Options to achieve better resilience and security of fuel supply for Auckland, in particular for jet fuel

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Fueltrac Pty Ltd

ABN: 83 633 839 330

T +61 7 32194466

M +61 401 992 846

[www.Fueltrac.com.au](http://www.fueltrac.com.au)

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# Glossary of Terms

**AIAL**  Auckland International Airport Limited

**BARA** Board of Airline Representatives of Australia

**BARNZ** Board of Airline Representatives of New Zealand

**Bridger** An unloading or loading facility for the receipt or dispatch of jet fuel from a truck to a storage facility or vice versa.

**Closed access** Where third party fuel suppliers are unable to obtain access rights to fuel infrastructure

**Fuel Interface** Batches of different refined products and grades are pumped back-to-back in a multi-product pipeline, often without any devices separating them. Some mixing of different fuel products occurs at the interface of two adjacent batches. The interface material resulting from the pumping of batches of different products, like gasoline and jet fuel, produces a mixture, which requires reprocessing at a refinery or fuel terminal.

**FTL** Fuel throughput levy

**PSCE** Petroleum Sector Coordinating Entity in New Zealand

**FY** Financial year. The financial year for 2009/10 is FY2010

**Ground Fuel** Diesel and Gasoline fuels

**HSE** Health Safety & Environment

**Jet Fuel** Aviation turbine fuel (Jet A1).

**JFIWG** The Joint Fuel Industry Working Group formed by industry, airlines and government to consider jet fuel pipeline investment in the Sydney Basin in 2010/11

**JUHI** Joint User Hydrant Installation, an unincorporated joint venture made up of fuel suppliers that have taken a foundation equity share in the joint venture

**JV** Joint Venture formed between oil company owners to operate strategic fuel infrastructure.

**MBIE** Ministry of Business, Innovation and Employment.

**MCDEM** Ministry of Civil Defence and Emergency Management

**ML** Million litres

**NOC** The Australian Government established the National Operating Committee (NOC) on Jet Fuel Supply Assurance to minimize the risks around jet fuel supply disruption at major Australian international airports (Sydney, Melbourne, Brisbane, Perth, Adelaide, Darwin, Hobart and Cairns), in addition to three overseas airports (Auckland, Christchurch and Nadi). The NOC relies on information provided by the relevant Joint User Hydrant Installation (JUHI) managers at each airport.

**NOSEC** National Oil Supplies Emergency Committee is the main executive channel through which the Australian, State and Territory governments formulate their overall management response to a national liquid fuel emergency

**OERS** Oil Emergency Response Strategy in New Zealand

**Open Access** Where all jet fuel suppliers have equal rights to access jet fuel supply infrastructure through a fee-based, non-discriminatory pricing agreement with the owners/operators of the infrastructure. The Australian Productivity Commission used the term to reflect the current JUHI access terms at the Melbourne and Darwin Airports.[[1]](#footnote-2)

**Peak day** Calculated as the average of the 30 non-contiguous peak days in a calendar year.

**RAP** Refinery to Auckland Pipeline

**Rateable** A consistent, reliable and forecastable demand of petroleum products over the forecast period. A similar offtake or even demand profile of petroleum products from month to month.

|  |  |
| --- | --- |
| **Restricted Access** | Jet Fuel suppliers are required to purchase an equity stake in fuel infrastructure in order to obtain access rights to the infrastructure. The Australian Productivity Commission used the term to reflect current JUHI access terms under the equity participation model used at most Australian airports.[[2]](#footnote-3) |

**TLF** Truck Loading Facility

**WAP** Wiri to Auckland Airport Pipeline

# Scope of the Report

**Government Inquiry into the Auckland Fuel Supply Disruption (Inquiry) – Terms of Reference**

The Refinery to Auckland Pipeline (**RAP**) was shut down for 10 days following the discovery of a leak on 14 September 2017. This led to rationing of jet fuel supplied to the Auckland Airport, flight cancellations, and stock-outs of some ground fuels (mainly premium petrol) at a number of service stations around Auckland.

The Inquiry’s Terms of Reference, as notified in the Gazette,[[3]](#footnote-4) note that the New Zealand Government reviewed fuel security most recently in 2012. The 2012 review found that the fuel supply network in New Zealand is reasonably robust, the oil supply industry is adept at responding to most supply disruptions and the Government has processes in place to manage severe disruption events.

The RAP outage highlighted that fuel supply can be vulnerable to disruptions, and that effective risk management practices and contingency plans need to be in place to minimise the risk and impact of disruptions. The purpose of the Inquiry is to draw lessons from the RAP outage to inform how the fuel industry and the Government could improve the resilience of fuel supply in the Auckland region.

The Terms of Reference direct the Inquiry to (among other matters):

* inquire into the cause(s), contributory factor(s) and impacts of the RAP outage, the operational responses to the outage, and the relevant operational and risk management practices of Refining NZ, fuel suppliers, airlines, national and regional civil defence emergency management organisations, and any other relevant parties; and
* taking into account the factors contributing to the RAP outage and its impact, report and make any recommendations it sees fit regarding the resilience of fuel supply in the Auckland region, and any other relevant matters.

The Terms of Reference enable the Inquiry to take into account other relevant studies, including the New Zealand Petroleum Supply Security 2017 Update (which was published by the Ministry of Business, Innovation and Employment in September 2017); and any other fuel security studies commissioned by interested parties that may be completed before or during the course of the Inquiry.

**Fueltrac’s instructions**

The Inquiry has retained Fueltrac to:

* assess the current security and reasonably expected future security of the fuel supply chain (including, but not limited to, importation, production/refining, storage and transfer) to and within the Auckland region; and
* assess options and make recommendations on what options, if any, are available to improve the security and resilience of the fuel supply to Auckland.

In relation to the second bullet-point, Fueltrac was asked to prepare a report that:

* considers the current situation, options for change canvassed in previous reports or being put forward by parties, and other standard options used internationally that might be relevant to Auckland’s situation;
* details the various options for change, the assessment method, the outcome, and the preferred options for improving security of supply and resilience in the short and long term, and any other resulting recommendations.

The Inquiry has not instructed Fueltrac to carry out a risk assessment of potential disruption events to the fuel supply chain and/or quantify their likely probability. Nor has the Inquiry instructed Fueltrac to carry out a cost/benefit analysis of the various options to identify what could be described as “optimal resilience”. Rather, Fueltrac has been asked to assess the attributes of, and identify the potential vulnerabilities in, the fuel supply chain to and within Auckland, and to make recommendations as to the various options available to address any issues identified.

# Executive Summary

The fuel supply chain from Marsden Point to Auckland is critical fuel infrastructure for New Zealand’s largest city and main international airport. There is currently no rateable, efficient, alternative supply option for supplying jet fuel to the Auckland Airport.

Whilst alternative supply options exist for diesel and gasoline, the quantity of diesel and gasoline transferred on the Refinery to Auckland Pipeline (RAP) will diminish with time (as jet fuel demand grows) unless pipeline capacity is upgraded. At a minimum, capacity upgrades of the RAP and the Wiri Terminal to Airport Pipeline (WAP) will be required to meet the fuel demand growth of the Auckland market.

**Mitigating Risk**

There is potential for disruption in the supply of liquid fuels to occur at any point in the fuel supply chain – from the Marsden Point port, to the production of crude oil, to refining facilities, to any of the various modes of transport, to receiving, distribution and retail infrastructure. Disruptions could occur both internationally and domestically and many potential events that might affect supply are beyond the control or influence of either the importer or government. While many disruptive events will pass with little or no visible impact on supply, some may adversely affect supply and market pricing.

Multiple modes of fuel supply from multiple seaboard terminals add supply diversity and strengthen the resilience of the supply chain. Reliance on a single transport mode or single terminal adds supply chain risk and weakens supply chain resilience.

Even with a dedicated jet fuel pipeline, the supply of jet fuel by alternative transport modes reduces risk, as is the case at Melbourne Airport. Diversity of supply is critical as it:

* mitigates the risk of a jet fuel supply disruption caused by a single point failure in the pipeline, an unplanned maintenance event, natural phenomena, or intentional acts of disaffected parties in the community.
* provides a low-cost option of supplementing demand that cannot be met by a pipeline without the need for further capital investment in a new/ increased capacity pipeline.

**Current & Desired Future Security of Fuel Supply to the Auckland market**

Fueltrac has assessed the current liquid fuel security to the Auckland market and identified a desired future position. In our opinion, investment in **jet fuel** infrastructure is required in the near term. The current **jet fuel** supply chain:

* Is subject to single point of failure risk from port to airport;
* Has inadequate storage close to market, which is forecast to decrease with time; and
* Has inadequate days’ consumption cover to meet the best case resupply time in the event of a significant, unplanned disruption.

Whilst input supply capacity to the JUHI currently meets the target resilience measure, investment will be required in the near term. Fueltrac is of the opinion that a second WAP would add diversity of supply to the airport and provide a sound basis for considering the combined Wiri and JUHI storage as effective on-airport storage.

Diversity of supply to the ground fuels market has reduced with the closure of the Wynyard Wharf storage facility. Investment in ground fuels storage is suggested.

The fuel supply chain into New Zealand will also need development to access flexible international supply chains to meet the forecast increased demand of jet fuel.

**Table 1: Current & Desired Future Security of Fuel Supply to and within the Auckland region**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Security of Fuel Supply Parameter** | **Jet Fuel - Current** | **Jet Fuel - Desired** | **Ground Fuels - Current** | **Ground Fuels - Desired** |
| Diversity of Supply | One supply chain with single point of failure risk from Port to Airport | A minimum of two supply chains from Port to Airport | Supply chain from Marsden Point, and Tauranga | A minimum of two supply chains from Port to Market |
| Days' Total Cover in seaboard storage and close to market | ~ 10 days at the low point of the supply cycle | A minimum of 14 days at the low point of the supply cycle | ~ 12 days at the low point of the supply cycle | A minimum of 14 days at the low point of the supply cycle |
| Jet Fuel Storage Input Capacity (Airport) | 110% of peak day demand | Always exceeds 110% of peak day demand |  |  |
| Days' Cover Close to Market (Wiri & Airport) | ~ 6 days at the low point of the supply cycle | A minimum of 10 days’ cover at 80% peak days’ demand |  |  |

**Benchmarking the Auckland Supply Chain**

The New Zealand fuel market is of comparable size to the South East Queensland market. Fueltrac observe that the Brisbane market is likely to be of a similar size to the Auckland market. Brisbane is supplied from the Lytton refinery, whilst Auckland is supplied by the Marsden Point refinery. Although the number of refineries is the same (i.e. one), there are key supply chain differences between Brisbane and Auckland which affect fuel supply chain resilience. These include:

* Whilst the Wiri Terminal is the only significant fuel terminal servicing the Auckland market, there are five fuel terminals servicing the Brisbane market.
* Brisbane and Auckland have similar sized airports in terms of aircraft movements, total passenger numbers and fuel demand. Brisbane has 2 pipelines supplying the airport, whereas Auckland has one. At Brisbane, each pipeline feeds the Brisbane JUHI from different directions using separate pipeline easements. Each of the two pipelines supplying Brisbane Airport has a capacity which currently exceeds total daily airport demand. Brisbane is not exposed to single point failure risk in either its terminal or pipeline supply network. By comparison, Auckland has no in-built redundancy in its supply chain to the Airport to accommodate significant unplanned shutdowns of key infrastructure.

Some Inquiry participants have suggested that Perth Airport is a more appropriate comparator. Perth Airport, like Auckland, is also subject to single point of failure risk. In its September 2018 submission to the Australian Productivity Commission Perth airport noted that there is an opportunity for it to achieve a strategic change in its existing fuel supply model, including:[[4]](#footnote-5)

* constructing a storage facility that allows multiple supply routes to the airport;
* increasing on-airport storage to assist in mitigating supply risk disruption; and
* increasing airport control of on-airport infrastructure (storage, hydrants and pipelines) to ensure appropriate control over future investment decisions.

