NSW GOVERNMENT | Chief Scientist & Engineer

Assessment of Preparedness for the NSW Energy Markets 2024-2025

12th May 2025

Acknowledgement of Country

The Office of the NSW Chief Scientist & Engineer acknowledges the Traditional Custodians of the lands where we work and live. We celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of NSW.

We pay our respects to Elders past, present and emerging and acknowledge the Aboriginal and Torres Strait Islander people that contributed to the development of this Report.

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Office of the Chief Scientist & Engineer

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12th May 2025

The Hon Penny Sharpe MLC
Minister for Climate Change
Minister for Energy
Minister for the Environment and
Minister for Heritage

Dear Minister Sharpe,

Re: Assessment of preparedness for the NSW energy market: 2024-2025

In September 2018 the (then) Minister for Energy and Environment requested I provide advice on emergency management risks within the national electricity market (NEM). Since then, I have provided an annual assessment of the preparedness of the NSW energy system. In accordance with the Terms of Reference, the advice for 2024-2025 includes assessment of all energy markets including electricity, gas and liquid fuel, and considers risks to NSW for the coming 12 months.

The 2024-2025 assessment was undertaken by an Expert Panel (the Panel), chaired by Dr Darren Saunders (Deputy Chief Scientist & Engineer), with Mr Neville Henderson (former commissioner of the Australian Energy Market Commission) and Professor Emeritus David Hill (Professor of Electrical Power and Energy Systems, Monash University). The Office of the Chief Scientist & Engineer (OCSE) provided secretariat support and report drafting. The Panel received briefings and presentations from energy market stakeholders including national market bodies, state government agencies and market participants regarding their preparedness and concerns.

This year's report is presented in two parts: Part 1 focuses on electricity and gas and Part 2 focuses on liquid fuels. The findings and recommendations reflect that – in the context of the extensive transition to renewables – the current national electricity market (NEM) is no longer fit for purpose and needs to be modernised. While stakeholders provided assurances that individual organisations are adequately prepared for the next 12 months, many are concerned that medium to long-term risks may be realised earlier without appropriate actions. NSW energy market participants expressed a strong concern at a lack of coordination or coherent energy transition plan at the national level. The Panel agrees with these assessments and reiterates that unexpected coincident or compounding events have the potential to realise significant near-term risks to NSW consumers. Increasingly interconnected electricity, gas and liquid fuel systems amplify this risk.

The vulnerability of our energy system is demonstrated by recent events in NSW and underscored by more significant nation-wide grid failures in Chile, Spain and Portugal. Unless actions are taken, risks remain and will compound over time for NSW.

Yours sincerely,

H. Durrant-Whyte

Hugh Durrant-Whyte
Chief Scientist & Engineer

Executive Summary

The findings outlined in this report are the result of analysis supported by both independent research and comprehensive stakeholder consultation. This work builds on an established program of annual energy market assessments by OCSE, providing evidence-based insights into the evolving risks and challenges facing the NSW energy market. While this year's assessment reflects emerging challenges, it also reinforces several risks and vulnerabilities that have been identified in previous reports.

Importantly, the findings presented in this report are not intended to be read in isolation. They are interdependent and reflect the complex and interconnected nature of the energy system. The recommendations provided are grounded in the entirety of the findings and evidence gathered throughout this process. They are not presented in any order of priority and should be interpreted in the context of the broader system-wide analysis set out in the full report.

Findings

Part 1 - Electricity and Gas

1.1 There is a relatively high risk of interruptions to the NEM and normal system operation over the next 12 months. This risk is increasing over time.

1.2 Adjustments to the NEM to accommodate the ongoing transition to renewables have lacked a coherent, coordinated strategy for reform, making the NEM less reliable and unlikely to support the future energy system.

1.3 Investment in the gas supply chain is urgently needed to ensure its role as a transition fuel source.

1.4 Previously identified medium to long-term risks to the reliable provision of energy are now more immediate (i.e. relevant to the coming 12 months).

1.5 NSW risks breaching the Energy Security Target (EST) through insufficient firm generation capacity and the impending retirement of coal-fired power generation.

1.6 Increasing network complexity and delays to approval, construction and commissioning of new generation and transmission capacity are increasing the overall risk to NEM reliability and resilience.

1.7 Energy system services require greater focus.

1.8 Changing climatic patterns and unpredictable extreme weather events are putting further pressure on the energy systems and emergency responses.

1.9 Ongoing workforce shortages and industrial action risk delaying planned maintenance and the overall progress of the energy transition.

1.10 New and emerging risks to energy supply and emergency response (e.g. increased susceptibility to cyber security threats) require further scoping.

1.11 Recent events highlight the increasing frequency and risk of NEM customer interruption in NSW.

1.12 Communication and community engagement are vital aspects of emergency response and energy system transition.

1.13 Existing NSW Government initiatives aim to address some of the concerns identified in this assessment and recommendations from the Electricity Supply and Reliability Check Up are being implemented. However, the reliability and security of electricity and gas markets could be further improved.

Part 2 - Liquid Fuels

2.1 The overall risk of disruption to the liquid fuel supply chain in NSW over the next 12 months is low.

2.2 NSW (and other Australian states) rely heavily on domestic and international liquid fuels imports. This dependency is mitigated through diversified imports and import opportunities, onshore storage and domestic production, although the latter two are limited.

2.3 Emergency events can have a high impact on the liquid fuel supply chain, including localised fuel shortage, infrastructure damage and demand challenges, requiring contingency planning and collaboration between government, industry and the community.

2.4 The liquid fuel, electricity and gas markets are interconnected and interdependent. Disruptions or changes to one sector have potential for significant impact on others (i.e. potential for compounding risks).

2.5 Diesel has an increasingly important role in maintaining power system reliability and security through its use as a secondary fuel in gas-powered generation (GPG) and its use in remote areas.

2.6 Liquid fuel demand in NSW is growing, led by demand for diesel and jet fuel in transport, mining and construction sectors.

2.7 Medium to long-term solutions to the challenges facing the Australian liquid fuel market will require significant investment and time to scale up

Recommendations

Recommendation 1: NSW Government advocates for a more coordinated national energy transition and leads by example in the delivery of critical projects.

Recommendation 2: NSW Government continues to investigate and implement reliability and resilience measures.

Recommendation 3: NSW Government finds a near-term solution to gas supply and energy generation to be in place before 2030.

Recommendation 4: NSW Government actively monitor unexpected events and strengthens NSW response to energy emergencies.

Recommendation 5: NSW Government explores opportunities to enhance liquid fuel production and storage capacity and better understand interdependencies between electricity, gas and liquid fuels networks.

Background and Introduction

Since 2018, the NSW Chief Scientist & Engineer has undertaken an annual review of the risks within the NEM and provided advice to the Minister for Energy on how to better manage energy security and resilience[1]. This annual assessment contributes to NSW's preparedness in responding to energy disruption over the 12-month period while also identifying emerging risks in the medium and long term.

The scope of the 2024-2025 review (Review) has been expanded to include an assessment of all energy markets that now have an impact on the ongoing operation of the NEM, including electricity (thermal and renewable), gas and liquid fuel. The methodology for this Review follows the principles and processes for independent reviews established by OCSE – guided by an expert panel, informed by stakeholder consultation and supported by commissioned analysis. The advice is delivered in two parts: findings and recommendations on electricity and gas markets in Part 1 and additional advice on the liquid fuel market in Part 2.

This report should be read together and in full as well as previous OCSE reports and the commissioned expert paper *Liquid Fuel State of Play for the Annual Energy Markets Assessment 2024/2025* as supplementary information. All references were available when accessed on 2 May 2025.

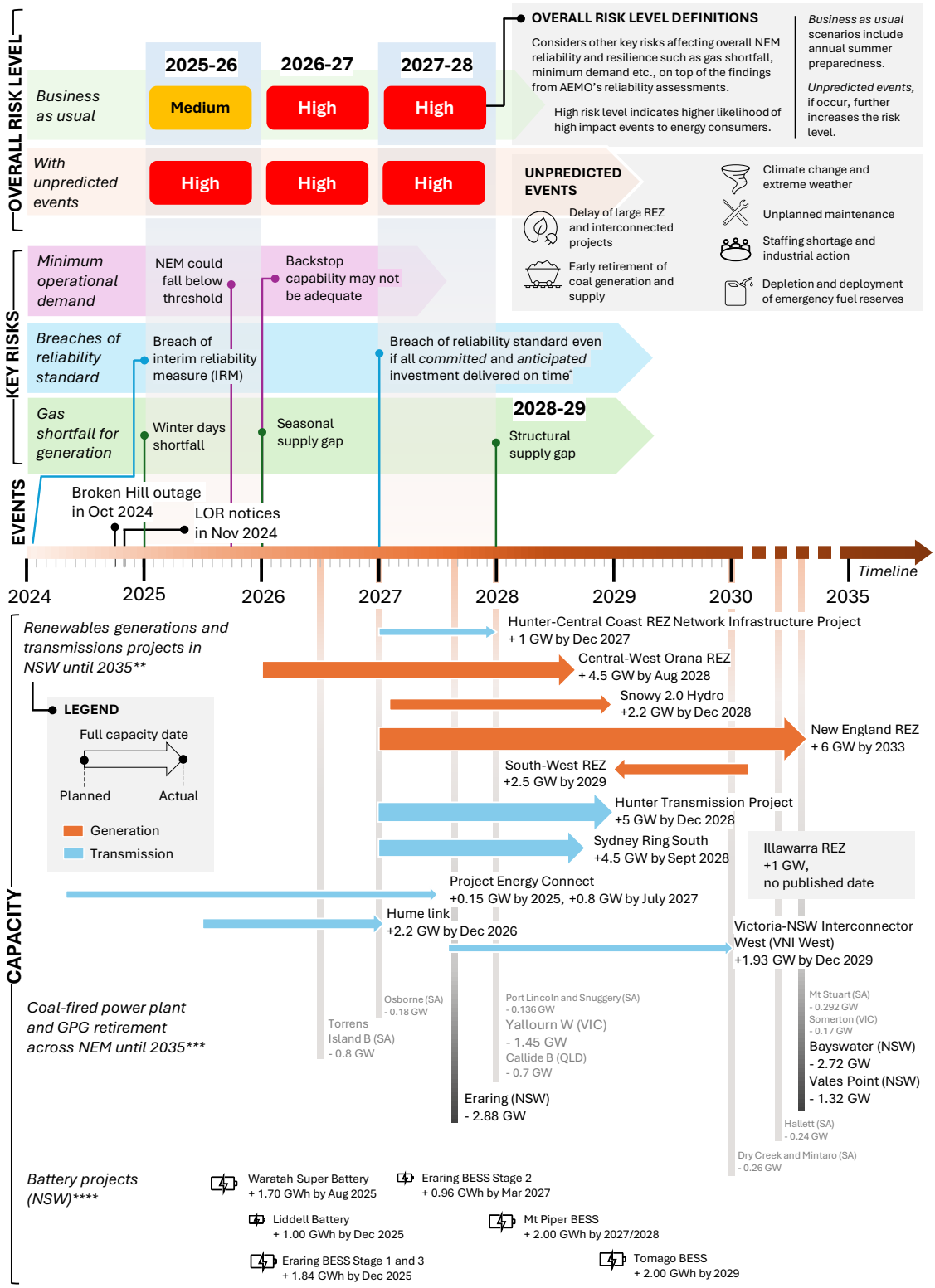
[1] Previous review reports are available on OCSE website

Part 1 – Electricity and Gas Assessment Findings

1.1 There is a relatively high risk of interruptions to the NEM and normal system operation over the next 12 months. This risk is increasing over time.

- There is a high risk that system reliability and security will be breached, with forecasted and actual Lack of Reserve 1-3 conditions (LOR) already occurring in spring and early summer 2024. High impact events that occur simultaneously and/or across jurisdictions will further exacerbate this risk, with a compounding effect on NEM reliability.
- This risk profile is summarised in Figure 1 and based on the following factors:
  - the strong likelihood of unpredictable weather events (particularly high impact storms)
  - delays in anticipated and committed generation entering the market
  - decreased reliability of existing coal-fired power plants
  - maintenance and connection delays due to protected industrial actions
  - emerging dynamics from minimum demand scenarios
  - an increased reliance on gas during periods of high electricity demand (and the risk associated with gas supply and transportation).
- The number of LOR notices in NSW has increased since 2019, representing the growing risk of interruptions to the NEM over time (Figure 2).
- Other jurisdictions within the NEM have recognised similar energy supply risks (and mitigations) to those identified in this assessment and highlighted the challenges in achieving an equitable transition to meet emission targets while controlling market prices. Infrastructure Victoria has released two reports[2,3] that outline risks for the NEM and highlight the need for a coordinated approach across the NEM regions, given the increased reliance on interconnection for all jurisdictions. Of specific relevance to NSW, these reports identify:
  - Requirement for a faster buildout of renewables (solar and wind, including offshore) and associated major grid development, in conjunction with ensuring the timing of coal plant closures to facilitate this deployment
  - Requirement for a more detailed understanding of the impact of rapid electrification (such as uncertainty in rates of change in the movement away from residential gas and the uptake of electric vehicles), which in turn inform the role and scale of grid-firming technologies, consumer embedded storage and other emerging technologies that will be required in the transition.

[2] Aurora Energy Research (2024), *Energy Transition Analysis*, prepared for Infrastructure Victoria, https://assets.infrastructurevictoria.com.au/assets/Energy-transition-analysis.pdf
[3] Jacobs (2024), *Victoria's energy transition risks and mitigation actions*, prepared for Infrastructure NSW, https://assets.infrastructurevictoria.com.au/assets/Victorias-energy-transition-risks-and-mitigation-actions.pdf



*Reliability forecast are for all *committed* and *anticipated* investment and does not include all *proposed* investment according to AEMO's commitment criteria. The reliability forecast does not include New England REZ, Sydney Ring South, Hunter Transmission Project and VNI West illustrated above. See AEMO (2024) ESOO.
**Illustrates the delay of renewable generations and transmissions projects in NSW.
***Note that the diagram includes coal-fired power plant and GPG retirement across NEM to illustrate loses across the system. Reduced capacity from NSW totals at 6.92 GW.
**** Selected high-capacity battery projects in NSW that are announced, under detailed planning or under delivery, not including REZ's battery projects.

Figure 1: Energy Risk Timeline – Critical factors influencing NSW energy reliability and security between 2024 and 2030.[4]

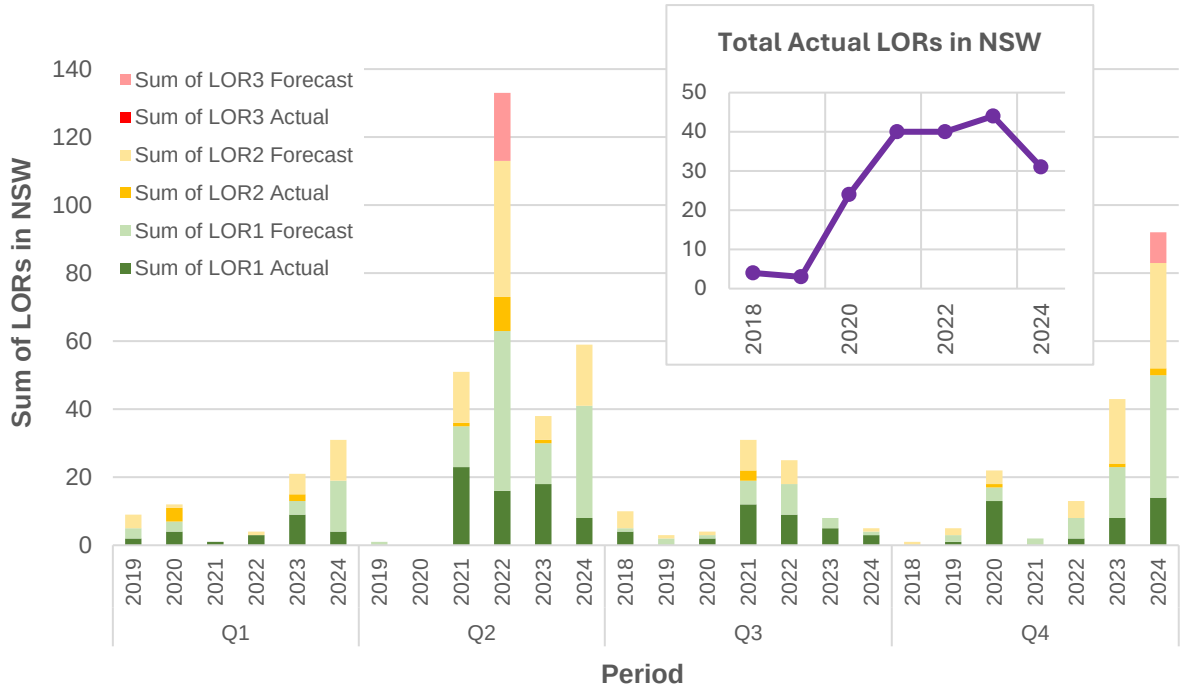


Figure 2: Sum of LOR notices in NSW from 2018 to 2024 by quarter, and total actual LOR notices in NSW from 2018 to 2024 (inset). Source: AEMO (2018-2024), NEM Lack of Reserve Framework Quarterly Reports, available on: https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/power-system-operation/nem-lack-of-reserve-framework-quarterly-reports.

1.2 Adjustments to the NEM to accommodate the ongoing transition to renewables have lacked a coherent, coordinated strategy for reform, making the NEM less reliable and unlikely to support the future energy system.

- When the NEM was established in 1998 the power system and energy market were in a steady state – electricity demand and production was readily predictable, and investment signals were clear. The NEM functioned well for over a decade without the need for government intervention. Over recent years the NEM arrangements have been continually adjusted, typically on an ad-hoc basis, to cope with a changing energy landscape resulting from the significant penetration of intermittent renewables, distributed energy systems and diminishing availability of generation firming capacity, alongside greater integration of electricity and gas systems.
- The future power system will have much greater complexity, dimensionality and uncertainty, facing new dynamics and control issues. System operation will rely on more complex and higher volumes of data. This system will be increasingly susceptible to unpredictable and high impact events, especially if these occur consecutively, simultaneously and/or across jurisdictions within the NEM. Examples of this are seen in recent events in Far West NSW (October 2024) and the LOR 3 notices in November 2024.
- Current NEM arrangements are not fit for purpose to cope with the transition, as the future market will shift from a model dominated by the cost of producing energy to

[4] Based on publicly available data and information (e.g. AEMO reporting). Not an exhaustive list of all risks down to organisation level. Refer to Table 4 in Appendix 3: Key energy reliability terms and definitions for a summary of energy reliability terms and impacts to consumers.

one of delivering energy to users. Some experts[5] and stakeholders interviewed for this Review believe the way in which the power system and market is regulated and managed needs to be modernised to ensure energy is dispatched in a cost-effective, reliable and secure manner which meets consumers' expectations and emissions requirements. The future grid will be fundamentally about infrastructure and grid services, so market arrangements need to be completely redesigned, and appropriate arrangements determined for the provision of services – either mandated or via market mechanisms. Economists and engineers need to work side-by-side on this problem to avoid unintended consequences for the physical behaviour of the power system.

- Many of the stakeholders interviewed expressed a concern that there was a lack of coordination or plan in how the energy transition is to occur; they do not see a coherent plan being presented by government or market institutions. Many operators of existing firm generation capacity communicated a perceived lack of clarity in policy and regulatory signals around expectations of their role in the energy transition.
- Without a clear picture for the future structure of the energy system, many of the issues now evident are being addressed on a local, ad-hoc basis. The necessary wholistic, system-level solutions have not been adequately addressed or actioned by various panels and reviews (e.g. the Energy Security Board or the Energy Advisory Panel). The recently established Expert Independent Panel is only tasked with determining market settings, not the structure of the system and market. Reviews to date have focused on market dynamics and trends, rather than the power system engineering that is required for a reliable transition.
- The successful transition to renewables requires construction of a highly complex machine, with many underlying physics and systems issues that do not have clear solutions at this time. Power system engineers were part of the development of the current NEM but new solutions are needed. Power system engineers now need to develop the smart system that will accommodate large amounts of variable renewables, demand response mechanisms and distributed energy resources. This will require innovations in planning, controls, system operation and monitoring to maintain system stability and reliability. Power system engineers should also be part of ongoing high-level decisions on structuring the system during the transition to renewables. There could be missed opportunities to leverage the expertise of power system engineers who have created and modernised the NEM for the future system design. Loss of that expertise in the NEM planning and operation would further exacerbate the existing skills shortage issue.
- Individual NEM participants do not necessarily have the capacity and expertise to implement these system-level solutions adequately and in a timely (i.e. immediate) manner.

1.3 Investment in the gas supply chain is urgently needed to ensure its role as a transition fuel source.

- The latest Gas Statement of Opportunities (GSOO) forecasts the potential for small seasonal supply gaps from 2026-2027, and notes that from 2028 more significant structural supply gaps will require new gas supply.[6] NSW does not currently produce

[5] Wood (2024), *Fixing the Electricity Market for Good*. Australian Financial Review, https://www.afr.com/policy/energy-and-climate/fixing-the-electricity-market-for-good-20240818-p5k3d5; Ben-David (2023), *Rethinking markets, regulation and governance for the energy transition*. ACCC/AER Regulatory Conference.

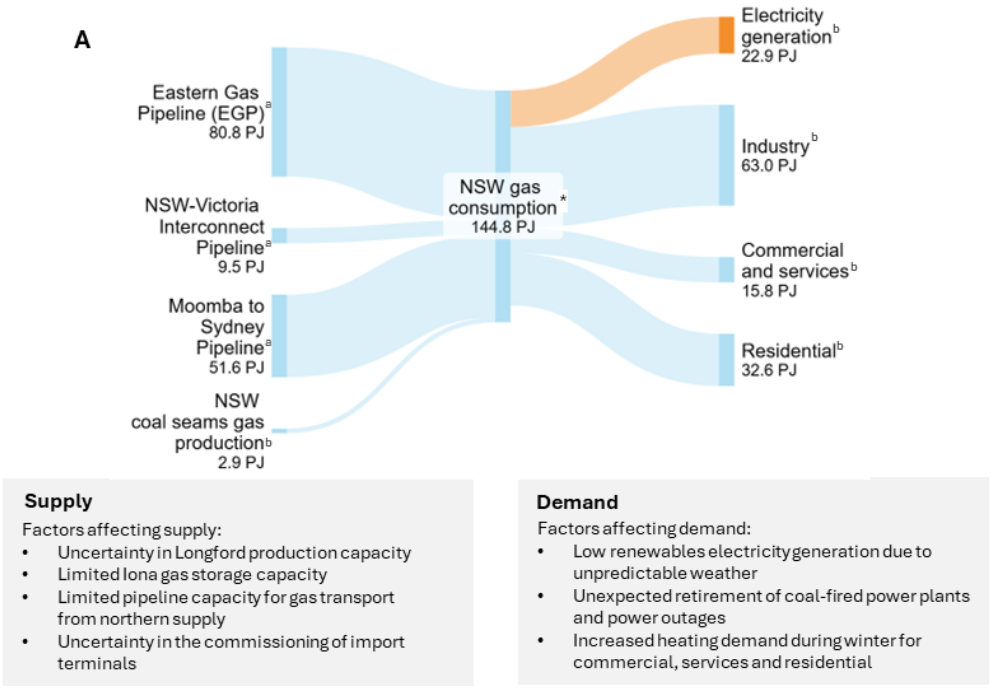
[6] AEMO (2024), *Gas Statement of Opportunities (GSOO)*, https://wa.aemo.com.au/energy-systems/gas/gas-forecasting-and-planning/gas-statement-of-opportunities-gsoo

its own gas, and is reliant on supply from other states, including Victoria, South Australia and Queensland (Figure 3).

- The Australian Competition and Consumer Commission (ACCC) December 2024 Interim Update on the East Coast Gas Market largely echoes the forecasts presented in the GSOO. The ACCC notes that despite the importance of gas in the energy transition, east coast gas supply is in decline. Traditional supply sources such as the Gippsland Basin, which have served the east coast market for decades at a relatively low-cost, are rapidly depleting and investment in new supply has been insufficient to replace them.
- Four key immediate risks for southern gas markets are driving a high potential for instantaneous gas shortfalls in winter 2025:
    - An increasing reliance on GPG during periods of high electricity demand or low output from renewable generation is likely to coincide with high consumer demand for heating in winter. In the event of a gas supply shortage, there is a possibility that GPG could be curtailed, meaning gas shortfalls may have an impact on electricity supply. This risk is further compounded by some large industrial users and generators increasingly not entering large, longer-term supply contracts, and instead relying on short-term contracts in balancing markets. This is increasing the spot price in the gas market and is also making it more difficult for gas suppliers to predict and prepare for any potential gas supply shortfalls. The risk of gas shortfalls is partly mitigated in NSW due to gas supply from both Queensland and Victoria.
    - Production from Longford Gas Plant, scheduled to retire later this decade, will continue to decline. The unpredictable nature of the decline of these legacy gas fields presents a key risk to both gas and electricity supply in the coming years, particularly if the decline is greater and more sudden than anticipated. To somewhat arrest this decline, Esso has announced it is looking to expand its Bass Strait operations and has lodged development plans for drilling of up to five gas production wells at its Marlin field in the eastern area of Bass Strait.[7] Esso also has approval to develop its Kipper gas field. Until these developments are proven, there is still the risk of production declining.
    - Iona Gas Storage Facility was heavily relied upon in the early stages of winter 2024, depleting levels faster than anticipated. A warmer end to winter 2024 prevented a system-wide gas shortage issue. There is a risk for the coming 12 months if Iona is relied on heavily once more.
    - Physical pipeline constraints on the eastern seaboard limit transport capacity of gas from northern production fields to southern markets in the required quantities during high demand scenarios, which could limit GPG output and availability for domestic or industrial use.
- The GSOO forecasts that LNG import terminals, such as the Port Kembla Energy Terminal (PKET), may delay supply gaps until 2033 and help to mitigate peak supply shortfall risks. However, PKET's owners have so far struggled to obtain sufficient interest in contracting supply which would justify the relocation of a floating storage and regasification unit (FSRU).[8]
- Residential and commercial gas demand on the east coast is forecast to decrease over the next two decades. However, this decrease is largely offset by an expected increase in GPG as coal power stations retire, accompanied by a constant industrial

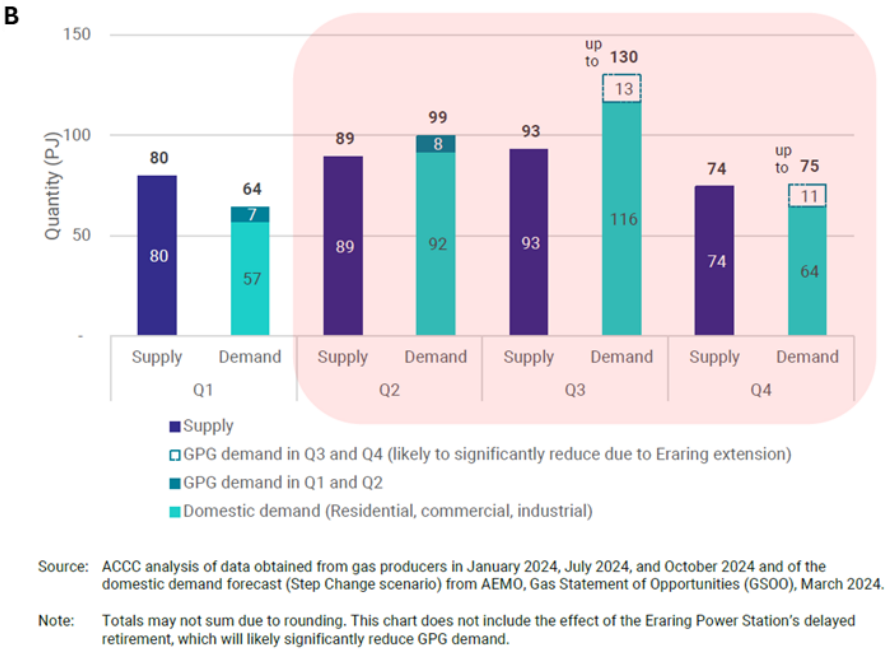
[7] EnergyToday (2025), *Esso looks to expand Bass Strait operations*, https://www.energytodaymag.com.au/esso-looks-to-expand-bass-strait-operations/
[8] As above, AER (2024), *State of the Energy Market 2024*.

demand. This means that total gas demand on the east coast over the next two decades is predicted to remain constant.[9]



Notes
*Data for NSW natural gas consumption includes ACT. Numbers may not add due to rounding and loses. Total consumption includes both primary and secondary fuel.

