, as energy demand grew. System planning again played a crucial role as engineers needed to ensure that there is sufficient power carrying capacity in both transmission and distribution systems. Conservative engineering, with a lack of serious implementation of energy efficiency and demand management, lead to over-estimation of peak demand (measured in megawatts). Tariff pricing didn't help as it didn't reflect the cost of supply at different times of the day. Some tariffs even used perverse electricity pricing that

encouraged wasteful energy use with cheaper rates offered as you used more energy. These are called declining block tariffs and still exist in the gas industry.
The rapid uptake of air conditioning (partly driven by a warming climate) contributed largely to this problem. The Productivity Commission estimated that this upgrading of the distribution system amounted to a subsidy of $7000 per air conditioner from homes without air conditioning to homes with air conditioning (Renew Economy, 8 Oct 2012). Often more than one air conditioner is installed, increasing the subsidy per home. But compounding this was the market demand for larger houses and more appliances such as multiple large screen TVs across several rooms and swimming pools. Larger open plan floor areas with significant areas of glass doors and windows (worst case facing the mountain views I.E. west) requires more energy for heating and cooling. Poor regulation, training and enforcement of energy efficient building design made matters worse. For example, most homes are energy star rated by private contractors using 'prescriptive methods' rather than best case computer modelling. The latter gives superior results. This is a very competitive service and poorly overseen by Local Government who don't have the resources to check if, for example, energy efficiency measures are properly implemented. Also, the construction industry and developers have historically resisted planning improvements at every opportunity, citing increased costs to buyers (often exaggerated), but ignoring reduced running costs and emissions (HIA, 2021:5). Best practice solar efficiency design and real estate sub-division are still largely ignored.

Figure 3 – Real indexed residential retail prices – historical and forecast, neutral scenario (2016=1.00) Source: Jacobs Australia 2016.



During this time, the regulatory asset base of the distribution network increased significantly. As well as over-estimated peak demand projections, this increase has been attributed to:

- Tightening in network reliability and bushfire standards in NSW and Queensland,
- Smart metering roll-out in Victoria in particular,
- Increased financing costs due to the GFC,
  (Rai et al, 2019:11-12).

There have been a number of long term factors due to privatisation that have contributed to higher costs of electricity as outlined in a report to The Australia Institute (Richardson, 2013).

These include:

- Productivity, as measured by gross value added per hours of work, fell between 1995 and 2012. The report argued this was probably due to the reform agenda itself, splitting companies into smaller business units, resulting in an increase in the total number of staff, a significant number with no role in actually generating electricity – marketing department personnel, administrative and clerical staff, managers and professionals increased the most.
- Lack of coordination across business units.
- Increased capital servicing costs associated with privatisation and increased interest paid on loans for new acquisitions.
- Asset price inflation also occurred, requiring a higher price on electricity sales to ensure a competitive rate of return on investments.

Overseeing the NEM is a very top heavy bureaucracy of quasi government agencies that involves four levels of management. These are:

- Energy Security Board (ESB) - established by the nation's energy Ministers. It coordinates implementation of recommendations from the Independent Review into the Future Security of the National Electricity Market (Finkel Review).
- Australian Energy Market Commission (AEMC) - makes the rules under the national energy laws, and advises governments on overall energy market development.
- Australian Energy Regulator (AER) - regulates wholesale and retail energy markets, and energy networks, under national energy legislation and rules. Its functions mostly relate to energy markets in eastern and southern Australia.
- Australian Energy Market Operator (AEMO) - oversees the operations and security of the National Energy Market (NEM) system (both electricity and gas) in eastern and south-eastern Australia and the Wholesale Energy Market (WEM) in Western Australia, as well as transmission and trading of electricity and gas, ensuring that residential, business and industrial customers can access secure, reliable energy.

These agencies are far from being independent. For example, the AEMC website states that "AEMO is a public company limited by guarantee and has two types of members: government and industry, constituting 60 and 40 per cent respectively." (AEMC, 2022). These agencies are made up of numerous well paid boards of directors, executive staff and support workers, all adding to the cost of electricity provision.

