

National Energy Security Assessment (NESA) Identified Issues: Australia's International Energy Oil Obligation

Prepared for Department of Resources, Energy and Tourism

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Executive Summary

Australia is a member of the International Energy Agency (IEA) where, as a signatory to the Agreement on an International Energy Program (the "IEP Agreement"), it benefits from the coordination of crude oil and petroleum product supply in the event of a major disruption to international oil markets. Under the IEP Agreement, member countries accept a treaty obligation to hold crude oil and petroleum product stocks equivalent to a minimum of 90 days of the previous year's daily net import demand and participate in collective actions initiated by the IEA during a liquid fuel emergency.

Since December 2009, Australia has regularly breached the minimum inventory obligation set by the IEA. With local production of crude and condensate falling and petroleum demand increasing, the commercial stocks held by market participants are no longer sufficient to cover the minimum obligation which is based on 90 days of the daily net imports. The Bureau of Resources and Energy Economics (BREE) is forecasting the expected shortage of stock against the 90-day target to increase from the current level of 1.4 million tonnes, to around 3.3 million tonnes in 2016 and 6.6 million tonnes in 2022. These are substantial volumes with current commercial stocks in Australia reported to be between 5 and 6 million tonnes. The forecast can change significantly with changes in demand and domestic production assumptions.

This report looks at options for holding emergency stock to return Australia to compliance. It does not consider the economic benefits of the additional stock or the benefits to Australia from being in compliance with its international obligations.

Emergency Stockholdings

Emergency stocks are usually held in two ways. They can be held as physical stocks in storage facilities dedicated to holding emergency stocks. The storage facilities are often normal petroleum tank farms although for very large facilities other storage methods are used such as salt caverns, in-ground tanks or floating storage.

Alternatively, emergency stocks can be held through option contracts referred to as tickets. In this case the organisation wanting emergency stock purchases an option to buy stock from a stock owner. The option can only be exercised in an emergency, with the option holder able to buy the stock at market prices. The purchaser of the ticket is able to count the stock as part of its obligation and the seller of the ticket has to subtract any ticket sales from their stocks. When these are between organisations in different countries these are referred to as bilateral tickets and they are backed by government-to-government agreements between both countries that give support to the structure (the ability to hold and count stock in the other country and no impediments if the purchase is exercised).

Responsibility

The responsibility for holding emergency stocks can sit either with the government or industry. If industry has responsibility, this is done through the government setting an obligation on industry to hold a certain level of stock (normally expressed in days of imports or days of sales). Many countries set up a dedicated stock agency to manage stock although this report treats that as a subset of the base choice between government and industry.

Option development

Although there are two prime methods of holding stock and two options for responsibility, a combination of options can be used for the emergency stockholding strategy. These combinations

are illustrated in the following table along with indications on cost and complexity involved in operation of the stockholding. Indications of which IEA countries use which option are also given.

	Ticket Stocks	Tickets and physical stocks	Physical Stocks
Government owned	Option 1 (e.g. New Zealand)	Option 2 (e.g. Ireland)	Option 3 (e.g. US, Germany)
Combined government and industry obligation	Option 4	Option 5 (e.g. France, Netherlands)	Option 6 (e.g. Japan, Korea)
Industry obligation	Option 7 (e.g. Luxembourg)	Option 8 (e.g. United Kingdom)	Option 9 (e.g. Austria)

Increasingly complex regulation required. Change in cost not certain but may be higher.

Increasing cost and complexity; capable of managing more volume

Four models were investigated which cover a full range of options likely to fit an Australian context (options 1, 2, 5 and 8). In all cases the models assumed some ticket stock, as a portion of ticket stock is an appropriate method to manage against the significant annual variation of Australia’s requirement. Tickets manage this annual variation efficiently and cost effectively. Options 4 and 7 were not considered as the complexity of setting up an industry obligation was not deemed worthwhile if the intention is to only hold ticket stock.

Brief details of the four different models are shown in the following table. The cost of each model is compared as if Australia was in full compliance by 2016 and by 2022. In practice, compliance by 2016 is very unlikely and still uncertain by 2022. This is covered in more detail below.

	Model 1	Model 2	Model 3	Model 4
Responsibility	Government	Government	Government and Industry	Industry
Stock type	Tickets only	Physical stock and tickets	Physical stock and tickets	Physical stock and tickets
Funding	Budget or levy	Probably levy	Probably levy + industry pass through	Industry pass through
Stock location	All offshore (option for some in Australia.)	Physical in Australia; tickets offshore	Physical in Australia; tickets offshore	Physical in Australia; tickets offshore
Stock split	2016: 3,543kt 2022: 7,146kt	2016: tck-850kt; phy-2,685kt 2022:tck-850kt; phy-6,279kt	All: tck-850kt; phy ind-83kt 2016: phy govt: 2,654kt 2022: phy govt: 6,248kt	2016: tck-850kt; phy 2,657kt 2022: 6,252kt each

The assessment of how well each model meets the key criteria set for the emergency stockholding system is shown below.

	Model 1	Model 2	Model 3	Model 4
Compliance				
Meets the IEA obligation	Uncertain – volume may not be available	Good	Good	Good
Time to secure first stock (tickets)	Good: ~ 1 – 1.5 years	Good: ~ 1 – 1.5 years	Good: ~ 1 – 1.5 years	Poor: ~ 4-5 years
Possible time to full compliance	Average: 5-10 years if possible at all	Average: ~10+ years	Average: ~10+ years	Poor 10-15 years

Security

Allows participation in collective international action (stock release)	Good	Good	Good	Good
Improves domestic security	Poor - Average	Good	Good	Good

Cost estimate 2016 assuming full compliance all models¹

Estimated capital required (AUD millions)	\$0	\$4,163	\$4,148	\$4,121
Estimated per annum cost including capital recovery (AUD millions)	\$264	\$296-495	\$305-496	\$492-696
Per litre charge if on products (AU cpl)	0.5	0.6-1.0	0.6-1.0	1.0-1.4

Cost estimate 2022 assuming full compliance all models²

Estimated capital required (AUD millions)	\$0	\$9,738	\$9,722	\$9,695
Estimated per annum cost including capital recovery (AUD millions)	\$573	\$840-1,106	\$649-1,107	\$1,103-1,582
Per litre charge if on products (AU cpl)	1.1	1.2-2.2	1.3-2.2	2.2-3.1

¹ Based on current forecast, full compliance by 2016 is very unlikely whichever model is chosen.

² Compliance by 2022 may be possible, although the rapidly increasing requirement will still make this difficult under all model choices.

Other items

Flexible to meet changing target	Good (but volume limited)	Good	Good	Average
Impact on national oil market operation	Good (no impact)	Average (Govt. participant in market)	Average (some competitive impact)	Poor (significant)
Complexity to implement	Good (not complex)	Average	Poor (complex)	Poor (very complex)
Legislation required	Average - Good (levy)	Average (some)	Poor (lots)	Poor (lots)

Storage facilities

All the costs above assume investment in above ground storage and the cost of the stock along with annual operating costs. At high volumes other storage options such as in-ground storage might be more cost effective. Given the high volume requirement forecast for future years, we recommended possible in-ground storage options within Australia are investigated. However storage only makes up 35-40% of the capital cost, so the influence of cheaper storage is reduced. Storage on water is also an option for faster compliance (in ships) or possible longer term storage (as in Japan).

Choice of model

The choice of model that best suits Australia's requirements will depend on the importance given to the different rating criteria. Model 1, with the government taking responsibility and using ticket stock (the New Zealand model), is the simplest and cheapest but has some issues. It does not improve domestic security (except through participation in collective international action) although this could be addressed by ensuring a portion of ticket stock is held in Australia. Of more concern is the forecast volume requirement. The traditional ticket market is only likely to have 500,000-1,000,000 tonnes readily available. It is likely at volumes above this level the cost will increase to a similar level, or possibly even above the cost of physically storing stock. For higher volumes the participants in the ticket market would need warning to investigate larger storage options that may be suitable – contractual terms may need to be adjusted such as longer term contracts. A sensible way to enter the ticket market would be to start with lower volumes (up to 500,000 tonnes) and then build up volumes contracted based on the market response.

Model 2 solves the volume and security issue with Model 1 but with a substantial upfront capital cost of AUD4.0 billion rising to nearly AUD10 billion by 2022. To avoid the government needing to put up this capital, a stock agency could be set up: the stock purchase could be debt funded with revenue generated by a levy on fuel sales. The levy is expected to be around 1.0cpl if charged on all products, rising to between 1.2-2.2cpl by 2022.

The decision to move to Models 3 or 4 comes down to a question of the value of having industry involved in holding emergency stock. An industry obligation does increase the complexity of a stockholding scheme substantially, but there can be benefits in that industry is likely to be most adept at finding the least cost ways to meet the obligation. Model 4 (industry obligation only) has the substantial risk of changing the shape of the industry due to market participants reconsidering their involvement in the Australian market to avoid the need to invest the substantial capital required. The industry in Australia is very capital constrained and this was raised as a major issue during industry consultation.

An advantage of an industry obligation is that the reporting of current stocks will become compulsory. This is likely to increase the stock levels reported in Australia, reducing the emergency stock requirement. Even if there is no industry obligation established, it would make economic sense to instigate compulsory stock reporting to avoid Australia securing unnecessary emergency stock.

Compliance timing

Ticket stock could start to be secured in one to one and a half years if the government is involved (Models 1, 2 or 3). The volume of ticket stock in the traditional ticket market is likely to be limited which may mean that options that include physical stock need to be considered for compliance. The substantial increase in the emergency stock forecast requirement over the next ten years may mean it is infeasible to 'catch up' in the 10-year timeframe, as the target increases as quickly as storage facilities can be built. Therefore based on the current forecast it is difficult to be certain on a time to meet full compliance whichever model is chosen.

Another constraint for storage construction was highlighted by industry: the same resources required to construct storage facilities are those currently in short supply (and expensive) due to the resources boom in Australia. This could further constrain the time to meet full compliance with the 90-day net import target.

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Glossary

bbbl	barrel
BREE	Bureau of Resources and Energy Economics
COVA	The national stock agency of the Netherlands
cpl	cents per litre
EU	European Union
G-to-G Agreements	Government to Government Agreements between two IEA countries covering the ability for one country to hold stock (and count it towards its obligation) in another country.
IEA	International Energy Agency
IEP Agreement	IEA Agreement that covers the coordination of petroleum in an emergency along with minimum stock holding requirements
kbd	Thousand barrels per day
km ³	Thousands of cubic metres
kt	Thousand tonnes
m ³	Cubic metres (=thousand litres)
NORA	National Oil Reserves Agency of Ireland
NZ	New Zealand
RET	Department of Resources, Energy and Tourism
RIS	Regulatory Impact Assessment
Tonne/te	Metric tonnes

1.0 Introduction

Australia is a member of the International Energy Agency (IEA) where, as a signatory to the Agreement on an International Energy Program (the "IEP Agreement"), it benefits from the coordination of crude oil and petroleum product supply in the event of a major disruption to international oil markets. Under the IEP Agreement, member countries accept a treaty obligation to hold crude oil and petroleum product stocks equivalent to a minimum of 90 days of the previous year's daily net import demand and participate in collective actions initiated by the IEA during a liquid fuel emergency.

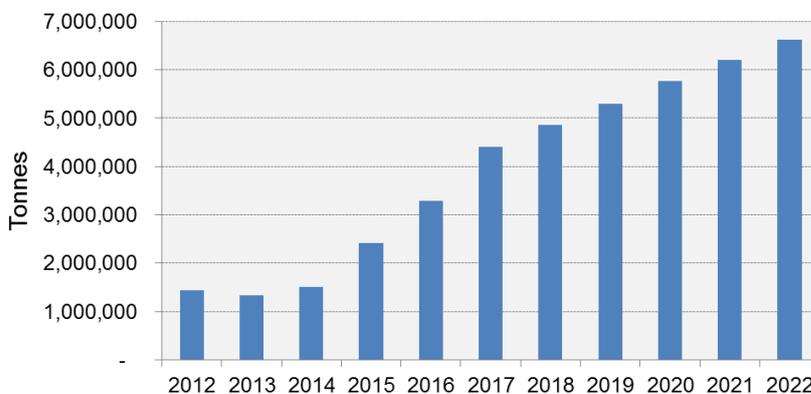
Since December 2009 Australia has regularly not achieved the minimum inventory obligation set by the IEA. Over the last decade the demand for petroleum products has increased while domestic petroleum production fell. Both these trends increase the daily net imports which results in a higher stock requirement to meet the 90-day obligation. Australia relies on commercial stock holding to meet the obligation and as these have not changed significantly, they are no longer sufficient to cover the increasing minimum obligation.

The Government is considering various policy options in response to Australia's compliance with the IEA oil stockholding commitment. The Department of Resources, Energy and Tourism (RET) is responsible for developing energy security policy and therefore preparing any Regulatory Impact Statement (RIS) necessary for consideration by the Government. In developing a RIS, it would be necessary for RET to identify and assess all feasible options including establishing emergency stockholding reserves.

The amount of additional emergency stock required depends on the net import requirement and the existing commercial inventories. Over the past couple of years domestic crude and condensate production has declined (reflecting in rising crude imports and falling exports) while product demand is increasing (reflected in rising product imports). The net import requirement for 2011 (2010 base year) was around 55 tonne/day and this increased to 67 tonne/day from 1 April 2012 when the target moved to using a 2011 base year. Current inventories covered about 82 days of the target in 2011 and this has fallen to a forecast average of around 69 days in the current year.

The Bureau of Resources and Energy Economics (BREE) forecast calculation of the expected shortage of stock against the 90-day target is shown in Figure 1.

Figure 1: Forecast stock shortage against 90-day requirement



Source: BREE

The forecast increases rapidly from 2014 due to falling domestic production and increasing demand. The forecast is highly sensitive to these assumptions, so if there is higher production than expected in future years or Australia's consumption does not continue to grow at the relatively high rates seen in the past five years then the requirement will increase more slowly. The forecast takes into account closure of Clyde and Kurnell refineries.

The forecasted stock shortage towards the end of the 10 year period is substantial, reflecting a more than doubling of Australia's current commercial inventory level.

This report reviews the options for holding emergency stocks and then assesses which models might be suitable for use in Australia. Initially the "what and how" of the stock is assessed – either physical emergency stockholding or ticket contracts where emergency stock is managed through an option contract to buy product in an emergency event. The options for "who" are then assessed - does the Government take responsibility or is it devolved to the petroleum industry? In both cases how the cost might be funded is reviewed.

The combination of options is then assessed to come up with a number of models that might be suitable in an Australian context. The operational details of each model are explained and reviewed as to how well they meet criteria including:

- National oil security;
- Impact on national liquid fuel market operation;
- International reputation;
- Economic cost to budget or consumers; and
- Efficiency of successful option implementation.

This report only assesses options for compliance with the IEA target. It does not assess whether the cost incurred will be of overall economic benefit.

The four oil refiner/marketers operating in Australia, along with the Australian Institute of Petroleum (AIP) have been consulted on a draft of this report. The final report includes feedback from this consultation including how each of the models might affect operation of the liquid fuel market. Individual company views on the wider issue of oil security and which model (if any) might be most appropriate for Australia's situation are not included in this report.

2.0 Emergency Stock Options

2.1 Physical emergency stock

Australia could meet its IEA obligation by increasing the physical stocks of petroleum held in the country by building emergency stock reserves. These stocks would be additional to normal commercial inventories. This section assesses what this would mean including:

- What type of stock might be stored;
- Options and costs for storage facilities;
- Storage location;
- How stock might be stored – separate facilities or comingled with existing stocks;
- Timing;
- Administration and stock management; and
- Access to and release of stock.

The detailed requirements for holding stock along with the basis of the cost build up are included in Appendix 1.

2.1.1 Stock Type

The decision on what type of stock to store depends on a number of factors. A number of large international petroleum reserve facilities store crude oil as this can be stored indefinitely, cheaper storage facilities can be used and it covers the full range of products required once refined. As a result it is usually a cheaper option, although it does require the country to have a refining system for the crude to be useful. Another reason that crude storage was initially favoured is the IEA reserves were set up following the oil embargoes and crises of the 1970's. At that time, it was crude oil that was restricted; therefore crude oil was stored to cover any future shortage.

