Stock on the Water Analysis

Prepared for the Australian Department of Resources, Energy and Tourism and the New Zealand Ministry of Business, Innovation and Employment

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Executive Summary

As members of the International Energy Agency (IEA), Australia and New Zealand have a treaty obligation under the Agreement on an International Energy Program (IEP) to report monthly statistics on oil stocks and to hold oil stocks equivalent to a minimum of 90 days of the prior year’s average daily net oil imports. As member countries of the IEA, Australia and New Zealand also have an obligation to contribute oil to an IEA global collective action in the event of a global oil supply disruption.

The IEP states that stock in “tankers at sea” cannot be counted toward the stockholding obligation (with some specified inclusions). With a long maritime supply chain and isolation from major trading centres, the IEA’s current stockholding methodology disadvantages Australia and New Zealand, because of the significant proportion of stock which is “on the water” and therefore not counted. As a result, Australia and New Zealand are obliged to significantly increase the volume (and cost) of stock held to meet a similar nominal net import target.

The exclusion of all stock on the water ignores that fact that the stock is part of a secure supply chain and useful for responding to supply disruptions. Stock within a country’s EEZ provides a good measure of the stock on the water that is very secure (close to a country) and flexible to respond to disruption (able to be diverted to various ports in country). Counting stock on the water within the EEZ would provide a reasonable balance between acknowledging that Australia and New Zealand will always require some stock on the water and acknowledging that this stock is useful in supply disruptions.

As the definition for counting stocks within a country’s EEZ is unclear in the IEP methodology, arguably this stock could be counted without a formal change to the rules for counting total stocks. As most IEA countries have much smaller maritime supply chains and much smaller EEZs, the change will not undermine the stock measurement basis for IEA countries stocks as a whole.

Australia and New Zealand both have about a quarter of the stock owned by locally based companies on the water (15 to 20 day’s supply for each country). For Australia about 36% of stock on the water is estimated to be within its EEZ; for New Zealand the portion is 10%.

The stock on the water is all owned and controlled by locally based companies and the method of securing supply in this region ensures stock is securely intended for each country’s market. The regional factors include (in contrast with Atlantic basin trading regions):

- A trading period for crude and product that occurs well in advance of loading (6 to 9 weeks) which results in a known and reliable supply chain;
- Little short term trading activity in the region meaning cargoes stay as planned;
- Product specifications that vary from most of the region (either by quality or season) and multi-product cargoes that mean cargoes are specifically suited for the planned destination;
- Distance from other demand centres which mean any changes to voyages once on the water are very expensive; and
- No in-country (or near country) market provided by producers, merchant refiners or traders holding stock which provides short term liquidity to the markets in the Atlantic Basin.

While secure under the control of locally based companies, the marine supply chain provides flexibility in responding to disruption events as ship discharges can be managed to ensure all available buffer stocks can be used as contingency. The 15-20 days of stock on the water also delays any impact from any disruption, giving countries time to make internal decisions for responding to any disruption.
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Glossary

Geographical area/country acronyms

- ME: Middle East (e.g. Saudi Arabia)
- MED: Mediterranean (e.g. Libya)
- PNG: Papua New Guinea
- SEA: South East Asia (e.g. Brunei, Indonesia, Malaysia)
- WAF: West Africa (e.g. Nigeria)

Other acronyms

- EEZ: Exclusive Economic Zone - a marine zone up to 200 nautical miles from a country’s coast defined in the UNCLOS
- FOB: Free On Board, a term of trade indicating that ownership of cargo passes to the buyer once the cargo passes the ships rails at the port of shipment
- FPSO: Floating Production Storage and Offloading unit: an offshore installation producing crude where the crude oil is stored until shipment
- IEA: International Energy Agency
- IEP: International Energy Program

Definitions

- Break-bulk: To consolidate cargo in one location and load on a subsequent vessel with other cargoes to its final destination
- Bunkers: Fuel used to power vessels (heavy fuel oil for the vessel’s main engines or marine diesel oil for the auxiliary engines)
- Dated Brent: Market price for physical Brent Crude oil commonly used as a benchmark for pricing other crudes
- Demurrage: Charges incurred by the charterer of a vessel for using the vessel beyond the agreed timeframe
- Feedstock: Crude and other stock used in a refinery to produce refined products
- Import ‘slate’: A slate is the mix of crude/products required for imports to meet demand
- Merchant refinery: Independent refinery not attached to oil majors
- Spot arrangements: Spot arrangements are short term (usually one-off) transactions for the purchase of crude or products (as opposed to ‘term arrangements’)
- Term arrangements: Longer term contracts for the purchase of crude or products over a period (as opposed to ‘spot arrangements’)

1.0 Introduction

As members of the International Energy Agency (IEA), Australia and New Zealand have a treaty obligation under the Agreement on an International Energy Program (IEP) to report monthly statistics on oil stocks and to hold oil stocks equivalent to a minimum of 90 days of the prior year’s average daily net oil imports. As member countries of the IEA, Australia and New Zealand also have an obligation to contribute oil to an IEA global collective action in the event of a global oil supply disruption.

