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All at Sea: Fuel, War, and Australia's Achilles' Heel

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Stronger Regions for a Stronger Australia

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Foreword

Australians are known for being a relaxed and irreverent people who reject hierarchies and dislike those who regard themselves as superior. The long shadow that these qualities cast, however, is unquestionably that of complacency, which when combined with disengagement, a degree of cynicism and poor leadership, can be deeply troubling.

Recent events have made it very clear that our "she'll be right mate" attitude doesn't cut it anymore.

Quite simply, despite years of warning, we as a nation, and our political leadership, have failed to prepare in any responsible way at all for the possibility of serious disruption to our supply chains.

Now, a conflict on the other side of the world has thrown our irresponsibility into stark relief.

Australia's economy is perhaps the world's most dependent on liquid fuel, and in all the hoopla of recent weeks, we seem to have lost sight of the fundamental reality that while petrol gets us to work and helps us pick the kids up from school, it is diesel, and gas derived fertilisers, that feed us.

That Australia, a nation which normally feeds many more people than its own population, now sees its agricultural production capability quite seriously compromised is a telling indictment upon us all.

The oil shocks of the 1970's (which I am old enough to remember) set off a high degree of economic mayhem which took years of dedicated, focused and courageous leadership to right.

Part of the better thinking that came out of that era was the development of the International Energy Agency, the IEA, which Australia joined in 1979. The 35 or so member nations agreed to hold a minimum of 90 days of fuel reserves, and the only exceptions were to be those countries, like Australia at the time, that were self-sufficient and exported surpluses of crude oil refined product.

From around 2005 (at about the time that I left high office), Australia's self-sufficiency started to decline. Extraordinarily, our government failed to encourage any further exploration and development of domestic resources, nor offset our decline in production by building stocks to meet our obligations.

It is beyond staggering to me that virtually all countries except for Australia have met or exceeded, and in some cases by very large margins, those commitments.

Our New Zealand cousins have been holding in excess of 90 days. Japan has something in excess of 200 days and is now offering, it seems, to help us out (sluggards that we are), in return for us not imposing unhelpful conditions on our exports of gas and other resources.

One can only imagine the folly of ignoring this crisis should conflict break out to our North. We may or may not choose to be involved in a direct conflict in the Asia-Pacific, but surely we can now see clearly that any disruption in our region would lead to a massive reduction, if not total freezing, of shipping to Australia.

Should that entirely feasible reality occur, we would be on our knees within days.

It should be noted that in these circumstances most serious governments have been able to commandeer their nationally flagged fleets. This is not an option for Australia because (thanks largely to Australia's maritime unions) we have no Australian flagged tankers or bulk carriers at all. None.

There is an old saying that you should never waste a crisis. One hope is that there is sufficient robustness in our political, industrial and military leadership that we not only learn the lessons from the events of the last few weeks, but that we take real and far-reaching action, even at this belated hour.

I am delighted as the Chairman of the Page Research Centre that we are in a position to bring a serious plan to bear for action at a level that addresses our vulnerabilities with the urgency that our country surely deserves.

The Hon. John Anderson AC FTSE
Former Deputy Prime Minister of Australia
Chairman of the Page Research Centre

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Executive Summary

Australia is critically exposed to geopolitical risk due to our overwhelming dependence on imported liquid fuels.

The recent Iran war and disruption through the Strait of Hormuz have already shown how quickly overseas conflicts can translate into price spikes, physical shortages and emergency planning in Australia, even before any direct conflict emerges in our own region.

A major war in Asia could cut off far more of our supply almost overnight, and this is no longer a contingency Australia can afford to ignore. Current policy positions have failed to confront the seriousness of this exposure, and have left us without a sufficient response.

Happily, Australia is blessed with energy abundance on the shores of our own continent, and this abundance can be harnessed to dramatically improve our security through domestic production of liquid fuels. The necessary steps to achieve this may have very little economic cost. Clear political signals that overturn recent demonisation of fossil fuels could potentially unlock private investment that could transform our domestic production. And even if some costs are unavoidable and ongoing, there's a strong case to suggest that those costs would yield far greater benefits to our national security than comparable expenditures we already make in defence.

Part I outlines the current liquid fuel insecurity in Australia, grounded in the growing threat of a major war in our region.

Liquid fuels are essential to the functioning of our nation and economy, and are likely to remain so for several decades, making liquid fuel security a national security priority. Australia's liquid fuel supply is critically insecure. With very little domestic crude extraction or refining, we import 90% of our liquid fuels, primarily from Asia.

Our region is becoming increasingly dangerous and the risk of a major war in the Pacific is becoming non-trivial, evidenced by China's military build-up to contest US primacy, geographical expansion in the South China sea, and increasingly aggressive posture towards neighbours. A war in Asia would put almost all of our fuel supply in jeopardy, particularly due to our reliance on major Asian refineries.

Fuel security is national security.

Existing policies are discussed from first principles, and efficacy and cost are compared across strategies of reserves, diversification, demand reduction, and domestic production.

- Reserves are only useful for short-term shocks. Our 30-day stocks do not provide significant security in the event of war;
- Diversification offers the semblance of security but, in reality, it does not guarantee supply;
- Demand reduction through electrification is not a viable strategy. Passenger vehicles are only 30% of demand. Freight, aviation, agriculture and mining will continue to need liquid fuel in the medium term;
- Increased domestic production – both in terms of refinery capacity and local feedstocks for them – is the only strategy that will achieve real risk mitigation under an Asian war scenario.

We conclude that Australia is unprepared for a major war with regard to fuel supply, that we remain extremely vulnerable to anything except short-term shocks in the supply chain, and that much more serious action is required.

Part II shows that Australia has realistic and cost-effective options for fuel security. We recommend a strategy of domestic production as the only way to achieve genuine security, and highlight that there are very promising opportunities that may have little net cost to achieve high levels of domestic production.

- Large-scale crude reserves are discussed as possible but potentially costly, and still only useful as a bridging mechanism to restored supply;
- Domestic production is recommended, particularly the opportunity to deregulate and incentivise exploration for unconventional oil resources;
- Alternative synthesis of fuel from domestic feedstocks is also recommended, with coal, gas, oil shale and biomass being candidates. Of these, coal presents the greatest opportunity due to cheap and plentiful feedstock offering scale and cost benefits. The spread of heavier molecules produced by such conversions promises to meet our high demand for diesel and aviation fuels in a way that our existing condensate-heavy production cannot. They also have the ability to produce a range of valuable and critical chemicals to support the economic case. We recommend that private initiatives for pilot plants, and subsequent large-scale developments be approved, or incentivised if necessary.

Part III discusses the rationale for paying an insurance premium to secure our fuel supply. Besides the direct national security benefit, there are other benefits of a strategy of domestic production which have significant value;

- Reducing imports of fuel – our most critical import – would radically reduce the critical volume of shipping our nation depends upon in a crisis. Recasting our defence strategy in light of this presents significant opportunities. Whilst it is popular in defence circles to repeat the refrain that we are an island, and hence must be a maritime power, it is simultaneously true that we are also a continent. Our abundance of almost every critical physical resource within our own domain can allow us to engage in maritime commons out of a sense of opportunity, rather than existential obligation. Reducing the need to escort large numbers of slow-moving ships through contested straits and narrows could save crucial resources for more effective military capability developments.
- A strategy of domestic production would also significantly enhance the value Australia could offer to the US alliance and AUKUS. A plentiful supply of fuel across northern bases would make allied operations in our region much easier, at a cost that might be far less than expenditure we are already committed to under AUKUS for naval bases for this purpose.

The costs of realistic solutions are not extreme and are within the range of what could be absorbed by consumers at the fuel bowser, or what governments currently spend on closely related defence objectives. In many cases, all that is required are regulatory green lights. We conclude with recommendations to:

- **Prioritise, incentivise, and deregulate domestic exploration and drilling** for crude oil, gas, and unconventional petroleum in Australia, in order to restore domestic production as the central objective of fuel security policy;
- **Approve and, if necessary, back coal-to-liquids pilot plants**, so that Australia can test and scale one of the few domestic pathways capable of supplying a substantial share of national fuel and chemical demand;
- **Expand in-country fuel reserves as a bridge, not a substitute**, with priority given to distributed storage close to major end-users such as farmers, miners, freight operators, and remote industry;
- **Recapitalise and expand domestic refining capacity to meet Australia's diesel-heavy fuel needs**, including hydrocracking capability able to process a wider range of imported and synthetic feedstocks;
- **Support complementary fuel streams where they make strategic sense**, including Gas-to-Liquid, biofuels and other alternative liquid fuel pathways, while recognising that feedstock constraints are likely to limit them to a supplementary role;
- **Establish a dedicated fuel security budget**, funded from a portion of fuel excise, a new dedicated excise, or the defence budget, to support stockholding, enabling infrastructure, pilot projects, and other strategic interventions.

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Introduction

Why now?

Fuel security has been the subject of many articles, papers, parliamentary committees and reviews over the last decade.

So why another paper on liquid fuels? And why now?

It is clear that our strategic environment is shifting faster than previous commentators expected, and Australia's liquid fuel vulnerabilities have been laid bare.

The recent conflict involving Iran does not represent the worst-case scenario examined in this paper. But it does provide a timely warning. Disruption around the Strait of Hormuz has shown that even a geographically distant conflict can push up Australian fuel prices, strain physical supply, and force emergency interventions. If a shock in the Gulf can do this, a major conflict in Asia – where most of our refined fuel imports originate – would be vastly more dangerous.

China's military modernisation has greatly exceeded expectations, as has their assertiveness in Asia. The capacity and commitment of the United States to maintain supremacy in our region must be in doubt. We can no longer rely upon pax-Americana ensuring a strategically benign environment.

We also cannot rely on America to yield quickly to a new pax-Sinica. It's not clear that we'd want them to either. The possibility of great-power war in our region, with Australia involved, must be confronted directly. It's more important to contemplate this today than it has been for 80 years.

The very slow – perhaps stalling – change is the reliance of our economy (as well as our military) on liquid fuels. This hasn't changed much at all, and it doesn't look like it will.

The pace of electrification of passenger vehicles has slowed.[1] Even if it hadn't, it would have taken decades to make a moderate dent on our demand. Cars and passenger vehicles on our roads make up less than a third of this[2], with 70% of our fuel used for things like freight (trucks and rail), aviation, mining, agriculture, manufacturing and construction. The hope that hydrogen would become a ready substitute for any of those applications has evaporated.

Australia today relies on liquid fuel for more than half of our final energy demand.[3] This means the security of liquid fuel is an existential risk for us. We depend upon it in ways that are simultaneously inescapable yet often unremarkable. Each of the 25,000 individual products on the shelf of a supermarket has been grown, processed, packaged and transported using liquid fuels. If the flow of liquid fuels stops, Australia stops, and stops quickly.

Since there is no prospect that our need for liquid fuels will evaporate within the timeframes in which serious strategic risks might crystalise into a crisis, we must grasp this nettle more firmly than before.

A dire situation, badly diagnosed

The official response to this critical issue has been inadequate, both in practical outcomes and in the quality of analysis that has guided it.

Our fuel insecurity has never been more acute. Our refinery capacity meets just 20% of our demands. Our production of crude would only be sufficient for 20% of our needs. Instead of satisfying our refineries, almost all of this is a 'condensate' that is unsuitable for our own refineries, and hence exported. Thus, our refineries import around 80% of their feedstock[4], meaning over 95% of our liquid fuel supply currently depends on a ship arriving safely in our ports. And around 80% of those originate from parts of Asia that are highly vulnerable to hostile maritime strike platforms and weapons in the event of war, if they aren't already today.

We've also come to see that the quality of analysis and commentary is nearly as poor as the situation itself. In particular, the one key metric that best captures the problem – days of stock in reserve – has too often been mistaken for providing the structure of a sufficient solution.

Consequently, Australia currently has a set of fig-leaf policies centred around stockholding and reserves that are wholly insufficient to meet the risks we face. Not every hedge or insurance policy is effective. Some strategies can look impressive (and costly) but deliver little actual security. This is certainly the case with stock-holding strategies, which at best provide a bridge to some future means of restoring supply.

The commentariat has keenly called for larger reserves, without articulating what comes next – the strategy for restoring supply that the reserves would be sufficient to bridge to. The only reports that do contemplate what would resolve a crisis implicitly or explicitly exclude the most important contingency from consideration: major war.

Why the paper took the shape it did

Part I tests whether the current approach is sufficient, both in outcomes and in the way the problem is framed. It argues that reserves and stockholding are often treated as the answer when they are only one component of an answer, and definitely won't be sufficient in a crisis.

The structure of true security is knowable: **a credible way to restore or sustain supply, and enough reserves to bridge the gap.** On that basis, Part I asks whether Australia can realistically rely on stockpiling, or whether domestic production must carry much more of the burden.

Having established that standard, Part II surveys the practical options. It considers what each option can actually do for security, what constraint limits it, and whether the likely cost is modest, material, or prohibitive. Australia is fortunate that some of the most promising options may require little more than regulatory certainty and political permission.

Happily for Australia, we do have options for domestic production. We found that some of them may not be costly at all, and might even be profitable.

This paper does not attempt to produce a fully costed national investment plan. Doing so credibly would require a larger body of technical and commercial work, especially because some options may be close to cost-neutral while others would require meaningful public underwriting.

It was clear that some projects (such as coal-to-liquid conversions) had been seriously attempted by private capital in Australia, and were stifled by green or red tape. Others (such as biofuels) are still being attempted by private companies, but are entirely dependent on mandates or subsidies imposed by our government, or others overseas, to operate commercially.

We have had the sobering experience of observing an 'at-any-cost' subsidy scheme emerge to hit politically determined industrial targets for renewable electrical energy.[5]

Such a scheme emerged from[6] (and remains cloaked within[7]) the rhetoric of overall long-term net costs being negative, and leading to price improvements for energy consumers. Indeed, in 2021 Reputex provided the Labor party a report[8] suggesting 82% renewables would be achieved in 2030 by mostly-market forces, with a minimal subsidy (Rewiring Australia) for supporting regulated infrastructure (transmission). The fact that this could lead to our entire regulatory system being railroaded into forcing that outcome to occur without any knowledge of the total cost to consumers of taxpayers[9] is enough to stay the hand of these authors from rushing in to replicate such a public policy disaster.

Instead, the third part of the paper seeks a more modest goal: roughly sizing up some of the plausibly measurable benefits of establishing greater domestic supplies of liquid fuel. We do this by using comparable defence expenditures Australia makes to achieve effects that might be substituted for domestic fuel production (naval surface ships for escorts) or complimented by domestic fuel production (US bases and force hosting through AUKUS).

The question is not whether every dollar can be priced with precision today, but whether the likely cost range is plainly within the bounds of what a serious country should contemplate for such a critical vulnerability.

The paper therefore makes three claims. First, Australia's present fuel position is strategically inadequate in a major Asian war. Second, reserves, diversification and demand reduction may help at the margins, but domestic production is the only class of response that can genuinely change the structure of the risk. Third, the cost of pursuing that security is likely to be well within the range of burdens Australia already carries for other defence purposes.

There's a viable path to liquid fuel security by improving domestic supply, which is structurally different to a stockpiling strategy that assumes that seaborne trade in bulk liquids can be quite quickly and durably restored. This allows us to make a few limited, but firm policy recommendations about steps which we can take quickly with confidence, and ones which we should avoid or defer.

Part I – The current approach to fuel security is insufficient

1 The risk of great power war in our region

Any discussion of the liquid fuel situation in Australia must begin with an analysis of the risks, because in a zero-risk environment there is no downside to the current approach.

The partial closure of the Strait of Hormuz has made it abundantly clear that most of the world is exposed to a disruption to oil, gas, and chemical supplies that come from the Persian Gulf. However, Gulf oil production lies upstream of the most critical global juncture of our maritime supply lines.

The first six fuel ships that have been confirmed as cancelled or delayed in this crisis come from Malaysia, Singapore and South Korea, which host major refineries.[10] It's well known that Asia buys a large share of our natural resource exports. Less well known is that Asia also provides us with most of our critical imports, including refined fuels, so the security of the Indo-Pacific region is extremely important to us.

Since the end of World War II, there has been little prospect of a major power using military force against us in our immediate surrounds. That has now changed. The crisis in the Gulf has shed light on how exposed we are to a clash between a global super-power and a third-rate power on the other side of the world. This crisis should be seen as the canary in the coal mine, which should alert us to the more profound consequences of a potential clash between two superpowers in the region where most of our crucial supply lines converge.

> 'We have an abundance of the bulk materials and food required for a prosperous modern society. We even have an abundance of energy resources. We are uniquely placed among the world's nations to be within a stone's throw of total self-sufficiency. Very few other nations on earth have this natural advantage.'

1.1 The risk of a great power clash has approached much faster than expected

The rise of China and its increasingly direct competition with the U.S. for strategic dominance in the Indo-Pacific has made our environment significantly riskier than in the last several decades.

This is the explicit view of the Australian Defence Force. The 2023 Defence Strategic Review discusses a strategic shift from a mindset of "limited to low-level regional-based threats" to a recognition of "major power competition involv[ing] threats and risks far beyond and quantifiably different to any faced since the end of the Second World War".[11] The review also asserts that "China's military build-up is now the largest and most ambitious of any country since the end of the Second World War", and goes on to acknowledge the "highest level of strategic risk we now face as a nation: the prospect of major conflict in the region that directly threatens our national interest."

Global events since 2020 such as the invasion of Ukraine and China's increasing aggression in the South China Sea, as well as tensions over Taiwan, and Xi Jinping's direction to the PLA to be ready for war by 2027[12], have dramatically shortened the plausible lead time to a major conflict. Other commentators are aware of this growing risk, with the Lowy Institute stating that "major war in Asia [is] one of the relatively low-probability but very high-impact risks that Australia cannot afford to ignore."[13]

Although it is not inevitable that Australia would be drawn into such a conflict, we can certainly not comfortably exclude the possibility that we will be. We are a close ally of the United States, currently hosting some of their forces on our shores. We've never failed to participate in any significant US combat operation against another state since the end of WWII. And whilst we should treasure our independence, including choosing to abstain from US wars in the future, there's a very real possibility that we might have less choice than we'd like. If a clash appeared inevitable or desirable to an adversary, our own bases or facilities could be targeted pre-emptively at the opening of hostilities. In any case, we cannot rule out the possibility of engaging in or being affected by such a conflict.

1.2 The credible reach of militaries has extended rapidly in our direction

China's militarisation in the South China Sea has been underway for over a decade, with multiple islands created from previously unoccupied atolls.

Figure 1 – Fiery Cross Reef – Spratly Islands

Figure 2 - Subi reef, Spratly Islands

These activities have significantly extended China's ability to exert military power in the Southeast Asian region. No longer can it be assumed that an Asian crisis could be confined to North Asia.