Source
[a]AER (2024), Average daily flows – NSW/ACT demand region, accessed from https://www.aer.gov.au/industry/registers/charts/average-daily-flows-nswact-demand-region-monthly
[b] DCCEEW (2024), Australian Energy Statistics 2024, Table K2, Table Q3, accessed from https://www.energy.gov.au/publications/australian-energy-update-2024
[c] Diagram tool available at Sankeymatic.com



Source: ACCC analysis of data obtained from gas producers in January 2024, July 2024, and October 2024 and of the domestic demand forecast (Step Change scenario) from AEMO, Gas Statement of Opportunities (GSOO), March 2024.

Note: Totals may not sum due to rounding. This chart does not include the effect of the Eraring Power Station's delayed retirement, which will likely significantly reduce GPG demand.

Figure 3: A) NSW natural gas flows 2022-2023 (petajoule, PJ) and factors affecting NSW gas supply and demand; B) Quarterly supply-demand balance in southern states in 2025 (PJ) from ACCC (2024) Gas Inquiry December 2024 Interim update on east coast gas market available on: https://www.accc.gov.au/about-us/publications/serial-publications/gas-inquiry-2017-30-reports/gas-inquiry-december-2024-interim-report

[9] As above, AER (2024), *State of the Energy Market 2024.*

1.4 Previously identified medium to long-term risks to the reliable provision of energy are now more immediate (i.e. relevant to the coming 12 months).

- The Panel is concerned that the current business-as-usual approach to the modernisation of the grid is not progressing in the necessary timeframes. Findings and recommendations from previous OCSE assessments of energy preparedness are still relevant and applicable.
- While previous findings and recommendations have been acted on in a timely manner, many remain relevant and should be part of current and future considerations. For example, previous recommendations have addressed challenges around workforce recruitment within the government and industry (refer finding 1.9). While action has been taken to address this issue, the Panel has concerns that this challenge remains and requires ongoing action and possibly new responses.
- Lack of clarity associated with the involvement of multiple agencies in transmission infrastructure planning in NSW has the potential to extend the timeframe for delivery of essential transmission augmentations. EnergyCo is one of several entities appointed by the NSW Government to deliver the Electricity Infrastructure Roadmap, alongside the Consumer Trustee, the Regulator, the Electricity Infrastructure Jobs Advocate, the Energy Security Target Monitor and the Renewable Energy Sector Board. There is a role for a single authority to coordinate the delivery of the Electricity Infrastructure Roadmap.
- The recent communication from the Reliability Panel to the Australian Energy Market Commission (AEMC)[10] emphasises the urgency of system security investment to keep pace with the transition.
    - The NEM's transition to a system dominated by VRE is underway and will continue to accelerate, as the Australian Energy Market Operator (AEMO) 2024 Integrated System Plan (ISP) shows. It is critical that the system can operate within its technical operating envelope as synchronous generators continue to retire.
    - The Reliability Panel is of the view that to keep pace with the energy transition, security needs must be identified earlier so that timely investment can occur. Security risks are emerging faster than expected. For example, system strength and minimum system load have become critical risks earlier than expected, and market interventions have been needed to maintain system security.
    - It is critical that the Transition Plan identify the critical investments or operational measures needed to support security as far in advance as possible. Ample notice of specific security needs is important for three reasons:
        1. Investors need enough lead time to make the necessary investment decisions, and then to procure and install the required equipment.
        2. Procurement must factor in lead times to mitigate timing risks.
        3. The risks of over- and under-investment are asymmetric. The risk of over-investment in security services, or investment earlier than needed, comes with much lower costs than under-investment or investment that is too late.

[10] AEMC Reliability Panel (2025), *Comments on AEMO's Transition Plan for System Security*, https://www.aemc.gov.au/sites/default/files/2025-04/Reliability%20Panel%20comments%20on%20AEMO%27s%202024%20Transition%20Plan%20for%20System%20Security.pdf

1.5 NSW risks breaching the Energy Security Target (EST) through insufficient firm generation capacity and the impending retirement of coal-fired power generation.

- The NSW Energy Security Target Monitor (ESTM) Report 2024[11] forecast sufficient firm capacity to meet the EST from 2024–2025 through to 2026-2027, including capacity from existing and committed generation, storage, interconnectors and demand flexibility, as well as anticipated projects (Figure 4). EST breaches are forecast following the retirement of NSW coal-fired power stations. The first EST breach is forecast in 2027-2028, corresponding with the retirement of Eraring Power Station. The second EST breach is forecast in 2033-2034, following the retirement of both Vales Point and Bayswater Power Stations.
- The 2024 ESTM Report explores a number of additional sensitivities to understand the impacts of alternative assumptions. All scenarios found EST breaches in 2027-2028 and 2033-2034 as the base case scenario. These analyses identify the most impactful variables on the 2027-28 EST breach as demand growth, availability of flexible demand and timing of delivery of transmission projects.
- The findings from the ESTM Report suggests additional actions are necessary to ensure a reliable electricity supply following the retirement of coal-fired power stations. The NSW Government has outlined actions taken to address this potential shortfall, including:
    - NSW's Capacity Investment Tender, for the allocation for 900 MW of new dispatchable capacity projects
    - The *Energy Amendment (Long Duration Storage and Investment) Act 2024* legislated an additional minimum objective of 12 GWh of long duration storage by 31 December 2033
    - The Peak Demand Reduction Scheme (PDRS, November 2024) provides incentives for the installation of new batteries in homes and small businesses, and for eligible air conditioners and heat-pump water heaters
    - The Energy Security Corporation, established under the *Energy Security Corporation Act 2024* as a state-owned green bank that is seed funded with $1 billion to unlock investment for vital storage and firming projects in NSW
    - Construction of the Waratah Super Battery as a network standby battery
    - A total of $8.4 million grants to Transgrid and AEMO for additional grid connection engineering resources.[12]
- The Energy Security Corporation's first Investment Mandate has been released, outlining how the corporation will co-invest with the private sector in energy storage projects such as large-scale batteries, community batteries, pumped hydro and Virtual Power Station (VPP). Investment of ESC projects may help in addressing the shortfall of firming capacity depending on the time taken to approve, build and commission them.

[11] AEMO (2024), *Energy Security Target Monitor Report 2024*, https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap/entities-delivering/target-monitor

[12] NSW Government (2024), *Speeding up connection of batteries to NSW electricity grid*, https://www.nsw.gov.au/media-releases/speeding-up-connection-of-batteries-to-nsw-electricity-grid

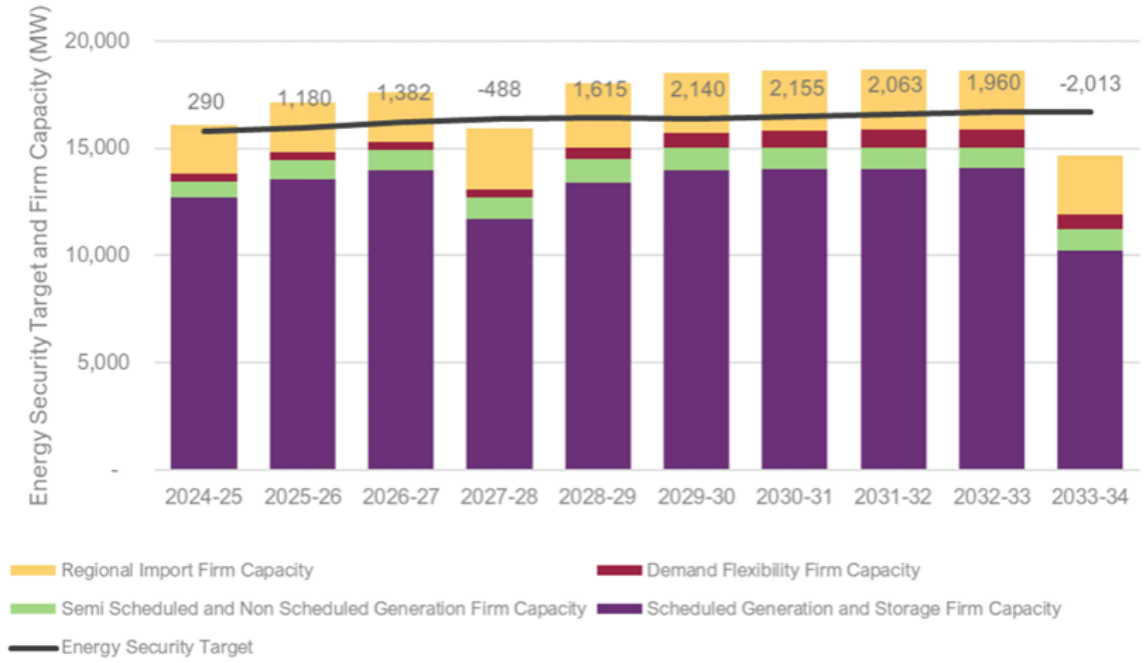


Figure 4: NSW's projected EST assessment under the "Committed and Anticipated Investment Sensitivity", from AEMO (2024), Energy Security Target Monitor Report 2024, available on: https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap/entities-delivering/target-monitor

1.6 Increasing network complexity and delays to approval, construction and commissioning of new generation and transmission capacity are increasing the overall risk to NEM reliability and resilience.

- NSW is forecast to breach the Interim Reliability Measure (IRM) as early as 2024-25 and Reliability Standard (RS) in 2027-28, even if the expected investments are delivered on time followed by the retirement of Eraring and Bayswater coal-fired power stations (See Figure 1).[13] There is a significant reliability risk for NSW and possible earlier breach of the IRM and RS if expected investments are not delivered according to the existing timeline or early retirement of coal-fired power stations.
- Insufficient investment has caused the delay of renewable generation, firming capacity and transmission infrastructure projects. This will impose significant pressure and risks to energy systems. Delays in project planning and approval processes could send weak investment signals, potentially creating a vicious cycle of slow progress and further delays in new investment and projects.
- The projected retirement timelines of coal-fired power stations are based on their technical lifetime; however, their operation and economic lifetime will be impacted by fuel source, market conditions and system limitations. The uncertainty of the actual retirement timeline of coal-fired power stations is potentially causing delay of investment decisions on replacement capacity and service.
- The Panel still has significant concerns that there is a lack of system coordination to bring new projects and infrastructure online to meet reliability requirements and provide real-time supply adequacy, stability and resilience in order to cope with high impact, low probability events.

[13] AEMO (2024), *NEM Electricity Statement of Opportunities (ESOO)*, https://wa.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-reliability/nem-electricity-statement-of-opportunities-esoo

1.7 Energy system services require greater focus.

- Scenarios requiring maintenance of system adequacy and technical limits under minimum operational demand are becoming more prevalent. Provision of system requirements such as inertia, voltage and frequency control are all subject to uncertainty under the existing and emerging market structures, particularly as these services have been historically provided by the large thermal generators. Individual market participants are not incentivised towards broader systematic security, reliability and resilience under current market design. While individual energy market participants are actively addressing their specific areas of responsibility, this does not necessarily guarantee that the system is adequately prepared to manage emerging risks.
- AER is examining mechanisms to shift demand throughout the day – expanding upon current incentives such as network tariff models that encourage this behaviour. Further, AEMO has requested the ability curtail Distributed energy resources (DER) (i.e. to implement emergency backstop capabilities) in addressing minimum operational demand.
- There is an opportunity to influence and coordinate market behaviour to mitigate risks to the system. Long-term reliability needs immediate action: short-term measures such as Government Energy Action Response (GEAR), Voluntary Demand Reduction (VDR), Interim Reliability Reserves (IRR) and Reliability and Emergency Reserve Trader (RERT) (See definitions in Table 4 – Appendix 3: Key energy reliability terms and definitions) may provide temporary relief but are lacking as a long-term solution. Without tackling these root causes, risks to reliability and security will intensify and emerge sooner than the current timeline (See Figure 1).

1.8 Changing climatic patterns and unpredictable extreme weather events are putting further pressure on the energy systems and emergency responses.

- Stakeholders expressed ongoing concerns for the impact of extreme and unpredicted weather events and the emergency response for such disruptive events.
- Key climate drivers for the coming months include: El Niño-Southern Oscillation (ENSO) index in the neutral range showing weak La Nina characteristics; Indian Ocean Dipole (IOD) neutral; Southern Annular Mode (SAM) currently negative but indicating a return to neutral values.[14] These climate drivers will result in weather conditions that will influence both demand and supply, and emergency responses in several ways:
    - Higher rainfall in northern and eastern parts of Australia, with a potential impact on decreased solar generation output of 2 – 4 W/m^2 (given greater cloud cover, i.e., higher forecasted average daily solar anomalies, in the majority of NSW)
    - Prolonged periods of warm nights, with a higher frequency of heatwaves (but with an anticipated lower maximum intensity) anticipates higher evening and overall peak demand in NSW
    - Increased likelihood of severe tropical cyclones due to very warm ocean temperatures, which has the potential to damage electricity infrastructure
    - Above normal fire risk for areas of central NSW,[15] potentially requiring greater resources for emergency response in this area. Nonetheless, normal fire risk is

[14]AEMO (2024), *Spring/Summer Outlook 2024*, https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/system-operations/summer-operations-report

[15] AFAC (2024), *Seasonal Bushfire Outlook - Summer 2024,* https://www.afac.com.au/auxiliary/publications/seasonal-outlook/seasonal-outlook-article/seasonal-bushfire-outlook-summer-2024

predicted for the rest of NSW. Severe-to-extreme drought in western VIC and southeast SA leads to an increase in dry vegetation and risk for bushfire which could potentially impact NSW border towns.

- The energy transition requires climate scientists and power system engineers to work together to design the power system to be sustainable, resilient and reliable. Climate scientists can inform power system engineers on short-term projected weather patterns which will impact system demand, renewable generation and the resulting utilisation of the network.

1.9 Ongoing workforce shortages and industrial action risk delaying planned maintenance and the overall progress of the energy transition.

- Workforce shortages are felt acutely in areas of specific expertise including network engineers, grid connection, electricians (particularly in regional settings), and other fabrication and construction required during the transition period (e.g. welders, boilermakers). The Clean Energy Council notes that there are an estimated 30,000 people currently working in the renewable sector, with an additional 50,000 jobs expected if all the projects in the renewable pipeline go ahead.[16] As most of the renewable projects are in regional areas, this will increase the pressure on services to local communities. There is a significant demand for workforce from concurrent construction projects. For example, crane operators are in high demand for high-rise residential projects, which is competing with the construction of new wind turbines in Renewable Energy Zone (REZ) projects.
- There is the potential to miss an opportunity to leverage the expertise of experienced power system engineers who created and modernised the NEM for future system design. Loss of that expertise in the NEM planning and operation would further exacerbate the existing skills shortage issue.
- Recruitment trends have shifted, with employers increasingly focusing on attracting talent for roles specific to renewable energy projects, but these efforts have faced challenges. The renewable energy sector, while growing rapidly, often struggles to compete on salary and conditions with other sectors like mining and construction.
- The TAFE and apprenticeship system is offering training pathways, however current talent supply has struggled to adequately meet this increasing demand. A stronger alignment between training institutions and industry needs is essential to ensure a pipeline of skilled workers to support the energy transition. Tertiary education institutions and training programs must play a more significant role in promoting the long-term career potential and value of renewable energy jobs. Initiatives such as targeted scholarships, micro-credentials and flexible training pathways, and industry partnerships, could help grow and attract the right talent.
- The Panel notes the NSW 2030 Renewable Energy Workforce Plan[17] has been drafted by the NSW Government to increase awareness, access, support, equity and mobility in meeting the skill gaps in renewable energy education, training and employment.
- The Electrical Trades Union (ETU) undertook protected industrial action from 1 February 2024. While the ETU action has impacted planned outages and maintenance, stakeholders indicated that they are still generally well-placed moving into the next 12 months. As of the delivery of this report, the Panel notes there is still

[16] Clean Energy Council (2022), *Skilling the Energy Transition*, https://cleanenergycouncil.org.au/news-resources/skilling-the-energy-transition

[17] NSW Government (2024), *Draft NSW 2030 Renewable Energy Workforce Plan*, https://education.nsw.gov.au/content/dam/main-education/skills/renewable-energy/renewable-energy-workforce-plan-consultation-draft.pdf

ongoing protected industrial action affecting Transgrid and Essential Energy. The protected industrial action of workers at Ausgrid and Endeavour Energy has ended. The residual risk from unresolved protected industrial action includes delays in grid connections, with consequent cumulative effects on the energy transition by delaying availability of new generation capacity.

1.10 New and emerging risks to energy supply and emergency response (e.g. increased susceptibility to cyber security threats) require further scoping.

- The telecommunications operators Telstra and Optus switched off their 3G networks on 28 October 2024, following earlier decommissioning by other operators (e.g. TPG and Vodafone). Telstra operates the largest network across Australia and is particularly important in providing connectivity in rural/regional settings.
- The decommissioning of 3G telecommunications may affect the usage of key assets and communications in emergency situations (such as requiring hardware replacement or software updates for DNSP/TNSPs), especially in rural and regional settings. The way in which these assets and communications could be affected is difficult to predict until such an emergency situation occurs.
- The increased threat of cyber attacks represents an emerging vulnerability in the energy system, exacerbated by the interconnectedness of energy transmission (gas and electricity) among the states, grid transmission and the use of Internet of Things (IoT) devices such as solar inverters or smart meters.[18] While there is a direct risk, foreign investment/ownership or supply chain domination can also be a potential vulnerability. In early 2024, an energy supplier in NSW reported a distributed denial-of-service (DDoS) incident which disrupted remote connections to the system used to gather and process data to apply operational controls.[19] Although there were no significant interruptions to energy supply, as the facilities remained operational using onsite access and remote connections (restored within eight hours), additional responses were implemented to prevent further threats on the system.
- Steps to mitigate the risk of cyber threats include security uplift of critical personnel and improvement in physical security and governance structures. In December 2024, AEMC ruled the new cybersecurity roles and responsibilities for AEMO. These functions are facilitative and flexible and are not designed to enable AEMO to impose new obligations on market participants. AEMO is currently conducting consultations on cost recovery and impact on market participants.[20] Recognising the commitment to ensure the security of its customers, infrastructure and the broader energy sector, Endeavour Energy announced its ISO 27001:2002 certification for Information Security Management (IMS) for over 16 critical assets.[21] The certification is not mandatory but is considered as industry best practice.

1.11 Recent events highlight the increasing frequency and risk of NEM customer interruption in NSW.

Event 1: Broken Hill outage event (October 2024)

[18] CSCRC (2023), *Power Out? Solar inverters and the silent cyber threat*, https://cybersecuritycrc.org.au/power-out-solar-inverters-and-silent-cyber-threat
[19] ASD (2024), *Annual Cyber Threat Report 2023-2024*, https://www.cyber.gov.au/about-us/view-all-content/reports-and-statistics/annual-cyber-threat-report-2023-2024
[20] AEMO (2025), *Consultation Paper – AEMO's new cybersecurity toles and responsibilities*, https://aemo.com.au/consultations/current-and-closed-consultations/new-cyber-security-roles-and-responsibilities-for-aemo---declared-nem-project
[21] Endeavour Energy (2024), *Australia First: Paving the Way for a Cyber-Secure Energy Future*, https://www.endeavourenergy.com.au/news/media-releases/australian-first-paving-the-way-for-a-cyber-secure-energy-future

- On Thursday 17 October 2024 severe thunderstorms damaged transmission infrastructure that provides power to Broken Hill and surrounding communities in Far-West NSW, affecting approximately 20,000 community members. This event demonstrated the vulnerability of energy infrastructure to weather extremes and the impact that disruptions can have in a regional setting. The Panel notes that both the Indpendent Pricing and Regulatory Tribunal (IPART) and the Australian Energy Regulator (AER) are conducting specific investigations into this event. Additionally, the NSW Parliamentary Inquiry by the Legislative Assembly Committee on Environment and Planning and After-Action Review (AAR) by Energy and Utilities Services Functional Area Coordinator (EUSFA) are also examining the response to the event. Energy market stakeholders indicated that the overall NSW Government response to the outage event (as coordinated by the EUSFA) was adequate, although some frustrations around lack of communication on the event and coordination were expressed by community members. Key actions included activating an emergency response team, deploying backup generators and fuel resources, establishing community hubs for charging devices and prioritising vulnerable residents, including those on life-support equipment.

Event 2: Spring heatwaves and LOR event (November 2024)

- In late November 2024, a combination of factors including unseasonably warm temperatures in spring and maintenance of coal-fired power stations led AEMO to declare forecast LOR3 conditions in NSW for the first time since the market suspension in June 2022. Coincident contributing factors included heatwave conditions, transmission outages and planned and unplanned generation outages. While no actual LOR3 condition eventuated, an actual LOR2 condition was declared on 27 November from 15:30 to 16:45. An estimated 65 MWh of reserves were activated via Reliability and Emergency Reserve Trader (RERT) contracts between 15:45 and 16:45, with an estimated cost of $3,557,700 ($54,734/MWh).[22]
- The NSW Government also responded to these conditions by activating the GEAR and VDR protocols between 15:00–20:00 – asking NSW Government agencies, local councils, Commonwealth facilities in NSW, water utilities and the City of Sydney to voluntarily reduce electricity use.[23]
- Heatwave conditions: Australia recorded the hottest spring on record, with a mean temperature of ~2.5ºC above pre-industrial levels, with temperatures in Western Sydney forecast to exceed 35ºC over five consecutive days.
- Planned and unplanned outages in coal-fired power stations (two Bayswater units, one Vales Point unit and one Eraring unit)[24]

1.12 Communication and community engagement are vital aspects of emergency response and energy system transition.

- Many aspects of system adequacy, reliability security and resilience have significant impact on consumers (see Appendix 3: Key energy reliability terms and definitions
-) and the management of these will require ongoing and coordinated communication to ensure consumers' continued support of the energy transition. Consumers are

[22] AEMO (2024), *Estimated payments and volumes for RERT activation on 27 November 2024*, https://aemo.com.au/-/media/files/electricity/nem/emergency_management/rert/2024/rert-activation-estimates-report-for-27-nov-2024.pdf?la=en

[23] NSW Government (2024), *NSW Government Update on hot weather*, https://www.nsw.gov.au/media-releases/nsw-government-update-on-hot-weather

[24] AEMO (2024), *Media statement (11:30am) – low electricity reserves*, https://aemo.com.au/newsroom/media-release/media-statement---11-30am

more likely to support the transition if it is reinforced by a simple, coordinated and transparent framework that demonstrates its value.

- The NSW Government already plays a key role in communicating emerging system resilience measures (e.g. equitable or rolling load shedding or applying backstop mechanisms to curtail DER) to impacted communities.
- In REZ areas where there has been a significant influx of workers, local communities are concerned that the local infrastructure is being stretched and thus services diminished and do not see this situation improving.
- During consultations with stakeholders, it was noted that communication and coordinating efforts should be focused on the outcomes for the local community, particularly vulnerable residents. Further, intra- and inter-state emergency events pose operational risks and may require 'pain sharing' between NSW and other jurisdictions to maintain NEM reliability, which should be communicated to the affected communities.

1.13 Existing NSW Government initiatives, including implementation of recommendations from the Electricity Supply and Reliability Check Up, aim to address some of the concerns identified in this assessment.

- The Electricity Infrastructure Roadmap is the NSW Government's long-term strategy to guide the energy transition by coordinating investment in generation, storage and transmission. Twelve GW of new renewable electricity generation and 2 GW of long-duration storage are expected to be delivered under the Roadmap by 2040.
- The Gas Decarbonisation Roadmap (2026 release) and the Renewable Fuel Strategy (mid-2025 release), both under development, may include measures to address both supply and demand pressures.
- NSW Government Check Up Recommendations Implementation Update 2024[25] addresses the NSW Government's response to the Electricity Supply and Reliability Check Up Recommendations. Twenty-seven recommendations have been implemented, 23 are progressing and two were not accepted by the NSW Government. Key measures implemented include direction for clear priorities for EnergyCo, agreement with Origin Energy to extend Eraring operation until August 2027, establishment of the Energy Security Corporation and release of Renewable Energy Planning Guidelines.
- Recommendation 10 was not accepted, as the NSW Government wants EnergyCo to be the delivery-focused entity to oversee the Central-West Orana REZ, as part of overseeing all REZ infrastructure construction and operation. Recommendation 11 was not accepted as it was stated that HumeLink is a "Commonwealth and NSW Government priority and is proceeding under the National Electricity Market Rules' regime for transmission infrastructure".[26]
- Actions being taken under existing initiatives, expected outcomes and timelines of progressed recommendations are not always transparent or clearly communicated.

[25] NSW DCCEEW (2024), *Check Up Recommendations Implementation Update 2024*, https://www.energy.nsw.gov.au/sites/default/files/2024-12/202412-Check-Up-Recommendations-Implementation-Update.pdf

[26] NSW DCCEEW (2024), *Check Up Recommendations Implementation Update 2024*, https://www.energy.nsw.gov.au/sites/default/files/2024-12/202412-Check-Up-Recommendations-Implementation-Update.pdf

Part 2 – Liquid Fuel Assessment Findings

This section presents an assessment of the liquid fuel market, with a particular focus on NSW supply chain resilience, vulnerabilities and interdependencies with the gas and electricity markets. The assessment draws on the analysis and stakeholder consultation results in the accompanying expert paper *Liquid Fuel State of Play for the Annual Energy Markets Assessment 2024/2025.*[27]

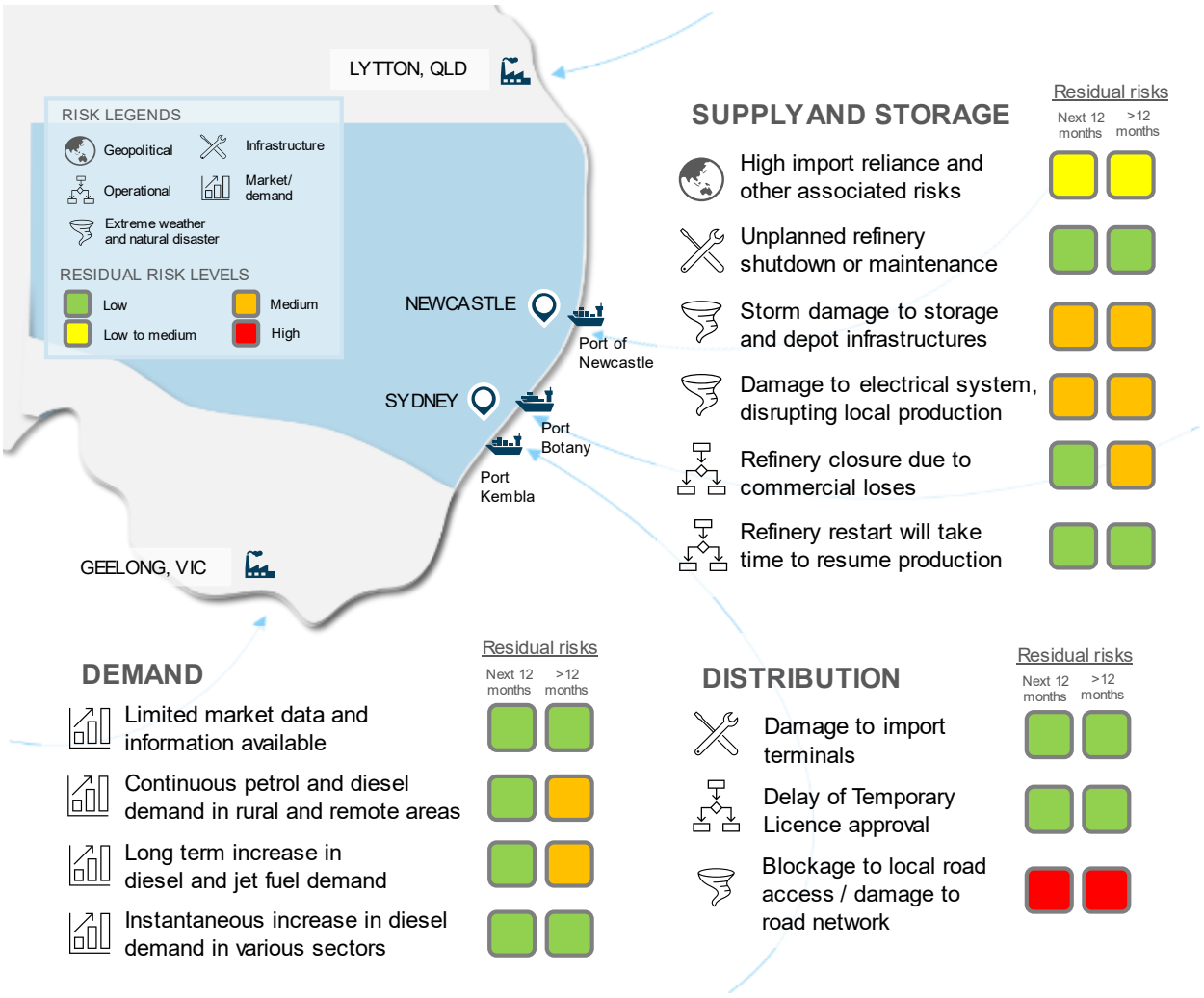


Figure 5: Summary of residual risks of liquid fuel supply chain (supply, storage, distribution and demand), for the next 12 months to beyond 12 months. For more information, refer to Table 5 in Appendix 4: Risk assessment of liquid fuel supply chain.

