SUSTAINABILITY COUNCIL of NEW ZEALAND

The Value of Perpetual Storage

Onshore Fuel Stockholding Consultation

Submission by Sustainability Council

The absence of formal requirements for reserve supplies of fuels, and pending closure of the Marsden Point refinery, suggest that a first principles review of onshore fuel storage needs would be timely.

While the limited availability of relevant data means there is less opportunity for precision analysis now, this submission presents a framework for a first principles review and some early findings.

Sovereign Reserve Capability

The consultation document seeks to examine "the pros and cons of various options to hold onshore fuel stocks to ensure that New Zealand's fuel supply will remain secure and resilient during the next two decades. The options discussed in this paper focus on the level of onshore fuel stocks and how to achieve target levels".[i]

In other words, the Government's core objective is resilience for the energy services that petroleum products currently sustain. That is perhaps best expressed as an objective to secure reserve capability within New Zealand for these energy services. Framing the objective in this way first allows for renewable energy options to progressively become part of the analysis (even if their impact is tiny now, as the consultation document notes). It also allows reserve capability to be thought of in terms of dynamic capacity as well as fixed capacity (provided through tank storage), as further discussed below.

We submit that: **the objective be framed in terms of a Sovereign Reserve Capability for energy services that are currently met by petroleum fuels.**

Different Fuel Uses Have Different Values to New Zealand

When considering how much reserve capability is desirable to hold, a key observation is that the economy and society will derive more value from utilising scarce reserves for certain activities than others. Ambulance services for example will generate one of the highest returns, while a single person out sightseeing in a car would be amongst the lowest.

New Zealand's only current reserves requirement stems from the IEA obligation to hold enough stocks to meet 90 days of net imported fuel use. This framing implicitly assumes all fuel use is of the same value. Yet as the values of use can differ by orders of magnitude, and

storage carries significant costs, this suggests that reserve capabilities should be assessed against the relative value of different uses and the volumes those uses typically demand.

While New Zealand has a good understanding of the cost of non-supply of electricity, parallel estimates for liquid fuels have not been derived. The consultation document states that "The consequences of a sustained import disruption is also difficult to quantify".[ii] Nonetheless, it is possible to broadly categorise different uses by value and so consider reserve capacity for each grouping.

A first category is suggested by the data obtained from Covid level 4 lockdown. While directed at minimising the spread of a virus, the regulations devised for level 4 are also a reasonable proxy for those services required to sustain basic economic and social needs over an extended period. In April 2020 they sustained 61% of the productive economy and 71% of GDP.[iii] In line with the resulting cut of around a third of economic activity, overall fuel use during the period reduced by about 38%.[iv]

That 38% cut in fuel demand under level 4 clearly still involved considerable sacrifice of economic value - the Treasury put the cost of the lockdown at $1.6 billion a week.[v] However, this experience suggest that the nation can function sustainably with such a cut in services and that a 38% cut in fuel, and even a 50% drop in the critical fuel diesel, can be sustained. Thus a first block of lower value activities accounting for 38% of annual demand can be identified.

At the other end of the value spectrum are emergency services and those critical to the maintenance of health, welfare and the economy, including:

- Police, fire and ambulance services
- Trucking of food and medical supplies, fuel distribution
- Operation of utility services (power, water, gas, sewage, rubbish collection)[vi]
- Communication services
- Hospital and other medical facility operations
- Air services for essential supplies (eg pharmaceuticals)

While we are not aware of figures specific to New Zealand for the fuel used by such services, we infer from other data that this would account for no more than 5% of normal demand. Thus an emergency and critical services block of 5% is proposed. (It is unclear to what extent this aligns with the "critical fuel customers" that the National Fuel Plan would give first priority to as those customers are not identified.)[vii]

Next down are the highest value economic and social services. This is not easily defined but will include for example: public transport, production of key food items for domestic consumption, priority value uses for fuel servicing the export economy (eg milk tankers). The boundaries of this block will be somewhat arbitrary and there is limited data to support such an allocation. But for the purposes of further development of this approach, it is assumed this higher value block accounts for a further 25% of annual demand.

