

**The GAP & IIER-A  
National Resilience Project**

# **Australia's Poor Energy Systems Resilience**

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**Global Access Partners  
Institute for Integrated Economic Research - Australia**

This report is a part of a program of work on national resilience through the lens of the COVID-19 experience. It is one of the products of the National Resilience Project being co-led by the Institute for Integrated Economic Research-Australia and Global Access Partners.

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# Australia's Poor Energy Systems Resilience

## Executive Summary

The topic of energy has become so politicised in Australia, both between the major parties and within the Liberal / National Coalition Government, that our national interest and security has been subsumed by both party and personal interests.

Politics in Australia “is now a very short-term game, characterised by point scoring and blame shifting, rather than developing evidence-based policy or solving problems or meeting challenges.”<sup>1</sup> The reality is that energy security, like national security, can only be addressed with consistent bipartisan political support. That does not exist today.

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In 2021 Australians are faced with a number of concurrent, in some cases existential, challenges. These include climate change and the urgent need to reduce emissions, growing global and regional security risks, a global pandemic which will have persistent societal and economic impacts, a global energy transformation where we are lagging the developed world, fragmented national energy systems with a poor level of energy security, and a global market model that has resulted in reduced resilience, as evidenced in the face of crises.

These challenges are exacerbated by our Federal political system which has not been able to address them in a coherent, systemic manner and a Federation structure that may have been fit for purpose a century ago, but that cannot deal with the scale of challenges we face today. Unfortunately, the prevalence of political marketing over the past decade has further dulled our senses to the point of complacency. Neither side of politics is blameless in this respect.

Regarding our energy systems, we need to have a coherent strategy, policy and plan based on a realistic understanding of our current risks and vulnerabilities. We need leadership at the political level that is prepared to face the challenges and convince a complacent population of the need to act, despite to costs of doing so. The cost of inaction is much greater ... *but of course, that is beyond the next election or two.*

The actions we need to take are not beyond our ability to design and implement. We have considerable expertise and resources in this country. We have seen courageous political and business leadership in the past; we need to find that again to deal with the future. We, the Australian people, need to wake up.

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<sup>1</sup> Dr John Hewson, former Liberal Party Leader – *On shame and politics*, The Saturday Paper, 26 June 2021.

## Introduction

This report is one component of our National Resilience Project.<sup>2</sup> It explores the need for an energy strategy and plan for Australia; one that should be coordinated / correlated with strategies for national security and resilience, economy, environment, industry, and research (*if only they all existed*).

The report is structured in the following five sections:

- Australia's national resilience.
- Energy policy and strategy.
- Energy emissions.
- Energy security - *liquid fuels and electricity power systems examples*.
- Energy transition.

The focus on liquid fuels and electricity generation system in the discussion of energy security is to highlight that the solution to many of the issues in fuel security depend on having a resilient and adaptable electricity system. We do not have one today.

## Resilience in Australia

Our National Resilience Project is highlighting Australia's lack of resilience. The COVID-19 pandemic has exposed a global lack of resilience as a result of a collective failure of preparedness and mobilisation. Preparedness and mobilisation are terms used largely by the military; however, it is a model that we need to adopt across our society. It is not enough to just react to a crisis; we need to improve our resilience as a nation by preparing for a range of potential crises.

In our work to date, we have concluded that there are three key characteristics or attributes that we need to strengthen in our society to improve our resilience. These are:

- **Shared Awareness / Goals.** With shared awareness we can act rationally and prepare accordingly because we can then define a shared goal - a common aimpoint; without it, we just react to each crisis as it occurs.
- **Teaming / Collaboration.** We cannot solve our complex challenges by looking for incremental, stove-piped, quick wins; we need a team approach within our nation and, as importantly, with our neighbours and allies.
- **Preparedness / Mobilisation.** There is no verb for 'resilience'; the verb 'prepare' is the most relevant in this case. There is an opportunity to learn from Defence preparedness concepts and systems and to adapt and implement them across our wider society. As a nation we need to prepare for future disasters / crises and not just wait to react. "Crossing our fingers" and hoping is not a method we can afford to employ. In addition to preparing, we must be able to mobilise the nation to address an emerging threat.

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<sup>2</sup> <https://www.jbcs.co/iieraustralia-projects>

Our national response to the COVID-19 pandemic has highlighted significant failures in all three key areas. A fuller discussion of these resilience issues in the Australian context can be found here: <https://www.jbcs.co/iieraaustralia-projects>

## Energy Policy / Strategy

In January 2021, Australian media headlines regarding potential power supply failures included statements such as “Absolute urgency needed to stop grid failure as renewables take off” and “Energy industry warns disjointed climate and energy policies risk network failure.”<sup>3</sup> The reports were triggered by a call from Kerry Schott, chair of the Commonwealth's Energy Security Board (ESB), for urgent reforms. Ms Schott had said the ESB market design paper showed the absolute urgency of new policy and regulations to stop electricity price blowouts and power supply failures.<sup>4</sup>

Energy and Emissions Reduction Minister Angus Taylor agreed it was critical to act swiftly and manage the transition from coal to renewables. “Taking action now is critical and will minimise disruptions and avoid unintended consequences.”<sup>5</sup>

This situation reflects an ongoing problem in Australia with respect to our energy systems. We do not have coherent, integrated, energy policies; Governments largely react to impending crises rather than prepare for foreseeable system failures. Compounding this vacuum is the increased use of political spin leading to growing public apathy and complacency. A current example is where the term resilience has become a verbal ‘tick’ for some politicians celebrating the latest political initiative. The rebranding of the Northern Territory Quarantine facility as the ‘Centre for National Resilience’ is perhaps the most farcical example of this.<sup>6</sup> A repurposed mine worker’s camp is not a centre for national resilience.

The Government has not conducted a comprehensive risk analysis of our energy dependencies nor updated the 2011 National Energy Security Assessment (NESA) despite being in power for the past eight years. We have been placated by repeated reassurances from politicians and energy industry lobby groups that there is no problem as the “market” will be able to respond to any issues.

Compounding this is the lack of a national security / resilience strategy for Australia to guide subordinate strategies such as one for energy. This is an unacceptable situation in today’s complex world that is being ravaged by a pandemic and facing growing global economic and regional security challenges.

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<sup>3</sup> Sydney Morning Herald, 5 January 2021, <https://www.smh.com.au/politics/federal/absolute-urgency-needed-to-stop-grid-failure-as-renewables-take-off-20210104-p56rmo.html> & <https://www.smh.com.au/politics/federal/energy-industry-warns-disjointed-climate-and-energy-policies-risk-network-failure-20210105-p56rvo.html>

<sup>4</sup> Ibid.

<sup>5</sup> The Hon. Angus Taylor MP, Media Releases, *Securing the Future of the National Electricity Market*, 5 January 2021, <https://www.minister.industry.gov.au/ministers/taylor/media-releases/securing-future-national-electricity-market>

<sup>6</sup> <https://coronavirus.nt.gov.au/updates/items/2021-04-30-howard-springs-moving-forward-with-expansion>

## Energy Emissions

A key driver of our energy strategy must be the need to reduce global emissions to address the threat of climate change. The transition towards a low emission energy system requires transforming our electricity generation with renewables and electrifying other energy consuming systems such as our transport and logistics networks.

### IPCC Sixth Assessment Report – August 2021<sup>7</sup>

In Australia:

- Land areas have warmed by around 1.4°C between ~1910 and 2020 and annual temperature changes have emerged above natural variability in all land regions.
- Heat extremes have increased, cold extremes have decreased, and these trends are projected to continue.
- Relative sea level rose at a rate higher than the global average in recent decades; sandy shorelines have retreated in many locations; relative sea level rise is projected to continue in the 21st century and beyond.
- The frequency of extreme fire weather days has increased, and the fire season has become longer ... the intensity, frequency and duration of fire weather events are projected to increase.
- Heavy rainfall and river floods are projected to increase.
- An increase in marine heatwaves and ocean acidity is observed and projected.
- Sand storms and dust storms are projected to increase throughout Australia.
- An increase in marine heatwaves and ocean acidity is observed and projected.

Global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in carbon dioxide (CO<sub>2</sub>) and other greenhouse gas emissions occur in the coming decades.

Whilst the Government has made repeated claims that Australia has done more to cut greenhouse gas emissions than other countries, recent analysis suggests otherwise. A report released by the Australia Institute in August 2021 states that, “when compared to 22 OECD economies and Russia, selected due to comparable wealth, population, and development, it becomes clear that Australia is significantly behind in the energy transition.”<sup>8</sup> The analysis concludes that Australia’s energy emissions continue to rise, while productivity and decarbonisation rankings fall.

Such analysis combined with the August 2021 IPCC report further highlights the need to address emissions reduction in a transparent manner under an Australian energy transition strategy.

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<sup>7</sup> <https://www.ipcc.ch/report/ar6/wg1/#SPM>

<sup>8</sup> H Sadler, *Back of the pack, An assessment of Australia’s energy transition*, The Australia Institute, August 2021.



## Energy Security

A significant problem we have in addressing energy security is that of language. The terms “national security” and “energy security” do not have common definitions amongst Australians. Nor is there a common view that energy security is a subset of national security.

The Macquarie Dictionary defines national security as the protection afforded to a nation against any external threat to its existence. However, when the Australian Government talks about “energy security” it defines it as the adequate, reliable and competitive supply of energy across the electricity, gas and liquid fuel sectors, where reliability is the provision of energy with minimal disruptions to supply. In effect, the Government has articulated energy security through a “market” lens. The conditions under which this is assessed are not clear. It is therefore not surprising that there are significantly different views regarding energy security when considered from industry, national security or bureaucratic policy perspectives.

Energy security is fundamental to our modern way of life. Without reliable and secure energy supplies and without resilient supply chains, our society will falter. We only need to reflect on how a short-term interruption to electricity or fuel supplies impacted our lives in recent events, in order to imagine what a longer-term interruption could do, possibly as a result of extreme weather events, conflict, financial crisis or another pandemic.<sup>9</sup>

September 2021:

“Thousands of British petrol stations have run dry as motorists scrambled to fill up after the post-Brexit truck driver shortage disrupted the fuel supply ... Prime Minister Boris Johnson is considering calling on the army to deliver fuel to the pumps ... “

“The fuel panic comes as Britain faces several crises: an international gas price surge that is forcing energy firms out of business; a related shortage of carbon dioxide that threatens to derail meat production; and a shortage of truck drivers that is playing havoc with retailers and leaving some shelves bare.”<sup>10</sup>

The combination of poor political leadership and a lack of preparedness can expose poorly understood system interdependencies with serious consequences – this could happen here ...

A multitude of reviews and reports have highlighted aspects of energy security that are seriously deficient. Energy security is about much more than just the Defence force, or a more “reliable” electricity supply. It is about our resilience, and therefore, our security as a nation, it is about protecting our society and our way of life and, as such, it is a highly complex issue.

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<sup>9</sup> Even significant energy infrastructure failures, such as the 2016 South Australian electricity system blackouts, have faded from the news cycle around much of the country.