[27] Arup (2025), *Liquid Fuel State of Play for the Annual Energy Markets Assessment 2024/2025*.

2.1 The overall risk of disruption to the liquid fuel supply chain in NSW over the next 12 months is low.

- Analysis in the commissioned expert paper[28] and further discussions with stakeholders indicate the liquid fuel sector in NSW (and Australia) is well placed for the next 12 months, with a summary of the residual risks outlined in Figure 5.
- Stakeholders highlighted that the robust liquid fuel supply chain (nationally and internationally) and emergency readiness plans provide confidence the market can respond to disruptions. At the state level, pre-existing protocols guide responses to local emergency situations. Responses include sourcing liquid fuel supply from strategic stockpiles, rationing or obtaining alternative sources from within Australia or diverting imports. This is evident from recent events where liquid fuel market participants and the NSW community responded promptly to local situations. For example, in preparation for Cyclone Alfred that struck Queensland in early March 2025, Ampol cleared the refinery site in Lytton and placed it in a 'safe circulation mode' (i.e. a non-production mode), while also ensuring enough supply for emergency services. Ampol lost approximately 10 days of production but resumed normal operation and production rates at 9-10 days after restart. [29] During stakeholder consultations for this report, it was noted that communication with Queensland's government and third-party sites during this event was key for the preparation.

2.2 NSW (and other Australian states) rely heavily on domestic and international liquid fuels imports. This dependency is mitigated through diversified imports and import opportunities, onshore storage and domestic production, although the latter two are limited.

- In 2024, NSW accounted for 31% of petrol and 33% of diesel consumption in Australia.[30] However, without any refineries NSW depends heavily on domestic and international fuel imports. Reliance on liquid fuel imports exposes the system to a number of key risks, including:
  - dependency on single countries or regions
  - disruptions in major international shipping lanes
  - geopolitical instability.
- Australia leverages a diversified sourcing strategy and investment in key storage facilities to ensure continual reliability of liquid fuels across all sectors:
  - Ability to import from over 70 countries[31], minimising risk associated with relying on single countries or regions, disruptions in major international shipping lanes and/or geopolitical events. In addition, our proximity to Southeast Asia allows relatively short transit time for some imports (6-15 days).
  - The Commonwealth's Boosting Australia's Diesel Storage Program (BADSP) in 2020 awarded grants totalling $50,130,000 to two NSW projects to increase diesel storage capacity in Port Kembla and Newcastle. The successful projects

[28] Arup (2025), *Liquid Fuel State of Play for the Annual Energy Markets Assessment 2024/2025*.
[29] Ampol (2024), *Update on Cyclone Alfred and Release of Analyst Presentation*, https://www.ampol.com.au/about-ampol/investor-centre/asx-announcements
[30] Commonwealth DCCEEW (2024), *Australian Petroleum Statistics*, https://www.energy.gov.au/energy-data/australian-petroleum-statistics
[31] In 2024, imports of crude oil were sourced from Southeast Asia (63%), North America (17%), Middle East (10%) and other countries (10%). Imports of refined products were sourced from East Asia (46%), Southeast Asia (41%), Middle East (1%) and other countries (11.7%). Commonwealth DCCEEW (2024), *Australian Petroleum Statistics*, https://www.energy.gov.au/energy-data/australian-petroleum-statistics

were expected to increase the total diesel storage capacity in NSW by 259 ML.[32] This storage capacity increase, when filled, is the equivalent of 12 days of NSW's diesel consumption in 2024 or about 15% increase in capacity compared to the Minimum Stockholding Obligations (MSO)[33] required in 2023-2024.

- The two remaining refining facilities in Australia, Geelong Oil Refinery (Victoria, owned by Viva Energy) and Lytton Oil refinery (Queensland, owned by Ampol), produce approximately 24% of Australian petroleum product sales, with an annual combined production rate of approximately 14,513 ML (2024).[34] These refineries are supported by the Commonwealth Fuel Security Service Payment (FSSP), established under the *Fuel Security Act 2021* (Cth), receiving production payments during loss-making periods in exchange for an agreement to continue operating until at least 30 June 2027 with an option to extend to 30 June 2030. There is a risk to the operation of these refineries beyond these dates given the uncertainty associated with this support ending.
- Historically, national liquid fuel reserves were considered adequate under normal consumption rates. Australia's stocks are measured using three different methods which are not directly comparable: consumption cover days, MSO days and International Energy Agency (IEA) days:
  - **Consumption cover days** are based on total stocks held in Australia (on land and in domestic coastal waters) at the end of each month, divided by average daily consumption for the last 12 months. This gives an indication of how long each type of fuel would last. As of February 2025, Australia held stock volume equivalent to 30 days normal consumption for petrol, 28 days for diesel and 23 days for jet fuel.[35]
  - **MSO days** are monitored more frequently, and also include stocks held in pipelines and on water in Australia's Exclusive Economic Zone. In FY 2023-2024, the Commonwealth DCCEEW reported that all MSO entities held higher-than-average required stocks of petrol, diesel and jet fuel (petrol at 78% above the required 961 ML, diesel at 57% above the required 1656 ML and jet fuel at 103% above the required 364 ML).[36]
  - **IEA days** are not a measure of consumption, but instead a measure of total oil stocks held relative to net imports (being the equivalent stock figure of imports minus exports). It combines all feedstocks and refined products into a single figure, and also includes stocks held internationally such as any held in the US Strategic Petroleum Reserve (SPR) (none at present). The IEA stockholding obligation requires all members to hold stocks equivalent to 90 days of net

[32] BADSP projects in NSW are in Port Kembla (Park, 30 ML; Qube Holdings, 73 ML) and Newcastle (Stolthaven Australia, 126 ML; Park, 30 ML). From DISR (2021), *Media Release: Expanding Australia's diesel storage to boost long-term fuel security*, https://www.minister.industry.gov.au/ministers/taylor/media-releases/expanding-australias-diesel-storage-boost-long-term-fuel-security

[33] MSO was implemented by the Commonwealth Government 1 July 2023 with major fuel importers and refiners required to hold a baseline level of stock: petrol (refiners, 24 days; importers, 27 days), jet fuel (refiners 24 days, importers 27 days) and diesel (refiners 20 days, importers 32 days). More information Commonwealth DCCEEW (2024), *Minimum stockholding obligation*, https://www.dcceew.gov.au/energy/security/australias-fuel-security/minimum-stockholding-obligation

[34] Domestic refinery production from Commonwealth DCCEEW (2024), *Australian Petroleum Statistics*, https://www.energy.gov.au/energy-data/australian-petroleum-statistics

[35] Commonwealth DCCEEW (2024), *Australian Petroleum Statistics*,https://www.energy.gov.au/energy-data/australian-petroleum-statistics

[36] Commonwealth DCCEEW (2024), *Minimum stockholding obligation for liquid fuels: 2023-2024 statistics*, https://www.dcceew.gov.au/energy/security/australias-fuel-security/minimum-stockholding-obligation/2023-24-statistics

imports in order to '*be ready to collectively respond to severe supply disruptions affecting the global oil market*'.[37]

- In the last Liquid Fuel Security Review, the Commonwealth Government committed to being compliant with IEA stockholding obligations by 2026.[38] In 2020, the Australian and US governments entered into a lease in that will allow Australia to hold oil in the US Strategic Petroleum Reserve (SPR) until 2030. This held stock, ~1.7 million barrels of crude oil, could be counted towards the compliance obligations set by IEA.[39] Australia is running below the obligation, with only 48 days' worth of net imports held (as measured December 2024).[40,41] However, at present, there is no Australian stock held in the SPR[42] due to the IEA collective actions in 2022.[43] Current geopolitical tensions (such as the current US administration's stance on trade and the IEA call on SPR reserves for relief from pressures on the global market due to the Ukraine conflict), introduce uncertainty about how any potential future Australian-held stock in the SPR might be accessed by Australia.

2.3 Emergency events can have a high impact on the liquid fuel supply chain, including localised fuel shortage, infrastructure damage and demand challenges, requiring contingency planning and collaboration between government, industry and the community.

- Stakeholder consultation identified risks associated with emergency events including location-specific deployment of liquid fuels, facilities that require ongoing fuel supply (such as generators), response time, recovery time and costs associated with stockpiling and ongoing disruptions:
  - Restarting a refinery from shutdown takes one to two weeks for full productions to resume.[44] This may have a localised effect on fuel supply.
  - Increasing stockholding in times of emergencies incurs upfront costs that may result in increases in price to consumers.
  - While obtaining international/offshore supply during a local/domestic emergency is not necessarily an issue, temporary price increases impact customers as the fuel price in Australia is defined by global crude oil prices, international

[37] The IEA days are calculated differently from the MSO and consumption cover days. IEA days are based on stocked divided by daily net imports, not by daily consumption, and is agnostic of fuel type.
[38] Commonwealth DCCEEW (2020), *Liquid Fuel Security Review – Final Report*, https://www.dcceew.gov.au/sites/default/files/documents/72895-2.pdf
[39] Commonwealth Government (2020), *Australia strengthens fuel security with new US Arrangement*, media release by The Hon. Angus Taylor MP, https://www.minister.industry.gov.au/ministers/taylor/media-releases/australia-strengthens-fuel-security-new-us-arrangement
[40] Commonwealth DCCEEW (2024), *Australian Petroleum Statistics*, https://www.energy.gov.au/energy-data/australian-petroleum-statistics
[41] IEA (2025), *Oil Stocks of IEA Countries*, https://www.iea.org/data-and-statistics/data-tools/oil-stocks-of-iea-countries
[42] Australian stocks held overseas under agreement is indicated as "none at present" (0 days, December 2024). See Commonwealth DCCEEW (2024), *Measures of liquid fuel stocks,* https://www.dcceew.gov.au/energy/security/australias-fuel-security/measures-of-liquid-fuel-stocks. See also IEA (2025), *Oil Stocks of IEA Countries*, https://www.iea.org/data-and-statistics/data-tools/oil-stocks-of-iea-countries
[43] Commonwealth Government, (2023) *Freedom of Information request: Liquid Fuel Security – Actions to support Australia's fuel Security*, https://www.dcceew.gov.au/sites/default/files/documents/72895.pdf
[44] Viva Energy (2025), *Geelong Refinery update*, https://www.vivaenergy.com.au/investor-centre/asx-announcements and Ampol (2024), *Update on Cyclone Alfred and Release of Analyst Presentation*, https://www.ampol.com.au/about-ampol/investor-centre/asx-announcements

benchmarks for refined products and market dynamics.[45] Similarly, localised disruption may result in temporary price hikes due to the additional transportation cost of fuel to the affected or isolated area.

  - During emergency events, it may be important to access liquid fuel from berthed ships. Under the *Coastal Trading (Revitalising Australian Shipping) Act 2012* (Cth), shipping tankers registered internationally require a *Temporary Coastal Licence* for the vessel to dock within Australia. Some stakeholders raised concerns that the timeframes and administrative requirements under the Act to obtain or vary a *Temporary Coastal Licence* could prohibit a rapid response to onshore supply disruptions and shifts in demands.[46,47,48] An independent review into the Act is ongoing, with a final report expected mid-2025.

- **2019-2020 bushfires in NSW**:[49] Despite the overall supply being sufficient, road closures affected fuel distribution, power outages impacted retail fuel supplies (pump operations) and telecommunications (electronic payment), and the access to backup generation was impacted by the limited availability of electricians to access and connect equipment. For example, an unanticipated demand occurred at Moruya (NSW south coast) where fuel shortages were exacerbated by the temporary increase in demand by the thousands of tourists leaving the area.[50] Some fuel stations ran dry or had to ration fuel to customers in affected regions. The NSW Government provided limited intervention through the SES and provision of backup power generators.[51]
- **2022 NSW Northern Rivers floods**: Significant infrastructure damage to fuel stations and storage tanks affected post-flood fuel supply recovery. Lismore-based fuel distributor, North Coast Petroleum, suffered infrastructure damage to eight sites across the region. Local industrial diesel storage was damaged, not only resulting in loss of supply but also causing environmental and property damage from resulting oil spills.[52,53] As part of the emergency response, ADF's NSW task force delivered more than 80,000 litres of fuel. In conjunction with the NSW Rural Fire Service, logistics for fuel delivery to isolated communities in the area were established to sustain community generators until road access was re-established.[54] Maritime NSW, also provided logistical support.[55] EUSFA's liaison officer has also coordinated fuel data inventories, delivery schedules from oil companies in affected area and ensured fuel

[45] ACCC (2025), *Report on the Australian petroleum market - December quarter 2024*, https://www.accc.gov.au/about-us/publications/serial-publications/australian-petroleum-industry-quarterly-reports/quarterly-report-on-the-australian-petroleum-market-december-quarter-2024
[46] Caltex (2012), *Caltex submission on the Stronger Shipping for a Stronger Economy reform agenda,* https://treasury.gov.au/sites/default/files/2019-03/Caltex.pdf
[47] Ampol (2024), *Independent review of the Coastal Trading Act 2012 – Ampol*, https://www.infrastructure.gov.au/sites/default/files/documents/ircta-ampol.pdf
[48] Commonwealth DCCEEW (2020), *Liquid Fuel Security Review – Final Report*, https://www.dcceew.gov.au/sites/default/files/documents/72895-2.pdf
[49] As above, Commonwealth DCCEEW (2020), *Liquid Fuel Security Review – Final Report*
[50] As above, Commonwealth DCCEEW (2020), *Liquid Fuel Security Review – Final Report*
[51] As above, Commonwealth DCCEEW (2020), *Liquid Fuel Security Review – Final Report*
[52] NSW EPA (2024), *Boral hydrocarbon spill – South Lismore*, https://www.epa.nsw.gov.au/Working-together/Community-engagement/updates-on-issues/Boral-hydrocarbon-spill-South-Lismore
[53] NSW EPA (2023), *Broadwater clean-up program,* https://www.epa.nsw.gov.au/Working-together/Community-engagement/updates-on-issues/Broadwater-clean-up-program
[54] ADF (2022), *Operation Flood Assist 2022,* https://www.defence.gov.au/news-events/news/2022-04-08/operation-flood-assist-2022
[55] NSW Parliament (2022), *Response to major flooding across New South Wales in 2022*, https://www.parliament.nsw.gov.au/lcdocs/inquiries/2866/Report%20No%201%20-%20Response%20to%20major%20flooding%20across%20New%20South%20Wales%20in%202022.pdf

availability for Emergency Services.[56] One of the recommendations from the *NSW Independent Flood Inquiry*[57] includes ensuring that essential services infrastructure is situated as much as possible above likely flood levels. For example, funding arrangements by Commonwealth and NSW Governments has helped North Coast Petroleum to raise generators and sensitive equipment above flood level, repair weighbridge and major equipment at the depot and petrol pumps.[58] NSW EPA has also required local licence holders to anchor bulk fuel storage tanks to the ground to prevent overturning.[59]

- In an event of a national liquid fuel emergency, NSW's readiness is supported by the *Liquid Fuel Emergency Act 1984* (LFE Act)[60] and the *National Liquid Fuel Emergency Resource Plan* (NLFERP)[61]. The NLFERP are managed by the National Oil Supplies Emergency Committee (NOSEC) at the federal level. During 'business as usual' periods, NOSEC maintains NLFERP and its communication process (internal and public facing), including information about the roles and responsibilities of various parties, and consultations and decision-making procedures.[62] NOSEC holds meetings to conduct emergency simulations exercises, learn from supply incidents or disruptions, and support harmonisation of emergency responses between jurisdictions and at federal level. NOSEC runs emergency response exercises (Exercise CATALYST) every two years with states and territory governments, and the industry. During a liquid fuel supply shortage, a range of voluntary measures can be implemented to reduce demand (e.g. car-pooling, increase use of public transport) by up to 10%, without the need to trigger the *LFE Act*.[63] If the voluntary measures are insufficient, there is an option to escalate to a stronger retail rationing approach under the *LFE Act* – with restrictions applied to the maximum transaction value per vehicle per day, not by volume of petrol sales, and is therefore highly dependent on price fluctuations. To date, the *LFE Act* has never been invoked.
- The competitive nature of the domestic and international liquid fuel industry results in limited public availability of market information. To ensure that accurate information can be obtained on the liquid fuels market, mandatory reporting was streamlined through a reporting tool in October 2022 – the *Liquid Fuel Gateway*[64] – to align with the *Petroleum and Other Fuels Reporting Act 2017*. This increases the publication of

[56] NSW Independent Flood Inquiry (2022), *2022 Flood Inquiry – Volume Two, Full report*, https://www.nsw.gov.au/nsw-government/engage-us/floodinquiry
[57] See Recommendation 28 in NSW Independent Flood Inquiry (2022), *2022 Flood Inquiry – Volume Two, Full report*, https://www.nsw.gov.au/nsw-government/engage-us/floodinquiry
[58] Commonwealth Government (2024), *Media Release: North Coast petrol stations back and thriving after floods*, https://minister.homeaffairs.gov.au/JennyMcAllister/Pages/north-coast-petrol-stations-back-thriving-after-floods.aspx#:~:text=Flood%20damaged%20buildings%20have%20also,stock%20storage%20during%20future%20floods.
[59] NSW EPA (2023), *Broadwater clean-up program,* https://www.epa.nsw.gov.au/Working-together/Community-engagement/updates-on-issues/Broadwater-clean-up-program
[60] The LFE Act grants the government broad powers to control production, distribution, sale and use of liquid fuels across Australia in an emergency.
[61] The NLFERP aims to most efficiently manage fuel stocks in a fuel rationing scenario, minimising impact of an emergency situation on fuel users.
[62] NOSEC (2022), *NOSEC 41st Meeting Minutes*, https://www.dcceew.gov.au/sites/default/files/documents/73875.pdf
[63] Commonwealth Government (2016), *NOSEC Guidance Note – Retail Rationing Under the Liquid Fuel Emergency Act 1984*, https://www.energy.gov.au/sites/default/files/nosec-guidance-note-retail-ration-liquid-fuel-emergency-act-1984-2016.pdf
[64] The *Liquid Fuels Gateway* can be accessed from: *https://lfg.industry.gov.au/landing*

information and the transparency of liquid fuel markets data, allowing industry and government agencies to coordinate response in meeting demand.[65]

2.4 The liquid fuel, electricity and gas markets are interconnected and interdependent. Disruptions or changes to one sector have the potential for significant impact on others (i.e. for compounding risks).

- Interdependencies between liquid fuel, electricity and gas markets are increasing due to shared infrastructure, competition for resources, overlapping supply chains, and substitution between fuels. For example, OCSE reports have previously identified the confluence of energy availability and environmental water conditions for Snowy Hydro[66] and for the coal-fired generators located on Lake Macquarie.
- Another recent example of the interplay between different fuel sources is the power outage at Viva Energy's Geelong Refinery,12 January 2025; a lightning storm that affected the local power grid caused an unscheduled shutdown of all units, leading to a temporary (approximately two weeks) halt to operations and a reduction in fuel production.[67] While Viva Energy indicated that there was no interruption to supply, if an event of this nature was to be extended (i.e. longer duration power outage) then it could have further impact on customers – for example, reduced production could start to have flow-on effects to personalised backup energy (i.e. generators).
- Refineries are also reliant on large quantities of gas for the oil refinement process. If there were gas shortages (production or high sustained demand), this could impact local fuel production. This could, in turn, affect the operation of GPG and increase the tension between electricity supply and demand. To address anticipated gas shortages in south-eastern Australia, Viva Energy has proposed the development of a gas terminal adjacent to its refinery, to ensure a secure and flexible gas supply to this region.[68]

2.5 Diesel has an increasingly important role in maintaining power system reliability and security through its use as a secondary fuel in GPG and its use in remote areas.

- The 2024 ISP considers flexible GPG as a "critical provider" of dispatchable capacity in periods of peak demand and low VRE. Acknowledging the historical limitations on the availability of gas for electricity generation in GPG, the ISP assumes that secondary fuels (such as backup diesel) will be available for required electricity generation in periods where gas supply is limited,[69] and notes these fuels "may be necessary to maintain reliable electricity supply".[70] AEMO has included a requirement in the 2024 ISP assumptions for all new entrant flexible gas generation to incorporate

[65] The *Australian Petroleum Statistics* can be accessed from: https://www.energy.gov.au/energy-data/australian-petroleum-statistics
[66] OCSE (2023), *2022/23 Assessment*, https://www.chiefscientist.nsw.gov.au/independent-reports/assessment-of-summer-preparedness
[67] Viva Energy (2025), *Geelong Refinery update*, https://www.vivaenergy.com.au/investor-centre/asx-announcements
[68] Viva Energy (2024), *Viva Energy LNG terminal critical infrastructure to secure Victoria's gas supply*, https://www.vivaenergy.com.au/media/news/2024/viva-energy-lng-terminal-critical-infrastructure-to-secure-victorias-gas-supply
[69] AEMO (2024), *Appendix 2. Generation and Storage Development Opportunities*, https://aemo.com.au/-/media/files/major-publications/isp/2024/appendices/a2-generation-and-storage-development-opportunities.pdf?la=en
[70] AEMO (2024), *2024 Integrated System Plan for the National Electricity Market*, https://aemo.com.au/-/media/files/major-publications/isp/2024/2024-integrated-system-plan-isp.pdf?la=en

additional on-site storage of secondary fuels for at least 14 hours of operation[71], although it remains unclear to the Panel whether this is an assumption for modelling only, or represents a new requirement for grid connection.

- Risks of peak day shortfalls in gas capacity to meet extreme demand (including from GPG) are identified from 2028.[72] However, the GSOO assumes all GPG fuel is gas and there is a risk that when a gas shortfall occurs, some GPGs may not have adequate backup of liquid fuel.
- Most gas generators in the NEM rely solely on gas supplied through the gas network, with only 13% (by capacity) having on-site gas storage capacity. This 'storage' is predominantly from access to local line pack (i.e. gas stored within pipelines) within operator control, which provides an average of 21 hours of gas storage.[73] GPG which uses diesel as a secondary fuel reported an average of 12 hours' worth of diesel storage. There is no minimum or mandated level of secondary fuel storage for GPG.
- While electricity generation by oil products in NSW (FY 2008-FY 2023)[74] increased slightly over the past decade, it still only represents around 0.5% of NSW's total energy production (Figure 6).
- Periods of high electricity demand and low VRE output are likely to coincide with high consumer gas demand for heating in winter. This means GPG demand will be competing with residential, commercial and industrial gas demand during these periods. In the event of a gas supply shortage, GPG will likely be curtailed first to maintain gas security for the community. This could potentially result in gas shortfalls exacerbating electricity shortfalls. Prior to 2023, the Gas Supply Guarantee ensured there was sufficient gas supply for GPG to meet peak demand periods in the NEM. The Gas Supply Guarantee was replaced by AEMO's East Coast Gas System (ECGS) Reliability and Supply Adequacy functions. This gives AEMO the power to provide written directions to relevant entities to maintain and improve the reliability and/or adequacy of gas within the ECGS.
- The major GPGs in NSW that provide reserve capacity and are primarily fuelled with natural gas, but that have backup diesel firing in the event of interruptions to gas supply, are listed in Table 1. Diesel back-up generation duration will depend on the storage capacity at each site. For example, Colongra can run four units for seven hours with 1.37 ML diesel,[75] and Hunter Power Project can run for three consecutive days (each unit of two gas turbines runs for 10 hours a day) with a total of 3.5 ML diesel storage.[76,77] Topup diesel, however, will need to be delivered by B-double oil tankers through existing road networks on an 'as needed' basis. The original

[71] AEMO (2024), *Appendix 4. System Operability,*https://aemo.com.au/-/media/files/major-publications/isp/2024/appendices/a4-system-operability.pdf?la=en.
[72] AEMO (2025), *2025 Gas Statement of Opportunities*, https://aemo.com.au/energy-systems/gas/gas-forecasting-and-planning/gas-statement-of-opportunities-gsoo
[73] AEMO (2024), *2024 Electricity Statement of Opportunities*, https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-reliability/nem-electricity-statement-of-opportunities-esoo
[74] Commonwealth DCCEEW (2024), *Australian Energy Statistics - Table O,* https://www.energy.gov.au/publications/australian-energy-statistics-table-o-electricity-generation-fuel-type-2022-23-and-2023
[75] Snowy Hydro (2019), *Colongra Power Station Operation Environmental Management Plan*, https://www.snowyhydro.com.au/wp-content/uploads/2020/03/Colongra-OEMP-December-2019.pdf
[76] Snowy Hydro (2024), *Statement: Hunter Power Project Update*, https://www.snowyhydro.com.au/news/statement-hunter-power-project-update
[77] Jacobs (2024), *Modification Report*: *Use of diesel fuel during first year of operation*, https://www.planningportal.nsw.gov.au/major-projects/projects/mod-3-diesel-fuel-operation-year-1

planning application[78] and previous environmental licence[79] for Tallawarra B had included provisions for it to run for 20 hours with 2.0 ML diesel storage on-site. However, these provisions were removed from the environmental approval in 2020, with only natural gas or natural gas blended with up to 5% hydrogen now listed as approved fuels.[80]

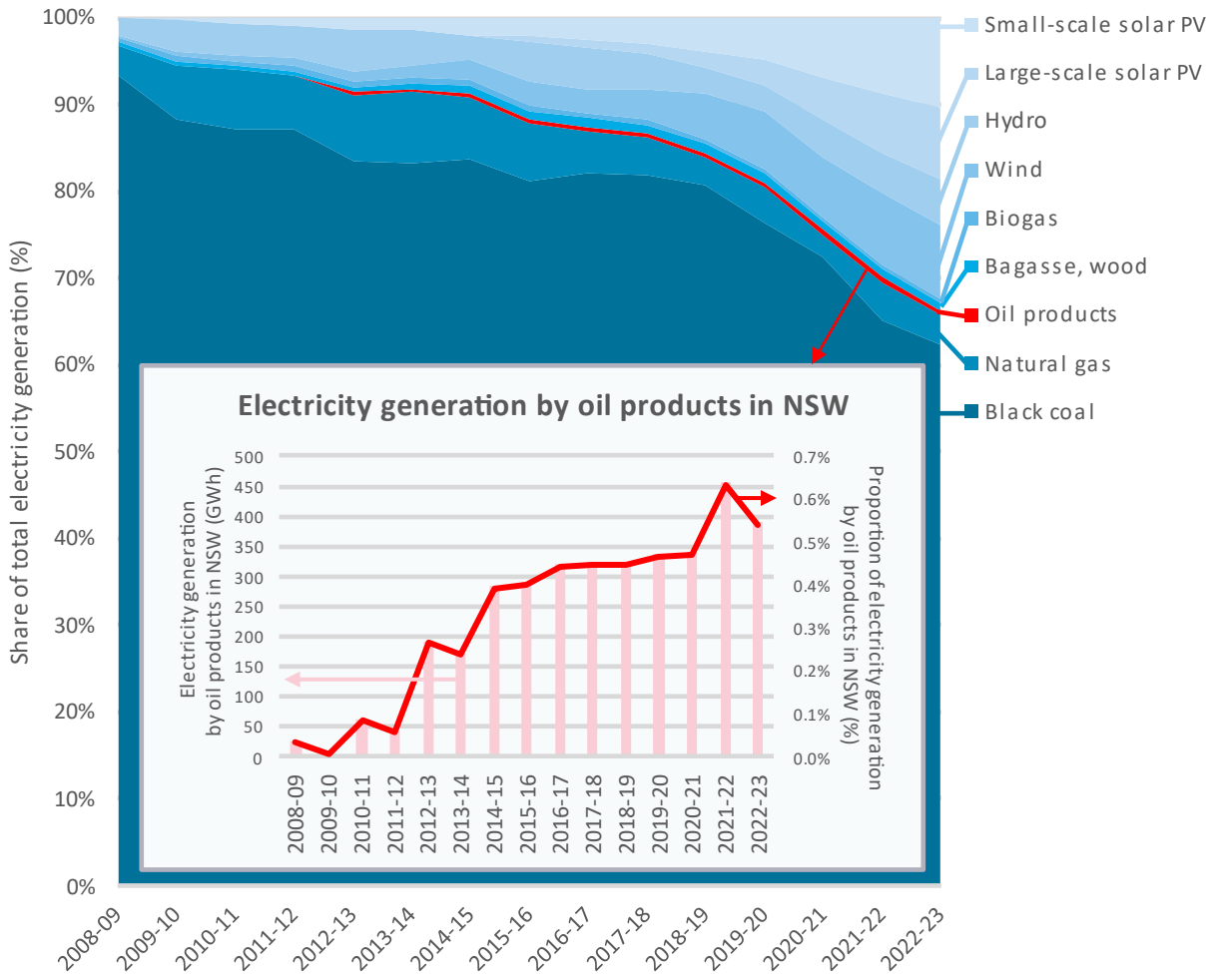


Figure 6: Proportion (%) of electricity generation in NSW by fuel type, 2008-09 to 2022-23. (Insert: Electricity generation by oil products in NSW (GWh) and proportion of oil product generation compared to other fuels (%)). Source: Commonwealth DCCEEW (2024), Australian Energy Statistics – Table O, https://www.energy.gov.au/publications/australian-energy-statistics-table-o-electricity-generation-fuel-type-2022-23-and-2023.