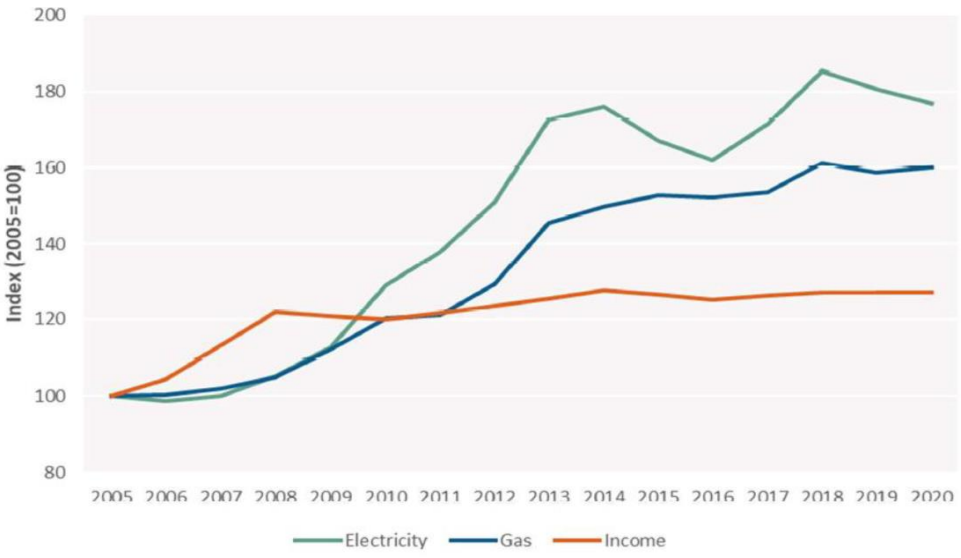
In 2020, the Energy Security Board (ESB) released an annual review analysing the "health" of the National Electricity Market. It examined the operation and governance of the NEM in terms of COAGS Strategic Energy Plan objectives. These covered aspects such as affordability, security, reliability, emissions, competition, investment and governance. This report rated the objectives for 2020 and compared them with the ratings in 2019. Table 1 presents a summary of the results.

Table 1 – Current 2020 Status and Forward Outlook for the NEM (Source: ESB report 2020)

	2020 Ratings		Last Year's Ratings	
	Current status	Outlook	Current status	Outlook
Affordable energy and satisfied consumers	Moderate-Critical	Moderate	Moderate-Critical	Moderate
Secure electricity and gas system	Critical	Moderate-Critical	Critical	Critical
Reliable and low emissions electricity and gas supply	Moderate	Moderate	Critical	Moderate
Effective development of open and competitive markets	Good	Good-Moderate	Moderate	Good-Moderate
Efficient and timely investment in networks	Good-Moderate	Moderate	Moderate-Critical	Moderate
Strong but agile governance	Moderate	Moderate	Moderate	Moderate

It concluded that the outlook for the NEM was "Moderate" to "Good – Moderate" for most criteria, with small improvements over 2019. However, prices of both electricity and gas had increased dramatically since 2005 under privatisation and corporatisation, as the report shows. The ESB reporting failed to examine much longer term data for electricity as in figure 2, and failed to properly critique the success or failure of the privatisation/corporatisation process. What the data shows is that, in recent years, fluctuations are occurring in electricity prices that are relatively small, compared to overall long term data as in figure 2, and that the overall trend appears to be increasing costs for both electricity and gas, as figure 3 predicts. For example, figure 4 shows that electricity prices increased by 14 percent between 2016 and 2018, and fell by about 4 percent from 2018 to 2020. Predictions from the current energy crisis are that both electricity and gas prices will continue to rise, with some commentators suggesting a 50 percent increase in electricity prices in the next 12 months.

Figure 4 – Trends in energy prices and income 2005 to 2020 (Source: ESB report 2020)



SOURCE – AER ANNUAL RETAIL MARKETS REPORT 2019-20 - ELECTRICITY AND GAS INDEX – ABS, CONSUMER PRICE INDEX, VARIOUS YEARS; INCOME INDEX – ABS, HOUSEHOLD INCOME AND WEALTH, AUSTRALIA, VARIOUS YEARS.

AEMO's Quarterly Energy Dynamics Q2 2022 outlines reasons for the current rapid increase in both electricity and gas prices. These are in summary as follows:

- Protracted cold weather, in part driven by climate change.
- Rising and volatile spot fuel market costs (for coal, oil, gas) internationally and the flow through to local markets in a globalised world economy. These costs increased the wholesale price of electricity (and gas) dramatically, forcing retailers to start passing on costs from July, 2022.
- The Russia-Ukraine war destabilized energy supplies and the COVID pandemic disrupted supply chains.
- Reduction in availability of coal-fired generation due to scheduled maintenance and unforeseen, forced outages. This required more costly gas generation to ensure sufficient capacity, which in turn put pressure on gas supplies.
- "Fuel supply and hydrological constraints on a number of thermal and hydro generators" (AEMO, Q2 2022)