Whereas the United States, Japan, Korea and now China's strategic petroleum reserves are all crude oil based, Europe uses a mixed model where the reserves include some requirement for product stocks. This has resulted from internal European Union (EU) requirements rather than the IEA obligation which does not specify any specific stock type in its minimum requirement. Product stock is included in the EU requirement as it is more immediately available to the market and also covers events which disrupt the refining sector. The disruption caused by Hurricane Katrina in 2005 primarily affected the product market with the sudden shutdown of a significant portion of refinery capacity on the US Gulf Coast. It was product stocks held in Europe that provided the most immediate relief to the market and the IEA requested countries preferentially release product during this emergency. Following the Katrina event (and some internal market disruption), the United States now holds some product stocks as part of its strategic reserves.

For Australia, the decision on what stock type should be held depends on the aims for holding stock (Table 1).

Table 1: Stock type options

Aim	Discussion	Possible stock type held
Purely to meet 90-day IEA obligation	In this case cost is the main driver so the cheapest option would be chosen	Crude if refining system available
To meet 90-day obligation and provide security to an international disruption	The aim of the IEA stockholding obligation is security against an international disruption. If this is a driver for the stock holding it would make sense to have the security stock holding roughly match the import mix.	Crude (~63%) Product (~37%) – mix of products with diesel making up nearly 50% of the requirement.
To meet 90-day obligation and provide security to an international or domestic disruption	The addition of domestic security means the stock is also intended to provide security for domestic events (such as the loss of a refinery or tank farm for a period). Crude/product split based on percentage of demand met from domestic refineries versus product imports.	Crude (64%) Product (36%) - split between products in line with total market share (petrol, jet fuel, diesel and LPG make up over 95% of demand)

The contribution of stocks to the IEA calculation can also affect the decision. Product stocks are credited with a positive yield benefit (1.065) whereas crude stock has a negative yield benefit (0.96). The net effect is that product stock will contribute 11% more to the inventory target than

the same volume of crude. This can be enough to make product stock storage more cost effective than crude in some circumstances.

2.1.2 Storage facilities

Not all of the crude emergency reserves are stored in typical above ground storage tanks. The Strategic Petroleum Reserve in the United States uses salt caverns, as does Germany. Korea and Denmark's reserves storage includes man-made caverns (concrete lined in-ground tanks). Such storage facilities will be economic if the natural environment is suitable (in a suitable location) and the requirement is for large facilities. While Australia is geologically stable and may have locations where such a facility is a possibility, this report develops costs for storage terminals with the expectation they will be near an existing oil terminal or refinery. The higher volume requirement forecast in future years would justify more work to look at alternative storage options.³

Purpose built facility

For significant storage capacity it is likely a dedicated new facility would need to be built. Costs for facilities are given in Appendix 1. Costs for a larger facility (140,000 tonnes) are in the order of AUD550-670/tonne depending on crude or product storage and how close it is to existing facilities (cost of connections). For larger storage volumes (greater than 140,000 tonnes) the costs reduce marginally (down to around AUD530/tonne) until around a 420,000 tonnes facility, after which it is reasonable to assume costs will increase in proportion to volume stored.

These storage cost estimates are significantly higher than cost estimates recently issued by the IEA although consultation with industry confirmed them as reasonable with feedback giving costs at a similar level to that indicated, to around 50% higher. Industry noted there has not been construction of storage facilities on this scale in Australia since the refineries were built in the 1950's.

Integration in current facilities

Government consultation with the industry to date has noted that there is little excess storage capacity in the system. This is expected in a commercial system where owners do not want to invest in more infrastructure than required. However there are often assets which may not have justified upgrade in the past that could be brought into service for emergency stock. A tender approach may result in these opportunities being identified and industry recommended this approach if storage facilities were being sought for emergency stocks. Industry also noted that third party providers of storage operating in Australia would be expected to be interested in providing facilities for emergency stock.

How stocks can be integrated in the current system is covered in Section 2.2.4. It is noted that the cost of upgrading existing (older) facilities is sometimes as much as building new facilities so this may not provide much economic advantage.

Marine options

Ships are a key component in the petroleum supply chain especially for Australia. Most crude (even Australian produced) is delivered to refineries by ship and 36% of the market is met by direct product imports. Ships also play a role in managing supply and demand variation and offer

³ IEA/SEQ(2012)10 which is a Progress Report on the Costs, Benefits, and Financing of Strategic Oil Stockholding notes that underground caverns capital costs are considerably lower than above ground tanks if these cavern facilities are of sufficient size (at least 1.5 million cubic metres ~ 1.2-1.3 million tonnes).

some security benefit as distribution can be varied as necessary. Producing countries often use tankers as floating storage when demand for crude is weak rather than restraining production. In consuming countries product or crude can be stored on ships when demand is weak and the market structure favours storage⁴. During the period following the global financial crisis approximately 100 million barrels (~13 million tonnes) of product was stored on ships in Europe⁵.

Floating storage provides an option for more immediate implementation than onshore storage although over a longer time period onshore storage will be cheaper. The issues with floating storage are covered in Appendix 1 and the current storage cost for a large crude carrier is estimated at around AUD51/tonne/year.

Japan has marine storage facilities that go a step further. They are large facilities that are permanently moored in sheltered waters. Essentially they are like permanently moored ships without engines. These facilities are large - the two facilities used in Japan store approximately 2.8 and 4.0 million tonnes of crude oil. It is claimed that they are 20% cheaper than land based facilities and the Japanese Government is helping promote them in Asia.⁶

Whether such a facility is an option for Australia is likely to depend on availability of suitable locations (near deep water for discharge and loading of ships but also sheltered from adverse weather) and ability to get regulatory approval. Storing oil permanently on water may face a lot of public objection. This report does not develop this option further but notes that it may provide a possibly cheaper option than land based storage tanks for very large volumes.

2.1.3 Location

International

Most countries hold their physical emergency stock (non-ticketed) within their borders. This is the case for all IEA countries outside Europe but not for all European countries. Some European countries have physical stock that the country owns (through government, stock agency or the country's industry) located in another country. The integrated supply chains in Europe can mean the most logical storage location for one country is in another country. Natural facilities (e.g. Germany's salt caverns) in one country may also provide the most cost effective storage location for another country's stock.

As an island continent, Australia's supply chain is not integrated with other countries, unlike Europe. The source of imports is largely independent of IEA countries except for some crude imports from New Zealand and some product imports from Japan and Korea. The key supplier for most product imports (approx. 67%) is Singapore, but Singapore is not an IEA member. Industry reported that Singapore could be a logical storage location for Australian emergency stock but confirmed that no other IEA country provides a logical location. Any offshore storage would also be dependent on shipping availability when the stock is required in an emergency.

Storing and owning stock in another country only makes sense if there is a strong cost driver. As the oil cost will be similar in any location, a lower cost is only likely if a country has underutilised

⁴ Where the price curve on futures or forward markets indicates the market places a higher value on crude or product in later time periods.

⁵ <http://www.newworldorderreport.com/News/tabid/266/ID/282/Buying-Oil-for-storage-at-sea-dubbed-floating-storage-demand-by-physical-traders-creates-the-illusion-of-consumption-in-the-products-market-and-keeps-profit-margins-for-distillates-positive.aspx>

⁶ http://platts.com/RSSFeedDetailedNews/RSSFeed/Oil/7233138?WT.mc_id=WT.tsrc=Eloqua

storage facilities that could be leased at significantly lower cost than the cost of a new domestic facility. The cost difference would have to overcome:

- That improvement in domestic supply security would be lower than for domestically held product, despite a significant spend;
- A significant spend (e.g. taxpayer dollars or a consumer levy) that is benefiting a foreign company/country rather than a domestically based one; and
- A reliance on shipping and the availability to get the stock to Australia in an emergency, and security of that stock while on the water.

For these reasons this report only costs new storage within Australia. As noted above, Singapore could provide a sensible option if the non-IEA member country issue can be overcome.

When considering offshore stock, the flexibility provided by contracting through a ticket structure may be more suitable as long as the cost of the flexibility provided by tickets does not increase the cost beyond the ownership alternative. Tickets contracts are covered in Section 2.2 – the rest of this section focuses on storing emergency stock domestically.

Domestic

Some countries specify that their emergency stocks need to be spread around the country relative to the location of consumption. This may also make sense in Australia, especially given the total storage volume required. However availability of suitable locations for storage facilities along with proximity to demand (i.e. refineries for crude, markets for products) should be the drivers for selecting the initial domestic locations rather than a spread.

Industry comments that location selection will be difficult as demand is dispersed, so it is quite likely the stock may not be stored where it is most needed. Generally it was felt that storage close to existing facilities and population centres (if available) made the most sense.

2.1.4 How the stock can be stored

Physical emergency stock could be stored in completely separate tank farms (although cost and logistics will normally see these located close to existing facilities) or integrated in some way with the existing supply chain. This may mean holding emergency stock in tanks within an operational tank farm that are surplus to commercial requirements or even within the same tank. Integrating the emergency stock with commercial stock is referred to as comingling, a term normally used in industry to refer to stock of separate ownership stored in the same tank (separate tanks dedicated to emergency stock within commercial tank farms are quite common but it is not regarded as comingled as the stock is kept separate and often physically locked off).

The benefits and issues with comingled stock are shown in Table 2.

Table 2: Benefits and issues with comingling stock

Benefits	Issues
<ul style="list-style-type: none"> ■ Allows for more efficient utilisation of existing facilities which may be cheaper than a new storage facility. ■ Management of the stock is easier, particularly product quality management (turnover, etc.) ■ Can be used to assist in investment in new 	<ul style="list-style-type: none"> ■ Audit and control of the emergency stock can be more difficult ■ The risk that holding emergency stock will affect normal commercial stock holding decisions is increased (unless commercial stock owner has a separate stock obligation)

facilities (a larger more cost effective facility is developed with some of it used for emergency storage).	<ul style="list-style-type: none"> ■ Excise tax issues more difficult to handle unless all emergency stock taxed
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Comingling is used in a number of countries and may be a cost effective option so will be considered in the development of models to be investigated.

2.1.5 Timing and investment

Building new storage facilities takes time – there is no experience with facilities on this scale (420,000 tonnes) recently within Australia but it is likely to take more than two years to construct and be made operational after consent is obtained. If the storage options include using redundant tanks within existing facilities this might be reduced to six months to a year (depending on remedial work required). Even if spare storage is readily available, it is likely to take at least three months to organise the stock for the facility on a planned basis.

The volumes required for emergency stocks may require several storage facilities to be built. The scale of these facilities is substantially larger than any recent terminal investment in Australia. The construction of the facilities would need to be staged over a period so that the local industry would be capable of managing the investment. The substantial increase in the forecast over the next 10 years (Figure 1) may mean it is infeasible to ‘catch up’ in the 10-year timeframe as the target increases as quickly as tanks can be built. It was also highlighted in industry consultations, that the same resources required for storage facility construction are those currently in short supply (and expensive) due to the resources boom.

Storage facilities are long life assets. A storage terminal would normally be expected to have a 40 year life. If the storage facilities are going to have no other purpose except for storing emergency stock, this life needs to be taken into account in the way the owner’s investment in the storage is going to be secured. A relatively short term contract (five to 10 years) may require a full payback for the owner/investor if they thought the asset was at risk of stranding at the end of the contract.

2.1.6 Administration and stock management

Holding physical stock requires resources to manage both the stock and the facility. The areas that need to be covered include:

- Land costs;
- Product quality management and stock turnover;
- Operating costs;
- Maintenance costs; and
- Management and administration.

Details of requirements and cost estimates are included in Appendix 1.

2.1.7 Release of stock

A necessary part of a decision to store physical emergency stock is agreeing on the rules and regulations about when and how these stocks can be accessed and released. A critical element is ensuring the emergency stock does not affect normal commercial decisions around stock management. Companies normally hold enough stock to manage normal operational variation along with safety stock to manage typical disruptions to their supply chain (e.g. refinery trips, late imports). Emergency stock should not be a factor affecting these commercial decisions.

This can be made explicit by setting the requirements for when emergency stocks can be released. For New Zealand, release conditions include:

- In response to an IEA declared emergency;
- In response to a domestic natural disaster; and
- In response to a terrorist attack.

Specific exclusions from release are:

- To manage prices; and
- In response to one commercial operator having supply problems.

Most stock agencies have tender systems ready to use should the stock need to be released. This allows stock to be released promptly (within days rather than weeks) when there is an emergency that requires a physical stock release.

Australian industry agreed that the rules on emergency stock release need to be tight to avoid impacting commercial stock decisions. There was concern that the government owning physical stock would create another participant in the market competing as a seller. This could be managed by agreeing to a limited number of market participants (e.g. current importers) that would be allowed to tender for any release of the emergency stock. The assumption would be that in an emergency a current importer would purchase emergency stock so they can back off imports that they would have normally purchased.

2.1.8 Total cost of physical emergency stock options

Appendix 1 details the cost for storage facilities and the related costs. These are summarised below for six different storage facilities. The stock cost is based on crude oil at US\$115/bbl (Dated Brent)⁷. The stock cost is approximately 60% of the initial capital cost with the storage facility and land making up the balance.

By comparison the on-going costs are not substantial. The largest of these will be the maintenance of the facility. Other costs include operating costs (lower than a normal facility as there is a lot less activity) and product turnover costs.

⁷ 12-month average price to June 2012.

Table 3: Cost estimates for physical storage

Storage options: Cost estimates			One off capital costs			Annual costs
Stock Type	Facility size (tonnes)	Storage facility (AUD M)	Stock cost (AUD M)	Land (AUD M)	Total (AUD M)	Operations and Maintenance cost (AUD M)
Product storage	420000	233	412	22	667	6.2
Product storage	140000	85	137	7	230	2.2
Product storage	15000	19	15	1	34	0.4
Crude storage	420000	222	371	22	615	3.9
Crude storage	140000	77	124	7	208	1.4
Crude storage	50000	37	44	3	84	0.7
		AUD/tonne				
Stock Type	Facility size (tonnes)	Storage facility	Stock cost	Land	Total (AUD/tonne)	Annual costs (AUD/tonne)
Product storage	420000	555	982	51	1,588	14.7
Product storage	140000	607	982	51	1,640	15.5
Product storage	15000	1,267	982	51	2,300	26.2
Crude storage	420000	529	884	51	1,464	9.4
Crude storage	140000	550	884	51	1,485	9.7
Crude storage	50000	740	884	51	1,675	13.1

2.2 Ticketing

2.2.1 The ticket market

Ticketed stock (tickets) is the name given to a stockholding arrangement under which the seller agrees to hold (or reserve) an amount of oil on behalf of the buyer in return for an agreed fee. In essence the buyer is purchasing an option to purchase physical oil that can only be exercised in an oil supply emergency. The purchaser of the ticket gets the right to count the stock reserved as part of its stockholding and the seller of the ticket does not count the stock in its stockholding.

The ticket market developed as a flexible way for both oil companies and countries to meet their stockholding obligations amid varying inventories. Companies which are going to be short of inventory for a period buy a ticket to make up the short from a company that has excess stock. While many tickets are between companies in the same country, where countries have an agreement to recognise stocks held by companies or stock agencies from another country in their territory, they are also across international borders (called bilateral tickets). The agreements between countries are referred to as government to government agreements (G-to-G agreements).

The ticket market developed in Europe where stockholding obligations were devolved to industry and countries had additional European Union stock obligations as well as those from IEA membership. International agreements between European countries are common and enable industry to rationalise their compulsory stocks across their European affiliates, and also allows national stock agencies to secure stock in a number of countries.

Until New Zealand entered the ticket market in 2007, the ticket market was exclusively European. IEA members outside Europe were net exporters of crude or met their stock holding obligation through normal commercial stock holdings or through direct government stock ownership. New

Zealand's decision to secure reserve stock through the ticket market has seen Australia (until 2008) and Japan (from 2008) become involved in the ticket market as sources of ticket contracts.