The IEP states that stock in “tankers at sea” cannot be counted toward the stockholding obligation (with some specified inclusions). With their long maritime supply chain, the IEA’s current stockholding methodology may disadvantage Australia and New Zealand, thereby increasing the volume and cost of stock these countries are required to hold.

This paper investigates the typical quantity of stock both Australia and New Zealand hold in the category of "tankers at sea" and where the stock is typically located by assessing the route between the source location and the destination for import tankers.

The way in which petroleum supply is contracted by Australian and New Zealand companies is then reviewed with the differences with the situation in most other IEA countries (particularly those in Europe and North America) highlighted.

Using the analysis of stock on the water and the differences in supply contracting, arguments are then considered as to why the maritime supply chain provides security for Australia and New Zealand and why some or all of this volume should be included in each country’s oil stocks that are counted towards their IEA obligations.

2.0 Summary of current stock on the water rules

The annex to the IEP outlines the basis for calculating total oil stocks. Article 1 lists the stock types that can be included and excluded. With regard to stock on the water the inclusions and exclusions are:

**Table 1: Stock on the water included/excluded in total stocks calculation**

<table>
<thead>
<tr>
<th>Stocks included</th>
<th>Stocks excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td>In barges</td>
<td>In seagoing ships’ bunkers</td>
</tr>
<tr>
<td>In intercoastal tankers</td>
<td>In tankers at sea</td>
</tr>
<tr>
<td>In oil tankers in port</td>
<td></td>
</tr>
<tr>
<td>In inland ship bunkers</td>
<td></td>
</tr>
</tbody>
</table>

The Monthly Oil and Gas Questionnaire\(^1\) (MOS) that IEA members are required to complete clarifies the split further. This definition is:

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\(^1\) Organisation for Economic Co-operation and Development, International Energy Agency, Committee for Energy Policy, Monthly Oil and Gas Questionnaire (November 2010)
Stocks held on board incoming ocean vessels in port or at mooring (Category f): Include stocks irrespective of whether they have been cleared by customs or not. This category excludes stocks on board vessels at high seas. It includes oil in coastal tankers if both their port of departure and destination are in your country. In the case of incoming vessels with more than one port of unloading, only report the amount to be unloaded in your country. (Table 5, Stock Levels, f, pg. 12).

The stocks on national territory are defined as follows:

(a) All stocks on national territory: Include stocks held by all importers, refiners, stock holding organisations, governments and major consumers, whose stocks are subject to government control. (Table 5, Stock Levels, a, pg. 12).

The stocks on national territory also include stocks held as part of floating offshore production that are in a country's exclusive economic zone (EEZ).

The definition for counting of stocks is designed to be consistent with the counting of petroleum imports/exports which is defined as follows:

Imports and Exports: Data should reflect amounts having crossed the national territorial boundaries, whether customs clearance has taken place or not. (Table 1, Supply of Crude Oil, NGL, Refinery Feedstocks, Additives and other Hydrocarbons, 5/6).

2.1 Inconsistencies

The methodology outlined above leads to some inconsistencies in counting a country's total stock.

For instance:

- Stocks located on floating offshore production facilities, located within a country's EEZ are eligible for counting, but stocks located on import or export ships in the same location are ineligible;
- Stocks are eligible for counting in a host country (if a member of the IEA), up until they commence transit, become ineligible until reaching the owner country, and are then eligible again;
- Stocks are eligible for counting during intercoastal shipping between two ports, but are ineligible for counting for an import ship in the same location if that ship has not yet arrived in a port of that country. This results in cases where a ship that bypasses a port cannot be counted, but would be eligible if the ship had entered that port, regardless of whether any loading or unloading of stocks occurred;
- Imports and exports are counted when they cross national territorial boundaries (normally 12 nautical miles from coast) but stocks don't get counted until arrival in port; and
- Stocks are to be excluded if the import tanker is "at high seas" but included if they have arrived at port; Section 2.2 notes that "high seas" are officially defined as outside a country's EEZ so stocks within a country's EEZ and/or territorial waters are outside either category.