[78] SKM (2009), *Tallawarra B Power Station Environmental Impact Assessment – Chapter 5 Project Description*, https://www.planningportal.nsw.gov.au/major-projects/projects/tallawarra-b-power-station
[79] NSW Government Department of Planning (2016), *Mod 1 Consolidated Project Approval 07_0124*, https://www.energyaustralia.com.au/sites/default/files/2021-06/Tallawarra%20Stage%20B%20MOD1_%20Consolidated%20Approval.pdf_.pdf
[80] NSW Government Department of Planning (2024), *Mod 3 Consolidated Project Approval 07_0124*, available on: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=MP07_0124-MOD-3%2120241010T053106.810%20GMT

Table 1: Nameplate capacity, on-site diesel storage and equivalent runtime on diesel for major GPG in NSW.

Generator	Nameplate capacity (MW)	On-site diesel storage (ML)	Equivalent runtime on diesel (hours)
Colongra	667	1.37	7
Hunter Power Project	660	3.5	30*

* OCSE analysis suggests around 5 ML of diesel would be required to power a 660 MW station for 30 hours.

- Diesel will likely be used more often in GPG as gas supply becomes constrained. Some stakeholders saw diesel in GPG as a suitable backup during the relatively infrequent periods of instantaneous gas shortages. Diesel's high energy density allows for on-site storage large enough to sustain several hours of GPG, offering a simpler and cheaper alternative to the extensive gas pipeline infrastructure that would otherwise be required to use gas during infrequent peak demand events. However, in addition to increasing the carbon emissions of GPG, the use of diesel in GPG is likely to place upwards pressure on electricity prices. Diesel is more expensive than gas on a per GJ basis. However, diesel can only be used in less-efficient open cycle gas turbine (OCGT) technology generators. As these are less efficient, they typically only run during extreme high price periods ('super-peakers'), in comparison to a more efficient combined cycle gas turbine (CCGT) plant which have a more 'mid-merit' role in the market.[81] While diesel in GPG may be required for electricity reliability, this may lead to the preferential construction of OCGT technology and could structurally embed these higher prices in the NEM.
- Some stakeholders reported it was "extremely hard" to obtain environmental approvals which enabled the use of diesel as an alternative fuel when building new GPG stations.
- Ambiguity around the operations of gas/LNG supply infrastructure might compound the risk of gas shortfall with an increased reliance on diesel for GPG. For example:
  - Work in progress on gas pipelines includes the Eastern Gas Pipeline reversal project[82] to supply gas up to 200 TJ/day for storage and use in Victoria by winter 2026, and the East Coast Gas Grid Expansion Plan[83] to deliver a 24% increase in north-to-south gas transport capacity by 2026 when needed. Further project expansion is subject to funding and regulatory approvals.
  - The delay in gas pipeline construction has driven the Hunter Power Project to seek approval to run entirely on diesel in 2025 (for a cumulative 1,100 hours in a calendar year) as a contingency plan. However, the application was withdrawn after receiving assurance of pipeline completion from the developer.[84]
  - There is uncertainty around the operation of PKET due to difficulty in contracting and when gas shortfall will occur.
- Diesel will also play an important role in future system restart ('black start') scenarios: in the NEM, system restart capability is provided by System Restart Ancillary Services (SRAS) which are procured by AEMO. These services have historically

[81] AEMO (2024), *Appendix 4. System Operability: Appendix to the 2024 Integrated System Plan for the National Electricity Market*, https://aemo.com.au/-/media/files/major-publications/isp/2024/appendices/a4-system-operability.pdf?la=en
[82] Jemena (2025), *Jemena takes crucial next step to avoid gas shortfall,* https://www.jemena.com.au/media/jemena-takes-crucial-next-step-to-avoid-gas-shortfall/
[83] APA (2025), *APA's East Coast Gas Expansion Plan*, https://www.apa.com.au/news/asx-and-media-releases/apas-east-coast-gas-expansion-plan
[84] See the status of the modification application and letters at https://www.planningportal.nsw.gov.au/major-projects/projects/mod-3-diesel-fuel-operation-year-1

been provided by large synchronous generating units, including gas.[85] As the generation mix transitions from large thermal synchronous generating units to one that is dominated by inverter-based resources, there will be an increased reliance on gas (and backup diesel generation) and potentially battery storage for providing this system service, in conjunction with other emerging technologies to balance generation and load. AEMO's SRAS contracts requires periodic testing of the system restart generators to ensure they remain functional.[86]

- Diesel has an important role in providing backup power to critical infrastructure and assets, as well as additional energy security for remote areas. Fringe-of-grid areas are in remote locations with low population densities, often with single transmission lines connecting them to the wider grid. These areas are subject to large transmission and distribution electrical losses and can experience regular power interruptions and power quality issues.[87] In the event of a significant disruption to NSW's liquid fuel supply that requires retail rationing, remote areas may be disproportionately affected due to the fuel required by road tankers to deliver to these areas. For example, Broken Hill is currently serviced by two backup diesel-powered generators with a combined nameplate capacity of 50 MW.[88] As outlined in Part 1, Broken Hill experienced an electricity outage in 2024 on the transmission infrastructure and both backups were unable to be deployed (one was under repair, the other failed). This is subject to investigations by the AER and IPART, which are still underway.

2.6 Liquid fuel demand in NSW is growing, led by demand for diesel and jet fuel in transport, mining and construction sectors.

- A continuous and growing liquid fuel demand is projected until the mid-2030s,[89] led by demand for diesel from the transport and mining sectors. Changes in demand for liquid fuels will depend on government policy, economic growth and major projects. Rural and remote areas are more likely to depend on petrol and diesel compared to urban/metro areas and will continue to depend on these fuels longer due to slower EV adoption and charging infrastructure build out in these areas.
- ***Petrol***: Mainly used for the transport sector (private and business passenger vehicles). While current petrol demand is strong at approximately 5,000 ML per year in NSW since 2022, this value is 13% lower than NSW's petrol consumption pre-COVID (5,776 ML in 2018). A slight decline in petrol demand and its shares in liquid fuel sales compared to diesel can be attributed to the gradual shift to the use of electric vehicles (EV). In 2024, BEV and PHEV made up of 10% of NSW's total new vehicle sales (compared to 2022, it was only 4%).[90] NSW's EV sales target is 50% of

[85] AEMO (2024), *2024 General Power System Risk Review – Report*, https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/draft-2024-general-power-system-risk-review-report-consultation/2024-gpsrr.pdf?la=en
[86] AEMO (2021), *System Restart Ancillary Services Guideline*, https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/ancillary_services/sras/sras-guideline-2021.pdf?la=en
[87] ARENA (2014), *Australia's Off-Grid Clean Energy Market: Research Paper*, https://arena.gov.au/assets/2014/12/ARENA_RAR-report-20141201.pdf.
[88] AEMO (2025), *NEM Generation Information January 2025*, https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information.
[89] Commonwealth DCCEEW (2020), *Liquid Fuel Security Review – Final Report*, https://www.dcceew.gov.au/sites/default/files/documents/72895-2.pdf
[90] AAA (2025), *Electric Vehicle Index*, https://www.aaa.asn.au/research-data/electric-vehicle/

new cars by 2030.[91] However, the rise in EV would see an increase in overall electricity demand from the NEM and required demand management by DNSPs. The EV Council's DNSP scorecard shows strong readiness for NSW in this area.[92]

- ***Diesel***: In 2024, diesel was the largest component of liquid fuel sales (demand) in NSW (7,609 ML), [93] of which only 42% was sold to retailers and the rest sold on a contractual basis. Diesel is relied upon in the transport (freight vehicles and some passenger carrying vehicles), industrial, agriculture, marine and ports, and emergency services sectors, including as backup fuels for electricity generation.
  - Freight transport is projected to remain the largest consumer of diesel (road freight is projected to grow by 2% annually until at least 2030)[94]. The ratio of petrol sales to diesel sales is also trending downwards, reducing from 0.87 in 2018 to 0.66 in 2024. This means petrol sales compared to diesel sales has reduced by 23%, indicating that future demand will lean more towards diesel.
  - For the next few years, strong diesel demand is expected in the mining and construction sectors. Major infrastructure (e.g. Sydney Metro, Western Sydney International Airport (WSI), etc.) and fast-tracked housing projects in various locations in NSW will drive diesel demand for construction machinery and freight transport. Further breakdown of consumption in various sectors can be found in the commissioned report.[95]
  - Electrification of trucks and heavy machinery is yet to be upscaled and cost effective, therefore, diesel demand will remain strong in this sector.
- ***Jet fuel***: There is a projected increase in demand of jet fuel from late 2026 due to the opening of WSI, adding an annual additional demand of 1,500 ML in the first year (about 47% increase from NSW jet fuel demand in 2024), and rapid growth of demand exceeding 2,500 ML per year by 2050.[96] The jet fuel distribution to WSI will rely on tanker trucks running on the road network from suburban distribution terminals linked to jet fuel storage in Kurnell.[97] An estimated 43 B-double tanker deliveries per day are needed to meet the projected fuel demand for Stage 1 operations.[98] Western Sydney Airport Co Limited and Transport for NSW are currently examining the possible development of a Western Sydney fuel pipeline.

[91] NSW Government (2021), *NSW Government's Electric Vehicle Strategy,* https://www.nsw.gov.au/driving-boating-and-transport/nsw-governments-electric-vehicle-strategy
[92] Electric Vehicle Council (2024), *State of Electric Vehicles 2024*, https://electricvehiclecouncil.com.au/wp-content/uploads/2024/12/1734312344781.pdf
[93] In 2024, sales of liquid fuels in NSW are diesel (7,609 ML, 46%), petrol (5,046 ML, 30%), jet fuel (3,217 ML, 19%) and other products (750 ML, 5%). Commonwealth DCCEEW (2024), *Australian Petroleum Statistics*, https://www.energy.gov.au/energy-data/australian-petroleum-statistics
[94] BITRE (2022), *Australian aggregate freight forecasts – 2022 update*, https://www.bitre.gov.au/forecasts
[95] Arup (2025), *Liquid Fuel State of Play for the Annual Energy Markets Assessment 2024/2025*.
[96] WSI (2023), *Review of Aviation Fuel Supply Options*, https://wsiairport.com.au/media-releases/wsi-review-aviation-fuel-supply-options
[97] WSI (2023), *Review of Aviation Fuel Supply Options*, https://wsiairport.com.au/media-releases/wsi-review-aviation-fuel-supply-options
[98] DIRD (2016), *Volume 2a Stage 1 Development, Environmental Impact Statement, Western Sydney Airport*, https://www.westernsydneyairport.gov.au/media-resources/resources/environmental-assessment#eis-2016

2.7 Medium- to long-term solutions to the challenges facing the Australian liquid fuel market will require significant investment and time to scale-up.

- A medium- to long-term solution to meet increasing demand, reduce reliance on imports and provide fuel security – particularly for hard-to-abate industries – could include:
  - increasing domestic production and storage of any fuel (i.e. petroleum products and renewable fuels), and/or
  - accelerating opportunity for a renewable fuels industry (e.g., renewable biodiesel or sustainable aviation fuels (SAF))
- There are some challenges faced by renewable fuel manufacturers:
  - ***Feedstock*:** SAF production from waste feedstock can be commercially challenging due to uncertainty in feedstock composition and unsustainable feedstock supply.
  - ***Demand and investment*:** There is currently low demand for renewable fuels, driven by a lack of awareness of synthetic renewable fuels and its specification, and pricing disparity between petroleum products and renewable fuels. The renewable fuels are yet to be cost-competitive with fossil fuels, thus, unlikely to attract the demand and significant investment needed for scaleup in this area.[99]
- As renewable fuels production becomes established and funded outside of NSW, NSW might become reliant on imported renewable fuels from interstate or overseas. Current projects for renewable fuels are:
  - Ampol is conducting a pre-FEED study for the construction of a renewable fuels' facility at the Lytton Refinery in Queensland to produce SAF (90%) and renewable diesel (10%) by 2029, using tallow, canola and used cooking oil.
  - In Victoria[100] and Western Australia[101], Viva Energy is conducting trials on renewable diesel to ensure that it meets fuel standards, and the blending procedures are standardised. Viva Energy has also secured ARENA's funding to support development of SAF infrastructure to supply Brisbane Airport.[102]
- The NSW Government is sending market signals to show the potential of NSW's competitive advantage. NSW's diverse range of feedstocks is estimated to be 21 Mt/yr (22% of Australia's potential feedstock for SAF production). NSW has SAF production potential of 5,200 ML/year by 2050.[103]

[99] NSW DCCEEW (2024), *Opportunities for a renewable fuel industry in NSW*, https://www.energy.nsw.gov.au/nsw-plans-and-progress/regulation-and-policy/public-consultations/building-thriving-renewable-fuel
[100] Viva Energy (2025), *Viva Energy supports Cleanaway with Renewable Diesel supply*, https://www.vivaenergy.com.au/media/news/2024/viva-energy-supports-cleanaway-with-renewable-diesel-supply
[101] Viva Energy (2025), *Rio Tinto renewable diesel trial press release*, https://www.vivaenergy.com.au/media/news/2025/rio-tinto-renewable-diesel-trial-press-release
[102] Viva Energy (2025), *Viva Energy secures ARENA funding to establish Sustainable Aviation Fuel infrastructure*, https://www.vivaenergy.com.au/media/news/2025/viva-energy-secures-arena-funding-to-establish-sustainable-aviation-fuel-infrastructure
[103] NSW DPRID (2024), *Sustainable Aviation Fuel Prospectus*, https://www.investregional.nsw.gov.au/saf

Recommendations

As detailed in the findings above, research and stakeholder interviews generally reflect that individual NSW energy market participants are well-prepared to address vulnerabilities across the generation, transmission and distribution sectors for the next 12 months. However, there is a growing concern that the compound nature of existing and emerging risks cannot be resolved by individual organisations acting alone. Unexpected extreme events will continue to test the strength of the system, pushing it closer to its limits. Without a coordinated, holistic approach to addressing these challenges, the likelihood of power outage and large-scale blackouts increases, as the system's ability to cope with compounded stresses and unforeseen disruptions becomes increasingly strained.

A number of NSW Government initiatives address some of the concerns identified in this assessment, including implementation of recommendations from the Electricity Supply and Reliability Check Up.

The medium- to long-term challenges facing the energy sector, such as energy transition coordination, workforce capacity and infrastructure readiness, are no longer distant concerns – they are materialising sooner than anticipated. The accelerating pace of change, combined with the increasing complexity of managing renewable energy integration and maintaining grid reliability, has brought these issues to the forefront. Unless addressed promptly, these challenges will continue to compound, making it progressively harder for government and industry operational teams to manage the grid effectively and ensure a reliable supply of electricity over the next 12 months.

Recommendation 1: NSW Government advocates for a more coordinated national energy transition and leads by example for the delivery of critical projects.

- NSW Government advocates for a modernisation of the way the energy systems and markets are regulated and managed through a coordinated approach to energy market design and transition. An independent body should be established and tasked with developing the framework for system redesign and market modernisation to accommodate a more complex and decentralised future power system. This group should have appropriate expertise in power system engineering and operation, market economics, renewable technologies, existing thermal and hydro technologies and consumer technologies, and social behaviour (social licence), as it is the nexus of these areas that is important to future energy security, reliability and resilience.
- NSW Government consider appointing a single entity with clear authority to coordinate delivery of the NSW Electricity Infrastructure Roadmap.
- NSW Government works with national market bodies to identify practical and tangible actions to fast-track investment opportunities from the AEMO Integrated System Plan (ISP) for electricity generation, firming, transmission and distribution capacity.
- NSW Government considers having regular independent reviews (e.g. NSW Check Up Report) to ensure that the development of new energy infrastructure is consistent with the NSW Energy Security Target to mitigate reliability risks identified by AEMO.
- Once a more strongly coordinated way forward for the energy transition has been established, governments and energy market bodies should support clear, transparent and consistent communication with consumers about the social values and risks of energy transition. This includes government reporting on completed and in-progress responses to recommendations to ensure that market participants are aware of government response to evolving challenges.

Recommendation 2: NSW Government continue to investigate and implement reliability and resilience measures.

- Implement the outcomes of the investigations into the Broken Hill October Event (AER, IPART, NSW Parliamentary Inquiry and AAR), ensuring that recommendations and learnings are appropriately acted upon across the NSW energy market and advocate for these to be incorporated into the broader NEM emergency management frameworks.
- As identified in previous OCSE reports, there should be ongoing discussions and advocation for the viability of novel and emerging system resilience measures to include high impact events, including technologies and regulations that facilitate standalone power systems (particularly in remote and regional NSW that become 'islanded' during emergencies).

Recommendation 3: NSW Government find a near-term solution to gas supply and energy generation to be in place before 2030.

- NSW Government to closely monitor NSW gas shortage risks.
- NSW Government consider available policy levers to mitigate risks for instantaneous gas supply shortfall and to improve long-term supply security.
- NSW Government works with industry to identify the most cost-effective solutions for improving the state's gas situation, considering a combination of options including new and expanded local supply/distribution capacity, importing infrastructure and alternative sources of supply such as biomethane.
- As identified in the NSW Electricity Supply and Reliability Check Up (recommendation 34), NSW Government should review NSW gas infrastructure to determine potential requirements for additional storage for generators.

Recommendation 4: Actively monitor unexpected events and strengthen NSW response to energy emergencies.

- Conduct emergency exercises to stress-test NSW Government and energy market participant responses to 1) multi-jurisdictional and/or consecutive events; 2) high impact extreme weather events; 3) cross energy markets event (electricity, gas and liquid fuel), as well as their coordination with emergency-combating agencies and other essential services providers.
- Test NSW emergency response and redundancy capability for blackout events, including 'island' events, ensuring availability of sufficient assets (for example, backup generators), fuel and workforce requirements (staffing, resources, fatigue management), and their rapid deployment for energy emergencies.
- Scenario design and simulation to better understand impacts of extreme weather events (including novel weather events within the NSW jurisdiction, such as cyclonic winds) to energy infrastructure using the latest modelling tool and data such as NSW and Australian Regional Climate Modelling (NARCliM 2.0).
- Consider EUSFA workforce development for energy emergency preparedness.
- EUSFA works proactively with AEMO to understand the potential risks to a projected supply situation (i.e. before any LORs are issued) so that the government is forewarned if unexpected weather, demand and/or generation events occur that could quickly lead to the need for load-shedding or load reductions. This would ideally involve dedicated warnings before the usual LOR process for warning the market.

- In acknowledging the increased risk to the community from energy emergencies, EUSFA, relevant government agencies and energy market stakeholders (in particular the DNSPs and Transgrid) develop clear and concise customer-facing communication packages.
- Extreme weather events place considerable pressure on emergency resources and with the likely increasing frequency and severity of extreme events, EUSFA should monitor how these resources are coping and identify potential remedial measures.

Recommendation 5: NSW Government explore opportunities to enhance liquid fuel production and storage capacity, and better understand interdependencies between electricity, gas and liquid fuels networks.

- Explore opportunities to enhance domestic production capacity, including renewable fuels. This should include consulting with both the Commonwealth and other state governments with jurisdiction over existing refining capability to better understand capabilities and opportunities.
- Explore the potential to increase the diesel storage capacity at Port Kembla and Newcastle, and at regional hubs.
- Obtain a better understanding of the diesel storage capacity at the major gas-fired power stations in NSW, and:
    - how long this capacity could be used to fuel the stations
    - how long the stations are permitted to run on diesel
    - logistics of replenishing storage (duration and origin of supply).
- Explore investing in modernised infrastructure, expanding strategic reserves and enhancing cybersecurity measures to protect critical fuel supply infrastructure.
- Further explore insights and arrangements regarding liquid fuel security from other jurisdictions that may be relevant to NSW.
- Undertake modelling to better understand and quantify interdependencies between electricity, gas and liquid fuels networks. This should include rare and unpredictable scenarios (i.e. ‘black swan’ events) to understand the resilience of the liquid fuel supply chain and potential impacts of disruption on other energy markets.

Appendices

Appendix 1: Terms of Reference

Background

In 2017, the Minister for Energy and Utilities established a NSW Energy Security Taskforce to look at how NSW manages energy security and resilience, including readiness, planning, preparation, and response capability to extreme events such as summer weather. The Taskforce released its final report on 19 December 2017.

Since 2018 the Minister for Energy has requested that the Office of the NSW Chief Scientist & Engineer (OCSE) convene an expert panel to assess the adequacy of the State's annual preparedness in relation to energy markets and associated emergency management arrangements and identify any actions to address emerging risks in the approaching summer and beyond.

In each report, the Expert Panel concluded that the NSW Government was well prepared for the approaching summer, noting that protocols and exercises by the (then) Office of Energy & Climate Change now Department of Climate Change, Energy, the Environment and Water, other NSW Government agencies and industry stakeholders have improved readiness and energy emergency response.

The NSW Government is again seeking expert advice from the OCSE on risks within the national energy markets including electricity, gas and liquid fuels. This will build on the work of national bodies and focus on opportunities for the NSW Government to take further action to maintain the reliability of energy supplies in the State.

While summer presents the likelihood of the highest demands, recent events and previous CSE assessments have demonstrated that energy markets resilience and reliability is an important consideration throughout the year. Clarity in communication that risks to energy security and resilience can occur at any time of year will reinforce the need for readiness, planning, mitigation, preparation, and response capabilities outside of the anticipated high demand events of summer.

Previous reports by the NSW CSE have also highlighted stakeholder concerns around the immediate requirements for coordinated action to ensure the reliability and security of the energy sector during the transition to renewable energy in the mid- to long-term.

Scope of review

The review will:

1. build on previous CSE assessments of annual preparedness of the NSW energy markets and review the work completed by the NSW Government in response to the recommendations in those reports. This includes the identification of any emerging risks for the next 12-month period and provide an assessment that:
    a. synthesises work undertaken by the Australian Energy Market Operator (AEMO) and other stakeholders in relation to the electricity supply and demand outlook in NSW, including the adequacy of firm generation, transmission, and demand response;
    b. considers the current NSW Government actions to address energy reliability and security risks across all forms of energy (electricity, gas and liquid fuels), including the capability and capacity of the NSW Government Energy Security and Emergency Management resources available to plan, prepare, mitigate, respond and recover from energy related incidents and emergencies; and

   c. makes recommendations to address vulnerabilities identified, such as potential delays on assets maintenance, across generation, transmission and distribution organisations in the next 12 months;
2. identify longer term energy sector trends and actions that will be required to ensure energy reliability and security while addressing renewables transition and emissions reduction targets.

Process

An expert panel, support by OCSE staff, will consult and analyse work being undertaken by the NSW Government and other relevant organisations such as generators, TransGrid, Distribution Network Service Providers, AEMO, the Australian Energy Regulator and the Australian Energy Market Commission, and retailers and consumer organisations.

The Expert Panel is to provide a report by early December 2024 upon request, provide updates to the review thereafter. The Expert Panel should draw on the work undertaken by AEMO where possible and focus on areas particularly related to NSW. OCSE may commission expert paper/s to inform certain aspects of the report if required.

Dr Darren Saunders, Deputy NSW Chief Scientist & Engineer, will chair the Expert Panel. Secretariat services will be provided by the OCSE.

Appendix 2: Acronyms, abbreviations and units

Table 2: Acronyms and abbreviations

Acronym and abbreviations	Complete Term
AAA	Australian Automotive Association
ACCC	Australian Consumer and Competition Commission
ADF	Australian Defence Force
AEMO	Australian Energy Market Operator
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
AFAC	Australia and New Zealand National Council for fire and emergency services
BADSP	Boosting Australia's Diesel Storage Program
BOM	Bureau of Meteorology
CCGT	Combined-cycle gas turbines
CER	Consumer energy resources
CIS	Capacity Investment Scheme
CT Act	Coastal Trading (Revitalising Australian Shipping) Act 2012
DDoS	Distributed denial-of-service
DER	Distributed energy resources
DNSP	Distribution network service provider
DPE	NSW Department of Planning and Environment
DSP	Demand side participation
EAAP	Energy Adequacy Assessment Projection
ENSO	El Niño–Southern Oscillation
ECL	East Coast Low
ECCMC	Energy and Climate Change Ministerial Council
ESOO	Electricity Statement of Opportunities
EST	Energy Security Target
ESTM	Energy Security Target Monitor
EUSFA	Energy and Utilities Services Functional Area
EUSFAC	Energy and Utilities Services Functional Area Coordinator
EV	Electric Vehicle
FEED	Fron-end engineering design
FSRU	Floating Storage and Regasification Unit
FSSP	Commonwealth Fuel Security Service Payment
GPG	Gas-powered generation
GSOO	Gas Statement of Opportunities
IEA	International Energy Agency
IEEE	Institute of Electrical and Electronics Engineers
IMS	Information Security Management
JSSC	Jurisdictional System Security Coordinator
IOD	Indian Ocean Dipole
IRM	Interim Reliability Reserve
ISP	Integrated System Plan
LFE Act	Liquid Fuel Emergency Act 1984
LNG	Liquified natural gas
LOR	Lack of Reserve
MSO	Minimum Stockholding Obligation
NEM	National Electricity Market
NER	National Electricity Rules
NLFERP	National Liquid Fuel Emergency Resource Plan

NOSEC	National Oil Supplies Emergency Committee
NSW EPA	NSW Environmental Protection Authority
OCA	Sydney Olympics Coordination Authority
OECC	Office of Energy and Climate Change
PASA	Projected Assessment of System Adequacy
PV	Photovoltaic
RERT	Reliability and Emergency Reserve Trader
REZs	Renewable Energy Zones
RFS	NSW Rural Fire Service
RIT-T	Regulatory Investment Test for Transmission
SAF	Sustainable Aviation Fuel
SAM	Southern Annular Mode
SES	NSW State Emergency Service
SPR	Strategic Petroleum Reserve
SRAS	System Restart Ancillary Services
USE	Expected unserved energy
VRE	Variable renewable energy
VRET	Victorian Renewable Energy Target
WSI	Western Sydney International Airport

Table 3: Units

Units	Description
GW	gigawatt
GWh	gigawatt hour
ML	megalitre
MW	megawatt
MWh	megawatt hour
PJ	petajoule

Appendix 3: Key energy reliability terms and definitions

Table 4: Key energy reliability terms and impacts to consumers

Term	Definition	Impact on consumers (if applicable)
Energy Adequacy Assessment Projection (EAAP)	Additional assessment of the reliability impact of water (severe drought conditions observed during the Millennium Drought) and low thermal fuel availability (one-in-10-year low fuel availability) scenarios	
Expected USE	Weighted-average USE calculated by AEMO over a wide range of simulated outcomes	
Interim Reliability Measure (IRM)	Expected USE in any region of no more than 0.0006% of energy demanded in any financial year	USE events would statistically occur around once every five years. Larger USE events (power outages averaging 10% of average regional demand for five hours) have an expected frequency of once in every 10 years
Interim Reliability Reserves (IRR)	Reserves procured by AEMO if stricter reliability target is forecast to be exceeded. Participants are paid regardless of whether reserves are activated.	Total cost of $4,252,685 in NEM for 2023-24.
Lack of Reserve (LOR)	Lack of a 'buffer' or extra level of reserve energy that is available to assist in meeting electricity demand. The declaration of lack of reserve (LOR) conditions is a key mechanism by which AEMO communicates the short-term risk of involuntary load shedding (i.e. the need to reduce or disconnect load from the power system) to the market. LORs are categorised over three tiers.	On a forecast LOR_3, load shedding may be required, while for an actual LOR_3, load shedding will be or is already activated.
LOR1	Notification that reserve levels are lower than the two largest supply resources in the state	
LOR2	Notification that reserve levels are lower than the single largest supply resource in the state	AEMO may activate RERT contracts, leading to high prices per MWh – ultimately passed on to consumers.