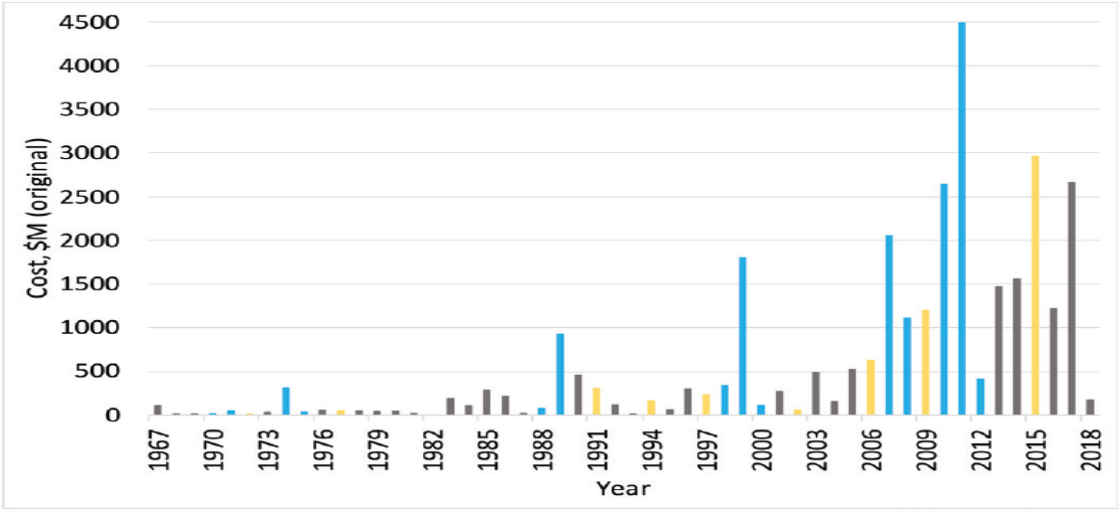
From 2013 to 2015, a small increase in costs occurred as a result of environmental levies. This included the carbon tax introduced by Federal Labor in 2013/14, which contributed about 2 cents per kilowatt-hour or about 13 percent to the retail cost of electricity at the time (Rai et al, 2019:10). State Governments also incurred costs due to generous feed-in tariffs being offered to encourage homes and businesses to install solar PV systems. The carbon tax and feed-in tariffs aimed to stimulate the renewable energy sector and reduce carbon emissions, to help transition away from coal and gas to renewables. These measures were working to lower emissions as home owners and later business owners took up roof-top solar in droves and reduced their bills and emissions. However, the Federal Liberal National Party government under Tony Abbott responded to pressure from the fossil fuel industry and removed the carbon tax, and prices again increased a little. Abbott's denial of climate science, and campaign against a carbon tax, effectively socialised this pollution cost. The general public eventually have to pay for these costs directly or indirectly at a later date, such as through poorer health and associated health costs, premature death, insurance and food costs due to more extreme weather or environmental clean-up costs. This is already happening (Climate Council, 2019).

What happened to reliability?

Electricity system reliability is measured by the network service companies in terms of the duration and frequency of power outages. Data from about 2006 to 2018 showed that both these measures had been reducing (Cainey, 2019:45). However, the data does not include the outages associated with extreme weather events such as cyclones, floods and fire. These events typically cause longer outages. Hence, the reliability data is skewed to 'normal' days of operation.

The insurance costs associated with extreme weather events have been increasing and are projected to continue increasing due to climate change. Figure 4 shows insurance costs to 2018. Recent fires and floods have set new records, with the 2019 fires costing $5.47 billion and 2022 floods costing $3.35 billion (Insurance Council of Australia). Cainey points out that we need to consider the 'resilience' of the electricity systems to these major events. Rather than avoiding the effects of extreme events, improving resilience requires focusing on these 'bad days' and measures the ability to both withstand and recover from major events (Cainey, 2019:48).

Figure 4 – Insurance costs of severe events (Source: Insurance Council of Australia, 2018)



Analysis from 2009 to 2018 by the Grattan Institute does show that the NEM has been very reliable over this period, with most outages being of very short duration and occurring largely within the electricity distribution system, not with transmission or generators (Wood et al, 2019). Typically, the most common outages have been from storm damage to power lines and lightning strikes. However, this is changing as coal and gas plants age, resulting in increased planned and unplanned maintenance. This is exacerbated as coal power stations, in particular, consist of several large generator sets of up to 750 megawatts of capacity each. So loss of one generator set can have a significant impact on the NEM's reliability, reducing the reserve (safety) margin of available generating capacity. A shortage of available coal and gas plant has happened in the current power crisis and details are shown in figure 5 below and is becoming more frequent. By comparison, renewable energy generators are made up of multiple smaller generators. So loss of capacity is more likely to occur in much smaller amounts, with less effect on the electricity supply and reliability.

Figure 5 – Coal-fired plants facing difficulties.

Coal-fired plants facing difficulties

Owner	Site	Capacity (MW)
Origin Energy[1]	**Eraring, NSW**	**2880**
AGL[2]	**Bayswater, NSW**	**2665**
AGL[3]	**Loy Yang A, Vic**	**2240**
AGL[4]	**Liddell, NSW**	**2000**
Gladstone Power Station	Gladstone, Qld	1680
Stanwell Corporation	Stanwell, Qld	1460
EnergyAustralia	Yallourn, Vic	1450
Stanwell Corporation	Tarong, Qld	1400
EnergyAustralia	Mt Piper, NSW	1390
Delta Electricity	Vales Point B, NSW	1320
Gippsland Power	Loy Yang B, Vic	1160
Millmerran Power Partners	Millmerran, Qld	852
Callide Energy[5]	**Callide C, Qld**	**840**
CS Energy	Kogan Creek, Qld	744
CS Energy	Callide B, Qld	700
Stanwell Corporation	Tarong North, Qld	450

1. Reduced capacity due to coal supply, coal spot price
2. Unit 3 offline until beginning of July for planned maintenance
3. Unit 2 offline until August 1 due to technical issues
4. One of four units offline until July 30 due to unplanned maintenance
5. Unit 4 offline until April 7, 2023 due to fire

SOURCE: FINANCIAL REVIEW, AEMO, COMPANY FILINGS FROM AGL, ORIGIN, CS ENERGY

Loss of coal (and potentially gas supply) is occurring more frequently, due to extreme weather events causing flooding of coal mines, or loss of rail infrastructure to transport the coal to power stations. It can be exacerbated if there are insufficient coal stockpiles at power stations. This happened in Queensland during cyclone Yasi (Berrill, 2012:37) and recent floods in Queensland and New South Wales. As well, coal and gas plant efficiency is lowered during heat waves and their maximum operating power level has to be reduced.