Some of these inconsistencies have arisen since the IEP methodology was established in the 1970s following changes to marine definitions in the UNCLOS which came into force in the 1980s. The following section summarises the changes in maritime definitions.
2.2 Maritime definitions

Since the IEP Agreement was agreed in 1974, UNCLOS has been concluded (1982) and come into force (1994). This convention defines the rights of all countries to the sea and particularly the rights of coastal states to their territorial waters (up to 12 nautical miles from the coast) and exclusive economic zones (up to 200 nautical miles from the coast). The exclusive economic zones (EEZ) were not in place when the IEP Agreement was put in place so the definitions reflect only territorial waters (count stocks once they have crossed) and high seas (don’t count stock unless on an intercoastal tanker).

The UNCLOS defines high seas as "all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State." (Article 86). Therefore the definition of the total stocks methodology leaves a gap in that stock within a country’s EEZ does not fall into the included (arrived at port) or excluded (on high seas) categories.

Within its EEZ, a country has "sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds;" (Article 56 1 (a)).

3.0 Calculation of typical stock on the water quantities

This section calculates the amount of stock owned by domestically based companies in Australia and New Zealand that is “on the water” and excluded from the calculation of total stocks as defined by the IEA. The methodology is designed to calculate only the stock on the water that is currently excluded from the calculation, not those categories of stock on the water that can be included in total stocks.

3.1 Methodology

Both Australia and New Zealand collect petroleum import, export and stocks data (on a voluntary basis currently although Australia is introducing mandatory reporting). The stocks data is collected from companies in a way to ensure it is consistent with the IEA stocks methodology – i.e. stock on import tankers is not included.

While all import ships are captured for both countries, the actual amount of stock on the water is not reported routinely or comprehensively. Because of this, H&T have developed a model which uses imports over a period and source country to calculate the amount of stock on the water. This provides a high level, transparent way to calculate stock on the water without detailed data gathering or data verification exercises. The model’s methodology is as follows:

1. All petroleum imports over a period are collected by source country and product type (Australia and New Zealand both have reliable import data).

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2 For Australia the period July 2011 to June 2012 year was analysed; for New Zealand the 2012 calendar year was analysed.
2. The import demand by destination is analysed over the same period to establish the demand locations (differentiated between crude and product and particular product types in some cases).

3. Shipping distances between supply source and destination are calculated using Worldscale and Q88¹ and converted into voyage time.

4. The stock on the water is calculated by calculating the volume over each route and the voyage time.

5. Each voyage is analysed as to time the vessel is likely to be within a country’s EEZ (within 200 nautical miles).

The advantage of this methodology is that it gives the typical stock levels on the water for each country rather than the stock at a particular point of time. It also allows us to analyse the voyage routes to look at where much of the stock is located (i.e. some distance from the country or relatively close to the country’s coast).

This methodology also has the benefit of automatically excluding any crude or product that is being transported between ports within the same country. These stocks should be captured in the currently reported stocks as they are allowed to be included under the current IEA methodology. It also excludes stock as soon as it has arrived in a port even if there is some time before it is discharged. Any crude or product in this category can also be included in the current IEA methodology for total stock.

The source location of the some crude is from non-crude oil producers (e.g. Singapore, South Korea). In this case, crude is being purchased in these locations from companies storing crude (so only the voyage after purchase is included). Companies can also break-bulk crude oil where crude is initially shipped to a break-bulk location where it is transferred on to a smaller ship (possibly co-loaded with another crude) for on shipment to Australia/New Zealand. In this case, companies can own the stock on both voyages. The methodology will generally under predict stock on the water in this case as it calculates direct voyages rather than via break-bulk locations. It also does not account for ships loading part cargoes from two different supply ports which will add time to shipping journeys.

To partially take account of these factors, we have modelled an average shipping speed of 12.5 knots, slightly lower than the normally deemed maximum ship speed (14 knots). The lower speed also takes account of the fact that ship speed can be restricted in certain locations and by bad weather⁴.

The model methodology was outlined in a questionnaire to the major oil companies in Australia and New Zealand. They all agreed that the methodology would provide an accurate high level assessment of typical stock on the water for each country.

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³ Worldscale publish freight rates (including distance) for standard oil tanker voyages between any ports in the world. Q88 provide registers of ship details and other related information such as shipping distances between ports.

⁴ Oil company feedback included advice that 12-13 knots was an appropriate speed to use to calculate actual journey time.
3.2 Australia

Australia’s current mix of petroleum imports is about 59% crude and 41% products\(^5\). The percentage of product imports will increase over the next few years as those refineries announced for closure are shut down.

Crude imports make up 80% to 85% of the refinery intake with crude sourced from South East Asia (43%), West Africa (20%), Middle East (16%), New Zealand/Papua New Guinea (12%) and various other countries\(^6\). The time crude is on the water varies from four days to nearly 30 days with the average voyage being 16 to 17 days.