Term	Definition	Impact on consumers (if applicable)
LOR3	Deficit in electricity supply resulting in a system security condition	Actual load shedding
Minimum System Load (MSL)	Today, unused electricity from millions of rooftop solar systems flows back into the power system. In certain conditions high volumes of rooftop solar can reduce the need for electricity from grid-scale generation, known as minimum system demand or load events, which can pose risks to grid security.	If actions with industry have not sufficiently reduced grid security risk, AEMO could notify the relevant state transmission network service provider to dial down or disconnect rooftop solar systems temporarily
Reliability and Emergency Reserve Trader (RERT)	Mechanism through which AEMO can use reserve contracts to prevent load shedding, by paying large industrial customers to reduce their electricity consumption. Participants are only paid if reserves are activated.	Prevents load shedding, but average RERT cost of just over $36,000 per MWh in previous 5 financial years. This cost is ultimately passed on to consumers.
Reliability Standard	Expected USE in any region of no more than 0.002% of energy demanded in any financial year. Excludes outages caused by 'non-credible' threats, such as bushfires and cyclones, as well as supply interruptions originating in local distribution networks.	USE events would statistically occur around once every three years. Larger USE events (power outages averaging 10% of average regional demand for nine hours) are expected about once every 5 years
Unserved energy (USE)	Energy that cannot be supplied to consumers when demand exceeds supply	Involuntary load shedding (loss of customer supply)
Value of Customer Reliability (VCR)	A threshold set by the Australian Energy Regulator that represents the per kilowatt cost to the economy of a load shedding event.	

Appendix 4: Risk assessment of liquid fuel supply chain

Table 5: Risk assessment of liquid fuel supply chain within Australia and NSW from the next 12-months to beyond 12-months.

Hazard	Mitigation	Impact and locality	Likelihood	Residual risk	
				Next 12 months	Beyond 12 months
Geopolitical risks					
Supply and distribution: High import reliance (and other associated risks, e.g., blocked international supply route or geopolitical conflicts); unable to access overseas storages (such as from IEA participating countries)	Diversifying import; increased national storage; Increase local productions, explore renewable fuel supply options	*Aus & NSW*: Supply shortage Price increase	Possible	Low to medium	Low to medium
Infrastructure risks					
Supply: Unplanned refinery maintenance; impacts to long-term output and/or closure	Increase import and/or storage of refined products Two local refineries provide some level of redundancy Communication between government and industry	*Aus & NSW*: Supply shortage, price increase	Likely	Low	Low
Distribution: Damage to the import terminals	Increase onshore storage	*NSW*: Dependence on interstate supply	Unlikely	Low	Low
Extreme weather and natural disaster risks					
Supply: Storm damage to storage, depot infrastructure	Damage-proof critical assets and equipment Emergency management protocols	*NSW*: Localised shortage Price increase	Likely	Medium	Medium
Supply: Damage to the electrical system, disrupting local liquid fuel production and/or supply and increasing local demand	Emergency management protocols	*NSW:* Localised shortage/rationing	Possible	Medium	Medium
Distribution: Localised road access blocked/ damage to road networks	Can only be managed by emergency response	*NSW*: Localised shortage and price increase	Very likely	High	High

Hazard	Mitigation	Impact and locality	Likelihood	Residual risk	
				Next 12 months	Beyond 12 months
Operational risks					
Supply: Refinery closure due to commercial loses	FSSP from Commonwealth, but until 2027, with an option to extend to 2030	*Aus & NSW*: Supply shortage	Possible	Low	Medium
Supply: Restarting refinery from shutdown can take one to two weeks for normal production to resume	Refined products storage on site Consumption cover days for all fuels are longer than two weeks	*Aus & NSW*: Supply shortage	Likely	Low	Low
Distribution: Delay of Temporary Licence approval	Increase onshore/on-site storage CT Act is currently under review	*Aus & NSW*: Slower response to onshore shortage	Likely	Low	Low
Market and demand risks					
Market: Limited market data and information available	Mandatory reporting established	*Aus & NSW*: Impede planning for emergency response	Unlikely	Low	Low
Demand: Continuous demand of petrol and diesel in rural and remote areas	Increase storage in rural/remote areas	*NSW rural and remote areas:* Price increase Delayed delivery of backup diesel	Likely	Low	Medium
Demand: Long-term increase in demand for diesel and jet fuels	Explore renewable fuel supply options	*NSW*: Supply shortage	Likely	Low	Medium
Demand: Instantaneous increase in diesel demand in various sectors	Diesel commercial contracts and arrangements in place for generators On-site diesel storage	*NSW:* May affect availability for backup generations or GPG	Unlikely	Low	Low

Notes:

- Likelihood scale and descriptions:
  - Very unlikely – Not expected to occur, but may occur under exceptional circumstances
  - Unlikely – Slight possibility it may occur at some time
  - Possible – Equal possibility of may or may not occur at some time
  - Likely – Strong possibility of occurrence
  - Very likely – Expected to occur in most circumstances

- This risk assessment is a qualitative assessment, and the residual risk is based on the hazards and mitigation discussed in Part 2 findings and Expert Paper.[104]
- OCSE does not rule out or dismiss hazards/events that historically have not occurred before, due to its impacts that are worth mentioning. For example, while geopolitical risks can be mitigated by diversifying import or increasing storage etc., the uncertainty in current geopolitical climate increases the likelihood of liquid fuel shortage or price increase for the next 12 months, compared to the previous year.

[104] Arup (2025) *Liquid Fuel State of Play for the Annual Energy Markets Assessment 2024/2025*.

Appendix 5: Stakeholder engagement

Table 6: List of stakeholders engaged

Organisation
ACEREZ (a consortium of Acciona, Cobra and Endeavour Energy)
AEMC
AEMO
AER
AGL
Ampol
Ausgrid
Australian Climate Services
Australian Institute of Petroleum
Boeing
Bureau of Meteorology
Commonwealth Department of Home Affairs
Deloitte
Delta Electricity
Edify Energy
Endeavour Energy
Energy Australia
Essential Energy
Grattan Institute
Jemena
Marsden Jacobs
Neste
NSW Department of Climate Change, Energy, the Environment and Water
NSW Department of Education
Origin Energy
Pollination
Qantas
QLD Department of Energy and Climate
RFC Ambrian
Snowy Hydro
Southern Oil
Squadron Energy
Transgrid
Vast
VIC Department of Energy, Environment and Climate Action
Virgin
Viva Energy

Note:

- For some organisations consulted, there were multiple meetings and interviews organised with different functional teams and units within the organisation.
- Stakeholder engagement for liquid fuel market assessment was led by UNSW and Arup as part of the expert paper process.
- OCSE reached out to Tomago Aluminium as NSW largest industrial electricity user for stakeholder consultation, however, they are unable to participate the consultation.

Liquid Fuel State of Play for the Annual Energy Markets Assessment 2024/2025

Expert Paper – Commissioned by the Office of the Chief Scientist and Engineer (OCSE) for the NSW Energy Markets Assessment 2024/2025.

Executive Summary

This expert paper provides a comprehensive analysis of the liquid fuel market in New South Wales (NSW), focusing on the supply chain, demand, and pricing trends for liquid fuels. It aims to assess the current and projected state of liquid fuel supply and demand, while also examining the key drivers behind pricing fluctuations and their implications for the region as well as for Australia. The study also evaluates fuel infrastructure, distribution networks and highlights the broader global and national economic and policy factors shaping the liquid fuel market in Australia, with specific attention to NSW's role in the national landscape.

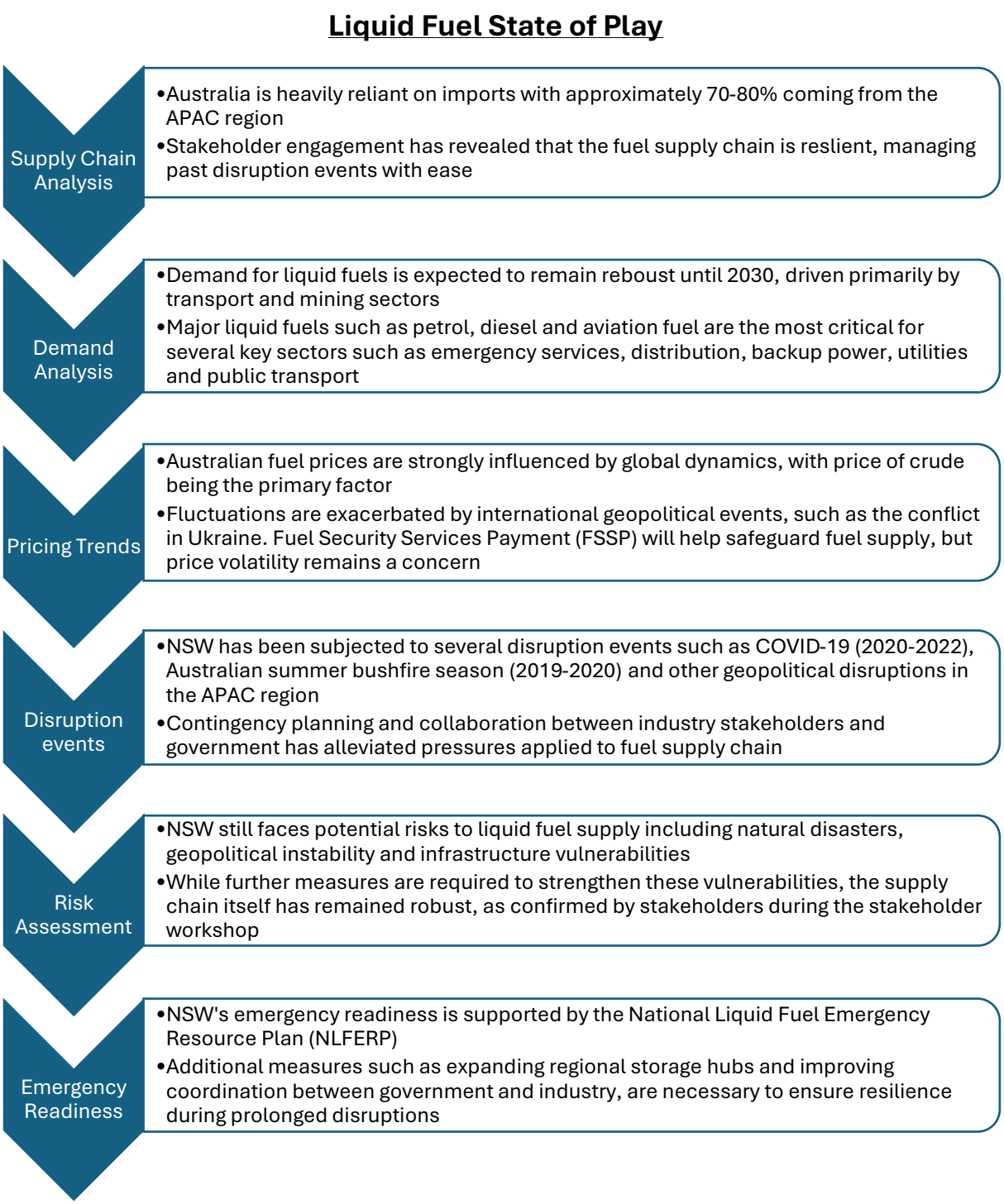
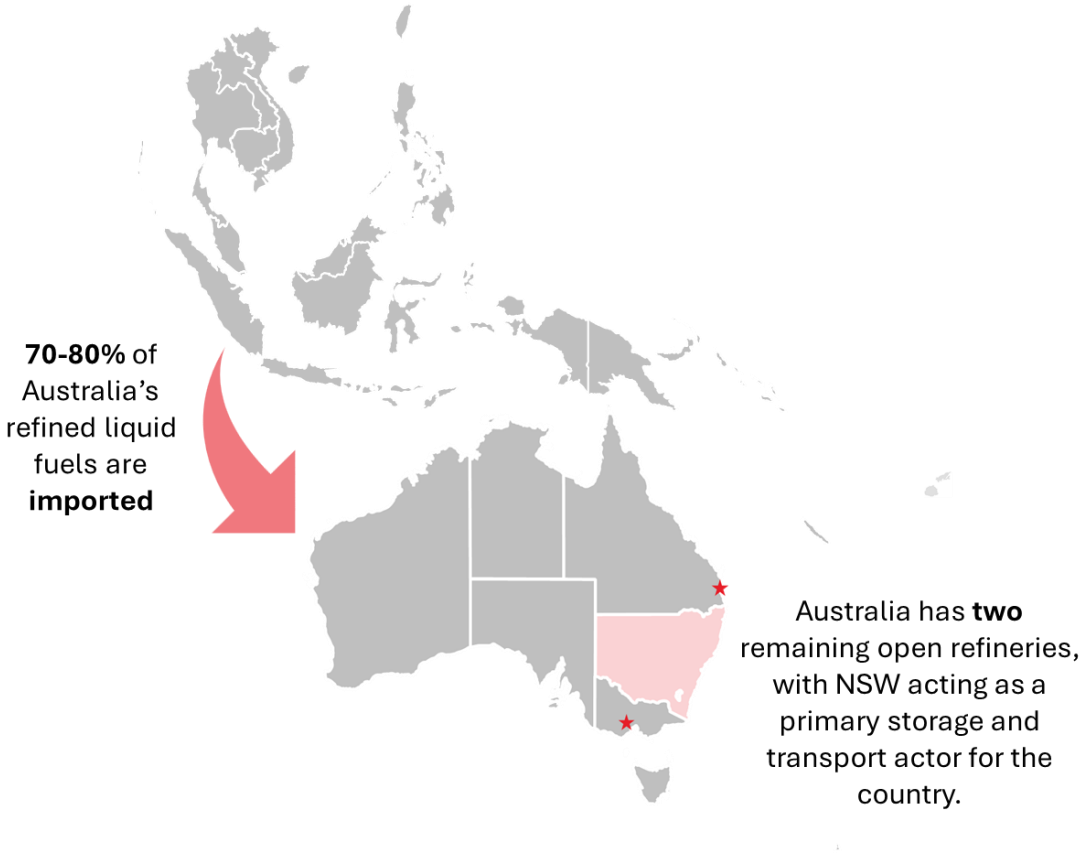


Figure 1: Analysis Summary Graphic

The study also examines the lesson learnt from past disruption events and how these can be incorporated into strengthening NSW's fuel security.

By examining these factors, the report identifies potential vulnerabilities in the State's fuel supply and identifies potential strategies to improve resilience, enhance fuel security, and manage price volatility.

Supply Chain Analysis



Australia remains reliant on imported liquid fuels, with approximately 70% of the country's supply coming from the Asia-Pacific region[1]. The country imports almost 70-80% of its refined liquid fuels from overseas, specifically from Singapore, South Korea, Japan, Malaysia and US, given majority of the country's refineries are shut down[2]. The two remaining refineries, Ampol (Lytton, QLD) and Viva Energy (Geelong, VIC), produce around 229,000 barrels per day. In NSW, the closure of the Caltex Kurnell Refinery and its conversion as an import facility has led to further increased dependence on fuel import to the State.

NSW, being a major consumer of liquid fuel within the country, has well-developed storage facilities and transportation networks (primarily road tanker transport) that ensures the distribution of fuels across the State. Recent funding from the Australian Government such as the Boosting Australia's Diesel Storage Program (BADSP) has enhanced the diesel storage capacity in Port Kembla and Newcastle to bolster NSW's resilience and fuel security.

[1] Australian Petroleum Statistics (2025). https://www.energy.gov.au/energy-data/australian-petroleum-statistics
[2] Statista (2024). https://www.statista.com/statistics/674596/australia-petroleum-import-volume-by-country-of-origin/

Stakeholder Engagement

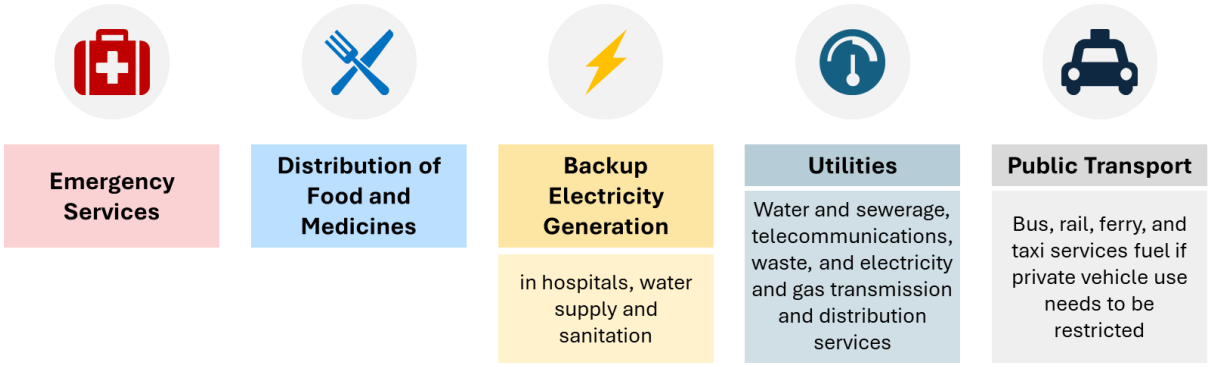
Stakeholder engagement with fuel suppliers, consumers, and project developers highlighted that critical events have been well managed over the last few decades. Major events such as the Northern River Flooding and the Black Friday bushfires have seen short-term supply disruptions where these are typically due to short-term road closures isolating communities and limiting the fuel transportation and distribution network. However, these incidents have not caused major disruptions to fuel supplier operations, where they are managed through coordinated industry and community approaches such as re-routing fuel supplies and sourcing from various suppliers with viable supply routes, leading to confidence in the fuel supply chain.

Stakeholders are mostly concerned by global issues causing supply chain disruptions and black swan events but noted that fuel supply chains have still remained in operation when these events occur. They stated that onshore fuel production would further enhance the resilience of liquid fuel supply chains but noted that the policy landscape in Australia makes it difficult to produce and adopt low carbon fuels, which is a barrier to the country's efforts to both decarbonise its activities and improve its supply chain security[3].

Demand Analysis

Demand for liquid fuels in NSW and Australia is expected to remain robust until at least the mid-2030s, driven primarily by the transport and mining sectors. The Bureau of Infrastructure and Transport Research Economics (BITRE) forecasts that domestic transport will increase by 26% over the next decade, which is expected to result in an equivalent increase in fuel consumption. The demand is expected to reach 40 billion litres of diesel fuels by 2050[4]. This forecast is corroborated by Australia's oil consumption growth of 8.3% exhibited from 2022 to 2023[5].

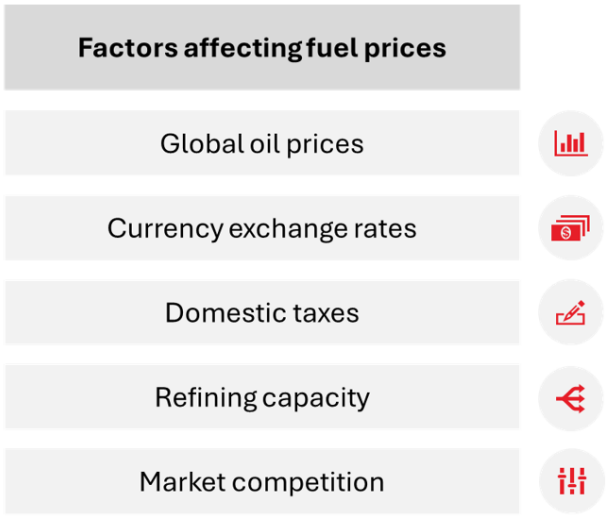
Of all the major liquid fuels – petrol, diesel and aviation fuel (jet fuel) – diesel is the most important for NSW and Australia and is critical for the following sectors:



[3] Update: Stakeholder engagement occurred on 05/03/2025. As of 06/03/2025 the Australian Government has announced funding to accelerate our low carbon liquid fuel (LCLF) industry.
[4] LCLF – A future made in unlocking Australia's low carbon liquid fuel opportunity (2024). https://www.infrastructure.gov.au/sites/default/files/documents/lclf2024-anonymous.pdf
[5] DCCEEW (2023). https://www.energy.gov.au/energy-data/australian-energy-statistics/energy-consumption#:~:text=Australia's%20energy%20consumption%20rose%202.0,energy%20sources%20accounted%20for%209%25.%20For%20referencing%20and%20discusing

Pricing Trends

Fuel prices in Australia (and NSW) are strongly influenced by global oil market dynamics, with crude oil prices being a primary factor. International geopolitical events, such as the ongoing conflict in Ukraine, have exacerbated fluctuations in global oil prices, which in turn affect domestic fuel prices. In recent years, retail fuel prices in Australia have seen significant volatility. Petrol prices have average between $1.47 and $1.89 per litre, while diesel prices have fluctuated between $1.43 and $2.07 per litre in major cities, based on national average retail prices from 2021 to 2024[6]. These fluctuations are further compounded by factors such as currency exchange rates, domestic taxes, refining costs, and market competition. While the Australian Government has implemented various measures, such as the Fuel Security Services Payment to safeguard fuel supply, price volatility remains a concern for consumers and businesses in NSW.



Review of Liquid Fuel Disruption Events

Over the past five years, NSW has experienced several disruptions to its liquid fuel supply chain due to natural disasters, a global pandemic, and geopolitical events. The 2022 floods demonstrated how decentralised storage facilities and alternative transport routes can enhance supply chain resilience. Similarly, the COVID-19 pandemic demonstrated how diversified sourcing strategies and strategic reserves can safeguard critical imports. Lessons learned from these events show that robust contingency planning and collaboration between government and industry stakeholders can alleviate pressures applied to the fuel supply chain and limit future impacts from unforeseeable or global events.

Risk Assessment

NSW faces potential risks to its liquid fuel supply, including natural disasters, geopolitical instability, and infrastructure vulnerabilities. Fuel supply chains can be affected by aging infrastructure, reliance on imports, and transportation bottlenecks. The increasing frequency of extreme weather events, coupled with global geopolitical tensions, and Australia's critical reliance on road transport for fuel supply underscores the importance of maintaining a secure fuel supply chain. Possible mitigation measures include investing in modernised infrastructure,

[6] Australian Institute of Petroleum (2024). AIP Annual Retail Price Data | Australian Institute of Petroleum

expanding strategic reserves and enhancing security measures to protect critical fuel supply infrastructure.

Emergency Readiness

NSW's emergency readiness is supported by the National Liquid Fuel Emergency Resource Plan (NLFERP) and the Liquid Fuel Emergency Act (LFE). These frameworks provide a robust structure for managing fuel rationing and allocation during crises. Notably however, these measures have never been enacted, and national supply chains have successfully been managed by industry during previous fuel supply disruptions through measures such as re-routing fuel supply chains and sourcing fuels through alternative suppliers and regions. Additional measures, such as expanding regional storage hubs and improving coordination between government and industry, are necessary to ensure resilience during prolonged disruptions. Retail rationing strategies and prioritisation of critical sectors, such as emergency services and utilities, are integral to maintaining continuity of operations during emergencies.

Summary of Analysis

The liquid fuel market in NSW is shaped by ongoing events related to supply security, price volatility, and changing demand patterns. The short-term outlook for fuel prices suggests continued fluctuations as the Australian market is dependent on the global oil price, efforts to enhance domestic refining capacity, improve fuel storage infrastructure, and ensure energy security will help mitigate some of these risks. Businesses and consumers should remain prepared for potential price hikes, while policymakers should continue addressing the long-term challenges of reducing reliance on imported fuels and transitioning to locally produced low-carbon liquid fuels.

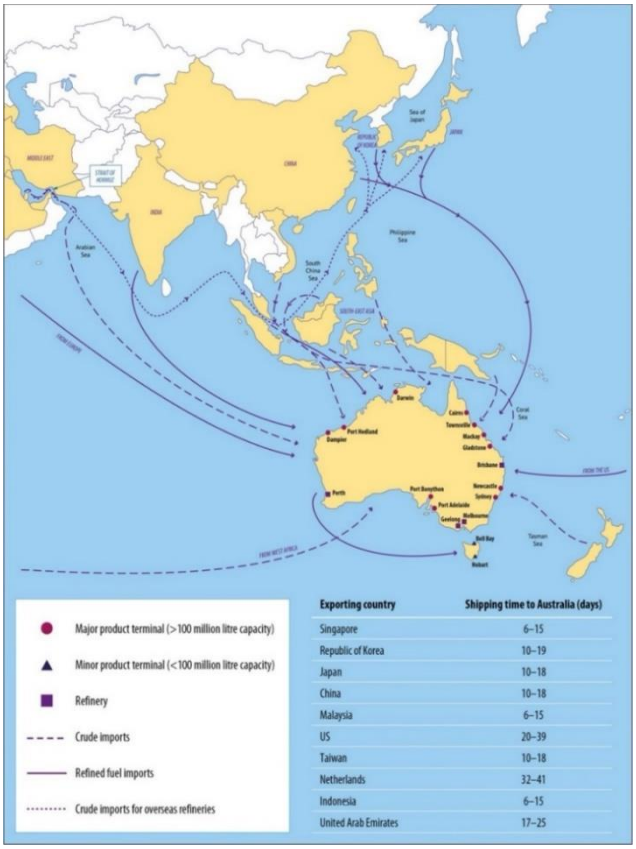
Table of Contents

Table of Acronyms

Acronym	Definition
AIP	Australian Institute of Petroleum
BADSP	Boosting Australia's Diesel Storage Program
BAU	Business as Usual
DCCEEW	Department of Climate Change, Energy the Environment and Water
DEF	Diesel Exhaust Fluid
EV	Electric Vehicle
FSSP	Fuel Security Services Payment
GPG	Gas Powered Generation
GDP	Gross Domestic Product
ICDRA	Initial Contingency Demand Restraint Action
IEA	International Energy Agency
LCLF	Low Carbon Liquid Fuels
LFE	Liquid Fuel Emergency Act 1984
ML	Mega Litre (million litres)
MOSDEF	Maintaining Our Supply of Diesel Exhaust Fluid
NLFERP	National Liquid Fuel Emergency Resource Plan
NOX	Nitrogen Oxide
OPEC	Organization of the Petroleum Exporting Countries
OCSE	Office of the Chief Scientist and Engineer
ppm	Parts per million
SAF	Sustainable Aviation Fuel
SAFF	Sydney Airport Fuel Farm
SCR	Selective Catalytic Reduction
SPR	US Strategic Petroleum Reserve
ULSG	Ultra-low sulphur gasoline
WSI	Western Sydney International Airport
ZEV	Zero Emission Vehicle Strategy

1 Supply Chain Analysis

Australia's conventional oil reserves were estimated at 1.8 billion barrels in 2018, which represents about 14 years of supply at the 2021 production rate. However, declining domestic production and the closure of several refineries in the past decade have intensified the country's reliance on imports[7]. Against a total liquid fuel demand of 1 million barrels per day (bpd), Australia produces only 229,000 barrels per day[8,9]. Figure 2 displays the oil routes to Australia and their shipping times, highlighting sovereign supply chain risks that may arise from geopolitical events, specifically in the South China Sea.



Exporting country	Shipping time to Australia (days)
Singapore	6–15
Republic of Korea	10–19
Japan	10–18
China	10–18
Malaysia	6–15
US	20–39
Taiwan	10–18
Netherlands	32–41
Indonesia	6–15
United Arab Emirates	17–25

Figure 2. Oil import routes to Australia with estimated shipping times [10]

While Australia is reliant on foreign imports, there are a large number of ports and seaborne routes both to and from Australia, and no single sea blockage or disruption in any one area can stop fuel imports into Australia. Similarly, upon arrival to Australia, there are multiple points of entry improving supply chain security.

[7] Australian Petroleum Statistics (2023). https://www.energy.gov.au/publications/australian-petroleum-statistics-2023

[8] DCCEEW (2024). Measures of liquid fuel stocks. https://www.dcceew.gov.au/energy/security/australias-fuel-security/measures-of-liquid-fuel-stocks

[9] CEIC Data (2023). Australian Oil Consumption https://www.ceicdata.com/en/indicator/australia/oil-consumption#:~:text=1965%20%2D%202023%20%7C%20Yearly%20%7C%20Barrel,BP.OIL:%20Oil:%20Consumption

[10] DISER (May 2021). Securing Australia's Domestic Fuel Stocks and Refining Capacity Regulation Impact Statement

1.1 Refining Capability in Australia and NSW

Australia's domestic refining sector has seen six refineries shut down in the last two decades due to factors such as high operational costs, low margins, and increasing competition from larger and more modern refineries in the Asia-Pacific region. In 2000, Australia had eight refineries. By 2025 only two remain operational:

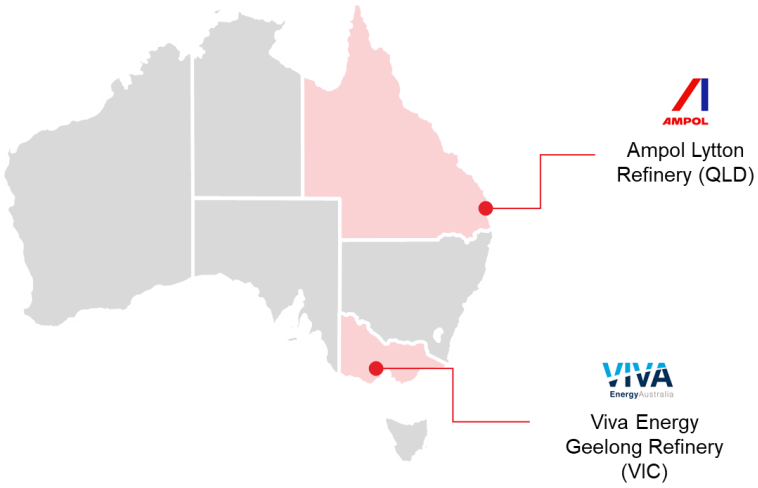


Figure 3. Operational refineries in Australia

Both refineries are critical to Australia's liquid fuel supply chain, but they do not have the capacity to meet the country's overall demand for refined products. Combined, the two refineries have a total refining capacity of around 229,000 bpd (Ampol Lytton: 109,000 bpd[11]; Viva Energy Geelong: 120,000 bpd[12]).