The figures below show the growth of China's anti-access/area denial capability over the last decade.[14]

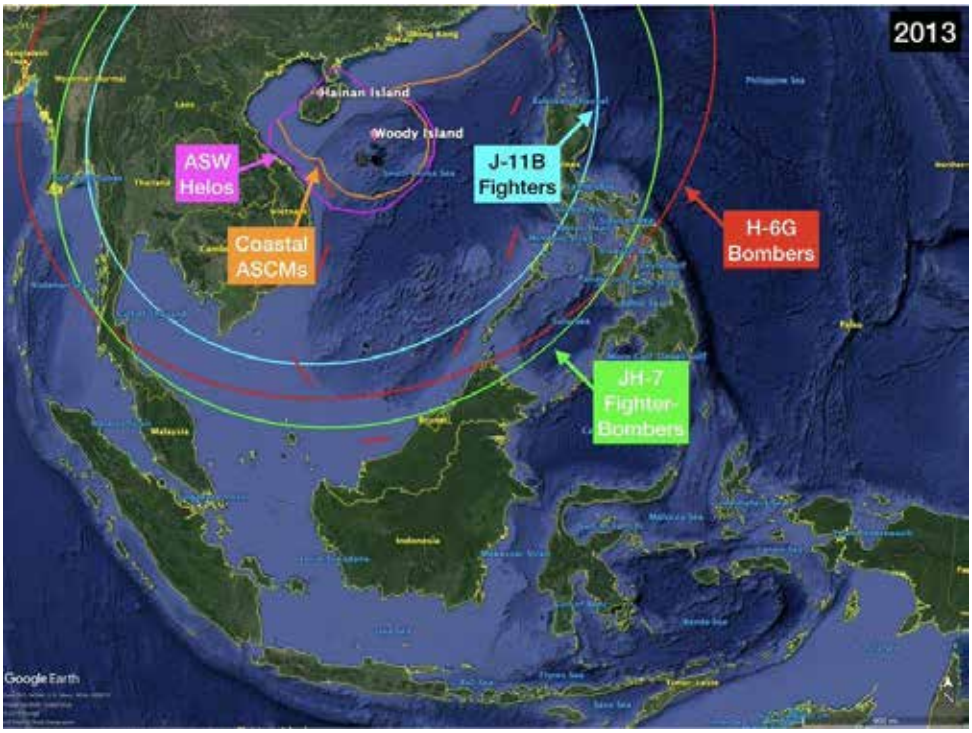

Figure 3 - China's area denial capability in 2013

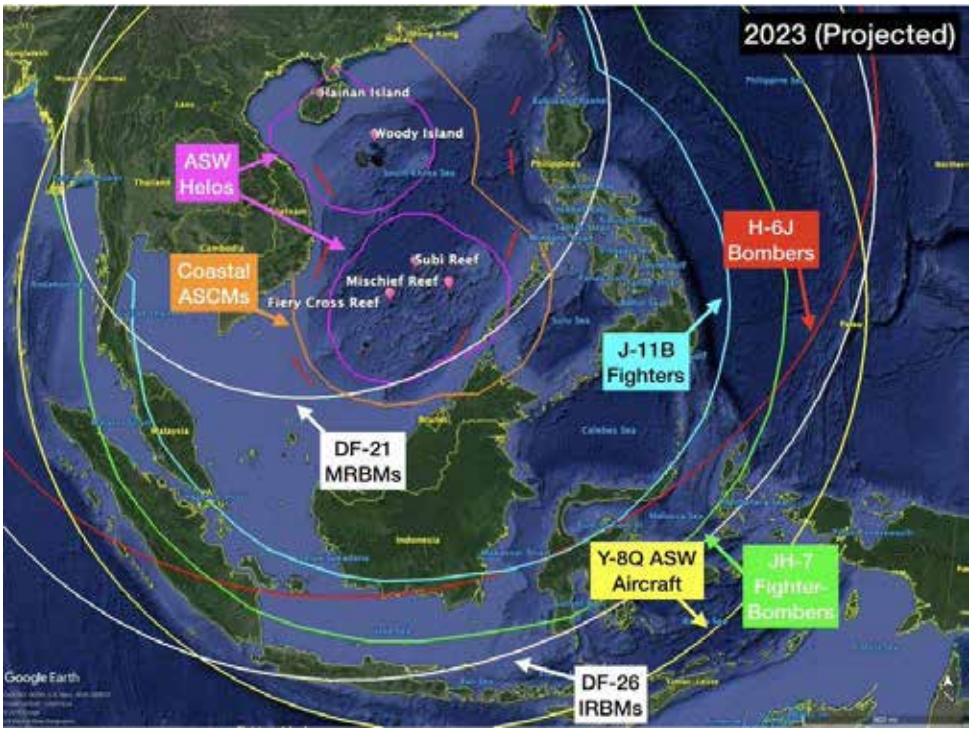

Figure 4 - China's area denial capability in 2023

In 2025, not only can't we exclude the possibility of a major war in Asia, but the reach of belligerents in such a conflict is not comfortably distant.

In this case, due to Australia's strategically significant location and its heavy dependence on Asian trade, China might be active and intent on using lethal force to destroy any or all shipping which strengthens Australia or our allies in the struggle. Such an effort would involve a range of well-established and emerging forms of maritime strike, from submarines and airborne platforms to drone attacks and remotely emplaced mines. It is reasonable to consider a scenario where areas as far south as the Sunda and Lombok Straits fall within easy reach of Chinese maritime strike weapons. This would have grave implications for all of our current trade routes to Singapore, Malaysia, Brunei, China, Taiwan, Korea and Japan.

1.3 The bleak fate of ships in war

Shipping is a very vulnerable mode of transport. The targets are by their nature very large, slow-moving, and confined to a two-dimensional plane. Every opponent gets one coordinate for every ship for free. Many shipping lanes, including in Asia, required transiting narrow straits, meaning the remaining two coordinates are trivial to solve at some future point for a patient enemy who can surveil the strait. Australia, with our high dependency on critical imports from Asia, is therefore vulnerable in a range of scenarios, acutely so in a major war.

The evolution of military technology and tactics following WWII also indicates that surface ships have become much more susceptible to modern weapons, rather than less.

The extent of the success of Argentina sinking British ships in the Falklands war using land-based missiles and planes demonstrated that one doesn't need a navy to sink a navy. The British sinking of the Belgrano, and subsequent withdrawal of the entire Argentinian fleet from the area of operations, confirmed this fact. Many Argentinian aircraft succeeded in landing unguided free-fall bombs on British ships, most of which failed to detonate, due to faulty fuses. If these fuses had worked as planned and the British expedition failed due to those naval losses, history would have given an even clearer indication of the shortcomings of air defences for ships.

The more recent war in Ukraine has confirmed that this defensive disadvantage of ships has changed little. Following the sinking of the Moskva using land-based missiles, the use of aerial and surface drones by Ukraine has effectively reduced the Russian fleet in the Black Sea to a rump, despite Ukraine having no navy of its own.[15]

Traditional maritime denial weapons appear to have maintained or expanded their asymmetric edge. During the Gulf War, USS Tripoli, an amphibious assault ship leading mine-countermeasure operations for the US navy, hit a mine, as did the USS Princeton, a cruiser.

In 2006, the Israeli Corvette INS Hanit was hit by a C-802 anti-ship missile fired by Hezbollah. This underscores the limited effectiveness of air-defence systems even by modern navies, which don't provide any defence unless in an active and alert configuration, and can still be evaded or overwhelmed. The 2010 sinking of the Korean Corvette ROKS Cheonan resulted in the death of 46 sailors. After a lengthy investigation, it was concluded that it was most likely sunk by torpedo from a North Korean mini-submarine.[16]

Not only have mines, missiles and torpedoes been effective against military surface vessels which should have had some means and capability of detecting or defeating such threats, but modern militaries have also invested in low-cost maritime weapons suitable for enforcing distant blockades against merchant ships over vast distances. The United States 'Quicksink' bomb guidance kit is one such example.[17] The PLAN has also developed an impressive array of mine deployment capabilities, from long-range aircraft to civilian vessels.[18]

The events of the first few weeks of the current clashes with Iran have provided clear evidence of this extreme asymmetry that makes surface ships relatively easy to threaten in choke-points, and quite hard to protect.

On the 3rd of March 2026, just three days after the initial strikes, President Trump posted on Truth Social that he had ordered the United States Development Finance Corporation to provide political risk insurance to help get shipping moving through the Gulf.[19] This was in response to it becoming apparent that shipping through the crucial channel had effectively stopped, after insurers stopped providing war coverage. The same post said "If necessary, the United States Navy will begin escorting tankers through the Strait of Hormuz, as soon as possible. No matter what, the United States will ensure the FREE FLOW of ENERGY to the WORLD."

By March 11, Reuters reported that six vessels had been attacked by Iran, including showing spectacular footage of tankers ablaze.

On the 16th of March, Trump explained that he was seeking assistance from other countries to help open the Strait, and getting mixed responses. At an official briefing he said: "We've protected them from horrible outside sources, and they weren't that enthusiastic. And the level of enthusiasm, it matters to me. We have some countries where we have 45,000 soldiers, great soldiers protecting them from harm's way, and we have done a great job. And when we want to know 'Do you have any minesweepers?' 'Well, we would rather not get involved sir.'"[20]

Two days later, Lloyds List published analysis with the headline: "Iran establishes 'safe' shipping corridor for approved and paid for transits".[21] The article discusses how Iran appears to have offered safe passage for vessels willing to pass between their coast and Larak Island, close enough to be easily visually inspected.

At time of writing, these facts make it clear that Iran can successfully maintain a threat level in the Strait that the United States and Israel cannot overturn, despite having essentially unfettered control of the skies for almost three weeks. The United States still hasn't attempted any naval escorts in order to make good the promise that the world would have a free flow of energy.

The asymmetrical advantage possessed by simple and small weapons - including drones, missiles and mines – against very large and valuable floating targets is clearly at least as large today than it has been in history.

1.4 In war, we cannot assume maritime access to Asia

There are other relevant scenarios which affect fuel security such as refinery outages, pandemics, and financial crises, but these are no longer the dominant driver of our security concerns.

We cannot rule out the possibility of a great power conflict in Asia. We cannot assume that we will not be involved. And it is clear that the modern weapons available to the belligerents will have devastating effects on surface ships, and their reach extends right to our Northern Shores, and potentially beyond.

Hence this paper will focus on the one threat that drives the most severe threat: a major Asian power exercising a modern military in war against our maritime interests.

Far from being the most unlikely scenario (and therefore unnecessary to consider), this is precisely *the key* scenario we need to prepare for. As noted in the Defence Strategic Review, this is the scenario that our defence strategy is oriented around. In such a scenario, no safe passage of large surface ships through Asia will be possible until much of the war is won.

2 Liquid fuel security is Australia's strategic Achilles' heel

It is said that Australia is a maritime nation, but this easy idiom has obscured a complex relationship with the sea. Australia is uniquely both an island and a continent. These two attributes are at odds with each other when it comes to defining a nation's relationship with the sea.

Island nations typically depend on the sea to *survive*, as well as thrive. Countries like Britain, Japan, and Singapore have populations and economies whose demands for physical resources massively outstrip the supplies of their relatively small land endowments. Without seaborn imports of raw material inputs, including minerals, energy and food, their survival would be imperilled. Their economic dependence on maritime movements is absolute.

Continental nations have a different outlook. Countries like the United States, Canada, and Russia have vast land areas, and typically enjoy massive surpluses of mineral, agricultural and energy production, which they export to others who have less. In the modern era they also develop prolific maritime trade relations, because of their ability to profit from those exports of bulk materials, and import manufactured goods of better variety, quality and price than what can be domestically produced.

Both strategic outlooks benefit from secure international shipping, but the canonical island outlook has a *need* relationship with trade, whereas most for most continental powers, it's a matter of *want*. Continents profit from seaborn trade. Islands are imperilled without it. If a country like Russia or the United States was cut off from seaborn trade altogether, without a doubt standards of living would decline, but not nearly as precipitously as for a country like Japan or Singapore.

In this section we will demonstrate that Australia has positioned itself with the vulnerability of a typical island, despite having the resources of a continent. Notwithstanding our prodigious abundance of minerals, food and energy, our ability to harness these things for our benefit depends entirely on liquid fuels, for which we remain completely dependent on foreign supply.

2.1 The asymmetry of exports and imports, by volume and value

Like most continental countries, we generate much of our wealth by exporting vast quantities of our natural resources, and we use this wealth to import much of our value-added goods from overseas. The overwhelming majority of this trade occurs through shipping. But not all of our shipping is of equal value; hence, not all of our shipping is equally important, or feasible, to defend.

Across the history of our nation, we've been major exporters of the particular commodities we were good at producing, from gold and wool to bulk minerals and metals, which our continent affords us in abundance. In Adam Smith's parlance, this is our comparative advantage.

At the same time, during the most recent 80 years of increasing global trade and prosperity, Australia has found that it is cheaper to import an array of goods from overseas, rather than make them all onshore. Many industries have disappeared, unable to compete against overseas neighbours with advantages in labour, or higher concentrations of capital and skill.

This is a predictable consequence of increasingly liberal global order, as market forces search for optimal capital allocation. This trend has accelerated over the past few decades as global free trade has increased. Australians have benefited from easy access to the best manufactured goods from all around the world, and globally competitive prices. This has doubtless enhanced living standards. However, Australia now finds itself dependent on concentrated supply lines for some imports that are critical to our economic survival in the short run, which could imperil our survival in a crisis.

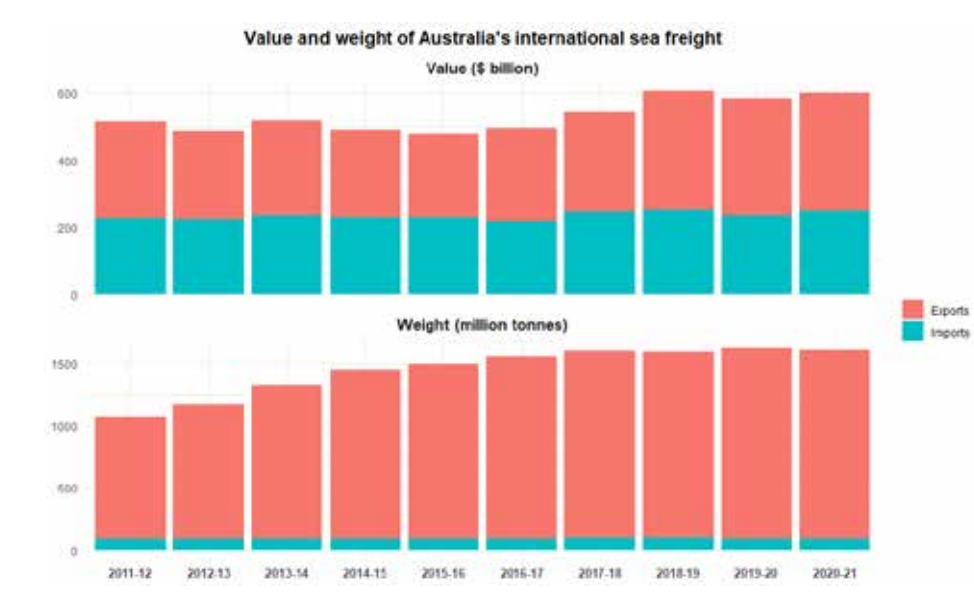

Figure 5 - Value and weight of Australia's international sea freight[22]

Australia exports a staggering 1.5 billion tonnes of commodities and energy products every year.[23] More than half of this goes to China alone, with a further third going to the rest of Asia, leaving just 10% for the rest of the world.

Compared to the sheer volume of our exports, Australia's imports appear modest, at 97 million tonnes per annum. Every year, around 4 million containers (TEUs) arrive in our ports[18] on 1600 container ships (4-5 per day).[24] We also receive roughly 1100 tankers, 400 vehicle carriers, and 500 general cargo ships every year. All up, there are about 10 ships every day delivering goods.

Curiously, our imports and exports have a similar *value,* but the exports are an order of magnitude large in *volume.* This necessitates some confronting questions about what Australia's maritime strategy is. Do we attempt to secure all the shipping we *want* to sail safely because these exports contribute to enhanced prosperity? Or do we focus on securing that shipping we *need* to import because it is critical for our survival?

Once posed, this question answers itself. Our needs are more important than our wants. Fortuitously, our needs are at least 15 times smaller in volume than our wants. Islands dependent on importing bulk materials to support their direct mineral, energy, and nutritional needs do not enjoy this luxury. By concentrating our efforts on a much smaller flow of shipping, we have greater prospects of success. Moreover, there's no prospect that we can secure all of our current exports to existing destinations, not least because so much of them go directly to China, or countries immediately proximate to China, who could be involved in the war. The idea that our military can (or should) secure exports in their current distributions is impossible.

It is important to acknowledge that in a long-run war, some exports may still be very important if we are to continue to fund the imports required for the war effort. However, it is very difficult to predict the changes to export amounts, prices, and destinations in this scenario.

Our export offerings include ubiquitous metals, energy, and foodstuffs which are in demand throughout the world, some good share of which can be accessed via Southern ports well removed from the highest threat-zones in China. The prospect that we will have no means to offset the imports we require by some exports, of some substances, to some destinations outside of Asia is slim.

We will leave a detailed consideration of our rearranged exports outside the scope of this paper. Instead, we turn to focus on the criticality of our imports to our national security.

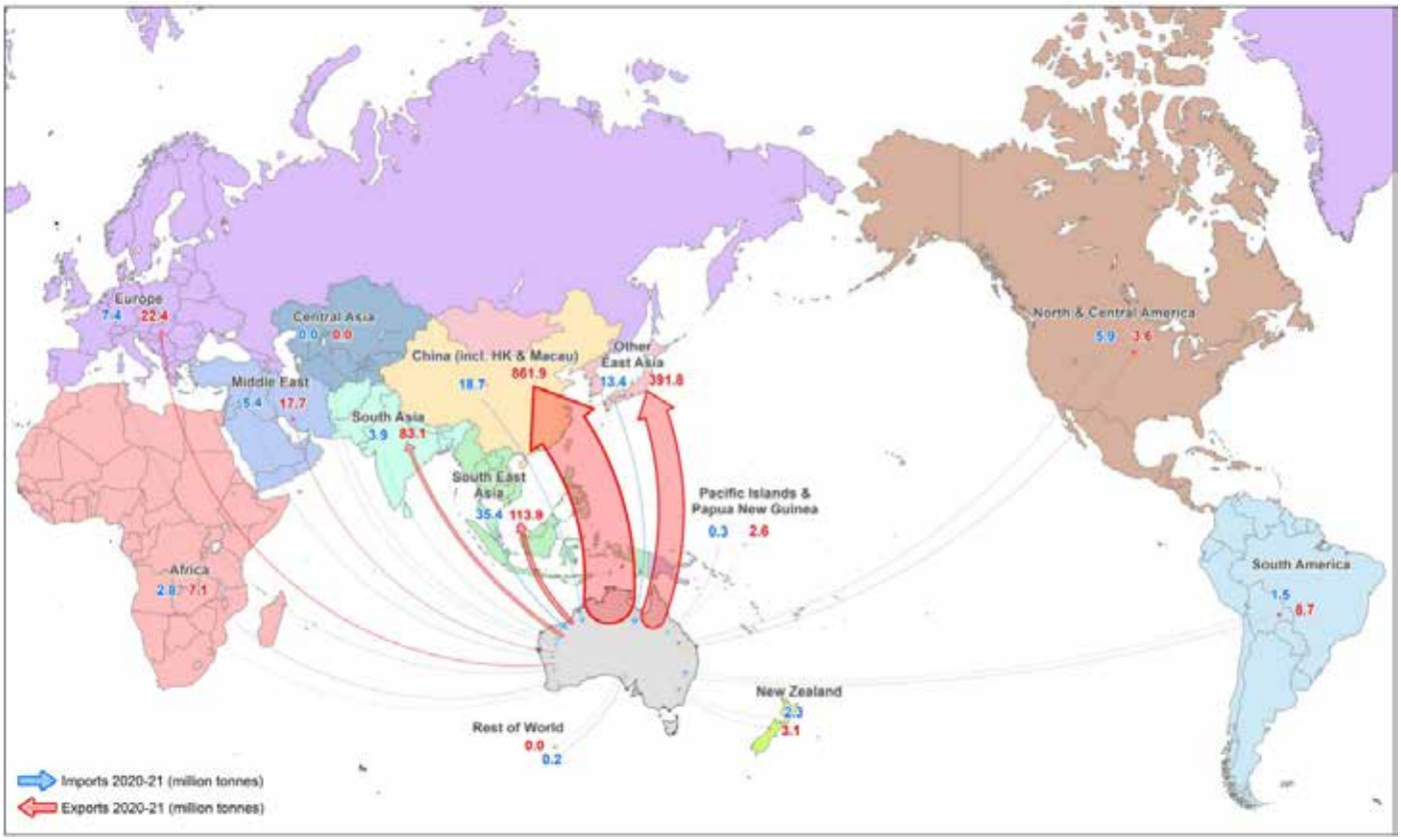

Figure 6 - Weight of Australia's international sea freight by trading region of final destination or origin, 2020–21 - From BITRE [25]