Product imports come primarily from Singapore (60%) supplemented by South Korea/Japan (25%) and a mix of minor suppliers. Over time, as total product import volumes increase it is expected that the proportion of total supply from Singapore will reduce (although still increase in actual volume)\(^7\). LPG is an exception where imports come primarily from the Middle East. The average time product imports are on the water is 12 days (varying between 4 and 23 days). The shorter journey time for product reflects both closer supply locations and some product import demand in the north of Australia whereas the bulk of the crude demand is in the south-east, further from the source locations.

The total volume of import stock on the water has been calculated by the model at 1,653 ktonnes (split between 67% crude and 33% product). The reported stock in Australia over the same period is 5,130 ktonnes. Therefore, if total stocks inclusive of stock on the water are calculated, stock on the water would make approximately one quarter of total stocks (or alternatively, currently reported stocks are only 75% of the stock owned by Australian based companies). For the downstream companies that refine and market petroleum products, the proportion of their stock on the water is even higher (approximately 30%), as some of the reported stocks are held by crude oil producers where all the stock on the water is owned by the downstream companies.

The stock on the water has been further analysed by looking at shipping routes and how much of each voyage is likely to be within Australia’s EEZ. Australia is geographically large, with the key demand centres in the south-east of the country. Most imports (both crude and product) travel a considerable period of their voyages along the Australian coast within the EEZ (as shown in Figure 1). Australia’s EEZ is shown in Appendix 1.

\(^5\) All proportions based on year from July 2011 to June 2012
\(^6\) Includes Russia and countries in the Mediterranean such as Libya.
\(^7\) National Energy Security Assessment (NESA) Identified Issues: Competitive Pressures on Domestic Refining pg. 18
Figure 1: Australian import voyages

Figure 2 illustrates the stock Australian based companies own on the water, split between stock within Australia’s EEZ and beyond the EEZ. In total we estimate about 36% of the stock on the water is within the EEZ. This percentage of stock on the water that is relatively close to the country is likely to be significantly higher for Australia than any other IEA country.

Figure 2: Australia – breakdown of total stock including stock on the water

For this calculation we have include all the voyage time from a vessel likely first entry point to Australia’s EEZ (excluding the EEZ around Christmas, Cocos and Keeling Islands).

Period analysed for the stock breakdown is July 2011 to June 2012.
* The IEA target is adjusted to be shown as an equivalent physical tonnes level to compare with the physical inventories. This takes into account that when reporting to the IEA, inventories are adjusted for product yields and a 10% deduction for unavailable emergency stock.
Figure 3 and Figure 4 break down crude and product stock on the water by source country (in tonnes) split between that within the EEZ and that beyond the EEZ (by percentage). The area of each pie chart is relative to the proportion of the total stock on the water from each location.

**Figure 3: Australia - crude stock on the water**

- **SEA**: 326 kt (58%)
- **WAF**: 357 kt (27%)
- **MED**: 79 kt (22%)
- **PNG**: 21 kt (58%)
- **Russia**: 47 kt (19%)
- **NZ**: 20 kt (16%)

**Figure 4: Australia - product stock on the water**

- **Singapore**: 267 kt (48%)
- **Japan**: 89 kt (20%)
- **Korea**: 87 kt (19%)
- **ME**: 34 kt (36%)
- **Others**: 60 kt (38%)

*Note that the proportion of stock on the water from a location will be different than the proportion of total imports as those locations further from Australia will have more stock on the water for the same import volume.*
In summary, Australia has a significant proportion of the stock owned and controlled by Australian based companies on the water and excluded from the current IEA methodology of counting total stocks. Much of this stock is relatively close to Australia’s coast. It is also worth noting that 60% of Australia’s product imports come from Singapore which, while not an IEA country, does have close economic and diplomatic ties with Australia. In addition 28% of the total imports come from other IEA countries (South Korea, Japan and New Zealand).

3.2.1 Forecast changes in stock on the water

Since the period analysed in the stock on water calculation (July 2011 to June 2012) the Clyde refinery in Sydney has closed. Caltex has also announced the closure of the Kurnell refinery in Sydney which will take place in 2014\textsuperscript{10}. These changes will shift the import slate from crude to product so that product imports volumes (~56%) will exceed crude (~44%).

While the current average crude voyage is 16 to 17 days and the average product voyage is 12 days, analysis of the Sydney market (which will now be supplied by imports) is that the typical crude journey for the crudes currently consumed there is similar to the current average (16 to 17 days). However the product import journeys will be longer as Sydney is further south than the current average import destination and the mix of supplying countries will generally be further afield (North Asia and India increasing in proportion). We estimate that the typical journey time for product supply into Sydney will be similar to the crude it replaces.