**Australian & International Jet Fuel Case Studies**

The 2017 RAP fuel pipeline disruption represents the third significant jet fuel rationing event at an airport in Australasia this decade. The other two occurred at Sydney Airport (FY 2010, FY 2011) and Melbourne Airport (FY 2016, FY 2017). In Sydney and Melbourne, the Australian government formed industry working groups to agree on the risk mitigation plans, infrastructure investment solutions and the timeframes to implement them.

Hong Kong is prone to tropical cyclone risk. In recognition of the supply risk associated with unplanned weather events, the Hong Kong government decided during the planning phase of the new airport that the aviation fuel reserve to be maintained at the airport should be equivalent to 11 days of projected demand.

Following the fire and explosion at Buncefield terminal (UK) in 2005, supply of jet fuel into Heathrow was not adequate to meet unconstrained demand. The airport undertook a study which recommended the construction of additional on –airport storage. An incremental 26 million litres of on-airport storage was constructed to meet the needs of airlines refuelling at Heathrow. Supply capacity to the airport was also upgraded to meet the forecast demand.

Hong Kong, Heathrow and Melbourne airports acted to mitigate fuel supply chain risk by installing extra on-airport storage. Sydney, Melbourne and Heathrow also upgraded pipeline and bridger supply capacity. As noted above, Brisbane Airport has two pipelines supplying the airport from different directions under separate easements.

The decisions of these governments and airports provides insight into the options at Auckland in order to improve security of supply.

**Recommendations**

The Australian Productivity Commission has made specific recommendations in its 2019 draft report on the economic regulation of airports on the benefits of Open Access for **jet fuel** storage at airports and the importance of supply coordination forums. Fueltrac assess that recommendations similar to those made by the Commission may provide options to improve the security of **jet fuel** supply to Auckland Airport.

Based on the information provided to the Inquiry, and insights gained from international case studies, Fueltrac suggest that the liquid fuel security of Auckland could be enhanced by:

1. Development of a multi-port, multi- terminal fuel supply chain to mitigate single point of failure risk in the existing **jet fuel** supply chain. There is also a need to increase **jet fuel** storage close to market and upgrade JUHI input receipt capacity from pipelines and alternative transport modes. The overall solution is likely to involve a package of the following options:

* Increasing **jet fuel** storage at both Auckland Airport & Wiri Terminal. During the closed workshop of Inquiry participants on 30 May 2019, industry appeared to support a minimum of 10 days’ cover at 80% peak days’ demand. Fueltrac supports and recommends such an amount of minimum storage cover.
* Developing an alternative supply capability for **jet fuel** - potentially through the Marsden Point or Mount Maunganui terminals - with the capability to supply **jet fuel** by road and/or rail on a rateable basis.
* Implementing capacity upgrades of the RAP to ensure adequate supply of diesel, gasoline and **jet fuel** are available at the Wiri Terminal.
* Implementing capacity upgrades to the WAP in the short term, and potential duplication in the mid-term, to build diversity of **jet fuel** supply between Wiri and Auckland Airport.
* Development of an emergency supply capability similar to that proposed by Refining NZ (the mobile skid option). Wiri Terminal will, however, need to invest in certain infrastructure in order to be able to receive deliveries of **jet fuel** by truck if the emergency supply capability is to provide more than 20% of Auckland Airport’s demand.
* Implementing the Hong Kong Open Access Operating Model at Auckland Airport. Creating Open Access introduces contestability in the market and may stimulate investment by third parties in new strategic fuel infrastructure to supply the market.

These initiatives would build resilience and enhance liquid fuel security. With these changes in place, the jet fuel supply chain would resemble that of Melbourne Airport and the Auckland ground fuels market: that is, supply from at least 2 terminals using at least 2 different transport modes.

1. Establishing processes to allow government to obtain real time, whole of supply chain information from the industry, in a common format, in order to keep it informed and to support the management of a liquid fuel emergency. This includes:

* Reporting by fuel companies (to government) of unplanned disruptions adversely impacting supply.
* Scenario planning and development of processes and procedures for significant unplanned fuel disruptions. This includes having emergency response plans, documented, agreed, communicated and ready for implementation.
* Monitoring of stocks (by government) at key terminals/ locations throughout New Zealand.
* Communicating the importance of business continuity planning to liquid fuel users, including identifying priorities for fuel use.

# The Auckland Fuel Supply Chain

Crude oil is imported through the crude oil berth infrastructure at Marsden Point.

Crude oil is refined at the Marsden Point Refinery. The refined fuels are certified as “on specification” at the Refinery.

Most refined fuel for the Auckland market is transferred through the RAP to the Wiri Terminal in Auckland. The pipeline is a multi-product pipeline. Refined fuels are re-certified at the Wiri Terminal and transferred to end use markets. Diesel and gasoline are transported by road. Jet fuel is transferred by pipeline (WAP) (and supplemented by trucking where necessary) to the storage tanks at Auckland Airport (at the JUHI).

Alternative supply for diesel and gasoline is provided from truck loading facilities (TLF) at Mt Maunganui and Marsden Point. There is no current, permanent alternative supply option for jet fuel, although emergency supply options have been proposed by Refining NZ. The JUHI currently has capacity to receive approximately 20% of its jet fuel demand by road, if required.

There is a number of other independent resellers in the gasoline and diesel markets.[[5]](#footnote-6) There is no independent, non-oil company JV operator in the jet fuel market. The access terms to the key jet fuel infrastructure at Auckland Airport are based on a Restricted Access system. That is, jet fuel Infrastructure can only be accessed by the equity participants of the infrastructure.

The fuel supply chain from Marsden Point to Auckland is characterised by key fuel infrastructure which has not been duplicated. In respect of jet fuel there is no rateable, efficient, alternative supply option. Whilst alternative supply options exist for diesel and gasoline, the quantity of diesel and gasoline transferred on the RAP to Auckland will diminish with time (as jet fuel demand grows) unless pipeline capacity is upgraded.

**Figure 1: The Auckland Fuel Supply Chain**

Flow chart showing delivery of fuel to Auckland Airport and Wholesale & Retail forecourts from Marsden Point Crude Berth.
To Auckland Airport:
Marsden Point Crude Berth to Marsden Point Refinery, transported via RAP pipeline to Wiri Oil terminal (WOSL), then transported via WAP pipeline or road to Auckland Airport.
To Wholesale & Retail forecourts:
Marsden Point Crude Berth to Marsden Point Refinery, transported via RAP pipeline to Wiri Oil terminal (WOSL), then transported via road to Wholesale & Retail forecourts.
Marsden Point Crude Berth to Marsden Point Refinery to Marsden Point terminal, transported via road to Wholesale & Retail forecourts.
Marsden Point Crude Berth to Marsden Point Refinery to Marsden Point refined products berth. Then from Marsden Point refined products berth to Mount Maunganui refined products berth to Mount Maunganui terminal, then on to Wholesale & Retail forecourts.


# Measuring Liquid Fuel Supply Security

Fueltrac notes that the Inquiry’s Terms of Reference direct the Inquiry to take into account the factors contributing to the RAP outage and its impact, and to make any recommendations it sees fit regarding the resilience of the fuel supply chain in the Auckland region, as well as any other relevant matters. In doing so, the Inquiry is permitted to consider (among other things) the New Zealand Petroleum Supply Security 2017 Update published by MBIE in September 2017, and any other fuel security studies commissioned by interested parties.

**Defining resilience and liquid fuel security**

In preparing this report, Fueltrac has had the benefit of considering the range of definitions of “resilience” put forward by the Inquiry participants. The definition given by MBIE captures the key themes across the various definition submitted:[[6]](#footnote-7)

We consider that resilience is the ability of a system to maintain adequate service levels in face of a severe shock and to return quickly to normal or better service levels after a shock. Resilience in the context of the supply chain of importation of crude to delivery of jet fuel to Auckland Airport, is a function of: refining capacity, pipeline capacity, numbers of coastal vessels and tanker trucks (including drivers), and the amount of fuel stored at or near the airport. Resilience can be improved by increasing the capacity, including redundancy, in any of those things, or by making them more resistant to hazards, and by improving contingency plans to utilise any spare capacity in response to a disruption.

Resilience can also be improved beyond the fuel supply chain – e.g. by having redundant capacity in aircraft, and in airfields or other transport services, so that the public is less vulnerable to a fuel disruption affecting a critical transport mode or service.

In general, achieving optimal resilience may involve some combination of all of the above, with complex trade-offs between different costs and benefits.

Fueltrac has considered the Australian Department of Energy and Environment’s Liquid Fuel Security Review (Interim Report),[[7]](#footnote-8) which defines liquid fuel security as having three core elements:

**Reliability of Supply:** Do we have enough liquid fuel to meet our needs and can we distribute it to the right places.

**Resilience:** How well does the liquid fuel supply chain manage disruption and can it adjust to our future needs.

**Affordability:** Can users buy fuel at a competitive price.

The definition in the Department of Energy and Environment’s Interim Report treats “resilience” as one component of the wider concept of liquid fuel security.

**Fueltrac’s methodology**

Fueltrac has been asked by the Inquiry to assess what options, if any, are available to improve the liquid fuel security (including resilience) of the Auckland region. In order to do so, Fueltrac assesses liquid fuel security according to the following parameters:

**Diversity of Supply** identifies whether there are at least two fuel supply chains from port to market. In the event of an unplanned disruption in the primary supply chain, the alternate supply chains should be capable of suppling a large portion of the market.

**Storage Close to Market (Wiri & Airport):** The agreed industry resilience measure for airport fuel storage capacity is published by IATA[[8]](#footnote-9). IATA provide worked examples of the methodology used to determine the required level of jet fuel storage.

**Days’ Total Cover (in seaboard storage and close to market) vs Resupply time** measures whether the days' consumption cover in storage is sufficient to meet the resupply time from a flexible international supply chain where the buyer is prepared to pay a premium to secure an option, an exchange, a supply diversion, or another trading option to facilitate prompt deliveries of liquid fuels.

**Input Supply Capacity vs Peak Day Demand (Airport):** The recently agreed input capacity resilience measure for pipelines and bridgers at Melbourne Airport was that the combined input capacity to the JUHI from pipeline and bridgers should exceed 110% of the peak day jet fuel demand throughout the term of the agreement. This parameter represents a reasonable measure of the capability of pipelines and bridgers to meet peak demand whilst allowing spare system capacity/redundancy in the case of short term unplanned pipeline shutdowns or transportation delays.

Fueltrac has previously adopted these parameters with other clients, including government, to assess the resilience of the fuel supply chain in various locations in Australia.

Fueltrac has not been instructed to carry out a detailed cost benefit analysis of the merits of each option. As noted above, Fueltrac is identifying vulnerabilities in the fuel supply chain – including identifying impediments (if any) to the proper functioning of the market.

# Resilience of the Current Fuel Supply Chain

## Mitigating Risk

There is potential for disruption in the supply of liquid fuels at any point in the fuel supply chain – from the receipt of crude oil, to refining facilities, to any of the various modes of transport, and to receiving, distribution and retail infrastructure. Disruptions may occur both internationally and domestically and many potential events that might affect supply are beyond the control or influence of either the importer or government. While many disruptive events will pass with little or no visible impact on supply, some may adversely affect supply and market pricing.

Multiple modes of fuel supply from multiple seaboard terminals adds supply diversity and strengthens the resilience of the supply chain. Reliance on a single transport mode or single terminal adds supply chain risk and weakens supply chain resilience.

Even with a dedicated jet fuel pipeline, the supply of jet fuel by alternative transport modes reduces risk, as is the case at Melbourne Airport1. Diversity of supply is critical as it:

* mitigates the risk of a jet fuel supply disruption caused by a single point failure in the pipeline, an unplanned maintenance event, natural phenomena or intentional acts of disaffected parties in the community; and
* provides a low-cost option for responding to demand that cannot be met by a pipeline without the need for further capital investment in a new/increased capacity pipeline.

## Fuel Infrastructure Risk from Port to Auckland Airport

**Japan, 2011**

In March 2011, a 9.0 magnitude earthquake rocked Japan, prompting a 30-foot tsunami. Media reported that one major oil refinery caught fire, while nearly a dozen nuclear plants were shut down, creating power shortages throughout Japan. In the short-term, international crude and refined product prices rose as Japan was forced from being a net exporter of refined products to a net importer (to meet its domestic power needs). Japanese export refineries claimed force majeure on fuel supply contracts. Japan was a supplier of jet fuel to the Australian market. Importers with term contracts with Japanese refiners were required to source fuel from other Asian export refineries at short notice.