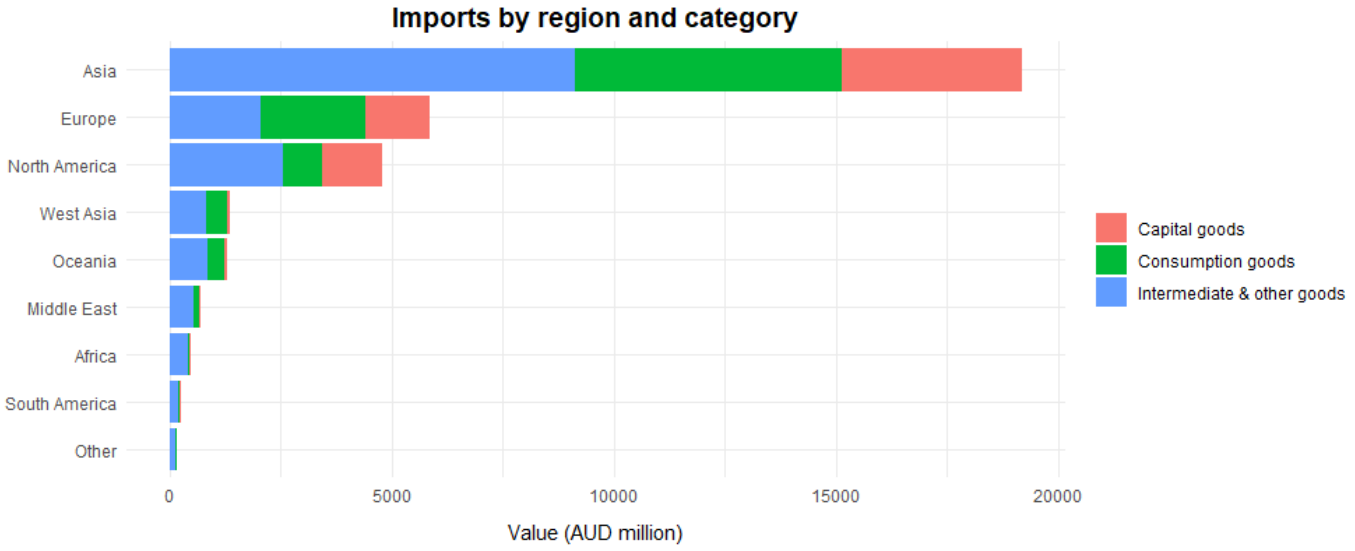

Figure 7 - Value of import categories by region of origin, December 2024[26]

2.2 The asymmetry of our liquid fuel and manufactured imports, by volume and value

Liquid fuels are by far our largest import by volume. When combined with chemicals, they make up over 60% of the weight of our imports. Yet by value they represent a modest minority of our imports. This mirrors the asymmetry discussed in our exports and imports, where the most valuable stream of shipping is also the smallest one. The extremely critical nature of our reliance on bulky liquids spoils the prospect of concentrating our efforts on the smaller sub-stream of shipping.

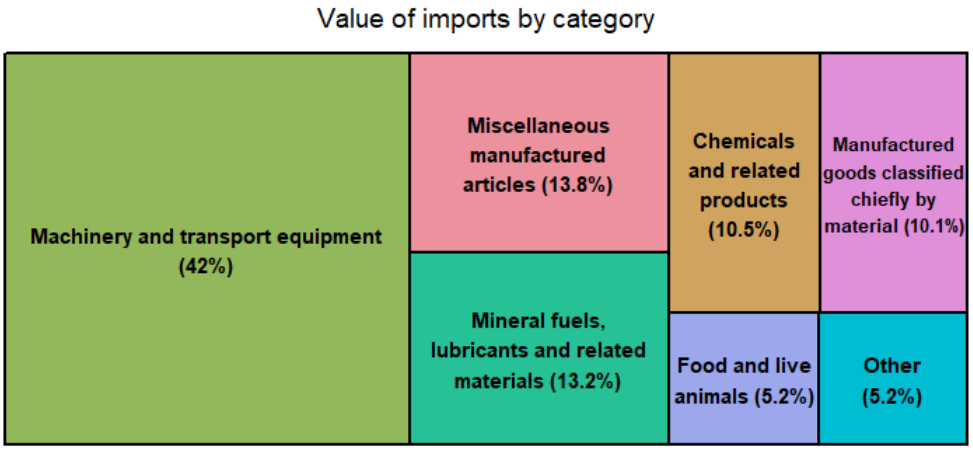

Figure 8 – Distribution of the value (AUD FOB) of Australian imports by category[27]

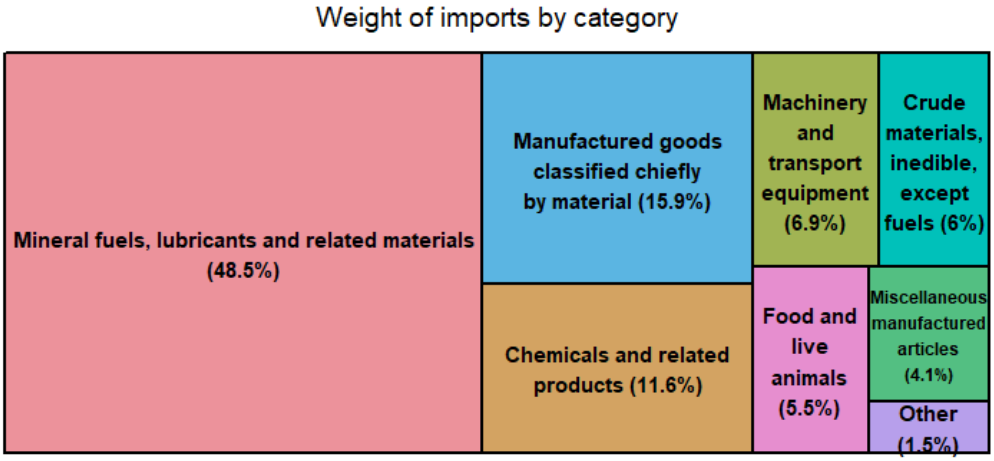

Figure 9 - Distribution of the weight of Australian imports by category[28]

The above two charts tell a story of the inverse weight-value relationships of our imports. Liquid fuels make up 13% of the value, but 48% of the weight, and machinery makes up 7% of the weight but 42% of the value.

We can assume that most machinery, medical, and technological imports are high-value, and low-volume, currently arriving via container ships or general cargo. A subset of this is possibly light enough to be air-freighted if needed.

Australia produces plenty of food, so we can assume our food imports are a luxury – not necessary for survival. Portuguese wine and French cheese are nice, but we won't need these in a crisis. We can also assume the majority of 'Manufactured goods classified chiefly by material' are cheaply made but non-essential consumer goods.

Crude inedible materials include many products which we readily can readily produce in Australia, such as clinker[29], but are increasingly tending to be imported due to increasing costs of accounting for carbon emissions in Australia.

This means that if we exclude liquids such as fuel and chemicals, only a relatively tiny volume of shipping might actually be critical to Australia. Perhaps 70 million tonnes of annual imports are critical currently, but 50 million of this is oil or refined oil, and 10 million constitutes chemicals that would likely be produced domestically if petrochemical feedstocks were available.

If we can exclude liquid fuels and chemicals, perhaps 10 million tonnes of annual imports are genuinely critical to Australia. This is two orders of magnitude less than the total volume of imports and exports. Whilst we currently have perhaps 80 ships arriving in Australia's ports daily, perhaps five or ten are currently essential to our survival, and this could only be one or two if we could produce our own liquid fuels and chemicals.

Currently, our dependence upon imported liquid fuels and chemicals single-handedly spoil the remarkable opportunity our continent-island affords us to be largely self-sufficient in every bulky raw material that our economy requires.

2.3 The temporal intensity of our liquid fuel dependence

Liquid fuels are uniquely critical amongst critical goods because of the time sensitivity of our dependency on liquid fuel. A protracted period of unavailability of almost all other import categories would not be catastrophic, with the possible exception of certain medical supplies. Without fuel, however, Australia stops, and stops quickly. We are heavily reliant on fuel for freight – both rail and trucking, as well as agriculture and mining, especially in remote areas. Taking food as an example, fuel is required for every step of the supply chain, from the farm to the supermarket shelves.

These factors make liquid fuels a matter of utmost national security concern. Energy security is essential to national security.

So how are liquid fuels currently treated compared to other national security and defence concerns? On a national level, we recognise the importance of a domestic supply of critical minerals. The government has recently proposed to

underwrite offtake from projects and establish a stockpile, in addition to expanding the $4bn Critical Minerals Facility.[30]

Likewise, at varying levels within Defence, it is recognised that national manufacturing capability for key requirements is necessary. This is the case for small arms and munitions[31] and increasingly for other areas of capability such as guided weapons and explosive ordnance.[32]

It is arguable that fuel is even more critical than some of these industries, where a shortfall might only have severe effects over months or years. The effects of a protracted supply issue of fuel would be many times more devastating and develop much faster than a supply issue with critical minerals, small arms or even larger munitions. To date, little has been done to bring about any meaningful fuel security. This has been an area of concern for commentators and the government for at least a decade, but there are serious flaws in the recommendations and policies.

2.4 Status report on current fuel security

Australia imports around 95% of its liquid fuel requirements from overseas, with over 75% of our total demand coming from the Asian region.

Australia has required roughly 377 million barrels of liquid hydrocarbon fuels per year over the last decade. This equates to just over 1 million barrels (MMbbl) per day.[33]

The last 15 years have seen the steady decrease of our domestic refinery capacity, from seven operating refineries in 2010 down to two today, resulting in an increasing reliance on imported refined products, primarily from Asia.[34] More than 80% of our liquid fuel imports are refined products, of which a combined 79% comes from Singapore, Taiwan, China, Korea or Malaysia. If Australia became involved in a great power conflict, the proximity of these nations to a likely hostile China would mean trade of oil products with any of them would most likely become impossible if China sought to oppose it.

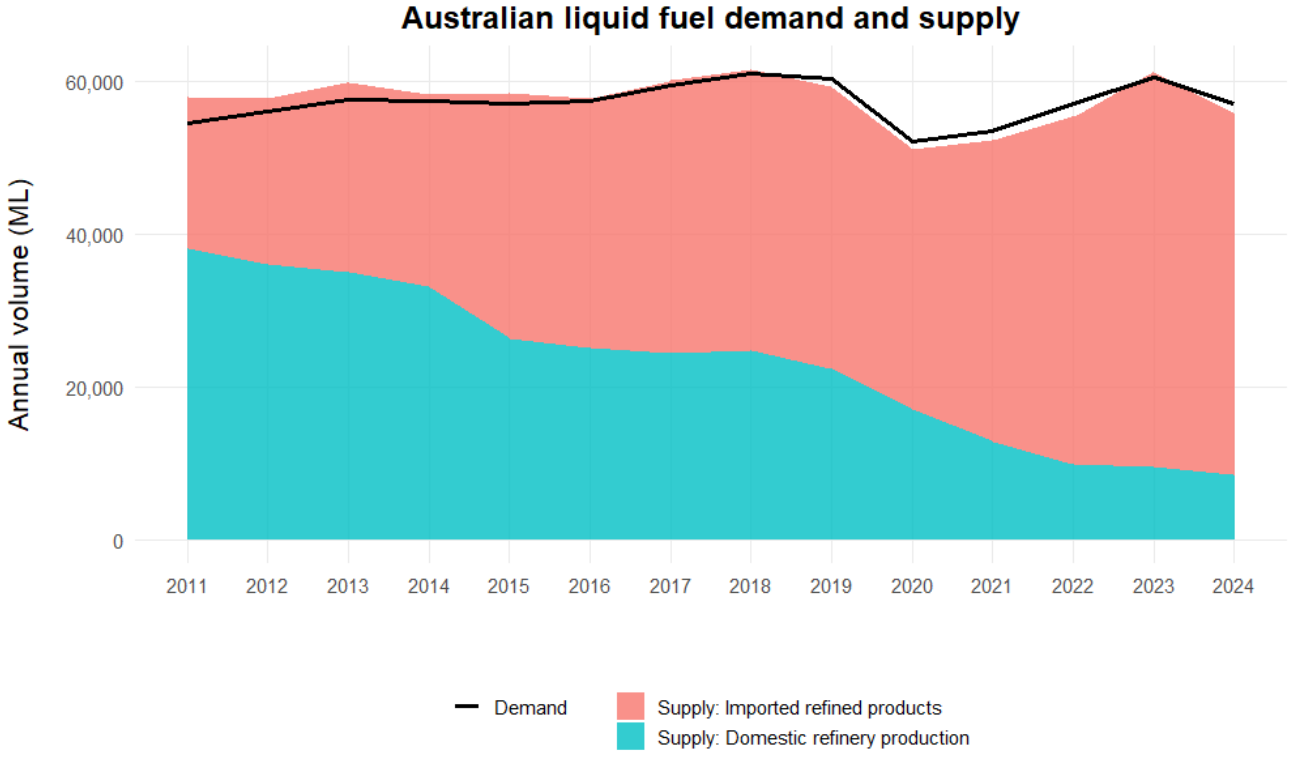

Figure 10 - Australian domestic liquid fuel demand and supply [28]

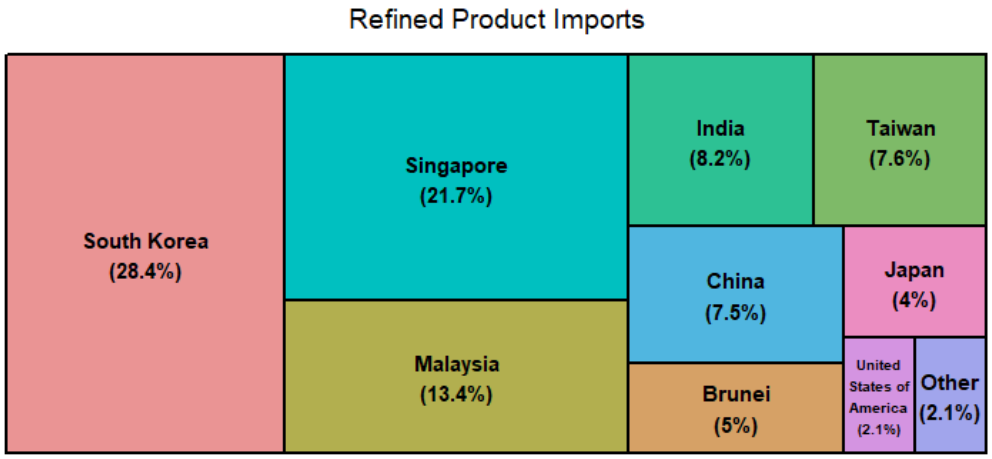

Figure 11 - Refined liquid fuel imports by country of origin [28]

Australia's crude production *and* remaining reserves of resources are also very small, and we source less than 20% of our refinery feedstock domestically, relying on crude imports for the rest.[35] This means that only 4% of our fuel demand is met by domestically produced and refined oil.

Australia has two operating refineries, supplying roughly 20% of the fuel demand:

- Geelong, VIC, operated by Viva Energy Australia, capacity of 120,000 bpd[36]
- Lytton, QLD, operated by Ampol, capacity of 112,000 bpd[37]

The Australian government passed the Fuel Security Act 2021[46], which is intended to guarantee the economic feasibility of these refineries into the future, recognising their importance to national security. Notably, the Australian Defence Force has contracted Viva Energy for the supply of several military-specific grades of fuel.[38]

However, we still import 80% of the feedstock for the refineries[30], and a combined 58% of our crude oil imports are coming from Malaysia, Brunei and Vietnam. An illustration of the criticality and vulnerability of these locations is seen in the fact that Japan specifically targeted Borneo in order to obtain oil at the start of their campaign in WWII. Borneo was captured in less than three months, with Australian forces going to significant effort to recapture the territory in the Borneo campaign.

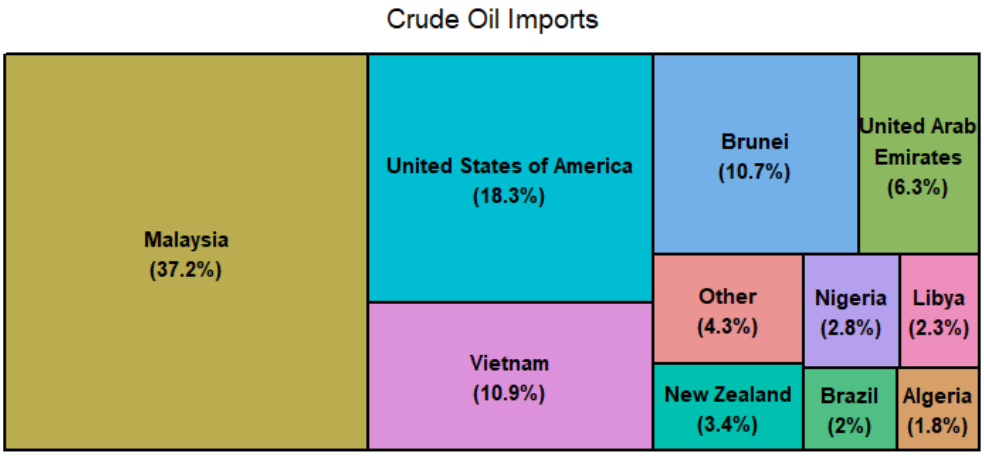

Figure 12 - Crude oil imports by country of origin [28]

Thus, it is clear that we rely on shipping imports for more than 90% of our liquid fuel requirements. In an Asian war scenario, 76% of our liquid fuel requirements would be in immediate jeopardy.

2.5 The asymmetry in our fuel types, by demand and potential supply

Australian oil demand used to be heavily weighted towards petrol, but today diesel dominates our overall demand, as shown below from historical data[39] and the latest official sources[40], in Figure 13.

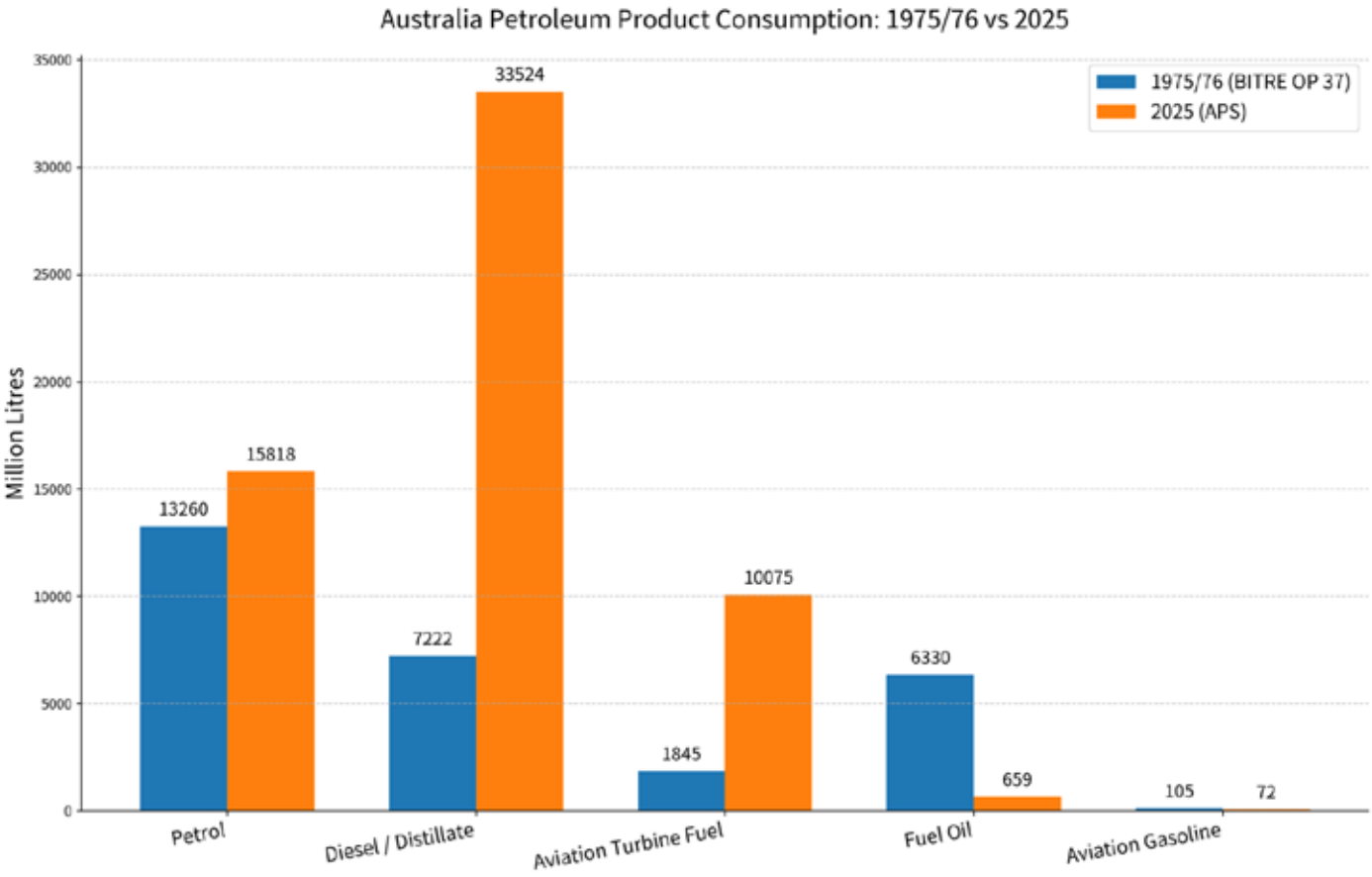

Figure 13 – Comparison of Australian Consumption of major petroleum products in 1975 and 2025

This shift toward diesel and aviation turbine fuel matters because it changes the fuel mix that must be prioritised, with implications for both feedstock requirements and refining processes.