As the two refineries run a small portion of domestic crude, the volume of product imports will actually be a bit more than the crude imports being backed out. Therefore with similar journey times we expect a small increase in stock on the water following the refinery closures.

3.3 New Zealand

New Zealand has a higher proportion of crude imports with 76% of imports being crude and only 24% product. Again, very long marine journeys are required with the average crude journey being 20 days (varying between 5 and 32 days) and the average product journey being 17 days (varying between 5 and 21 days).

While New Zealand is smaller than Australia, it still has a long coast line and therefore a large EEZ that import vessels travel through on their way to the destination ports. The bulk of New Zealand’s crude imports and a reasonable portion of product imports come around the south of Australia so also spend some time in Australia’s EEZ on the voyage to New Zealand.

The total volume of import stock on the water has been calculated by the model at 379 ktonnes (split between 78% crude and 22% product). The reported stock in New Zealand over the same period is 1,155 ktonnes so if total stocks inclusive of stock on the water are calculated, stock on the water would make approximately one quarter of total stocks (or alternatively currently reported stocks are only around 75% of the stock owned by New Zealand based companies). For the downstream companies that refine and market petroleum products, the proportion of their stock on the water is even higher (approximately 30%), as some of the reported stocks are held by crude oil producers where all the stock on the water is owned by the downstream companies.

\[^{10}\text{Caltex Australia Media release 28 September 2012}\]
Figure 5 shows the amount of stock New Zealand based companies are holding in addition to those reported to the IEA. In New Zealand’s case, with longer marine journeys and a smaller EEZ, the proportion of stock on the water within the EEZ is only about 10%.

**Figure 5: New Zealand – breakdown of total stock including stock on the water**

Period analysed for the stock breakdown is the calendar year 2012.
* The IEA target is adjusted to be shown as an equivalent physical tonnes level to compare with the physical inventories. This takes into account that when reporting to the IEA, inventories are adjusted for product yields and a 10% deduction for unavailable emergency stock.

Figure 6 and Figure 7 show the stock on the water by source country (in tonnes) and split between those within New Zealand’s EEZ and those outside (by percentage). While New Zealand has a smaller proportion of its stock on the water within its EEZ, approximately 40% of the stock on the water is within the wider Australian/New Zealand marine zones.
Figure 6: New Zealand - crude stock on the water

- ME: 168kt, 8%
- Asia: 120kt, 11%
- Others: 10kt, 13%

Within EEZ
Outside EEZ

Figure 7: New Zealand - product stock on the water

- Singapore: 47kt, 12%
- Korea: 23kt, 11%
- Others: 5kt, 14%
- US: 6kt, 19%

Within EEZ
Outside EEZ
3.3.1 Forecast changes in stock on the water

Refining NZ, the operator of the only refinery in New Zealand, has announced investment in expanding its petrol making facilities due for commissioning in 2015\(^1\). The investment is likely to increase petrol production through improved yields and less down time. Therefore there should be a small reduction in net imports (less petrol imports, slightly more crude imports) which should result in a marginal reduction in stock on the water (1-2%).

3.4 Summary

In summary, Australia and New Zealand both have about one quarter of the stock in their supply chains excluded from the IEA calculation for total stocks. This stock on the water represents between 15 and 20 days’ supply of total market demand. We are unsure if there are equivalent statistics for other IEA countries, but would expect this proportion to be much lower in other countries (especially those in Europe and North America).

4.0 Petroleum supply contracting in Asia-Pacific

Australian and New Zealand companies secure their supplies within the Asia-Pacific petroleum market although the actual supply comes from as far afield as West Africa and the Middle East. The Asia-Pacific market, centred on Singapore, is part of the global trading system for crude and products with the other large trading regions being Europe (centred on Rotterdam) and North America (centred on the Gulf Coast and the linked inland markets).\(^2\) While the markets are all linked and crude and product travels between the trading regions, each region trades in a different way influencing how market participants in those regions secure supplies.

For the Asia-Pacific region, compared to the markets around the Atlantic basin (those servicing Europe and North America), the most significant differences in securing supply is the earlier commitment to cargoes, the greater proportion of supply through "term" arrangements rather than "spot" and the relative lack of near term trading opportunities as cargo arrivals get firmed up into manufacturing plans. With their distance from major trading routes and sources of crude oil, these differences are even more pronounced for Australian and New Zealand based companies.

These differences impact on how companies in Australia and New Zealand regard their arrangements to secure supply and how producers of oil and condensate trade their production. This then flows through to how the maritime supply chains are managed.

4.1 Trading timeline

The trading period for crude and product cargoes takes place earlier in the Asia Pacific region. With so much of the region supplied by long haul crude (primarily Middle Eastern and West African, although some North Sea crude is also traded) and the dispersed demand centres, the whole market trades on an earlier time frame.