**Introduction**

In this section, Fueltrac identifies and assesses the risks to the critical infrastructure along the fuel supply chain from Marsden Point to Auckland Airport, specifically:

1. The berth infrastructure at Marsden Point;
2. Marsden Point Refinery;
3. RAP & WAP Pipeline;
4. Wiri Terminal;
5. Airport Storage; and
6. Airport Hydrant Systems.

**The berth infrastructure at Marsden Point.** If the berth infrastructure at Marsden Point is damaged due to an unplanned weather event (leading to ships being unable to load or discharge) or if access to the berths is blocked as a result of a ship sinking at the berth or in the channel, there could be a disruption in the supply of fuel within New Zealand.

Whilst the single point of failure risk in respect of the channel and berth infrastructure is low, tsunamis & weather events have affected supply to other regional fuel markets. Some regional markets have responded to perceived fuel supply chain risk by increasing storage close to the market. For example, the Hong Kong government decided during the planning phase of the new airport that the aviation fuel reserve should be equivalent to 11 days of projected demand due, in part, to the risk of fuel supply disruptions resulting from tropical cyclones.[[9]](#footnote-10)

**Marsden Point Refinery:** Unplanned refinery and terminal shutdowns affecting both Australasian and international markets do occur from time to time. In most cases the public are unaware of the interruption, as supply to the physical market is unaffected. In Australia, the risk of supply interruptions is mitigated in major markets by the presence of multiple terminal or refining infrastructure.

The Marsden Point Refinery is the only refinery in New Zealand. An unplanned shutdown of the berth infrastructure, Marsden Point refinery and/or RAP exposes airlines to supply risk (due to the absence of diversity of supply in the jet fuel supply chain), particularly in the event of an unplanned outage similar to the 2017 RAP pipeline outage, the 2012 Victorian refinery or BP Texas City outages (Table 2).

**RAP & WAP Pipeline:** The RAP and WAP are the only pipelines supplying Auckland Airport**.** The key difference between the diesel, gasoline and jet fuel shortages during the 2017 RAP shutdown was the presence of alternative supply from Marsden Point TLF, Wynyard Wharf and Mount Maunganui terminals for diesel and gasoline. Alternative supply options meant that there was no need for gasoline and diesel rationing.

The RAP will need capacity upgrades to ensure it continues to meet the needs of the Auckland market. (Fueltrac understands that Refining NZ is currently look at trialling the use of drag reducing agents to improve capacity, as well as investigating possible sites for future pumping stations). If capacity upgrades of the RAP are not carried out in a timely manner, then the ability of the RAP to meet the Auckland market requirements for diesel and gasoline will reduce with time. As a result the Auckland market may become more reliant on Mount Maunganui and Marsden Point TLF for supply of diesel and gasoline (Figure 2).

Fueltrac uses an order of magnitude estimate for fuel pipeline construction of $2.5 million per km (± 50%). The pipeline construction cost typically increases in urban areas and with larger diameter pipes. The cost typically decreases in regional areas or where existing easements are used. Based on these assumptions, investment in a new pipeline to duplicate the RAP is likely to require an order of magnitude investment of ~ $425 million. Investment in a new pipeline to duplicate the WAP is likely to require an order of magnitude investment of ~ $15 million. The WAP is operating near capacity and will need some combination of an upgrade, duplication and/or replacement to continue to meet the long term needs of Auckland Airport. Based on information supplied to the Inquiry, more trucking from Wiri Terminal to the JUHI or additional WAP capacity will be required in the near term.

**Figure 2: The Effect of Jet Fuel Demand on the RAP without further Announced Capacity Upgrades**

**Wiri Terminal:** Wiri Terminal is the only terminal supplying jet fuel to Auckland Airport. Damage to the Wiri Terminal and associated infrastructure preventing supply from the facility for more than a few days will adversely and materially affect supply of all fuels within the Auckland market. Alternative supplies of diesel and gasoline could be sourced from the Marsden Point TLF and Mount Maunganui terminals. Emergency supplies of jet fuel would need to be initiated immediately at the Marsden Point Refinery as there is currently no alternative jet fuel terminal servicing the Auckland market.

**Buncefield Terminal, United Kingdom, 2005**

The Buncefield fire was caused by a series of explosions on 11 December 2005 at the Hertfordshire Oil Storage Terminal. The terminal was the fifth largest oil-products storage depot in the United Kingdom, with a capacity of about 270ML of fuel. The terminal was owned by Total (60 per cent) and Texaco (40 per cent). Buncefield terminal handled eight per cent of the overall UK liquid fuel supply and forty per cent of Heathrow’s aviation fuel demand. Jet fuel supply to Heathrow was affected.

A series of explosions at the terminal eventually overwhelmed 20 storage tanks. The emergency services announced a major emergency and a fire- fighting effort began. The cause of the explosion was a fuel-air explosion in a vapor cloud of evaporated leaking fuel. The event was described as the largest of its kind in peacetime Europe. The Buncefield terminal remains closed today.

**Airport Storage:** There is one centralised jet fuel storage facility at the airport. The most common risk to airport storage is product contamination risk.

Jet fuel needs to be recertified every time it is moved between tanks or between terminals in a non- dedicated (e.g. multi-product) system. If contaminated jet fuel is received into airport storage, jet fuel rationing may be required.

On-airport jet fuel storage facilities are not designed to handle multi-product interfaces or handle off-specification fuels. Pipelines directly feeding on-airport storage facilities should be dedicated to jet fuel. The international case studies at Manchester Airport[[10]](#footnote-11) and Sydney[[11]](#footnote-12) illustrate the risk of jet fuel contamination of centralized airport storage.

**Airport Hydrant Systems**

Based on information supplied to the Inquiry, AIAL has identified single point of failure risk in the hydrant system and has developed a plan to mitigate the risk.

**Summary**

Fueltrac observe that the Auckland jet fuel supply chain from Marsden Point Port to Auckland Airport is currently subject to single of point of failure risk at:

1. The channel leading into Marsden Point;
2. The Marsden Point Berth Infrastructure;
3. The Marsden Point Refinery;
4. The RAP;
5. Wiri Terminal;
6. The WAP;
7. Airport storage; and
8. The airport hydrant system.

Fueltrac is of the opinion that the highest potential impact event is a fire and explosion at Wiri Terminal, similar to that at Buncefield. This type of incident could be caused by an unintentional incident, such as an industrial accident, or an intentional incident, such as an act of terrorism.

Historical case study examples of the types of fuel disruptions that pose a risk to Auckland Airport are provided in Table 2.

**Table 2: Examples of Incidents Causing a Disruption in the Fuel Supply Chain[[12]](#footnote-13)**

|  |  |  |
| --- | --- | --- |
| Incident | Location | Impact |
| Product Contamination. | Sydney 2005 | Sydney airport JUHI rationed fuel to airlines when jet fuel was found to be off specification on conductivity. The product contamination resulted in a seven day rationing of fuel at the airport |
| Production Issues. | Manchester 2012 | Production issues at the Essar refinery stopped fuel being pumped to the airport by pipeline. There was inadequate jet fuel in storage at the airport to cover the production shortfall. |
| Pipeline disruption. | Auckland 2017 | Ten days rationing for jet fuel at the airport following a disruption to the RAP pipeline |
| Terminal shutdown. | Sydney, 2013 | A major fuel spill at the Caltex terminal as a result of a failure in a tank valve during a planned maintenance event. Around 130,000 litres leaked. Three people were injured and a firefighter was taken to hospital. An exclusion zone was established around the terminal. Sydney fuel supplies were sourced from the other three fuel terminals in Sydney until Banksmeadow was re-opened |
| Input Pipeline Capacity did not meet demand. Bridger facility at airport not upgraded to meet demand | Sydney (FY 2010, FY 2011) | The Caltex and Shell jet fuel pipelines supplying Sydney airport were not upgraded in time to meet increased demand at the airport. The JUHI had not upgraded the bridger facility to receive increased quantities of jet fuel. Rationing events occurred over a 2 year period. Data was recorded by the NOC |
| Input Pipeline Capacity did not meet demand. Bridger facility at airport not upgraded to meet demand. Insufficient on-airport storage to meet demand. | Melbourne (FY 2016 to FY 2017) | The dedicated jet fuel pipelines supplying Melbourne airport were not upgraded in time to meet increased demand at the airport. The JUHI had not upgraded the bridger facility to receive increased quantities of jet fuel. On-airport storage levels had fallen below 1.5 peak day cover. Rationing events data was recorded by the NOC |
| Series of short term unplanned refinery shutdowns. | Melbourne 2012 | Two unplanned refinery shutdowns within a two to three week supply period caused a depletion of inventories at the low point in the supply cycle. This led to rationing of refined fuels in Victoria |
| Severe weather event/ natural disaster. | Japan 2011 | In March 2011, a 9.0 magnitude earthquake rocked Japan, prompting a 30-foot tsunami. Media reported that one major oil refinery caught fire, while nearly a dozen nuclear plants were shut down, creating power shortages throughout Japan |
| Explosion and fire damage to tanks, pipeline. Loss of life. | Buncefield, UK (2005); BP Texas City refinery | Both events resulted in extended shutdowns and disruptions to fuel supply. |

# Security of Fuel Supply for Auckland

## Forecast Changes in the New Zealand Fuel Supply Chain

The long term demand for fuel in New Zealand has previously been modelled by Hale & Twomey. The growth projections differ significantly by fuel type.

* The demand for gasoline is forecast to decline due to changes in efficiency and fuel composition within the passenger vehicle fleet.
* Diesel growth in the short term will be driven by the International Maritime Organization’s implementation of a global cap on sulphur in marine fuel. Demand growth in the mid to longer term is likely to be low.
* Jet fuel growth is expected to be driven by increased demand from international long haul aircraft. The high case forecast has the Auckland Airport long term jet fuel demand growth at 4% per annum.

Figure 3 below (prepared by Hale & Twomey) provides base, low and high demand forecasts for jet fuel demand at Auckland Airport through to 2044.

**Figure 3: Hale & Twomey - Auckland Airport demand with forecast through to 2044[[13]](#footnote-14)**

Line graph showing forecast jet fuel demand at Auckland Airport to 2044. Historic data shown from 1990 to 2018, forecasted data up to 2044. Forecasted cover is shown as separate lines for low, mid, and high case scenarios.
The vertical axis shows throughput (million litres) from 0 to 3,600 in increments of 400ML.
The horizontal axis shows the year range from 1990 to 2044 in increments of 2 years.
In 1990 there was approx. 600ML throughput of jet fuel to Auckland Airport, this increased to 1,400 in 2018.
2018 forecasting provided the following data. 
Low case forecast shows a steady increase to approx. 2,400ML in 2044.
Mid case forecast shows a steady increase to approx. 2,800ML in 2044.
High case forecast shows a steady increase to approx. 3,600ML in 2044.


During the Inquiry Workshop held on 30 May 2019, this forecast in Figure 3 was presented to the participants. The majority of participants agreed that:

* the Hale & Twomey forecast in Figure 3 is the best available forecast of likely jet fuel demand at Auckland Airport; and
* the high to base (mid) range forecasts were the best forecasts to rely on (with a figure of an average of 3.5-4% per annum growth to 2030 being suggested).

Fueltrac agrees with this assessment and is of the view that the low forecast presents an unrealistically low projection of likely fuel throughput at Auckland Airport through to 2044.

If per annum growth reaches 4%, approximately 1 billion litres of jet fuel will need to be imported from export refineries to supplement Refining NZ production by 2030. Refining NZ has indicated that it is currently installing incremental jet fuel tankage to support the development of an import supply chain for jet fuel to supplement refinery production.

## Diversity of Supply

This parameter identifies whether there are at least two fuel supply chains from port to market. In the event of an unplanned disruption in the primary supply chain, an alternative or secondary supply chain should be capable of supplying a large portion of the market.