In particular, petrol is a very light refined product, dominated by molecules between 5 and 10 carbon atoms. Diesel is a heavier fuel, with molecules averaging roughly twice this size, with aviation fuel being just slightly lighter than diesel.

In general, the processes available to refineries are better at breaking larger molecules into smaller ones (cracking) rather than bonding smaller ones together. This means that feedstock availability tends to have a direct impact on what production slates are economically viable.

Product Category	Typical **Central** Carbon Number Range[41]
Gasoline (petrol)	C5-C10
Kerosene and Jet Fuel	C11-C13
Diesel	C13-C17
Fuel Oil	C19-C25

Much of Australia's domestic crude oil production, particularly from the Gippsland Basin in Bass Strait, has come from relatively light crude discoveries. This meant that they naturally yielded relatively high proportions of petrol, and refineries were set up to optimise for petrol production, even when operating with heavier imported crudes.

Today our remaining refineries still produce slightly more petrol than diesel, despite local demand for diesel being much higher.[42] Fluid Catalytic Cracking (FCC) processes which crack longer molecules into smaller ones with a high petrol yield have been dominant. The Geelong Refinery had a substantial upgrade to allow heavier fractions (more significant in imported heavy crude) to be converted to petrol via this type of catalytic cracking process in 1992.[43]

Unfortunately, as Australia's oil production declines it is tending towards an even lighter range of feedstocks, with the dominant light crude from the Gippsland Basin in Bass Strait now almost exhausted, and relatively minor heavier crudes from the Carnarvon basins also drawing down.

This shift towards a higher share of condensate was anticipated for some time[44], and without new discoveries of significant heavier grades of oil, will greatly confine the possible slate of refined outputs that would be possible to produce from our own resources, and make it practically impossible to meet our diesel-heavy demands unless a sustainable and secure source of larger molecules in our feedstock can be secured.

As can be seen in Table 1, only heavy and medium crude oil contain fractions of longer molecules significantly greater than that of naptha, the primary precursor to petrol. Even if our condensate could be directed to suitable local refinement, they would only serve to worsen the current imbalance between our petrol-skewed refinery output and our diesel-heavy demand.

Table 1: Indicative distillation yields by feedstock (specific examples, % of barrel)

Feedstock	**Gas (C1–C4)**	**Naphtha (Petrol) ~C5–C10**	**Middle Distillates (Kerosene &Die-sel)~C8–C22)**	**Vacuum Gas Oil ~C20–C40**	**Vacuum Residue ~C40+**	**Reference / Notes**
Heavy Crude (M aya)	3%	17%	26%	18%	36%	EIA (2015)[45]
Medium Crude (Hibernia)	1.5%	20.5%	32%	29%	17%	Jechura (2019)[46] Slide 22 – TBP cuts
Light Crude (Bakken)	4%	35%	37%	18%	6%	EIA (2015)
Condensate (Gippsland)	2%	79%	18%	1%	0%	ExxonMobil (2025)[47] full TBP + molecules table (naphtha increased by 12% to absorb C5–C6 boundary overlap)
Low-Temperature Fischer–Tropsch (Co-LTFT)	12%	20%	22%	26%	20%	de Klerk (2009)[48] Table 1 (C22+ wax split by n-paraffin BP)

As well as the structural imbalance between our heavy demand slate for a diesel-dominated economy and the light grades of feedstocks available, a glance at the overall scale of Australia's demonstrated resources (including contingent resources) highlight the severe shortfall we have in all conventional oil resources.

Oil shale dominates Australia's demonstrated oil resources, but despite demonstration-scale processing being demonstrated in the Stuart Oil Shale Project between 1999 and 2004, no major projects are currently in production.[49]

It is important not to confuse **oil shale**, which Australia has in large quantities, with **shale oil**, which drove the American fracking boom.

Oil shale is a rock that contains kerogen - organic material that has not yet turned into liquid oil. To produce usable fuel from it, the rock must be mined and heated, or heated underground, to release a synthetic oil. That oil then usually needs further upgrading before it can be refined into finished fuels.

Shale oil, by contrast, is already liquid crude oil trapped in very dense shale or tight rock formations. It is extracted directly using horizontal drilling and hydraulic fracturing. Once produced, it behaves much more like conventional light crude.

Commodity	Type / Category	Total Demonstrated Resource (PJ)	Equivalent Units	Traded Commodity Value (AUD$/GJ)	Reference Price (conventional unit)	Notes / Highlights
Oil	Conventional (crude + condensate + LPG)	20398	3,557 MMbbl	23.4	AUD$143 per barrel	Brent-based crude oil benchmark (converted at prevailing AUD rate)
Oil	Oil Shale	78966	13,430 MMbbl	N/A	N/A	No commercial traded market; undeveloped resource
Oil	Other Unconventional (tight/shale liquids)	891	152 MMbbl	N/A	N/A	No commercial traded market
Oil	**Total Oil**	100255	17,142 MMbbl	—	—	~79% is oil shale (undeveloped)
Natural Gas	Conventional	174625	155.3 Tcf	13	AUD$13 per GJ	East Coast wholesale (producer contracts)
Natural Gas	Unconventional (CSG + tight/shale/other)	72802	64.7 Tcf	13	AUD$13 per GJ	Same traded market as conventional
Natural Gas	**Total Gas**	247427	220 Tcf	13	AUD$13 per GJ	East Coast wholesale benchmark
Coal	Black Coal	1959440	77,750 Mt	7.4	AUD$200 per tonne	Newcastle export thermal coal benchmark (~27 GJ/t)
Coal	Brown Coal (lignite)	3247899	331,424 Mt	1.5	~AUD$40 per tonne (domestic)	Mine-mouth power-station fuel; not internationally traded

Figure 14 – Total Demonstrated Energy Resources in Australia[50]

Oil shale would likely yield significant medium and heavy fractions in processing that would be suitable for producing diesel fuel.

With light condensate dominating our conventional oil resources, which in and of themselves still comprise perhaps just a decade worth of Australia's demand if fully exploited, it is difficult to avoid the conclusion that if Australia is to produce a significant fraction of feedstocks for its heavy diesel needs domestically, the local sources will look increasingly unconventional.

Conversions from gas or coal, or the exploitation of oil shale, will be necessary to provide material portions of our need for a significant period of time. New exploration for new conventional resources would doubtless yield new discoveries. But unless these discoveries rival or eclipse in scale the largest we've had to date, they will likely be supplementary to other sources, and insufficient on their own to singularly ensure long-term fuel security.

2.6 International comparison

Australia is far behind its international peers in relation to fuel security.

Energy independence has been the intention of the United States since Richard Nixon's Project Independence pledge in 1973 in the wake of the OPEC oil crisis.[51] The result was not instant, and it took until 2018 for the U.S. to finally become a net energy exporter as a result of the Shale Revolution.[52] Nevertheless, the U.S. government has been intentional in supporting investment and development of domestic oil production. The shale revolution was partially driven by government- sponsored technological improvements and deregulation, but it was ultimately achieved by the private sector.

Countries pursuing policies of energy independence include the United States, Brazil, Norway, Iran, Venezuela, Russia, China and India. Most of these countries have plentiful oil reserves. The latter two pursue policies of reduced reliance, rather than pure independence.

The U.S. Strategic Petroleum Reserve was instituted in 1975 and has the capacity to store 714 MMbbl in huge underground salt caverns. These are connected into the existing oil pipeline infrastructure on the Gulf of America. Until 2016, the reserve was full, although it has been sold down to roughly 400 MMbbl, which equates to approximately 19 days of US domestic consumption.

For nations not blessed with domestic resources, the response is usually to maintain large reserves. This is usually split between mandated storage capacity for industry, and government-owned stocks:[53]

Country	Crude production (% of demand)	Refinery capacity (% of demand)	Reserves/stockholding	
			Industry (government-mandated)	**Government-owned**
Korea[54]	0%	132%	40 days (in practice is 80 days)	123 days
Japan[55]	0%	91%	70 days (in practice is 90 days)	150 days
France[56]	0%	76%	98 days	73 days
Italy[57]	8%	139%	90 days	-
Sweden[58]	5%	217%	90 days	-
UK[59]	57%	86%	67 days	-
Australia	<20%	20%	30 days	-

In some cases, an abundance of coal or gas can make up for a lack of oil resources. This is the case in South Africa, which is the subject of a detailed case study in Part II.

3 First-principles fuel security

3.1 Unhelpful risk paradigms

The debate over fuel security in Australia has been clouded by weak assumptions about risk and weak definitions of success. Before discussing solutions, we need a clearer first principle: fuel security is not measured by whether a policy sounds prudent, but by whether it would actually preserve national function in a major crisis.

The first error is to think about this risk in ordinary peacetime terms. Many disruptions can be managed through diversification, modest buffers, or market responses. But major war is different. In such cases, risk is not well understood as a normal distribution of small and manageable interruptions with only a remote chance of something severe. Once a serious geopolitical threshold is crossed, the consequences escalate rapidly, and many of the assumptions of normal commerce cease to hold. This is why fuel security planning must be biased toward the most severe plausible contingency, not the median case.

The second error is to mistake a collection of partial measures for a coherent strategy. Some policy responses can look substantial while offering little real protection. Stockpiles are the clearest example. **Reserves are not a solution in themselves. They are only useful as a bridge to some credible means of restoring supply**. If that restoration cannot be identified, then extending the bridge does not remove the abyss beneath it. This is why calls for larger reserves, on their own, do not answer the core strategic question.

3.2 The case for government involvement in managing risk

The third error is to assume that fuel security can be left largely to market logic. In normal times, markets are highly effective at delivering efficiency. But they do not reliably insure a nation against strategic contingencies such as blockade, war, or the loss of maritime access. Nor should we expect private firms, acting individually, to bear the full cost of preparing for national emergencies whose benefits would be shared by the whole country. Fuel security therefore belongs in the same category as other essential strategic capabilities: the state need not do everything itself, but it has a legitimate role in shaping, underwriting, and enabling the conditions for resilience.

From these points, a simple definition follows. Sufficient fuel security consists of two things:

First, a credible means of securing or restoring enough supply in a crisis and;

Second, enough reserves to endure until that supply is available.

Anything less may reduce inconvenience, but it does not provide genuine security.

This provides the standard by which policy options should be judged. Diversification may help at the margins, but does not guarantee access in wartime. Demand reduction through electrification cannot solve the problem in the relevant timeframe or at the necessary scale. Stockpiling alone can only ever be temporary. The one option that changes the structure of the problem is increased domestic production. That is why the remainder of this paper focuses on domestic supply as the only serious path to genuine fuel security under the scenario that matters most: major war in Asia.

3.3 What comprises sufficient fuel security?

Australia will consume 1 million barrels per day of oil products for the foreseeable future.

Specifically, we require:

	bbl/day
Petrol	279,580
Diesel	574,205
Aviation turbine fuel	160,296
LPG	26,191
Aviation gasoline	1,211
Fuel oil	14,657
Lubricating oils & greases	5,548
Other products	11,071
Total	1,072,760

Table 1 - Australian petroleum requirements 2024[28]

Some percentage of the peacetime consumption should be chosen as the fuel supply to secure domestic production. The exact number needs to be the subject of substantial debate, and should be considered in conjunction with the sizing of a reserve. In a wartime scenario, discretionary use will decrease, and rationing will most likely occur. Overall civilian fuel use may decrease but this may be offset by military fuel use, especially if allies such as the U.S. base a portion of their forces here.[103, 104] The Department of Industry, Science, Energy and Resources (DISER) report asserts the 'critical' portion of the fuel supply is 26%.[53] However, during the pandemic lockdowns in 2021 the national fuel usage only dropped by 20%, which suggests that much more than 26% of our fuel supply is critical.

Another consideration is the interaction of our security with a hostile adversary's planning. As long as our domestic production is only a trivial fraction of our overall needs,

an adversary can tailor a naval capability around cutting off our seaborne supplies, knowing that at some certain future point (determined by our reserves, which are publicly known) Australia would be economically crippled. This allows considerable leverage to intimidate us short of conflict breaking out, since their ability to impose catastrophic pain is so clear. This further encourages an opponent to develop such a capability, since the pay-off is clear. With only 30 days of reserves, and near-total dependence on imports, successfully sinking a single convoy would bring us to our knees. Honing the ability to do this has clear returns for an adversary.

If we can cover a meaningful share of our normal demand domestically, particularly at levels we could sustain by curbing discretionary use, as we did during COVID, then a maritime blockade becomes far less predictable as a coercive tool, especially when backed by a credible reserve. This would discourage adversaries from investing in such a capability, since it would achieve vastly less leverage than if the expiring of reserves was imminent and catastrophic.

If our domestic supply is enough to meet or exceed our domestic capability, (i.e. exporting some fuel or chemicals, as well as supplying our own routine needs) then cutting off seaborne oil supplies would have no impact on us. Furthermore, in a position of production surplus, we would likely be immune to many efforts to damage domestic production through sabotage or long-range missile/drone strikes, particularly in conjunction with some stocks held in reserve.

Perfect security has no sharp threshold. But the underlying test is clear: a large fraction of routine demand, and an even larger fraction of essential demand, must be securable. Otherwise reserves provide only a longer countdown to failure.

3.4 Measures to contribute to fuel security

Thinking from first principles, there are four main ways to reduce one's vulnerability to disruption of supply of an imported consumable product:

1. Reserves - Build a stockpile of enough of the product to last the period of the outage;
2. Diversification - Shift or diversify the supply of the product away from the primary risks;
3. Demand reduction - Consume less of the product, to reduce the impact of shortfalls;
4. Domestic production - Onshore production such that it is not vulnerable to the primary risks.

3.4.1 Reserves – a longer bridge into the abyss

Australia's reserves are measured in days of consumption and are therefore currently only useful to alleviate short-term disruptions in the supply chain.

The cost of a reserve will always scale with the amount of storage capacity required, both for the storage facility itself and the capital cost of the product. The shelf-life of petrol and diesel is about one year[60], which effectively caps the maximum storage usefulness.

The Fuel Security Act 2021[61] established a national fuel reserve through an industry minimum stockholding obligation (MSO), where roughly one month of reserves of refined products is currently held by fuel importers.[62] The government's own costings for the MSO indicate a tiny 0.15 c/L increase in the fuel price[63], primarily because the rules allow stocks on water in the Exclusive Economic Zone to be counted towards the coverage, meaning that the cost figures do not forecast *any* capital cost for storage. If the costs were actually as low as claimed by the government, there would obviously be a strong case to increase the reserve to at least six months. However, other reports have cited likely costs closer to 3 c/L.[64] It is reasonable to assume that if the coverage days were to increase, storage would have to be built, and the costs would increase substantially.

Alternatively, crude oil is easier to stockpile than refined products because it can be stored in large ground reservoirs and has no shelf life. No such storage currently exists in Australia, despite the geological potential for it.[65]

The problem with a reserve strategy is one of sufficiency. It is an example of 'patchwork approach' thinking. In the real world, careful design is required to ensure a reserve connects effectively with other measures to restore supply. Under our key risk scenario, what length of time do we anticipate fuel imports to be unavailable for? Given the current reserve requirement is 30 days, do we intend to maintain sovereignty and economic function for longer than a month?

It is also an example of the 'inanimate threat' error. If our reserves can be measured in days, any malign actor can simply target this vulnerability and force our submission.

Any recommendations for more robust stockholding requirements are ultimately inadequate unless they account for the entire period of a major war in Asia. This is the key flaw in a stockholding tactic – the period for which we might need the reserves is unknowable, but it is likely to be far longer than a month.

Doubling our reserve requirement to 60 days might seem like a good idea. In reality, what events would it help us cope with that 30 days would not? Is a period of 180 days even enough?

When considering the scenario of a major war, it becomes obvious that even large reserves would not make our fuel supplies fundamentally secure. An incremental increase in reserves does not really deliver an incremental national security benefit until it connects with an effective strategy to restore supply. In a major war, this requires considerable military success. Of course, short of war, reserves are still useful for minor disruption scenarios. But any strategy that measures our readiness in 'days' will leave us profoundly unprepared for a serious war.

This is an extremely important point – one that runs counter to the prevailing rhetoric. The most common criticism of Australia's liquid fuel security is that we do not have large enough reserves. But the criticism should be of reserves as a strategy altogether. They do almost nothing to ameliorate risk in our worst-contingency: a major war. The only exception to this would be reserves large enough to serve as a bridge to other production methods – for example, to give us time to scale up coal-to-liquids technology to a national scale. Such a transition would likely take 12 months or more, which would require very large reserves and incur significant costs.

3.4.2 Diversification – many vendors, negligible impact on risk

If the key risk scenario involves imports from Asia, could we diversify our supply chain away from Asia? Or at least prepare to be able to quickly redirect supply in the event of a crisis?

Such a strategy would probably benefit from importing a larger proportion of crude oil and reducing reliance on refined fuel, in order to reduce concentration risk on the relatively few regions that export refined fuels. This would then need to be accompanied by an increase in refinery capacity.