That leaves a medium value block taking 32% of current demand.

Reserve Capability by Value of Activity

If follows that where different uses of fuel have different value to the nation, that the value of holding reserve capability to power each activity will similarly vary. This means more reserve capability would be held for the higher value activities than the lower ones.

For the highest value emergency and critical services, the costs to the country of not having these is such that the design specification for reserve capability should be the ability to withstand essentially any scenario. This would include the extremely unlikely, but nonetheless possible, deprival of petroleum imports for more than a year.

One way to approach this is to reserve a first tranche of whatever total volume of fuel stocks are held to that highest value set of uses. This is the traditional method for recognising this group of critical uses, even if not expressed in this way. The implicit logic is that supplies will be managed under a crisis to make sure that whatever happens, a capability for emergency and critical services is always retained.

An alternative approach is to look beyond the use of static capacity alone and also incorporate dynamic capacity – particularly perpetual capacity. In this case, the availability of domestic crude oil and the potential to still secure continued operation of the Marsden Point refinery opens up the potential for a source of perpetual capacity for the highest value services.

While the refinery is not designed for the light crudes produced locally, MBIE has estimated that 3-5% of diesel demand could be met through processing these at Marsden Point, before considering physical changes to the plant that would raise the product yield further.[viii]

Such a capability could be maintained essentially indefinitely, and so is a good match for this first tranche of reserve capability targeting critical services. On current forecasts, it is also likely to be considerably cheaper to underwrite the refining margin that Refining NZ receives than to build new storage that would provide an appropriate level of cover.

As the consultation document states, it is a matter of judgement what level of cover is appropriate. However, if 90 days is the IEA benchmark for all fuel demand, appropriate cover for just emergency and critical services could easily be two years or more.

Tank storage capable of holding 5% of the nation's demand for even 2 years would need to have a capacity of around 820 million litres.[ix] That is roughly 1.25 times the current storage available in New Zealand for refined products.

The construction cost alone of a tank farm capable of holding 820 million litres is in the region of NZ$650 million.[x] This is before the cost of land and connecting pipelines.

Such a large outlay is normally amortised over decades. However, given projected rates of decarbonisation, the repayment period will be much shorter than has historically been the case for a good fraction of that storage. As a nation, whether such storage would ultimately be funded by consumers or taxpayers, it would make more sense to devote the more

exposed portion of that money to alternative uses – such as building infrastructure for zero emissions transport.

Meanwhile, there is the potential for perpetual storage at zero to low net cost through keeping the refinery open. Refining NZ's principal argument for closure is the volatility of refining margins. One option for addressing this is for the Government to provide a loan to the refining company that would be triggered when refining margins fell below a nominated level, thus underwriting a minimum rate of return for the company, while obtaining repayments when the refining margin was above the trigger level. The Minister of Energy and Resources proposed that consideration be given to pursuing this option in a September Cabinet paper.[xi]

Information provided in Refining NZ documents allows calculation of what the Government's exposure would be to the loan under a range of trigger values for activating the loan. This indicates that if the refining company's central forecast for refining margins were to be fulfilled, the Government's maximum net exposure would be a few hundred million dollars – this occurring over the next two to three years.

However, as the forecast is for refining margins to improve significantly after that period, repayments of the loan would then begin and the actual net cost to the Government is expected to be significantly less.

For example, if the Government obtained an agreement with Refining NZ to remain open for ten years, then the total net cost to that point would be between $0 and about $50 million if its forecast were fulfilled – **an average annual insurance cost of $0 to $5 million.**

These results are consistent with those derived by the independent financial advisor Grant Samuel, which reported to Refining NZ. **Grant Samuel projects that Refining NZ would be more profitable over the period to 2035 were it to keep the refinery open**, than to close it and become an import only terminal. In financial terms this is expressed through measuring the net present value of the two potential businesses and it estimated that continuing to operate the refinery yielded a positive and higher value. This was after applying a higher cost of capital to the refinery business to account for higher risk.[xii]

So against the very large cost of building new fixed storage capacity, keeping the refinery open would provide perpetual capacity at a zero to low net cost on current forecasts for refining margins.