Table 4: Advantages and disadvantages of ticket contracts

Advantages of ticket contracts	Disadvantages of ticket contracts
<ul style="list-style-type: none"> ■ Very flexible for volume (up to a point) and timing allowing easier management against a changing inventory target ■ More cost effective (although high volumes may influence this) ■ Very good short term option (typical term of a year) ■ Easy to manage (stock owner continues to manage all issues with the stock including quality and price risk) ■ Simple fee structure 	<ul style="list-style-type: none"> ■ Limited number of countries involved in the ticket market (and most of these are in Europe, a long way from Australia) ■ Likely to be a limit on volumes available ■ No certainty of continuing availability of tickets and does not provide a long term solution ■ Have to pay market price if exercise purchase option – this is likely to be a time of high prices ■ Reliant on host country to honour contract in time of crisis

Market size

There is no published information on the size of the ticket market. The IEA does publish data on stocks held abroad but this includes both physical stock and bilateral ticketed stock. Examples of ticket purchases by stock agencies include COVA (Netherlands Stock Agency) who purchased 710,000 tonnes of ticket stock in 2011⁸ and NORA (Irish Stock Agency) who purchased 235,000 tonnes of ticket stock in 2010 (up to 2007 NORA had over 600,000 tonnes of ticket stock but have shifted their emergency stock mix to more physical stock since then). The largest quantity New Zealand has secured in the ticket market is 457,000 tonnes.

Who sells the tickets

The sellers of tickets are mainly market participants who own refineries, who already meet their compulsory stock obligation so have excess stock they can sell tickets against. Traders are also active in the ticket market. Tickets can be sold against stock they are using for trading plays.

2.2.2 International requirements for ticket contracts

A ticket contract is only valuable to the purchaser if they have some assurance that they will be able to exercise the purchase option should the need arise and that they are allowed to count it towards their IEA obligation. The IEA wants to ensure that ticket stocks are 'additional'; that is they are not sold on stock that is already counted towards obligations and would be held anyway. In order to ensure this, the IEA only allows reserve stock to be counted if it is held in an IEA country where they have an obligation to report stock. The IEA can then ensure that stock being counted through a ticket contract in one country is specifically excluded from the stock in the country where it is held (the IEA does reconcile ticket contracts monthly between countries – specifying ticketed stock (both purchases and sales) is a requirement of the monthly oil stock submission).

⁸ COVA is only able to secure ticket contracts in the Netherlands.

As it is governments that report stocks, the requirement to report ticket stocks is one of the items covered in the G-to-G agreements. The contracts themselves require each party to report the contract details (excluding price) to their respective governments.

Another feature of the G- to-G agreements is that the governments will not put any impediments in the way of the option being exercised. The agreements can be treaties or arrangements depending on the preference of the two governments. Changes in the European compulsory stock system mean that members of the European Union no longer need specific G-to-G agreements between member countries.

Sovereign risk

Holding stock (whether physical or through a ticket contract) offshore does expose the buyer to sovereign risk: that is, whether the host country will honour the contract in a time of supply emergency. While sovereign risk is a factor of holding offshore stock, the stock is covered by an agreement (often a Treaty) between the two countries that states there will be no impediments to the release of the stock.

As one of the foundations of IEA membership is a sharing mechanism between member countries so that they might be equally affected/protected in an emergency, honouring a ticket contract is equivalent to honouring a country's membership of the IEA. Not honouring a contract would effectively be reneging on one's IEA membership. Moving offshore stock (or ticket type contract) outside IEA countries would remove this protection, as well as not be recognised by the IEA as approved emergency stock.

2.2.3 Ticket contract structure

The essential features of a ticket contract include:

- Term of the contract;
- Quantity;
- Type and quality of product reserved;
- Location of stock;
- Fee;
- Circumstances of option to purchase;
- Basis of pricing for purchase; and
- Terms used for purchase.

The contract structure features are detailed in Appendix 2.

2.2.4 Option to Purchase or Release

A ticket purchaser has the option to purchase product in an IEA declared emergency. The IEA stock release in response to Hurricane Katrina in 2005 led to ticket buyers finding their contracts were not as flexible as required. In order to meet obligations to release stock to the market, some stock agencies, on behalf of their governments, wanted to exercise certain ticket contracts. However they didn't actually want to purchase the product themselves, rather allow the product to be released to market. At the time the problem was resolved by both parties agreeing to cancel the ticket contract. This allowed the stock owner to draw down on the inventory and sell that product directly to market to meet demand and the country holding the ticket to meet its obligation to release product.

The New Zealand Government has made the release of stock a formal part of their ticket contracts (i.e. the purchaser of the ticket can choose, at their option, to release and end the ticket contract or purchase the stock). This increases the flexibility for the ticket holder to respond to different sort of events (e.g. in a Katrina type event there is no use in a government/stock agency in Australia or New Zealand purchasing product in Europe or Japan). The release mechanism allows the product to be sold into the market should there be demand.

We are unsure how widespread the 'release' clause in the New Zealand contract has become in ticket contracts although there have been no issues from counterparties with its inclusion.

2.2.5 Australia's entry into the international ticket market.

Currently Australia's involvement in the international ticket market is through a G-to-G agreement with New Zealand. This was prompted by New Zealand wanting the option to hold stock in Australia to meet its IEA commitment. Australia will now need to secure agreements with countries which have excess stock on which tickets may be sold.

Europe

Countries and companies in Europe are familiar with ticketing which makes it an easy market to enter. As the centre of the petroleum trade in Europe, the Netherlands is normally a good source of tickets. The United Kingdom has also been a net seller of tickets, although this may change over time as they are no longer a net exporter of petroleum and face a rising net import target.

Other countries are also active in the ticket market although many of them are net buyers so would not typically be a source of tickets. However with petroleum consumption falling in Europe there may be opportunities in countries that have not previously been sources of tickets as the stocks they normally hold now more than cover their minimum inventory targets.

Asia-Pacific

The IEA countries outside Europe all border the Pacific Ocean so could be regarded as more in Australia's natural market area. These countries include Canada, Japan, South Korea, New Zealand and the United States. Of these countries Japan is the only one to have been active in the ticket market through a G-to-G Agreement with New Zealand which allows its oil companies to sell tickets on their stock if they wish. Japanese companies have a legal minimum day's stock obligation so if they are selling stock tickets they are holding stock above this level.

New Zealand did actively pursue a G-to-G agreement with the United States, but laws restricting export of crude and product in an emergency meant they were not able to sign an Agreement with a non-impediments clause. The United States would only be an acceptable location to hold stock if the intention was only release into their domestic market in the event of an emergency.

Canada is a net exporter of crude so does not have an IEA stock obligation. They are yet to participate in any arrangement to hold stock for other countries.

Korea has large storage facilities and leases these to third parties (such as Saudi Aramco for the storage of crude). They are also a large product exporter (including to Australia) which would make them a good location for prospective tickets. However Korea's storage agreements with third parties require Korea to have the right to use the product stored in an emergency which means no tickets can be sold on the stock. If Korea was prepared to look at changing this requirement (at least partially) then they may be a source of ticket stocks.

2.2.6 Development of a domestic ticket market in Australia

The government, a stock agency or industry could purchase the required volume of tickets offshore. However it would be expected that the domestic industry has the opportunity to compete in any tenders to hold ticket stock.

The main issue with the development of a domestic ticket market is ensuring that any stock contracted using tickets is additional to normal commercial stocks and that the presence of ticketed stock does not change the commercial operators' inventory decisions.

In Europe and Japan this issue is largely managed through an obligation on the industry. If a company has an obligation to hold a minimum amount of stock, the government doesn't mind if they sell tickets on stock held above their minimum requirement. The government knows that as long as the minimum obligation is always met, the country will meet its international obligation despite any ticket sales. Some countries make it explicit that only companies with a stock obligation in that country can participate in the ticket market.

Without an industry obligation, the only way to ensure ticket stock is additional to normal commercial stock is to make this an explicit requirement in the contract. New Zealand does this through their Request for Tenders and contract. These are detailed in Appendix 2. The conditions for release are also detailed, stating that there will not be release for what is considered normal market disruption.

Another feature of domestic ticketing is the option of splitting the stock and storage parts of the contract. As there may be expense in setting up the storage to offer into a ticket market, the seller wants to know they will get the fee for the full term of the contract. If the purchase or release option is exercised during the contract, the stock payment is terminated while the storage fee continues to the end of the term.

The options Australia has in developing a domestic ticket market are:

- Give the market an opportunity to offer ticket contracts to hold stock with the contract ensuring that that stock is additional to normal commercial stocks in a similar manner to the New Zealand contract.
- Put stock obligations on the industry at some level that would then enable companies to make their own decisions to hold more stock and offer ticket contracts if they choose to.

2.2.7 Management of a ticketing system

Management of a ticketing system is relatively simple. Commercial operators in Europe generally have a person responsible for managing their compulsory stock obligations and trading in the ticket market if they need to. The person responsible will normally cover a number of European countries and compulsory stocks may only be part of their role.

Stock Agencies also participate in the ticket market as purchasers of tickets. This is a relatively routine operation that involves a tender process on a periodic basis (quarterly or annually). Compared to managing physical stocks, tickets are far less resource intensive, as the seller of the ticket continues to manage all the issues relating to the stock.

New Zealand manages its reserve stock requirements within a government department rather than a separate stock agency. By running an annual tender round (to get tickets that last for a complete year) the administration is simplified.

Work required to set up a ticketing system

There are a number of things that are required for a ticketing system. These include:

- Deciding on suitable IEA member governments to approach for bilateral agreements;
- Establishing G-to-G agreements with any countries that respond positively;
- Approaching the petroleum industry within the country to establish relationships with prospective ticket sellers;
- A template ticket contract - while the major ticket sellers have their own contracts, many stock agencies and governments prefer to use their own contracts so they have a uniform contract for all their ticket holdings. As covered above a different template contract may be required for ticket stocks held domestically to cover additionality;
- Tender documentation - the tender documentation for running the tender; and
- Assurance around suitability of counterparties.

Ticket operation and ability to count stock

Tickets run for a calendar quarter or a multiple thereof. Payment is made in the middle of each month. As the IEA count stocks at the end of a month, clarity is needed about how stocks can be counted. A contract for the first quarter will be from 1 January (effective from 00:00:01AM) to 31 March (24:00:00). The contract volume can be included in the buyer's stock for the end of January, February and March. The contract volume would be included in March end stock but then is immediately finished and (if necessary) replaced by a contract that starts 1 April. The seller needs to exclude stocks in those same periods when reporting stock. Tickets trade in the period one to two months prior to the start of the ticket term.

The IEA has recently adjusted their obligation system so that a country needs to meet the previous year's net import requirement from April (it was January). This means that an annual ticket will cover the period 1 April through to 31 March of the following year to match the obligation period. Tickets for that period will trade in late January and February.

2.2.8 Cost of a ticketing system

Ticket costs are not publically available although some stock agencies publish annual costs and volumes. The European market has traded in product categories to date (to meet the EU regulations that will change at the end of 2012). Because the European system is typically 'short' diesel (diesel is imported), tickets covering middle distillate (jet fuel/diesel) are more expensive than other tickets. With the decline of petrol consumption, Europe has excess petrol production which is exported. As a result petrol tickets are much cheaper. The cheapest tickets are fuel oil although fuel oil stock offers little protection for most users of petroleum products.

Information from the market in 2006 gave the following ranges for ticket costs⁹:

- Petrol: USD1.00-1.50/tonne/month
- Diesel/Jet fuel: USD1.30-3.50/tonne/month

Public information from governments and stock agencies (converted to US dollars) include:

- New Zealand: USD0.80-1.90/tonne/month¹⁰ (2007-2012 range)

⁹ Information from Connect Oil, European based brokers for compulsory stock obligations

¹⁰ <http://www.med.govt.nz/sectors-industries/energy/international-relationships/international-energy-agency/international-energy-programme>

- COVA (Netherlands): ~USD2.00/tonne/month¹¹ (2011)
- NORA (Ireland): USD1.10-2.10/tonne/month¹² (2009/2010)

New Zealand might be expected to purchase tickets at a marginally lower cost than the European stock agencies as it doesn't have to get a spread of product type (it can preferentially purchase the cheaper petrol tickets).

The cost of tickets varies over time and the influences on their value include:

- Demand for tickets, particularly from governments and stock agencies.
- Supply of tickets which is influenced by the level of obligation put on industry in countries where there is excess stock.
- Market structure in crude and product markets – if spot prices are lower than future prices (contango), companies will be encouraged to hold stock (market structure covers storage cost) and tickets will be cheaper. Conversely if spot prices are higher than forward prices, there is a disincentive to hold stock and as a result ticket prices usually increase. This structure particularly influences the offers from trading companies.
- Number of options (including number of countries involved, flexibility of product type and number of approved counterparties).

In this study it is assumed that the ticket cost for volumes up to 300,000 tonnes will be in the USD1-2/tonne/month range. The next tranche up to 500,000 tonnes may average around USD3.50/tonne/month and if more than 500,000 tonnes is required the ticket cost may reflect more dedicated storage (we assume a cost between USD5-9/tonne/month increasing as volumes increase). At higher volumes we assume the cost is similar to dedicated physical storage.

2.2.9 Decision on release and/or purchase of stock

As with physical stock, release and purchase arrangements need to be considered for ticketed stocks. For the release of stock, only a priority order of release is needed as the process is straightforward.

For offshore tickets, the purchaser has the option of purchasing the stock and transporting it to meet domestic demand. The decision to purchase stock needs to be thought through – in what circumstances would the purchase option be exercised? The purchase option is for purchase at the prevailing market price so purchase would only be warranted where similar product is not physically available (or sufficiently available) in the market place.

With offshore stock there will also be the risk that shipping is not available. If the disruption is localised (e.g. Singapore disruption) it is likely shipping resources will be in demand as stock is transported longer distances than normal. This might result in shipping being the constraint as to whether the purchase option is exercised. Conversely a global disruption may result in more shipping availability as there is less crude and product than normal to transport.

Another option for purchase is to include a product swap in the contract. That is, although the product is held in Europe, the holder of the ticket might sell an equivalent amount of product in a closer location, if available (e.g. Singapore). While providing useful flexibility, the contract retains the fall-back to purchase the product where it is held as that is where the stock availability is guaranteed and backed by the host government obligation.

¹¹ <http://www.cova.nl/financiel.php>

¹² NORA Directors Report and Financial Statements Year Ended 31st December 2010

While the holder of the ticket has the purchase option, the holder may not be a market participant (e.g. government or stock agency). As the purchase option is only likely to be exercised if the local market requires product, the holder of the ticket may set up tender processes where they offer the product to local market (most likely restricted to those companies who are importers into the country). It is sensible for the government (or stock agency) to have worked through these processes and set up appropriate decision trees and documentation to allow release and purchase to be done promptly if required.

2.2.10 Australia's volume requirement

Australia's emergency stock volume requirement is expected to be significantly higher than the volumes reported as purchased by other governments and stock agencies, as outlined in Section 2.2.1. It could be that a large requirement could swamp the ticket market. It may also move the market to where the marginal providers of tickets are those making specific decisions to hold additional stock and who will look to fully recover these costs. This could move the ticket cost up to an equivalent level as holding physical stock or even higher if paying for the flexibility of a ticket contract (e.g. short term holding). Costs at these levels are assumed in the cost build up in this report for large ticket volumes.

Given this, Australia will need to carefully manage any entry into the ticket market including:

- Commencing at lower volume requirements (say up to 500,000 tonnes) in the initial year and increasing the volume over a number of years up to the volume required/targeted for ticket volumes;
- Ensuring as many countries as possible are options to hold stock for Australia;
- Investigating options for more substantial holdings with market participants and seeing how contracts might be modified to facilitate these options and make them cost effective;
- Investigate whether longer ticket terms (multiple years) will improve cost effectiveness; and
- Pursue stock options within Australia under a ticket structure (also likely to be longer term) that may prove as cost effective as offshore options.

2.3 Summary of stock holding options

The following table summarises the contrast between using tickets and physical stock for emergency stock reserves.

Table 5: Tickets versus physical stock

	Tickets	Physical Stock
Flexibility	Very flexible to manage changing volume.	Long term commitment required. Cost exposure if frequently changing volume stored and possible regret investment in storage facilities.
Volume	Likely to be upper limits of volume available through tickets (at a reasonable price)	Can expand capacity to meet emergency stock requirement if construction resources available although would want to do this in large steps for economy of scale.