The alternative supply chain should be rateable and efficient. Furthermore, an established and alternative supply chain is better than an option that is only utilised in emergencies. This is because the alternative supply chain is already established, and no time is lost in setting up emergency supply. Delays associated with emergency supply options can arise from:

* Re-commissioning bridger facilities;
* In the case of jet fuel, converting tanker trucks from diesel to jet fuel service;
* Finding appropriately qualified and trained drivers;
* Time taken to reposition trucks and drivers to initiate the emergency response;
* There is a risk that infrastructure and machinery associated with an emergency option will not have been regularly used and/or tested; and
* There is incremental health, safety and environmental risk with emergency supply options, such as risks associated in transferring jet fuel from a product ship directly to a tanker truck across a wharf.

The **jet fuel** supply chain from Marsden Point to Auckland currently has no rateable, efficient, alternative supply option to mitigate single point of failure risk. Fueltrac assesses this as a liquid fuel security risk.

The development of incremental seaboard terminal capacity at Tauranga and new road and rail options for supply of **jet fuel** to Auckland could provide alternative supply options.

Fueltrac is of the opinion that a multi-port, multi-transport mode solution is desirable. A new pipeline from Marsden Point or Tauranga to Auckland Airport is unlikely to be economically feasible. The development of both road and rail options to supply **jet fuel** from Tauranga or Marsden Point to Auckland Airport would diversify supply to the market and strengthen resilience.

Diversity of supply capability would also benefit other markets in New Zealand. That is, if the primary fuel supply chain to the market suffers a significant disruption, an alternate fuel supply chain exists with a capability to supply a significant portion of the market.

## Storage Close to Market (Jet Fuel)

This parameter measures the capability of the market to accommodate an upstream disruption in supply.

The commonly used industry resilience measure for airport jet fuel storage capacity is published by IATA[[14]](#footnote-15). Worked examples of the methodology are provided in Annex 2 for London (Heathrow), Athens and Hong Kong International Airport. Both Heathrow and Athens have the capability to receive jet fuel using multiple transport modes from the supplying refineries and therefore have a more diverse supply chain than Auckland. Hong Kong is prone to a higher supply risk than Athens and London and carries a greater level of on-airport storage.

The IATA guidance for on-airport storage varies between 3 to 11 days depending on the supply chain risk. Hong Kong has determined it requires a minimum of 11 days’ cover, whereas a minimum of 3 days is recommended where there is diversity in the supply chain and the airport is supplied by a dedicated jet fuel pipeline from the supplying refineries.

Figures 4 & 5 illustrate the Hale & Twomey historical and forecast days’ cover for jet fuel at Wiri and the JUHI based on the current level of jet fuel tankage.

**Figure 4: Hale & Twomey – Average Jet Fuel Days’ Cover Forecast at Wiri[[15]](#footnote-16)**

Line graph showing Average Jet Fuel Days’ Cover Forecast at Wiri. Historic data shown from 1990 to 2018. Forecasted cover is shown from 2019 to 2044.
The vertical axis shows average days cover from 0 days up to 10 days in increments of 1.
The horizontal axis shows the year range from 1990 to 2044 in increments of 2 years.
Average Jet Fuel Days’ Cover at Wiri fluctuates between a high of over 9 days in 1996 to 1998, to a low of less than 5 days in 2018.
Forecasted average Jet Fuel Days’ cover shows a steady decrease from 5 days in 2018 to approx. 2.25 days in 2044.


In 2012, the combined days’ cover for jet fuel at Wiri and the JUHI was ~10 days. Today it is ~ 6 days. It is forecast to fall by 3.5 to 4% per annum due to forecast jet fuel market growth. In Fueltrac’s opinion, investment in storage is required at Wiri and the JUHI in the near term.

During the 30 May 2019 workshop, the participants appeared to be comfortable with the idea of a minimum of 10 days’ cover at 80% peak days’ demand close to market (at Wiri and the JUHI). Peak days’ demand is to be calculated as the average of the top 30 noncontiguous peak days in a calendar year.[[16]](#footnote-17) Industry participants appeared to agree on the level of days’ consumption cover based on the experience and learnings from the 2017 RAP outage.

Fueltrac is comfortable with the basis of the proposed industry position. However it does suggest that diversity in supply between Wiri and the airport storage, from a second WAP, would strengthen liquid fuel security and provide a sound basis for considering both Wiri and airport storage as a combined on-airport storage capacity.

**Figure 5: Hale & Twomey – Average Jet Fuels Days’ Cover Forecast at the JUHI[[17]](#footnote-18)**

**Line graph showing average jet fuel days’ cover forecast at JUHI. Historic data shows 2 lines from 1990 to 2018, ‘JUHI average jet days cover’ and ‘JUHI peak month jet days cover’. Forecasted cover is shown from 2019 to 2044 with separate lines for ‘Forecast average days cover’ and ‘Forecast peak month days cover’.
The vertical axis shows average days cover from 0 days up to 5 days in increments of 1.
The horizontal axis shows the year range from 1990 to 2044 in increments of 2 years.
‘JUHI average jet days cover’ shows as approx. 2.5 days in 1990 with a low of approx. 1.5 in 2014. This increased to over 3 days of cover in 2015 before dropping to over 2 days in 2018. 
‘JUHI peak month jet days cover’ closely follows the average jet days cover but with a slightly lower value.
‘Forecast average days cover’ starts in 2018 at over 2 days cover, this falls steadily to approx. 1 day in 2044.
‘Forecast peak month days cover’ closely follows the same trend as forecast average days cover with a slightly lower value.**

## Days’ Total Cover (in seaboard storage and close to market) vs Resupply Time

This parameter measures whether days’ consumption cover in storage is sufficient to meet the resupply time from a flexible international supply chain where the buyer is prepared to pay a premium to secure an option, an exchange, a supply diversion, or another trading option to facilitate prompt deliveries of liquid fuels.

Based on the information supplied to the Inquiry, there appears to be approximately 12 to 17 days’ consumption cover of diesel and gasoline and 10 to 14 days of jet fuel in storage in the supply chain at different stages of the supply cycle. This assessment includes product in storage at Marsden Point Refinery, Wiri Terminal, Auckland Airport (for jet fuel) and retail forecourts (for diesel and gasoline), but excludes the contribution from Wynyard Wharf.

The low point of the supply cycle generally occurs:

* Immediately following the loading of coastal tankers for resupply to other New Zealand terminals;[[18]](#footnote-19) or
* Following delays in international shipping caused by weather events or berth congestion at the load port; or
* Following a short term planned or unplanned refinery outage (e.g. regulatory shutdown); or
* When a tank is taken out of service for a regulatory inspection (e.g. at Wiri Terminal and the JUHI).

Alternative supply during an unplanned shutdown is potentially available by leveraging the fuel import supply chain into Australia, however, it could take between 10 to 20 days to reposition a product tanker to discharge fuel at a New Zealand Port (voyage time from Australia is about 5 days). The timeframe will depend on the position of the ship and the supply/ trading option agreed between the buyer and seller. Currently there are around 90 product tankers discharging fuels into Australian seaboard terminals each month.

Based on the information supplied to the Inquiry, it would take a further 4 to 6 days to discharge fuel from the product tanker, certify at Marsden Point, pump via the RAP, recertify at Wiri Terminal and distribute fuels to the end use market.

Assuming a best case scenario resupply time of 14 days by leveraging the Australian import supply chain, the current days’ consumption cover is below the resupply time to the Auckland market during a significant portion of the supply cycle.

The risk is mitigated for diesel and gasoline to some extent due to the presence of an existing, scalable import supply chain into Tauranga and Marsden Point, with the potential to receive imported product.

Some risk mitigation could be achieved in the **jet fuel** supply chain with further development of the emergency supply option (mobile skid) proposed by Refining NZ. Wiri Terminal would need to invest in certain infrastructure to be able to receive deliveries of jet fuel by truck if the emergency supply capability is to provide more than 20% of Auckland Airports demand. In Fueltrac’s opinion, the development of an emergency supply option from the Marsden Point refinery should be independent of decisions to increase days’ consumption cover and the creation of diversity of supply in the fuel supply chain.

If:

* industry invests to ensure it complies with a minimum of 10 days’ cover at 80% peak days’ demand at Wiri Terminal and the JUHI; and
* Refining New Zealand installs incremental jet fuel tankage at the Marsden Point refinery to support the development of an import supply chain (to supplement refinery production); and
* an alternative jet fuel supply chain is developed from Tauranga to the airport with a capability to supply a significant portion of the market:

then it is highly likely that jet fuel days’ consumption cover for Auckland will increase to a level comparable to the Australian market prior to the refinery closures earlier this decade (In Australia, the days’ cover of gasoline, diesel and jet fuel over the last decade has ranged between 17 to 20 days).[[19]](#footnote-20)

Fueltrac suggests a minimum of 14 days’ consumption cover (combined refinery, Wiri and JUHI days’ cover) at the low point of the supply cycle is used as an indicative benchmark for liquid fuel security.

## Input Supply Capacity vs Peak Day Demand (Jet Fuel)

This parameter measures the capability of the existing supply infrastructure to meet the current needs to the airport.

The recently agreed input capacity measure for pipelines and bridgers at Melbourne Airport was that the combined input capacity to the JUHI should exceed 110% of the peak days’ jet fuel demand at the airport throughout the term of the operating lease. This measure was agreed between the airport and the JUHI to ensure timely investment in new fuel infrastructure occurred throughout the tenure of the new lease.

For example, if the peak day demand is forecast to be 10 million litres of jet fuel in a budgetary cycle, then the combined input capacity of the pipeline and bridgers should exceed 11 million litres.

Fueltrac has adopted this parameter in its resilience assessment because it is a reasonable measure of the capability of the pipelines and bridgers to meet peak demand whilst allowing some spare system capacity/redundancy for short term unplanned pipeline outages or transportation delays.

Based on the information supplied to the Inquiry, the consortium of oil companies who own Wiri Terminal and the WAP appear to comply with this measure at the moment. However, capacity additions will be required to the WAP in the near term. Minor capacity upgrades of the exisiting WAP appear feasible.

Trucking capacity to the JUHI, as an alternative to pipeline supply, has reportedly been assessed at a peak of approximately 20% of current on-airport demand.

Trucking is currently used to supplement WAP supply to the airport during periods of peak demand. In peak periods (ie December and January), the WAP cannot meet the daily demand required and, accordingly, trucking from Wiri Terminal to the JUHI is required. If the market continues to grow at 3.5 to 4% per annum and the WAP is not upgraded, duplicated or replaced, increasing amounts of jet fuel will be required to be supplied by truck to the airport.

The rate limiting factor impacting trucking is the capacity to receive by truck at the JUHI. The airport has also advised that, in its opinion, trucking to the current JUHI is problematic given its location and the effect on traffic. This may change at a new JUHI location.

In the near term, the WAP will need either an upgrade, duplication and/or replacement to continue to meet the target input capacity requirements and long term needs of Auckland Airport.

## Summary

A summary of Fueltrac’s assessment of the security and resilience of the fuel supply chain to and within the Auckland region is set out in Table 3.

**Table 3: Current Security of Fuel Supply to the Auckland Market**

|  |  |  |  |
| --- | --- | --- | --- |
| **Security of Fuel Supply Parameter** | **Description** | **Jet Fuel** | **Ground Fuels** |
| Diversity of Supply | At least 2 independent supply chains from Port to Market | There is currently no capability to supply jet fuel on a rateable basis if there is a significant disruption to the primary supply chain | Ground Fuels can be supplied through Tauranga terminals if there is a disruption in the primary supply chain. Diversity of supply is being reduced through the closure of Wynyard Wharf |
| Days' Total Cover (in seaboard storage and close to market) vs Resupply Time | Days' cover should be sufficient to cover resupply time using Supply/ Trading options | Days’ Cover below resupply time using imports through Marsden Point infrastructure | Resupply can be initiated by coastal ship from Marsden Point or imports into Tauranga leveraging the strength of the Australian supply chain |
| Jet Fuel Storage Input Capacity (Airport) | 110% of Peak Day Input Capacity | Currently meets, however investment will be required in the near term |  |
| Days' Cover Close to Market (Airport) | IATA methodology (Hong Kong as best case) | Investment is required at Wiri Terminal and Auckland Airport |  |

## Oil Emergency Response Strategy

The Ministry of Business, Innovation and Employment (MBIE) administers the Oil Emergency Response Strategy (OERS) which includes mechanisms to reduce demand or increase supply of fuel. These include ticket release; specification relaxation; surge production; restricted purchasing (rationing) and voluntary fuel savings.