\(^2\) There are a number of other trading centres; this paper concentrates on the largest ones and those servicing IEA countries.
As shown in Figure 8, crudes trade between six and nine weeks in advance of loading and combined with the shipping time means cargoes are locked in two to three months before they arrive in Australia/New Zealand.

By contrast, although long haul crude is part of the European supply mix, there is short haul availability and a liquid local market that trades two to four weeks prior to loading (Dated Brent is based on reported trades between 10 and 25 days prior to loading). As this crude is short haul to regional destinations (a few days in many cases), many refineries can choose to hold off committing to their full crude slate to less than a month before it is required. Similarly the US crude market has a lot of domestic and regional short haul crude that can be traded in a much shorter time frame around the long haul crude coming into the region.

While Australia and New Zealand both produce crude, this crude is traded on the same timing as shown in Figure 8 whether it is being sold to domestic refineries or exported. This means there is no "local" or near term crude market to make late decisions for supply and manufacturing.

Products also trade well in advance of loading in the region with little short term trading. Generally cargoes are locked in at least six weeks before loading with a 1 to 3 week voyage to destination after loading. For Australia and New Zealand, the requirement to lock in the product import slate early is also influenced by having product specifications that are different to most other countries in the region, and that mixed product cargoes are often required.

The shipping market for crude and product also trades two to four weeks prior to loading providing further stability to the supply chain.

For this region, this trading timeline and the lower level of short-term flexibility means the supply chain needs to be locked in much earlier in order to provide more stable and secure supply:

- the market is making ‘make or buy’ decisions much earlier; refineries need to know what they are running because their own manufacturing sales plan is determined by the market operating within these time frames – if they don’t do this they may be short (buying in a market with limited availability) or long (generally resulting in demurrage or distressed sales due to the lack of storage options in country);

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13 Even countries in the region that have similar specifications to Australia and New Zealand, (e.g. Japan, Korea) the seasonal specifications are always different due to the different hemispheres.
generally a far greater proportion of the supply is contracted through longer "term" arrangements as it is too risky to rely too much on "spot" trades given the limited availability; and

there is little ability to trade in the near term including limited risk management flexibility to successfully hedge optimisation decisions.

By contrast, in major markets around the Atlantic Basin there is:

- much greater geographic concentration of demand resulting in a greater provision of infrastructure (e.g. storage, merchant refining) for trading activities that provides short term liquidity to the market;
- significant volume of short haul crude (within a few days sailing) that gives flexibility to optimise and make short term decision to manufacture or not; and
- trading companies providing liquidity to the physical market with the ability to risk manage positions in paper markets.

4.2 Lack of near term trading opportunities

Manufacturing decisions by refiners involve choosing the right balance of feedstock to meet the manufacturer’s market demand. Hence the product slate to be produced is defined within similar timeframes. There may be flexibility to rely on product stock held by others but that flexibility is tested against the ‘make or buy’ decision and hence is still subject to the same timeframe conditions.

In addition to locking the crude and product slate well in advance of requirements, in this region there is less ability for companies to trade short term cargoes for optimisation. There is little in the way of a short term market and hence manufacturers will want to be sure that they have adequate cover for their market demand. Once these decisions are made commitments to marketers are also made.

This is especially the case for Australia and New Zealand which are a long way from the trading centres. In most trading centres there are traders and producers who hold crude and products that can be traded on a short term basis. The centres, such as Rotterdam, Singapore and US Gulf Coast, have the large storage facilities that enable this trade to take place.

Australia and New Zealand have no such facilities in-country or any nearer than Singapore which is an 8-14 day voyage from the manufacturing locations in Australia and a 16 days voyage from New Zealand. They significantly increase supply risk if they rely on trading companies or producers filling any gaps in their slate or managing the variation if demand is different than forecast. This has to be managed internally with cargoes adjusted in advance of loading within the limits of the suppliers’ facilities.

Australia and New Zealand can also be characterised as concentrated demand centres that are spread around the country but isolated from each other. Unlike North America or Europe there is no pipeline network linking these centres (or barge trade as in Europe). The road distances are also substantial meaning road transport cannot be relied on to manage disruption. With few internal links, this limits the attractiveness of storing oil on land - in all likelihood it will not be where it will be required. Having stock on water actually provides much greater flexibility to respond to disruption as it can be quickly relocated to where it is required. Companies can and do use their marine supply chains this way.

As noted in Section 4.1, local crude production trades one to two months before loading whether being sold locally or exported. Therefore companies cannot rely on local crude production to cover
any gaps in their crude slate. As both countries import product there is no supply of excess product in Australasia (except for a small volume of fuel oil that is exported from New Zealand to Australia) and there are no merchant or trading refineries providing liquidity to the products markets as in other regions.