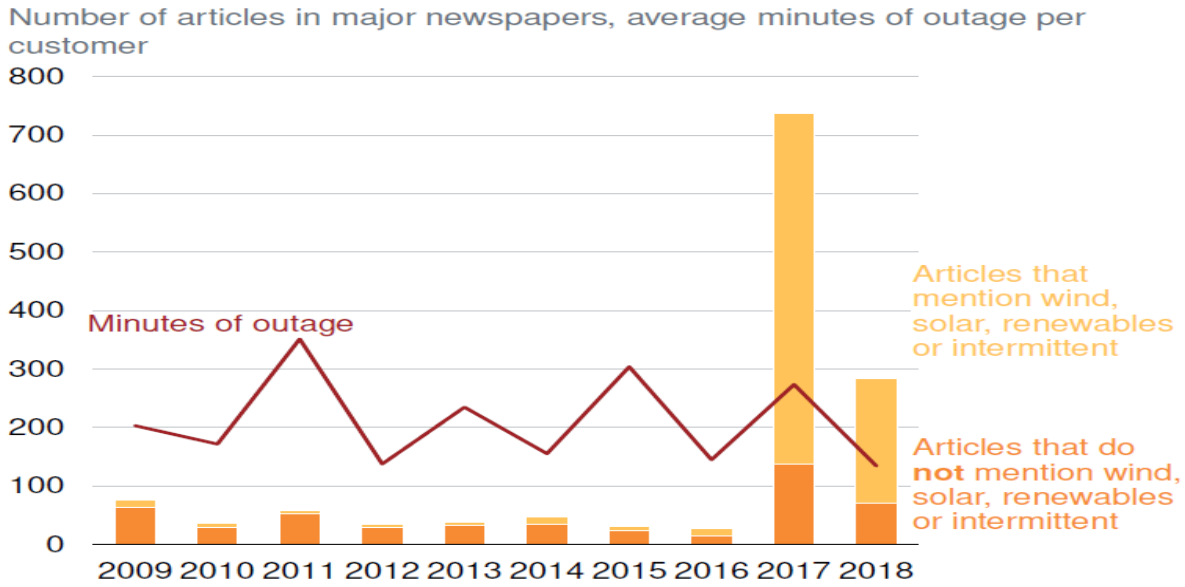
In her 2003 book, Power Play, Professor Beder stated that "companies in a deregulated, competitive environment are loathe to build reserve capacity (extra plant on standby) in case they are not able to get an adequate return on their investment. System reliability is therefore compromised by the unwillingness of deregulated private companies to maintain and plan for reserve capacity in case of sudden rises in demand." As well, "The market system, which rewards companies in times of shortages with high prices, also encourages the premature retirement of generating facilities." (Beder, 2003:15). Beder outlines other strategies used by generators during periods of shortages of supply including withholding supply to price gouge. These are strategies that generators have been accused of in recent years.

Public perception of system reliability is influenced by mainstream media articles and frequency of reporting of outages. Figure 6 below is from the Grattan Institute's 2019 report "Keep calm and carry on – Managing electricity reliability." It shows that, while outages have remained fairly constant, mainstream media reporting of reliability has at times in recent years become exaggerated.

Often renewable energy generators have been overly blamed for creating outages. The most extreme example happened after a massive storm front in South Australia flattened 23 power pylons on a major high voltage transmission line, as wind speeds exceeded 144 km/hr, the maximum design wind speed for these pylons. "The damaged power lines caused voltage fluctuations that stressed the ride-through capability of most of the wind farm capacity, causing nine of them to shut down." The wind farms had responded according to their rid-through settings, but the ride-through capability of some of the wind farms had incorrect software settings, causing them to remain off line. Network manager, AEMO, identified and corrected this problem. But further problems compounded the crisis. Gas plant failed repeatedly to start. Diesel backup plant in critical services such as hospitals also failed. All this led to a State-wide blackout. The event highlighted the need for better planning, maintenance, experience and preparation for extreme weather events (Wikipedia, 2016 SA Blackout and Renew Economy, 11 February, 2019).

Media reports on system reliability increased following the 2016 South Australian blackout as the Murdoch press waged a war to discredit renewable energy. This can be seen clearly in figure 6. Some Murdoch staff were so disillusioned by the blatant misleading reporting, particularly of climate change and renewable energy reporting by the Murdoch press, that they resigned. Even James Murdoch criticised the Murdoch press for misreporting climate change science and impacts (SBS, 15 Jan 2020).