NSW no longer has any operational oil refineries, following the closure of the Kurnell Refinery in 2014. The Kurnell Refinery, located near Sydney, was one of Australia's largest, with a refining capacity of around 124,000 bpd before it was converted into an import terminal. This closure has made NSW entirely dependent on imported refined fuels to meet its liquid fuel needs. Refined products are now primarily imported through key terminals, such as:

Figure 4. Import terminals in NSW, Australia

[11] MiningLink (2025). Lytton Oil Refinery. https://www.mininglink.com.au/mine-details/lytton-oil-refinery
[12] Viva Energy (2024). Geelong Refinery. https://www.vivaenergy.com.au/operations/geelong

- **Port Botany**: Handles a significant volume of gasoline, jet fuel, and diesel, playing a crucial role in supplying the Greater Sydney area.
- **Port Kembla** and **Newcastle**: Other major entry points for refined fuel products, particularly diesel, which is critical for transport, agriculture, and mining.

1.1.1 Federal Government's Fuel Security Services Payment (FSSP)

Recognising the challenges posed by the decline in domestic refining capacity, the Australian Federal Government introduced the Fuel Security Services Payment (FSSP) in 2021[13]. This package provides financial support to the two remaining refineries (Ampol Lytton and Viva Geelong) to ensure they remain operational at least until mid-2027, with an option to extend this support to 2030. The FSSP consists of several key components aimed at improving Australia's fuel security:

Production Payments: The government provides payments to refineries to cover operational losses and ensure ongoing production. This helps to protect against the potential closure of the remaining refineries, which would leave Australia almost entirely reliant on imports for its refined fuel needs.

Refinery Upgrades Program[14]: As part of the FSSP, the government has also committed up to AUD $302 million to upgrade refinery infrastructure. This includes:

- Phase 1: Up to AUD $250 million to enable refineries to produce ultra-low sulfur gasoline (ULSG) by 2024, in line with international fuel quality standards (maximum of 10 parts per million (ppm) sulfur content).
- Phase 2 (optional): An additional AUD $52 million for upgrades aimed at reducing aromatic content in Australian gasoline, aligning with best practices in the global refining industry.

The two operational refineries in Australia are both actively utilising this funding to upgrade their facilities.

Viva Energy's Geelong Refinery: Viva has made substantial progress toward upgrading its Geelong Refinery to produce ULSG. Supported by AUD $125 million in government funding, the refinery is undergoing a broader investment of approximately AUD $350 million to meet international fuel quality standards. Major equipment for the ULSG production plant has already been delivered to the site, demonstrating significant progress in the upgrade process[15]. The project is on track for completion by December 2025. Once operational, the upgrades will position the refinery to comply with the new standards.

Ampol's Lytton Refinery: Ampol's Lytton Refinery has also utilised AUD $125 million in government funding to support similar infrastructure upgrades[16]. The refinery is working toward

[13] DCCEEW (2021). https://www.dcceew.gov.au/energy/security/australias-fuel-security/fuel-security-services-payment
[14] DCCEEW (2021). https://www.dcceew.gov.au/energy/security/australias-fuel-security
[15] Primemovermag (2024). Viva energy refinery. https://primemovermag.com.au/viva-energy-refinery-undergoes-biggest-upgrade-in-decades/
[16] Ampol (2024). Lytton refinery. https://www.ampol.com.au/about-ampol/news-and-media/lytton-refinery-to-continue

achieving the 10 ppm sulfur content requirement by the December 2025 deadline. While specific details on the construction milestones are less widely reported, Ampol's efforts align with the broader goals of the FSSP initiative. These upgrades are expected to enhance the refinery's operational efficiency and ensure compliance with evolving fuel quality standards.

1.1.2 Diesel Exhaust Fluid Shortage

Diesel exhaust fluid (DEF), or AdBlue as it is more commonly known, is a crucial component for diesel powered vehicles made from 32.5% technical grade urea and 67.5% water. The primary purpose of AdBlue is to reduce the nitrogen oxide (Nox) emissions from engines which contribute heavily to air pollution, smog and respiratory problems.

Modern diesel vehicles equipped with selective catalytic reduction (SCR) control systems are design to run efficiently with AdBlue and fail to operate without it due to the design considerations implemented by engine manufacturers. Whilst great for ensuring compliance with environmental regulations, the compulsory addition of AdBlue in diesel cars makes it a clear vulnerability for Australian transport.

The global shortage of urea in 2021-22 was primarily caused by the energy crisis in the southern hemisphere which forced major urea producing nations (Russia, Egypt and China) to stifle supply to the rest of the world causing a supply shortage and severe price increase. The figure below highlights the urea price spike when it to soared from $400/Mt in January 2021 to $1,042/Mt in March 2022.

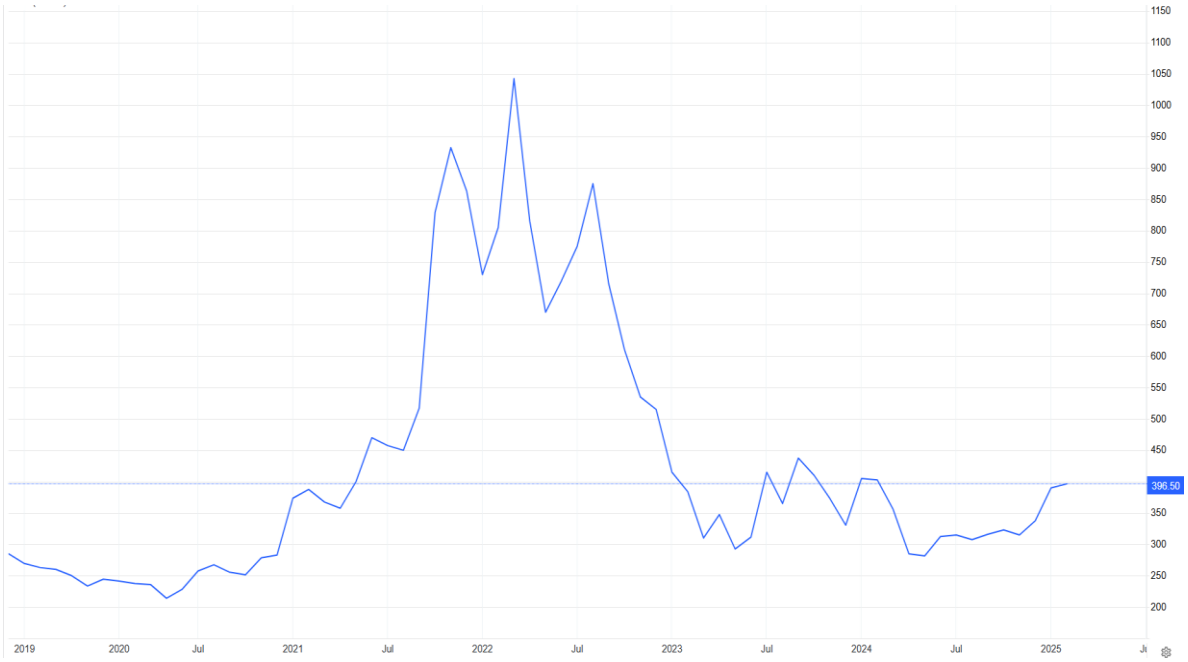


Figure 5. Urea Price Trend[17]

In 2022, it was forecasted by economists that this shortage would halt the Australian mining, transport and agricultural industries because technical grade urea is a critical input to these industries[18]. The recovery of the price to pre-crisis levels occurred in February 2023, after which

[17] Trading Economics (2024). Urea. https://tradingeconomics.com/commodity/urea
[18] The Assay (2021). Urea crisis threatening Australia's mining sector https://www.theassay.com/articles/feature-story/urea-crisis-threatening-australias-mining-sector/

the Department of Climate Change, Energy, the Environment and Water (DCCEEW) launched a grant program which distributes $49.5m over four years to fund the following three measures:

- The Maintaining our Supply of Diesel Exhaust Fluid (MOSDEF)
- A government-controlled stockpile of 7500 tonnes of technical grade urea
- An ICT project to collect data from industry on urea and DEF stocks

1.1.3 Impact of Declining Refining Capacity

The decline in domestic refining capacity has had several key implications for NSW and Australia as a whole:

Increased reliance on imports

- With no refineries in NSW, the state relies almost entirely on imported refined products. Approximately 70% of Australia's liquid fuel consumption is met through imports, primarily from refineries in the Asia-Pacific region, such as Singapore, South Korea, and Japan.

Exposure to global supply chain disruptions

- NSW's dependence on imported fuels opens the State to the implications of disruptions in global supply chains, such as those caused by geopolitical tensions, natural disasters, or fluctuations in global oil prices. The closure of the Kurnell Refinery has reduced the State's ability to respond to emergencies or supply shocks, increasing the importance of strategic storage facilities.

Fuel security considerations

- The closure of refineries and increased reliance on imports have raised concerns about Australia's compliance with the International Energy Agency (IEA) fuel stockholding obligations. The IEA requires member countries to maintain 90 days of net oil imports in reserve, but as of June 2022, Australia was non-compliant, with only 58 days of oil stocks. However, this reserve capacity will only likely cover Australia for approximately 30 days based on overall fuel consumption. The Australian government holds additional fuel reserves overseas, however in the event of a major supply disruption, it is unclear whether these stocks would be used within Australia.

1.2 Storage Infrastructure in NSW

Storage infrastructure is a critical component of NSW's liquid fuel supply chain, ensuring that fuel is available for distribution during periods of high demand or supply disruptions. As a state reliant on imported liquid fuels, NSW's ability to store adequate quantities of oil products like gasoline, diesel, and jet fuel is important for maintaining energy security.

Australia's total oil storage capacity is estimated at around 60 million barrels[19], with storage facilities distributed across the country. NSW houses a significant portion of this capacity (24%)

[19] Department of Industry, Science, Energy and Resources. (2023). *Australian Petroleum Statistics 2023*. https://www.energy.gov.au/data-and-publications/australian-petroleum-statistics (note: based on the ASPI Strategist article, Australia has 54 days of refined fuel storage capacity. Assuming a daily consumption of ~1 million barrels (Australian Petroleum Statistics 2023), the volume can be approximated to be 54 million barrels. The official estimate of 60 million barrels likely reflects additional storage assets and variations in consumption)

through several major storage terminals, particularly at Port Kembla and Newcastle, which serve as key entry points for imported refined fuels to the State. These terminals are equipped to store large volumes of refined oil products, including gasoline, diesel, and jet fuel.

An overview of NSW's liquid fuel storage capability is summarised below:

Port Botany: As Australia's largest common-user bulk liquids facility, Port Botany handles over 5.5 billion litres of bulk liquids and gas annually. It features two bulk liquid berths—Bulk Liquid Berth 1 and Bulk Liquid Berth 2—operated by NSW Ports, which is used for importing fuel, which is then stored primarily at the Vopak Terminal, which comprises of 29 tanks with a capacity of 477,919 barrel of liquid fuel[20].

Port of Newcastle: Newcastle hosts several terminals, including those operated by Caltex, Shell/Mobil JV, and BP. These terminals are supplied by pipelines from Sydney and import products through Newcastle Port.

The Port of Newcastle Bulk Fuel Terminals consist of three major terminals within the port, with a combined tankage capacity that is set to increase from 266 ML to 624 ML following ongoing expansions[21]. These terminals handle a range of fuels, including diesel, petrol, and jet fuel, supplying both the domestic market and international shipping. The port's infrastructure is integral to the fuel supply chain in Australia, ensuring the timely delivery of essential fuels to various sectors, including transportation, industry, and aviation.

One of the major operators in Newcastle is Stolthaven Terminals, located in Mayfield within the Port of Newcastle. Stolthaven has developed a dedicated bulk liquids precinct, with a storage capacity of around 450,000 cubic meters (approximately 450 million litres) for bulk fuels and chemicals[22]. The terminal is one of the most advanced in Australia, featuring berthing capabilities for large vessels and handling various bulk liquids. It serves as a critical hub for refined petroleum products and chemicals.

Another key facility is the Park Fuels Terminal, located in Kooragang within the Port of Newcastle. This terminal has significantly expanded its diesel storage capacity. Originally holding 54 million litres (ML), it has recently added a 30 million litre diesel storage tank, increasing its capacity to around 84 million litres[23]. The terminal plays a vital role in the distribution of diesel fuel across industries in the region.

Hexham Facility: Ocwen Energy Pty Ltd, through Lowes Petroleum, plans to establish a key regional hub in Newcastle at Hexham. The proposed $21.6 million project includes a 24-hour service station and a petroleum-based products distribution warehouse[24].

Sydney Airport Fuel Supply: Sydney Airport has a dedicated fuel storage and distribution system that supports the needs of its various airlines and services. The airport's fuel facilities are

[20] Vopak (2025). https://www.vopak.com/terminals/vopak-terminal-sydney-site-b?language_content_entity=en
[21] Port of Newcastle (2021). Newcastle to play critical role in boosting Australia's fuel security - Port of Newcastle
[22] HunterHeadline (2019). Largest tanker arrival the culmination of significant investment in Newcastle | Hunter Headline
[23] Port of Newcastle (2023). Work to begin on strategic fuel storage tank at Port of Newcastle - Port of Newcastle
[24] The Voice of Downstream Petroleum (2024). Proposed $21.6m service station and petroleum-based products distribution warehouse at Hexham – ACAPMAg

managed and operated by the Sydney Airport Fuel Farm Pty Ltd (SAFF), a consortium of oil companies, including Shell, ExxonMobil, BP, and Ampol. These companies provide the bulk aviation fuel stored at the airport and handle its delivery to airlines through a network of pipelines, tanker trucks, and refuelling hydrants summarised in the figure below:

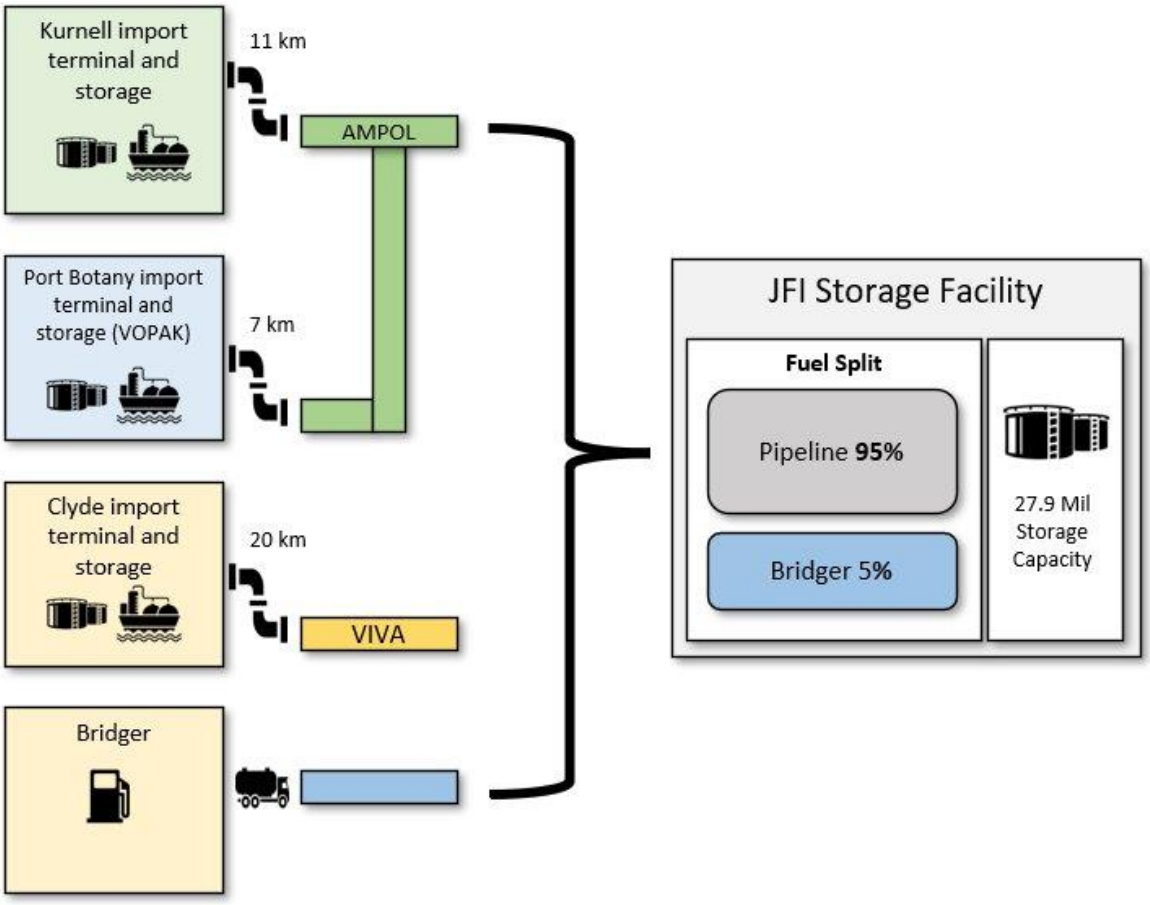


Figure 6: Sydney Airport Fuel Supply (Stakeholder Workshop)

The total fuel storage capacity at Sydney Airport is estimated to be around 27.9 million litres (27.9ML) of aviation fuel[25]. This storage capacity is spread across several tanks, which are designed to store both Jet A-1 and Jet A fuels, the primary types of aviation fuels used at the airport.

1.3 Transportation

Rail transport is also used for bulk fuel distribution, particularly from Newcastle and Sydney to regional hubs, enabling more cost-effective transportation for larger volumes of fuel. However, for most of the fuel transportation to service stations for retail consumers, road tankers are used and are considered essential for fuel distribution throughout Australia. Across NSW, there are over 2,200 service stations covering the State as shown below, where overlaying the fuel oil suppliers, they are distributed across multiple ports along the eastern seaboard. These fuel

[25] Sydney Airport (n.d.). Jet Fuel

suppliers feed both the storage terminals as well as road tankers for distribution across the State to regional storage hubs and directly to service stations.

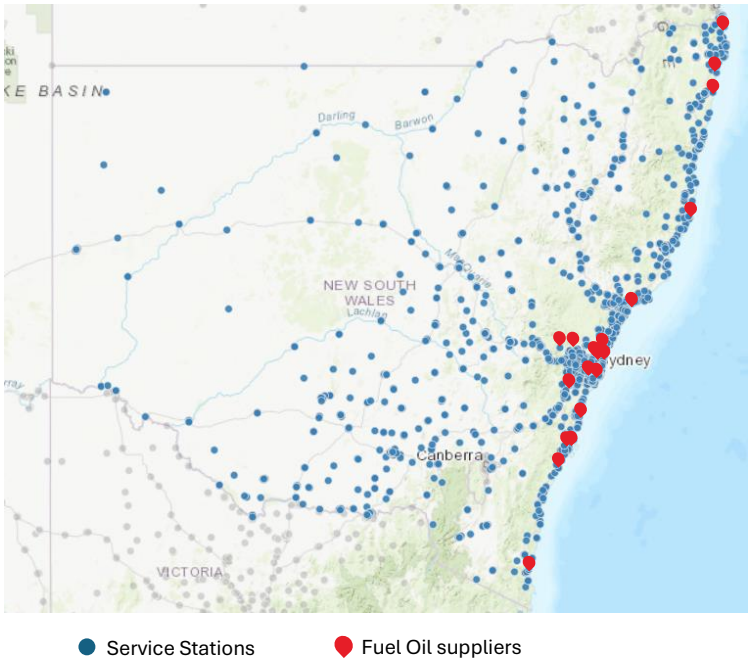


Figure 7. NSW service stations and fuel oil suppliers map [26,27]

Various private transport companies distribute fuel to major industrial users such as mining and agriculture where this is managed by smaller industrial fuel reserve stores throughout the State. These industries are also typically serviced by road tankers.

1.4 Stakeholder Engagement

A stakeholder engagement workshop was held on Wednesday 5th March to gather industry perspectives and discuss risks and opportunities in NSW's liquid fuel supply chain. The workshop discussion covered two main areas: sustainable fuels and supply chain security, summarised in the text below. The workshop logistics, the list of attending stakeholders, and an elaboration on the details of the workshop discussion are available in Appendix A.

Sustainable Fuels

It was clear that adoption of sustainable fuels and decarbonisation was front of mind for many of the organisations as they look to reduce their carbon footprint and improve the sustainability of their operations. Two main conclusions were drawn from this topic:

1. The general sentiment was that the policies currently in place are not strong enough to promote and support the transition to sustainable fuels in Australia[28]. The benefits for

[26] Digital Atlas of Australia, an Australian Government Initiative (2025). Petrol Stations. https://digital.atlas.gov.au/datasets/digitalatlas::petrol-stations/about
[27] Australian Maritime Safety Authority (2024). New South Wales Fuel Oil Suppliers. https://www.amsa.gov.au/marine-environment/air-pollution/new-south-wales-fuel-oil-suppliers
[28] Notably since this discussion occurred. The Australian Government has announced a LCLF policy to incentivise production

uptake are not encouraging enough, and the penalties for not switching aren't dissuasive enough.
2. The room also expressed difficulties in covering the premium for sustainable fuels. There needs to be both a willingness to pay and an ability to pay. In the case of the airlines, they raised that it's difficult to pass on the cost to customers unless they are willing to pay the premium, and the airlines don't have the capacity to bear the cost themselves because of the already thin margins of their industry.

Supply Chain Security

Regarding supply chain security, the consensus was that domestic issues have been dealt with effectively for decades. This confidence was due to various reasons including good prior planning (for foreseeable emergency scenarios), contingencies (e.g., reserve fuel supplies), collaboration between companies (e.g., United can sell fuel to Ampol if they are experience a shortage), and highly skilled workers (rectifying issues to get facilities running again after failures).

The two main supply chain issues that concerned the stakeholders were:

1. Global factors, likely outside the control of the NSW Government. This includes scenarios such as shipping routes halting due to war, major natural disasters etc.
2. Black swan events, which are rare and unexpected events with severe consequences, making them difficult to plan for since they are unforeseeable.

It was noted that good mitigation measures against the consequences of the above listed and other disruptive events would include increasing onshore storage and/or increasing our ability for onshore production. However, increasing onshore storage is expensive, and it only protects against external supply shortages for a set amount of time. As such, developing onshore production (particularly of low carbon fuels) is seen as a more wholistic solution. \

Other takeaways

Additional takeaways from the workshop discussions followed:

- Without domestic production, there is a risk of NSW bio-feedstocks being shipped offshore, processed into low carbon fuels, and then sold back to Australia. In this scenario, NSW misses the value adding opportunity to the State from the associated jobs, economic growth, and fuel security.
- The current process for obtaining a Temporary Coastal Licence for a foreign vessel can take up to 5 days, which is seen as a roadblock to agile responsiveness to low local fuel supply levels. Ampol raised that they can charter fuel tankers from the international spot tanker market to be in Australian ports within 24 hours, however the 5-day process to obtain a licence for those vessels to dock diminishes their ability to react to onshore fuel shortages, which can result in supply shortfalls for crucial industries. Ampol (formerly under the trading name Caltex) has been requesting that crude oil vessels be exempted from requiring a temporary license since 2012[29], which is yet to be implemented and is an ongoing subject of discussion.

[29] Caltex (2012). Caltex submission on the Stronger Shipping for a Stronger Economy reform agenda

2 Demand Analysis

The demand for liquid fuels in NSW and across Australia continues to grow, driven by sectors such as transport, mining, and industry. As outlined in Figure 8, automotive gasoline, diesel and aviation turbine fuel represent the majority of NSW's liquid fuel mix. While there is a long-term trend towards decarbonisation and the adoption of renewable energy sources, liquid fuels, particularly diesel, remain a critical part of the State's energy mix.

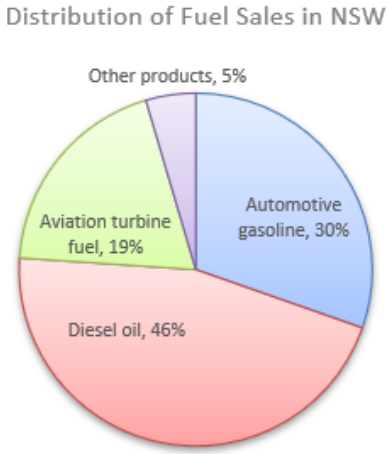


Figure 8. Distribution of Fuel Sales in NSW (yearly total from Nov 2023 to Nov 2024) [30]

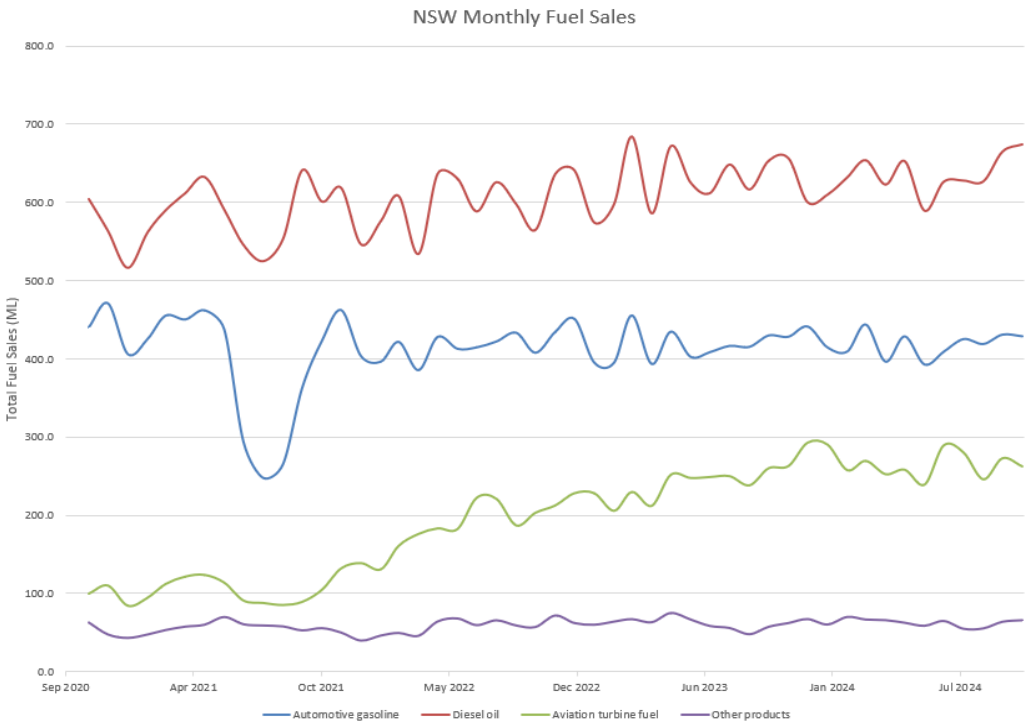


Figure 9. NSW Monthly Fuel Sales 4-year trend [30]

[30] Australian Petroleum Statistics – November 2024 Data Extract (2024). Australian Petroleum Statistics 2024 | energy.gov.au

2.1 Liquid Fuel Demand by Sector in NSW

2.1.1 Transport Sector

The transport sector is the largest consumer of liquid fuels in NSW. This sector includes road transport, aviation, and rail transport, with road transport being the dominant contributor.

i. **Road Transport:** Road transport accounts for approximately 55-60% of the total liquid fuel demand in the State[31]. Petrol is used primarily in private cars and light vehicles, while diesel is the dominant fuel for trucks, buses, and other commercial vehicles. According to 2024 Australian Petroleum Statistics, NSW consumes approximately 5 billion litres of petrol and 7.5 billion litres of diesel annually, with diesel playing a crucial role in freight and logistics operations[32].

ii. **Aviation:** The aviation sector also represents a significant share of liquid fuel consumption in NSW. This is particularly at Sydney Airport, which is considered to be the gateway to Australia. In 2019, Sydney Airport had an average daily jet fuel demand of 10 million litres[33]. Other regional airports, such as those in Newcastle and Illawarra, contribute to fuel demand, although on a smaller scale compared to Sydney. The Western Sydney International Airport (WSI), expected to open in late 2026 and handle 10 million passengers annually, is forecasted to be responsible for a demand of 34 billion litres of jet fuel between opening and 2050, averaging out to approximately 1.13 billion litres per year[34].

iii. **Rail Transport:** Diesel-powered trains are used for both freight and some passenger services. The rail sector's diesel consumption in NSW is estimated at around 100-150 million litres annually, based on national rail fuel consumption figures and NSW's historical share of rail diesel use[35,36].