<sup>10</sup> Sydney Morning Herald, 27 Sept 2021, *French swipe at ‘fraudulent’ Brexit as panic buying drains Britain’s petrol pumps*

Australian Governments' have readily accepted responsibility for national security; when launching the 2016 Defence White Paper (DWP), Defence Minister Payne noted the Government's firm commitment to the Australian people that *"we will keep our nation safe and protect our way of life for future generations. This is a fundamental responsibility of the Australian Government ..."*<sup>11</sup> Unfortunately that sentiment is lacking for non-military systems that are critical to our way of life, such as our energy supplies. Australian Governments have stated that energy security is a "shared responsibility between governments, market institutions and energy businesses." It has been largely left to the market to manage.

Energy system resilience is a prerequisite for protecting our way of life. Markets cannot be held responsible for energy resilience as this is a component of national security and Governments must take that responsibility.

A further problem in the discussion of energy security is that of implicit assumptions. Many people assume that if something hasn't failed recently that it will continue to operate. However, we do need to have some people think deeply about these issues and to make whatever preparations are necessary to ensure our ongoing security. We need to apply the national security framework and analytical tools that we have applied to our nation's Defence Forces to areas of risk, such as energy security, that are critical to our national security.

The following sections examine the issues in liquid fuel security and in our electricity system design that impact our national resilience.

## **Liquid Fuel Insecurity**

*This section summarises Annex A*

We generally assume that when we go to a petrol station that there will be fuel there for our cars and that there will always be sufficient diesel fuel for the logistics system in Australia to keep operating. However, over the past decade, our fuel supply chains have changed, and our energy security and resilience have diminished, as discussed in Annex A.

Australia's fuel supply vulnerabilities include areas such as just in time supply chains, low levels of storage, as well as hub and spoke distribution systems. These vulnerabilities are compounded by a very low tolerance for loss and disruption in our society. Over the past decade, concerns regarding potential energy security risks were often minimised by Government Ministers from both sides of politics, as well as by some Government Departments. The question that is not readily answered is "what assumptions are being made?"

The 2018 International Energy Agency's (IEA) review of Australia's energy policies concluded that *"It is less clear how the country (Australia) would respond in the event of a serious oil supply disruption leading to market failure."*<sup>12</sup> The IEA review also concluded that, whilst Australia is endowed with natural resources, there are energy security risks across several

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<sup>11</sup> <https://www.defence.gov.au/whitepaper/Docs/2016-Defence-White-Paper.pdf> page9.

<sup>12</sup> <https://www.iea.org/reports/energy-policies-of-iea-countries-australia-2018-review> page 53.



sectors that have increased. Australia is also the only IEA member country that fails to meet its IEA member 90-day net imports stockholding obligations.

Compounding the situation is the lack of a current NESA. The last NESA was conducted in 2011 ... a decade ago.<sup>13</sup>

By 2018 we were importing over 90% of our liquid fuels as either oil for our remaining refineries to process, or as refined fuels produced by Asian refineries. All of the imported fuel and oil that comes to Australia is on foreign owned / controlled ships. We had seven refineries in 2017, we will have only two refineries left by 2022 and potentially none by 2028.<sup>14</sup>

In March 2018, the Parliamentary Joint Committee on Intelligence and Security published an Advisory report recommending that the Government review and develop measures to ensure that Australia has a continuous supply of fuel to meet its national security priorities. In announcing this review, then-Prime Minister Turnbull stated that the Government's review into Australia's Liquid Fuel Security *"should not be construed as Australia having a fuel security problem"* ... he described the review as *"good housekeeping"*.<sup>15</sup> Again an example of strategic blindness. The target date of December 2018 for the report was missed.

In 2018, the Australian Government decided to address the IEA shortfall and committed to meeting our obligations by 2026 by using the purchase of "tickets" with the US and Europe (*options to purchase oil for release to the market*).

In April 2019 an *interim* report on Australia's Liquid Fuel Security was released. It highlighted significant problems such as "there is no overarching understanding of the whole liquid fuel market in Australia and how different parts interact with each other."

In September 2020, faced with the impending closure of the last four oil refineries in Australia, the Government finally responded to our fuel insecurity. The Prime Minister acknowledged the risks we face when he said: *"Fuel security underpins our entire economy. Not only does it keep Australia moving, the industry supports thousands of people across the country ... the events of 2020 have reminded us that we cannot be complacent. We need a sovereign fuel supply to shield us from potential shocks in the future."*<sup>16</sup>

In response to the growing likelihood of refinery closures, Minister for Energy and Emissions Reduction Taylor announced that Australian refineries would be subsidised to stay open and that new storage facilities would be constructed to "strengthen the nations fuel security and prevent crippling shortages."<sup>17</sup>

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<sup>13</sup> <https://www.energy.gov.au/publications/national-energy-security-assessment-2011>

<sup>14</sup> When the current fuel refining subsidy contract ends.

<sup>15</sup> <https://www.abc.net.au/news/2018-05-07/australia-has-limited-emergency-fuel-stocks-left/9734164>

<sup>16</sup> <https://www.pm.gov.au/media/boosting-australias-fuel-security>

<sup>17</sup> <https://www.afr.com/politics/federal/taxpayers-pay-to-stockpile-oil-keep-refineries-going-20200913-p55v3z>

In 2021 there is still no final Fuel Security report published. If the Government does not have an “overarching understanding of the whole liquid fuel market” how can they possibly make rational risk decisions regarding such critical infrastructure?

Sadly, the Minister’s announcement was too little, too late, and too short-sighted as only two of the four refineries agreed to accept the Government’s support plan and to be contracted to remain open until 2027. It may have moved the issue off the agenda for the next Federal election; however, there is no public plan for what will happen with respect to our fuel security after 2027.

It must be recognised however, that the announcement by Minister Taylor was the first time in a decade that an Energy Minister had really acknowledged the criticality of our dependence on foreign energy supply chains.

Without a NESR, nor a finalised Liquid Fuel Security Review, it is not surprising that there is no coherent energy security policy or long-term plan in Australia. We remain largely reactive to market crises. Given that investors thrive on three commodities: a policy signal, a price signal, and some level of investment certainty; there has been little chance, to date, for coherent market actions with respect to our critical fuel supplies.

### ***Australia’s Fuel Insecurity – where to next?***

Australia’s Fuel Security risks cannot be addressed simply by delaying the closure of our last two refineries. Their eventual closure seems inevitable due to their small size and high operating costs; they simply cannot compete with much larger and lower cost Asian refineries. Therefore, the recent Government initiatives to stave off the closure of some refineries until after 2027 is a welcome initiative but it is not enough.

Our fuel insecurity needs to be addressed as one component of the larger energy system transition underway in Australia and globally. An obvious option to address our fuel security problem is to accelerate the transition where it can address the overwhelming dependence on imported fuels.

If we examine the LNP coalition Government’s approach to an energy strategy, i.e. the technology roadmaps, it doesn't really look like a plan and certainly has no definitive targets. We need to define where we need to go, and then build a plan of how to get there. Whilst this sounds simple, it is very complicated.

A part of this design process is facing the reality of a changing world; we must not only react we must also adapt. We will also need to accept the reality of our fossil fuel dependency for the next few decades and the real cost of the energy transition. In the case of our dependence on imported fuels the following steps are examples of what our Government could do:

- **Production.** It's clear that the small scale of our refineries cannot compete financially with the large-scale refineries in the Asian region. There is no appetite in Government to invest in such infrastructure and that the market assessment is that it would still not be competitive enough to warrant investment purely on a commercial basis. Smaller scale, distributed, production across a range of technologies such as biofuels, gas to liquids, small scale latest generation refineries, and waste oil reprocessing may produce part of

our demand but are unlikely to provide it at sufficient scale to meet a significant proportion of our growing transport energy need over the next two decades.

- **Demand Reduction.** Given the almost certain 100% import dependency for fuels by 2030 and the reality that production alternatives will not be able to meet growing demand, demand reduction must be prioritised. This could be addressed, in part, through a combination of higher fuel efficiency standards, hybrid power trains, and transfer of logistics loads from road transport to more energy efficient modes (i.e. increased use of train and coastal shipping systems.) Of greater significance would be the large-scale adoption of renewable transport energy options such as electric, green hydrogen and green ammonia propulsion systems. The renewable energy options offer the largest opportunity to significantly reduce our dependence on imported fuels, achieve emissions reductions, deliver reliable energy supply and increase our nation's ability to continue operating in a supply chain crisis. But what are the risks of this transition given the massive increase in electricity demand on an already fragile electricity generation system?

Unfortunately, the LNP coalition Government has politicised the issue of electric vehicles to such an extent that their adoption has been obstructed. On the opposing Labor side of politics, electric vehicles have been championed based on emission reduction, thus drawing the objections from right-wing climate deniers, whilst largely ignoring the significant national security and resilience benefits from reducing our overwhelming dependence on imported fuels.

Large scale adoption of electric vehicles will present both significant opportunities and significant challenges for our electricity networks. Without clear targets for adoption of these technologies, as has been done by many other developed countries in the world, the design of our future networks will be fragile. Analysts project a 2-to-3-fold increase in electricity demand to support the potential growth in electric vehicle energy demand. The redesign of our electricity system needs to be initiated now, and not in 10 years' time.

### **A Note of Caution**

The transition to renewable energy transport systems is revealing a simplistic argument between some advocates such as that between electric vehicles (EVs) and hydrogen fuel cell vehicle (HFCV) advocates. They, on occasion, denigrate each other.

The way ahead needs to be a combination of many technology options that will provide diversity of energy sources and technologies whilst producing large-scale reductions in transport sector emissions. The rapid global move to EVs will result in a massive growth in global demand for batteries and EV associated components. That demand growth will result in new business opportunities but also significant supply chain challenges in the next decade.

Australia will need to understand the risks of swapping one supply chain problem (liquid fuels) for another (EV batteries and components.) Given our lack of manufacturing capability in Australia we need to understand the risk of yet another, near-total, import dependence for renewable transport energy systems for our nation's resilience.

The Government therefore needs to design this transition rather than continuing to be a passenger on a nebulous technology roadmap-journey.

## Australia's Electricity System Design

*This section summarises Annex B*

Are Australia's electricity generation systems and distribution networks resilient and will they be able to scale rapidly to meet projected increases in electricity demand as we in Australia undergo a challenging energy transformation journey? We "hope" so ... *but hope is not a basis for a resilience strategy.*

The expectation in the design of an electricity power system some forty years ago was that people would not experience blackouts by the year 2000. In the 1970s, energy architects in the US predicted that blackouts would not exist in the year 2000 as governments will have provided supplemental energy sources for critical functions. Given the South Australian blackouts in 2016 and the Texas blackouts in 2021, this prediction was clearly a bit optimistic.

Energy systems were developed since the 1980s by distributing business functions (generation, network, and retail) into marketplaces. The power system and the marketplace remain two separate entities. One part is a 'mechanical' system maintained and improved by a workforce. The other is a virtual auction room where electricity retailers buy power.

Australian politicians and officials established the marketplace based on planning that did not fully contemplate the technological changes that would occur to future power systems. Repeated reviews of the electricity system as recently as 2015 were also based on an assumption that the Australian energy market governance was fundamentally sound and amongst best practice internationally, and thus recommended no major reforms.