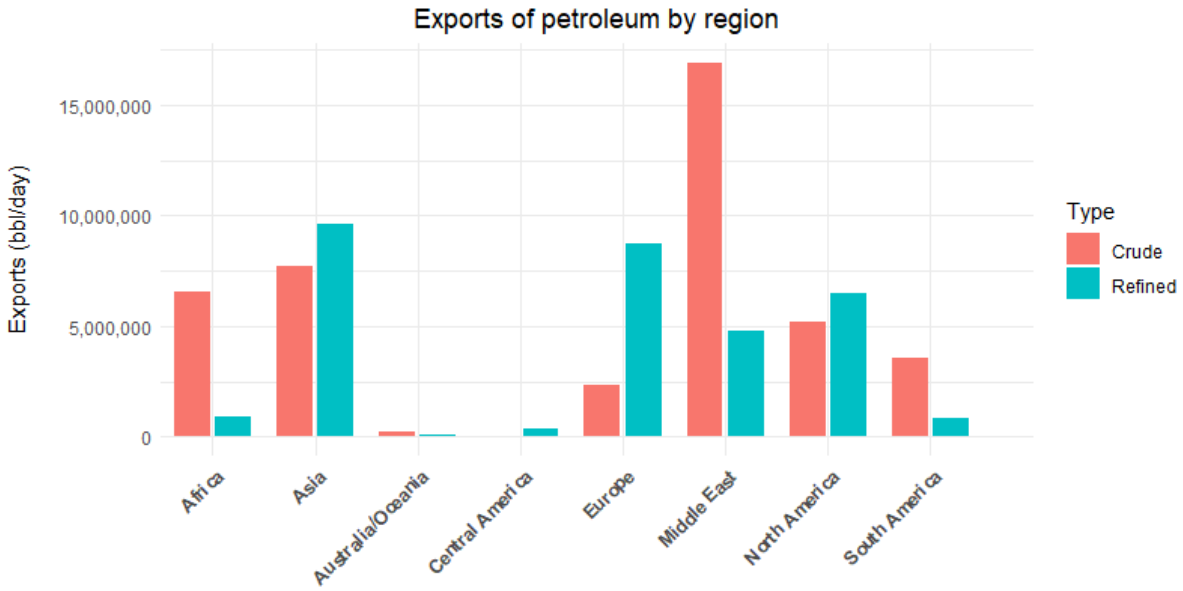

Figure 13 - statistics on exports of different fuel types across regions, 2021[66]

Assuming Australia continues to rely on refined fuel, the peacetime cost of diversification will simply be the spread between prices of fuel obtained from Asia and other regions. Assuming fuel prices are relatively globally competitive (to prevent arbitrage), our modelling suggests that fully diversifying fuel imports would increase the freight costs from about 1 c/L to 3 c/L[67].

	Asian imports	Diversified imports
Weighted average journey days	10.4	26.6
Average voyage cost, MR tanker, (AUD)	638,283.0	1,635,252.7
c/L freight component of fuel	0.011	0.029

This might suggest that diversification is a relatively low-cost way to improve fuel security. But the current war involving Iran has reinforced why that conclusion is too optimistic. In a major power conflict, it is not safe to assume that global oil markets will simply rebalance and that supply sourced from outside the immediate theatre will remain secure.

The disruption around the Strait of Hormuz has shown that even partial interdiction, threats to shipping, higher insurance costs, attacks on energy infrastructure, and uncertainty over access can materially impair flows through one of the world's most important energy chokepoints. Around a fifth of global oil and LNG trade ordinarily passes through Hormuz, and recent fighting has already tightened Asian crude supply[68], forced rerouting, and prompted the IEA to consider further releases from strategic reserves.[69]

The broader lesson is that diversification reduces concentration risk in normal times, but it does not guarantee security in war. The risk of Middle Eastern disruption may be correlated with Asian disruption rather than offsetting it. If conflict in Asia expands into a contest over energy supply, it is entirely plausible that oil moving from the Gulf to Asia would become a strategic target, whether through direct interdiction, coercion of shipping, or attacks on regional energy infrastructure.

The present conflict has made that point harder to dismiss. It has also shown that emergency stock releases, while useful, are temporary relief measures rather than substitutes for secure supply. For Australia, that matters because the question is not merely whether fuel can still be bought somewhere in the world, but whether it can still be delivered here reliably in the conditions that matter most.

3.4.3 Demand reduction – a long road to little gain

Demand for fuel could be reduced through the electrification of passenger vehicles or through fuel efficiency standards. This is partially useful, as it would increase the length of benefit received from a nominal capacity of reserves. But the major flaw with this approach is that passenger vehicles make up only 30% of the total liquid fuel demand.[2] The remaining sectors are likely to be resistant to electrification in the longer term.

Passenger vehicles have good electrification prospects due to factors like peaky demand, relatively high charge-to-use time ratios, short distances, and proximity to urban infrastructure, but almost entirely rely on petrol. In contrast, sectors like freight (rail and trucks), aviation, and mining involve long hours of operation, long distances, remote locations, minimal downtime, and hence a requirement for high energy density and lower volatility diesel. Costs to electrify will increase non-linearly with all of these factors.

Fuel efficiency standards are also costly, but these costs are borne by consumers, rather than the government, through increased complexity and maintenance costs, fuel additives, and higher manufacturing compliance costs – all arguably offset by lower fuel consumption costs. If there were clear benefits, market action would render government-mandated standards unnecessary. This would be the case for any remaining fuel efficiency improvements the government proposes to mandate. Logistics companies are already heavily incentivised to reduce their fuel bills. The imposition of more stringent standards is unlikely to deliver net cost benefits.

Even if highly ambitious targets to electrify much of the passenger fleet are achieved, the bulk of fuel demand – including the most critical sectors – remains vulnerable. Reducing non-essential demand may lower overall fuel use, but this does little to address the ongoing reliance of sectors like aviation, agriculture, mining and freight on a steady supply of fuel.

Demand reduction as a strategy therefore doesn't really increase fuel security, because there are low prospects of substantially reducing the actual critical demand. The only potential benefit of demand reduction would be to marginally lower the overall cost of holding reserves since a smaller volume would be required for the same number of days of supply.

3.4.4 Domestic production – the only satisfying solution

Domestic production isolates the supply chain from geo-political disruption. Of course, the natural resources must exist to do so, and they must have a reasonable cost of production. Unlike reserves, an incremental increase in domestic production produces an incremental national security benefit for the key risk scenario of a protracted supply issue.

This would involve exploration and drilling for conventional and unconventional petroleum products, as well as synthesising fuel from non-crude sources (coal, gas, biomass). Even production of alternative fuels like ammonia or hydrogen would also be classed in this category.

Costs for domestic production will be considered in Part II. It should be noted that this is the only strategy with the potential for an inverted cost curve, where domestic fuel production becomes *cheaper* with economies of scale.

Domestic production is the only strategy that results in genuine security from the dominant geopolitical risk of war, which would dramatically escalate the threat to all seaborne oil imports**.** All other strategies leave us exposed to a substantial amount of risk in this scenario.

3.5 Realistic options for genuine fuel security

Once we seriously consider the scenario of a major war in Asia, contemplate the implications, and define our goals, it becomes clear that domestic production is the only solution that genuinely mitigates the risks we face from a major power war in the Pacific. It is acknowledged that other strategies are indeed useful in less extreme scenarios. But there should be no confusion: they do not contribute to our national security under our most challenging threat.

The conclusion we arrive at requires us to leave behind the false comfort of a 'she'll be right' approach. But ultimately, a program of half-hearted, inadequate solutions isn't much better than putting our heads in the sand. It falls short of protecting against our most significant risks. It would be like insuring a house against everything except major damage and hoping it never catches fire.

We will turn now to consider the state of the current policy debate using this framework.

4 The major flaws of existing policy proposals

4.1.1 Overview

Over the last decade there has been much discussion in parliament and in several government and private reports highlighting the importance of our liquid fuel supply to our national security. Most commentators agree that our fuel supplies are vulnerable, although there are different views on the urgency of the problem and the potential solutions.

The Department of Industry, Science, Energy and Resources (DISER) completed a liquid fuel security review in 2019.[70] A subsequent parliamentary committee also featured significant discussion of liquid fuel security and sought departmental and industry advice.[71] This resulted in the Fuel Security Act 2021, under which refinery support and a minimum stockholding obligation were instituted.

The parliamentary committee itself notes that

> *Australia's civil and defence fuel security should be an area of urgent specific strategic focus for the Government, particularly as Australia's primary geographic area of national interest has moved from the northern hemisphere to regions and countries closer to home in an increasingly unstable geopolitical environment.*[54]

An honest look at the evidence reveals that almost no substantial progress has been made on fuel security.

The key recommendations of the commentary to date are summarised below.

Report Issuer	Reserves	Diversification	Demand Reduction		Domestic production		
	Stockholding and storage	Australian crewed fleet	Electrification	Fuel efficiency standards	Refin-ery support	Alternative fuel synthesis	Explore and Drill
DISER[53]	Y				Y		Y
Blackburn[72]	Y		Y	Y	Y	Y	
ASPI - Hellyer[73]			Y				
ASPI - Yildirim[74]						Y	
ASPI - Stevens and Coyne[75]	Y						
Lowy Institute[76]						Y (SAF)	
Maritime Union[77]		Y					
Australia Institute[78]			Y				

Below is a timeline of the commentary, key events and actions to-date.

2000	Australia reaches peak domestic liquid fuel production
2009-2011	NESA – National Energy Security Assessment. Fuel security assessed as high in short term, moderate in long term. Increasing reliance on international supply chains is predicted but not seen as a big deal
2011	Closure of Clyde refinery
2012	Closure of Kurnell refinery
2013-2014	NRMA publish Blackburn reports in two parts, 'Australia's Liquid Fuel Security', noting our low reserve levels and reliance on imports, and our vulnerability to a confrontation in the Asian region. Recommendations include reducing demand, increase stocks, develop alternative fuel sources, supporting refineries
2013	Hale & Twomey report prepared for the Department of Resources, Energy and Tourism, noting the insecurity, but predicting that the commercial market can adapt to almost all supply chain disruptions in reasonable time
2014	Oil price collapses from ~$100 to ~$50, and domestic exploration starts to decline
2015	Closure of Bulwer Island refinery
2015	Senate Inquiry into Australia's transport energy resilience and sustainability. Recommendations are: a whole-of-government fuel supply risk assessment, the creation of a Transport Energy Plan, and the requirement for fuel suppliers to report stock levels to the government.
2018	Parliamentary Joint Committee for Intelligence and Security recommends government investigate the fuel security situation
2019	Department of Environment and Energy complete 'Liquid Fuel Security Review – Interim Report', and seek public consultation and submissions
2019	Department of Industry, Science, Energy and Resources complete the Liquid Fuel Security Review final report and present to government
2020	Angus Taylor, Minister for Energy and Emissions Reduction, announces deal with US to store crude oil in their Strategic Petroleum Reserve
2021	Kwinana and Altona refineries close
2021	Joint Standing Committee on Foreign Affairs, Defence and Trade Inquiry into the Department of Defence Annual Report 2019-20. Fuel security discussed with reference to the Review. Overall, Defence and industry representations imply the fuel security is relatively robust.
2021	Government passes the Fuel Security Act 2021, which mandates fuel holdings for all importers, and underwrites the two remaining refineries
2021+	A flurry of commentary from ASPI and other institutes, with varying recommendations
2021-2024	PEP-11 gas exploration title off the NSW coast is cancelled arbitrarily by Scott Morrison, then after a court case is resurrected only to be cancelled again under Labor. NSW parliament passes a ban on all offshore drilling.

4.1.2 Failure to acknowledge and prepare for the most significant risks

Perhaps the greatest flaw in policy proposals to date is the lack of specificity around the key scenarios for which Australia is planning, and a failure to reckon with our most significant risks. The risk of war in Asia is dismissed as a remote possibility – too extreme to plan for. The fat-tail nature of geopolitical risks, and the recent fattening of this tail, have essentially been ignored.

Both the DISER report and the parliamentary committee discussion considered several supply chain disruption scenarios ranging from localised refinery outages to global conflict. In particular, a conflict causing disruption to the supply from North-East Asia is considered, but it is assumed that Southeast Asian imports would still be viable. In light of the Chinese militarisation of the South China Sea, this is a naive assumption. A 'worst case' scenario is also considered, where there is a protracted period of no fuel imports to Australia. It is noted that this will also restrict exports and likely lower overall domestic demands. The report effectively admits that this risk cannot be hedged, conceding that *"recommendations in this Review do not address all impacts of this extreme scenario. The cost of completely insuring against an event with such a low probability is far too high".*[79]

This is manifestly out of step with the Defence statement of the need for a "whole-of-nation effort to develop strategic resilience", in order to combat our "highest level of strategic risk we now face as a nation: the prospect of major conflict in the region that directly threatens our national interest".[9]

A further flaw in the approach is that the worst case looks considerably worse than assumed. The DISER report states that our critical services and infrastructure only require approximately 26% of our fuel demand, and therefore could continue to run in the event of a serious breakdown of supply chains.

It is worth pausing to note that a reduction to 26% of our fuel supply would be nothing short of an economic catastrophe – completely crippling our nation. Note that the pandemic lockdowns only saw a temporary 20% reduction in total fuel usage[28], despite the majority of the country being stuck inside for several months. Any extended amount of time in this situation will bring Australia to its knees, effectively making us exposed to economic coercion via a single mechanism – an Asian trade blockade.

The major recommendation of the DISER report was the minimum stockholding requirement, which led to the Government passing the Fuel Security Act 2021. As noted above, this is only useful in the case of a short-term supply shock.

During 2021, Australia also held 1.7 MMbbl (*less than two days of domestic demand*) of crude oil in the U.S. Strategic Petroleum Reserve in Texas[80], but these were released in 2022.[81] Australia currently does not hold any oil in the Strategic Petroleum Reserve. This example alone should ring alarm bells about the state of policy and commentary. Two days of unrefined reserves held overseas, a 40-day voyage away, contributes effectively nothing to our security. The episode illustrates how symbolic measures can be announced with considerable fanfare while delivering negligible strategic value.

Both the DISER and Hale & Twomey reports argue that our supply chains are robust and that the market has an incentive to resolve any supply issues with maximal efficiency. The idea is that price signals will simultaneously reduce demand and re-route supply until the system rebalances.[82]

> *As the DISER report puts it, "there are still good reasons to have confidence in the global oil market. The world will remain highly interconnected, and economies and businesses will still trade with each other … mutual interests create incentives to reduce the threat of major, disruptive incidents and promote a functioning oil market".*[53]

During the Joint Standing Committee on Foreign Affairs, Defence and Trade Inquiry into the Department of Defence Annual Report 2019-20, the ADF submitted that:

> *"the fuel industry in Australia is able to respond to a range of disruptions to critical shipping lanes to maintain reliable fuel supply to the country. They see that the shipping lane disruptions present a tactical response challenge to the industry as opposed to a fundamental loss of capability. They see this happening through an industry tactical response using alternative shipping routes and supply points to mitigate against shipping lane disruptions … This would result in us having an increase in supply chain lead time of about nine days because they would be looking to source fuel from as far afield as the US, India and the Middle East"*[54]

These comments are all fine with regard to low-medium level disruptions, but none of them hold true in the event of a major war, particularly given the context of our high dependence on refinement capacity in Asia. As has been demonstrated already over the several weeks of the crisis in the Gulf, countries like Australia will be competing with many other nations facing similarly constrained supplies, and war damage to facilities could lead to potentially long drops in output.

Several reports recommend mitigating risk via an overall reduction in demand for liquid fuels. This is supposed to be achieved primarily through the electrification of passenger vehicles or through fuel efficiency standards. However, as noted above, the vast majority of our liquid fuel demand is for applications which have little hope of effective electrification, relying heavily on diesel for critical functions such as supply chain transport and agriculture. Hence, this is likely to be a costly endeavour that does very little in terms of true security benefits.

5 Conclusion to Part I

After more than a decade of agitation and policy introspection, what has Australia prepared for? On review of the evidence, it must be conceded that all we are actually ready for is a minor blip in supply.

We remain decidedly unprepared for a major war, even though the geopolitical environment is becoming significantly more dangerous.

The current approach of refinery support for two small refineries and 30 days of refined reserves is a scattergun approach. It advocates for a little bit of everything but in effect delivers no real security. We remain incredibly vulnerable as a nation to any serious shock to fuel supplies, and we remain very far behind peer nations, who are doing much more than we are to ensure their fuel security.

What is needed is not incremental proposals for a bit more of everything, from reserves to biofuels or electrification. Instead, the current approach must be completely rejected. Policy makers have completely failed to ask the simple-but-hard question of just what approach results in actual fuel security.

The next section will consider the options available to us to remedy the situation.

Part II – Solutions for genuine fuel security are available

6 How to achieve fuel security

We have argued that Australia should produce a domestic supply of liquid fuel, as this is the only sufficient mitigation measure. Demand reduction and stockholding are ineffective on their own.

We now move to a discussion of how this could be achieved. Once a sufficient amount is decided on, sources can be assessed to see what combination of production methods can be used. Cost and scalability are the key factors in this discussion.

It should be noted that a government intention to mitigate risk doesn't necessarily lead directly to government intervention or spending. Solutions to the problem could still be provided by the market, providing proper signals are sent. In some cases, what is actually needed is a *removal* of government obstructions, rather than more government involvement.

If, in the final analysis, direct spending is required, then this must be justified on national security grounds, and the costs and benefits to both consumers, taxpayers and citizens must be very clearly laid out.

The section below surveys the available options, and we argue that there are ample commercially viable and well-trodden paths available to take.

6.1 Large scale crude reserves

Strategic role: a very large crude reserve could bridge Australia through a severe disruption while domestic production is scaled up.

Key constraint: it cannot be a stand-alone solution, because reserves only matter if they connect to restored supply.

Although 30 days of consumption cover is woefully insufficient, committing to a very large reserve of crude oil could be part of an effective plan to attain security, but only as a bridging mechanism to ramp up domestic production in a time of crisis. In other words, it could never be a standalone solution.

Crude reserves do, however, have one important advantage over refined products: they can be stored for much longer without degrading. If paired with sufficient refining capacity, and with geological storage options that allow very large volumes to be held at low cost, crude stockpiles could plausibly be expanded well beyond current levels. That in turn would allow reserves to bridge a wider range of contingencies for longer.

Australia has the geological potential for large underground salt caverns similar to the United States Strategic Petroleum Reserve.[50] Even built at half scale, that could deliver close to 12 months of crude storage.

The SPR cost around US$5 billion to build the facilities.[83] An Australian facility for 365 days of supply could reasonably cost roughly AU$2bn per year to maintain.[84] At a domestic consumption level of 1 MMbbl per day, this works out to a per-litre fuel cost increase of 3.5c. For context, the Australian fuel excise is now over 50c/L.

Australia could also substantially increase its refined fuel reserves without relying solely on expensive, centralised storage. One way to do this would be to encourage greater on-site storage among major fuel users such as farmers, miners, freight operators, and remote industrial sites. This could be supported through tax credits, accelerated depreciation, capital grants, or a dedicated national security storage payment.

To qualify, firms would need to show that they had increased storage capacity above an established baseline, maintained minimum fuel volumes with regular turnover, and agreed that the additional stocks could be directed or acquired by government in a declared national security emergency. This would increase the volume of fuel held within Australia, spread it more widely across the regions and sectors where it is most needed, and keep much of it in active commercial use rather than left sitting idle long enough to degrade.

6.2 Domestic exploration and extraction

Strategic role: expand Australia's own petroleum supply from conventional and unconventional resources.

Key constraint: current reserves, production rates and approvals settings are not yet aligned to that objective.

Possibly the most important question is: can we extract and refine our entire domestic supply from our own oil fields?

Australia has very little conventional crude resources, although this isn't necessarily a good indication of what is in the ground since proven reserves are the result of exploration, which has been in decline for some time.

Our total 2P (an industry measure of proven and probable resources) reserves of all conventional oil resources totalled 1,312 MMbbl in 2023, including less than 300 MMbbl of crude oil, with the majority of the remainder being condensate. This is less than 5 years of domestic consumption at 1 MMbbl per day. Even including contingent (2C) reserves, this number only grows to 3,557 million barrels, or less than 15 years' worth of demand.

Condensate, sometimes called natural gas liquids, is a very light oil extracted alongside natural gas. As discussed previously, these light feedstocks can readily produce a strong petrol yield, and contribute to some production of diesel. But in general they are not readily refined to produce a very high diesel yield which matches our demand slate.

Even if we *did* have the resource reserves, our current production rates (of which 80% is exported) total 51 MMbbl of crude oil and 75 MMbbl of condensate per year. If all of this were redirected to supply domestic refining needs, assuming we have the refinery capacity to meet our demand profile, this still only accounts for roughly a third of the domestic demand.