The Petroleum Sector Coordinating Entity (PSCE) coordinates the sector’s response in a fuel emergency. The PSCE is chaired by MBIE. The role of the PSCE also encompasses the role of National Emergency Sharing Organisation (NESO), in terms of New Zealand’s obligations as a member of the International Energy Agency (IEA).

The core members of the PSCE include MBIE, MCDEM, Mobil Oil New Zealand, Z Energy Ltd, BP Oil NZ, Gull Petroleum NZ, Timaru Oil Services Ltd and other fuel sector companies as needed (Refining NZ, COLL, distributors, terminal operators etc).

Key learnings and observations from the 2017 RAP outage appear to be divided into three areas of improvement. These are:

* The need for ongoing communication and transparency of jet fuel volumes in the supply chain;
* Having the appropriate emergency response plans, documented, agreed, approved, ready to execute within 24 hours; and
* Having sufficient local jet fuel storage to mitigate the adverse impact on Auckland Airport, aviation and dependent industries.

In Australia, the National Oil Supplies Emergency Committee (NOSEC) is the main executive channel through which the Australian, State and Territory governments formulate their overall management response to a national liquid fuel emergency. NOSEC comprises members of government, the Australian Institute of Petroleum (AIP) and representatives from the major oil marketers.

The NOSEC provides a forum to keep governments informed across jurisdictions, and to support the management of a liquid fuel emergency. In practice, the Australian Government’s involvement in managing most liquid fuel emergencies is seen as a last resort.

**National Oil Supplies Emergency Committee (NOSEC), Australia**

The task of the NOSEC is to ensure that the Federal Minister for Energy and the Environment receives relevant advice and information on issues confronting national supply of crude oil and liquid fuels.

NOSEC manages the National Liquid Fuel Emergency Response Plan which details how the Australian Governments respond to a fuel disruption with national implications. NOSEC also fulfills the role of National Emergency Sharing Organization, which is an on- going requirement of membership of the International Energy Agency (IEA).

NOSEC comprises representatives from the Australian, State and Territory Governments and the downstream petroleum industry – including the Australian Institute of Petroleum (AIP), Viva Energy, ExxonMobil, Caltex and BP.

The AIP and its member companies are active participants in NOSEC and support a market based response to fuel supply emergencies using existing commercial and business practices along the supply chain.

Fueltrac observe that the key structural differences between the Australian and New Zealand incident responses appear to be:

* The role played by the AIP and its key executives[[20]](#footnote-21), as the key industry association and spokesperson for industry; and
* The existence of the specialist government affairs staff at each of the oil companies, whose role is to work closely with the AIP and/or Government.

Australian Governments encourage strong industry associations that represent the collective position of industry.

On 1 January 2018, the Australian Government introduced mandatory reporting by industry of fuel data. The intention of this mandatory reporting is to enable more reliable and accurate reporting of information to assist the Australian Government, international organisations and industry to monitor the fuel markets. Some of the data is regularly published on the Australian Department of Environment and Energy’s website. The statistics have been used by the Australian Government to monitor Australia’s fuel supply security and compliance with its IEA obligations. Industry can also use this data in order to prioritise investment in fuel infrastructure.[[21]](#footnote-22)

Fueltrac suggest that processes are established to allow the New Zealand government to obtain real time, whole of supply chain information from the industry, in a common format, to keep it informed and to support the management of a liquid fuel emergency.

## The Long Term Future of Australasian Refineries

Australasian refineries are economically challenged relative to large, modern Asian export refineries**.** Modern Asian export refineries are up to 7 times larger than Australasian refineries, have lower labor costs, are more energy efficient and have been designed to produce clean fuels using the most efficient and latest technology in their refining processes.

In addition, the forecast decline in gasoline demand (due to electrification of the passenger vehicle fleet) and the increase in diesel and jet fuel demand may force the remaining Australasian refineries into expensive gasoline exports which may adversely impact their continuing economics and viability.

In the long term, the five remaining Australasian refineries may all be forced to convert from a refinery to a terminal. The three most recent Australian refinery to terminal conversions improved liquid fuel security as they led to an increase in days’ consumption cover as a result of:

* Crude oil tankage being converted to diesel and jet fuel service; and
* The increased frequency of product tanker imports (which are typically smaller than crude tankers) increased the days’ cover at the low point of the cycle.

# Benchmarking the Auckland Fuel Supply Chain

## Market Demand Benchmarks

This section is based on publicly available information sourced from:

* The New Zealand Commerce Commission Project no. 11.04/15357
* Australian Petroleum Statistics, Issue 264 (with interpolation of data by Fueltrac) and
* RFT FSB DFS 001-2015 data accessed via Austender

The 2013/ 2014 market demand of the New Zealand fuel market was compared to the Queensland, South East Queensland, Victorian, NSW and Australian Defence Force (ADF) market demand for fuels. The results are provided in Table 4 below.

**Table 4: Comparison of the New Zealand Fuel Market with Segments of the Australian market**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2013/14 Estimate | Diesel (Mlpa) | Gasoline (Mlpa) | Jet Fuel (Mlpa) | Other (Mlpa) | Total (Mlpa) |
| ADF (national) | 134 | 2 | 248 | 3 | 387 |
| New Zealand | 2,963 | 3,034 | 1,272 | 646 | 7,915 |
| South East Queensland | 2,580 | 3,500 | 1,380 | 831 | 8,291 |
| Victoria | 3,883 | 4,472 | 1,427 | 1,488 | 11,270 |
| Queensland (Total) | 7,375 | 4,073 | 1,673 | 1,278 | 14,399 |
| NSW | 4,990 | 5,636 | 3,487 | 1,646 | 15,759 |

Key observations are that:

* the New Zealand fuel market is of comparable size to the South East Queensland market. Fueltrac observe that the Brisbane market is likely to be of a similar size to the Auckland market. Brisbane is supplied from the Lytton Refinery whilst Auckland is supplied by the Marsden Point Refinery.
* the ADF fuel demand is less than 5% of the total New Zealand fuel demand. The ADF is currently investing to build the resilience of its supply chain. It recently announced[[22]](#footnote-23) a planned $1.1 billion dollar investment in its fuel network, of which $127 million will be spent over the next 3 years.

## Fuel Terminal Benchmarks

Whilst the Wiri Terminal is the only significant fuel terminal servicing the Auckland market, there are five terminals in Brisbane and four each in Melbourne and Sydney.

If a significant incident were to occur at a terminal in Brisbane, Melbourne or Sydney, there is sufficient fuel terminal capacity such that the market can continue to be supplied without any adverse impact on fuel supply. In this respect the Brisbane, Melbourne and Sydney fuel terminal market has a more diverse supply chain, has in-built redundancy in the system and is more able to accommodate an unplanned disruption in the supply chain caused by unintentional, intentional or natural cause events.

If a significant supply disruption occurred at the Wiri Terminal, there is insufficient alternative supply capability to maintain supply to the Auckland fuel market without rationing. Fueltrac assess this as a liquid fuel security risk.

The Buncefield (2005) and Sydney (2013) terminal shutdowns (Table 2) indicate that terminal shutdowns of varying severity do occur. If either event occurred at the Wiri Terminal, rationing would need to commence immediately in the Auckland market, whereas a resilient supply chain can withstand a level of disruption in infrastructure without requiring fuel rationing.

## Jet Fuel Supply Benchmarks

The data in Table 5 compares the aircraft movements, total passengers, jet fuel demand and modes of supply of jet fuel to Auckland, Brisbane, Melbourne, Sydney and Perth Airports. Sydney, Melbourne and Brisbane airports are observed as having a more diverse supply chain than Auckland Airport.

**Table 5: Benchmarking Airport Key Demand Metrics**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Airport | Total Aircraft Movements 2017/18 (BITRE & Auckland Airport) | Total Passengers 2017/18 (BITRE and Auckland Airport) | Jet Fuel Qty 2017/18 (Mlpa) Fueltrac | Dedicated Jet Fuel Pipelines (no.) | Avge Daily Pipeline Qty (ML/day) Fueltrac | Avge Truck Movements/ Day (Fueltrac) |
| Sydney | 314,352 | 44,035,329 | 3613 | 2 | 9.54 | 8 |
| Melbourne | 234,789 | 36,318,753 | 2021 | 1 | 4.20 | 25 |
| Brisbane | 192,917 | 23,238,261 | 1384 | 2 | 3.80 | 0 |
| Auckland | 175,439 | 20,754,056 | 1460 | 1 | 4.00 | 0 |
| Perth | 94,747 | 12,558,276 | 1030 | 1 | 2.82 | 0 |

Brisbane and Auckland have similar sized airports in terms of aircraft movements, total passenger numbers and fuel demand. Brisbane has 2 pipelines supplying the airport, whereas Auckland has one. Each pipeline feeds the Brisbane JUHI from different directions using separate pipeline easements. Each of the two pipelines supplying Brisbane airport has a capacity which currently exceeds total daily airport demand. Brisbane is not exposed to single point failure risk in either its terminal or pipeline supply network.

Melbourne and Sydney Airports are supplied by multiple transport modes. In both cases, the alternative or secondary supply chain is potentially capable of supplying approximately 50% of the market, whilst the major or primary supply chain is capable of supplying the majority of the market in its own right.

During the 30 May 2019 Workshop, some participants suggested that Perth Airport was a better model against which Auckland Airport should be benchmarked because it has one dedicated fuel pipeline as its single source of supply of **jet fuel**.

Perth, like Auckland, is also susceptible to single point of failure risk. Perth Airport has recently raised a number of concerns with the Australian Productivity Commission about this single point of failure risk, including concerns that:[[23]](#footnote-24)

* the current supply chain to Perth Airport is constrained by the throughput capacity of the Kewdale to airport pipeline and on-airport storage capacity;
* there is inadequate protection against major supply disruptions such as that recently experienced at Auckland Airport; and
* the supply chain is not sufficiently equipped to cater for growth in aircraft traffic.

Perth Airport is currently planning the relocation of its existing JUHI storage facility. As part of this project, Perth Airport has noted that there is an opportunity for it to achieve a strategic change in its existing fuel supply model, including:[[24]](#footnote-25)

* constructing a storage facility that allows multiple supply routes to the airport;
* increasing on-airport storage to assist in mitigating supply risk disruption;
* increased airport control of on-airport infrastructure (storage, hydrants and pipelines) to ensure appropriate control over future investment decisions; and
* the establishment of an asset management group with representatives from Perth Airport, airlines, the operator of the facilities and fuel suppliers to ensure that all relevant stakeholders are involved in management of the infrastructure.

Fueltrac also notes that an independent fuel supplier has announced plans to construct a new 220 ML terminal facility at Kwinana with direct supply through the bulk liquids berth[[25]](#footnote-26) (completely independent of the refinery supply chain). This will enhance diversity of supply to the market.

# Australian Case Studies (Jet Fuel)

The 2017 RAP fuel pipeline disruption represents the third significant jet fuel rationing event at an Australasian airport this decade. The other two occurred at Sydney Airport (FY 2010, FY 2011) and Melbourne Airport (FY 2016, FY 2017). In Sydney and Melbourne, the Australian Commonwealth and State Governments formed industry working groups to agree on the risk mitigation plans, infrastructure investment solutions and the timeframes to implement.

**Sydney International Airport**

Sydney Airport is supplied by two dedicated jet fuel pipelines and by road from terminals in the Sydney Basin. The pipelines are owned by two of the oil companies. One of the pipelines permits limited access by third parties on commercial terms whilst the other is based on a Restricted Access regime. The members of the on-airport JUHI consist of all 4 oil companies and a major airline.