Australia eventually became aware of power system fragility when on the afternoon of 28 September 2016, South Australia experienced a state-wide blackout. It was triggered by severe weather that damaged transmission and distribution assets, resulting in all remaining electricity generation in the State shutting down. The Australian Energy Regulator report into the blackout identified, amongst other technical and governance recommendations, that communication and transparency are particularly critical given the introduction of new types of energy generation.

The 2016 Finkel Review of the South Australian grid failure was comprehensive, gaining the support of 49 out of 50 recommendations from the incumbent government. However, the review continued the existing marketplace model. That decision was revisited in 2018 when the ACCC Chair, Rod Sims, stated that "The National Electricity Market (NEM) is largely broken and needs to be reset"<sup>18</sup>

### ***The need for a NEM reset***

An open question is whether the NEM failure is beyond the ability of the current marketplace to address? The first issue that needs to be addressed is who is providing advice regarding

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<sup>18</sup>Australian Competition and Consumer Commission, media release, *ACCC releases blueprint to reduce electricity prices*, 11 July 2018. Accessed 6 September, 2021. <https://www.accc.gov.au/media-release/accc-releases-blueprint-to-reduce-electricity-prices>

the NEM reset and who is setting the change in design based upon that advice? It appears that this issue presents a fundamental problem.

Regardless of the technologies available to project designers, if a system (in this case our electricity generation system) is not driven by coherent strategies, policies and plans and is not designed and managed under an effective governance framework, then it will not be resilient.

Annex B discusses the significant gaps in the electricity system governance framework. It concludes that the existing governance framework is not able to deal effectively with the full complexity of current and future generation systems. This is because current decision making is focused on energy access and there are not adequate means to properly address power system resilience issues.

Energy advice is about two distinct energy features: consumers' energy access and power system critical functions. Energy resilience underpins both Australia's economic and social fabrics. What has become apparent is that decision-makers lack a coherent framework for advice to address energy access together with energy resilience.<sup>19</sup>

### *Governance frameworks for resilience*

Historically, power system resilience was managed out of sight as part of the bulk power system. It worked because customers were only consumers (purchasing energy, energy access and power system resilience from the one electricity service provider). There have been significant shifts in this model in recent years.<sup>20</sup>

After government incentivisation of rooftop solar, customers now participate through retail tariff structures in providing energy back to their local communities. Customers are now interacting in new ways that have implications for energy purchasing, energy access and power system resilience. The consequences of these shifts have not been addressed by existing governance systems. Put simply, Governments have provided access and encouraged uptake through subsidies, but have not provided the means to sustain access (i.e., resilience).

Governments have responded to their need to be more informed about the risks to the power system identified after the South Australian system black event in 2016. However, decision-makers still lack a coherent framework for advice to provide both energy access and energy resilience. For example, the Australian Energy Market Commission (AEMC) made a determination on 3 June 2021, implementing a general power system risk review. The determination shifts from a power system frequency risk review focus (balancing supply and demand) to a focus on supply side resilience through a so-called general power system risk review. The new approach is incomplete because it omits resilience (and flexibility) on the demand side.

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<sup>19</sup> The original expectation of the market, devised by an MIT think tank led by Schweppe (Power systems '2000': hierarchical control strategies, IEEE Spectrum, July 1978), was to provide critical functions during times of stress (resilience). This thinking underpinned the design of Australia's National Electricity Market.

<sup>20</sup> These include the creation of renewable energy zones to address locational pricing failures (via NEL 90F, despite being out of the security and resilience scope intended for this power) and addressing edge of grid reliability constraints through new technology,

Moreover, the determination expands AEMO's responsibilities without any funding mechanism being provided by Government. Despite AEMO not being funded to provide a solution, it is taking action to build this capability through goodwill. Outside of AEMO's current remit, it has been working on creating a power system design and engineering framework (with market participants and including Engineers Australia).

### ***Where to next?***

There is a need to move boundaries set by the existing energy governance framework, lowering barriers to providing energy resilience through critical functions and adding new thinking about beneficial features. To address some of these issues the Annex B report makes a proposal to establish an "Australian Prospect Body", providing a new access regime to benefit Australians by focussing on socially practicable outcomes.

The National Electricity Law (NEL) gives the Australian Energy Regulator (AER) the power to address only detrimental features in relation to the wholesale market. None of these powers to think, conduct reviews, or release information provide a mechanism to think and act on beneficial features. This needs to be addressed.

Australia's energy market relies on the electric power system to provide energy access. However, some delineation is required between energy access as an economic imperative and providing energy resilience as a social imperative. This social imperative should be articulated through a Ministerial Council on Energy (MCE) statement of policy principles for critical functions. No MCE policy principles are currently published.

There is a need to pivot to a "system level" power and energy framework. A whole of system level power and energy framework implies more than simply adding services that are expected to be accessible. For example, a double-glazed window is not a service, but it shifts the energy usage characteristics of a household. Access to such features is needed before access to services that are provided via market means. Power system critical functions are also not just a service, being always required to provide power system and energy resilience.

### ***Social impact considerations***

Social impact considerations are also not well addressed in current electricity market incentives. Incentives such as the new AEMC access regime for rooftop solar applies only to households capable of generating power. They do not apply to households seeking to improve energy efficiency nor people seeking to contribute to social impact.

A simple social impact example could be making a better choice than installing incentivised rooftop solar when a street/precinct is already at capacity with, for example, 46 rooftop solar systems. Moreover, including household generation as a service will not resolve the fact that excess energy cannot leave the local network (because distribution transformers are designed to move energy in one direction only, transmitting energy to the local network). This means



household choices made in response to this service will not link to productive uses outside the local network.<sup>21</sup>

Collaborative social features are also not guaranteed through services. Households may wish to do ‘good’ for the environment and the local area but are faced with choices that require them to act competitively. Household generation services are valued through a market pricing mechanism. If a second service is introduced, e.g., a neighbourhood scale battery designed to meet the same local energy consumption needs, current householder decisions and incentives may no longer be optimal.

### ***Electricity System Design Conclusions***

The call to action by the ACCC Chair, Rod Sims, when he stated that “The National Electricity Market (NEM) is largely broken and needs to be reset” has not been implemented; there is much still to do.

Energy resilience underpins both Australia’s economic and social fabrics, but the discovery of practicable means to advance energy resilience can only happen through goodwill owing to a missing piece in the energy governance framework. There are currently no effective options for introducing alternative of thinking / expertise to support the design of the electricity system, leading to the potential for incumbent ‘group think’ and the continuation of a fragile electricity generation system.

Whilst energy advice is currently focused on consumer access and power system critical functions, delineation is also required between energy access as an economic imperative and providing resilience as a social imperative.

Decision-makers lack a coherent framework for advice to provide energy access together with energy resilience. Despite the technologies available to power system designers, a system will not be resilient unless the governance frameworks and processes are appropriately designed.

Are our electricity networks resilient enough both today and in the face of massive increases in electricity demand as we undergo a significant energy transformation in Australia? The answer is no, not as currently designed, governed, and operated. This must be addressed if we are to manage our energy transition over the next decade without preventable, recurring, system failures.

## **Energy Transition**

Our energy security challenges are compounded by an ongoing global energy system transition that is overlayed with the pandemic and the associated economic system impacts. The academic world is littered with economists (*a lot of economists*), historians, engineers and a range of other disciplines writing about energy transitions and the lessons that can be learned for the world from historical changes in energy systems.

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<sup>21</sup> e.g. hydrogen production for export

The political, economic, social, infrastructure and broader structural framework of societies and individual nations present inherent challenges to quick transition. Each nation evolves their energy systems to meet individual resource, climatic, economic, and social imperatives so transition planning needs to factor in these unique drivers.

The high-level conclusions of Distinguished Professor Vaclav Smil<sup>22</sup> (*not an economist*) are worth reflecting on:

- More energy will be demanded by growing global populations that seek to achieve a decent quality of life; this quality of life is underpinned by an economic model that assumes continuous growth.
- Economic growth will require increased energy consumption, noting that a 3% growth rate means the world economy doubles every 24 years.
- Further growth in current methods of energy consumption will threaten the integrity of the environment on which our survival depends; this is an existential security problem.

Despite this imperative, Smil notes that the transition from wood to fossil fuels took more than a century. Today, fossil energy is dominant, with coal, oil, and natural gas still supplying 80+% of the world's primary energy. The bottom line, he says, is that the world could take many decades to wean itself from fossil fuels.<sup>23</sup>

Coal needed 103 years to account for only 5 percent of total energy consumed in the USA and an additional 26 years to reach 25 percent. Globally, coal surpassed the 25 percent mark in 1871, more than 500 years after the first commercial coalmines were developed in England. In the USA, crude oil took half a century from its exploratory stages in the 1860s to capturing 10 percent of the market in the 1910s, then 30 years more to reach 25 percent; some nine decades after Edwin Drake drilled the first commercial well in Titusville, Pennsylvania in 1859. Natural gas took 70 years to rise from 1 percent to 20 percent.

While the decades / generations for transition view seems to be the most widely held position amongst academics, an interesting paper published in Oxford Scholarship Online<sup>24</sup> in 2017 argues that there are also historical examples of 'quick' transitions from which we can learn. These quick transition examples are generally end-use specific technologies (lighting in Sweden, cookstoves in China, aircon in the USA) or in the instances of national energy system change, brought about by the discovery of significant resources, a supply shock necessitating a re-think, or a public health issue (Canada's decision in 2008 to retire all coal-fired electricity generation). However, the same paper notes that 'Unfortunately however, neither private markets nor government agencies seem likely to spur a transition on their own ... shifts to newer, cleaner energy systems ... often require significant changes not only in technology, but also in political regulations, tariffs, and pricing regimes, and the behaviour of users and adopters.'

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<sup>22</sup> Vaclav Smil - <http://vaclavsmil.com/>

<sup>23</sup> <https://www.sciencemag.org/news/2018/03/meet-vaclav-smil-man-who-has-quietly-shaped-how-world-thinks-about-energy>

<sup>24</sup> *The Political Economy of Clean Energy Transition*, Douglas Arent, Channing Arndt, Mackay Miller, Finn Tarp and Owen Zinaman, Oxford Scholarship Online, May 2017

Despite the systems shocks evident in the ongoing pandemic, it would be safe to assume that in Australia's case, the lack of any coherent energy system targets, strategy or plan mean that our energy transition journey will be lengthy and uncoordinated.

Compounding these conclusions is the observation that humans tend to break down complex systems into discrete parts to address problems. The implicit assumption is that if we address the parts of a problem, the overall system will somehow operate effectively. This does not appear to have worked in practice; it is somewhat akin to buying a list of dinner ingredients and expecting them to coalesce into an edible meal without a recipe or a somewhat competent cook; *some call this a technology roadmap*.

We conclude that we cannot address our systemic risks using business models developed for stand-alone, stove-piped components. We need a 'designed' approach to the change we need to make; is about more than just the pieces, it is about how we develop, operate, and sustain our societies in a more complex interconnected global context. Faced with this challenge, cultural change of the scale experienced in a war is required in order to prioritise some collective /community outcomes over individual personal wealth or lifestyle goals; this will require societal cohesion beyond that which we currently have.