Australia does have very large, estimated deposits of unconventional oil resources such as shale oil and tight oil, as well as huge quantities of unconventional gas, but these are as yet undeveloped. The U.S. Energy Information Administration's outlook for technically recoverable resources[85] is positive: "With geologic and industry conditions resembling those of the USA and Canada, Australia has the potential to be one of the next countries with commercially viable shale gas and shale oil production".[86] These resources are mainly located in Western Australia, the Northern Territory, and Queensland.

There is a clear case for heavy investment in exploration and development of both conventional and unconventional oil resources as part of a strategy to achieve greater energy independence. In order to give companies the confidence to invest, these projects require clear and efficient legislative frameworks and clear signals that both sides of government are willing to permit and cooperate with the industry. Unfortunately, oil and gas exploration has become politically unpopular over the last decade.

In Western Australia, Woodside's North West shelf project extension has taken seven years to be approved, including four years in environmental review, and two years in an appeals process brought by activists over emissions concerns.[87] With regard to unconventional oil, a moratorium on fracking existed during 2017 but was lifted in 2018 after an inquiry found risks of fracking manageable.[88] Nevertheless, the practice is still banned in 98% of the state – everywhere except existing petroleum titles. The only project proposal submitted since then languished in environmental approval stages for four years and the company eventually gave up.[89]

In New South Wales, the Narrabri coal seam gas project is now more than two decades old and is still not approved[90], and the 2024 cancellation of the exploration drilling of the PEP-11 gas field off the NSW coast and subsequent total ban on offshore exploration and drilling is evidence that politicians are willing to pander to vocal activist groups instead of ensuring our national security.[91]

In Victoria, all onshore oil and gas exploration was banned between 2012 and 2020, and coal seam gas extraction and fracking are now constitutionally banned.[92] Conventional gas was permitted from 2020, but no new onshore licenses have been approved since then. Santos CEO Kevin Gallagher hyperbolically likened the Victorian jurisdiction to North Korea.[93] Some offshore gas exploration has been approved in the Otway region, but activists have also been successful in blocking a seismic survey that would have greatly increased investment in the region.[94]

In South Australia, exploration in the Great Australian Bight frontier region was abandoned in 2021, due to a convergence of factors. Offshore petroleum licenses are administered by the national regulator NOPSEMA rather than the states, and exploration drilling permits were issued to several majors, although no wells were drilled. The activity did face significant activist opposition, though this was probably not a major factor in the decisions.[95]

Queensland and the Northern Territory both have sensible policies that permit fracking. This has allowed significant investment, in particular the coal seam gas production from the Bowen and Surat basins.

Australian policymakers must remember that capital is globally mobile and will always take the path of least resistance. Regulatory or political barriers, the risk of barriers, or even the *perceived* risk of barriers all contribute to the flight of capital. Oil and gas companies will simply go to where it is easier to do business. The CEO of Santos puts it succinctly: "If I had $1 to spend in PNG, Alaska or Australia today for the same project and with the same economic returns, it would be PNG or Alaska because I know that, when I get my project approved, and I start to spend serious dollars, I get to finish the project".[77]

This is the first and most obvious starting point for any government action regarding domestic liquid fuel supply: stop obstructing companies willing to devote capital to the extraction of fossil fuel resources.

Of course, there must be strong legislation to protect the environment and people, but clearly the regulatory process is being used by activists to obstruct nationally important projects.

6.3 Domestic refinement

Strategic role: convert a larger share of domestic crude, condensate or imported crude into usable fuel within Australia.

Key constraint: refinery economics are challenging, so new capacity may require underwriting or a larger guaranteed market.

Australia's current 200,000 bbl/day refinery capacity will not be sufficient to supply domestic demand if refined fuel imports are cut off, even if alternative crude sources are found. Rebuilding significant refinery capacity will be essential if domestic oil production increases or if a strategy of diversification increases the proportion of oil imported as crude.

It is difficult to estimate the fundamental cost difference between domestic and foreign refined fuel. Australia's refineries are old, and relatively small by modern standards. However, refineries can also have much of their machinery incrementally replaced, making their lives technically very extendable. Neither size nor age alone prevent refineries operating, including in developed countries, such as the Ardmore refinery in Oklahoma, which was constructed in 1913, and has a current capacity of 90,000 barrels per day[96], which is less than some Australian refineries.

It is important to consider carefully what could have contributed to refineries closing in Australia, and whether Australian refineries are destined to be unviable for a structural reason which can or cannot be easily addressed.

Capital is globally mobile and will flow to the highest margin projects. Closure of refineries doesn't necessarily indicate that they are loss-making, but can simply indicate that it is even more profitable for refinery owners to concentrate their refinement capacity elsewhere.

The history of the 'crack spread' in refining petrol and diesel products is instructive when overlaid with Australia's refinery closures. The crack spread indicates the difference between the price of a barrel of a finished product, and a barrel of crude. This defines the potential gross margin that a refinery can make on this product.

As can be seen in Figure 14, the petrol crack spread is cyclic, and has been relatively flat around or just below about $9.25 cents per litre.

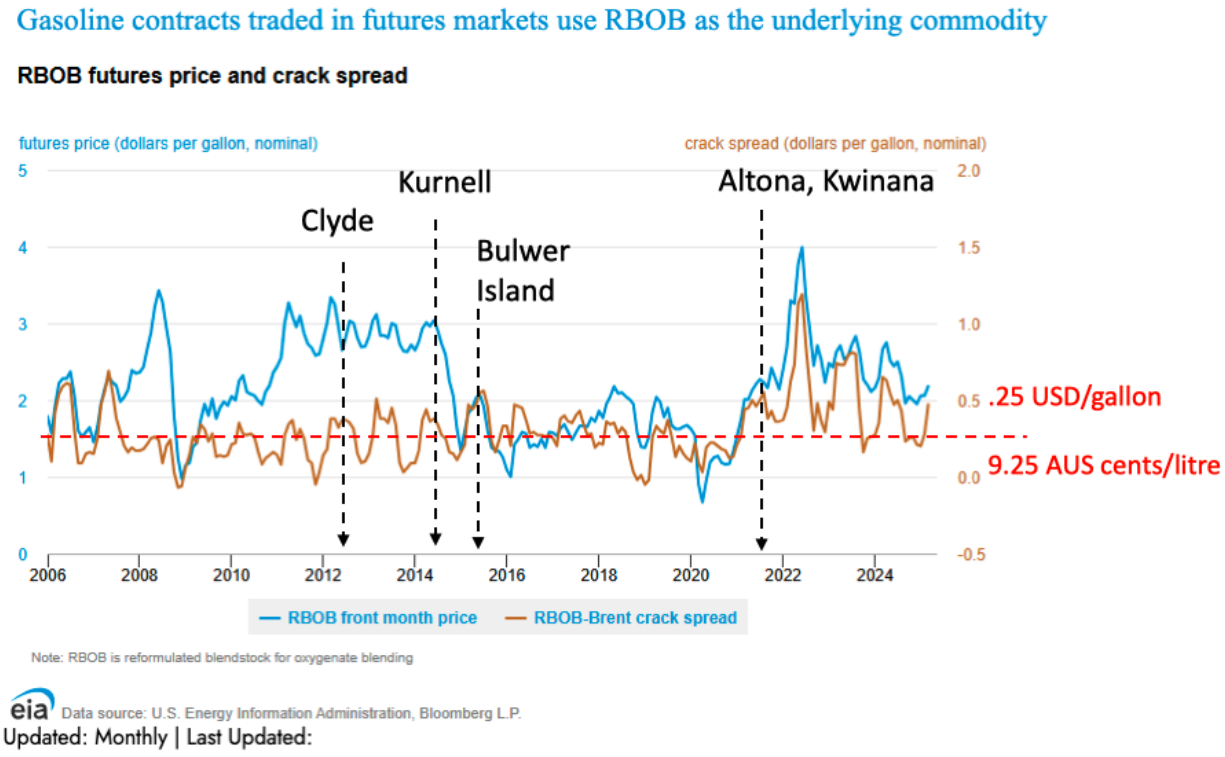

Figure 14: RBOB (petrol) crack spread on Brent crude and Australian Refinery Closures[97]

The situation for diesel was slightly different, with a less cyclic pattern, and relatively higher spread for significant periods, including during periods when refineries closed. It is plausible that diesel was a significant source of potential margin for our refineries.

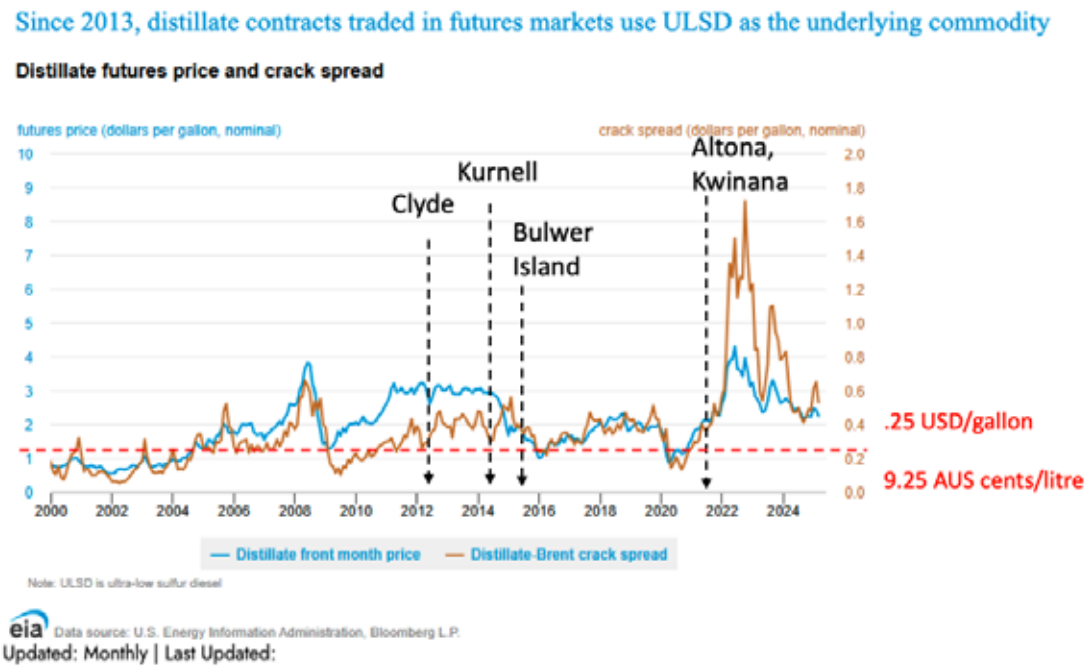

Figure 15: Distillate (diesel) crack spread on Brent crude and Australian Refinery Closures[98]

A possible explanation for the closure of refineries in Australia that is consistent with broad commentary about difficulty competing with new larger Asian competitors is that Australian refineries were not well suited to provide for the diesel-heavy demand slate that Australia had developed.

Not all refineries are the same. In particular, there are different methods available to crack heavier molecules down to lighter products. All of Australia's refineries were equipped with Fluid Catalytic Crackers (FCCs), which are ideal for producing relatively high petrol yields from heavier fractions, such as Vacuum Gas Oil (VGO).[99]

There is an alternative method for cracking larger molecules, called hydrocracking. This process has a fundamentally different approach to managing the change in the hydrogen-to-carbon ratio that necessarily increases as molecules are cracked, leaving more room for hydrogen to connect to the ends of carbon chains. In FCC, hydrogen is scavenged from some molecules to produce napthas (suitable for petrol), leaving other molecules stripped of all hydrogen, creating a coke residue. In most cases, the coke is simply burned off of the catalyst, though releasing a small percentage of the carbon feedstock to the air as CO2.[100]

Hydrocrackers instead add additional hydrogen to the reaction, saturating the molecules with hydrogen. However, this process happens at much higher pressure than FCC units, demanding heavy pressure vessels which represent significant capital costs[101], as well as a plant for producing and handling hydrogen at high pressures, which is also technically demanding and capital intensive.

Whilst capital intensive, these hydrocrackers have the advantage of being operationally efficient, eliminating any carbon waste, and also returning a very high yield of middle distillates suitable for diesel and aviation turbines.

A summary of the two processes is shown below. Between 2004 and 2018, world hydrocracking capacity outside the US increased by 37%, where catalytic cracking capacity increased by 4%.[102] Within the United States over the same period, hydrocracking increased 60%, going from 1415 thousand barrels per day to 2284 thousand barrels per day, where catalytic cracking capacity went slightly backwards.[103]

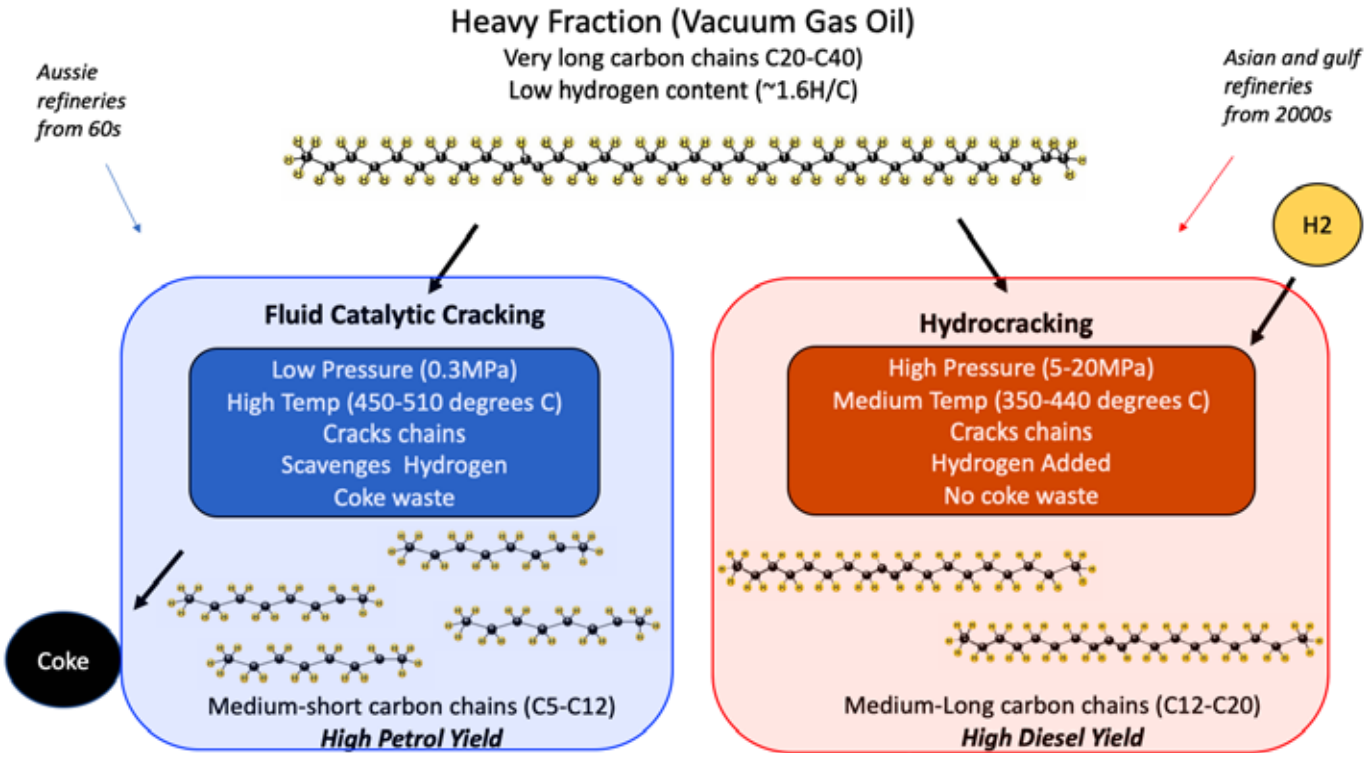

Figure 16: A summary of the alternative methods of cracking Vacuum Gas Oil

Australia only ever had one hydrocracker installed at a refinery in Bulwer Island in 2000.[104] In 2012, Australian refineries produced 90% of Australia's petrol demand and only 62% of our diesel, managing an overall share of 75% of refined fuels.[105]

It is plausible that as Australia's demands shifted further towards heavier fuels, the viability of existing petrol-oriented FCC refineries simply became challenged. Global companies would have been weighing up whether to invest in hydrocracking capacity to shift their output slate to better meet Australia's needs, or simply import products from large refineries elsewhere. Without substantial local feedstocks, Australia represented a small market that was distant to its crude sources. Whilst shipping crude one direction is not excessively costly, managing an imbalance between the refinery output and what is consumed locally could potentially require exporting surplus petrol, adding a second shipping leg.

With global demand for oil depressed, spare capacity compressing the crack spreads, and an uncertain path to recovery, it is unsurprising that Australian refineries were amongst the first to close in a period of global consolidation.

Following the closure of Kwinana and Altona, the government acted to preserve the remaining two refineries. The Fuel Security Act 2021 provided a government guarantee for our two remaining refineries through the Fuel Security Services Payment (FSSP). The policy is subsidy dependent on refinery margins, capped at 1.8c/L. The federal government allocated $2.05 billion of funds over the nine years to 2030.[106] The Defence Force also procured bespoke fuel grades to be produced domestically to ensure total security.[33] The total payment through the FSSP to date has been $37.5 million.[107] As is clearly visible in figures 14 and 15, crack spreads quickly reinflated with the Ukraine war, and have remained elevated.

It is likely today that refinery businesses operating in Australia would be profitable, and only moderate incentives may be required to bring about significant recapitalisation or expansion of refining capacity.

This is likely to be a no-regrets investment. Equipping existing or emerging refineries with substantial hydrocracking capacity would help Australia convert a wider range of crude imports into the diesel-heavy product slate it now needs. The same capability would also be well suited to processing heavier molecules from syncrude or Fischer–Tropsch[108] liquids if Australia develops coal- or gas-to-liquids pathways in the years ahead.

6.4 Synthetic fuels

Strategic role: create liquid fuels from abundant domestic feedstocks rather than from crude oil alone.

Key constraint: capital intensity and feedstock economics vary substantially by pathway.

In recent history, when nations have been faced with oil supply issues, other means of obtaining liquid fuels have been found. Germany during WWII, and South Africa from the 1950s onwards, both developed Coal to Liquid (CtL) technologies and built them at national scale.[109] Broadly, these technologies are known as power-to-liquid or PtX, and can produce a range of liquid hydrocarbons of varying length and uses.

These technologies make sense for countries like Australia, with large coal or other energy resources, but fewer oil resources.

6.4.1 Coal to liquid – Sasol case study

Strategic role: coal-to-liquid offers a scalable domestic source of fuel and petrochemicals using an abundant Australian feedstock.

Key constraint: projects require upfront capital, political permission and a realistic treatment of emissions.

Sasol is a South African company that has been producing oil from coal since the 1950s. Initially created by the government because of South Africa's relative lack of oil resources and abundant coal resources, it was fostered during the 1970s-1990s while oil prices were high and South Africa's economy faced apartheid isolation. Today, the company produces over 130,000 barrels of liquid fuels a day, supplying 30% of South Africa's fuel requirements, as well as a wide range of other petrochemical products.[110]

Unlike green hydrogen, this is a proven, scalable, economic technology with existing production, justifying viability. We don't have to appeal to 'advancements in technology' or 'feasibility studies' to know that this works.

Estimates for costs of Sasol's current operations indicate a break-even oil price of around US$35-55/bbl[111] – well below the average price of oil over the last two decades.

Sasol does not receive any subsidy or price guarantee, and fuel prices in South Africa are not subsidised. Fuel prices are not higher in South Africa as a result; they are still set by the international refined fuel market and shipping costs, and are in line with prices in other countries.

Interest in CtL technology has increased worldwide as oil prices have remained high, with projects built in multiple countries, including several projects in China to build CtL plants with a capacity of 80,000 barrels per day.[112, 113]

An added benefit of CtL is its ability to produce products across the spectrum of petrochemical chain lengths. Sasol do not only produce petrol, diesel and jet fuel, but a huge range of chemicals, including agricultural fertilisers (ammonium nitrate/sulphate), lubricants, naphtha, alcohols, polymers, solvents, surfactants, co-monomers, ammonia, methanol, crude tar acids, sulphur, illuminating paraffin, bitumen and fuel oil.[114] Many of these are also very important for national security.