	Tickets	Physical Stock
Stock Type	Can include mix of stocks although ticket cost and availability will influence selection	Can define split to best meet the country's requirements (be that price and/or supply security).
Cost	Likely to be lowest cost option, especially if volumes are not too high. Pay as you go.	High cost option especially if building new storage facilities. Large upfront cost – option to use loans to change to a pay as you go system
Location	Likely to be primarily offshore (but could have some in Australia). This results in a transport availability risk if wanted domestically	Likely to be primarily domestic although offshore options should be considered if cost effective.
Implementation timing	Can be implemented relatively quickly (~1 year, post decision point) for small volumes but will take longer for large volumes	Depending on approach likely to take ~ 4 years to implement before stock can be begin to be held; large volumes would need done over a 10 year+ period as storage facilities are constructed.
Key contractual requirements	Relatively straight forward including: <ul style="list-style-type: none"> ■ Government to Government Agreements ■ Framework contracts for ticket reservation ■ Tender process 	More complex including: <ul style="list-style-type: none"> ■ Likely tender process to establish storage options ■ Arrangement for funding for substantial up front cost ■ More likely need to set up stock agency with associated legislation
International and Domestic security	Provides international compliance so gives domestic security through collective international action but unlikely to provide physical stock for domestic security.	Provides domestic security as well as compliance with international security obligations.
Issues	Can be a perception that money is being paid for no real increase in security (other than meeting acceptability criteria of IEA)	High cost given current supply security using commercial stocks is deemed to be sufficient (by both the NESA and by industry). Possible impact on domestic market operation.

3.0 Responsibility for emergency stocks

This section looks at who could be responsible for holding and managing emergency stocks. The IEA classifies country's stocks into two categories - industry or public.

- Public stocks are those held by the government or a stock agency specifically set up to manage emergency stocks.
- Industry stocks are those held by the petroleum industry in the country for normal commercial operation and in some cases due to a legal obligation to hold certain stock levels.

Stock agencies can be government, public or private companies but in all cases there is some government oversight/regulation with the stocks only being able to be released with government authorisation. Whatever the ownership, the IEA classifies agency stock as public. This report looks at the option of a stock agency as part of the government responsibility section (although industry can set up a stock agency to manage their compulsory stock obligations - this option will be discussed in the industry section).

There are many different models for managing emergency stocks in the IEA (Table 6). There is no IEA stock obligation on net exporting countries.

Table 6: IEA countries stockholding

	Net Oil Importers		Net Oil Exporters	
	No compulsory industry stockholding	Compulsory industry stockholding	No compulsory industry stockholding	Compulsory industry Stockholding
Only industry stocks	Australia	Austria ¹³ Greece, Italy Luxembourg Sweden Switzerland Turkey United Kingdom	Canada	Norway
Industry and government/public agency stocks	United States New Zealand Czech Republic Germany Hungary Ireland Slovak Republic	Japan, Korea Belgium, France Finland Netherlands Poland, Portugal Spain		Denmark ¹⁴

¹³ Austria places a minimum stockholding obligation on industry most of which is held at the private, non-profit stockholding company ELG. By IEA definition ELG falls under "public stock" although the reporting to IEA does not separate ELG stocks from industry held stocks.

¹⁴ Denmark has compulsory stockholding required to meet EU obligations.

Of the countries that hold government or public agency stocks as well as industry stocks, most European countries use stock agencies to manage the public stock component. In countries outside the European Union (United States, New Zealand, Japan and Korea) the public stocks are directly owned by government. The IEA gives details on the systems in individual member countries at <http://www.iea.org/netimports.asp>.

Most countries use a combination of methods to meet their stock holding obligations and there is no common or standard system. In the IEA 2007 Oil Supply Security Review the following statement was made.

One general attraction of a mixed system is that it can improve overall "visibility" of emergency stocks whilst maintaining an operational link with the oil companies. This should help to ensure rapid drawdown in an emergency. Nevertheless, there is no single, perfect system for maintaining the required minimum stockholding level. Any given stockholding arrangement will have both advantages and disadvantages in terms of efficiency, cost and equity. Ultimately, the choice will depend on the particular country circumstances.

3.1 Government responsibility

This section looks at how the government can manage compliance stockholding options.

3.1.1 Possible models

As noted above there are several different ways governments have chosen to own and manage stocks. These include:

- Direct ownership of stock (either actual stock or tickets) and management by an appropriate government department;
- Direct ownership of stock with management by a third party (either an agency or a private company);
- Setting up a stock agency (government owned) which will own and manage the emergency stocks; or
- Contracting others directly to hold stock on the Government's behalf.

As noted previously, management of physical stocks is a lot more complex than if only tickets are used, especially the financial management of the asset value. New Zealand is the only country that uses tickets exclusively for its public stocks and this is managed within a government department. The expense and legislative process required to set up a stock agency was not deemed justified to manage a ticketing process.

3.1.2 Resources/expertise required

The resources for managing and administering physical and ticket stocks were covered in the details on the stock type sections. This section briefly looks at the annual process and work required for managing stock types.

Ticket stock

While the resource requirement for managing ticket contracts is not significant there is still a range of expertise required, albeit on an intermittent basis. This includes:

- Tender process management (preferably a once a year process but it may be more frequent);

- Technical advice on oil industry contracts and pricing;
- Legal advice on oil industry contracts;
- General advice on government tendering (especially offshore); and
- Invoicing and payment.

If there are ticket contracts held within Australia there will also need to be an audit function. This may be best managed by outsourcing to a third party with the appropriate expertise (e.g. an inspection company).

Physical stock

Holding physical stock increases the resource requirement although as noted in section 2, many tasks are likely to be outsourced. The actual requirement will depend on the approach (covered in the next section). Whichever approach is taken, annual tasks are likely to include:

- Running tenders for more storage capacity (if required);
- Running tenders to buy more stock (if required);
- Monitoring product quality and carrying out product turnover as necessary (this may involve selling stock and buying replacement stock);
- Managing loans (if used);
- Managing financial instruments (e.g. hedging, foreign exchange); and
- Financial accounts.

The expertise required will include specialist petroleum engineering, technical, legal and financial advice.

3.1.3 Physical stock approaches

Governments and stock agencies have a variety of approaches to holding physical stock and the related storage facilities. Some governments have developed and own the storage facilities (particularly in-ground storage facilities). Others lease any storage they want from the market and leave it to private providers to own and manage the facilities. In this case storage facilities are normally secured through a tender process (which can be for a build, own and operate contract if the government wants to be removed from facilities ownership but new facilities are required).

With regard to stock, most governments own the stock even when they lease the storage facility. It would be possible for a government to contract a third party to own the stock (variation on a ticket contract) although there will be issues with managing the third party's price exposure over the term of the contract. The oil market can have radical price movements in a short space of time so a provider of stock could be left with a very different asset value at the end of the contract with no assurance that the stock would be further required. Managing this price exposure may increase the cost versus direct ownership.

3.1.4 Agency

Many countries have set up stock agencies to manage their emergency stocks. Agencies require legislation to establish them and because the assets they buy, hold and sell are large, often operate with a government guarantee. This is sensible as it is in the government's interest to keep the borrowing cost as low as possible. Where a levy is applied to fuel sales to fund the stock holding, the income goes directly to the agency.

The advantages of stock agencies include:

- Separation from general government activities;

- Clearly demarcating a commercial activity; and
- Making the costs involved transparent.

There are costs involved in setting up an agency – it is only worth the expense if the commercial activity in the agency will be significant.

3.1.5 Funding

There are three models for funding emergency stocks.

- Funding from the general government budget.
- Funding using a levy on consumers.
- An obligation on the industry to be recovered from the market.

The first two of these are discussed here, the third in the discussion on industry obligation.

Some countries fund emergency stock from the general government budget particularly non-European countries. However many of these countries established their reserves over a long period of time when the petroleum prices were at lower levels. Setting up emergency reserves now, where some physical stock is included, is likely to put a strain on the Australian Government's budget and would need to be done over a period.

Direct funding via a levy on consumers is common in Europe and most countries tax petroleum in some way. The levy provides an annual income stream to the government or stock agency. With physical stocks there are large upfront costs so a lot of stock agencies use loans to purchase fuel which can then be funded through the levy income.

3.2 Industry responsibility

This section explores how industry might manage a stockholding obligation and what issues this involves.

Nineteen IEA countries have a stockholding obligation on their industry. In the main they are European countries where they also have to meet European Union compulsory stock requirements although outside the EU, Japan and Korea have industry obligations.

Before discussing the industry obligation it is important that the petroleum industry is understood and categorised as the obligation may only apply to part of the industry or in different ways to different parts of the industry.

Industry can be segmented as follows:

Table 7: Industry categories

Category	Description
Upstream	Companies who explore and produce crude oil, condensate and LPG.
Refiner/wholesaler (retailer)	Companies who are involved in the purchase and processing of crude into products and then wholesale products in the marketplace (which may or may not include retail). ¹⁵
Product importer/ wholesaler/(retailer)	Companies who purchase imports directly into terminals and then wholesale into the market (they may also retail).
Product importer/own use	Companies who import product for their own use – this may be via an agent.
Terminal owner	While many of the integrated companies covered above will own terminals, there are also specialist terminal operators who don't own stock.
Retailers	Companies who retail but do not import or wholesale product.

The categories are determined by differences in supply chain. In practice all Australian refinery/wholesalers are also direct importers. Some upstream producers also directly wholesale LPG.

3.2.1 Upstream/Terminal owners/Retailers

The amount of emergency stock required depends ultimately on the total demand of the country. The net import requirement is reduced by indigenous production and the commercial inventories contribute to total stock holdings. However total demand is the key driver and it is the consumers of these products (and the economic consequence of them not being supplied) that is being protected through compulsory stocks. All countries that put obligations on industry therefore focus on the supply chain to the consumer - refiner/wholesalers/retailers. No country currently puts any obligation on the upstream industry.

Australia is no different so similar logic sees the focus for obligation on the non-upstream industry categories.

¹⁵ Australia has no independent refiners

While specialist terminal owners hold stock they are generally not involved in owning stock and selling into market. As the obligation is related to the import or sale of stock, then logically no obligation should apply to a specialist terminal operator.

Most countries have many more petroleum retailers than wholesalers. This is because importing and wholesaling fuel requires some specialised expertise, a reasonable scale and a significant amount of capital. Retail by contrast is less capital intensive and can be small scale. A retailer only needs to purchase fuel for delivery in a road tanker - a very small volume in the context of importing and wholesaling.

It is also at the importer/wholesaler (and refiner) stage that the bulk of stocks are kept and maintained. For these reasons it is the refiner/importer/wholesaler segment of the market where obligations are generally applied. This also limits the number of companies involved in an obligation scheme.

3.2.2 Refinery/importer differences

The reason for splitting out refiners from direct importers is their supply chains are different and for normal commercial operation they will hold different amounts of stock. A refiner imports crude in large ships and will retain a buffer stock to ensure continuous operation. They will then have intermediate stocks (as part of refinery operation) as well as finished product. A direct product importer imports products on ships that are typically smaller than crude vessels and will also keep a buffer stock. While a direct importer is likely to have higher finished product stocks than a refiner, in total they may have significantly less in terms of day's sales, once crude feedstock and refinery intermediates are taken into account.

This difference in commercial stock levels depending on the supply chain is relevant when obligations are contemplated.

3.2.3 Obligation options

Nineteen out of the 28 IEA countries place some obligation on their domestic industry. There is no standard model but all have the following features.

Obligation Basis: Typically based on the data from the previous year – either import volumes or sales to market.

Obligation Type: Can be for specific crude or product (LPG is usually covered and sometimes petrochemicals) or can be left to industry decision

Obligation Level: This varies widely from 13.5 days of net sales in the Netherlands to about 100 days in Austria where the total obligation is put on industry¹⁶

From review of obligations systems, countries don't generally distinguish between the different supply routes (importers versus refiners). That is, one litre of product should carry a similar obligation no matter its supply source. In theory this should make it easier for refiner/marketers to meet an obligation than direct importers (as they tend to carry more days of stock). A few countries appear to address this issue by allowing high levels of 'contracting out' of obligation, an action that is usually taken by importers/marketers that don't refine. This means they will not

¹⁶ The obligation can be above 90 days to cover the removal of 10% of stock when counting stocks toward the IEA minimum obligation.

have to hold the stock themselves but can look for cheaper market based options (such as tickets).

Having a low level obligation (which may allow a refiner/market to have excess inventory) would allow a ticket market to develop (there would be sellers and buyers immediately in the market) but would give a relative gain to the refiners over direct importers. It may be that many countries are comfortable with this as a way of helping domestic industry (and refineries do actually result in more stock in the country).

At the lower level (as in the Netherlands), the obligation can be below the normal minimum level of operation. This provides a base above which those companies can then participate in the ticket market. For most countries the obligation is set at a level that would be above their normal operational minimum and sometimes above their average stock level requiring additional storage facilities.

How companies are allowed to meet the obligation varies widely between countries. This includes:

- Requiring the set minimum level of stocks to be held by each company;
- Allowing companies to trade the obligation between themselves;
- Allowing a portion of the obligation to be contracted out to a stock agency (either private or state owned); and
- Allowing companies to meet the obligation using tickets (in some cases only in-country, in others with bilateral tickets).

Stock measurement

The IEA's measurement of the stock that can be counted toward the obligation is different than that owned by industry. Typically companies will purchase crude or product when the ship is loaded so own the product well before it gets to Australia. The IEA only allows the product to be counted once it is in Australian waters. Any obligation would need to be very clear on what basis it is being measured. There would be an advantage if the obligation was on the same basis as the IEA measurement, as then companies would ensure that all stock that could be counted would be (it is likely that stock levels would be higher than those currently reported). However this may be difficult for companies to manage with their systems working on ownership. If ownership is used the target would then need to take account of the stock on the water which is not counted.

3.2.4 Obligation system for Australia

Based on the previous discussion this section looks at what an obligation system would look like for Australia.

Location of obligation

The obligation will be related to consumption of products. All major products consumed in Australia are subject to excise tax whether refined, directly imported or produced in Australia (LPG). Efficiency and logic would suggest the obligation to hold stock be related to volume through the excise point in the previous year – the company paying the excise tax would have the obligation.

Which companies would be included?

Setting the obligation at the above point should catch all refineries/wholesales, all importers and producer/wholesalers of LPG. A list of these companies is not available but in addition to the four oil majors (who refine) there are likely to be quite a number of other companies who import

product for own use and on-sale. The companies who produce and wholesale LPG would also need to be included in the scheme.

All companies that pay excise would need to be involved. To exclude any groups would give exempted market segments a competitive advantage.

Products covered

The demand which sets the net import target (and therefore inventory target) includes all petroleum products. However it is only a few products that make up most of the demand. From 2011 consumption data, six main products made up 98.4% of the total demand (petrol, jet fuel, diesel, LPG, fuel oil and bitumen). For efficiency it would make sense to have the obligation apply to these products only. The low volume products tend to have higher stocks in days cover anyway.

Level of obligation

Setting the level of any obligation needs to account for the year to year variation of the target due to the influence of upstream production changes. If the total target was met through a physical stockholding obligation it may be difficult for industry to manage, as a different number of days of cover may be required each year. Unless the obligation was set well above the 90-day minimum to account for the variation expected (which could significantly increase the cost). It would be difficult for industry to manage against a target that changed annually (most countries' industry obligation levels only change occasionally).

A more practical obligation system for Australia (if the total obligation was to be managed by industry) would be to set minimum levels that needed to be held as physical stock and then allow volumes above this to be managed collectively and/or flexibly (that is through an agency and/or with the use of tickets).

Setting the obligation at or just above the current commercial stock minimum would be recognition that the current level of stocks provides sufficient supply security. However because of the different supply methods, it may require direct importers to hold a little more stock to meet the same number of days that refinery/marketers hold.

An obligation would allow a ticket market to develop as covered in Section 2.2.6. There would be significant costs involved both for the industry and the government in setting up, managing and monitoring an obligation.

3.2.5 Cost of obligation

When an obligation is put on industry the expectation is that the cost will be passed through to the market. If the obligation is higher than normal commercial stock levels, industry will incur costs for the extra stock held and in storage provision, especially if they need to build more storage facilities (or bring forward investment). Industry will expect to make a return on these costs. As long as the obligation is put consistently across industry (all litres sold incur a similar obligation) then market forces should see that cost passed through at an appropriate level. However because the industry's expectation of the return on investment may be higher than the

government, the actual cost passed through to consumers may be higher under an industry obligation than a government levy.¹⁷

The need to fund the costs involved could put pressure on the industry especially one already said to be under pressure for financial returns. Any obligation will need to be carefully thought through and implemented slowly (if different to current stock levels) to avoid any shocks on the industry.