Figure 6 – Media articles mentioning ''blackouts" have increased; power outages have not



Notes: Articles mentioning (blackout or black-out or "black out") *and* electricity *in The Australian, The Australian Financial Review, The Hobart Mercury, The Age, The Herald Sun, The Sydney Morning Herald, Daily Telegraph, The Adelaide Advertiser or The Courier-Mail. The number of articles in these newspapers has remained relatively constant over this time period. Minutes of outage are for customers of all NEM-connected distribution networks and include all sources of outage. Data in financial years. Victorian outage data for July to December 2008 and January to June 2018 was estimated due to unavailability.*

Sources: Grattan analysis of Dow Jones (2018) and AER (2018b).

What happened to customer service?

In terms of customer service, there is plenty of room for dissatisfaction. We all know the difficulty in getting through on the telephone to customer service in many large companies (and Government agencies) these days, with the standard telephone message being that "we are experiencing an unusually high call rate, but please hold the line as your call is important to us"!! A 30 to 40 minute wait is not uncommon. In relation to the electricity retailers, an ombudsman service had to be introduced to deal with the high number of complaints. In Queensland alone, there have been over 5600 complaints to the electricity ombudsman in the first 6 months of 2022.

Consumer advocate organisation CHOICE stated in a recent review of retailers: "Unfortunately, as you'd expect, there are some pretty ordinary companies out there – and you might be surprised to know that some of the biggest players are among the worst." That includes AGL, Origin Energy and Energy Australia. All three rated badly in customer service. (Choice, 8 April, 2022)

Consumer confidence in the energy market has recently hit a new low. This is shown with the release of a survey by Energy Consumers Australia, as rapid increases in wholesale prices started to be passed on to customers. *"At the same time, confidence that the market is working in the long-term interests of consumers has also taken a hit, falling from 44% to 37%, the survey says."* (Renew Economy, 30 Aug, 2022).

Privatisation also led to many more retailers entering the market. Each presented their bills to customers differently, often with a range of discounts on various parts of the bill. So customers' bills became more complex and it became more difficult and time consuming to compare offers between various retailers. As a result, customers often just stuck with the same old retailer, regardless of whether there were cheaper options available. Furthermore, feed-in tariffs that paid solar system

owners for excess power exported to the grid during the day, complicate matters. Few people know how to properly assess the benefits of solar electricity and some relied on so called independent web sites that made the comparison between retailers for customers. The only independent comparison site is that from the Federal Government, "Energy Made Easy". This site left the solar feed-in tariff contribution out of their calculation for comparison of retailers' price offers. It appears to have been too complicated to include. See: www.energymadeeasy.gov.au

Why an Energy Crisis?

Why have we ended up with an energy crisis? There are converging issues that have come together to create the crisis in Australia's energy system. These include failure of long term government policy and planning, extreme weather events worsened by climate change, aging infrastructure with more frequent either planned or unplanned outages, a concentration of power in a few big generator/retail companies and resulting market manipulation, and a struggling market operator. Privatisation has played a key role as outlined previously. As well, these issues are compounded by international factors including failure of a globalised supply chain, climate change, poor response to a pandemic and war affecting energy and food resources.

There has been for many years a lack of certainty around addressing climate change through co-ordinated energy and emissions policy. This should have comprised comprehensive measures to replace fossil fuel use with renewable energy and storage, and to massively improve energy efficiency, as Australia continues to lag well behind OECD countries in this regard. Minimum standards for energy efficiency measures for some appliances had been introduced in the 1990s, but national energy rating of buildings took longer, only really starting around 2003 across most States. Both have resulted in slow, incremental improvements in energy efficiency but not sufficient to contribute significantly to emission reductions. A report in 2021 by Australia's leading energy efficiency researcher Dr Hugh Saddler *(TIA, Aug 2021)* shows that:

According to key indicators of decarbonisation and energy transition Australia ranks very poorly, and despite Federal Government claims to the contrary, Australia's fossil fuel reliance for energy has in fact risen since 2005.

Between 2005 to 2019 (pre-COVID), Australia has performed worse than any of the other 23 countries at reducing its energy dependence on fossil fuels in overall terms

> *The Australian economy remains the most emissions intensive energy system among OECD countries, with the exception of Poland.*
>
> *Despite the Australian government prioritising productivity to meet its Paris Agreement target, Australia has achieved a smaller energy productivity increase than any of the other 23 countries.*

Although there has been a significant increase in the share of wind and solar generation in the last decade, Australia still did not move forward in rankings given faster energy transitions taking place in the other OECD countries.

This failure of government to provide coordinated, long term planning of the Australian energy system came about as climate change policy and initiatives became an "ideological war" between the LNP and Labor parties. This resulted in dysfunctional energy and climate policy and action, where policy uncertainty ruled and investment went through boom and bust cycles. Businesses came and

went. The transition of the electricity system to renewable energy with storage, and upgrades to the transmission system, has lacked a clear and consistent pathway over the long term.