The public awareness of these risks is also relatively poor; significant energy infrastructure failures, such as the 2016 South Australian electricity blackouts or as a result of the 2019/20 East Coast bushfires, have faded from the news cycle around our country. Much of the current political rhetoric / spin emphasises "how great" things are in Australia, whilst minimising discussion of risks and vulnerabilities, resulting in widespread complacency. It is almost as if we are trapped in an electioneering cycle that dulls the senses to the point that we can only react to crises rather than prepare for them. We are a nation floating downstream gazing backwards gazing at where we have been with smug satisfaction, rather than facing ahead at the dangerous rapids we must transit ...

## Conclusions

Energy resilience is not just about the fuel security and electricity generation system examples discussed in this report. It underpins our sovereignty, national security and resilience, economy, transport, industry, supply chains, maritime trade, and is a critical factor in addressing climate change. Unfortunately, there is no strategy and plan for this complex and interconnected national resilience challenge; our assumptions regarding our energy resilience are, frankly, naïve.

In 2021 Australians are faced with concurrent, and in some cases existential, challenges. These include climate change and the urgent need to reduce emissions, growing global and regional security risks, a global pandemic which will have persistent societal and economic impacts, a global energy transformation where we are lagging the developed world, and a global market model that has resulted in reduced resilience, as evidenced in the face of recent crises.

At the beginning of this report, we highlighted three key characteristics or attributes that we need to strengthen in our society to improve our national resilience. These are shared awareness, teaming, and preparedness. How do we in Australia rate with respect to these three areas with respect to the Energy domain?

### **Shared Awareness**

The Government has not conducted a comprehensive risk analysis of our energy dependencies nor updated the 2011 National Energy Security Assessment despite being in power for the past eight years. The Energy Minister has not published the Liquid Fuel Security Review that was provided to him by the Energy Department at the end of 2019. These are fundamental failures to build shared awareness of critical risks in our national energy system. Meanwhile, fossil fuel industry lobbyists have continued to maintain that the market can manage the risks ... *nothing to see here*.

Without shared awareness we cannot build consensus on shared goals, so we will continue to react to crises as they occur, rather than invest in our national resilience. Sadly, our reactions are often too little, too late and too short-sighted, and we risk repeating the mistakes of the past.

### **Teaming**

Our federal government is not structured for, nor currently capable of, addressing the range of complex interlinked issues as a whole system; it works in stovepipes. In the case of our energy systems, we will need State, Territory, business, and community leaders to collaborate to help drive the transition and to determine the required trade-offs, not just for the sake of their individual or group or State interests but for the sake of our nation. In the case of emissions reduction goals, they are already doing that.

Unfortunately, the pandemic has exposed a fundamental lack of teaming and collaboration across our nation. We will not be able to address our energy resilience unless we find mechanisms to collaborate more effectively.

Despite the technologies available to our power system designers, a system will not be resilient unless the governance frameworks and processes are appropriately designed. The call to reset the NEM has not been implemented; there is much still to do. This will be a demanding team effort.

### **Preparedness**

Without shared awareness and an ability to team and collaborate, a nation cannot prepare for, and then mobilise effectively, in the face of a crisis. This is our situation in Australia today.

As stated at the beginning of this report: Politics in Australia “is now a very short-term game, characterised by point scoring and blame shifting, rather than developing evidence-based policy or solving problems or meeting challenges.”<sup>1</sup> The reality is that energy security, like national security, can only be addressed with consistent bipartisan political support. That also does not exist today.

A question that requires further examination is, “what does being prepared mean for our energy systems?” Clearly, both our fuel and electricity systems have vulnerabilities. Preparedness in the case of our energy system starts with assessment of these system vulnerabilities through a current NESA. This has not been done.

There will need to be compromise between economics and engineering as resilience cannot be achieved without some cost penalty. Therefore, the public will need to be engaged in a process, a 'democratisation of the grid,' so that communities and individuals will support the necessary investment in our energy infrastructure and the associated cost impact. This will be challenging in the current environment of misinformation often motivated by partisan business interests.

The actions we need to take are not beyond our ability to design and implement. We have considerable expertise and resources in this country. We need to refocus our efforts to build societal consensus and trust to enable the collective action necessary to prepare and to adapt to the reality of our changing world. We need leadership from all aspects of Australian society but particularly our most powerful leaders in business, government, and politics.

The cost of inaction is much greater. We have seen courageous political and business leadership in the past; we need to find that again to deal with the future. We, the Australian people, need to act and to demand more of our socio-political system, and of ourselves.

#### **The discussion we largely avoid ...**

We now find ourselves in a position where the Government has committed to the purchase of nuclear submarines for which we will have no industry base to provide support. It is an opportunity to have a rational discussion about the role of a peaceful nuclear energy industry in Australia. As custodians of over 30% of the world's uranium resources, it is an essential discussion to be had. However, we choose to export it unprocessed, without adding value to our economy, our energy security, nor to our sovereign capability.

In a similar manner to the debate on climate change in Australia, any discussion of the potential role for nuclear energy generation to provide some baseload power capability, leads to both political point scoring and public vitriol.

The COVID-19 pandemic will hopefully shock the nation out of a state of complacency. We must be prepared to consider all options, including the value of having some level of sovereign nuclear energy capability, if we are to address our significant national resilience issues.

#### **Annexes:**

- A. Australia's Liquid Fuel Insecurity
- B. Australia's Electricity System Design

## **Workshop Participants**

This component of the National Resilience Project was co-led by AVM John Blackburn AO (Retd) and Professor Peter Sokolowski. Contributing authors include Anne Borzycki and Neil Greet.

A large number of energy sector and/or national security professionals, politicians and business leaders participated in the Chatham House workshops and interviews conducted for this report. Some of the participants are listed in the Annex Reports where they have agreed to be identified. Their listing should not be interpreted as their personal agreement with all aspects of this report, nor necessarily representing the organisations they are associated with.



## Australia's Liquid Fuel Insecurity in 2021

*too little, too late, and too short-sighted*

We generally assume that when we go to a petrol station that there will be fuel there for our cars and that there will always be sufficient diesel fuel for the logistics system in Australia to keep operating. However, over the past decade, our fuel supply chains have changed, and our energy security and resilience have diminished. By 2018 we were importing over 90% of our liquid fuels as either oil for our remaining refineries to process, or as refined fuels produced by Asian refineries. All of the imported fuel and oil that comes to Australia is on foreign owned / controlled ships. As illustrated in Figure 1, we had seven refineries in 2017, we will have only two refineries left by 2022 and potentially none by 2028.

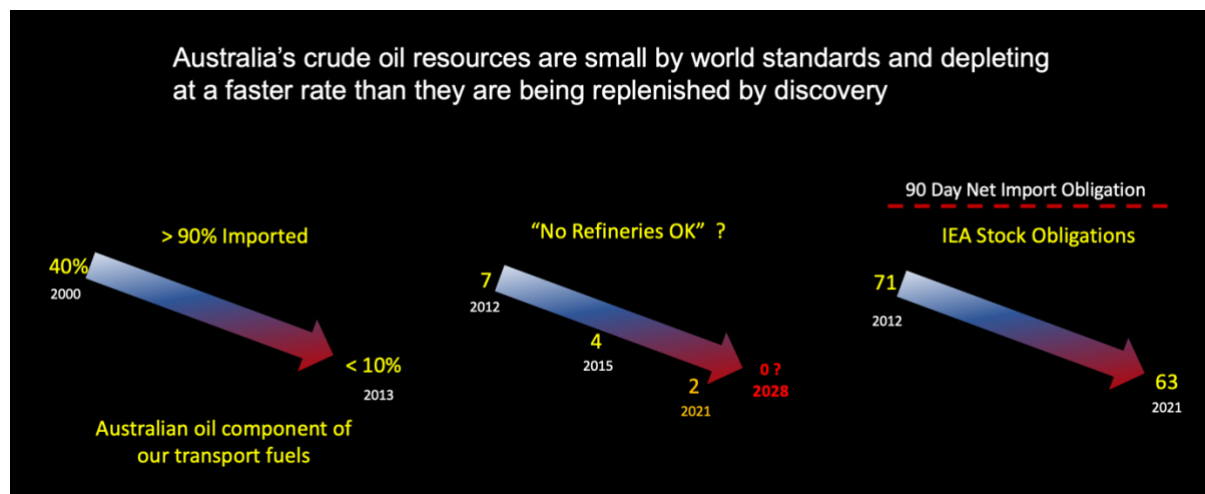


FIGURE 1: AUSTRALIA'S DIMINISHING FUEL SECURITY

In 2018 the Home Affairs Department published the report Profiling Australia's Vulnerability.<sup>1</sup> It asked the question, what makes us vulnerable? It highlighted Australia's vulnerabilities in areas such as just in time supply chains, low levels of storage, as well as hub and spoke distribution systems. Our nation's dependence on fuel imports was a specific example cited in the Report. These vulnerabilities were compounded by what was assessed as a very low tolerance for loss and disruption in our society.

Given the issues highlighted in the Report it was somewhat surprising to read the following in the Australian Newspaper in January 2019: "The Energy Department said Australia's low (fuel) supplies were not a serious concern as there had never been a serious interruption to Australia's supply."<sup>2</sup>

<sup>1</sup> <https://knowledge.aidr.org.au/resources/profiling-australias-vulnerability/>

<sup>2</sup> <https://www.theaustralian.com.au/nation/politics/red-light-flashing-over-fuel-security/news-story/4d5101e1585ddc95017beb946d184f9f>

### The 2019/2020 Summer Bushfires

*“...thousands stranded in evacuation centres ...the availability of power, communications and fuel were concerns for isolated communities ....” ABC NEWS , 1 JANUARY 2020*

In the bushfires of the 2019/2020 summer, people were trapped on the south coast when the power supply was disrupted and, as a result, fuel could not be dispensed at affected petrol stations. In this case, the failure was the result of a vulnerable “hub and spoke” distribution system. Yet again, our supply chain vulnerabilities had been ignored.

## Australia’s Fuel Insecurity - the Journey to 2020

Australian Governments have largely reacted to crises rather than prepare for foreseeable system failures. Over the past decade, concerns regarding potential energy security risks were often minimised by Government Ministers from both sides of politics, as well as by some Government Departments. The question that is not readily answered is “what assumptions are being made?”

The 2018 International Energy Agency’s (IEA) review of Australia’s energy policies concluded that *“It is less clear how the country (Australia) would respond in the event of a serious oil supply disruption leading to market failure.”*<sup>3</sup> The IEA review also concluded that, whilst Australia is endowed with natural resources, there are energy security risks across several sectors that have increased. They noted indicators of stress in the Australian energy system and highlighted that energy policy governance in Australia is very complex and fragmented. The review also stated that Australia was increasingly exposed to new challenges for maintaining security of supply and, had we had proper monitoring analysis and planning, these issues could have been signaled earlier and remedies could have been applied.