3.2.6 Government requirements for industry obligation

There will be a number of changes required by the government in order to implement an obligation scheme including:

- Legislation/regulations;
- Monthly stock reporting must be mandatory;
- Monthly compliance verification;
- An audit system needs to be developed (some governments have the stock agency do this task); and
- A penalty system for non-compliance (countries have a mixture of fines and other penalties such as removal of licence to operate or imprisonment).

The process to implement an obligation system will be relatively complex and could take two to three years to work through all the issues and to develop the legislation/regulations required. There would then need to be a period of transition to give industry time to adjust to the obligation and to gradually build up stock levels.

3.2.7 Stock release

Although industry would own the stock under an obligation system, the government still needs control over stock release. This is normally done by reducing the number of days stock obligation in an emergency event. If the obligation is managed partially through a stock agency, the stock agency would release the stock once the obligation was reduced.

3.3 Summary of Responsibility options

Table 8: Government responsibility versus industry

	Government	Industry
Flexibility	Likely to be easier to manage a changing requirement with the impact of domestic production changing the target.	The change in requirement forecast will be difficult for industry to manage against (i.e. a rapidly changing stock days obligation)
Volume	Volume can be managed	Volume can be managed
Stock type	Option for a mix of stocks	More likely to be weighted to product due to influence of direct imports
Cost	Government control can mean use of infrastructure providers who may provide cheaper cost (i.e. funding) than industry participants for storage facilities.	Integration with existing supply systems may provide cheapest storage options (at least for some initial volume). Would need to phase in slowly given large upfront cost.

¹⁷ There is likely to be very little difference in the actual cost of capital given the financial size of many of the industry participants – what is different is the expectation of return from that capital

	Government	Industry
		Higher capital return expectations may result in a higher costs passed through to consumers. High capital requirements could put industry participants under financial strain and lead to market exits.
Location	Dependent on choice between physical stock and tickets	Will be held domestically unless allowed to meet a portion of the obligation with offshore tickets.
Implementation timing	Likely to be faster as less legislation required	Legislation and compliance systems would be required which may increase the time required for implementation.
Key contractual requirements	In line with the requirements for ticketing and/or physical stock	Additional requirements for government including: <ul style="list-style-type: none"> ■ Legislation for establishing obligation and rules around whether obligation can be traded or transferred ■ Legislation for reporting, monitoring and compliance ■ Possible need to have legislation allowing industry to set up a stock agency Industry would have to set up their own systems for contracting stock
Funding	Option of either general budget or levy on fuel use	With obligation on total market the cost would be passed through to consumers by industry.
International and domestic security	Provides international compliance – domestic security impact will depend on choice between physical stock and tickets. Government would control release.	Likely to provide some improvement to domestic security as well as international compliance. Government would control release though control of the obligation level.
Issues	Do not gain any benefit from having a strong link between industry and government in provision of emergency stock.	Complex implementation and much more resource intensive to operate – may be difficult to justify with the current commercial stocks reported as sufficient for supply security. ¹⁸

¹⁸ ACIL Tasman, October 2011, Liquid fuels vulnerability assessment.

4.0 Synthesis of options

With two primary ways of holding stock and two key options for who takes responsibility, there would be four options for managing emergency stock. However with a combination of the type of stock and who has responsibility, there can be hybrid options, giving a total of nine options as shown in Table 9. Based on the preceding discussion the table indicates the trend or direction in cost, complexity and ability to manage different volumes against the options (with examples of the countries that use each system type).

Table 9: Emergency stock options

	Ticket Stocks	Tickets and physical stocks	Physical Stocks
Government owned	Option 1 (e.g. New Zealand)	Option 2 (e.g. Ireland)	Option 3 (e.g. US, Germany)
Combined government and industry obligation	Option 4	Option 5 (e.g. France, Netherlands)	Option 6 (e.g. Japan, Korea)
Industry obligation	Option 7 (e.g. Luxembourg)	Option 8 (e.g. United Kingdom)	Option 9 (e.g. Austria)

Increasingly complex regulation required. Change in cost not certain but may be higher.

Increasing cost and complexity; capable of managing more volume

Australia's requirement

As covered in Section 1.0 Australia's requirement for emergency stocks is expected to increase substantially from the current 1.4 million tonnes over the next decade. While BREE noted in their forecast that work is continuing improving the counting of all stocks, more physical stock counted will reduce the current target but not change the profile of increase. This is a result of a forecast decline in production coupled with a forecast increase of demand. There is a significant degree of uncertainty in the forecast beyond five years as the requirement can change with exploration success. For a non-frontier basin discovery, it can be as quick as five years from discovery to production (a frontier discovery would normally be longer). A field that is expected to produce 50k b/d in its early years¹⁹ would reduce the minimum stock obligation by 0.56 million tonnes; a significant impact.

The uncertainty in the forecast, coupled with the rapid year to year change, means there is a significant incentive to use a system which provides flexibility to manage variations cost effectively.

¹⁹ Australia's current crude and condensate production is between 400-450k b/d

While different models will take different times to implement, and full implementation will be dependent on the total amount required (the higher the amount the longer it is likely to take), for cost comparison purposes this report calculates the cost of full implementation of each model in 2016 and 2022. This report refers to stock required to meet the IEA obligation as 'IEA tonnes'; there are defined conversions for converting physical stock to IEA tonnes.

*For crude: IEA tonnes = physical tonnes crude * 0.96 * 0.9*

*For product: IEA tonnes = physical tonnes product * 1.065 * 0.9*

For comparison, the normal commercial stock levels are around 5 million tonnes (at the low point).

Models for further consideration

Some of the options in Table 9 are similar and in some cases they may not be practical to meet Australia's requirements. It is proposed to investigate in detail the following four models which cover a full range of options for consideration.

Model 1: (Option 1). Government responsible for the IEA stockholdings and uses ticket contracts to secure emergency stock above existing commercial stock levels.

Model 2: (Option 2). Government responsible for the IEA stockholdings and uses both physical stock and tickets to secure emergency stock above existing commercial stock levels.

Model 3: (Option 5). Combining government responsibility with an industry obligation and using both physical stock and ticket contracts for emergency stock.

Model 4: (Option 8). There is an industry obligation which will ensure the target can be met with the option to use both physical stock and tickets to meet the obligation.

The reasoning for selecting these options for detailed investigation and evaluation and excluding the other five options in Table 9 is as follows:

Option 3: (Government responsibility using only physical stock) All the issues with this approach arise in Option 2. However the use of some ticket contracts is likely to provide volume flexibility and a quicker implementation that will be beneficial as well as to avoid regret investment in facilities if the requirement reduces.

Option 4/7: (including an industry obligation, with or without government responsibility, along with using only tickets). Setting up an obligation system for industry will be complex. If the intention is not to change the physical level of stocks in Australia (compliance met through ticketing) then the work required for the set-up is unlikely to be justified.

Options 6/9: (including an industry obligation, with or without government responsibility, along with using only physical stock). As covered in the previous discussion, tickets contracts are likely to provide the flexibility Australia needs to manage a changing stock requirement. Therefore it makes sense to have the ticket option included and Models 3 and 4 will cover all the issues with using physical emergency stock under these responsibility options.

In the four models chosen the value or appropriateness of having a stock agency structure is discussed.

5.0 Description of models

The four models selected in section 4 are described below following the same structure.

5.1 Model 1: Government responsibility using tickets

5.1.1 Responsibility and description

Government takes the responsibility for holding sufficient emergency stock above commercial stocks held by industry to ensure the IEA obligation is met. It will do this using the ticket contract structure so Government will not own or manage any physical stock.

5.1.2 Cost of implementation

Tickets are paid for when held so there is no upfront cost (other than the internal costs for developing the agreements and contracts required). Australia's required volume is now above those other countries/agencies have secured through the ticket market. Given this, it would be sensible to initially secure lower volumes of ticket stock (500,000 tonnes) and build up to higher volumes as the market responds to the additional demand with more options. The volumes required in future years are so significant that they are unlikely to be available under the normal ticket contract structure. Options covered in 2.2.10 would need to be considered to look for ways in which additional volumes might be made available.

While there is substantial uncertainty whether the volumes forecast required for 2016 and 2022 respectively would be available through tickets, for purposes of cost comparison we assume they are. In developing the cost estimates it is assumed stock above 1 million tonnes is available at a similar cost to storing physical stock.

Table 10: Model 1 cost estimate

	2016 estimate	2022 estimate
IEA tonnes	3,287,969	6,631,382
Ticket volume required	3,543,000	7,146,000
Total cost estimate (AUD M)	264	573
Average ticket cost (USD/te/month)	6.50	7.00

Cost estimate assumes stock held will be 30% crude and 70% product and all stock is held offshore. The forecast administration cost is AUD1 million/year although this could be higher if new contracting strategies are required due to the large volume requirement. The cost will primarily relate to fees for services (particularly legal).

One issue that needs to be decided in advance is whether there will be preferential treatment for ticket stock held in Australia. While ticket offers from Australian companies may be more expensive than offshore tickets for lower volume requirements, this may not be the case at these high volume requirements. Domestic tickets have the added benefit of providing security against domestic supply disruption.

The decision on whether to treat Australian ticket stock more favourably is a policy decision that should be agreed in advance of issuing tenders.

5.1.3 Revenue Options

Under this option the government could choose to fund the cost from the general budget or through a levy on consumers. Management through the general budget would give flexibility to manage what will be an unknown total cost prior to tender however at forecast volumes the cost is significant.

Levy: If funded by a levy it would be advisable to set the levy to cover the maximum expected cost. If more revenue is received than spent then this can be retained to meet future cost increases or in time allow a reduction in levy. On the forecast, the required levy would rise from just above 0.5cpl in 2016 to over 1cpl by 2022 assuming it is charged on all six main products.

5.1.4 On-going management and related issues

As covered in Section 3.1.2, management of a ticket operation is straight forward and requires little dedicated resource although for the high volume requirement a lot of preparatory work exploring options with interested parties will be required. This should be done over a period of a few years so the market adjusts to the new and much higher demand for ticket contracts.

5.1.5 Contractual framework and governance issues

Section 2.2.7 covers the work required to set up a ticketing system including the contractual basis. As the volumes are significant and will likely require Australia to investigate changes to the typical contract structure, it may be justified to set up a specialised unit or agency to manage the operation. Undertaking ticketing within Australia will add to the complexity. For offshore tickets the host country ensures compliance which is included as part of the collection of stock data for IEA reporting.

5.1.6 Access and release issues

Access to and release of ticket stock is covered in Section 2.2.9. Unless some ticket stock is held in Australia the stock is unlikely to have a direct impact on improving domestic security. It will have an indirect effect by active participation in the ability for IEA members to respond to emergencies. There is also, in extreme circumstances, the ability to purchase ticketed stock held offshore and bring the stock to Australia should companies have trouble securing stock at market prices during an emergency. The purchase option is only likely to be exercised if the industry approaches the government saying they would like access to the stock. In these circumstances the government would run a tender to sell the stock in conjunction with exercising the purchase option (i.e. is unlikely to get involved in bringing stock to Australia). The tender would only be for those companies active in importing stock into Australia (i.e. active in servicing the Australian market at that time).

5.1.7 Benefits and risks

Table 11: Model 1 - Benefits and risks

Benefits	Risks
<ul style="list-style-type: none">■ Annual flexibility fits in with Australia's changing target■ Likely to be lowest cost option■ Fastest implementation■ Easier to implement and manage	<ul style="list-style-type: none">■ Least improvement in domestic security■ Dependent on other countries allowing bilateral stock holdings■ Likely to be a limit to total volume that can be secured (at an appropriate price)

<ul style="list-style-type: none"> ■ Avoids regret investment ■ Allows full participation in IEA collective action (through release of stock) 	<ul style="list-style-type: none"> ■ High volume requirement will require preparation and some years to fully implement ■ Offshore stock reliant on shipping being available if need to transport to Australia
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5.1.8 Impact on competition

There should not be any impact on competition in the petroleum industry. On the small chance the purchase option is exercised, if the stock is offered in tender to those companies servicing the Australian market (i.e. active importers) then this should avoid any market distortions at that time.

5.1.9 Possible impacts

Table 12: Model 1 - Possible impacts

Group	Comment
Consumers	This model would have the least impact on petroleum consumers even if a levy is used to fund it. At higher volumes the levy could be over 1cpl which would be high enough to result in public interest.
Government	The model provides the lowest cost option for government with no new regulation required (unless a levy is used to fund it). At higher volumes the cost is likely to be significant which may rule out general budget funding.
Petroleum Industry	This model leaves industry to operate as now and make its own decisions on stock levels. Other than the opportunity to tender to hold ticketed stock there will be little direct impact. If a levy is implemented, industry would be involved in its collection as it does for excise tax.
Business*	There should be no impact on the general business community.
Community*	The main issue with the community is that there may be a perception that Australia's oil security is improved through spending this money. In practice there is little change to domestic security unless some ticket stock is secured in Australia.

* Fuel price rises will have an impact on fuel intensive businesses/sectors and also vulnerable community members, however for the purposes of this analysis, these impacts are quantitatively included in the Consumer group in the table. It is beyond the scope of this report to consider the qualitative social or welfare implications of the models.

5.1.10 Indicative timeline for initial implementation

The following chart shows the timeline for initial implementation steps once a decision has been made on the model choice. It is likely to take a year to set up the government to government agreements and the tender documentation and stock can be held from two months after a tender. At higher volumes it may a number of years, if feasible at all, to build up to the full volume required especially if the volumes mean that some adjustment is required to the contract documentation (e.g. for structures that result in holdings for longer periods). The initial implementation time to obtain some ticket stock should be significantly quicker than initial physical stock options for obtaining some emergency stock.

Total time to compliance is uncertain as it is unlikely there will be sufficient volume in the tradition ticket market to meet Australia’s total requirement. It may depend on the market looking at different ways they might hold stock that will still be compliant.

Model 1: Government Ticket Option - initial steps to compliance

#	List of Activities	Start	Dur	Year 1				Year 2				Year 3				Year 4			
				1Q	2Q	3Q	4Q												
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Develop and sign G-to-G Agreements	1	3	█	█	█													
2	Decide on funding approach - if levy implement legislation	1	4	█	█	█	█												
3	Decide on approach to allowing ticket stock offers from within Australia.	1	3	█	█	█													
4	Develop template ticket contract (s)	1	3	█	█	█													
5	Approach interested companies and agree template contractual terms and assess suitability	3	2			█	█												
6	Prepare tender documentation	4	1				█												
7	Run tender for up to 500,000 tonnes	5	1					█											
8	Secure initial stock	6	4						█	█	█	█							
9	Explore options for additional stock holdings	6	3							█	█	█							
10	Run tender for up to 1,000,000 tonnes	9	1									█							
11	Secure large volume of stock	10	4										█	█	█	█			
12	Run tender (including next increment of stock)	13	1															█	
13	Volumes for future tenders dependent on market response. Timing to compliance uncertain if achievable at all.	14	4																█

5.2 Model 2: Government responsibility using physical stock and ticket contracts

5.2.1 Responsibility and description

Government will take the responsibility for holding sufficient emergency stock above the commercial stocks held by industry using a combination of physical stock and ticket stocks offshore.

The key decision is the split between physical stock and tickets. As noted earlier, Australia's target can change markedly although there will be some warning (the time taken to develop a new field into production) of upcoming changes. Based on the forecast, in most years the target is changing by just over 400,000 tonnes a year. It is recommended that at least two years likely variation is held as ticket stock, given the time period to develop physical storage infrastructure. Therefore we assume that 850,000 tonnes of the target will be held as ticket stock.

It would be more economical to secure physical stock in relatively large increments due to the economies of scale for new storage facilities. Therefore ticket stock would operate in a band where ticket stock could be reduced when physical stock was secured.

The cost assumes the physical stock held in Australia, in which case there will be no need to have ticket stock in Australia unless it is an equivalent price (our assumption is it won't be). The split of the physical stock with ticket stock would be expected to provide an appropriate balance between onshore and offshore stock.