If it were contended that a genuine alternative is to simply reallocate all existing storage capacity to be notionally available first to the emergency and critical services, that would be fallacious. The fallacy is that once that storage is allocated to the highest value uses, allowing for about a year's supply, it means other uses have no reserves at all. To suggest otherwise is to double count the reserve capabilities.

A key benefit of categorising uses by value and then looking at what reserve capability is worthwhile to allocate to each is that it exposes any implicit double counting and makes clearer the tradeoffs between present day costs and future potential costs. Note that an allocation for planning purposes in this way need not tie the hands of those rationing fuel in a crisis: the stocks can easily be interchanged between categories as best fits the

characteristics of each particular crisis. The benefit of the initial allocation is its ability to make clear in advance what reserve capability is being valued to what degree for each group of activities, and what is therefore worth funding.

Appropriate Reserve Capability for Other Activities

What level of reserve capability is appropriate for higher value, medium value, and lower value activities is a question we believe deserves detailed examination by MBIE before setting onshore storage requirements, and an approach to reserve capabilities more generally.

The grounds for proposing a 28/24 day storage requirement set out in the consultation document do not provide an adequate basis for concluding that level is appropriate. Indeed it is unclear from the application of the assessment criteria shown on page 19 why a similar storage level to that prevailing now is favoured (as stated on page 5) over a doubling in the level that the page 19 table indicates is of similar merit.

While the consultation document notes that Australia has only a 28 day minimum requirement for onshore storage, and so New Zealand would be similar in this regard, it is not also acknowledged that Australia currently uses 19% of its crude oil production in domestic refineries and has a domestic refining capacity equal to about 20% of annual demand.[xiii] Australia's commitment to maintain a "sovereign refining capability" at that level provides a first tranche of reserve capability that is perpetual capacity. Thus the total reserve capability far exceeds what New Zealand plans and the perpetual capacity component must be taken into account when making such comparisons.[xiv]

We submit that the 28/24 day proposed minimum onshore requirements are too low and that the additional work recommended above is needed to identify what is optimal.

The High Value of Perpetual Storage

In order to show the potential impact of perpetual storage on reserve capability and costs, the following provides a worked example for demonstration purposes - and is not our recommended level of reserve capability.

In this scenario, the number of days cover chosen for each category of activity are set out in the tables below. Lower value activities are provided with just 14 days cover, medium value activities 28 days, those of higher value 56 days, and the emergency and critical services are given 730 days cover in recognition of their importance.

Taken as a group, the scenario would provide storage for an amount of fuel equal to 65 days of the consumption forecast for 2022 (8,200 million litres). This roughly equates to Option 3 in the consultation document – a doubling of current storage capacity. We are not aware of a published figure for New Zealand's current storage capacity but MBIE has provided a table that covers that available at the main terminals. While not a complete picture of fuel product storage, we take this as a working estimate of that capacity.[xv] In the first response

option to the scenario set out in the table below, all reserve capability is provided by way of fixed storage in tanks.

Fixed Storage Response

Annual Demand (ML)	8200	**Proportion of**	**Cover**	**Storage**	**Extra Storage**
Current Storage (ML)	665	**Total Demand**	**Provided**	**Required**	**Required**
		(%)	(Days)	(Mill Litres)	(Mill Litres)
Sector	**Emergency and Critical Services**	5	730	820	
	Higher Value Activies	25	56	315	
	Medium Value Activities	32	28	201	
	Lower Value Activities	38	14	120	
Total Volume				**1455**	**790**
Total Fixed Storage Cover			**65**		

The next table describes an alternative response option capable of delivering the same reserve capability. It introduces the perpetual storage option of keeping the Marsden Point refinery open in addition to using fixed storage. Under this variation, the refinery is used to process Taranaki crude in the event of petroleum imports being cut for a period. It is assumed that the refinery is capable of producing at least 5% of annual demand and that only 28 days stocks are needed to be held at any time for emergency and critical services. Those tanks would then be perpetually filled through the ongoing operation of the refinery.