2.1.2 Industrial Sector

i. **Mining and Resources:** The mining industry in areas such as the Hunter Valley and Western NSW is a major consumer of diesel, used in heavy machinery and trucks. The total demand for diesel in the mining sector is estimated at 600-700 million litres annually[37,38].

ii. **Manufacturing and Construction:** Manufacturing industries, such as those in steel production, chemicals, and cement, as well as the construction sector, consume

[31] The Australia Institute (2022). Addressing Australia's Liquid Fuel Security. P1036-Over-a-barrel_liquid-fuel-security-WEB.pdf

[32] Australian Petroleum Statistics (2024). Australian Petroleum Statistics 2024 | energy.gov.au

[33] Sydney Airport (n.d). Jet Fuel

[34] Review of Aviation Fuel Supply Options May (2023). WSI Review of Aviation Fuel Supply Options 2023.pdf

[35] The 100-150 million litres estimate is based on national rail diesel consumption (~1.6 billion litres annually), as reported in Australian Energy Statistics (2021) Australian Energy Statistics 2021 Energy Update Report

[36] NSW's historical share of ~23% of national rail diesel use (NSW EPA). Locomotive Emissions Project. This figure is further adjusted to exclude mining and industrial rail operations, which account for a significant portion of overall rail diesel use

[37] ARENA (2020). Australia's total mining diesel consumption (~5.3 billion litres per year) Renewable Energy in the Australian Mining Sector - Australian Renewable Energy Agency (ARENA)

[38] Australian Energy Statistics (2020). NSW's historical share (~11-13%) of national mining output. Australian Energy Statistics 2020 Energy Update Report

substantial amounts of diesel for machinery and power generation. Additionally, liquid fuels play a critical role beyond energy use, serving as feedstock for plastics, oils, lubricants, and other petrochemical products, which are more challenging to replace with renewable alternatives. The total diesel demand from these sectors is estimated at 400-500 million litres annually[39].

iii. **Diesel for Backup Generators**: Diesel plays a critical role in emergency response and contingency planning. When other energy sources fail, diesel generators are used to restart the electricity grid and support essential services such as hospitals, water, and sanitation. Disruptions in electricity or gas networks may also lead to diesel shortages, with potential impacts on other sectors. Approximately 2 per cent of Australia's population lives in off-grid areas, which consume 6 per cent of the country's total electricity. While most remote generation is powered by natural gas, diesel supplies 26 per cent of off-grid electricity and remains the universal backup fuel source[40].

2.1.3 Agriculture Sector

The agriculture sector is another significant consumer of diesel, particularly in rural areas like the Riverina, Central West, and North Coast. Diesel is used to power farm machinery (such as tractors, harvesters, and irrigation systems) and for transporting agricultural goods. This contributes an additional 2,430 ML of annual diesel fuel demand in Australia[41]. NSW has 14% of the agricultural land in Australia[42], which can be used to approximate the State's diesel fuel demand from the agricultural sector to be around 340 ML/year.

2.1.4 Marine and Ports Sector

The marine sector in NSW, including both commercial shipping and recreational vessels, consumes substantial quantities of fuel. Typical marine bunker fuels (a combination of heavy fuel oil and marine diesel oil) are produced as by-products from oil refining and are produced domestically at Viva. Marine fuel demand in NSW is dominated by commercial shipping due to the volume of shipping activity within our import and export industries. NSW is both a major import and export terminal within Australia, where marine fuel demand within the state is concentrated around major ports, including Sydney, Newcastle and Port Kembla. Marine fuel oil demand is estimated at ~1.68 billion L annually across Australia, where this is distributed primarily across major ports in NSW, QLD and WA[43,44].

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[39] Australian Energy Statistics (2020). NSW's manufacturing and construction sectors are estimated to consume 400-500 million litres of diesel annually, based on national diesel consumption data (~3.26 billion litres per year) and NSW's historical share (~12-15%) of national industrial output.

[40] Department of the Environment and Energy. (2019). Liquid Fuel Security Review—Interim report — Interim report

[41] Department of Prime Industries. (2021). MOV3MENT-A2EP Diesel use in Agriculture

[42] ABS. (2022). Agricultural Commodities, Australia. https://www.abs.gov.au/statistics/industry/agriculture/agricultural-commodities-australia/latest-release

[43] Department of Environment and Energy (2019). Calculated as 3% of total liquid fuel demand (56 billion L per ref.44). Liquid Fuel Security Review—Interim report —Interim report

[44] Department of Infrastructure, Transport, Regional Development, Communications and the Arts. (2024). lclf2024-anonymous.pdf

2.1.5 Backup Fuel for Gas-Powered Generation (GPG)

While the demand for liquid fuels for power generation is not significant, backup fuel storage is critical for gas-powered generation (GPG) facilities in NSW. Diesel is used as a backup fuel to ensure electricity reliability in the event of gas supply disruptions.

Colongra Power Station, with a capacity of 667 MW, operates open-cycle fast-start gas turbines. The station has a diesel storage tank with a capacity of 1.8 ML; however, bund volume restrictions limit the operational tank volume to 1.367 ML. Diesel fuel is delivered to the site via road tankers, and operational procedures ensure that the maximum storage capacity remains within safe limits. The available diesel supply allows the power station to operate at full load for approximately seven hours before refuelling via road tanker is required[45]. Additionally, diesel use within the turbines is limited to under 75 hours in any 12-month period except in cases to manage failures at existing major electricity generating facilities.

The Hunter Power Project, initially designed as a 660 MW fast-start open-cycle gas turbine facility, includes two diesel fuel storage tanks, each with a capacity of 2.1 ML, though they will be filled to an operational capacity of 1.75 ML per tank, totalling 3.5 ML of diesel storage. The fuel will be delivered to the power station via B-double tankers as needed. This storage capacity is sufficient to support operation at full capacity for three consecutive days, with each turbine running for ten hours per day[46]. These backup fuel arrangements are critical to maintaining electricity supply reliability in NSW, particularly during gas supply constraints or emergency situations. The reliance on road transport for diesel delivery presents a potential risk, as disruptions in supply chains due to weather events, infrastructure failures, or market constraints could limit the ability of these power stations to operate on diesel for extended periods.

Other gas generating plants such as Tallawarra and Uranquinty use turbines and generators that do not have the same capability to use diesel as a backup fuel and thus do not utilise it in appreciable quantities as a backup fuel. Minor demands may be utilised to supply electricity to site as emergency generators however this is considered negligible when compared to use for power generation.

[45] Snowy Hydro. (2019). Colongra Power Station. https://www.snowyhydro.com.au/wp-content/uploads/2020/03/Colongra-OEMP-December-2019.pdf

[46] Snowy Hydro. (2024). Hunter Power Project Update. https://www.snowyhydro.com.au/news/statement-hunter-power-project-update/

2.2 Key Trends in Liquid Fuel Demand in NSW

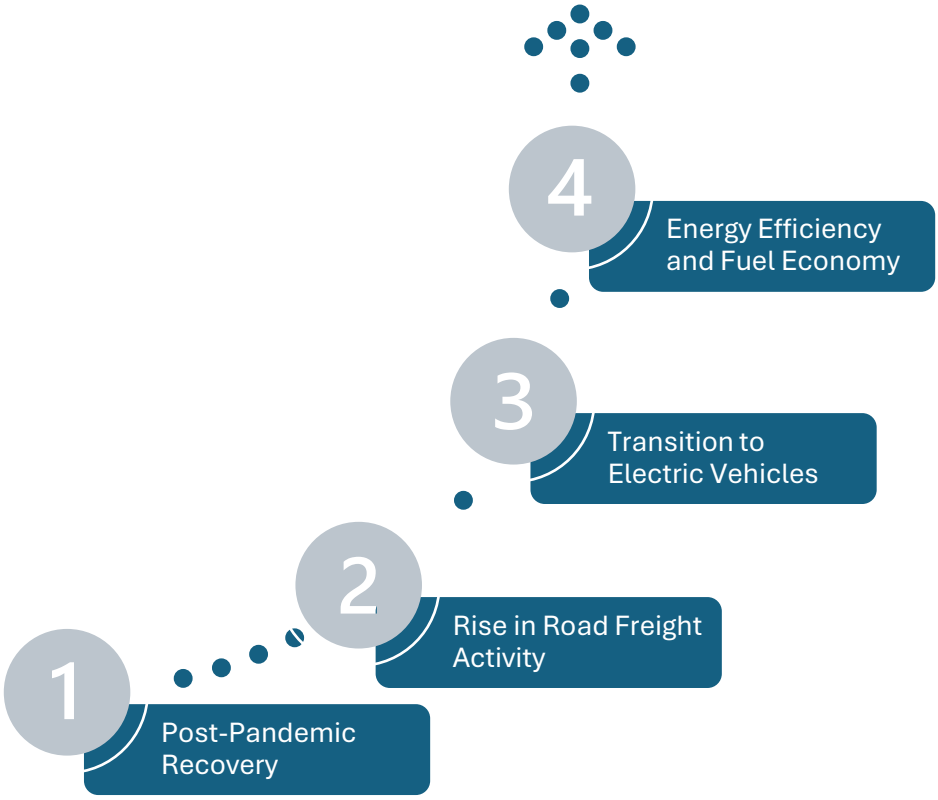


Figure 10. Liquid fuel demand trends in NSW

Several key trends are influencing liquid fuel demand in NSW:

1. **Post-Pandemic Recovery**: The COVID-19 pandemic had a significant impact on fuel demand, particularly in the aviation and road transport sectors. During the height of the pandemic, aviation fuel consumption in NSW dropped from 312.7 million litres in January 2020 to just 62.6 million litres in April 2020[47], an 80% decline due to lockdowns and border closures. As the economy continues to recover, demand for petrol, diesel, and jet fuel has rebounded. Jet fuel consumption in NSW rose from 2.93 billion litres in 2023 to 3.22 billion litres in 2024, reflecting the resurgence of domestic and international travel. NSW, with its large urban population and industrial base, is seeing increased fuel consumption as economic activity normalises.

2. **Rise in Road Freight Activity**: Road freight is a major driver of diesel demand, and this trend is expected to continue as e-commerce and logistics networks expand. The demand for freight services is expected to rise due to increased imports, domestic consumption, and online shopping, particularly during peak seasons such as the holiday period. The road freight task in NSW reached 86.2 billion tonne-kilometres in 2023–24[48], reflecting a 6.2% increase from the previous year, indicating a steady rise in freight activity.

[47] DCCEEW (2024). Australian Petroleum Statistics. https://www.energy.gov.au/publications/australian-petroleum-statistics-2024
[48] Department of Infrastructure, Transport, Regional Development, Communications and the Arts (2025). Table 4.2a Australian Infrastructure and Transport Statistics: Yearbook 2024

3. **Transition to Electric Vehicles (EVs)**: While gasoline and diesel continue to dominate the fuel mix for passenger vehicles, the gradual adoption of EVs in NSW is expected to reduce gasoline demand over time. Government incentives and investments in EV infrastructure, particularly in metropolitan areas like Sydney, are encouraging the shift towards electrification. However, this shift will be gradual and is unlikely to significantly affect liquid fuel demand in the short term. The share of EVs in new Australian passenger vehicle sales is forecast to rise to 6 per cent by 2025, 28 per cent by 2030, and 60 per cent by 2040[49].
4. **Energy Efficiency and Fuel Economy**: Improvements in fuel efficiency, particularly for heavy vehicles and industrial machinery, are expected to moderate the growth in fuel consumption. Newer vehicles and equipment are designed to be more fuel-efficient, which could slightly reduce the rate of demand growth for liquid fuels.

2.3 Projected Liquid Fuel Demand in Australia and NSW

Projecting future demand for liquid fuels in NSW involves analysing various factors, including economic growth, technological advancements, fuel substitution, and global market dynamics. While the transition to renewable energy and hydrogen derivatives is underway, liquid fuels remain essential for sectors like transport, industry, and agriculture.

2.3.1 Key Drivers of Projected Demand

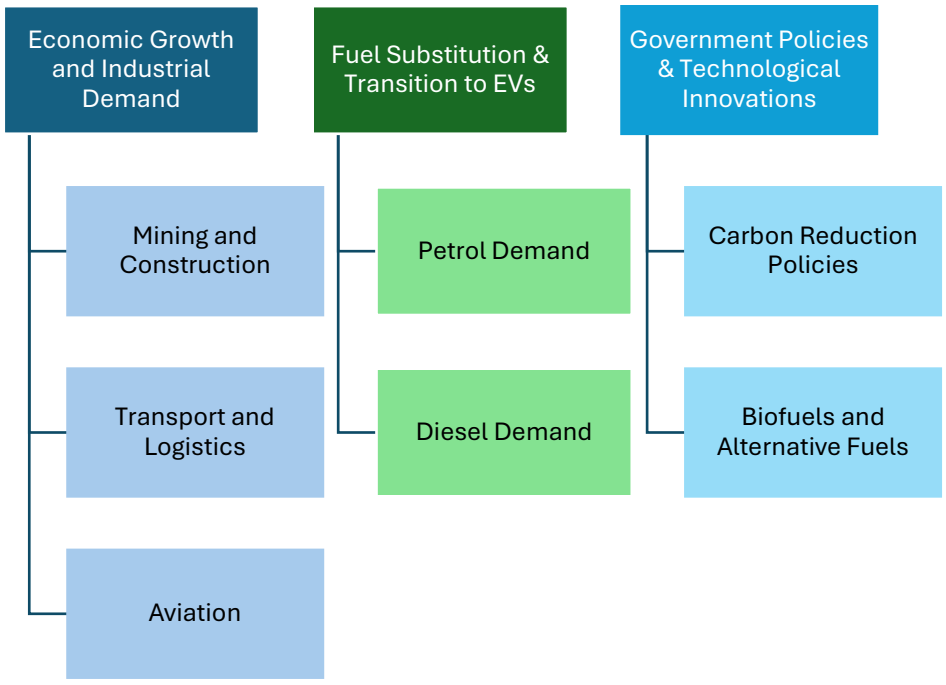


Figure 11. Demand drivers visualisation

[49] NSW EPA (2021). https://www.soe.epa.nsw.gov.au/all-themes/human-settlement/energy-consumption#transport-fuel-demand-pressures

2.3.1.1 Economic Growth and Industrial Demand

Australia's economic outlook in the near term is one of gradual recovery post-pandemic. As of 2023, Australia's Gross Domestic Product (GDP) growth is projected at 2.1%[50], driven by strong domestic demand, infrastructure investment, and a return to pre-pandemic activity levels in sectors like mining, transport, and construction. In NSW, which has a significant share of Australia's industrial and commercial activity, demand for liquid fuels will largely follow the economic growth trajectory.

- **Mining and Construction Sectors**: Diesel demand in the mining and construction sectors is expected to remain robust over the next few years, with major infrastructure projects (e.g., Sydney Metro and Western Sydney Airport) driving fuel consumption for construction machinery and freight transport. The mining sector, particularly coal and metal ore extraction in regions like the Hunter Valley, will continue to rely on diesel-powered equipment, making it a significant driver of future diesel demand.
- **Transport and Logistics**: Road freight transport is projected to remain the largest consumer of diesel fuel. As e-commerce continues to grow, particularly in NSW with its major distribution centres and logistics hubs, demand for freight transport will expand. Projections show that road freight will continue to increase by approximately 2% annually until at least 2030[51], particularly as freight volumes continue to expand in line with domestic and international trade. This will continue to sustain demand for diesel.
- **Aviation**: By 2025, jet fuel consumption in NSW is expected to reach pre-pandemic levels, with an annual growth rate of 3-4% due to the resurgence of air travel. Jet fuel consumption in NSW dropped significantly during the COVID-19 pandemic, from 312.7 million litres in January 2020 to 62.6 million litres in April 2020. However, by December 2024, consumption had rebounded to 295.3 million litres[52].

2.3.1.2 Fuel Substitution and the Transition to EVs

While the near-term outlook for diesel and gasoline demand is strong, the long-term trend is likely to be shaped by the adoption of EVs, both for passenger vehicles and commercial fleets. Australia has set ambitious targets for reducing carbon emissions, and the EV market is expected to grow rapidly. By 2030, the Australian EV market is expected to account for around 30% of total vehicle sales[53]. NSW is expected to lead the adoption of EVs due to its urban population, strong government support, and infrastructure development. For instance, the NSW Government's Zero Emission Vehicle (ZEV) Strategy 2022-2032 aims for 52% of new passenger vehicle sales to be zero-emission vehicles by 2030-31, with the target of having the vast majority of new car sales being EVs by 2035[54].

- **Petrol Demand**: Petrol demand in NSW is expected to gradually decline as more consumers switch to EVs, particularly in urban areas like Sydney. While EV adoption is slower in rural and remote areas where the infrastructure for EV charging may still be

[50] Reserve Bank of Australia (2023). Economic Outlook | Statement on Monetary Policy – November 2023 | RBA
[51] Bureau of Infrastructure, Transport and Regional Economics (2022). Australian aggregate freight forecasts – 2022 update
[52] DCCEEW (2024). Australian Petroleum Statistics 2024 | energy.gov.au
[53] CSIRO (2022). Microsoft Word - CSIROEVreport_20221124.docx
[54] NSW Government (2022). NSW Electric Vehicle Strategy

developing, urban centres are likely to see a faster transition. As EV adoption grows, gasoline demand in urban regions will fall, though this may be partially offset by increased electricity demand to power the growing number of EVs. A study indicates that widespread EV adoption could lead to a 15% increase in overall electricity demand[55,56]. This additional demand is expected to be met through a mix of renewable energy and gas/diesel-powered generation, particularly during periods of low renewable production or peak demand, with gas and diesel plants continuing to support the grid[57].

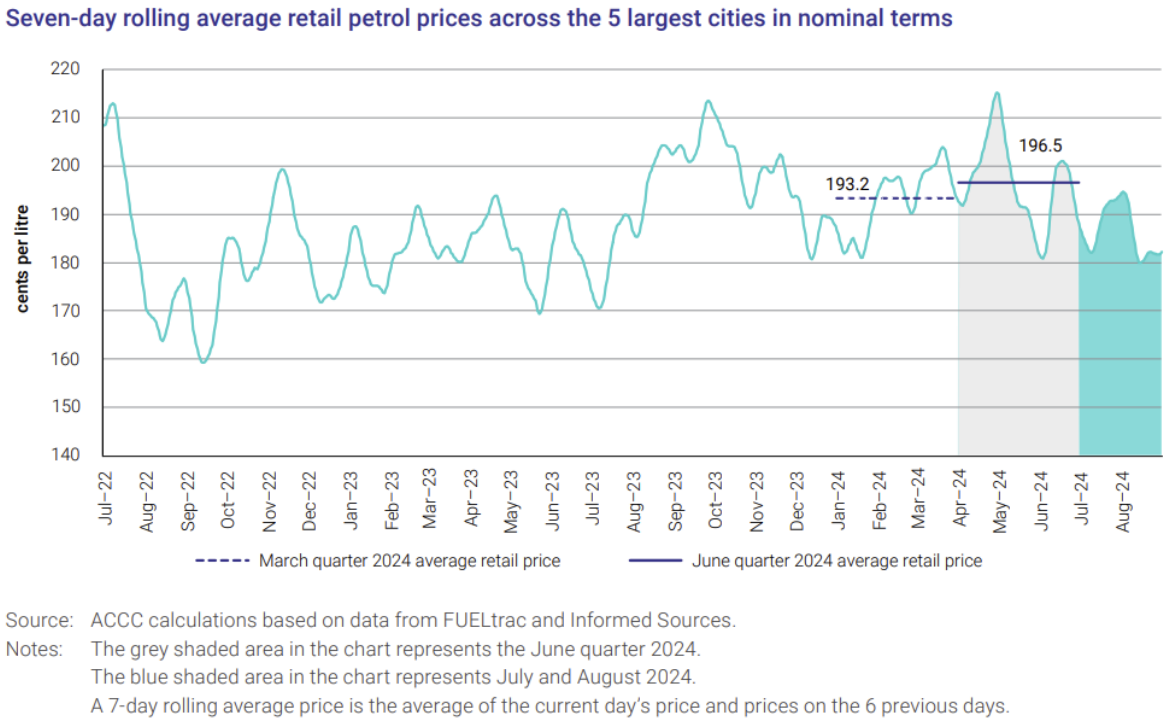
- **Diesel Demand**: The shift to electric vehicles will likely have a more limited impact on diesel demand in the short term, particularly in heavy-duty sectors such as freight transport, construction, and mining. While electric trucks and machinery are being developed, they are not yet at the scale or cost-effectiveness to replace diesel-powered equipment in these sectors. Diesel demand in these areas is expected to remain stable in the near term, with slight reductions anticipated in the longer run due to improvements in fuel efficiency and the adoption of alternative fuels. Additionally, hybrid systems combining diesel generation with renewable energy (solar or BESS) could reduce diesel consumption, especially during peak demand or low renewable production. However, diesel will continue to serve as a backup in the short term, and its role is expected to diminish as energy storage and renewable integration improve.
- **Government Policies and Technological Innovations:** Government policies play a significant role in shaping liquid fuel demand. In recent years, both federal and state governments have implemented various measures to improve fuel efficiency, encourage renewable energy adoption, and reduce greenhouse gas emissions.
- **Carbon Reduction Policies**: Australia has set a target to achieve net-zero emissions by 2050, with intermediate steps such as a 43% reduction in emissions by 2030. These policies are expected to lead to a gradual decline in liquid fuel demand over time, particularly for gasoline and diesel. The rollout of the Safeguard Mechanism, improved fuel efficiency standards for vehicles, and increased support for clean energy technologies, such as green hydrogen, are expected to affect long-term liquid fuel demand, particularly in the transport sector.

Biofuels and Alternative Fuels: Although Australia has no federal biofuel mandates, state mandates (e.g., Queensland and New South Wales) for biofuels like ethanol and biodiesel have had a limited effect on liquid fuel demand. However, in the longer term, the use of biofuels could increase, particularly if the government introduces policies that make biofuels more competitive with conventional fuels. This would impact the demand for petroleum-based fuels, especially in the transport sector, where biofuels are already used in limited volumes.

[55] Electric Vehicle Council (2025). Can the current energy grid handle the increasing number of electric vehicles on the road? - Electric Vehicle Council
[56] Electric Vehicle Council (2025). Home-EV-Charging-and-the-Grid-2030_-edition-2.1_all-edits-complete-MS.pdf
[57] DCCEEW (2024). Australian electricity generation - fuel mix | energy.gov.au

3 Pricing Trends

The pricing of liquid fuels in Australia is shaped by a wide range of factors, including global oil market dynamics, domestic production capabilities, taxes, and government policies. Understanding the underlying drivers of fuel pricing and how these factors interact is essential for forecasting future trends and preparing for potential price volatility. Figure 12 presents the price volatility across major Australian cities for petrol prices.



Source: ACCC calculations based on data from FUELtrac and Informed Sources.
Notes: The grey shaded area in the chart represents the June quarter 2024.
The blue shaded area in the chart represents July and August 2024.
A 7-day rolling average price is the average of the current day's price and prices on the 6 previous days.

Figure 12. Global oil pricing trends[58]

3.1 Historical and Current Pricing Trends

Australia's liquid fuel prices have fluctuated over the years, influenced by international oil price movements, domestic refining conditions, and changes in currency exchange rates. These fluctuations have significant implications for consumers, businesses, and the broader Australian economy.

Global Oil Price Dynamics and Australian Prices: Australian fuel prices are closely tied to the price of crude oil, especially Brent Crude (Figure 13), which is a benchmark for fuel pricing in the Asia-Pacific region. In recent years, crude oil prices have been volatile.

For example, in early 2020, due to the COVID-19 pandemic, global oil prices saw a dramatic decline due to a lockdowns and reduced transportation drop global demand. Brent Crude prices fell to as low as $20 per barrel in April 2020. However, as global economies began recovering,

[58] ACCC Quarterly Petrol Report (2024). Report on the Australian petroleum market – June quarter 2024

subsequent supply chain adjustments created volatility in fuel availability and oil prices rose sharply again. By December 2021, Brent Crude was priced at over $70 per barrel, and as of late 2023, it has remained fluctuating between $80 to $90 per barrel[59].

						Percentage changes		
World	Unit	2023	2024 s	2025 f	2026 f	2024 f	2025 f	2026 f
Production[a]	mb/d	102	103	105	106	0.3	2.1	1.1
Consumption[a]	mb/d	102	103	104	106	1.2	1.2	1.0
WTI crude oil price								
– nominal	US$/bbl	78	77	69	66	-0.8	-10.5	-4.5
– real[b]	US$/bbl	80	77	68	63	-3.8	-12.2	-6.4
Brent crude oil price								
– nominal	US$/bbl	83	81	73	69	-1.8	-10.2	-4.7
– real[b]	US$/bbl	85	81	71	67	-4.8	-11.9	-6.6
Australia	Unit	2022–23	2023–24 s	2024–25 f	2025–26 f	2023–24 s	2024–25 f	2025–26 f
Crude and condensate								
Production[ac]	kb/d	298	275	261	253	-7.6	-5.0	-3.3
Export volume[a]	kb/d	282	261	243	231	-7.1	-7.1	-4.7
– Nominal value	A$m	13,193	12,585	10,385	8,693	-4.6	-17.5	-16.3
– Real value[h]	A$m	14,153	12,956	10,385	8,407	-8.5	-19.8	-19.0
Imports[a]	kb/d	169	169	200	198	-0.2	18.2	-0.8
LPG production[acd]	kb/d	93	95	93	92	1.9	-1.6	-1.4
Refined products								
– Refinery production[a]	kb/d	252	256	255	253	1.3	-0.4	-0.8
– Export volume[ae]	kb/d	6	7	7	7	21.5	6.6	-7.5
– Import volume[a]	kb/d	856	896	913	919	4.7	1.8	0.8
– Consumption[ag]	kb/d	1,022	1,061	1,069	1,074	3.8	0.8	0.5

Notes: **a** data was revised in the December quarter 2021 to align with the Australian Petroleum Statistics; **d** Primary products sold as LPG; **e** Excludes LPG; **f** Forecast; **g** Domestic sales of marketable products, including imports; **h** In 2024-25 financial year Australian dollars; **r** Compound annual growth rate (per cent), for the period from 2023 to 2029 or for the equivalent financial years; **s** Estimate.

Source: ABS (2024) International Trade in Goods and Services, Australia, Cat. No. 5368.0; International Energy Agency (2024); US Energy Information Administration (2024); Department of Industry, Science and Resources (2024); Department of Climate Change, Energy and Environment (2024).

Figure 13. Australia's oil outlook and global pricing[60]

Current Retail Fuel Prices: As of late 2024, the average retail price for unleaded petrol in Australia is approximately $1.80 per litre, with diesel prices hovering between $1.80 to $2.00 per litre. These prices have been higher than the 2020 levels, which saw average prices for petrol dip as low as $1.10 to $1.20 per litre due to the downturn in global oil markets triggered by the pandemic. Diesel, typically priced at a premium, also reflected these movements, with prices stabilising around $1.60 per litre in early 2021[61].

3.2 Key Factors Influencing Fuel Pricing Trends

There are several critical factors that influence fuel pricing trends in Australia, ranging from global oil prices to domestic policies and market competition. Each of these factors contributes to the final price paid by consumers and businesses.

[59] IEA Global Oil Market Overview
[60] Resource and Energy Quarterly. Office of Chief Economist. DISR. September 2024.
[61] Australian Competition and Consumer Commission (ACCC). Fuel Prices Data

Table 1. Fuel price factors

Factor	Impact
Global oil prices 	Australia's fuel prices are directly affected by international crude oil prices. These prices are determined by supply and demand factors in the global market. The price of crude oil typically fluctuates based on geopolitical tensions, natural disasters, production decisions by the Organization of the Petroleum Exporting Countries (OPEC), and changes in global economic conditions. For example, the war in Ukraine, which began in early 2022, significantly impacted global oil supply, pushing up prices across the globe, including in Australia. Additionally, oil supply cuts by OPEC or oil-producing countries can push global prices higher, which is reflected in higher retail fuel prices in Australia.
Currency exchange rates 	Since crude oil is traded globally in US dollars, fluctuations in the value of the Australian dollar against the US dollar can directly impact fuel prices. For example, if the Australian dollar depreciates relative to the US dollar, it increases the cost of importing crude oil, which in turn leads to higher fuel prices at the pump. In recent years, the Australian dollar has been relatively weak against the US dollar, contributing to higher fuel prices in the domestic market.
Refining capacity and domestic production 	Australia's refining capacity is a critical factor in determining fuel prices. Since the closure of several refineries in Australia over the past decade, the country has become more reliant on imported refined products, making domestic prices more susceptible to fluctuations in international supply chains. The two remaining refineries in Australia, Ampol (Lytton, QLD) and Viva Energy (Geelong, VIC), have faced challenges in maintaining profitable operations due to rising production costs, resulting in a higher cost of domestic production.
Fuel Taxes and Government Policies 	The fuel excise tax is one of the largest contributors to fuel price increases in Australia. As of 2023, the Australian Government imposes a 41.5 cents per litre excise on both petrol and diesel. While this excise tax is used to fund road infrastructure and other projects, it directly impacts the retail price of fuel. In response to the COVID-19 pandemic, the Australian government temporarily suspended the fuel excise for six months in 2022, which led to a reduction in retail fuel prices. However, the excise tax has since been reinstated.
Market Competition and Retail Pricing 	The level of competition in the Australian fuel retail market also plays a significant role in determining pricing trends. In urban areas, there is a high level of competition among large retailers such as Ampol, BP, and Shell, which helps to drive prices down. However, in regional and remote areas where there are fewer retailers, fuel prices tend to be higher due to limited competition and higher transportation costs. The expansion of independent retail chains, such as United Petroleum and 7-Eleven, has helped lower prices in some metropolitan regions by increasing competition[62].