Despite the consortium of oil companies and airline being aware of the rapid growth in jet fuel demand from international long haul aircraft in late 2009, neither of the pipeline owners sought to upgrade their pipeline and the JUHI did not seek to upgrade its bridger facility to increase receipt capacity by road. In December 2009, during the peak season for air travel at Sydney, the airport was forced to declare a black traffic light on jet fuel availability and ration jet fuel supply to airlines. Sydney Airport input supply capacity for jet fuel was below peak day demand during FY 2010 and FY 2011 (Figure 6) until additional input supply capacity was commissioned. The extent of the rationing was mitigated by the presence of 29 million litres of jet fuel storage at the airport.

**Figure 6: Sydney Airport Supply/Demand Capacity Changes for Jet Fuel over Time[[26]](#footnote-27)**

Bar chart showing Sydney Airport Supply/Demand Capacity Changes for Jet Fuel over Time.  Sydney Avge Day (ML/day) is presented as a blue bar. Sydney Peak Day (ML/day) is presented as a red bar. Sydney Input Capacity (ML/day) is presented as a green line on the chart.
The vertical axis shows ML/day from 0.0 to 16.0 in increments of 2.0.
The horizontal axis shows the financial year from 2010-11 to 2017-18 in increments of 1 year.
Sydney Input Capacity shows as approx. 8.5 ML/day during 2010-11, this rose to 12.0 ML/day during 2012-13, and then approx. 14.5 ML/day during 2013-14. Input capacity stayed at this level through to 2017-18.
Sydney Avge Day was approx. 8.5 ML/day during 2010-11, this peaked at approx. 10.0 ML/day during 2016-17 before dropping to just below 10.0 ML/day during 2017-18.
Sydney Peak day was over 9.0 ML/day during 2010-11 (over input capacity), this peaked at approx. 11.0 ML/day during 2016-17 before dropping to just below 11.0 ML/day during 2017-18.


The Government formed a Joint Fuel Industry Working Group (JFIWG) to determine the most efficient means to upgrade input supply capacity. The JFIWG included members from industry, airlines, BARA and government. The JFIWG investigated the adequacy of supply infrastructure and barriers to investment.[[27]](#footnote-28) Both pipeline owners have subsequently completed capacity upgrades and supply rationing has disappeared from the airport.

It is noteworthy that the upgrades required the involvement of government and could not be implemented in a timely manner by industry, despite the visibility of the demand increase to all oil company members of the Sydney JUHI.

**Melbourne International Airport**

Melbourne Airport is supplied by a dedicated jet fuel pipeline and by road from terminals in the Port of Melbourne. The pipeline is owned by a consortium of oil companies and an independent investor, whilst the terminals are owned by individual oil companies. The members of the JUHI consist of all 4 oil companies. All the key infrastructure was based on a Restricted Access regime prior to 2018.

**Figure 7: Melbourne Airport Supply/Demand Capacity Changes over Time[[28]](#footnote-29)**

Bar chart showing Melbourne Airport Supply/Demand Capacity Changes for Jet Fuel over Time. Melbourne Avge Day (ML/day) is presented as a blue bar. Melbourne Peak Day (ML/day) is presented as a red bar. Melbourne Input Capacity (ML/day) is presented as a green line on the chart.
The vertical axis shows ML/day from 0.0 to 8.0 in increments of 1.0.
The horizontal axis shows the financial year from 2010-11 to 2017-18 in increments of 1 year.
Melbourne Input Capacity shows as over 5.0 ML/day during 2010-11, input capacity stayed at this level through to 2016-17, and then increased to approx. 7.5 ML/day during 2017-18.
Melbourne Avge Day was over 3.5 ML/day during 2010-11, there was a slight decrease during 2011-12 before steadily increasing to approx. 5.5 ML/day during 2017-18.
Melbourne Peak day was over 4.0 ML/day during 2010-11 there was a slight decrease during 2011-12 before steadily increasing to approx. 5.5 ML/day during 2015-16 (over input capacity), over 5.5 ML/day during 2016-17 (over input capacity), and over 6.0 days during 2017-18, by which point input capacity had been increased to approx. 7.5 ML/day.


Despite the oil companies being aware of the rapid growth in jet fuel demand at Melbourne Airport from international long haul demand from 2014, neither the pipeline owners, nor JUHI sought to upgrade the capacity of the pipeline, increase bridger receipt capacity at the airport or upgrade on–airport storage. During FY 2016 and FY 2017 peak day capacity at the airport exceeded input supply capacity to the JUHI (Figure 7) and jet fuel rationing was required. The rationing frequency was exacerbated by the low level of on-airport storage.

The Government formed a Round Table Working Group with key industry stakeholders to determine and coordinate the most efficient means to upgrade input supply capacity and on-airport storage. The Round Table Working Group included members from industry, airlines, BARA and government. Capacity upgrades have now been completed to the bridger and pipeline. A 25 million litre storage upgrade to on-airport storage is nearing completion. Additional seaboard terminal capacity is also being added at the Port.

As was the case at Sydney Airport, the capacity upgrades required the involvement of government and could not be implemented in a timely manner by industry, despite the visibility of the demand increase to all members of the Melbourne JUHI.

**Key Australian Government Reviews of Jet Fuel Infrastructure;**

**2010/11**: The Joint Fuel Industry Working Group formed by industry, airlines and government to consider jet fuel pipeline investment in the Sydney Basin.

**2011**: The Minister for Resources and Energy requested a working group of senior industry representatives and key stakeholders investigate the current and projected jet fuel demand for Melbourne Airport over the medium to long term.

**2011/12**: Application by BARA to the National Competition Council for the declaration of jet fuel supply infrastructure services at Sydney Airport. This would have allowed third party access to throughputters on a transparent basis.

**2017**: The Government formed a Round Table Working Group with key industry stakeholders to determine the most efficient means to upgrade input supply capacity and on-airport storage at Melbourne Airport. The Round Table Working Group included members from industry, airlines, BARA and government.

**2019**: The scope of the 2019 Productivity Commission inquiry included a review of competition in the market for jet fuel in Australia, including the provision of jet fuel at the major airports.

Fueltrac observes that the consortiums of vertically integrated oil companies operating strategic jet fuel infrastructure in Australasia have most recently been slow to provide expansionary capital for new strategic infrastructure investments. Fueltrac is of the opinion that this is a function of the commercial structure of the joint venture (JV) companies owning and operating strategic fuel infrastructure. These JVs require unanimous decisions on capital investment to proceed with a capacity upgrade in a budgetary cycle. However, the decision on whether to provide the capital in any budgetary cycle may be taken offshore (and prioritised based on regional or global needs of the business – not the specific needs of Australia or New Zealand in relation to supply chain resilience or liquid fuel security).

This raises the question as to whether the current ownership arrangements are optimal from a national interest policy perspective. It might be preferable for infrastructure owners, such as ports and airports, to invest in strategic fuel infrastructure rather than global, vertically integrated oil companies.

In the past 2 years Darwin and Melbourne airports have restructured their on-airport jet fuel supply chains. In both cases the airports have negotiated Open Access regimes which permit non-equity participants in the JUHI to market jet fuel at the airport.

At Melbourne Airport, the new lease with the JUHI (signed in early 2017) incorporates provisions that require the JUHI owners to meet benchmarks for on-airport storage capacity, input receipt capacity into the JUHI and the supply of hydrant infrastructure.[[29]](#footnote-30)

Darwin Airport also elected to take an ownership position in jet fuel storage and the hydrant system. Darwin Airport recovers its investment via a Fuel Throughput Levy.

Perth Airport, in its September 2018 submission to the Australian Productivity Commission, noted its concerns about the existing restricted access JUHI regime at the airport (which mirror the arrangements at Auckland Airport), including that:[[30]](#footnote-31)

* “Perth is encumbered with legacy jet fuel supply arrangements that do not provide the level of transparency, access or control that is required to ensure the market for the supply of jet fuel at the airport operates freely”;
* “The current structure also does not provide appropriate levels of supply security or redundancy to manage a supply disruption”; and
* there was “currently no formal avenue for the airport authority and its airline customers to have input into the management of on-airport infrastructure (maintenance requirements, expansion decisions and so on)”.

Perth Airport also submitted that the following core principles should apply to the jet fuel supply chain:[[31]](#footnote-32)

* "Truly open access that encourages entry of more competitors”;
* “De-coupling of tenure and entry requirements from infrastructure, operatorship and lease arrangements”;
* “Security of supply, which should include multiple modes of fuel delivery and adequate on-airport storage to mitigate the risk of supply disruption”;
* “Adequate control of on-airport infrastructure by the airport such that it can manage future investment decisions in conjunction with its airline customers”; and
* “Management of on-airport infrastructure by a committee that includes representation from the airport authority, the operator of the facilities, airlines and fuel supplier”.

# International Case Studies (Jet Fuel)

**North Asia (Airport Fuel Supply Company, Hong Kong)**

In October 2004, Hong Kong International Airport was presented with an IATA Fuel Trade Forum award in recognition of the excellent management of its aviation fuel system. The Board of Airline Representatives of Australia (BARA) in its media releases regularly promotes the Hong Kong Open Access model as a best practice example.[[32]](#footnote-33)

Hong Kong airport has a jet fuel demand in excess of 7 billion litres per annum. The bulk of the demand comes from long haul international flights[[33]](#footnote-34). Fuel is imported into Hong Kong airport from export refineries in Asia. There is no refinery in Hong Kong.

Jet Fuel is imported into Hong Kong via berth infrastructure at Sha Chau. Hong Kong is prone to tropical cyclone risk. In the past there have been occasions when 2 successive cyclones have adversely impacted supply through berthing infrastructure for up to 3 days each. Single point of failure risk exists at Sha Chau.

The Hong Kong government decided during the planning phase of the new airport that the aviation fuel reserve to be maintained at the airport should be equivalent to 11 days of projected demand.

Hong Kong Airport conducted a transparent open tender franchise process in order to include parties with specific expertise in construction and operation. Four parties were awarded franchises for a) investment in physical infrastructure; b) operation; and c) two into-plane services.

The development of the aviation fuel system was awarded in 1995 to Aviation Fuel Supply Company (AFSC), a Hong Kong registered limited partnership, whilst the operating rights were granted to AFSC Operations Ltd (the Operator) under a separate Operating Agreement. The Franchise Agreement gave AFSC the right to finance, design and construct the aviation fuel system and recover the investment over 20 years from July 1998. Both AFSC and the Operator is equally owned by 7 oil companies and 2 airlines.

After completion of the facility, AFSC handed the system over to the Operator to operate and maintain for 20 years, as per the Operating Agreement. Currently, the Operator is receiving technical support from an international oil company.

Hong Kong Airport exercised its right to acquire the centralised storage assets from the Operator [AFSC] in 2003 – 5 years after the facility was completed. The Airport recovers its investment through a Fuel Throughput Levy.

Third party jet fuel suppliers who do not hold an equity stake in the Operating Company at Hong Kong are able to access key fuel infrastructure under the same price and terms as all fuel suppliers to the Airport. Under the Open Access system, the Operator receives a return on its investment via a published Fuel Throughput Levy.

**United Kingdom (London, Heathrow)**

London, Heathrow has a jet fuel demand in excess of 8 billion litres per annum13. The majority of the demand comes from international long haul flights. Jet fuel is supplied to Heathrow by three pipelines, plus deliveries by train and road. Due to the diverse transport modes and capacity for transporting jet fuel to the airport, the airport typically carries about 1.5 to 2 days of jet fuel cover in on-airport storage.

Following the loss of Buncefield terminal in 2005, supply of jet fuel into Heathrow in 2006 and 2007 was not adequate to meet unconstrained demand. The airport undertook a study which recommended the construction of additional on –airport storage. An incremental 26 million litres of on-airport storage was constructed to meet the needs of airlines refuelling at Heathrow. Input supply capacity to the airport was also upgraded to meet the forecast needs of the airport.

The exercise to determine the current and future storage was undertaken by a task force including the Heathrow Airport Fuel Company, British Airports Authority, IATA and two airline representatives.

Today, jet fuel suppliers at Heathrow pay a British Airports Authority rental to cover fuel infrastructure, a Heathrow Fuel Company Operating Fee to operate the fuel facility and an airport throughput fee to cover the investment in the hydrant system. On airport fuel infrastructure costs have been split out from fuel charges. All fuel suppliers pay the same fuel infrastructure charges, irrespective of whether they are an owner of the Heathrow Fuel Operator.