Fundamentally the economics of coal-to-liquid are driven by cost of feedstock and price of final product. The chemistry of the conversion dictates a largely fixed process cost. A feedstock like black coal is undesirable due to its high export value, whereas Australia is rich in lignite (brown coal), which is very low cost and is not subject to price-setting by international export markets.

Australia's relative abundance of cheap coal makes us perfectly placed to pursue coal-to-liquid technology. Fuel is a comparatively lower value final product, so a plant is likely to prioritise the production of chemicals and fertilisers, which command a higher price per litre. This is still desirable as many commentators have also pointed out the insecurity of our agricultural supplies, particularly fertiliser.[115]

Victoria is a lignite superpower, with 33bn tonnes of economic lignite currently known (out of an estimated total resource of 430bn tonnes)[116]. To put this number in context, to date, Loy Yang, Yallourn and Hazelwood mines have produced a total of 2.7bn tonnes over their entire lives.[117] By any estimate, this represents hundreds of years of supply. The Advanced Lignite Demonstration Program (ALDP) initiative of the Victorian Government was an attempt to explore some of these opportunities, but the pilot projects failed to gain ground due to political meddling after a change of government.[118]

The opportunity here is not confined to niche production. In industries such as refining and chemicals, larger plants typically produce at lower unit cost, and those gains can remain significant even at high levels of output. If coal-to-liquids can be made commercially viable, that suggests it could be expanded well beyond a marginal role and potentially supply a large share of demand, supported by abundant and relatively cheap feedstock.

The emissions generated by these processes should be acknowledged, but treated with realism. Australia will continue to need liquid fuels far into the future, so these emissions are to some extent unavoidable, but there are technological solutions being developed to ameliorate emissions.

For example, Australian company Licella has developed a proprietary 'Cat-HTR' technology which it says has a lower carbon footprint than pyrolysis and gasification, owing to lower reaction temperatures and no requirement for external hydrogen.[119]

Unlike Fischer–Tropsch pathways, which rely on syngas production and synthesis, Cat-HTR is a hydrothermal liquefaction process that converts feedstocks into a bio-intermediate using hot, pressurised water.

The by-product fertilisers and agricultural products from these processes also have superior properties which increase carbon sequestration in soils, as well as nitrogen content.

Multiple companies have expressed interest in building a pilot plant in Gippsland, Victoria. These should be encouraged and approved quickly in order to give the market confidence to invest further. Having at least a small-scale capability in coal-to-liquid will also provide the opportunity to scale up much more quickly in a time of crisis than if we were starting from nothing.

6.4.2 Gas to liquid – Shell Qatar case study

Strategic role: gas-to-liquid could convert part of Australia's gas endowment into transport fuels and petrochemical inputs.

Key constraint: gas is already commercially valuable and domestically constrained, so opportunity cost matters.

Similar technology can also be used to convert gas into liquid fuels (GtL). Australia's natural gas reserves are plentiful, with 108,000 PJ of 2P reserves of conventional and coal-seam gas identified.[120] We are currently the world's second-largest LNG exporter.

The technology is already in use in major plants around the world, an example being Shell's Pearl GtL plant in Qatar which produces 140,000 barrels per day of liquid fuels.[121] Although the capital cost of US$24bn was much higher than the anticipated $5bn, the plant has proven profitability at normal oil prices, with a break-even oil price of around $40.[122]

The capital cost component allocated over each barrel of fuel produced can be roughly calculated as $31/bbl (assuming 15 years of life at 140,000 barrels per day). This seems high, but the plant is producing finished fuels, not crude oil. The value of a barrel of refined fuel at refinery-gate prices can still be close to $100/bbl. Gas to liquids plants are currently economically viable over the long-term, with the smaller-scale Shell plant in Bintulu, Malaysia in operation since 1993.[123] The primary output of the Pearl plant is transport fuels (diesel, petrol, and jet fuel) and naphtha (a key plastics feedstock), with paraffins and lubricant oils as smaller by-products of the process.[124]

Existing gas-to-liquid plants are in oil-producing regions where the gas feedstock is plentiful and cheap. In Australia, where gas is a valuable export commodity and the supply is relatively limited, it may not prove to be the best option in the short/medium term.

That said, GTL has not been entirely absent from Australian thinking. Public material linked to the Narrabri project identified gas-to-liquids as a possible downstream option as early as 2009[125]. The better explanation for why this did not proceed is not that GTL lacked strategic interest, but that Narrabri itself has remained mired in delay and has yet to reach final investment decision. So long as new domestic gas supply remains difficult to develop, GTL is likely to remain secondary. If that upstream constraint is eased, however, GTL could become a more serious option.

The constraints are therefore very closely linked with the exploration and drilling constraints discussed above. If supply can be increased, gas-to-liquids could well become an attractive prospect for investment.

6.4.3 Biofuels

Strategic role: biofuels can provide supplementary supply, support fuel diversification, and create useful value from agricultural and waste feedstocks.

Key constraint: feedstock availability is inherently limited, which means biofuels are unlikely to contribute more than a modest share of Australia's overall liquid fuel security.

The more recent focus for alternative fuel technology is on biomass-to-liquid uses such as sustainable aviation fuel (SAF).[126] Numerous companies are now pursuing projects, including Sasol. Licella is now using their proprietary 'Cat-HTR' technology – originally developed for coal to liquid conversion – in two joint venture plants in Canada and the United Kingdom, converting wood pulp and plastic waste to liquid fuels.[127]

There are sound reasons to support the development of biofuels. They can create additional markets for agricultural producers, support regional processing and investment, and make productive use of waste streams. These are worthwhile objectives in their own right.

Cost and scalability remain the key concerns for these processes. As a relatively new technology, estimates for SAF have historically indicated significantly higher prices than conventionally sourced jet fuel.[128] There are two components to the overall cost and scalability:

1. Process cost – determined by technology, which will improve with maturity; and chemistry, which is a fixed and unavoidable amount of energy required to transform the material. Licella indicates an efficiency such that they can achieve long-term competitiveness with conventionally sourced fuels;
2. Feedstock cost – determined by its intrinsic value and availability. The economics of the process is aided by the fact that much of the feedstock for these processes is waste or otherwise low or negative-value product.

Feedstock scale is the issue. There is a limited volume of waste available. An analysis of the volume required to achieve a non-trivial scale of production is concerning. Take canola as an example, used to synthesise biodiesel. Australia produced 2.14 million tonnes of canola in 2019, which is enough to produce 5.5 million barrels of biodiesel – just 1.5% of Australia's fuel demand. If all of Australia's current cropping agricultural land (31 million hectares) was diverted to canola production, this would still only produce 36% of our liquid fuel demand.[129]

It is clearly not feasible to divert productive agricultural land toward fuel feedstock. The EU initially introduced legislation to require a biofuel mix of 5.75% in transport fuel, but had to amend its legislation after observing that it had indirectly caused significant global deforestation and displacement of food crops, particularly palm oil in Indonesia and Malaysia, and soy in South America.[130]

Although biofuel processes promise low emissions, waste reduction, and sustainability, the comparative benefit of CtL or GtL is the scale of feedstock available – the huge quantities of coal and gas extractable on demand at known prices and from centralised sources.

For that reason, biofuels deserve consideration as part of a broader fuel strategy, especially where they can draw on waste streams and regional feedstocks but they are unlikely, on feedstock scale alone, to provide more than a relatively small contribution to Australia's overall fuel security. The advantage of coal-to-liquids and gas-to-liquids, by contrast, is not merely process design but the much larger scale, centralisation, and on-demand availability of the underlying feedstocks.

Ethanol Blending

Some states have set targets for fuel distributors to sell petrol with ethanol blended in to 10% of the fuel (E10). For example, NSW currently has a target for 6% of petrol sold to be ethanol, which would require approximately 60% of all petrol sold to be E10. In 2023, only 22% of petrol sold in the state was E10, meaning the target was not met.[131]

Effectively all service stations have been given exemptions from meeting the target, on the grounds that they have complied with all the requirements to make the fuel available and promote it. In other words, consumers are simply not buying the fuel enough for targets to be hit. E10 has a 3% lower fuel density than regular U91 petrol, so consumers are likely to be worse off buying E10 unless the discount is perceived to be greater than 3%.

In 2023, E10 only sold at a discount of 2.1c/liter on average, which is substantially less than the 3% that would make it economical for consumers, and there have been periods when E10 was more expensive than U91.[132]

Currently, east coast ethanol production capacity exceeds actual output. In 2023, Manildra and Wilmar Sugar produced about 196 million litres between them, roughly half of their installed capacity.[133]

If ethanol were blended mandatorily to 10% in all petrol fuels, they would reduce demand for refined petroleum by 9% of our petrol consumption, or just over 2% of total oil demand.

Ethanol cannot be safely blended into diesel or aviation gasoline, which together represent nearly three times total petrol demand.

Part III – A good deal: Why the options before us are worth the cost

The all-important question is: *Is fuel security worth the cost*? We certainly do not advocate for an 'at any cost' mindset to national security. Resources are constrained, and we must attempt to extract maximum national security from every dollar spent. Many policy solutions can be effective but highly inefficient, introducing exorbitant costs.

As in insurance or hedging, there are many examples where the market perceives so much risk that the cost of insurance just doesn't make sense. Having surveyed the options before us, do the benefits stack up with the costs?

It is clear that some solutions are cost-neutral or negative. Oil exploration and coal-to-liquid projects have been stifled by green or red tape, and private capital is waiting in line to invest once the door is open and the perception of regulatory risk is low enough.

Other solutions (such as large-scale crude storage) require public investment, and the premium paid can be sense-checked relative to the price of each litre of fuel sold.

We have recommended the cost-neutral actions to be taken immediately, and submitted the remaining actions for further consideration.

We begin by mentioning several by-products of fuel security that are difficult to measure in economic terms but are nonetheless valuable and add real weight to the cost-benefit analysis.

7 Defence dividends from increased energy independence

7.1 Impact on imports

As shown in Part I, liquid fuels are the dominant critical import dependency, making up nearly 50% of the weight of our imports. This number reveals a remarkable opportunity: securing a domestic supply of liquid fuels would halve our import requirements by weight. Further, if a domestic petrochemicals industry were to also manufacture most of our required chemicals (including fertilisers), this would account for a full 60% of the weight of our imports. These numbers become very important in a war scenario where shipping is fraught.

If we narrow our analysis to critical imports, we conclude that if we can source our liquid fuels domestically, this means that less than 20% of the weight of our current imports would be required for us to survive in a crisis. This presents a significant opportunity for Australia. We have a highly effective lever with which to make our nation more secure. Every increment of fuel security produces a major benefit to our national security.

This is not radical isolationism but a considered approach which identifies our critical inputs and seeks real security, rather than wishful thinking. It represents a new way of thinking about Australia.

Instead of being a 'maritime nation' that is dependent on imports, we suggest a new paradigm: Australia is a vast continent – naturally walled (girt) by sea, and abounding in nature's gifts – plentiful natural resources.

We have an abundance of the bulk materials and food required for a prosperous modern society. We even have an abundance of energy resources. We are uniquely placed among the world's nations to be within a stone's throw of total self-sufficiency. Very few other nations on earth have this natural advantage.

Again, what is being argued for is not to end all imports and pursue isolationism. Expansive trade in the bulk exports that earn us money, and diverse imported manufactured goods that our society will choose to spend it on should continue to flourish in times of peace. The opportunity identified is that if we can account for our liquid fuel demands, that leaves a very small volume of critical imports that remain to be protected in times of crisis. If this is the case, then our defence objectives can potentially be radically recast.

7.2 Impact on shipping requirements

Looking at this from another angle, we can analyse the number of ships that would be required to be employed at any one time (hulls on ocean) in order to conduct our critical imports.

Over three scenarios, we calculate that fuel independence has a huge impact on the number of ships required to keep our country functioning in a war.

Because of the slow pace of tanker ships and the comparatively long distances they would need to travel to source fuel from outside Asia, the ship requirements in a war are more than double the baseline requirements. If we can achieve fuel independence, this number is reduced significantly. See the appendices for full explanation of the methodology.

		Peacetime	War – critical supply only		
		Baseline	Critical supply only	Importing fuel	Fuel independent
	Weighted average journey days	10.4	10.4	25.9	0.0
Tankers	Hulls on ocean	34.1	34.1	85.0	0.0
	Weighted average journey days	9.5	9.5	19.8	19.8
Containers	Hulls on ocean	61.0	22.7	47.3	47.3
Total hulls on ocean		**95.1**	**56.8**	**132.4**	**47.3**

Table 2 - Hulls on ocean summary table

The implications of the above should be obvious for discussions about an Australian-flagged merchant fleet (or lack thereof), which has been an area of increasing concern and commentary.[134]

We leave these discussions aside in this paper, but in brief, Australia relies exclusively on foreign flagged vessels to conduct trade, meaning that there is no certainty any of these vessels will be available for use if war breaks out.

The single most effective thing we can do to improve our maritime trade vulnerabilities is to secure a domestic supply of liquid fuels and petrochemicals. This would not only resolve the fuel insecurity itself, but crucially, open up new possibilities for our defence planning, to which we now turn.

7.3 A radical recasting of Defence procurement objectives

An under-appreciated effect of our economic trade decisions is their implicit impact on our strategic defence decisions. The more dependent we become on international trade for critical supplies, the more our underlying assumption for defence becomes 'protecting trade'. This will lead to acquisitions of assets with the purported capability of sea-control over our trading routes. Whether or not the assets are sufficient for this purpose is another matter entirely.

Addressing our critical import dependencies opens up a significant opportunity to rethink Australia's defence paradigms.

There is an unchallenged chain of logic underlying our defence strategy:

1. Australia is a maritime nation. Our prosperity depends on trade conducted on ships. This shipping is a vital 'interest' to protect;
2. Therefore, our defence force should be strategically designed to have the capability to protect this trade.

The Defence White Papers from the past two decades have contained an increasing focus on trade security, with the most recent paper in 2016, stating that "Australia's reliance on maritime trade with and through South East Asia, including energy supplies, means the security of our maritime approaches and trade routes within South East Asia must be protected".[9]

> *"A stable rules-based regional order is critical to ensuring Australia's access to an open, free and secure trading system and minimising the risk of coercion and instability that would directly affect Australia's interests."*

The 2023 Defence Strategic review is clearer still:

> *"Since the 1980s, globalisation and the opening of the Australian economy have given rise to decades of growth and increased prosperity for the Australian people. Australia's economy has become more interconnected with the Indo-Pacific and the world. In turn, this means Australia has a fundamental interest in protecting our connection to the world and in the global rules-based order upon which international trade depends."*[9]

"Accordingly, the Australian Defence Force (ADF) must have the capacity to: …

- *deter through denial any adversary's attempt to project power against Australia through our northern approaches;*
- *protect Australia's economic connection to our region and the world;"*

It is clear that to some extent, a desire to protect our trade is indeed driving our defence force capability decisions. And yet there is no clear vision for any level of capability that is within our reach that could plausibly be sufficient to protect our trade travelling through Asia against a determined Asian power willing to commit blood and treasure to stopping it.

Australian military aircraft can only fleetingly reach into the Indonesian Archipelago without air-to-air refuelling. Maintaining the kind of sustained combat air patrol to resist missile and air attack from land-based planes further north would be essentially impossible. Only surface ships could plausibly provide the range and endurance, and their limited magazine (only 48 vertical launch cells) would be easily overwhelmed by a determined air attack benefiting from nearby land bases. Submarine and sea-mine threats

would be similarly insurmountable to any force resemblant of our current one, even significantly enhanced and upgraded.

The reality that must be acknowledged is that any goal of maintaining sea-control sufficient to protect Asian trade in a major power war is futile. It's easy to claim that greater effort is necessary, but it's pointless if the increased effort still doesn't approach plausible sufficiency.

By embracing the fact that Australia's southern ports are extremely distant to Asia and ensuring that we are not reliant on any critical supplies that must come through Asia, Australia can refocus its military expenditure on other measures which are more likely to be successful in protecting the limited trade we truly need.

7.4 Contributing real value to the US Alliance

Australia's alliance with the United States goes back more than a century, but the fast-changing world has introduced a dilemma for Australia. Some argue that there is no guarantee that it will be in the interest of the United States to directly defend Australia in a military conflict, especially if the current America-first philosophy prevails. The counterfactual is that the recent AUKUS agreement has made our defence ties more formal than ever, with close sharing of technology, information and even basing on Australian shores. Given that uncertainty remains, we should be looking for ways to increase the likelihood that the US will deem us worth defending.

Although our large land mass makes us a useful launching pad for operations, our lack of fuel makes us a very unattractive logistical prospect. Arguably the most effective way to assist the US in the defence of the Asian region and to ensure our alignment with US strategic interests is to have a plentiful and robust supply of fuel available.

Wars are fought with diesel and jet fuel. This was already the case in World War II, and has only become more so since. In peacetime, the ADF is a relatively minor consumer of fuel compared to the domestic economy, using about 1% of the total liquid fuel demand, but 3% of the jet fuel demand.[135]

Wartime requirements for liquid fuels will obviously be much higher than this, and the scope of operations could vary, with estimates ranging widely – up to 50,000 bbl/day.[136] If we were to support U.S. military activities operating out of Australia, there would be an extra 150k – 1m bbl/day increase in demand.[137]

AUKUS spending totals $368 billion.[138] Of this, $8 billion will be spent on the HMAS Stirling naval base expansion in Perth in order to host US and UK nuclear submarines.[139] The rationale for this is to allow friendly forces to be in the right place at the right time when they are needed and to allow a combined allied force to operate more effectively in this region. If this indeed our objective, a comparatively small investment in liquid fuel security stands out as a potentially more effective means of achieving it. It is difficult to assess the national security benefit per dollar spent, but we argue that a secure and plentiful domestic supply of fuel will be of immense strategic benefit in a war and make us a much more valuable partner in the US alliance.

8 Recommendations

Fuel security is not out of our reach. Many of the available actions are not exorbitantly expensive but are well worth the cost for the benefit delivered, if indeed there are net costs. Where specific proposals involve significant spending, these should be further considered.

8.1 Zero cost actions to immediately take

Domestic oil exploration and drilling, including unconventional resources, should be immediately prioritised. This would cost nothing to achieve but requires political effort. State-wide bans in Victoria and New South Wales should be removed, and approval processes should be streamlined to bring approval times down. Incentives could be offered to companies to give them confidence to invest in jurisdictions that have recently strongly discouraged investment, through bans or de-facto bans.

Pilot plants for coal-to-liquid conversions should also be approved, and encouraged. If the most promising commercial proposals include production of other non-fuel chemicals such as chemicals and fertilisers, these should also be accepted, as they would likely offset other critical import dependencies, and still develop the technologies and industrial capability relevant to fuel production.

In order to give confidence to private investors in this space, clear political signals that domestic fuel security is of more immediate importance than domestic emissions abatement are likely to be necessary.

8.2 Necessary but not sufficient

Larger fuel reserves are a necessary part of any serious fuel security strategy, but they are not sufficient on their own. Additional stocks can improve resilience to short-term disruption and buy valuable time in a crisis. But reserves do not provide true fuel security unless they are paired with a credible plan to restore or maintain supply over a longer period. Even substantial reserves are ultimately a bridge to some other source of fuel. The central task therefore remains the development of secure domestic production, with reserves playing an important but secondary role.

Care is needed to ensure that stockholding measures are not mistaken for a comprehensive answer to the broader fuel security challenge.

8.3 Analysing more complex options

Even if all regulatory barriers were removed, the scale of private activity may not be sufficient to achieve liquid fuel security. The fundamental argument made by this paper is that liquid fuel security is within the government's national security remit, due to its criticality to our nation's functioning. We should think about measures to provide security as an insurance premium.