Holding stock is a long term decision. If crude is held, there will need to be some expectation that Australia will continue to have a refining sector over the expected life of the storage and stock asset (40 years for storage).

5.2.2 Cost of implementation

The cost is shown for full compliance in both 2016 and 2022. In practice the target is increasing so rapidly it is debatable as to whether full compliance would be achieved even by 2022 (due to the volume of new storage facilities required). In practice there is likely to be a profile of increasing costs up to these levels.

Table 13: Model 2 cost estimate

	2016 estimate	2022 estimate
IEA tonnes	3,287,969	6,631,382
Physical tonnes (crude/product)	805,000/1,880,000	1,850,000/4,320,000
Ticket volume	850,000	850,000
Capital Cost (AUD M)	4,163	9,738
Annual cost (incl. Capital cost annualised at 5% rate of return AUD M)	255	597
Annual cost (incl. Capital cost annualised at 10% rate of return AUD M)	455	1064
Annual ticket cost and administration (AUD M)	41	43
Total annual cost (AUD M)	296-495	640-1106

5.2.3 Revenue Options

As with Model 1 the government could choose to fund the cost from the general budget or through a levy on consumers. The large costs (storage facility and stock) are likely to be known in advance once the model used to secure them has been decided and the likely cost of capital defined. Therefore it will be easier to set an appropriate levy level prior to the funds being required.

Government budget: Using the general government budget will be difficult given the substantial sums required for stock purchase (even if tanks are leased). On its own this is expected to be around AUD2.5 billion by 2016. The annual cost assumes this money is borrowed and repaid on an annual basis but for the government it may appear as debt so would have an immediate negative impact on balancing budgets.

Levy: The estimated per litre cost if a levy is used increases from between 0.58-0.86 in 2016 to 1.25-2.15 in 2022(applied to the six main products). The actual per litre cost may be marginally lower as the higher volume demand forecasts were not available for the calculation, so 2011 volumes are used.

5.2.4 On-going management and related issues

As there will be both physical and ticket stock there will be a reasonable amount of on-going management, especially with regards the maintenance of product quality. It may be that the task is best managed by an agency structure (covered below).

5.2.5 Contractual framework and governance issues

The contractual framework covered in Model 1 will need to be set up for this model. In addition a structure will need to be set up to manage physical stock. There may be value in setting up a stock agency to manage these tasks and give dedicated responsibility to an organisation to manage what will be substantial assets and significant revenue flows. If a levy is used this can go directly to the stock agency.

The key governance issue will be the management structure of the department or agency responsible for the emergency stock (physical and ticket). If an agency is set up there will need to be an appropriate governance structure including a Board. A number of stock agencies have industry representatives on the Board so there is an appropriate level of industry input into stock decisions.

5.2.6 Access and release issues

The presence of physical stock in Australia would reduce the likelihood of any offshore ticket stock actually been transported to Australia (it could still be released to meet Australia's commitment to any collective IEA action). As covered in Section 2.1.7, rules would need to be established around when the stock could be released so that the emergency stock holding did not affect normal market operation. This would need to be prepared and made known well in advance as once there is stock held there may be a general public perception that:

- The government can release stock to keep prices down (such a view is both unrealistic in view of the quantity held and with the principle that the Australia market should remain linked to the international market); and

- If there is a regional disruption caused by issues with one or more suppliers, that the government would act (this is unlikely to avoid interference in the market except perhaps in the case of a disruption caused by a natural disaster).

Another issue that needs to be thought through is the result if the government does release stock in an emergency. In any international event this release is likely to take place at a time of elevated prices. This may mean the stock is sold at a profit. This has happened with some stock agencies and generally any profit made is used to fund the on-going activity of the agency (i.e. reduce future levies). This would be an appropriate way of managing the issue – the key understanding is the stock is not being held with the purpose of making money in times of emergency.

5.2.7 Benefits and risks

Table 14: Model 2 - Benefits and risks

Benefits	Risks
<ul style="list-style-type: none"> ■ Provides flexibility with a reasonable portion of ticket stock to manage Australia’s changing target ■ Allows prompt implementation with some ticket stock and then building physical stock over time ■ Provides both domestic security and easy participation in collective international action through release of ticket stock ■ Allows flexibility between physical stock and ticket stock depending on the state of the ticket market (availability and cost) 	<ul style="list-style-type: none"> ■ High cost of physical stock holding ■ Risk of stranded storage facilities (regret investment) if Australia were to have a major oil discovery. ■ Dependent on other countries allowing bilateral stock holdings ■ Much larger impact on the budget

5.2.8 Impact on competition

There should not be any impact on competition in the petroleum industry if the government structures the way it secures physical emergency stock appropriately.

Industry raised a couple of concerns that could impact competition.

1. With the government holding physical stock they become a player in the market especially with the need for product turnover.
2. The establishment of new facilities for storing emergency stock could provide competition to existing facilities once their use for emergency stock was ended. The establishment of these facilities would have been underwritten by payments from the government for holding emergency stock.

The first of these concerns is likely to be manageable by rules governing turnover (e.g. buyer of product has to also supply the replacement product so there is no net impact on the market). The location of the facility could give one market player an advantage in providing the turnover service - in this case it would be sensible for the government to establish the costs for product turnover in advance of putting product into the facility.

The issue with infrastructure is more complex. Rules could be put in place to ensure the facilities are only used for emergency stock but this is likely to increase costs and possibly rule out sensible

options where in time those facilities could be used in the normal market operation without any competitive impact. In practice this may be an issue that needs to be managed on a case by case basis with any facility that is a new investment.

5.2.9 Possible impacts

Table 15: Model 2 - Possible impacts

Group	Comments
Consumers	This model would have an impact on petroleum consumers if a levy is used to fund it. It would provide consumers some domestic security to provide protection against domestic disruption.
Government	The model provides a flexible option although the upfront cost is substantial. This may encourage the government to set up stock agency (and fund using a levy) so the cost can be separated from the normal government budgetary activity.
Petroleum Industry	This model leaves industry to operate as normal and make its own decisions on stock levels. There is the opportunity to tender assets to store product for the government and sell stock to the government through tender processes. If a levy is implemented industry would be involved in its collection as it does for excise tax.
Business*	There should be little impact on the general business community.
Community*	The main issue with the general community is the perception as to how the money being spent is improving liquid fuel security. In this model there will be an improvement in domestic security but it needs to be understood that there is no protection against price movements in the international market.

* Fuel price rises will have an impact on fuel intensive businesses/sectors and also vulnerable community members, however for the purposes of this analysis, these impacts are quantitatively included in the Consumer group in the table. It is beyond the scope of this report to consider the qualitative social or welfare implications of the models.

5.2.10 Indicative timeline for initial implementation

The following chart shows the timeline for initial implementation steps once a decision has been made on the model. The ticket stock process would follow that outlined in Model 1 so initial stock can be secured around 12-15 months. As covered in Section 2.1.5, facilities would take time to build and for significant volumes the construction of new facilities would need to be staged. Therefore it may take up to 10 years or more to get to full compliance using this model because of the increasing target. The use of ticket stock could be expanded in the interim (above 850,000 tonnes) if there was sufficient availability.

Industry considers it worthwhile for the government to run a Request for Proposal process under this option to establish whether there are any opportunities for emergency stock storage within existing facilities. The upcoming shutdown of refineries may provide storage opportunities.

Model 2: Government Stock and Ticket Option - initial steps to compliance

#	List of Activities	Start	Dur	Year 1 Year 2 Year 3 Year 4 Year 5																			
				Year 1				Year 2				Year 3				Year 4				Year 5			
				1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
1	Set up ticketing system and begin securing stock (see Model 1 for details)	1	5	█	█	█	█	█															
2	Secure ticket stock - increasing over time	6	16						█	█	█	█	█	█	█	█	█	█	█	█	█		
3	Adjust ticket stock volume due to physical stock if necessary	10	8										█	█	█	█	█						
4	Set in place legislation for agency/ levy as appropriate	1	5	█	█	█	█	█															
5	Make a decision on whether stock can be comingled with commercial stock	1	2	█	█																		
6	Run a request for proposal for possible storage options in Australia and offshore	3	2		█	█																	
7	Reevaluate strategy based on reponses	5	1					█															
8	Set and charge levy at level that covers both initial ticket cost and likely physical cost	6	16						█	█	█	█	█	█	█	█	█	█	█	█	█		
9	Run tender for storage facilities	6	2						█	█													
10	Develop smaller scale options that don't need new facilities	8	2							█	█												
11	Likely first option for smaller quantities of physical stock	10	12										█	█	█	█	█	█	█	█	█		
11	Likely timetable to build 1st storage facilities for more significant storage	8	9										█	█	█	█	█	█	█	█	█		
12	Obatin loans for stock cost	8	1											█									
13	Run tender for stock for first facility	16	1																	█			
14	Secure larger quantity of physical stock	17	5																		█		
15	Likely timetable for second storage facility and then repeat over the following years a number of times before complipance	17	8																		█		
16	Monitor stock quality	10	12																		█		

5.3 Model 3: Combining Government responsibility with an industry obligation using physical stock and tickets

5.3.1 Responsibility and description

A model using a combined responsibility is likely to set an obligation for industry at a certain level (in terms of days sales), with the government taking responsibility for meeting the stock requirement above the industry obligation level. This model has the benefit of setting a stable obligation for the industry, with the government then responsible for managing the changing requirement due to growth and production changes.

The key decision with this model is what level to set the obligation for industry. If this is set too high then there might be too much stock held with nothing for the government to hold in balance (in that case it would be Model 4); too low and it defeats the purpose of having an obligation. The most appropriate level would be one which would result in marginally higher physical stocks than currently. That is, it might be around the minimum number of stock days a refinery/marketer might hold but a little higher than the minimum a direct importer might hold. While this will not have a significant impact on stock inventories held it has the advantage of:

- Setting a minimum benchmark that needs to be taken into account by industry in future business decisions (such as refinery closure);
- Opportunity to use the most cost effective storage (existing tankage) for at least some of the additional stock;
- It takes account of growth as commercial stocks will need to increase to match rising sales volumes; and
- It sets a baseline that then allows a flexible ticket market to develop in Australia which is likely to result in more cost effective ways to managing stock holdings.

With the target at a relatively low level, industry would be obliged to hold the stock as physical stock. The government would then hold the balance in physical and ticket stock.

For costing, it is assumed that the obligation increases the industry's physical stockholding by one day sales at inventory cycle minimum (110,000 tonnes) and the government holds the balance. Because the obligation only increases inventory at the cycle minimum it is assumed industry would adjust to working to this minimum and average inventories would increase by less (this would not hold with a single supply of fixed sized ship deliveries but supply chains are normally more sophisticated than this). For analysis we assume the average inventory only goes up 75% of the minimum increase (75% of 110,000 tonnes – i.e. 82,500 tonnes). This will be additional physical stock and we assume it will be product stock (not crude).

With the government responsible for the bulk of the emergency stock requirement, they still make a choice between tickets and physical stock (Model 1 vs. Model 2). For purposes of cost comparison this analysis assumes a similar mix to Model 2; that is 850,000 tonnes of ticket stock to manage two year's likely variation with the rest being physical stock.

5.3.2 Cost of implementation

The cost is shown as an annual cost. It is expected that industry could meet this obligation within the existing infrastructure as only the minimum inventory level is increasing. However industry is likely to expect a higher return on investment. To balance these two impacts, we assume the cost is the same as the new stand-alone terminal with stock at the 10% return (the cost of storage is likely to be lower than assumed but industry may seek a higher return on extra stock held that

offsets this). This cost would be incurred for the average extra physical inventory holding (82,500 tonnes). The government costs are similar to Model 2; slightly lower due to the small amount of extra stock industry holds.

Table 16: Model 3 cost estimates

	2016 estimate	2022 estimate
IEA tonnes	3,287,969	6,631,382
Physical tonnes (Industry/Govt.)	82,500/1,285,764	82,500/6,166,000
Ticket volume (Govt.)	850,000	850,000
Capital Cost (AUD M) (Industry/Govt.)	160/3,988	160/9,562
Annual cost (Govt. cost @ 5%) (AUD M) (Industry/Govt.)	20/245	20/587
Annual cost (Govt. cost @ 10%) (AUD M) (Industry/Govt.)	20/436	20/1,044
Annual ticket cost and administration (AUD M) (Govt.)	41	43
Total annual cost (AUD M)	305-496	649-1,107

As well as managing ticketed and physical stock, the government will have to manage and monitor compliance with the industry stock obligation which will involve significant costs. There will also be an administration cost incurred by the industry to manage the obligation level. The total cost will be dependent on the number of companies the obligation applies to and the complexity of the system. The above estimate assumes an administration cost of AUD2 million/annum for industry and a higher cost for government administration due to the large volume of physical stock required.

5.3.3 Revenue Options

Any cost from the obligation put on industry would be recovered from the market. However the extra cost for industry in this example is small (works out at less than 0.05cpl). It also may not be evenly spread across industry participants (covered in Section 5.3.8) so there is no certainty that a cost would be passed through to the market.

The government's cost is more significant; given the substantial funding needed it is likely a levy will be required. The levy is estimated at between 0.7-1.2cpl (2016) and 1.6-2.8cpl (2022).

5.3.4 On-going management and related issues

Most of the management issues with Model 3 relate to the management of compliance with the industry obligation. The government tasks for stockholding are as outlined in Model 2.

5.3.5 Contractual framework and governance issues

This model may well be the most complex in terms of the contractual framework. The entire contractual framework covered in Models 1 and 2 will need to be established for this model. In addition, there will need to be legislation to cover the obligation system and whether companies would be able to trade the obligations between themselves. Another option to consider is whether industry would be able to set up a stock agency to collectively manage some of the obligation

(probably not justified given the obligation is only likely to result in a small physical stock increase).

A stock agency (or specific government office) would provide value for both managing the government’s stock portion (tickets and/or physical stock) and for managing the compliance. The key governance issue will be the management of the obligation and how it will be enforced by the government.

5.3.6 Access and release issues

The industry obligation proposed for Model 3 would not raise industry stock levels a lot (or at all for some companies) so there would be limited means to respond to emergencies by reducing the obligation level. However there would now be an assurance of an appropriate level of physical stock whatever decisions individual companies made on their supply chains. If the government felt that physical inventories were not providing adequate domestic security they could increase the obligation at a future point.

As the government would hold emergency stock, the government could respond to collective international action by releasing ticket stock. Domestic emergencies would be covered if physical stock is held in Australia.

The government also has the ability to relax the obligation which would be expected to free up some supply for the domestic market as the obligation is designed that more stock would be held than if there was no obligation.

5.3.7 Benefits and risks

Table 17: Model 3 - Benefits and risks

Benefits	Risks
<ul style="list-style-type: none"> ■ Provides flexibility as ticket stock will be used to manage Australia’s changing target ■ Allows prompt implementation of some stock cover with tickets ■ Allows a constant obligation (in days sales) to be put on industry ■ Provides some improvement in domestic security and sets a baseline so that commercial stocks don’t fall in future and increase with increased sales ■ Allows easy participation in collective international action through release of ticket stock ■ Makes the development of a domestic stock ticket market more likely ■ Will result in much better capture of all stock in Australia 	<ul style="list-style-type: none"> ■ High cost of implementing and maintaining an obligation scheme for a small improvement in industry physical stock levels ■ Could have an uneven impact on the market participants (depends on supply route) ■ Dependent on other countries allowing bilateral stock holdings ■ Large impact on the budget

5.3.8 Impact on competition

The implementation of an obligation could have a negative competitive impact on the industry. This is because different companies have different underlying inventory levels depending on the supply routes used. The obligation will be set using days of sales (including own use) – some companies may already be at the level set whereas other will need to adjust their supply (and possibly increase their storage facilities) to ensure they always keep above the minimum amount.

While the overall cost impact (in cost per litre) is likely to be low for industry, for some companies it may be significant. Without access to individual company information it is impossible to predict who will be affected and who will not. It may be that companies that import for own use are most affected although often these companies are relatively conservative in their stock strategy to avoid any risk of running out and may have to do very little to comply with an obligation.