4.3 Ownership and control of cargoes

Virtually all Australian and New Zealand based companies take ownership (title) and risk to their crude and product cargoes at the port where it is loaded onto the ship transporting it (FOB purchase). This means all import cargoes on the water are owned and controlled by locally based companies. Because of the long voyage times this means that at any given time, companies hold a significant amount of their stock as stock on the water.

Ownership of cargoes, in addition to the lack of near term trading opportunities in the region, means that cargoes hardly ever get traded once on the water, which is a more regular feature of markets operating in the Atlantic Basin. Even in the month leading up to loading, changes are unusual or occur only in the case of upset or exigencies that commonly occur in the shipping market (e.g. delay at previous ports). On the few occasions there are changes, these tend to be adjustments in loading date or cargo segregations rather than anything more major.

Another reason product cargoes are not traded is that Australia and New Zealand have quite different product specifications from their near neighbours (those countries between Singapore and Australia/New Zealand). There is no common grade like Europe, which makes it is easier to change the destination from one country to another.

A similar factor is that Australia and New Zealand receive a lot of mixed product cargoes - these are tailored to the specific markets (and destination) they are intended for and are unlikely to be feasible alternatives for other locations.

4.4 Flexibility of the marine supply chain

Marine supply chains are very flexible, despite their long lead-time. Unlike a pipeline where product will stop flowing out of a pipeline as soon as product stops going into it, vessels will keep arriving even if supply is disrupted. With numerous cargoes on-water at all points in time, the supply chain can become non-linear (you do not have to wait for cargo A to discharge before loading cargo B). This allows maximum flexibility between final destinations, and allows all buffer stock across various ports to be used as contingency as cargoes are re-optimised to where they are required most. Ships once empty can be used to transport product around the coast to cover any infrastructure disruptions.

The marine supply chain is also flexible because it is diverse in source. If there is a disruption in one location (e.g. Middle East) more supplies can be obtained from other locations to replace some of the disrupted volume - if the voyage is shorter than the one being replaced that gives additional time to cover the disruption.

As noted in Section 4.2, the geography of Australia and New Zealand and the lack of land based interconnections between demand centres also means that marine stock can provide a much more flexible and fast response to disruption than stock on land that may not be where it is needed.
4.5  Company Feedback

In the questions sent to the main petroleum companies in Australia and New Zealand, they were asked if they have ever had cargoes diverted to other countries once on the water and how often their import slate changed once it was locked in six weeks out. Feedback included:

- Once loaded, cargoes have only ever been sold if the local company chose to because of a major refinery disruption (i.e. they no longer needed the crude). Even in these circumstances it was more common to keep the cargo and incur demurrage on the ship to avoid losses on selling a cargo which would now be “distressed”.
- On one occasion in the past few years, related companies in Australia and New Zealand have worked together to use part of a cargo intended for one country to help cover a shortage in another country. This was only done as the cargo owner could do this without compromising its inventory position (i.e. the cargo owner made the decision). As related affiliates often load product from the same refinery there can be some adjustment between their cargoes prior to loading as well.
- The changes made in the six weeks prior to loading are typically minor adjustments in grade splits and changes to load dates if possible to respond to other upsets which affect product supply (e.g. bringing an import forward to cover a refinery upset).
- There have on a couple of occasions where there has been a major disruption to a supplying refinery (Japanese 2011 tsunami was the most significant). In this case cargoes had to be replaced by securing alternative supply. It is possible to secure product cargoes in a shorter timeframe (about 3 weeks before loading) but at a significant cost.
- Companies do change destinations within country (e.g. switching crude between owned refineries or changing product destination ports) to help manage disruption or optimise supply.

4.6  Impact on the maritime supply chain

In summary, the way the regional market trades in Asia-Pacific, and Australia and New Zealand’s distance from the trading centre, results in the marine supply chain being:

- Contracted and secured well in advance (one to two months of loading);
- Supplied by a high proportion of crude and product contracted on a “Term” basis;
- Not subject to change through late trading for optimisation or any other reason;
- Controlled by the locally based companies;
- Operating to a reliable and constant profile; and
- Flexible when responding to disruptions.

5.0 Arguments for counting stock on the water

The reasons for the IEA excluding stock on the water are not fully spelt out although the arguments include:

- Like pipelines they are an essential part of the supply chain that needs to be there for it to function so are not useable in an emergency response;
- They are not secure in that they are not in a country’s “national territory” and/or they are at “high seas”; and
- They are not secure in that they might be traded to a buyer who is willing to pay more.