Substantial funding has also been directed to continue subsidizing the fossil fuel industry, such as the gas lead recovery of the Morrison government (Renew Economy, 28 Mar 2022). Equally as important has been the failure of government to take climate action in other sectors of the economy such as transport, agriculture and heavy industry. Analyses of this "ideological war", both between and within the major political parties are readily available, such as this one in The Guardian which covers the last eight years: https://www.theguardian.com/australia-news/2021/oct/17/eight-years-20-policies-how-australias-leaders-have-fumbled-and-dithered-on-climate

The reality of climate change is that it is causing more extreme and chaotic weather events. These events are making forecasting electricity demand more challenging and management strategies will have to respond. (Stanford News, 14 Dec, 2021). For example, the protracted wet weather from La Nina last year and this year, and the more recent cold snap, are creating issues around pumped hydro water and power management, as dams were full. Pumped hydro storage relies on being able to pump water from a lower dam to a higher one, and then discharging this water back through turbines to the lower dam when required by the NEM. If the upper dam is already full, then water must be released into lower catchments, potentially causing local flooding, particularly if those catchments are already saturated. As well, the La Nina weather pattern caused flooding of coal mines in Queensland and New South Wales and contributed to a shortage of coal supply. Coal power stations' output had to be reduced to conserve on-site stocks of coal. (ABC News, 20 Jun, 2022).

Coal power stations are aging and becoming less reliable. Currently they still contribute about 60 percent of total generation capacity across the NEM. But in the current energy crisis, about 25 percent of coal capacity (measured in megawatts) is unavailable, mostly in Victoria and Queensland. (AFR, 6 Jun, 2022). This is a very high percentage and puts at risk the security and reliability of power supply, particularly during very cold or hot weather when electricity demand for space heating and cooling increases greatly. Some of this capacity is predicted to remain off line throughout much of winter or even longer, such as Callide C coal power station, after a massive explosion and fire in one large generator set. Figure 5 above shows those power stations currently facing difficulties in operating at full capacity, and lists some of the reasons.

There is a concentration of power supply by just three large companies, Origin Energy, AGL and Energy Australia. These are vertically integrated companies that supply about 60 percent of the market and have been accused of price gouging. These companies are also amongst the biggest polluters in Australia. Both private and State owned power generators have been accused of market manipulation, including withholding power generation capacity when needed during peak periods. These links provide some examples from 2022 and 2016:

https://inqld.com.au/business/2022/06/16/price-gouging-claim-why-queenslanders-pay-more-for-electricity-than-anyone-in-australia/

https://reneweconomy.com.au/aer-details-extraordinary-price-gouging-gas-generators-sa-92740/

To address the issues above, the AEMO put forward an Integrated System Plan some years ago, "a whole-of-system plan that aimed to provide an integrated roadmap for the efficient development of the National Electricity Market (NEM) over the next 20 years and beyond." Its objective was "to maximise value to end consumers by designing the lowest cost, secure and reliable energy system capable of meeting any emissions trajectory determined by policy makers at an acceptable level of risk." (AEMO, 2022). Planning such as this plays an important role, and is necessary for a smooth

transition to renewables with energy storage. However, the top heavy architecture of the ESB, AEMC and the AER and associated rules has not helped a transition to renewables. For example, in 2021, AEMC rejected requests from transmission companies to help pay for major State interconnection upgrades. "The decision could potentially kill off plans to build major new network links identified in AEMO's Integrated System Plan, considered crucial for further investment in wind and solar projects and the transition to a renewables-dominated grid." (See: Reneweconomy 8 April, 2021 & 20 Dec, 2019).