5.3.9 Possible impacts

Table 18: Model 3 - Possible impacts

Consumers	This model would have an impact on petroleum consumers through any charge passed on by industry along with charges implemented by the Government to fund its stockholding. It could provide consumers with some domestic security to provide protection against domestic disruption.
Government	The model provides a flexible option for the government to manage the balance of the total obligation and results in an industry/government partnership to meet stock obligations. As the government will still need to secure significant stock holdings it is likely a levy may be required along with an agency structure.
Petroleum Industry	This model changes industry operation by forcing a minimum obligation. This may take away an opportunity for one company to be more competitive than another by being more efficient with their stock management. It is also likely to have a greater impact on direct importers than refiner/marketers. Having an obligation will give the industry more opportunity to generate income from selling tickets if they choose to hold stock above obligation levels.
Business*	There should be little impact on the general business community although those companies who directly import their fuel will be affected.
Community*	The only issues for the community are similar to those discussed with Model 2 (perception of security improvement and no protection against international price movements).

* Fuel price rises will have an impact on fuel intensive businesses/sectors and also vulnerable community members, however for the purposes of this analysis, these impacts are quantitatively included in the Consumer group in the table. It is beyond the scope of this report to consider the qualitative social or welfare implications of the models.

5.3.10 Indicative timeline for initial implementation

The following chart shows the timeline for initial implementation steps once a decision has been made on the model. The initial task will be to set an appropriate level for the obligation. It will then take some time to put the legislation in place along with the rules around the obligation. There will need to be a period to allow companies to adjust their inventory strategies before the obligation is implemented. In the interim period the government could start to build up their ticket/physical stock as with Model 1 and 2 to obtain some stock. These steps are similar to Model 2.

5.4 Model 4: Industry obligation using physical stock and tickets

5.4.1 Responsibility and description

With Model 4 the industry obligation would be set at a level that ensured Australia complied with its IEA obligation. This would be specified in terms of a certain amount of days sales needed to be held as inventory.

The rapidly changing emergency stock forecast will be difficult to manage purely with an industry obligation in days' sales. The target would either need to be set higher in advance to manage expected changes (thereby resulting in extra cost) or adjusted every year to reflect the new target. Some of the change is caused by market growth in demand for product. This aspect of the change should be managed more easily with companies needing to keep their stocks increasing in line with any market growth. However any increase as a result of declining domestic production will be more difficult to manage as that is outside of the control of the industry with the obligation.

As with Model 2 and Model 3, a significant portion of any obligation should be held as ticket stock to help manage the variation. For purposes of cost comparison this is assumed to be 850,000 tonnes of ticket although, if available, arguably even more should be held as ticket stock with this Model.

Under this model there would need to be decisions made as to whether companies would be able to trade the obligation between them and whether they would be able to set up a stock agency to which they could contract out the obligation. There are likely to be benefits in allowing industry to have these flexibilities as this is likely to provide a lower compliance cost and given the size of the emergency stock required, this cooperative approach is a necessity.

5.4.2 Cost of implementation

Table 19: Model 4 cost estimate

	2016 estimate	2022 estimate
IEA tonnes	3,287,969	6,631,382
Physical tonnes	2,657,000	6,252,000
Ticket volume	850,000	850,000
Capital Cost (AUD M)	4,121	9,695
Annual cost (@ 10% return) (AUD M)	450	1,059
Annual cost (@ 15% return) (AUD M)	654	1,538
Annual ticket cost and administration (AUD M)	42	44
Total annual cost (AUD M)	492-696	1,103-1,582

The government administration cost included above is estimated at AUD1.5 million, as once the obligation is set up; the only task will be monitoring compliance with the obligation. The administration cost for industry is assumed between AUD5 - 7 million due to the significant volumes to manage.

The above capital requirements are substantial rising from over AUD4 billion to AUD9 billion by 2022. The change is expected to more than double the commercial inventories which mean more than doubling one of the most significant capital costs for the industry. Such an imposition,

without a direct means of funding it (such as a levy directed to industry or an industry agent) would likely lead to market participants' re-evaluating their operations within Australia. The industry in Australia is very capital constrained and this was raised as a major issue during industry consultation.

If industry does have an extra cost imposed on it we assume a higher return expectation than for Government. Assuming a 15% return expectation the cost of the obligation rises from 1.8cpl in 2016 to 3.1cpl in 2022 (may be slightly lower as 2011 demand volumes assumed for calculation as forecast volumes not available).

5.4.3 Revenue Options

Any cost from the obligation put on industry would be recovered from the market. Model 4 has a high cost for industry so would result in a general increase in prices, likely to be higher than other models due to higher expectations for return on capital employed. As the total obligation is put on industry in this model, the additional cost is likely to be more evenly spread than Model 3 as all companies would be expected to face an equivalent (per litre) compliance cost.

Setting up an industry stock agency is likely to increase the cost transparency as an agency would set a cost for taking on companies' obligations.

5.4.4 On-going management and related issues

The main management issue for the government is compliance monitoring against the obligation. All participants in the market will need to set up staff to manage the obligation within their organisation unless they have the ability to contract it out.

5.4.5 Contractual framework and governance issues

This model is complex in terms of the contractual framework. The contractual framework covered in Model 1 will need to be set up for this model although in this case some of it will need to be done by government (G-to-G agreements) and some by industry (contracting basis). There will also need to be legislation to cover the obligation system and, if allowed, the trading regime and rules covering contracting out obligation.

The governance issues for the government are reduced as they have passed the obligation on to industry. However they will need to manage the obligation and its compliance.

5.4.6 Access and release issues

With Model 4, the control the government has over release of stock is through the level of obligation on industry. If Australia needs to release stock as part of a coordinated IEA action, the government would reduce the obligation level by the required number of days. It would then be up to industry how they reduced stock (e.g. release of ticket stock or reduce physical inventories). There is no certainty that inventories would actually be reduced as it would be up to individual companies how they responded. An example might be a company using the reduced obligation to back off imports and draw down on inventories (if imports are hard to secure).

The government could also reduce the obligation level in response to domestic production disruption which would provide additional domestic security (Japan did this following the March 2011 tsunami).

5.4.7 Benefits and risks

Table 20: Model 4 - Benefits and risks

Benefits	Risks
<ul style="list-style-type: none"> ■ Provides flexibility as ticket stock can be used to manage Australia’s changing target ■ Provides some improvement in domestic security and sets a baseline so that stocks don’t fall in future and increase with increased sales ■ Allows easy participation in international collective action through release of ticketed or physical stock ■ Makes the development of a domestic stock ticket market likely 	<ul style="list-style-type: none"> ■ Likely to be the highest cost option because of returns expected by industry ■ Longest period before start to secure emergency stock ■ Industry will have to manage against an obligation level that may change annually ■ Does have an uneven impact in the market depending on supply route ■ Dependent on other countries allowing bilateral stock holdings ■ Substantial capital impost on an industry that is capital constrained.

5.4.8 Impact on competition

The implementation of an obligation is likely to have a negative competitive impact on the industry. This is because different companies, and particularly where different supply routes are used, will have different underlying inventory level. However in this case as the obligation level will be above most companies current commercial stock levels the differences between companies are likely to be lower than with Model 3.

It is also possible that companies operating in Australia that are part of multinationals have an advantage as they can leverage off their companies experience in dealing with compulsory stock internationally and possibly manage stock holdings by ticketing with affiliates.

Conversely some market participants are listed on the Australian stock exchange. Any impost such as this which will have a significant impact on their business (in particular the capital required) will be quickly evaluated and reflected in the share value of the company. A negative impact will lead to comment that the government is imposing an obligation that is eroding company value; a positive impact will lead to comment that the government is giving a win to the companies at the expense of the consumer.

As noted above, such a large imposition of new capital investment on an industry is likely to lead to participants re-evaluating their participation in the industry. This could have a detrimental effect on the market and competition.

5.4.9 Possible impacts

Table 21: Model 4 - Possible impacts

Consumers	This model would have an impact on petroleum consumers through the cost passed on by industry. This would be noticeable and likely to be commented on by the public. It would provide consumers with some domestic security to provide protection against domestic disruption.

Government	The impact on the government is reduced by passing on the obligation to industry. While it will involve significant effort during the establishment phase once in place the government's role will just be setting the obligation, ensuring compliance and coordinating any stock release.
Petroleum Industry	This model changes industry operation by forcing a minimum obligation. This may take away an opportunity for one company to be more competitive than another by being more efficient with their stock management. It may also have differing impacts on participants, especially on those who are capital constrained. It could lead to revaluation of participation in the market. The industry is likely to incur significant cost both during the set up and for on-going operation against the obligation. The major oil companies may have an advantage in the ticket market due to their international operations in markets with compulsory stock obligations.
Business*	There should be little impact on the general business community although those companies who directly import their fuel will be affected by being required to invest more capital.
Community*	The only issues for the community are similar to those discussed with Model 2 (perception of security improvement and no protection against international price movements).

* Fuel price rises will have an impact on fuel intensive businesses/sectors and also vulnerable community members, however for the purposes of this analysis, these impacts are quantitatively included in the Consumer group in the table. It is beyond the scope of this report to consider the qualitative social or welfare implications of the models.

5.4.10 Indicative timeline for initial implementation

The following chart shows the timeline for initial implementation steps once a decision has been made on the model. Although the industry has the full obligation there is still a lot of work the government needs to do to set up the systems for the obligation and to allow ticket stock to be held offshore. As it will take time to put an obligation in place this model has the longest time before the first move to compliance – industry will not hold emergency ticket stock until an obligation is in place. As with the government models, time will then be required while the volume of stock is built up, especially given the capital industry would need to invest. We expect there would not be any stock held until all systems are established which is likely to be four to five years.

Like the other models with a physical stock component requiring storage facilities to be build, full compliance is likely to take more than ten years and lag a couple of years behind the other models due to the later start.

Model 4: Industry obligation: physical stock and tickets - initial steps to compliance

				Year 1				Year 2				Year 3				Year 4				Year 5			
				1Q	2Q	3Q	4Q																
#	List of Activities	Start	Dur	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Government sets up G-to -G Agreements	1	3	█	█	█																	
2	Government facilitates contacts between domestic industry and industry in host countries	4	4				█	█	█	█	█												
3	Government to set level of obligation and proportion that can be held as tickets or traded.	1	4	█	█	█	█																
4	Develop and put in place legislation for obligation and compliance	5	8					█	█	█	█	█	█	█	█								
5	Set the rules as to how the obligation can be traded and whether industry would be allowed to set up a stock agency	7	6									█	█	█	█								
6	Develop the rules around a ticket market for compulsory stock in Australia	7	6									█	█	█	█								
7	Industry to develop contracting tools for ticket stocks and compulsory stock swaps	13	3															█	█				
8	Government to set in place the structures and systems required including the profile of increase to give industry time to adjust.	13	4															█	█				
9	Time to allow companies to put in place strategy for initial stock strategies	13	6															█	█	█	█		
10	Industry obligation begins - likely to build up to the required compliance level over the following ten years.	19	4																				█

6.0 Comparison of Models

The four different models cover a broad range of options that Australia can use to develop an emergency stockholding to ensure compliance with its IEA obligation. The models are compared in Table 22 across a range of key criteria.

Table 22: Model comparison

	Model 1	Model 2	Model 3	Model 4
Responsibility	Government	Government	Government and Industry	Industry
Stock type	Tickets only	Physical stock and tickets	Physical stock and tickets	Physical stock and tickets
Funding	General budget or levy	Probably levy	Budget or levy + industry pass through	Industry pass through

Compliance

Meets the IEA obligation	Uncertain – may not be volume available	Good	Good	Good
Time to secure first stock (tickets)	Good: ~ 1 – 1.5 years	Good: ~ 1 – 1.5 years	Good: ~ 1 – 1.5 years	Poor: ~ 4-5 years
Possible time to full compliance	Average: 5-10 years if possible at all	Average: ~10+ years	Average: ~10+ years	Poor 10-15 years

Security

Allows participation in collective international action (stock release)	Good	Good	Good	Good
Improves domestic security	Poor - Average	Good	Good	Good

Cost estimate 2016 assuming full compliance all models²⁰

Estimated capital required (AUD millions)	\$0	\$4,163	\$4,148	\$4,121
Estimated per annum cost including capital recovery (AUD millions)	\$264	\$296-495	\$305-496	\$492-696
Per litre charge if on products (AU cpl)	0.5	0.6-1.0	0.6-1.0	1.0-1.4

²⁰ Based on current forecast, full compliance by 2016 is very unlikely whichever model is chosen.

Cost estimate 2022 assuming full compliance all models²¹

Estimated capital required (AUD millions)	\$0	\$9,738	\$9,722	\$9,695
Estimated per annum cost including capital recovery (AUD millions)	\$573	\$840-1,106	\$649-1,107	\$1,103-1,582
Per litre charge if on products (AU cpl)	1.1	1.2-2.2	1.3-2.2	2.2-3.1

Other items

Flexible to meet changing target	Good (but volume limited)	Good	Good	Average
Impact on national oil market operation	Good (no impact)	Average (Govt. participant in market)	Average (some competitive impact)	Poor (significant)
Complexity to implement	Good (not complex)	Average	Poor (complex)	Poor (very complex)
Legislation required	Average - Good (levy)	Average (some)	Poor (lots)	Poor (lots)

7.0 Conclusion

The choice of model that best suits Australia's requirements will depend on the importance given to the different rating criteria and the total volume of emergency stock required. Model 1 with the government taking responsibility and using ticket stock (the New Zealand model) is the simplest and cheapest but does have a couple of major issues. One is that despite significant payments it does not really improve domestic security (except through participation in collective action) and the second is that volumes required for full compliance are unlikely to be available in the current ticket market. It may be possible that Australia's demand for stock results in providers looking for new options to hold stock although it is likely that these options will be similar to, or possibly above the cost of holding physical stock domestically. Alternative contracting strategies may be required (e.g. longer periods) and these options would need to be considered as the volumes are built up over time.

The domestic security issue could be managed by insisting that some ticketed stock be held in Australia. At the higher volumes expected there may not be a significant difference in cost between the offshore and Australian options, although it may take longer to put Australian options in place (as it is more likely that there is spare tankage offshore).

Developing Model 2, where physical stock is held in Australia in addition to offshore ticket stock, will improve domestic security. However the upfront capital costs will be substantial – rising from AUD4 billion in 2016 to nearly AUD10 billion by 2022. In addition, the absolute volume of storage required will be a significant undertaking and will need to be staged over time. The forecast

²¹ Compliance by 2022 may be possible, although the rapidly increasing requirement will still make this difficult under all model choices.

volumes are so large that other storage options such as caverns or other in-ground storage should be considered instead of above ground storage.

It is very unlikely that the government would be able to manage such large amounts within their budget constraints. Given the requirement it would be sensible to set up a stock agency; under this structure the tanks could be leased and the stock purchase could be debt funded with revenue generated by a levy on fuel sales. The levy would need to be up to 1cpl by 2016, rising to between 1.2-2.2cpl by 2022 depending on the cost of capital.

The decision to develop Models 3 or 4 comes down to a question of the value of having industry involved in providing all or some of the additional stocks. An industry obligation does increase the complexity of a stockholding scheme substantially but there can be benefits in that industry is likely to be most adept at finding the least cost ways to meet the obligation. Given the significant costs involved, Model 4 has the risk of changing the shape of the industry due to market participants reconsidering their involvement in the Australia market to avoid the need to invest the substantial capital required.

Compulsory stock reporting (a necessary part of an obligation scheme) is also likely to result in improved inventory reporting. For instance, if compulsory reporting resulted in an extra 200,000 tonnes of stock reported each month this would reduce the cost of any scheme by between AUD10-30 million per annum. The potential benefit is so significant that this option should be considered regardless, or a way of making the voluntary reporting system more comprehensive.

Whatever option is chosen, we recommend that a significant portion is held using ticketed stock. The forecast requirement can change quite significantly with changing demand and changing domestic production. It would make sense to hold at least two years expected variation in target as ticket stock; based on the current forecast this is approximately 850,000 tonnes.

Appendix 1: Physical storage costs and details

Purpose built facility cost

The following section looks at the cost of a purpose built storage facility. A report for the New Zealand Government in 2005²² developed costs for a number of storage facilities that might be used for emergency stockholding. In late 2010 these costs were updated due to the substantial change in the cost of constructing tank farms over that period, especially the price of steel and related items. Requirements for tank farm construction such as spacing and fire water provision had also increased over the period.