We cover these issues in this section.
## 5.1 Volume of stock on the water

As calculated in Section 3, both Australian and New Zealand based petroleum companies have a significant proportion of the stock they own in the category of stock on the water which is excluded from the calculation of a county’s total stocks. The large amount of stock on the water is a result of both countries’ near total reliance on maritime supply and their relative isolation from both other large petroleum consumers and supply locations. With that dependence on shipping, the maritime supply chain becomes a key component of both countries’ supply and the security of that supply.

Given the flexibility of the maritime supply change to respond to disruption, its total removal from counting in a country's security stock is not accurate as it is a key component of response options for supply disruptions. With their high relative proportion of stock on the water, Australia and New Zealand are adversely affected by its removal as this results in each country needing to hold higher physical levels of stock to reach the same nominal target as measured by the IEA methodology.

## 5.2 Ownership/security of cargoes

As covered in section 4.3, the companies servicing the Australian/New Zealand market own virtually all the stock on the water. Even for the multinational companies whose supply is arranged by their trading arms, the local affiliate purchases the cargo at load port. Once on the water any decision on what happens to the cargo is controlled by the local affiliate. Due to the isolated location, product specifications and lack of near term trading opportunities cargoes loaded for the countries are always received.

Therefore we would characterise the marine supply chain to Australia and New Zealand as very secure and being owned by locally based companies ultimately under the influence of the respective governments.

## 5.3 Flexibility of the marine supply chain

The maritime supply chain is not like a pipeline where stock is always required in the pipeline for operation and not usable in an emergency. Stock on water would be used by Australia and New Zealand in any major IEA declared emergency. In the first instance it would give time to the countries to make internal decisions on demand responses (it will be 15-20 days before any disruption impact is felt at the earliest); it could also be distributed more widely to smooth any impact across the country; ultimately it could be sold/shared with other IEA countries if they were more adversely affected by the emergency.

To exclude all stock on the water on the principle that stock on the water is always needed as part of the supply chain ignores the flexibility that the stock provides and adjustments that can be made to that part of the supply chain in an emergency.

The only recent IEA event that Australia and New Zealand were both requested to respond to by the IEA was following Hurricane Katrina in 2005. In this instance no cargoes were diverted (due to the distance from the event) although we understand at least one product cargo was delayed so additional supply could be sent the US Gulf to help with the shortage there.
5.4 Counting a portion of stock on the water

The stock on the water that is most secure and useful to respond to disruption is that which is close to the country. Stock within a country’s EEZ provides a good measure of the stock on the water that is very secure (close to a country) and flexible to respond to disruption (able to be diverted to other ports in the country). Counting stock on the water within its EEZ would provide a reasonable balance between acknowledging that Australia and New Zealand will always require stock on the water in their supply chains and acknowledging that that stock is useful in emergency response.

As the definition for stocks within a country’s EEZ is unclear, arguably this could be counted without a formal change to IEA rules for counting total stocks. As most IEA countries have much smaller maritime supply chains and much smaller EEZs, it will not undermine the measurement basis for IEA countries’ stocks as a whole.

The following includes relevant parts of the UNCLOS covering the exclusive economic zone and high seas.

PART V
EXCLUSIVE ECONOMIC ZONE

Article 55
Specific legal regime of the exclusive economic zone

The exclusive economic zone is an area beyond and adjacent to the territorial sea, subject to the specific legal regime established in this Part, under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by the relevant provisions of this Convention.

Article 56
Rights, jurisdiction and duties of the coastal State in the exclusive economic zone

1. In the exclusive economic zone, the coastal State has:
   a. sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds;
   b. jurisdiction as provided for in the relevant provisions of this Convention with regard to:
      i. the establishment and use of artificial islands, installations and structures;
      ii. marine scientific research;
      iii. the protection and preservation of the marine environment;
   c. other rights and duties provided for in this Convention.

2. In exercising its rights and performing its duties under this Convention in the exclusive economic zone, the coastal State shall have due regard to the rights and duties of other States and shall act in a manner compatible with the provisions of this Convention.

3. The rights set out in this article with respect to the seabed and subsoil shall be exercised in accordance with Part VI.

PART VII
HIGH SEAS

SECTION 1. GENERAL PROVISIONS

Article 86
Application of the provisions of this Part

The provisions of this Part apply to all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State. This article does not entail any abridgement of the freedoms enjoyed by all States in the exclusive economic zone in accordance with article 58.
Australia's Maritime Jurisdiction
**New Zealand’s Maritime Jurisdiction**

**FIGURE 11.1:**

**NEW ZEALAND’S MARINE AREA**

- Territorial sea (12-mile limit)
- Exclusive Economic Zone
- Extended continental shelf
- Outer limits of the extended continental shelf
- New Zealand–Australian 2004 delimitation treaty

Data source: National Institute of Water and Atmospheric Research.