**Independent Service Providers**

There is a number of independent international service providers, operating both aviation fuel facilities and into-plane operations at international airports. These providers offer to build, own, operate and maintain on-airport fuel infrastructure on an open access basis (similar to Hong Kong and Heathrow).

Fueltrac understands that one of the larger independent service providers, Skytanking, reportedly manages the operation of more than 30 on-airport aviation fuel storage and hydrant systems worldwide[[34]](#footnote-35).

**Conclusions on the Australian and International Jet Fuel Case Studies**

Hong Kong, Heathrow and Melbourne airport acted to mitigate fuel supply chain risk by installing extra on-airport storage. Sydney, Melbourne and Heathrow also upgraded pipeline and bridger supply capacity. Brisbane Airport has two pipelines supplying the airport from different directions under separate easements. Each pipeline has the capacity to supply the entire market in its own right. Hong Kong, Heathrow and Sydney all charge Fuel Throughput Levies to cover a component of fuel infrastructure costs. The Fuel Throughput Levy is independent of the price of jet fuel charged by the fuel supplier.

The decisions of these airports provide an insight into the options at Auckland Airport.

# Australian Productivity Commission Draft Findings

Australian airports operated by the Federal Airports Corporation were privatized during the period 1997-2002. Whilst privatization resulted in significant airport infrastructure investments at major airports, successive governments have asked the Productivity Commission to undertake periodic reviews to determine whether the economic regulatory oversight of these airports remains in line with community and industry expectations.

In June 2018, the Australian Government requested that the Productivity Commission undertake an inquiry into the economic regulation of airports. The purpose of the inquiry was to determine the effectiveness of the economic regulation of services provided by airports to airlines, passengers, people and businesses that access the terminal precinct. The Commission was also asked to examine competition in markets to supply jet fuel in Australia, including the provision of jet fuel at the major airports. In its draft report issued in February 2019,[[35]](#footnote-36) the Productivity Commission observed that:

* “[t]he natural monopoly characteristics of jet fuel infrastructure, along with the market power from vertical integration and horizontal coordination, may have distorted the incentives for incumbent firms to invest.”[[36]](#footnote-37)

* it had heard of instances where “infrastructure development has not kept pace with industry demand” and referred to a submission by Virgin Australia Group raising concerns with the level of investment that had occurred in off-airport storage, pipelines and JUHI infrastructure in Melbourne.[[37]](#footnote-38)
* the concern for fuel security at Melbourne Airport was severe enough to require the Victorian Government to intervene by holding an aviation fuel roundtable with industry participants in order to coordinate future investment.[[38]](#footnote-39)

The Productivity Commission proceeded to find that “markets to supply jet fuel at some airports are characterized by conflicts of interests associated with fuel companies owning the JUHI infrastructure, which means they have an incentive to deny or inhibit access to new entrants. The terms of third-party access to infrastructure services are not always transparent, which makes it difficult for potential entrants to decide whether to enter a market or to assess whether these terms are reasonable.”[[39]](#footnote-40)

The Commission therefore issued a draft recommendation that:“Through the Shareholder Ministers of the Western Sydney Airport Corporation (the Minister for Finance and the Minister for Urban Infrastructure), the Australian Government should recommend …… that the JUHI infrastructure operate on an open access basis and that this should be a condition of any future privatization”*.*[[40]](#footnote-41)

The Productivity Commission also considered investment planning and coordination in relation to jet fuel infrastructure. It noted:

* “Planning and coordination in the jet fuel supply chain would be improved through regular consultative processes at each monitored airport involving the fuel suppliers, airports, airlines and government agencies. This may not directly address underinvestment concerns but would reduce instances where there has been uncertainty and a lack of coordination in investment planning. The Commission understands that similar processes in the past have been useful, particularly the Aviation Industry Roundtable established in Melbourne in 2017.”[[41]](#footnote-42)
* “…greater investment planning would likely lead to better outcomes for fuel security”.[[42]](#footnote-43)

Accordingly, the Productivity Commission also made a draft recommendation that:“The Minister for Infrastructure should recommend a jet fuel supply coordination forum be incorporated into the master planning process at each monitored airport. The forum should be tasked with discussing, among other things: i) capacity constraints and any potential pressure points; ii) linkages between infrastructure: iii) demand forecasts and security of supply iv) future infrastructure requirements and investment planning.”[[43]](#footnote-44)

The joint venture consortiums of oil companies that own key strategic infrastructure in New Zealand are similar in design and membership to Australia.

In Fueltrac’s assessment, the learnings from the Productivity Commission’s draft report are also relevant to the New Zealand market.

# Auckland International Airport

In this report, Fueltrac has assessed the current **jet fuel** supply chain to and within the Auckland region and concluded that it:

* is subject to single point of failure risk from port to airport;
* has inadequate days’ consumption cover (which is decreasing with time) to meet the best-case resupply time in the event of a significant, unplanned disruption; and
* has inadequate storage close to market (which is decreasing with time).

In Fueltrac’s opinion, investment in jet fuel infrastructure has not kept pace with increasing demand and is required in the near term. Fueltrac believes that the incentives for the incumbent joint venture parties who own and operate jet fuel infrastructure in Auckland are not sufficient to encourage them to invest in projects that are necessary to ensure the security of jet fuel supply.

Fueltrac understands that with respect to the storage and hydrant infrastructure at Auckland Airport:

* Ownership and operatorship of the hydrant lines resides with AIAL.
* A leasing agreement exists between AIAL and the JUHI joint venture participants in relation to the storage of jet fuel at Auckland Airport at the JUHI.
* The current access terms to the existing JUHI are based on Restricted Access terms.
* The location of the existing JUHI is due to be moved to another location within the next decade or so in order to accommodate the redevelopment of the domestic terminal.

It appears that AIAL may therefore have an opportunity to review ownership and operatorship of the jet fuel storage infrastructure at the airport, as well as any terms of access to such infrastructure. One such option is Open Access.

The Australian Productivity Commission distinguishes between the concepts of Closed Access, Restricted Access and Open Access:[[44]](#footnote-45)

* **Closed access** means that third parties are unable to obtain access to the relevant infrastructure;
* **Restricted access** means that third parties can access the relevant infrastructure by purchasing equity; and
* **Open access** means that any third party can access the infrastructure by paying an access fee.

There are a number of different ways to achieve Open Access at an airport JUHI facility which include:

* through an agreement between the owners and operators of any on-airport storage;
* by an airport requiring Open Access as a provision in any ground lease for on-airport storage;
* by an airport investing in airport storage and reaching agreement with another party to operate on-airport storage;
* by an airport reaching agreement with a third party to build, own and operate on-airport storage;[[45]](#footnote-46)
* government regulation.

Fueltrac is of the opinion that an Open Access regime at Auckland Airport is likely to enhance the security of jet fuel supply. This is for the following reasons:

1. Open Access would provide clarity of the terms for accessing the storage and hydrant infrastructure at Auckland Airport, and therefore remove a barrier to entry. This could enable new entrants to enter into the jet fuel market in Auckland, which, in turn, may incentivize the new entrants to build new off-airport infrastructure in the Auckland region. This would enhance security of supply.
2. There has been underinvestment in the current jet fuel supply chain infrastructure to meet increasing demand at Auckland Airport. The Australian Productivity Commission (considering similar joint venture consortiums of oil companies to the one that currently owns and operates the JUHI at Auckland Airport) has observed that there has been similar underinvestment in the jet fuel supply chain in Australia. The Commission also said that: “[t]he natural monopoly characteristics of jet fuel infrastructure, along with the market power from vertical integration and horizontal coordination, may have distorted the incentives for incumbent firms to invest.”
3. The introduction of Open Access at Darwin, Melbourne Airports and Hong Kong Airport has enabled airports, infrastructure companies and jet fuel suppliers to make independent decisions on the timing of new infrastructure investments. Open access potentially removes any potential conflict of interest between access to infrastructure and the number of suppliers participating in a market.

Fueltrac also observes:

* At Melbourne Airport, the new lease for the JUHI incorporates provisions that require the JUHI owners to meet benchmarks for on-airport storage capacity, input receipt capacity into the JUHI and the supply of hydrant infrastructure.[[46]](#footnote-47)
* In Europe & Asia the use of JUHIs is diminishing in favor of Open Access fuel concession models. The cost of jet fuel infrastructure in fuel concessions is recovered by Fuel Throughput Levies or aeronautical charges (i.e. passenger charges), rather than being embedded in the jet fuel price from the supplier.

The operating cost of these Open Access fuel concessions are typically lower than traditional JUHI’s as they use a lower investment rate of return. Fuetrac observes that:

* Individual or consortiums of vertically integrated oil companies typically seek returns of the order of 18%pa before tax on jet fuel infrastructure.
* Independent terminal operators typically target a 12 to 15%pa before tax return.
* Independent aviation service providers typically seek a 10-13%pa before tax return.

Lower investment returns from specialist fuel infrastructure investors could potentially lead to lower Fuel Throughput Levies and lower fuel prices. In Australia, independent fuel terminal operators now operate in Queensland, NSW, Victoria, South Australia, West Australia and the Northern Territory. Existing fuel suppliers are typically the major user of these fuel terminals.

An independent infrastructure owner at Auckland Airport that seeks a 10 to 13% per annum return before tax is likely to be able to provide the fuel storage and distribution service at Auckland Airport at a lower price than a JUHI owned by vertically integrated oil companies.

# Recommendations For Building Resilience and Enhancing Fuel security

In Fueltrac’s assessment, the options for building resilience and enhancing the security of fuel supply in Auckland can broadly be divided into four categories:

* improved communication and transparency of fuel volumes within the supply chain and the development, agreement, communication and testing of emergency response plans (before they are required);
* development of master plans using a jet fuel supply coordination forum similar to that proposed by the Australian Productivity Commission;
* development of a multi-port, multi- terminal, multi-pipeline fuel supply chain to mitigate single point of failure risk in the existing supply chain;
* increasing fuel storage close to market and upgrading input receipt capacity from pipelines and bridgers to ensure input supply capacity exceeds 110% of peak day input capacity;

## Incident Response Plans

A whole of supply chain response is required to supply chain disruptions. Information needs to be supplied in a common format and be based on real time data. In Australia, the whole of supply chain response is provided through NOSEC. The difference between the incident response plans in both countries appears to be the role played by the AIP in Australia, as the key industry association and spokesperson for industry. Fueltrac observe that there may be a role for this type of industry association in New Zealand to initiate and collect specific information from industry, including:

* Reporting by fuel companies (to government) of unplanned disruptions adversely impacting supply.
* Scenario planning and development of processes and procedures for significant unplanned fuel disruptions. This includes having emergency response plans, documented, agreed, communicated and ready for implementation.
* Monitoring of stocks (by government) at key terminals/ locations throughout New Zealand.
* Communicating the importance of business continuity planning to fuel users, including identifying priorities for fuel use.

**Recommendation 1:**

That processes are established to allow government to obtain real time, whole of supply chain information, in a common format (from industry) to keep it informed and to support the management of a liquid fuel emergency: This includes:

* Reporting by fuel companies (to government) of unplanned disruptions adversely impacting supply.
* Scenario planning and development of processes and procedures for significant unplanned fuel disruptions. This includes having emergency response plans, documented, agreed, communicated and ready for implementation
* Monitoring of stocks (by government) at key terminals/ locations throughout New Zealand.
* Communicating the importance of business continuity planning to liquid fuel users, including identifying priorities for fuel use.

## Master Planning using a Jet Fuel Supply Forum supported by Government

Fueltrac also suggests the recommendations of the Australian Productivity Commission are incorporated into the master planning process at Auckland Airport.