[62] Australian Competition and Consumer Commission (2025). Fuel and petrol monitoring | ACCC

3.3 Future Price Volatility and Projections

Looking forward, liquid fuel prices in Australia are expected to remain volatile, driven by several factors, including global oil price uncertainty, the transition to renewable energy, and changes in government policies.

Global Oil Market Volatility: It is difficult to predict the future of oil prices with certainty, as geopolitical tensions, natural disasters, and shifts in global supply and demand can cause significant price fluctuations. Global events like the Russia-Ukraine war, supply chain disruptions in key oil-producing regions, and OPEC's decisions to adjust production levels could continue to drive global oil prices up or down, which will have a direct impact on Australian fuel prices.

Renewable Energy Transition: The gradual shift towards renewable energy and EVs is expected to reduce long-term demand for gasoline and diesel, which may put downward pressure on fuel prices in the medium term. However, in the short to medium term, diesel demand from the mining and transportation sectors is expected to remain stable, which could keep diesel prices elevated compared to petrol.

Government Fuel Security Measures: Australian government initiatives, such as the Fuel Security Services Payment and the Boosting Australia's Diesel Storage Program, are designed to ensure a stable supply of liquid fuels. While these measures may not directly affect fuel prices, they are likely to help mitigate supply disruptions and reduce the risk of extreme price volatility in the event of future crises.

4 Review of Liquid Fuel Disruption Events

This section will identify and analyse the largest liquid fuel supply disruptions in NSW over the past five years, with examination of cause, impacts, and response measures implemented by market participants and government agencies in NSW. This will include assessment of best practice and lessons learnt from historical events.

4.1 Major Liquid Fuel Disruptions

4.1.1 COVID-19 Pandemic (2020–2022)

The COVID-19 pandemic (2020–2022) caused disruptions to the NSW liquid fuel supply chain, leading to challenges in demand, supply, and logistics. These disruptions necessitated adaptive measures and offered valuable lessons for future resilience.

Impact on Fuel Demand

NSW experienced significant reductions in fuel consumption due to COVID-19 restrictions[63]:

- Aviation Fuel: NSW aviation turbine fuel consumption plummeted from 312.7 million litres in January 2020 to just 62.6 million litres in April 2020.
- Petrol: NSW petrol sales declined from 5,575 million litres in 2019 to 4,926 million litres in 2020, reflecting reduced travel activity.
- Diesel: Diesel consumption remained relatively stable, experiencing only a slight decline during lockdown periods, as freight and essential services continued operating.

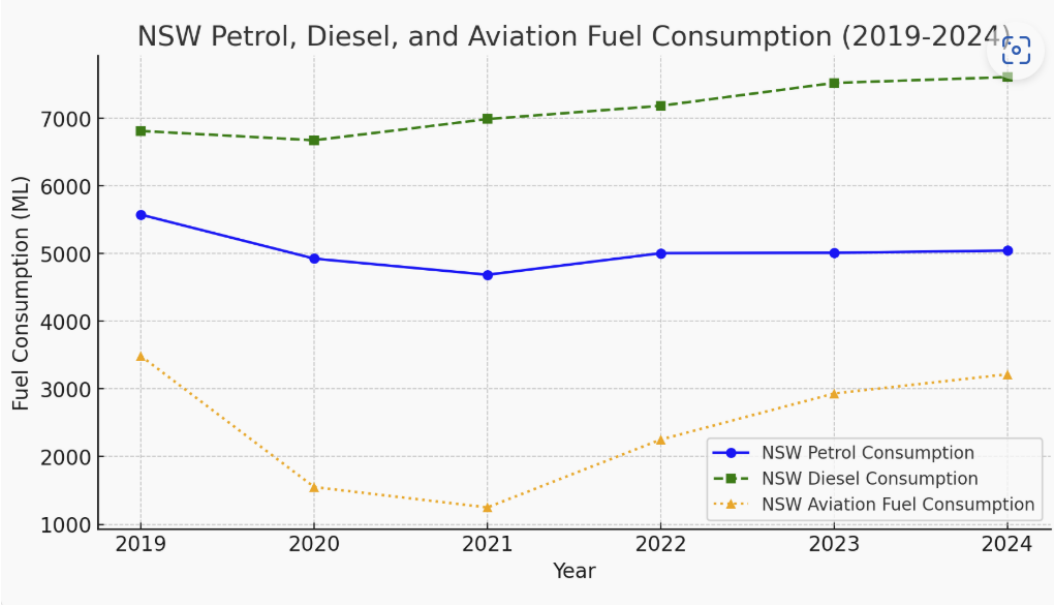


Figure 14. Fuel consumption in NSW from 2019-2024

[63] DCCEEW (2024). Australian Petroleum Statistics 2024 | energy.gov.au

Impact on Fuel Supply and Logistics

The sudden drop in demand led to challenges in fuel storage and supply chain management[64]:

- Storage Constraints: By mid to late April 2020, jet fuel storage facilities across Australia were operating at over 90% capacity due to the oversupply caused by incoming imports and reduced consumption.
- Operational Adjustments: Fuel suppliers responded by decreasing imports, reducing refinery outputs, and repurposing jet fuel for diesel production to manage the surplus.
- Regulatory Flexibility: The Australian government temporarily adjusted fuel quality standards, allowing refineries to adapt their operations to the changing market conditions[65].

4.1.2 Australian summer bushfire season (2019-2020)

The 2019–2020 bushfire season, known as the Black Summer, had a profound impact on NSW, burning over 5.5 million hectares—approximately 7% of the State. The bushfires led to widespread disruptions in fuel supply, with infrastructure damage, transport bottlenecks, and demand surges causing localised shortages across the State.

Localised Fuel Shortages

- Limited Access to Fuel Transport Routes: Road closures and power outages prevented fuel deliveries, leading to temporary fuel shortages in bushfire-affected communities such as Bega, Batemans Bay, and the Snowy Mountains[66].
- Moruya Fuel Rationing: In Moruya, petrol station introduced a 50-litre per person limit after selling 55,000 litres in half a day, with queues stretching over a kilometre[67].

Government and Industry Response

- Fuel suppliers coordinated with State emergency services.
- Supply convoys were escorted to fire-affected areas.
- No government-imposed fuel rationing; service stations accessed generators via the NSW Government and the broader fuel industry.

4.1.3 Northern NSW Floods (2022)

In 2022, northern rivers in NSW had catastrophic flooding event, flooding over 3000 homes in Lismore. Wilsons River rose to a height of approximately 12 metres with the flooding the city and causing a localised shortages in fuel and food supply[68].

Localised Fuel Shortages

- Limited Access to Fuel Transport Routes: Road, freight line closures and power outages prevented fuel deliveries, leading to temporary fuel and resource shortages in flooded

[64] Department of Industry, Science, Energy and Resource (2020). 72895
[65] Minister for Department of Industry, Science and Resources (2020). Australia to boost fuel security and establish national oil reserve | Ministers for the Department of Industry, Science and Resources
[66] ABC News (2020). Bushfire to affect residents and holidaymakers long after the flames die out - ABC News
[67] Department of Industry, Science, Energy and Resource (2020). 72895
[68] ABC News (2023). Have we learned the lessons from the 2022 Lismore flood disaster? - ABC News

communities. In response, alternative transport routes and vehicles were informally deployed to supply food/fuel such as helicopters and boats[69].

- Flooding of facilities: Infrastructure such as local water treatment plants in the flood-prone area were not sufficiently prepared. Sensitive equipment such as electrical infrastructure flooded and were damaged. Rebuilds included constructing essential equipment above probable flood levels and an improved local transport depot to provide vehicle and stock storage[70].

Enhancing Local Communities

- Communities were isolated as floodwaters cut off supply routes. As no industry could access the isolated communities through established supply routes, it was the communities who were ultimately responsible to deliver food and petrol through local boats/SES transport.
- A government buy-back scheme to purchase properties most at risk during the flooding to increase overall community resilience and mitigate impact of future floods[71].

At a local level, supply bottlenecks such as road transport can lead to localised shortages in times of natural disasters. To meet demand during these shortages, enabling and planning for community response is critical, such as enabling use of alternative transport (ie, boat/helicopter) to supply essential resources. Ensuring these are addressed in emergency policy and continuing to invest in regional storage hubs to ensure fuel availability in regional areas will enhance local resilience and the fuel supply chain.

4.1.4 Geopolitical Disruptions (Ongoing)

Global geopolitical events, such as the Ukraine conflict and tensions in the South China Sea, have impacted fuel availability and pricing in NSW. These disruptions have led to sharp increases in global oil prices, raising the costs of domestic fuel imports and creating financial strain for businesses and consumers. Australia's reliance on imported refined products has increased our exposure to liquid fuel supply chain risks associated with international instability.

In response, the Australian Government expanded strategic reserves through initiatives like the BADSP, ensuring greater resilience against supply chain disruptions. Efforts to diversify import routes were also implemented to reduce dependency on high-risk regions, thereby enhancing the security of fuel supplies.

These disruptions encourage continued investment in strategic reserves as a measure to mitigate geopolitical risks. Additionally, reducing reliance on singular trade routes is beneficial for strengthening supply chain resilience and safeguarding NSW's fuel security against future global uncertainties.

4.2 Lessons Learned

Over the past five years, several fuel disruption events in NSW—including the COVID-19 pandemic, flooding, Black Summer bushfires, and geopolitical tensions—have presented challenges to the State's fuel security. While these events resulted in short term disruptions, all were overcome thanks to contingencies, strategic planning and adaptive measures in place by the government and industry enabling fuel suppliers to successfully continue operation. The

[69] ABC News (2023). Have we learned the lessons from the 2022 Lismore flood disaster? - ABC News
[70] Janelle Saffin (2024). North Coast petrol stations back and thriving after floods | Janelle Saffin MP
[71] ABC News (2023). Have we learned the lessons from the 2022 Lismore flood disaster? - ABC News

following lessons highlight strategies to continually improve resilience, maintain supply chain stability, and reduce dependency on volatile global markets.

Reducing Import Dependency

- Australia imports over 70-80% of its refined fuel, making it vulnerable to supply chain shocks and global price volatility.
- Participation in IEA emergency fuel stockpiles ensures access to global reserves during disruptions.
- Adaptive Policies: Adaptable policies can help refineries and suppliers manage unexpected changes in demand and supply. For example, allowing refineries to increase production or reroute fuel supplies in response to local disruptions thereby maintaining stability in local fuel markets.

Maintaining Refining Capacity

- Sustaining domestic refining operations (e.g., Ampol Lytton and Viva Energy Geelong) is important for energy security.
- Programs such as the FSSP extend the operational life of local refineries and reduce reliance on imports.

Adaptive Policies – Enhancing Crisis Response and Supply Chain Stability

- During the COVID-19 crisis, temporary adjustments to fuel quality standards allowed refiners to repurpose jet fuel for diesel use, preventing oversupply issues.
- Implementing pre-approved emergency policies can ensure faster responses to future disruptions.

Future Preparedness – Investing in Alternative Fuels and Storage Capacity

- The Boosting Australia's Diesel Storage Program (BADSP) has increased NSW's diesel reserves, reducing short-term supply risks.
- More investments in regional storage hubs can improve accessibility and prevent local shortages.
- Investments in biofuels and electrification will decrease reliance on imported fossil fuels and enhance long-term energy security.

5 Risk Assessment

This section assesses the readiness of NSW to respond effectively to such emergencies, utilising lessons learnt from previous disruption and best practice for management, focusing on the mechanisms in place to ensure a coordinated and efficient response.

5.1 Supply Disruptions

With no refining capability, NSW dependent on imported refined fuels with supply primarily sourced from Singapore, South Korea, and Japan. This import dependency introduces several risks:

- Supply chain bottlenecks, particularly if major refining hubs experience disruptions.

- Storage and reserve limitations, with NSW not meeting the IEA's 90-day net import reserve standard.
- High reliance on road-based distribution networks, making fuel supply susceptible to weather-related transport disruptions.

5.2 Infrastructure Failures

The aging infrastructure supporting NSW's liquid fuel supply chain presents risks that could impact supply security, price stability, and overall system resilience. Potential challenges include delays in gas infrastructure projects, refinery closures, storage limitations, and pipeline vulnerabilities, all of which can contribute to fuel supply disruptions.

A short-term risk for NSW's liquid fuel market is the delay in gas pipeline construction, which directly impacts diesel demand. When gas supply infrastructure experiences setbacks, power stations that rely on gas may be forced to switch to diesel as a backup fuel, significantly increasing diesel consumption.

For instance, the Hunter Power Project at Kurri Kurri has sought approval to burn six times more diesel than initially planned due to delays in gas infrastructure development[72]. This unexpected increase in diesel reliance poses several risks:

- Fuel Supply & Pricing Pressures – Higher diesel demand for power generation could strain existing supplies and drive-up prices.
- Environmental & Emissions Concerns – Diesel combustion results in higher greenhouse gas emissions compared to natural gas.
- Logistical & Infrastructure Challenges – Increased diesel demand places greater pressure on storage facilities and transport networks, particularly road tanker supply chains.

These factors highlight the strengths of faster gas infrastructure delivery, improved diesel storage planning, and alternative energy solutions to mitigate risks associated with infrastructure delays[73].

Refinery Closures: The closure of the Kurnell Refinery in 2014 eliminated NSW's refining capacity, leaving the State wholly reliant on imported refined products and distributed fuel products from Queensland and Victoria. There is a medium-term risk if these refineries have early closure in 2027, if federal commitment is not extended. This dependence amplifies risks associated with international supply disruptions and underscores the importance of maintaining robust import facilities, distribution networks and storage infrastructure.

Storage Capacity: While programs like the BADSP have enhanced capacity at key sites like Newcastle and Port Kembla, NSW continues to fall short of IEA standards for 90 days of net oil import reserves[74]. This reduces the State's ability to withstand prolonged supply chain disruptions.

Pipeline and Terminal Vulnerabilities: Aging pipelines and limited redundancy in key terminals create chokepoints in the distribution network. Upgrades are required to accommodate advanced fuel types, such as ultra-low sulfur diesel, and to improve resilience against

[72] RenewEconomy (2024). Snowy seeks approval to burn six times more diesel than planned at Kurri Kurri gas generator | RenewEconomy
[73] Hunter Power Project Modification Report (2024). getContent
[74] IEA (2025). Oil Stocks of IEA Countries – Data Tools - IEA

mechanical failures. The LNG import terminal at Port Kembla is expected to provide additional supply security, helping to mitigate potential shortfalls in fuel availability. However, uncertainties around long-term contracting and supplier commitments pose risks to its effectiveness in addressing fuel security concerns.

5.3 Geopolitical Risk

With the 2024 U.S. elections, potential tariff increases or trade restrictions on crude oil and refined fuel under a Trump administration could lead to higher global oil prices, impacting NSW's fuel import costs. If the U.S. imposes export taxes or restrictions, refiners in Singapore and South Korea—NSW's primary suppliers—may face increased costs, which could be passed on to Australian consumers.

South China Sea Trade Dependencies: Over 60% of Australia's refined fuel imports transit through the South China Sea, where trade routes connect key suppliers in Singapore, South Korea, and Japan. Trade through this corridor is influenced by regional diplomatic relations, international maritime policies, and shipping regulations.

Australia sources crude oil from multiple regions, including New Guinea, Malaysia, West Africa, and Vietnam, while refined petroleum products are primarily imported from Singapore, with additional imports from South Korea, Japan, India, and Europe. This diversified supply structure provides access to multiple fuel markets, contributing to supply flexibility.

6 Emergency Readiness

6.1 Supply Chain Review

Australia and NSW are almost entirely dependent on fuel imports and global oil supply chains. Minor disruptions to supply chains such as delays in shipping or trucking occur regularly, while more extreme disruptions such as traffic interruptions in major international shipping lanes are relatively infrequent. Despite Australia's reliance on these international shipping lanes, the liquid fuel market has been largely resilient over the past several decades due to our diversified imports from over 70 countries. Due to this, it is assumed that any disruptions will be localised in their impact and the market is able to correct for disruptions. However, restrictions on shipping beyond business-as-usual (BAU) operations, such as port docking limitations, vessel availability, and industrial actions, could further affect the timely delivery of fuel imports[75]. Some ports may experience congestion due to capacity limitations, while regulatory requirements and customs procedures may also impact unloading times[76]. These factors could introduce additional vulnerabilities to the fuel supply chain that should be considered in resilience planning.

In the event of a disruption where Australia's imports are entirely hindered, NSW will become reliant on key storage facilities across the State and production of fuels within Australia. NSW has invested in their key storage facilities (particularly in Port Kembla and Newcastle) to bolster stock levels, specifically upgrading diesel fuel storage levels. This is important since in times of an emergency, diesel will be the primary fuel required to ensure transportation, delivery and backup power across the State continue to operate. Outside of fuel rationing scenarios, based on average consumption, Australian fuel reserves will be depleted in approximately 30 days. However, to enhance energy security, Australia maintains agreements for access to offshore strategic fuel reserves, such as those stored in the U.S. Strategic Petroleum Reserve (SPR)[77], as part of its commitment to the IEA[78] 90-day net import coverage requirement.

6.2 Liquid Fuel Emergency Act

In the event of a major prolonged disruption, where states and/or territories face an ongoing fuel shortage or emergency, the Australian Government can enact the *Liquid Fuel Emergency Act 1984* (LFE Act) to intervene, granting the Minister for Energy special powers to direct the implementation of fuel rationing for a pre-determined period of time (no longer than 3 months). In the event of a liquid fuel emergency, NSW must abide by national regulations, notably however the LFE Act requires the Governor-General to declare a national liquid fuel emergency, and the LFE Act has never been enacted.

The LFE Act gives the current Minister for Energy the ability to control the storage, transfer, sale and production of liquid fuels, including the ability to direct the management of industry-held crude stocks of both crude oil and refined products. This action would overrule typical market signals and alter fuel demand through direct allocation and management of fuel sources.

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[75] Australian Government (2023). Disruptions and price rises persist in the container freight supply chain, report finds | ACCC

[76] Department of Industry, Science, Energy and Resource (2020). 72895

[77] IEA (2023). Oil security and emergency response - About - IEA

[78] Australian Government (2020). Australia strengthens fuel security with new US Arrangement | Ministers for the Department of Industry, Science and Resources

Under the LFE Act is the National Liquid Fuel Emergency Resource Plan (NLFERP) developed by the Commonwealth Government with both State/Territory and industry input via the National Oil Supplies Emergency Committee (NOSEC). The NLFERP aims to most efficiently manage fuel stocks in a fuel rationing scenario, minimising impact of an emergency situation on fuel users.

The NLFERP Framework has five key characteristics embedded in the supporting policy to deliver a strong retail rationing framework:

1. Sufficiently constrains Australia's demand providing fair and transparent allocation of available fuel supply
2. Practical to implement and administer solutions. Includes rapid implementation, utilising existing business infrastructure and practices with the buy-in of fuel retailers and customers
3. Easy to understand and communicate to general public. It must also reflect normal consumer behaviour where possible
4. Flexible to the circumstances of each individual emergency situation
5. Provides a clearly defined (and appropriately limited) decision making framework

6.3 Retail Rationing

In a retail rationing scenario, there exist levers outside of the LFE Act. The National Oil Emergency Demand Restraint Strategy provides options for conserving available fuel in Australia through a list of Initial Contingency Demand Restraint Actions (ICDRA). This list sets out measures that have the potential to reduce demand for Australian fuel by up to 10% without enacting the LFE such as car-pooling and increasing the use of public transport[79].

The Government's current retail rationing approach involves restrictions in the form of a maximum transaction value per vehicle per day. In an emergency situation, due to Australia's robust supply chain, delivery and availability of fuels at service stations is not considered at-risk. Rationing approaches however may disproportionately affect fuel availability in rural areas due to the fuel required by road tankers to deliver fuel to these areas, as opposed to service stations located in major cities and transport hubs near bulk fuel storage facilities.

Notably, there are some parties exempt from fuel rationing during a liquid fuel emergency:

- Ambulance services
- Corrective Servies
- Fire or Rescue Services
- Police services
- Public Transport Services
- State Emergency Service or equivalent organisations
- Taxi services
- Australian Defence Force

[79] Australian Government (2016). NOSEC Guidance Note Retail Rationing Under the Liquid Fuel Emergency Act 1984

7 Conclusion

A detailed analysis of the liquid fuel market in NSW has been provided in this report, focusing on the supply chain, demand, pricing trends, fuel infrastructure, and past disruption events. By examining these factors, the report identifies potential vulnerabilities in the State's fuel supply and suggests several strategies to improve resilience, enhance fuel security, and manage price volatility.

NSW is entirely dependent on fuel imports from interstate and overseas. In the national context, Australia imports 70-80% of its refined liquid fuel from overseas, with the remainder coming from the nation's two remaining refineries in Geelong (VIC) and Lytton (QLD). Despite the reliance on international shipping, the liquid fuel market has been largely resilient over the past several decades due to our diversified imports from over 70 countries. Whilst critical events have successfully been managed by industry over the last few decades, domestic fuel production would further enhance the resilience of liquid fuel supply chains. A stakeholder engagement workshop with fuel suppliers, consumers, and project developers was also held as part of this work, which highlighted both the confidence in supply chain and that having supporting policy in Australia is critical to ensure the adoption of low carbon fuels.

Fuel demand within NSW is mainly distributed across the transport, agriculture, industrial, manufacturing, and maritime sector. Across these sectors, the largest fuel demand is diesel, being utilised across all sectors. While there are efforts to decarbonise through methods such as a transition to EVs reducing petrol/diesel demand, many sectors do not yet have such initiatives. Diesel is therefore considered to be integral to the fuel mix in the short term, however its role is expected to reduce into the long-term as energy storage, technology and renewable energy integration into these sectors improves.

As a net importer, Australia's oil price is typically volatile due to its exposure and reliance on global oil markets. However, government initiatives such as BADSP are designed to boost domestic supply helping mitigate disruptions and reduce the effect of extreme volatility in global markets in Australia.

In the event of a disruption where Australia's imports are entirely hindered, NSW will become reliant on key storage facilities across the State, supported by the domestic production at the Geelong and Lytton refineries. Based on average consumption, Australian fuel reserves will be depleted in approximately 30 days, however there are emergency measures in place to improve or extend our ability for fuel supply in these circumstances, such as the LFE Act and agreements to access offshore strategic fuel reserves.

Lastly, the main risks to the NSW liquid fuels market include supply disruptions, infrastructure failures and geopolitical influences. Recent fuel supply disruption events provide several lessons for improving resilience, which include reducing import dependency, maintaining refining capacity, adaptive policies and future preparedness including investing in alternative fuels and storage capacity.

Appendix A: Stakeholder Engagement Workshop Details

The stakeholder engagement workshop was held in the Arup Sydney office on Wednesday 5th of March 2025, with personnel in from Arup and OCSE attending alongside the following organisations representing various sections of the industry:

Table 2. Stakeholder engagement workshop attendees

Fuel suppliers	Project developers	Fuel offtakers	Industry bodies; academia
Viva Energy Ampol	Neste Southern Oil Vast Boeing Deloitte	Qantas Virgin	Australian Institute of Petroleum (AIP) RFC Ambrian Pollination

Company Profiles

Viva Energy: Major fuel supplier operates Geelong refinery and fuel distribution networks.

Ampol: Leading fuel supplier, involved in refining, distribution, and retail fuel sales.

Neste: Project developer focused on renewable fuels.

Qantas and Virgin: Major fuel off-takers, heavily reliant on stable fuel supply for operations.

Boeing: Aerospace company focused on developing and manufacturing commercial planes. Actively involved in supporting SAFs

Australian Institute of Petroleum (AIP): Industry body representing the interests of petroleum companies.

Southern Oil: Developer of advanced biofuels and recycling technologies.

Vast: Project developer focused on renewable fuels

Deloitte: Consultancy involved in assisting both project developers and fuel suppliers

RFC Ambrian: Consultancy supporting heavy industries and natural resource development

Pollination: Climate change investment and advisory consultancy

Workshop Logistics

In advance of the workshop, each organisation was sent several questions based on their position in the NSW fuel supply chain, which were there to guide for the approach and contribution to the workshop discussion from the organisations. Example questions include:

- How do you handle disruptions, and what sort of programs or procedures are in place for emergency situations (e.g., floods)?
- What kinds of policies would enhance the fuel resilience of NSW?
- Are there alternative fuel sources you are exploring (e.g., biofuels, synthetic fuel)?

- How can government and private sectors collaborate to integrate renewable fuels into the supply chain?

The workshop opened with an Acknowledgement of Country and introduction from Darren Saunders, NSW Deputy Chief Scientist and Engineer. Each organisation was then given 5-10 minutes to introduce themselves, present their discussion topics and opinions for the NSW Government, and field questions or participate in an open discussion with the floor.

Workshop Findings

Whilst the discussion was intended to centre around the State's liquid fuel supply chain security, a large proportion of the conversation revolved around the ability to adopt sustainable fuels. It was clear that this was front of mind for many of the organisations as they look to reduce their carbon footprint and improve the sustainability of their operations. Two main conclusions were drawn from this topic:

1. The general sentiment was that the policies currently in place are not strong enough to promote and support the transition to sustainable fuels in Australia. The benefits for uptake are not encouraging enough, and the penalties for not switching aren't dissuasive enough.
2. The room also expressed difficulties in covering the premium for sustainable fuels. There needs to be both a willingness to pay and an ability to pay. In the case of the airlines, they raised that it's difficult to pass on the cost to customers unless they are willing to pay the premium, and the airlines don't have the capacity to bear the cost themselves because of the already thin margins of their essential services industry.

Regarding supply chain security, the consensus was that domestic issues have been dealt with effectively for decades. This confidence was due to various reasons including good prior planning (for foreseeable emergency scenarios), contingencies (e.g., reserve fuel supplies), collaboration between companies (e.g., United can sell fuel to Ampol if they are experience a shortage), and highly skilled workers (rectifying issues to get facilities running again after failures).

An example from Viva's Geelong oil refinery was raised, when it experienced a power outage in January 2025 during a lightning storm due to a double lightning strike onsite. As a result, a temporary shutdown was required, and production was halted. The facility was gradually brought back to full production levels after 10 days, however there was no market disruption during this time, demonstrating the resilience of their fuel stocks and ability to rectify the issues that arose.

The two main supply chain issues that concerned the stakeholders were:

1. Global factors, likely outside the control of the NSW Government. This includes scenarios such as shipping routes halting due to war, major natural disasters etc.
2. Black swan events, which are rare and unexpected events with severe consequences, making them difficult to plan for since they are unforeseeable.

It was noted that good mitigation measures against the consequences of the above listed and other disruptive events would include increasing onshore storage and/or increasing our ability for onshore production.

However, increasing onshore storage is expensive, and it only protects against external supply shortages for a discrete amount of time. As such, developing onshore production (particularly of low carbon fuels) is seen as a more wholistic solution. The adoption of sustainable fuels needs to be addressed before large-scale domestic production can be invested in, and the issues with this were also raised as previously described.

Other takeaways from the workshop discussions yet to be mentioned are as follows:

- Without domestic production, there is a risk of NSW bio-feedstocks being shipped offshore, processed into low carbon fuels, and then sold back to Australia. In this scenario, NSW misses the value adding opportunity to the State from the associated jobs, economic growth, and fuel security.
- The current process for obtaining a Temporary Coastal Licence for a foreign vessel can take up to 5 days, which is seen as a roadblock to agile responsiveness to low local fuel supply levels. Ampol raised that they can charter fuel tankers from the international spot tanker market to be in Australian ports within 24 hours, however the 5-day process to obtain a licence for those vessels to dock diminishes their ability to react to onshore fuel shortages, which can result in supply shortfalls for crucial industries. Ampol (formerly under the trading name Caltex) has been requesting that crude oil vessels be exempted from requiring a temporary license since 2012[80], which is yet to be implemented and is an ongoing subject of discussion.

[80] Caltex (2012). Caltex submission on the Stronger Shipping for a Stronger Economy reform agenda