Australia is also the only IEA member country that fails to meet its IEA member 90-day net imports stockholding obligations. The IEA Review noted that Australia’s oil stocks were at an all- time low, that *(in 2018)* we had no strategic oil stocks and that we did not place any stockholder obligations on industry. Australia was unique in this area of stockholding compared to other developed countries and, as a result, is the least prepared for a supply chain interruption. Whilst the Energy Minister often quotes net import stock levels, e.g. 63 days, that figure is of little value when trying to ascertain what useable component fuels stocks are in Australia. Figure 2 illustrates the net import and actual stock levels for diesel fuel over the past decade. In the case of diesel, the real stocks number is closer to 21 days, but the location of those stocks at any point in time is not publicly visible.

<sup>3</sup> <https://www.iea.org/reports/energy-policies-of-iea-countries-australia-2018-review> page 53.

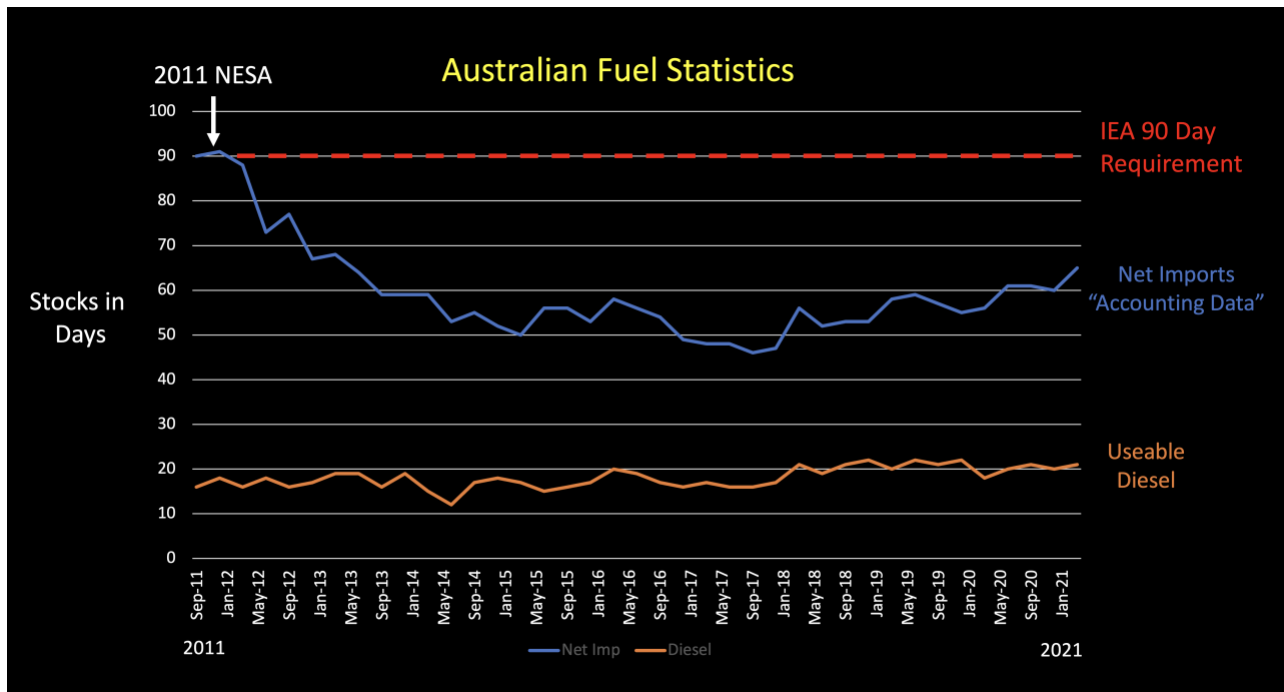


FIGURE 2: AUSTRALIA'S FUEL STATISTICS.

Preceding the 2018 IEA report was the following trail of Government mismanagement:

- There is no current National Energy Security Assessment (NESA). The last NESA was conducted in 2011 ... a decade ago.<sup>4</sup> Despite repeated Government commitments to produce one in 2014, 2015, and 2016, none has been conducted.
- Between 2012 and 2015 the number of refineries in Australia decreased from 7 to 4. In 2014, the Department of Industry, in relation to a question regarding what would be the necessary minimum number of refineries that we must have in Australia for security /resilience purposes, advised that no refineries were necessary ...as it would be cheaper to import refined fuel.<sup>5</sup>
- The recommendations made in the three fuel security reports written by the co-author of this report (*John Blackburn*) for the NRMA were ignored by both Labor and Liberal Energy Ministers.<sup>6</sup>
- The recommendations of the 2015 Senate Inquiry into "Australia's transport energy resilience and sustainability" were subsequently ignored by the Government.
- In March 2018, the Parliamentary Joint Committee on Intelligence and Security published an Advisory report recommending that the Government review and develop measures to ensure that Australia has a continuous supply of fuel to meet its national security priorities ... *within 6 months*. In announcing this review, then-Prime Minister Turnbull stated that the Government's review into Australia's Liquid Fuel Security "*should not be construed as Australia having a fuel*

<sup>4</sup> <https://www.energy.gov.au/publications/national-energy-security-assessment-2011>

<sup>5</sup> In 2014 a senior official in the then Department of Resources, Energy and Tourism expressed the view to the author of this report that it would be "OK" for Australia to have no oil refineries as it would be cheaper to import refined fuels than to refine oil in Australia. *He was an economist ...*

<sup>6</sup> <https://www.jbcs.co/#/energy-security/>

*security problem*” ... he described the review as *“good housekeeping”*.<sup>7</sup> Again an example of strategic blindness. The target date of December 2018 for the report was missed.

In 2018, the Australian Government finally decided to address the IEA shortfall and committed to meeting our obligations by 2026 by using the purchase of “tickets” with the US and Europe (*options to purchase oil for release to the market*). These tickets will, in reality, do little to improve our domestic energy security and resilience as the stocks would not be held in Australia and any stocks shipped to Australia would have to come on foreign owned / flagged ships that would not be under our control.

In April 2019 an *interim* report on Australia’s Liquid Fuel Security was released. It highlighted significant problems such as “there is no overarching understanding of the whole liquid fuel market in Australia and how different parts interact with each other.” A further 24 months later there is still no final report published and we are in the midst of a health and economic crisis. If the Government does not have an “overarching understanding of the whole liquid fuel market” how can they possibly make rational risk decisions regarding such critical infrastructure?

Without a NESA, nor a finalised Liquid Fuel Security Review, it is not surprising that there is no coherent energy security policy or long-term plan in Australia. We remain largely reactive to market crises. Given that investors thrive on three commodities: a policy signal, a price signal, and some level of investment certainty; there has been little chance, to date, for coherent market actions with respect to our critical fuel supplies.

A loss of refining capacity was predictable due to the small size of Australia’s refineries and the lower cost of importing refined product. Clearly commercial concerns drive the decisions of refining companies; we cannot expect commercial organisations to be responsible for our national security / resilience. But, over the past decade, our Governments have left our energy security / resilience to the largely foreign owned market.

### **Our Government Reacts ... *too little, too late, and too short-sighted***

In September 2020, faced with the impending closure of the last four oil refineries in Australia, the Government finally responded to our fuel insecurity. The Prime Minister acknowledged the risks we face when he said: *“Fuel security underpins our entire economy. Not only does it keep Australia moving, the industry supports thousands of people across the country ... the events of 2020 have reminded us that we cannot be complacent. We need a sovereign fuel supply to shield us from potential shocks in the future.”*<sup>8</sup>

In response to the growing likelihood of refinery closures, Energy Minister Taylor announced that Australian refineries would be subsidised to stay open and that new storage facilities would be constructed to “strengthen the nations fuel security and prevent crippling shortages.” The Minister also stated that “our farmers and miners rely heavily on diesel to do their jobs and provide services,

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<sup>7</sup> <https://www.abc.net.au/news/2018-05-07/australia-has-limited-emergency-fuel-stocks-left/9734164>

<sup>8</sup> <https://www.pm.gov.au/media/boosting-australias-fuel-security>

while the transport sector sources 98 per cent of its energy from liquid fuels ... That's why it is critical that Australia has control over its fuel security arrangements.”<sup>9</sup>

Using a combined market and regulatory framework, the Government decided to:

- invest \$200 million in a competitive grants program to build an additional 780ML of onshore diesel storage;
- create a minimum stockholding obligation for key transport fuels (which will require industry to hold petrol, jet fuel, and diesel stocks at or above pre-COVID national average levels from mid-2022 and from mid-2024, importers will be required to hold a 40 per cent increase in diesel stocks); and
- support the refining sector via a refinery production payment.<sup>10</sup>

**Sadly, the Minister's announcement was too little, too late, and too short-sighted as only two of the four refineries agreed to accept the Government's support plan and to be contracted to remain open until 2027.** It may have moved the issue off the agenda for the next Federal election; however, there is no public plan for what will happen with respect to our fuel security after 2027.

It must, however, be recognised that the announcement by Minister Taylor was the first time in a decade that an Energy Minister had really acknowledged the criticality of our dependence on foreign energy supply chains.

In addition to the security / resilience impacts, there are significant economic and employment impact should our remaining refineries close. A BIS-Oxford report published in late 2020 estimated that the closure of the last four refineries would result in the loss of around 5000 direct jobs, 13,800 support jobs, and an estimated economic impact of \$8.9 billion.<sup>11</sup> The significance of this report has not been acknowledged by Government.

<sup>9</sup> <https://www.afr.com/politics/federal/taxpayers-pay-to-stockpile-oil-keep-refineries-going-20200913-p55v3z>

<sup>10</sup> <https://www.minister.industry.gov.au/ministers/taylor/media-releases/boosting-australias-fuel-security>

<sup>11</sup> [https://www.awu.net.au/wp-content/uploads/2020/09/Fuel-Security-Report-AROC\\_BISOE-Final\\_100920.v3.pdf](https://www.awu.net.au/wp-content/uploads/2020/09/Fuel-Security-Report-AROC_BISOE-Final_100920.v3.pdf)

### The West Australia Fuel Security Situation

With the announcement of the closure of the BP Refinery near Perth, West Australians are becoming 100% import dependent on foreign controlled fuel supplies, carried on foreign controlled ships. Whilst oil company lobbyists will reassure the public that there is diversity in the supply chain, West Australians no longer have the diversity afforded by being able to use Australian sourced oil and imported oil for transport fuels, in addition to importing refined fuels from Asia. Despite having the largest oil reserves of any State or Territory, any oil extracted in West Australia will need to be exported for refining before it could be reimported for use in the State.

The West Australian Government has acknowledged that, given the geographical isolation of the State's fuel supply network, assistance from or to other State / Territory jurisdictions in relation to the disruption of liquid fuel supply is likely to be limited to logistical support in exceptional circumstances. In other words, as in the case of sharing of vaccines during the pandemic, you are on your own.

Bottom line: whilst Australia is sleep walking into a future fuel supply crisis, West Australia is travelling that road ahead of the rest of the country given the State's impending 100% refined fuel import dependency and the inability to easily move fuel from neighbouring States / Territories. Foreign Governments and corporations will be in complete control of West Australia's fuel supply.