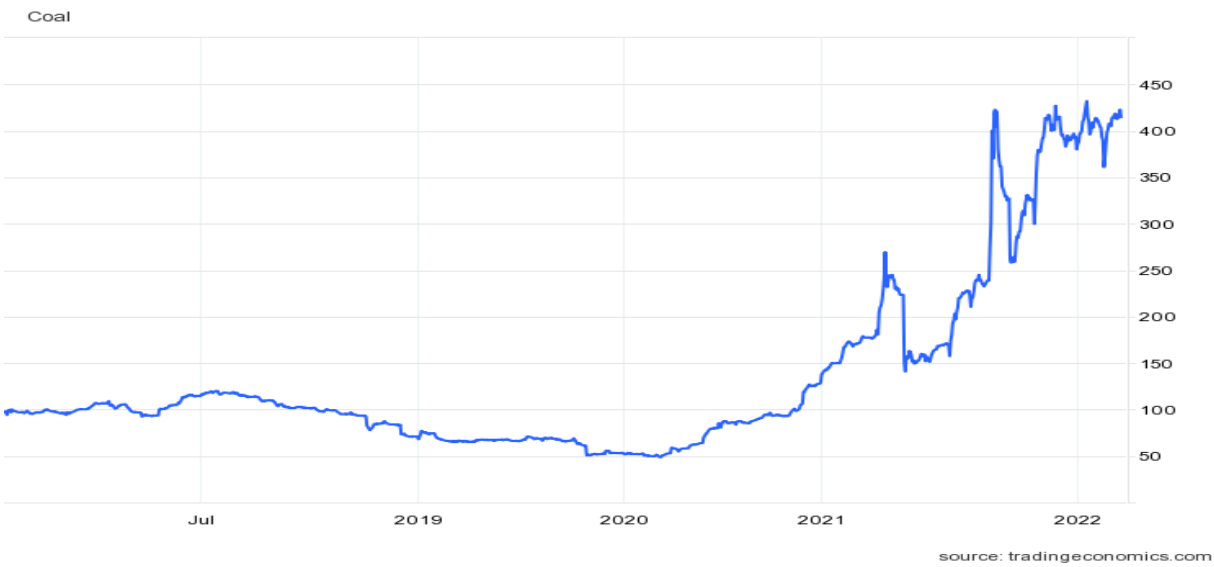
International Factors

International factors outside the control of Australian Governments have also contributed to increasing costs of electricity supply to some sectors. For example, the COVID19 pandemic resulted in decreased electricity consumption overall, BUT increased electricity consumption in homes as workers stayed home (Energy Networks Australia, Jul 2020). Some were unemployed and suffered financial stress. ACCC chair Rod Sims commented: "The pandemic is exacerbating energy affordability concerns. At a time when many consumers are experiencing reduced incomes, increased electricity consumption could lead to rising household debt and financial strain". (ACCC, 19 Oct, 2020).

Globalisation encouraged "just in time" supply chains and concentration of manufacturing in regions with cheap labour, with considerable supply of key components now coming from China. Lack of workers, due to the pandemic, across these complex supply chains, has resulted in a shortage of parts and expertise and long delays to maintain and upgrade our energy systems (ABS media release, 4/3/22).

The war in Ukraine interrupted the globalised energy market and shortages always benefit those energy suppliers still in the game. So the international price for coal and gas (and oil) increased greatly as the EU in particular sought alternative suppliers of coal and gas for power supply and heat, and oil for transport. For example, the international coal price has increased dramatically in the past 5 years, from averaging around US$80 per tonne, to over US$400 per tonne in recent months as in figure 7 (Trading Economics: Coal Price).

Figure 7 – Coal Trading Prices (US$/tonne) over the last 5 years



This had two effects on the NEM. First local gas and coal prices in Australia are linked to international prices so generators may see fuel cost increases, depending on contractual obligations, the need to access extra coal or gas on the spot market, and available supply sources. Second, for the NEM (on the east coast), there was no requirement to make available a fixed minimum amount of gas supply for gas power stations or gas heating within homes or industry, as in WA. So the AEMO had to force gas suppliers and gas generators to ensure sufficient electricity was available. So on the 16th June, 2022, AEMO "announced that it has suspended the spot market in all regions of the National Electricity Market (NEM) from 14:05 AEST, under the National Electricity Rules (NER). AEMO has taken this step because it has become impossible to continue operating the spot market while ensuring a secure and reliable supply of electricity for consumers in accordance with the NER. The market operator will apply a pre-determined suspension pricing schedule for each NEM region. A compensation regime applies for eligible generators who bid into the market during suspension price periods." **The MARKET had FAILED**. **In reality, it had failed since at least 2008 when prices started to escalate again.**

All of these factors have converged to make our electricity system more costly and less resilient to converging crises including climate change creating more extreme weather, pandemics causing labour and material supply shortages, and war creating unstable global economic conditions.

Another Energy Crisis – Oil Supply & Security

There is another energy crisis that is affecting Australians, namely petrol and diesel supply and costs. These fuel costs have also skyrocketed in recent months, with the war in Ukraine having a large impact on international supply and prices. Unlike coal and gas, Australia has little remaining easily recoverable **conventional** oil reserves. There is about three year's supply of oil at current consumption rates. Australia has significant potential for **unconventional** liquid petroleum resources hosted in oil shales, and shale oil and tight oil accumulations (Geoscience Australia, 2022). However, exploitation of these reserves is unviable given the necessity to stop expanding fossil fuel mining if we wish to keep global warming to 1.5 degrees Celsius. Little reserves are held in storage in the event of major disruptions such as extreme weather, war, a terrorist attack or oil tanker shortages. As well, we have little capacity to supply our needs locally with only two oil refineries remaining in operation in Australia.

According to a Parliamentary Library research paper from May 2020, titled: "Liquid fuel security: a quick guide–May 2020 update" by Dr Hunter Laidlaw, "Australia had 55 days of net import cover". The International Energy Agency recommends a minimum of 90 days. But the "net import cover" measure differs from "days of consumption remaining". This latter measure is more important and was estimated at "25 days for automotive gasoline, 20 days for diesel oil and 143 days for aviation gasoline". (Parliamentary Library, May 2020). While the Morrison Government signed up to have some oil stored in American strategic reserves, it takes a minimum of about 30 days to ship that oil across to Brisbane from southern USA ports. Engineers Australia reported in 2019, in a submission to Department of the Environment and Energy, Liquid Fuel Security Review that:

> *Australia's energy network (electricity, liquid fuel, gas) is an ad-hoc system, organised within stovepipes of energy types, creating system and systematic vulnerability. In the short-term Australia is faced with significant risk in liquid fuel security and there are no easy solutions to addressing it.*

The transport sector also faces a huge challenge in reducing its pollution and associated costs, and making Australia less dependent on imported oil. Currently it is a big contributor to greenhouse gas emissions, estimated at 18 percent in 2021 (Dept. of Industry, 2022), and air pollution in cities. According to a UNSW study, air pollution alone costs more than $11 Billion each year in health and infrastructure costs and results in over 3000 premature deaths (Dean et al, 2017:4). Reducing greenhouse emissions and air pollution, by electrifying the road and rail transport system, would mean huge savings; money that could go towards electrification costs.