So how much is reasonable to pay? An attempt could be made to calculate a number by analysing scenarios of war with and without fuel and trying to assign monetary values to outcomes, but such a number would always be too loaded with assumptions and projections to be useful. An easier method is to determine what number is politically and economically feasible. One potential option would be to raise money through a fuel security excise. In any case, it seems that cents per litre is the most useful metric for comparing the cost of security options relative to each other, and to the value of the fuel itself.

Australians pay for road use through the fuel excise (although in practice this is collected as general revenue). This is currently set at 50.8c/L, which suggests there is substantial tolerance for fuel price increases and excises in the consumer market. Additionally, fuel has varied between $1.3 and $2 per litre over the last 5 years, suggesting a high ability within Australian households to absorb price fluctuations.

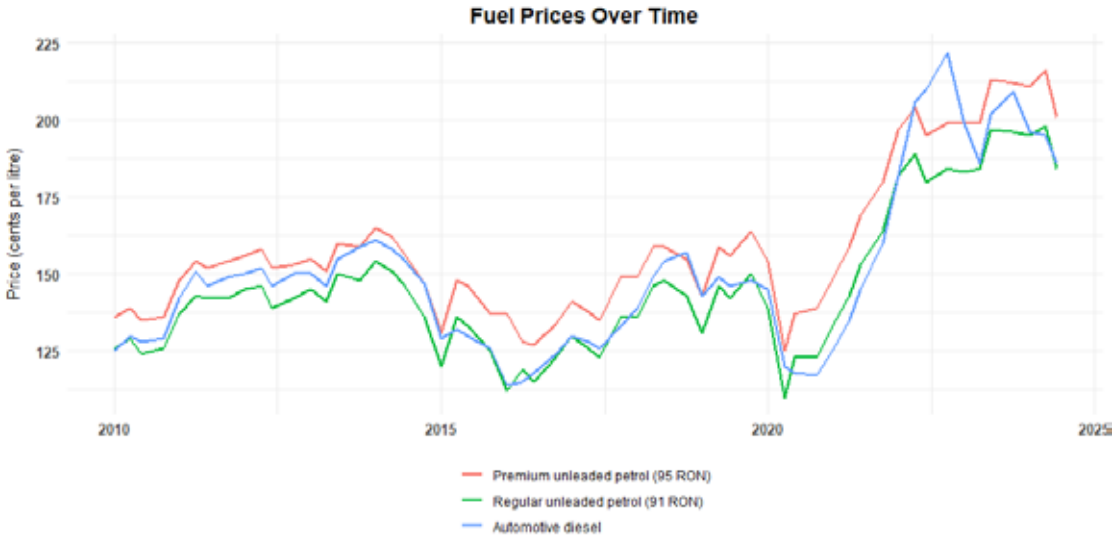

Figure 14 - Australian fuel prices[28]

The average Australian passenger vehicle drives 11,100 km per year, with a fuel consumption of 11.1 L/100km [140], meaning most motorists consume about 1200 L of fuel every year. An excise of 5c/L would cost the average motorist $60 annually yet raise $2.8bn.

This paper does not attempt to lay out a full cost structure for a potential government spending plan. That would be the work of a large departmental review, given the certainty required to make investment commitments at the scale that would be sufficient to meet Australia's fuel demand.

Some options must be coordinated to be effective. For instance, a large supply of domestic crude would need to be accompanied by an increased refinery capacity to be useful.

One strategy might be to increase storage to a non-trivial amount (6-12 months) and then pursue a coal-to-liquid or diversification strategy to provide a more robust, and hopefully scalable supply strategy this stockholding could bridge to. This would involve:

- **Building underground storage facilities** capable of holding 200–300 million barrels, at an estimated cost of around $5 billion;[68]
- **Incentivising distributed on-site storage** among major fuel users such as farmers, miners, freight operators, and remote industrial sites. This would increase total fuel held within Australia, disperse it geographically across the regions and sectors where it is most needed, and keep much of it in active commercial rotation rather than sitting idle long enough to degrade.
- **Purchasing large crude stockpiles** sufficient for roughly 6–12 months of use. Because this oil would remain a saleable asset, the principal cost is the financing cost of holding it, estimated at around $2 billion per year;[69] in a crisis, the value of the stock would likely rise rather than fall;
- **Building refinery capacity**, acknowledging that some structural cost difference may remain between refining in Australia and refining in large Asian hubs, depending on the degree of scale that can be achieved domestically;
- **Diversifying crude supply chains**, with greater geographic dispersion of import sources;
- **Approving coal-to-liquids developments** with a view to supplying a substantial share of fuel and chemical demand. This may require limited direct public expenditure if private firms are willing to invest, and, like refining, would likely benefit from economies of scale;

Combining lower and upper estimates of cost for each of these options on a cents/litre basis:

	Costs (c/L)	
	Lower estimate	Upper estimate
Underground crude storage (12m)	3	4
New refinery capacity	0	5
Diversification	1	3

The status quo also has a cost, despite delivering no real security:

	Costs (c/L)	
	Lower estimate	Upper estimate
Refinery support (FSSP)	0	1.8
Minimum stockholding obligation	0.15	3

9 Practical recommendations

In light of the available options, our key recommendations are:

1. Restore domestic production as the central objective

The Commonwealth should treat increased domestic fuel production as the core of any serious fuel security strategy. That means prioritising, incentivising, and deregulating exploration and drilling for crude oil, gas, and unconventional petroleum (Oil Shale) in Australia.

This should include a deliberate effort to identify and remove unnecessary regulatory barriers to upstream development, while providing the policy certainty needed to support long-term capital investment. In strategic terms, reserves buy time. Production changes the structure of the problem.

2. Approve and, where necessary, back coal-to-liquids pilot plants

Australia should approve and, if necessary, incentivise coal-to-liquids pilot plants as a matter of strategic importance.

A pilot phase would not by itself solve the broader fuel security challenge. But it would allow Australia to test commercial and technical assumptions, build operational capability, and create a pathway toward scalable domestic conversion capacity. If coal-to-liquids proves viable at pilot scale, the combination of abundant domestic feedstock and economies of scale could make it one of the few options capable of supplying a substantial share of national demand.

Government support need not imply permanent dependence on subsidy. The task in the first instance is to get projects through the valley between strategic interest and commercial demonstration. Once proven, larger-scale development may be able to proceed with much less public involvement.

3. Expand strategic reserves as a bridge, not a substitute

Australia should materially increase in-country fuel storage. Larger reserves are necessary, but they are not sufficient. They do not provide genuine fuel security unless they are paired with a credible means of maintaining or restoring supply over time.

The purpose of stockholding is to buy time: time to refine, time to convert, time to redirect, time to ration if necessary, and time for domestic production to respond. It should therefore be treated as an essential buffer within a broader strategy, not mistaken for the strategy itself.

A serious reserve policy should aim at a non-trivial level of in-country storage and be developed alongside plans for additional domestic refining, conversion, or supply restoration.

The quickest practical way to deepen that buffer may be to place more storage closer to end-users. The Commonwealth should establish a targeted scheme to encourage major fuel users in agriculture, mining, freight, remote industry, and other critical sectors to expand their on-site fuel storage capacity. This would increase the amount of fuel physically held within Australia, spread it across the regions and industries where it is most needed, and ensure that much of it remained in active commercial rotation rather than sitting idle long enough to degrade. It would also reduce dependence on a small number of centralised storage sites and make stocks harder to disrupt or target.

Support could be delivered through accelerated depreciation, tax credits, capital grants, or a dedicated national security storage payment. To qualify, firms should be required to demonstrate that storage capacity has been increased above an established baseline, that minimum stock levels are being maintained, and that these additional stocks would be made available to government direction or acquisition in a declared national security emergency.

This would not replace larger national reserves or domestic production. But it would strengthen resilience quickly, at relatively low public cost, while building a broader and more usable fuel buffer across the economy. In effect, it would extend Australia's reserve cover in a way that is practical, dispersed, and closer to the sectors most likely to feel the effects of disruption first.

4. Recapitalise and expand domestic refinement capacity to meet our diesel needs

Australia should recapitalise, consolidate, and expand domestic refining capacity as a core part of any serious fuel security strategy.

Maintaining refinery support remains necessary, but the larger task is to ensure Australia retains and builds enough refining capability to process available feedstocks into the products the country most relies on, especially diesel.

New refinery capacity must include hydrocracking facilities, in order to deliver higher diesel yields from a variety of heavy feedstocks, including synthetic crude from coal conversions or imported crude.

In the short term, it would improve Australia's ability to process a wider range of imported crudes into the diesel-heavy demand slate the country increasingly requires; in the longer term, it would also position Australia to refine heavier molecules from syncrude or Fischer–Tropsch liquids if domestic coal-to-liquids or gas-to-liquids industries are developed.

For that reason, the Commonwealth should not only maintain existing refinery support, but also investigate whether a public-private partnership model could help deliver refinery consolidation, expansion, and hardening where strategically justified.

5. Support complementary fuel streams where they make sense

Gas-to-Liquid, Biofuels and other alternative liquid fuel pathways may have a useful supporting role, especially where they use waste feedstocks or strengthen regional industry. These industries may also deliver worthwhile regional development such as waste-reduction in their own right.

Feedstock constraints mean they are unlikely to provide more than a modest share of national liquid fuel demand. They should therefore be pursued as complementary streams within a broader fuel strategy, not treated as a system-level answer to Australia's fuel vulnerability.

6. Establish a dedicated fuel security budget

The Commonwealth should consider establishing a dedicated fuel security budget to support stockholding, enabling infrastructure, pilot projects, and other strategic interventions.

Funding could be drawn from a portion of existing fuel excise, from a new dedicated excise, or from the defence budget. There is a strong case for any of these approaches.

This would provide a transparent basis for which efficient investments could be made to improve fuel security, without obligation for the spending to occur should it not be required to reach targets of improved domestic production.

10 Conclusion

Liquid fuels are critical to Australia's national security and will continue to be for many decades. Without fuel, core functions of our economy — transport, agriculture, mining, and even defence — would grind to a halt. Australia's reliance on fuel imports from Asia leaves us dangerously exposed to the risk of a major war. Yet our region is becoming increasingly dangerous and the risk of war in the Asia-Pacific is rising.

Australia has never been worse prepared for this scenario. Our two major policies – stockholding/reserves and refinery support for just 20% of our refining capacity – are completely insufficient responses to the risks. They deliver no genuine security.

Domestic production is the only viable strategy that delivers genuine security. But this is not beyond our reach. Options are available and they are worth the cost. The insurance premiums are reasonable. There are opportunities to deregulate and encourage the exploration and drilling of petroleum (both conventional and unconventional) as well as alternative fuel synthesis.

Securing a domestic supply of liquid fuel also radically reduces our shipping dependency on our most voluminous critical import, allows us to plan for defence capability without having to protect long maritime supply lines of slow-moving tankers, and makes us a very attractive ally to the U.S.

The events surrounding Iran and the Strait of Hormuz have not changed the substance of this paper's argument; they have simply made it harder to ignore.

Fuel security is national security. After two decades of inaction, now is the time to act to secure Australia's future.

Appendix 1 – Hulls on ocean

We conducted a first-principles analysis of the time that imported freight spends at sea, and how this is affected by different scenarios.

Assumptions must be made about how many ships are required, of what type, and where they are travelling from. This will then allow us to calculate the average time of journey in each scenario, and hence the total number of ships that will need to be employed at any one time (hulls on ocean) to meet our critical needs.

This is designed to be an illustrative exercise, not an exact prediction of what will actually take place in each scenario.

Ship types and speeds

Real time data was used to find the average speeds of a sample of actual ships currently under sail.

Ship type	Speed (knots)
Bulk Carrier	11.3
Container Ship	16.8
LNG Tanker	16.4
Oil Tanker	11.8
Vehicle Carrier	17.6

Ship arrivals

Firstly, we define our scenarios and what is happening in each. In each scenario (except the baseline), we restrict our analysis to critical imports.

All liquid fuels imports can be classed as critical. On average, there are 3.3 daily tanker arrivals in Australia from overseas.[141] Of the non-tanker imports, we can deem food, beverages, and animal products non-essential. We also make a rough assumption of 50% of the 'Manufactured goods classified chiefly by material' imports being critical.

Category	Weight (million tonnes)	
0-Food and live animals	5.3	Non-tanker
1-Beverages and tobacco	1.1	Non-tanker
2-Crude materials, inedible, except fuels	5.8	Non-tanker
3-Mineral fuels, lubricants and related materials	47	Tanker
4-Animal and vegetable oils, fats and waxes	0.3	Non-tanker
5-Chemicals and related products	11.2	Tanker
6-Manufactured goods classified chiefly by material	15.4	Non-tanker
7-Machinery and transport equipment	6.7	Non-tanker
8-Miscellaneous manufactured articles	4	Non-tanker
9-Commodities and transactions	0.1	Non-tanker
Total	96.9	

This leaves a generous 37% of the current cargo imports we currently receive deemed as critical.

Excluding bulk carrier ships (predominantly used for exports), there are an average of 6.4 daily non-tanker ship arrivals in Australia from overseas. Taking 37% of this, we have 2.39 critical arrivals. This allows us to construct three scenarios of daily ship arrivals.

	Number of critical import arrivals per day	
Scenario	tanker ships	container ships
Peacetime - baseline	3.3	6.43
Peacetime - critical	3.3	2.39
War - importing fuel	3.3	2.39
War - fuel independent	0	2.39

Table 3 - Number of daily ship arrivals by scenario and type

Journey time

The next input is the assumptions around the journeys taken in each scenario. For the baseline, data is taken from the BITRE report and petroleum statistics indicating the current distribution of our imports. For the scenario of a war in Asia, all imports from the region have zero weighting and the cargo must be redistributed to be sourced from elsewhere. For fuel, this is roughly spread between the Middle East, North America, and South America. For non-fuel, the weighting is more heavily towards North America and Europe.

Scenario	Category	Africa	China	Europe	Middle East	New Zealand	North America	Other East Asia	Pacific Islands	South America	South Asia	South East Asia
Peacetime	Fuel	0%	16%	0%	5%	0%	0%	14%	0%	0%	30%	35%
	Non-fuel	3%	19%	7%	6%	2%	6%	14%	0%	2%	4%	36%
War – importing fuel	Fuel	3%	0%	0%	32%	5%	35%	0%	0%	25%	0%	0%
	Non-fuel	5%	0%	30%	5%	10%	40%	0%	0%	10%	0%	0%
War – fuel independent	Fuel	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Non-fuel	5%	0%	30%	5%	10%	40%	0%	0%	10%	0%	0%

Table 4 – Weighting of import location of origin by scenario and type

Finally, the sea-route distance between Australian ports and other locations must be computed:

	Africa	China	Europe	Middle East	New Zealand	North America	Other East Asia	Pacific Islands	South America	South Asia	South East Asia
Sydney	6563	4632	11570	7005	1275	9240	4273	1738	8017	4577	4273
Perth	4715	4037	9575	4976	3202	10924	2220	2878	7941	2742	2220
Adelaide	5766	5332	10773	6208	2035	9859	3504	2694	8494	4026	3504
Melbourne	6104	5193	11111	6546	1645	9483	3842	2303	8119	4364	3842

Table 5 - Distance between locations along shipping routes (nautical miles)

The methodology is simple:

Divide distance by speed to get journey days. Multiply journey days by number of arrivals per day to get hulls on ocean. Weight this by the percentage of freight taking this journey. Sum to arrive at total hulls on ocean. Summary and full table below.

		Peacetime - baseline	Peacetime - critical	War - importing fuel	War - fuel independent
Tankers	Weighted average journey days	10.4	10.4	25.9	0.0
	Hulls on ocean	34.1	34.1	85.0	0.0
Containers	Weighted average journey days	9.5	9.5	19.8	19.8
	Hulls on ocean	61.0	22.7	47.3	47.3
Total hulls on ocean		95.1	56.8	132.4	47.3

Table 6 - Hulls on ocean - summary table

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Hulls on ocean														
		Africa	China	Europe	Middle East	New Zealand	North & Central America	Other East Asia	Pacific Islands	South America	South Asia	South East Asia		
Peacetime - baseline														
Weightings	Fuel	0%	16%	0%	5%	0%	0%	14%	0%	0%	30%	35%		
	Non-Fuel	3%	19%	7%	6%	2%	6%	14%	0%	2%	4%	36%		
Tankers	Journey Days	17.39	14.89	35.31	18.35	4.70	34.07	8.19	6.41	29.28	10.11	8.19	**10.4**	**Weighted average journey days**
	Hulls On Ocean	0.00	7.82	0.00	3.01	0.00	0.00	3.79	0.07	0.00	9.96	9.41	**34.1**	**Hulls on ocean**
Containers	Journey Days	11.69	10.01	23.75	12.34	3.16	22.92	5.51	4.31	19.69	6.80	5.51	**9.5**	Weighted average journey days
	Hulls On Ocean	2.24	12.46	10.53	4.74	0.50	8.95	4.99	0.09	1.96	1.71	12.87	**61.0**	**Hulls on ocean**
													95.1	Total hulls on ocean - Peacetime baseline
Peacetime - critical														
Weightings	Fuel	0%	16%	0%	5%	0%	0%	14%	0%	0%	30%	35%		
	Non-Fuel	3%	19%	7%	6%	2%	6%	14%	0%	2%	4%	36%		
Tankers	Journey Days	17.39	14.89	35.31	18.35	4.70	34.07	8.19	6.41	29.28	10.11	8.19	**10.4**	**Weighted average journey days**
	Hulls On Ocean	0.00	7.82	0.00	3.01	0.00	0.00	3.79	0.07	0.00	9.96	9.41	**34.1**	**Hulls on ocean**
Containers	Journey Days	11.69	10.01	23.75	12.34	3.16	22.92	5.51	4.31	19.69	6.80	5.51	**9.5**	**Weighted average journey days**
	Hulls On Ocean	0.84	4.64	3.92	1.76	0.19	3.33	1.86	0.03	0.73	0.64	4.79	22.7	**Hulls on ocean**
													56.8	Total hulls on ocean - Peacetime critical

War - importing fuel														
Weightings	Fuel	3%	0%	0%	32%	5%	35%	0%	0%	25%	0%	0%		
	Non-Fuel	5%	0%	30%	5%	10%	40%	0%	0%	10%	0%	0%		
Tankers	Journey Days	17.39	14.89	35.31	18.35	4.70	34.07	8.19	6.41	29.28	10.11	8.19	**25.9**	**Weighted average journey days**
	Hulls On Ocean	1.71	0.00	0.00	19.29	0.77	39.17	0.00	0.07	24.05	0.00	0.00	**85.0**	**Hulls on ocean**
Containers	Journey Days	11.69	10.01	23.75	12.34	3.16	22.92	5.51	4.31	19.69	6.80	5.51	**19.8**	**Weighted average journey days**
	Hulls On Ocean	1.40	0.00	17.04	1.48	0.76	21.92	0.00	0.00	4.71	0.00	0.00	**47.3**	**Hulls on ocean**
													132.4	Total hulls on ocean War - importing fuel
War - fuel independent														
Weightings	Fuel	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
	Non-Fuel	5%	0%	30%	5%	10%	40%	0%	0%	10%	0%	0%		
Tankers	Journey Days	17.39	14.89	35.31	18.35	4.70	34.07	8.19	6.41	29.28	10.11	8.19	**0.0**	**Weighted average journey days**
	Hulls On Ocean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**	**Hulls on ocean**
Containers	Journey Days	11.69	10.01	23.75	12.34	3.16	22.92	5.51	4.31	19.69	6.80	5.51	**19.8**	**Weighted average journey days**
	Hulls On Ocean	1.40	0.00	17.04	1.48	0.76	21.92	0.00	0.00	4.71	0.00	0.00	**47.3**	**Hulls on ocean**
													47.3	Total hulls on ocean War - fuel independent

Table 7 - Hulls on ocean - full table

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2. Shanghai Electric Australia Power & Energy Development Pty Limited (SEAPED) was granted $25 million for the development of a $119 million lignite-to-briquette plant.

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