### Australia's Fuel Insecurity – where to next?

Australia's Fuel Security risks cannot be addressed simply by delaying the closure of our last two refineries. Their eventual closure seems inevitable due to their small size and high operating costs; they simply cannot compete with much larger and lower cost Asian refineries. Therefore, the recent Government initiatives to stave off the closure of some refineries until after 2027 is a welcome initiative but it is not enough.

Our fuel insecurity needs to be addressed as one component of the larger energy system transition underway in Australia and globally. An obvious option to address our fuel security problem is to accelerate the transition where it can address the overwhelming dependence on imported fuels. The challenge that we have here is how we make the trade-offs between the competing commercial interest of the existing fossil fuel industry and our national security and resilience imperatives. The trade-off is the job of our politicians, but they are failing to address the task adequately.

If we examine the LNP coalition Government's approach to an energy strategy, i.e. the technology roadmaps, it doesn't really look like a plan and certainly has no definitive targets. Perhaps our Government is influenced by *Alice in Wonderland's* Cheshire Cat when he said, "if you don't know where you want to go, then it doesn't matter which path you take." This probably explains some of the other things that we've seen happening in our society in the last few years.

We need to define where we need to go, and then build a plan of how to get there. Whilst this sounds simple it is, in fact, very complicated. We could start by defining the characteristics or attributes that we consider essential for our society in the future. Examples related to energy could include the ability of our society to continue functioning in a crisis by having a significant degree of



control over critical energy sources, having both affordable and reliable energy supplies, and the need to significantly reduce emissions.

As we travel along the energy transformation journey we will need to ‘inject’ changes into our society and our business models that result in these types of characteristics and attributes. We need to plan and prepare for these changes and not just incrementally react to crises as they occur. The costs to our society of reacting and failing to prepare have become only too evident in our pandemic experience.

A part of this design process is facing the reality of a changing world; we must not only react we must also adapt. We will also need to accept the reality of our fossil fuel dependency for the next few decades and the real cost of the energy transition. In the case of our dependence on imported fuels the following are two *examples* of what our Government could do:

- **Production.** It's clear that the small-scale of our refineries cannot compete financially with the large-scale refineries in the Asian region. Options to address this include their replacement with a large-scale refinery on the east coast that uses latest generation technology to reduce emissions whilst continuing to provide us with a portion of our fossil fuel demand over the next few decades. There is no appetite in Government to invest in such infrastructure and the market assessment is that it would still not be competitive enough to warrant investment purely on a commercial basis. Smaller scale, distributed, production across a range of technologies such as biofuels, gas to liquids, small scale latest generation refineries, and waste oil reprocessing may produce part of our demand but will not provide it at sufficient scale to meet a significant proportion our growing transport energy need over the next two decades.
- **Demand Reduction.** Given the almost certain 100% import dependency for fuels by 2030 and the reality that production alternatives will not be able to meet growing demand, demand reduction must be prioritised. This could be addressed, in part, through a combination of higher fuel efficiency standards, hybrid power trains and, over the long term, transfer of logistics loads from road transport to more energy efficient modes (i.e. increased use of train and coastal shipping systems.) Of greater significance would be the large-scale adoption of renewable transport energy options such as electric, green hydrogen and green ammonia propulsion systems. The renewable energy options offer the largest opportunity to significantly reduce our dependence on imported fuels, achieve emissions reductions, deliver reliable energy supply and increase our nation's ability to continue operating in a supply chain crisis. The shift would enable us to control a large part of our transport energy sources and not be completely subject to a global market which can be disrupted, as evidenced in medicine and medical equipment supply chains during the pandemic. But what are the risks of this transition given the massive increase in electricity demand on an already fragile electricity generation system? Figure 3 illustrates the transition; the risks are addressed further in Annex B of this report.

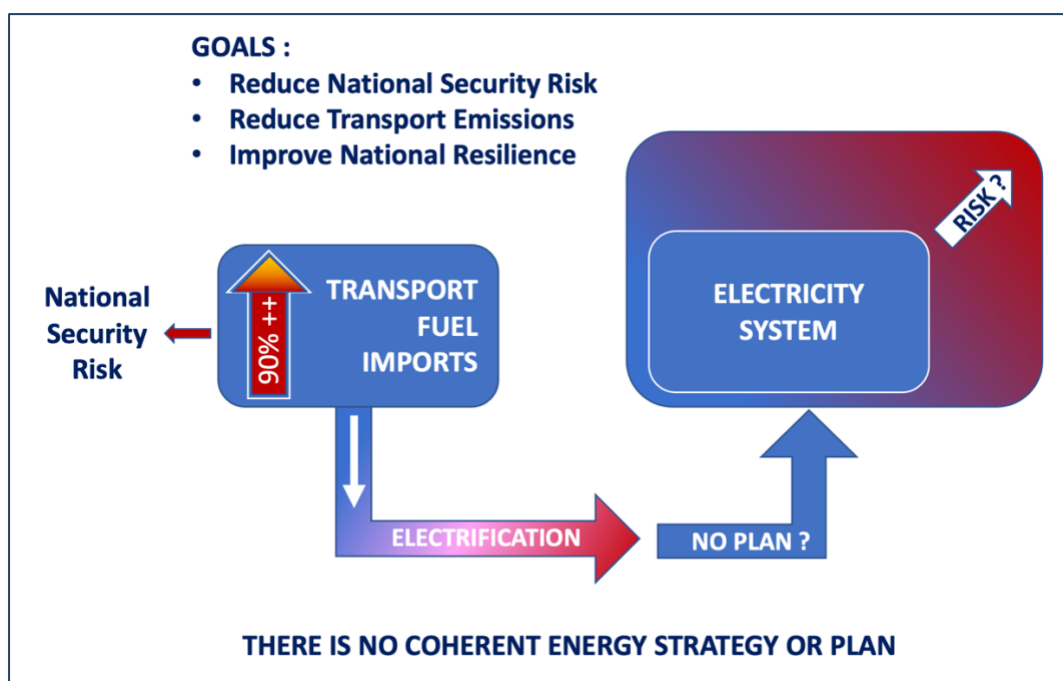


FIGURE 3: TRANSPORT ENERGY TRANSITION WITHOUT A COHERENT PLAN

Unfortunately, the LNP coalition Government has politicised the issue of electric vehicles to such an extent that their adoption has been obstructed. Ministers have mischaracterised the opposition Labor party’s ‘50 per cent by 2030’ goal for electric cars and bristled with the claim that “We are going to stand by our tradies. And we are going to save their utes” (*by opposing electric vehicle targets.*)<sup>12</sup> To a foreign reader this last statement will appear incomprehensible ... it is, and is somewhat shortsighted as Tesla subsequently marketed an electric utility vehicle (*ute.*) On the opposing Labor side of politics, electric vehicles have been championed based on emission reduction, thus drawing the objections from right-wing climate deniers, whilst largely ignoring the significant national security and resilience benefits from reducing our overwhelming dependence on imported fuels.

## Final Thoughts

This is not just about fuel security. It is not just about the economy; it is about our sovereignty, national security, resilience, energy, transport, industry, supply chains, maritime trade, and climate change, to mention some of the related issues. Unfortunately, there is no strategy and plan for this and our assumptions regarding our fuel security are frankly naïve.

<sup>12</sup> <https://www.smh.com.au/politics/federal/they-re-coming-for-your-utes-oh-please-enough-with-the-limp-scares-20190411-p51d9j.html>

There are people who think we can't focus on reducing emissions because the only thing that counts is the economy. And there are others who think the opposite is true ... This is a false dichotomy ... we need to get the strategy right for both.

- Prof Alan Finkel, Chief Scientist, Sep 20

Perhaps this logic needs to be applied across all our critical national systems?

Our federal government is not structured for, nor currently capable of, addressing these issues as a whole system. It works in stovepipes. We will need State, Territory, business, and community leaders to help drive this transformation and determine the required trade-offs in the absence of Federal Government leadership, not just for the sake of their individual or group interests but for the sake of our nation.

Electric vehicles (both battery and hydrogen fuel cell based) will have to be a major component of our transport energy mix in the future if we wish to have a degree of sovereign transport energy control, and to address the significant emissions reduction goals which will either be accepted by a future Government or, more likely, imposed upon us by "tariffs" such as the European Union's Carbon Border Adjustment Mechanism.

Large scale adoption of electric vehicles will present both significant opportunities and significant challenges for our electricity networks. Without clear targets for adoption of these technologies, as has been done by many other developed countries in the world, the design of our future networks will be fragile. Analysts project a 2-to-3-fold increase in electricity demand to support the potential growth in electric vehicle energy demand. The redesign of our electricity system needs to be initiated now, and not in 10 years' time. The change in design considerations for our electricity system are addressed in Annex B to this report.

### A Note of Caution

The transition to renewable energy transport systems is revealing a simplistic argument between some advocates, such as that between electric vehicles (EVs) and hydrogen fuel cell vehicle (HFCV) champions. They, on occasion, denigrate each other.

The way ahead needs to be a combination of many technology options that will provide diversity of energy sources and technologies whilst producing large-scale reductions in transport sector emissions. The rapid global move to EVs (other than in Australia,) e.g. the announcement by President Biden of a target of 50 per cent of all American car sales to be EVs by 2030<sup>1</sup> and the EU plan to sell 100% emissions-free cars in 2035,<sup>1</sup> will result in a massive growth in global demand for batteries and EV associated components. That demand growth will result in new business opportunities but also significant supply chain challenges in the next decade.

Australia will need to understand the risks of swapping one supply chain problem (liquid fuels) for another (EV batteries and components.) Given our lack of manufacturing capability in Australia we need to understand the risk of yet another, near-total, import dependence for renewable transport energy systems for our nation's resilience.

**The Government therefore needs to design this transition rather than continuing to be a passenger on a nebulous technology roadmap/ journey.**

## Australia's Electricity System Design

### *Moving past hope ...*

Are Australia's electricity generation systems and distribution networks resilient and will they be able to scale rapidly to meet projected increases in electricity demand as we in Australia undergo a challenging energy transformation journey? *We "hope" so ... but hope is not a basis for a resilience strategy.*

The expectation in the design of an electricity power system some forty years ago was that people would not experience blackouts by the year 2000.

***Fred C. Schweppe (MIT), architect of the energy marketplace, IEEE spectrum 1978:***

If the societal definition is used, blackouts will not exist in the year 2000. By then the public will have accepted the fact that total blackouts (technical definition) can occur and, therefore, will have provided supplemental energy sources for critical functions.

When there is a total blackout (technical definition), enough of these backup sources will work so that major societal interruptions and disturbances will not occur.

There is a good chance that by the year 2000 the term blackout (societal definition) will be considered to be a term out of the Dark Ages.

Given the South Australian blackouts in 2016 and the Texas blackouts in 2021, this prediction was clearly a bit optimistic.

The "no blackouts" expectation was acted upon by Governments, uniting a new way of operating the power system developed in the 1960s–1980s (cybernetics)<sup>1</sup> with competition policies that reformed utilities and distributed their business functions (generation, network, and retail) into marketplaces from the 1980s onwards. This power system model was designed for a moment in time, addressing perceived inefficient energy system investment to meet growth expectations, and had not been demonstrated to work before being put into practice.