Solutions

As Professor Beder reported in 2003, privatisation of our energy systems to date has failed on all three fronts: it has cost the public more, and has not improved reliability; nor has it improved customer service. That continues to be the case. It is apparent that a massive shift in the control, planning, structure, organisation and operation of Australia's energy systems is required. This is particularly so in the face of the climate crisis, where more extreme weather events are making management and reliability of the systems more difficult. As well, the world has been sharply awakened to the possibility of on-going destabilisation of an internationally globalised energy market, where both war (possibly nuclear) and pandemics have caused disruptions to "just in time" supply chains. This has resulted in both shortages of energy supply and huge increases in energy costs. These factors are now having serious repercussions politically, socially and environmentally.

The solution lies in a technological and social revolution in how we own, generate and manage the electricity system using a democratised model of the decentralised intelligent (smart) grid. This could encourage the community owned power models that are emerging across Australia and overseas, where communities, with Government assistance, invest in their own decentralised, renewable energy power systems with energy storage. This can be combined with localised energy efficiency and management programs to incentivise local demand management, to reduce peak power demand (the most expensive part of power generation). As well, it should incentivise shifting energy use to times of peak solar and wind generation. This can be enhanced with packetized energy management. This is a new control method that allows electricity demand to follow supply. It has great potential for variable wind and solar systems, can reduce peak demand, and save on storage and transmission costs. It's ideal for powering hot water, pool, space conditioning and electric vehicle charging. It is based on a prioritised, energy needs assessment of appliances that sends small packets of energy to appliances as required, randomly over time, instead of in large chunks as happens with currently controlled loads. This is similar to the way information is packaged into bits and sent over the internet.

Hydro power and biomass fired plant can be used for low wind and solar times, and combined with energy storage. There are many types of energy storage available including pumped hydro (the cheapest), compressed air and gravity systems in disused underground mines, hydrogen gas from electrolysis of water, and battery storage for shorter periods of several hours. Such systems can support micro-grid architecture, where sections of the grid can isolate themselves and run independently in emergencies, such as in times of weather extremes. This adds to system resilience, reliability and community safety.

In the transport sector, electrification of the road vehicle fleet and rail system is urgently required to address environmental and social costs, and our vulnerability to supply shortages. Electrification should happen in tandem with the uptake of renewable energy generation capacity, as electric vehicle batteries can provide storage for renewable energy, allowing it to be used later either for transport or within businesses or homes. As with all parts of the energy system, energy efficiency

should play a leading role and be incentivised. For examples, light weight electric vehicles should be encouraged over larger heavier vehicles for personal transport. Vehicle sharing programs can replace the need for individual ownership in many cases.

Land area is not a problem as both solar and wind farms can be integrated into agricultural land where the farmers earn income from both food and energy production. Many wind farms have already been built on grazing country which has helped secure the future of these farmers with a regular income stream. Solar farms are now been integrated into both grazing and crop production land. This is call Agrivoltaics or Agrisolar. A report by the Clean Energy Council can be found here: https://www.cleanenergycouncil.org.au/resources/resources-hub/australian-guide-to-agrisolar-for-large-scale-solar-1

Here are some sites that explain the opportunities for community owned renewables:

https://corenafund.org.au/community-energy/

https://renew.org.au/resources/how-we-can-help/community_energy/

https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jul/IRENA_Community_ownership_2020

https://theconversation.com/people-power-everyday-australians-are-building-their-own-renewables-projects-and-you-can-too-146885

Professor Quiggin also offers the following suggestions which would be a step in the right direction:

- The plethora of bodies regulating the market should be replaced by a single government agency that buys wholesale electricity from generators. This organisation could then sell electricity directly to customers or supply it to electricity retailers.
- The emergency purchasing arrangements AEMO currently has in place should be replaced by "power purchase agreements". These are long-term contracts between a buyer and a generator to purchase energy, in which prices, availability and reliability are set.
- Within those terms, generators that consistently produce electricity at very low prices are the first to be called on. This dispatch method, known as merit order, has been shown in Germany to lead to lower prices for consumers.
- At the same time, the Australian electricity grid should be returned to government ownership and operation. Its guiding principle should be moving to a decarbonised energy system, rather than the "net market benefit" test AEMO currently uses when deciding where to approve investment.

While Professor Quiggin states that "Labor's Rewiring the Nation policy provides a starting point for reform" by investing "directly in the expanded transmission network needed to support the transition to renewable energy", much more is required, including a return to public ownership and control. The market has failed! Let's move to a truly clean, affordable and reliable energy system.

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