**Recommendation 2**

A jet fuel supply coordination forum be incorporated into the master planning process at Auckland Airport. The forum should be tasked with discussing, amongst other things:

* Capacity constraints and any potential pressure points;
* Linkages between infrastructure:
* Demand forecasts and security of supply
* Future infrastructure requirements and investment planning**.**

**A jet fuel supply coordination forum be incorporated into the master planning process at AIAL. The forum should be tasked with discussing, amongst other things:**

* **Capacity constraints and any potential pressure points;**
* **Linkages between infrastructure:**
* **Demand forecasts and security of supply**
* **Future infrastructure requirements and investment planning.**

## Diversity of Supply; Increased Jet Fuel Storage; JUHI Input Receipt Capacity

Marsden Point and Tauranga are 170 km and 200km respectively from Auckland. Whilst Auckland would be the preferred location for a bulk liquids terminal to build diversity in the supply chain, it seems unlikely from the information provided to the Inquiry that an efficient fuel import supply chain can be developed at the Ports of Auckland or at Manukau Harbour.

The impending closure of the Wynyard Wharf storage facility will reduce the diversity of fuel supply options for ground fuels. A Port study was undertaken by the Auckland City Council on the development of alternative ports, however a potential port or a wharf with sufficient deep water draft to receive product tankers from export refineries in Asia or the Marsden Point refinery (other than Northland and Tauranga) has not been identified at this stage.

The development of a new port and bulk liquids facility close to Auckland does not appear to be currently feasible. The options for building fuel resilience need to focus on diversity of supply of jet fuel from Northland and Tauranga, increased storage close to market and upgrading input receipt capacity at the airport JUHI.

Based on the information provided to the Inquiry, and insights gained from international case studies, Fueltrac recommends that the resilience of the fuel supply to Auckland should be enhanced by the development of a multi-port, multi- terminal fuel supply chain to mitigate single point of failure risk. There is also a need to increase fuel storage close to market and upgrade JUHI input receipt capacity from pipelines and alternative transport modes. The overall solution is likely to involve a package of the following options:

* Increasing **jet fuel** storage at both Auckland Airport & Wiri Terminal. During the closed workshop of Inquiry participants on 30 May 2019, industry appeared to support a minimum of 10 days’ cover at 80% peak days’ demand. Fueltrac supports and recommends such an amount of minimum storage cover.
* Developing an alternative supply capability for **jet fuel** - potentially through the Marsden Point or Mount Maunganui terminals - with the capability to supply **jet fuel** by road and/or rail on a rateable basis.
* Implementing capacity upgrades of the RAP to ensure adequate supply of diesel, gasoline and **jet fuel** are available at the Wiri Terminal.
* Implementing capacity upgrades to the WAP in the short term, and potential duplication in the mid-term, to build diversity of **jet fuel** supply between Wiri and Auckland Airport.
* Development of an emergency supply capability similar to that proposed by Refining NZ (the mobile skid option). Wiri Terminal will, however, need to invest in certain infrastructure in order to be able to receive deliveries of **jet fuel** by truck if the emergency supply capability is to provide more than 20% of Auckland Airport’s demand.
* Implementing the Hong Kong Open Access Operating Model at Auckland Airport. Creating Open Access introduces contestability in the market and may stimulate investment by third parties in new strategic fuel infrastructure to supply the market.

**Recommendation 3:**

The most efficient solution for building resilience and enhancing fuel security at Auckland Airport is likely to involve a package of the following options:

* Increasing **jet fuel** storage at both Auckland Airport & Wiri Terminal. During the closed workshop of Inquiry participants on 30 May 2019, industry appeared to support a minimum of 10 days’ cover at 80% peak days’ demand. Fueltrac supports and recommends such an amount of minimum storage cover.
* Developing an alternative supply capability for **jet fuel** - potentially through the Marsden Point or Mount Maunganui terminals - with the capability to supply **jet fuel** by road and/or rail on a rateable basis.
* Implementing capacity upgrades of the RAP to ensure adequate supply of diesel, gasoline and **jet fuel** are available at the Wiri Terminal.
* Implementing capacity upgrades to the WAP in the short term, and potential duplication in the mid-term, to build diversity of **jet fuel** supply between Wiri and Auckland Airport.
* Development of an emergency supply capability similar to that proposed by Refining NZ (the mobile skid option). Wiri Terminal will, however, need to invest in certain infrastructure in order to be able to receive deliveries of **jet fuel** by truck if the emergency supply capability is to provide more than 20% of Auckland Airport’s demand.
* Implementing the Hong Kong Open Access Operating Model at Auckland Airport. Creating Open Access introduces contestability in the market and may stimulate investment by third parties in new strategic fuel infrastructure to supply the market.

It is expected that implementation of these initiatives will build resilience and enhance **jet fuel** security in the Auckland market. Post implementation of the changes, the jet fuel supply chain will resemble that of Melbourne Airport and the Auckland ground fuels market. That is, supply from multiple terminals using multiple transport modes (pipeline, road, rail).

Open Access to Auckland Airport may attract international oil traders and infrastructure investors to New Zealand to build new fuel supply chain infrastructure. In Australia, the closure of 3 East Coast refineries from 2012 to 2015 created a shortage in the regional refined fuel market which encouraged two of the world’s largest fuel traders to invest heavily in fuel companies and fuel infrastructure.

Conversely, a continuance of Restricted Access at the airport may not stimulate the required investment in strategic fuel infrastructure to build supply chain resilience and reduce liquid fuel security risk.

In addition, specialist global on–airport operators are replacing oil company JUHIs in many parts of Europe and Asia. These organisations do not have to manage the potential conflict of interest between maximising jet fuel margins and optimising investment in strategic fuel infrastructure to build supply chain resilience.

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1. See the Australian Government Productivity Commission’s Draft Report on the Economic Regulation of Airports (February 2019) at 254 (<https://www.pc.gov.au/inquiries/current/airports-2019#draft>). [↑](#footnote-ref-2)
2. At 252. [↑](#footnote-ref-3)
3. The Terms of Reference are accessible at: <https://www.dia.govt.nz/Auckland-Fuel-Line---Terms-of-Reference>. [↑](#footnote-ref-4)
4. Submission 51 – Perth Airport Pty Ltd – Economic Regulation of Airports Public Inquiry (September 2018) at 84. [↑](#footnote-ref-5)
5. For example, Gull Petroleum NZ and Waitomo Petroleum Limited. [↑](#footnote-ref-6)
6. MBIE “Response to 1 April 2019 information request from the Government Inquiry into the Auckland Fuel Supply Disruption” (12 April 2019) at 9. [↑](#footnote-ref-7)
7. Australian Government Department of Environment and Energy *Liquid Fuel Security Review (Interim Report)* (April 2019) at 10 (figure 2). [↑](#footnote-ref-8)
8. IATA Guidance on Airport Fuel Storage Capacity Edition 1, May 2008. [↑](#footnote-ref-9)
9. IATA Guidance on Airport Fuel Storage Capacity Edition 1, May 2008 at Appendix 4. [↑](#footnote-ref-10)
10. <http://www.independent.co.uk/news/uk/home-news/fuel-supply-problems-threaten-flight-chaos-at-manchester-airport-7820809.html> [↑](#footnote-ref-11)
11. <https://www.smh.com.au/national/flight-delays-expected-as-airport-rations-fuel-20050828-gdlykb.html> [↑](#footnote-ref-12)
12. Information accessed from publicly available reports on the incidents and general industry information [↑](#footnote-ref-13)
13. This graph is taken from Hale & Twomey: Jet Fuel System Resilience and Capacity Review (June 2018) at page 8 (Figure 4). [↑](#footnote-ref-14)
14. IATA Guidance on Airport Fuel Storage Capacity Edition 1, May 2008. [↑](#footnote-ref-15)
15. This graph is taken from Hale & Twomey: Jet Fuel System Resilience and Capacity Review (June 2018) at page 8 (Figure 5). [↑](#footnote-ref-16)
16. AIAL has offered a different definition of “peak day’s demand”, being: “…a minimum of 10 days of cover stored near-airport, calculated at 80% of peak period demand at the mid-point of the cycle”. If the words “. at the mid- point of the supply cycle” are removed, Fueltrac would agree. The demand measure “ a minimum of 10 days of cover stored near-airport, calculated at 80% of peak period demand” should apply at **all** points within the supply cycle. If, for example, a jet fuel tank at Wiri is taken out of service for a regulatory inspection, combined jet fuel storage at Wiri and the JUHI reduces by 25%. In Fueltrac’s opinion, the minimum days’ demand cover held at Wiri and the JUHI needs to consider these types of planned events. [↑](#footnote-ref-17)
17. This graph is taken from Hale & Twomey: Jet Fuel System Resilience and Capacity Review (June 2018) at page 8 (Figure 6). Based on the Hale & Twomey forecast, there will be less than 2 days’ cover at the JUHI by 2023 if no further storage capacity is built. [↑](#footnote-ref-18)
18. Response to Schedule 2 Information Request by Refining NZ Section 6, Typical Cycles [↑](#footnote-ref-19)
19. <https://www.energy.gov.au/government-priorities/energy-security/energy-security-assessments/liquid-fuel-security-review> [↑](#footnote-ref-20)
20. <https://www.aip.com.au/about-aip/aip-executives> [↑](#footnote-ref-21)
21. For further information see: <https://energy.govcms.gov.au/government-priorities/energy-data/mandatory-reporting-petroleum-statistics>. [↑](#footnote-ref-22)
22. <https://www.minister.defence.gov.au/minister/cpyne/media-releases/billion-dollar-investment-defence-fuel> [↑](#footnote-ref-23)
23. Submission 51 – Perth Airport Pty Ltd – Economic Regulation of Airports Public Inquiry at 83. [↑](#footnote-ref-24)
24. Submission 51 – Perth Airport Pty Ltd – Economic Regulation of Airports Public Inquiry at 84. [↑](#footnote-ref-25)
25. Information accessible at [www.der.wa.gov.au](http://www.der.wa.gov.au). [↑](#footnote-ref-26)
26. Data Derived using Australian Petroleum Statistics, Issue 264, publicly available announcements and media releases on capacity upgrades [↑](#footnote-ref-27)
27. See the Australian Government Productivity Commission’s Draft Report on the Economic Regulation of Airports (February 2019) at 261 (<https://www.pc.gov.au/inquiries/current/airports-2019#draft>). [↑](#footnote-ref-28)
28. Data Derived using Australian Petroleum Statistics, Issue 264, publicly available announcements and media releases on capacity upgrades [↑](#footnote-ref-29)
29. See the Australian Government Productivity Commission’s Draft Report on the Economic Regulation of Airports (February 2019) at 261 (<https://www.pc.gov.au/inquiries/current/airports-2019#draft>). [↑](#footnote-ref-30)
30. Submission 51 – Perth Airport Pty Ltd – Economic Regulation of Airports Public Inquiry (September 2018) at 82-83. [↑](#footnote-ref-31)
31. Submission 51 – Perth Airport Pty Ltd – Economic Regulation of Airports Public Inquiry (September 2018) at 82. [↑](#footnote-ref-32)
32. <https://bara.org.au>. [↑](#footnote-ref-33)
33. IATA Guidance on Airport Fuel Storage, Edition 1, May 2008 [↑](#footnote-ref-34)
34. <https://www.skytanking.com/en/home.html> [↑](#footnote-ref-35)
35. <https://www.pc.gov.au/inquiries/current/airports-2019#draft> [↑](#footnote-ref-36)
36. At 260. [↑](#footnote-ref-37)
37. At 260. [↑](#footnote-ref-38)
38. At 261. [↑](#footnote-ref-39)
39. At 262-263. [↑](#footnote-ref-40)
40. At 268. [↑](#footnote-ref-41)
41. At 268. [↑](#footnote-ref-42)
42. At 268. [↑](#footnote-ref-43)
43. At 269. [↑](#footnote-ref-44)
44. See the Australian Government Productivity Commission’s Draft Report on the Economic Regulation of Airports (February 2019) at 248 (<https://www.pc.gov.au/inquiries/current/airports-2019#draft>). [↑](#footnote-ref-45)
45. One example of such a third party operator/owner is Skytanking: see <https://www.skytanking.com/en/services.html>. [↑](#footnote-ref-46)
46. See the Australian Government Productivity Commission’s Draft Report on the Economic Regulation of Airports (February 2019) at 261 (<https://www.pc.gov.au/inquiries/current/airports-2019#draft>). [↑](#footnote-ref-47)