Energy systems developed since the 1980s were based on distributing business functions (generation, network, and retail) into separate marketplaces. Today, the power system and the marketplace remain two separate entities. One part is 'mechanical,' maintained and improved by a workforce. The other is a virtual auction room where electricity retailers buy power.

Since 1998, Australia's National Electricity Market (NEM) has been an experiment that aims to provide Australians access to energy via the electricity grid. Australian politicians and officials established the marketplace based on planning that did not fully contemplate the technological changes that would occur to future power systems. Repeated reviews of the electricity system as recent as 2015 were also based on an assumption that the Australian energy market governance was

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<sup>1</sup> Breslau, Daniel. "Redistributing Agency: The Control Roots of Spot Pricing of Electricity." *History of Political Economy* 52, no. S1 (December 1, 2020): 221–44.

fundamentally sound and amongst best practice internationally, and thus recommended no major reforms.

Australia eventually became aware of power system fragility when on the afternoon of 28 September 2016, South Australia experienced a state-wide blackout. It was triggered by severe weather that damaged transmission and distribution assets, resulting in all remaining electricity generation in the State shutting down. The Australian Energy Regulator report into the blackout identified, amongst other technical and governance recommendations, that communication and transparency are particularly critical given the introduction of new types of energy generation.

### **What is the NEM's focus?**

The pricing mechanism of the marketplace takes advantage of the contemporary power system's ability to respond to signals (via price). The marketplace is intended to engage energy stakeholders (generators, retailers, network providers) to buy and sell electricity for supply to consumers. Conspicuously, customers, those who use electricity, are rarely engaged with the marketplace. They rely on retailers to participate on their behalf.

In 2001 the Council of Australian Governments (COAG) commissioned an independent strategic review of medium to longer-term energy market directions (the Parer Review.<sup>2</sup>) The terms of reference provided an unconstrained scope for providing strategic policy advice to the government on matters likely to generate the most significant benefits. Unfortunately, the review did not 'fix' the situation. Strategic direction at the time was not open to current thinking and did not anticipate today's technologies.

The subsequent 2015 Vertigan Review<sup>3</sup> concluded that Australian energy market governance was fundamentally sound and amongst best practice internationally, again recommending no major reforms.

The 2016 Finkel Review of the South Australian grid failure was comprehensive, gaining the support of 49 out of 50 recommendations from the incumbent government. However, the review also continued the existing marketplace model. That decision was revisited in 2018 when the Australian Consumer and Competition Commission (ACCC) Chair, Rod Sims, stated that "The National Electricity Market (NEM) is largely broken and needs to be reset" <sup>4</sup>

The point to make here is that regardless of the technologies available to project designers, if a system (in this case our electricity generation system) is not driven by coherent strategies, policies and plans and is not designed and managed under an effective governance framework, then it will not be resilient.

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<sup>2</sup> Towards a truly national and efficient energy market [electronic resource] / Council of Australian Governments, Energy Market Review

<sup>3</sup> Vertigan, M. (2015) with AC/Professor George Yarrow/Mr Euan Morton (the Vertigan Review), "Review of Governance Arrangements for Australian Energy Markets", Final Report, October.

<sup>4</sup> Australian Competition and Consumer Commission, media release, ACCC releases blueprint to reduce electricity prices, 11 July 2018. Accessed 6 September 2021. <https://www.accc.gov.au/media-release/accc-releases-blueprint-to-reduce-electricity-prices>

## The need for a NEM reset

In accepting the ACCC Chair's assertion that the NEM is largely broken and needs to be reset, the first issue that needs to be addressed is who is providing advice regarding the NEM reset and who is setting the change in design based upon that advice? It appears that this issue presents a fundamental problem.

The existing advice framework uses Australian Energy Market Commission (AEMC) and Ministerial Council on Energy (MCE)<sup>5</sup> initiated reviews. Sometimes the Federal and State Governments become anxious owing to the political aesthetics of the framework failing, initiating their own reviews, e.g. the Finkel Review.<sup>6</sup>

A role of the ACCC is to look out for the fair and reasonable needs of consumers. Again, their framework can initiate a review (with a competition solution bias), but may lead to little, if no material changes are experienced by consumers.

The interface, interrelationships, and governance between these two frameworks is not well understood. The Finkel Review, for example, does not identify a distinct role for the ACCC in the governance of Australia's electricity market, other than by being structurally linked to the Australian Energy Regulator (AER). Moreover, the Australian Energy Market Operator (AEMO) provides advice on critical functions to the AEMC when requested and to jurisdictions, but not to the MCE. The flow of energy advice is summarised in Table 1.

Policy advice	Debate	Policy setting
AEMO (technical)	Critical functions (resilience)	MCE/AEMC
ACCC (consumers)	Consumers' energy access	

**TABLE 1 - ENERGY ADVICE AND POLICY MAKING**

Energy advice is about two distinct energy features: consumers' energy access and power system critical functions.

- **Consumers' energy access.** The ACCC should have a consumer policy advice role to the MCE/AEMC. Energy Consumers Australia (ECA) has been established to inform this relationship through advocacy, but not bridge the advice gap between the two.

<sup>5</sup> The Ministerial Council on Energy is referenced in legislation, and for that reason is used here rather than its replacement bodies Energy National Cabinet Reform Committee (ENCRC) and the Energy Ministers' Meeting (EMM)).

<sup>6</sup> The ESB does not provide a coherent or systematic integrating function. It is not designed to. The ESB was formed to implement Finkel Review recommendations (and in this way substitutes for the Market Body Forum — a voluntary arrangement between the market bodies to promote engagement). The Finkel Review Panel's intention was to use the ESB to benefit from a 'fresh set of eyes'



- **Power system critical functions.** By law AEMO is responsible for maintaining and improving power system critical functions. These functions are delivered in parallel to the development of consumer energy access policy.

The ECA was created to provide a long-term home for the function of providing consumers with access to decision making relevant to the energy market. However, the ECA is constrained to use a supply-side focus.<sup>7</sup> It provides grants<sup>8</sup> that advise on strategic consumer issues; however, the grants process is a competition, not a mechanism to foster strategic partnerships. Moreover, the ECA strategic agenda is focused on access, not resilience.

Whilst the ACCC has been equipped with the ECA to support the flow of energy consumers advice, the AEMO has not been equipped with an equivalent body to support the flow of energy technical advice. Consequently, advice comes voluntarily from market participants, influencers, advocates, or through general goodwill.

What is now apparent is that decision-makers lack a coherent framework for advice to provide energy access together with energy resilience.<sup>9</sup> There is little ability to introduce new features and shift directions to benefit the interests of customers. Energy resilience underpins both Australia's economic and social fabrics, but the discovery of practicable means to advance energy resilience can only happen through goodwill owing to this missing piece in the energy governance framework.

To address this deficiency a small, voluntary, practice-based group formed in 2018 to address the gradual deterioration of frequency control within Australia's National Electricity Market through an individual rule change request.<sup>10</sup> The group had highlighted that deteriorated frequency control made the electricity system more vulnerable during electricity incidents (such as weather events or equipment failures), increasing the chance of blackouts. Changes in electricity rules in 2009 had unintentionally incentivised the behaviour of energy suppliers to follow market ramping prescriptions rather than prioritise power system resilience through primary frequency response. The group proposed a rule change to address the vulnerability; it was subsequently accepted on 4 June 2020. Owing to the implementation of this rule, a power blackout on Australia's eastern seaboard was avoided on 24 January 2021, when AEMO's SCADA<sup>11</sup> control systems failed.

The example highlights an unanswered question - how can Australia better achieve power system resilience whilst energy decision making remains primarily energy access focused?

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<sup>7</sup>The National Electricity Code (2001) provided a mechanism for funding end users to participate in the NEM decision making processes. This function was subsequently transferred to the AEMC (Consumer Advocacy Panel) and then Energy Consumers Australia.

<sup>8</sup> ECA is funded by market participant levies (collected by AEMO) and applies the bulk of funding to self-directed activities (rather than grants).

<sup>9</sup> The original expectation of the market, devised by an MIT think tank led by Schweppe (Power systems '2000': hierarchical control strategies, IEEE Spectrum, July 1978), was to provide critical functions during times of stress (resilience). This thinking underpinned the design of Australia's National Electricity Market.

<sup>10</sup> (*Primary frequency response requirement* — ERC0277, proposed by Dr Peter Sokolowski, determined 26 March 2020)

<sup>11</sup> SCADA is the computer control system that provides supervisory control and data acquisition.

## Governance frameworks for resilience

Historically, power system resilience was managed out of sight as part of the bulk power system. It worked because customers were only consumers (purchasing energy, energy access and power system resilience from the one electricity service provider). There have been significant shifts in this model in recent years.<sup>12</sup>

For example, after government incentivisation of rooftop solar, customers participate through retail tariff structures in providing energy back to their local communities. Customers are now interacting in new ways that have implications for energy purchasing, energy access and power system resilience. The consequences of these shifts have not been addressed by existing governance systems.

As current decision making is focused on energy access, there are not adequate means to properly address power system resilience issues. The Government has created a distributed energy supply situation through incentivisation but has made individuals or households “own” that situation. Choices made by homeowners are built upon signals mediated by incentives. In the case of rooftop solar, incentives provide payback time horizons of seven years but are based on volatile policies. These policies are identified by public affairs specialists within government/political parties as appealing at the time, but future impracticalities are often overlooked.

Put simply, Governments have provided access and encouraged uptake through subsidies, but have not provided the means to sustain access (i.e. resilience).

Compounding the situation, another AEMC rule change (Access, pricing and incentive arrangements for distributed energy resources — ERC0311<sup>13</sup>) is a market response to a technical situation. A striking feature is the unpredictable penalties for exporting power, retrospectively shifting another technical problem created by governments to the consumer.

In parallel, Governments have responded to their need to be more informed about the risks to the power system identified after the South Australian system black event in 2016. The AEMC made a determination on 3 June 2021, in response to the COAG Energy Council rule change request (Implementing a general power system risk review — ERC0303). The determination shifts from a power system frequency risk review focus (balancing supply and demand) to a focus on supply side resilience through a so-called general power system risk review. The new approach is incomplete because it omits resilience (and flexibility) on the demand side. Moreover, the determination expands AEMO’s responsibilities without any funding mechanism being provided by Governments.

AEMO has the ability to raise levies for this work (on the supply side), but from market participants who themselves have an ownership stake in the company. Therefore, market participants have a legitimate right to exert influence on AEMO for their own market interests, rather than overall system technical grounds that are needed to provide system resilience (and flexibility). Despite AEMO not being funded to provide a solution, it is taking action to build this capability through goodwill. Outside

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<sup>12</sup> These include the creation of renewable energy zones to address locational pricing failures (via NEL 90F, despite being out of the security and resilience scope intended for this power) and addressing edge of grid reliability constraints through new technology,

<sup>13</sup> proposed by SA Power Networks, determined 12 August 2021

of AEMO's remit, it has been working on creating a power system design and engineering framework (with market participants and including Engineers Australia).