For this report, the 2010 New Zealand based costs have been reviewed by a petroleum engineer and increased by another 20%, primarily to reflect the higher cost of construction resources in Australia. It was noted in certain locations, where demand for resources used in tank farm construction is particularly high (e.g. Western Australia), the cost is likely to be higher again. They have also been extrapolated into larger storage facilities to the point where costs are likely to rise linearly with storage quantity.

Table 23: Storage facility costs for emergency stock

Option	Description* (ml = million litres)	Cost Estimate (AUD M)	Cost Estimate (AUD/te)
140kt Product terminal: location near refinery, import terminal or product pipeline	Comprises 8 tanks (total ~175ml) to store petrol, jet fuel and diesel. Estimate includes tanks, compound, pipework, fire protection and electrical work. Variation is whether tank wagon fill stand is included and for cost of connections to existing facilities.	\$85 - \$93	\$610-670
15kt Product Terminal: Location near port.	Comprises 3 tanks (total ~18ml) to store petrol, jet fuel and diesel. Estimate includes tanks, compound, wharf line, pipework, fire protection, connection to existing tank wagon fill stand and electrical work.	\$19	\$1265
140kt Crude terminal: location near refinery	Comprises 2 tanks (total ~175ml) to store crude oil. Estimate includes tanks, compound, pipework, fire protection, pipeline connecting refinery and electrical work.	\$77	\$550
50kt Crude terminal: location near refinery	Comprises 2 tanks (total ~65ml) to store crude oil. Estimate includes tanks, compound, pipework, fire protection, pipeline connecting refinery and electrical work.	\$37	\$740

*All cost estimates assume utilities (e.g. power, fire water) available at site boundary and exclude land.

²² Colegrave, F, Denne, T, Hale, R, Small, J and Twomey, I, 2005, *Oil Security*, Covec and Hale & Twomey Limited, Auckland, February.

The larger options (140kt) are indicative of the cost for storage of emergency stocks. The smaller crude facility gives an indication of the economics of scale. The small product terminal option is included for purposes of comparison. This shows costs are likely to be higher both with small scale investment and if the tanks need to be built in close proximity to a port (within one kilometre). Close to port there is often greater investment in ground preparation required increasing the cost.

For the product storage the low end estimate is used as it assumes that the facility is primarily for long term storage with product transferred in and out by pipeline. There would be no dedicated road loading facilities.

The costs have been extrapolated to larger storage facilities. While the tank and compound cost increases linearly (multiple tanks are built rather than larger tanks) some of the costs such as connection costs do not change.

	140kt (~174,000 m³) (AUD/te)	420kt (~522,000 m³) (AUD/te)
Product terminal	610	555
Crude Terminal	550	530

Once a facility is larger than 500km³ it is reasonable to assume the cost will increase linearly with volume requirement.

Comparison with IEA work

The IEA is currently investigating the costs and benefits of emergency stocks. As part of this they have obtained updated estimates for storage facilities²³. The capital cost for standalone above ground storage facilities was given as €140-180/m³ for a 500,000 m³ terminal. These are considerably lower than our estimates which translate to around €330-350/m³; nearly double the IEA estimate.

An element of this cost difference will relate to the premium included due to the demand for these types of resources in Australia at the moment – such work will compete with the many other major projects underway in Australia. The scale of tank building resources available in Europe/US may also provide further explanation of the difference. The scale of the storage facilities required is well above any recent terminal investment in Australia. These estimates also included some costs for connections (albeit not that significant) which are not included in the IEA estimates. While the differences with the IEA estimates can't be explained in detail (the details of the IEA estimates are not available), it should be noted that the storage cost makes up less than 40% of the total stockholding cost. Therefore a 25% reduction in storage cost estimate would only reduce the total cost estimates given in the paper by around 10%.

Shipping storage cost estimate

Australia could use floating storage as a means to meet its stock obligation. Over a long time period onshore storage would be expected to be cheaper than floating storage although floating storage is an option for faster implementation and more flexible capacity. Some of the issues that would need to be addressed with marine storage are:

²³ IEA/SEQ(2012)10 Progress Report - Costs, Benefits, and Financing of Strategic Oil Stockholding

- Is there a suitable location where a VLCC can be safely anchored or moored for an extended period in Australian waters?
- Would smaller ships be more suited to an Australian service?
- The ship would need to comply with Australian maritime requirements (e.g. double hulled).
- Would such a storage option require special consent? Is it consistent with Australian law?
- Any floating storage agreement would have a time limit - ships need to be surveyed at least every five years. For this the ship would need to be emptied and return to a suitable port (probably outside Australia). There would need to be a process to manage this.

An example for marine storage is to use a very large crude carrier (VLCC) which can hold 200-300,000 tonnes of crude oil, a significant proportion of Australia's current emergency stock requirement. While a VLCC is too large to dock at any Australian refinery, the crude could be offloaded by ship to ship transfer to tankers that are suitable for delivery to refineries. At current market rates a VLCC costs about USD35,000/day²⁴. This gives an annual cost of USD12.8 million or about AUD50/tonne assuming a 1.05 US/AUS dollar exchange rate.

Stock cost

The stock cost will be dependent on the price of crude and product at the time the stock is purchased. Crude prices are volatile and can vary by more than 10% in the space of a week. These costs are based on the current oil price with the following additional costs to get a cost into tank.

Crude cost = Benchmark crude price (Dated Brent) + crude premium + delivery cost

Where: Crude premium reflects the premium to Dated Brent for the type of crude stored (USD3/bbl assumed as typical)

Delivery cost is the cost of freight and related expenses to the receiving terminal (USD2.50/bbl assumed as typical)

Product cost = Benchmark crude price (Dated Brent) + product premium + delivery cost

Where: Product premium reflects the premium to Dated Brent for Singapore product benchmarks (i.e. the refining margin measured against Dated Brent; USD12/bbl assumed as typical)

Delivery cost is the cost of freight and related expenses from Singapore to the receiving terminal (USD3.50/bbl assumed as typical)

For a Dated Brent price of USD115/bbl²⁵ this gives the following stock costs.

²⁴ Shipping rates are very low at the moment (and have been for a couple of years). The rate could be triple this amount in a more buoyant market.

²⁵ This price is the average price over the period May 2011-April 2012

Table 24: Stock cost estimate

All USD/bbl	Benchmark price	Typical crude/ product premium	Typical delivery cost	Total
Average cost of crude	115.00	3.00	2.50	120.50
Average cost of product	115.00	12.00	3.50	130.50

Land costs

A report by BREE for RET (2011)²⁶ assumed a cost for land that might be used for large scale petroleum storage in Australia at AUD600,000/ha. This is in line with the estimate in Colegrave et al. (2005); the Colegrave report also estimated that 11.7kt of oil can be stored on every hectare of land.

Product quality and stock turnover

Generally crude is regarded as easier to manage as there is no particular quality to be maintained and it doesn't significantly deteriorate over time. However, there are still issues that need to be addressed, such as quality to be stored (e.g. light/heavy) and suitability for domestic refining.

The product stored should meet the appropriate Australian specification (and possibly a mix of seasonal specifications) otherwise it will not be useful to the market in an emergency. Product can deteriorate over time so the quality needs to be monitored and at times product will need to be turned over (existing product fully or partially sold and new product bought in). Advice received from companies when New Zealand was researching stock holding was that product may need to be turned over at least annually. However European stock agencies reported they had successfully stored product, maintaining agreed specification, for a number of years without turnover.

In practice what will need to be in place is a regular testing regime, with processes in place for turnover of product when it is necessary (note it is far more cost effective to turnover product before it goes off specification). Industry had some concern that product turnover could interfere with normal market operation. This would need to be managed carefully, possibly by making the product purchase dependent on resupply (i.e. one contract covering both) so there was no net impact on the market for the turnover.

The estimate of product quality turnover cost assumes that 25% of the stock will need to be turned over each year and the cost of turning over stock will be USD2/bbl. [Assuming the product can be delivered to market directly arguably there is little direct cost. However in order to get a company to do a buy/sell transaction there will be a fee which is the basis of this estimate]. This gives an average turnover charge of USD0.50/bbl/year or USD4/tonne/year.

Operating costs

There will be operational costs associated with the storage facility. These are likely to be lower than at a commercial storage terminal as there will be few operational movements (e.g. no regular truck loading). Where the facility is located near existing facilities it is likely that outsourcing operations to existing terminal operators will provide the most cost effective solution (i.e. operating cost will be an incremental cost rather than standalone).

²⁶ Nina Hitchens (2011), *Oil stockholding policies and costs*, BREE

The operating cost will be higher for a product terminal as there are more operations required to keep product on specification (e.g. water draining, product testing, etc.). There will also be economics of scale with larger terminals. For the terminals developed above the following are the assumed operating costs (based on incremental cost basis).

Table 25: Operating cost

Option	Annual cost (AUD)	Cost/tonne (AUD)
140kt Product terminal	350,000	2.50
15kt Product Terminal	50,000	3.33
140kt Crude terminal	200,000	1.43
50kt Crude terminal	100,000	2.00

Maintenance costs

Maintenance costs on a new terminal should be low. However tanks need to be inspected on a routine basis (normally 10 year cycle) and general maintenance (e.g. painting) done on an on-going basis. As an approximation over time maintenance costs are assumed at 1.5% of the capital value per annum.

Management and Administration

Storage of physical stock will require appropriate management and administration systems. Stock will need to be purchased (and at times turned over), stock insured, stock reconciled, financial accounts maintained and depending on structure possibly loans arranged. As a lot of the technical operational requirements are outsourced, the structure to support physical storage is not necessarily large. For example the Irish Stock Agency (NORA²⁷) that administers both physical and ticket contracts notes only five staff with a staff cost of € 440,000²⁸. The Dutch stock agency COVA administers 4.5 million tonnes of stock (physical stock and tickets) for a €2 million organisation operating cost.

Depending on volumes and how Australia sets up the operation it is assumed that between AUD 5-7 million will be required to cover management of physical stocks given the large quantities involved.

Summary of costs

The total cost for the larger options is shown in the tables below.

²⁷ National Oil Reserves Agency

²⁸ 2010 Financial statements available at http://www.nora.ie/financial/financial_statements.452.452.html

Table 26: Total Initial capital cost

Option	Storage facility (AUD M)	Stock cost (AUD M)	Land cost (AUD M)	Total (AUD M)	Total (AUD/te)
140kt Product Terminal	85	137	7.2	230	1,640
420kt Product Terminal	233	412	21.6	667	1,588
140kt Crude Terminal	77	124	7.2	208	1,485
420kt Crude Terminal	222	371	21.6	615	1,464

The initial capital cost is converted to an annual cost in the tables below. The annual cost is calculated with a return of 5% and a return of 10%. For the storage facility it assumes the cost is recovered over a 40 year asset life for the tank farm. The stock is assumed to have the same value at end of life as at the commencement (i.e. only incurs a cost of capital charge) as does land (in real terms).

Table 27: Annual cost using a 5% capital return

Option	Storage facility (AUD M)	Stock cost (AUD M)	Land cost (AUD M)	Annual costs (AUD M)	Total (AUD M)	Total (AUD/te)
140kt Product Terminal	5.0	6.9	0.4	2.2	14.4	103
420kt Product Terminal	13.6	20.6	1.1	6.2	41.4	99
140kt Crude Terminal	4.5	6.2	0.4	1.4	12.4	88
420kt Crude Terminal	12.9	18.6	1.1	3.9	36.5	87

Table 28: Annual cost using a 10% capital return

Option	Storage facility (AUD M)	Stock cost (AUD M)	Land cost (AUD M)	Annual costs (AUD M)	Total (AUD M)	Total (AUD/te)
140kt Product Terminal	8.7	13.7	0.7	2.2	25.3	181
420kt Product Terminal	23.8	41.2	2.2	0.4	67.6	161
140kt Crude Terminal	7.9	12.4	0.7	1.4	22.3	159
420kt Crude Terminal	22.7	37.1	2.2	0.7	62.6	149

Appendix 2: Ticket contract details

Table 29: Ticket contract structure

Contract Feature	Description
Term	<p>The European ticket contracts are developed around a calendar quarter (or multiples of calendar quarters). For countries outside Europe there is no requirement to fit within the fixed calendar quarter although as so much of the market trades on that basis it is easier to work within this timeframe. Some countries ensure the contracts are only calendar quarters (or multiples of) through bilateral agreements.</p> <p>Terms of up to a year are common. Typically governments/stock agencies buy annual tickets where they are looking to meet a requirement for a calendar year. The NZ Government has purchased tickets for terms of two years although there can be reluctance on the part of the seller as there is greater uncertainty with regard to their position in the second year. This can lead to higher prices.</p>
Quantity	<p>The contract will specify the quantity of stock in tonnes. Minimum stock quantities can be specified as a requirement to make administration easier (less contracts) and to make the volumes sensible for shipment to Australia (NZ sets a minimum of 35,000 tonnes for offshore contracts)</p>
Stock Type	<p>Ticket contracts must define the type of stock held. The stock can be crude or product. Previously European tickets were split into product categories but this is changing from 2013. The IEA does not have specific stock requirements so there is flexibility in the choice of stock held to meet the obligation.</p> <p>While the product type is specified and that will be the product purchased if the option is exercised, this doesn't mean that the specific product is sitting in a tank. A refinery offering a ticket may hold a certain amount of crude, proportions of which can be allocated to different product types that they can then sell tickets against. If the option is exercised the refinery will produce the product stock required from the crude held. In the case of a tank farm operator the stock may be held as components that can be blended into the product should the contract be exercised. This flexibility allows the sellers to offer competitive prices.</p>
Location	<p>The location of where the stock is held and where it can be purchased from if the option is exercised must be specified.</p>
Fee	<p>Sellers charge a monthly fee for ticket contracts priced in US dollars per tonne of product held. This is normally paid during the month that the stock is held.</p>
Purchase Option	<p>The circumstances of when the option to purchase can be exercised are defined in the contract. These are typically linked to the IEA declaring an emergency event although the contracts can include the ability to exercise the option should the host Government request this in response to a domestic emergency.</p>
Purchase pricing basis	<p>The contract defines the pricing basis for the stock should the purchase option be exercised. This will be a market related price (i.e. linked to appropriate pricing benchmark at the time of the purchase) with the pricing reflecting the cost of product in the location where it is held (e.g. an appropriate freight component). As the purchase option will only be exercised in an emergency it is likely the purchase will be at a time of high market prices. Therefore unlike physical stock owned for stockholding there is no opportunity to make a gain by selling product at times of high prices and no advantage in exercising the option should similar product be available at the prevailing market prices at the time.</p>

Contract Feature	Description
Purchase Terms	The contract needs to define the terms used should the purchase price be exercised. Typically the seller will want to use its General Terms & Conditions (GT&C's). New Zealand takes this approach although amendments are agreed in the contract to ensure the GT&C's do not conflict with the intent of the contract (e.g. GT&C's often include in the Force Majeure Clause the ability not to supply or short supply in the case of a supply shortage. As these contracts are only exercised in a supply shortage such a clause needs to be specifically excluded).

Rules for establishing a domestic ticket market

As covered in Section 2, in New Zealand's case this is done by having a different contract for domestic ticket stock than ticket stock held offshore. In essence the domestic contract includes clauses that reflect a physical holding of stock - these include:

- Requirement to show that the facilities being used to store ticketed product have not been used for normal commercial operation in the previous two years;
- Separate fee components for storage facilities and product stored (the fee is still paid for the storage if the contract is exercised as it is likely the facilities would have been dedicated for a period to holding reserve stock);
- Specific measurement clause and provisions to take account of product quality maintenance, product turnover and losses; and
- Audit provisions that allow the government to check that the product is being stored as per contracted arrangements.

The release provisions are also different in a domestic contract. As well as the right to purchase the stock in an IEA emergency event, the government has the right to purchase the stock in a domestic event (where the shortage is widespread in the market). However the contract explicitly states that the government will not declare an emergency domestic event and exercise the purchase option in order to "manage or provide for the price of petroleum or to assist any particular supplier of petroleum in New Zealand to maintain its supply of petroleum". This clause is included so that the participants in the market are aware that they still need to hold commercial stock to manage expected supply disruptions and that the government controlled stock will not be available should they get into supply difficulty.