The deployment of Distributed Energy Resources (DER) across Australia also demonstrates the mismatch between competition (energy access) models and local energy resilience outcomes.

### **The Incipient Distributed Energy Resources Crisis**

We are facing a situation where a fleet of “end user generating equipment” could simultaneously fail owing to ambient temperatures that exceed regulatory requirements or manufacturers' designs. If we suffer a failure event of this type, we lack a workforce capable of providing the level of service required to restore services across Australia in such an event. Responsibility could fall on over 100,000 individual homeowners to fix a situation that had in effect been created by past Government market incentives.

The result of this framework-free growth of DER to date has included:

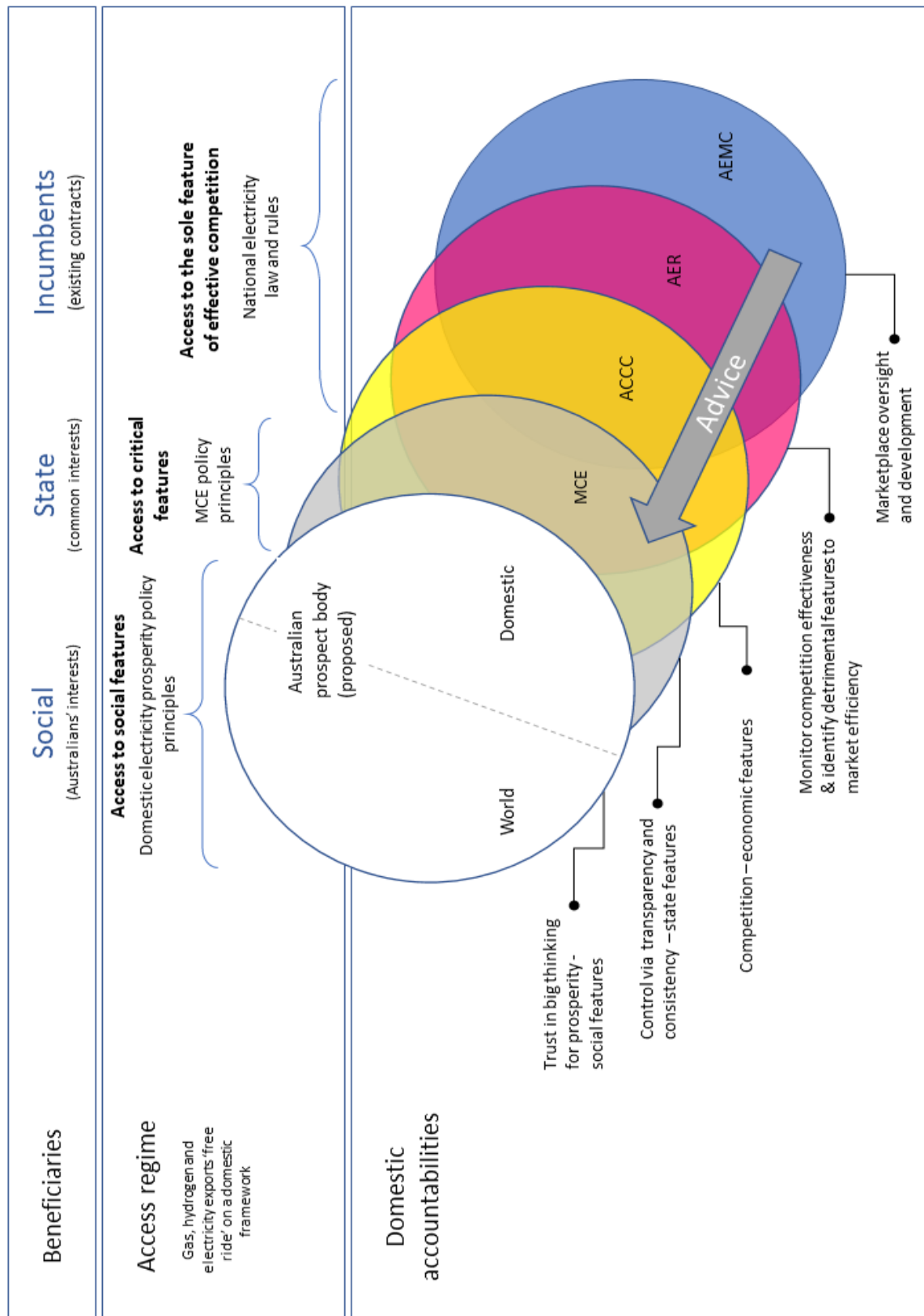
- Oversupply in some local areas within a community.
- Overvoltage owing to oversupply, compromising some wiring, electrical protection and appliance voltage standards.
- Slow regulatory reactions to evolving inverter standards (creating a fleet of legacy devices that may require special arrangements).
- Slow commercial responses to new innovation (owing to the need for commercial certainty to mitigate litigation exposure.)
- An attempt to develop solutions that do not match the scale: i.e. local area issues being addressed through general competition frameworks.<sup>14</sup>

A large proportion of the generating systems were connected through regulatory exemptions which appear to have contributed to the system level problems. This issue is the responsibility of the MCE, but it has failed to develop a framework for local area (aggregator and/or council) end user connected generating systems thus leading to a lack of local workforces needed to provide maintenance services of end user generating equipment.

The energy access-resilience mismatch highlights the need for governments to access new features through “prosperity-driven” frameworks. Figure 1 shows the arrangement of these functions and features in decision-making entities and the flow of advice. AEMO conspicuously does not appear — it has statutory responsibilities for managing energy-critical functions but has no advisory role to the MCE on the development of new features. Figure 1 proposes establishing an “Australian Prospect Body”, providing a new access regime to benefit Australians.

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<sup>14</sup> For example, Totally Renewable Yackandandah has created both a new framework and new features to deliver a local solution that meets community needs. However, this is not a repeatable model and has high transaction costs.



**FIGURE 1 – BENEFICIARIES, ACCESS REGIMES, AND DOMESTIC ACCOUNTABILITIES OF THE AUSTRALIAN ENERGY GOVERNANCE FRAMEWORK.**

## Where to next? - Four necessary shifts

The current competition-driven energy framework is focused on delivering energy access to consumers. There is a need to move boundaries set by the existing energy framework, lowering barriers to providing energy resilience through critical functions and adding new thinking about beneficial features for prosperous ways.

**Shift #1 - Move from economic ideology to holistic prosperity.** If the existing focus on economic benefit does not serve Australia's interests, then we should expect accountable leadership to advance prosperity through the energy framework. There are two possible sources of leadership to make a shift for citizens and consumers: the Prime Minister or Chair of ACCC. The MCE is not the place for this leadership owing to it being constrained and tethered through the Australian Energy Market Agreement. An option for consideration is, with the ACCC Chair's support, introducing an Australian prospect body focused on social practicable outcomes.<sup>15</sup>

**Shift #2 - Provide powers for thinking and relevant advice.** The National Electricity Law (NEL) gives the AER the power to address only detrimental features, not beneficial features in relation to the wholesale market.<sup>16</sup> The NEL also provides the ability for the AEMC to conduct reviews on the rules guided by the MCE statements of policy principles and provide its advice to the MCE. No policy principles are currently published. The AEMO is authorised by the NEL to release protected information (including to the public) if, in its opinion, the detriment does not outweigh public benefit. None of these powers to think, conduct reviews, or release information provide a mechanism to think and act on beneficial features.

**Shift #3 - Secure critical functions.** Australia's energy market relies on the electric power system to provide the means of exchange (i.e., through energy access). Delineation is required between energy access as an economic imperative and providing resilience as a social imperative.<sup>17</sup> The latter should not be vested in a company. This social imperative needs to be articulated through an MCE statement of policy principles for critical functions. To provide certainty in securing power system critical functions, the MCE needs to be equipped with access to a competent body (independent of market participant interests) to support the flow of energy technical advice.

**Shift #4 - Pivot to a system level power and energy framework.** A whole of system level power and energy framework implies more than simply adding services that are expected to be accessible. A double-glazed window is not a service, but it shifts the energy usage characteristics of a household. Access to such features is needed before access to services that are provided via market means. Power system critical functions are also beyond a service, being always required to provide power system and energy resilience. Power system critical functions could be provided via access to critical features.

With respect to Shift #4, the AEMC and the ESB are moving to create new services in recognition of customers increasing participation in generation. Establishing new mechanisms is worthwhile; but,

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<sup>15</sup> This requires AEMO sharing protected information with the proposed Australian prospect body.

<sup>16</sup> vis NEL 18C(2)(b)

<sup>17</sup> NEL 49(1)(e) to maintain and improve power system security.

for example, the new AEMC access regime for rooftop solar applies only to households capable of generating power. It does not apply to households seeking to improve energy efficiency nor people seeking to contribute to social impact.

### Social impact considerations

A simple social impact example could be making a better choice than installing incentivised rooftop solar when a street/precinct is already at capacity with say 46 rooftop solar systems. Moreover, including household generation as a service will not resolve the fact that excess energy cannot leave the local network (because distribution transformers are designed to move energy in one direction only, transmitting energy to the local network). This means household choices made in response to this service will not link to productive uses outside the local network.<sup>18</sup>

Collaborative social features are also not guaranteed through services. Households may wish to do 'good' for the environment and the local area but are faced with choices that require them to act competitively. Household generation services are valued through a market pricing mechanism. If a second service is introduced, e.g., a neighborhood scale battery designed to meet the same local energy consumption needs, current householder decisions may no longer be optimal.

Achieving social features is a concern for the ACCC; it cannot rely on 'buyer beware' messaging if it is to do its job of acting for consumers. This can be supported by shifting the role of ECA to be focused on the features relevant to people rather than advocating for an individual attribute, i.e. people as consumers of goods (energy usage) and services (access). However, this does not diminish the responsibility of the ACCC to provide these features through thought leadership.

### Conclusions

Are our electricity networks resilient enough both today and in the face of massive increases in electricity demand as we undergo a significant energy transformation in Australia? The answer is no, not as currently designed, governed, and operated. This must be addressed if we are to manage our energy transition over the next decade without preventable, recurring, system failures.

An open question is whether the NEM failure is beyond the ability of the current marketplace to address? We conclude that:

- Energy resilience underpins both Australia's economic and social fabrics, but the discovery of practicable means to advance energy resilience can only happen through goodwill owing to a missing piece in the energy governance framework.
- Energy advice is about two distinct energy features, consumer access and power system critical functions. Governments have responded to their need to be more informed about the risks to the power system identified after the South Australian system black event in 2016. However, decision-makers lack a coherent framework for advice to provide energy access together with energy resilience.

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<sup>18</sup> e.g. hydrogen production for export

- Delineation is required between energy access as an economic imperative and providing resilience as a social imperative.
- There are no effective alternatives for introducing different thinking to the design of the electricity system, leading to the potential for incumbent ‘group think’ and the continuation of a fragile electricity generation system.
- Despite the technologies available to power system designers, a system will not be resilient unless the governance frameworks and processes are appropriately designed.
- The call to action by the ACCC Chair, Rod Sims, when how stated that “The National Electricity Market (NEM) is largely broken and needs to be reset” has not been implemented; there is much still to do.

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