Fixed Plus Perpetual Storage Response

Annual Demand (ML)	8200	**Proportion of**	**Cover**	**Storage**	**Extra Storage**
Current Storage (ML)	665	**Total Demand**	**Provided**	**Required**	**Required**
		(%)	(Days)	(Mill Litres)	(Mill Litres)
Sector	**Emergency and Critical Services**	5	28	31	
	Higher Value Activies	25	56	315	
	Medium Value Activities	32	28	201	
	Lower Value Activities	38	14	120	
Total Volume				**667**	**2**
Total Fixed Storage Cover			**30**		
Perpetual Storage Cover			**5%+ of Demand**		

Comparison of the two different ways of meeting the same reserve capability shows a dramatic difference in the fixed storage requirements. Introducing perpetual storage under this scenario more than halves the fixed storage needed – reducing it from 1,455 to 667 million litres.

The response option that keeps the refinery open requires the same amount of tank storage as is currently available. **But under this scenario, the perpetual storage that is provided through the refinery remaining open allows the same level of reserve capability to be met as would be achieved through a doubling of current tank storage**.

The comparison also illustrates the large differences in cost that can arise when perpetual storage is employed. **Against existing tank storage totalling 665 million litres, the response option that relies on fixed storage alone would require an extra 690 million litres of storage at a cost in the region of $600 million**. (Again, this is just the rough capital cost of the tanks and excludes the cost of connecting pipelines and land.)

Alternatively, if the refinery were kept open, essentially no additional tank storage would be needed, and there would be no additional cost. That is a saving in the region of $600 million, based on this particular scenario. In addition however, any costs involved in supporting the refinery to stay open must be deducted from this saving.

As discussed above, on current forecasts the expected financial result from the Government making a loan to the refinery is that it would be a zero net cost, but if industry and Refining NZ forecasts are not met, the net exposure could be a few hundred million dollars. Under these assumptions, even in the worst case, keeping the refinery open would be more economic for the nation than investing in additional tank storage to make up for the loss of perpetual storage capacity.

The above results are sensitive to the cover period chosen for emergency and critical services, and the shorter the period the lower the saving from perpetual storage. However we submit that at least until MBIE has undertaken work to gain estimates of the cost to New Zealand of losing the ability to run emergency and critical services, a high period of cover should be provided for as the default.

In summary, combining perpetual storage with fixed storage can dramatically reduce the amount of storage required and the cost, while providing the added benefit of a source of supply that is not limited in duration and could be augmented over time to increase the level of perpetual capacity if required.

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[i] Consultation Document p 13.
[ii] Consultation Document p 11.
[iii] ASB, Economic Note, Covid Economic Impacts, 12 August 2020, p 2 and 3.
[iv] The Consultation Document p 10 notes that "During the early weeks of Covid-19 alert level 4 in April 2020, retail sales of petrol and diesel dropped below 25 per cent of normal levels. Jet fuel demand dropped to a similar level. Diesel sold at truck stops, however, dropped to a little below 50% of normal demand." The weighted average of this is about a 38% reduction in fuel use.
[v] ASB, Economic Note, Covid Economic Impacts, 12 August 2020, p 2 and 3.
[vi] The National Fuel Plan describes such services as "lifeline utilities"
[vii] National Emergency Management Agency, *National Fuel Plan*, Supporting Plan [SP 04/20], March 2020
[viii] Office of the Minister of Energy and Resources, *Fuel Supply Resilience Without a Domestic Oil Refinery*, 15 September 2021
[ix] Projected total demand for 2022 is 8,200 million litres. 5% over two years is 820 million litres.
[x] Most estimates of new tank costs are expressed in dollars per year, and so assume a standard amortisation profile that seems unlikely to be available in this case and also does not allow ready comparison of like with like up front costs. Estimates of the cost of constructing new storage vary considerably depending on the size of facility, connecting pipeline requirements, land costs, etc. In order to provide some guide to construction cost, an estimate provided for building a one million cubic metre tank farm is used as the baseline, US$550 million. This is then scaled to adjust for the 820 million litres of storage needed and an exchange rate of 0.70 to arrive at the figure of about NZ$650.
[xi] Office of the Minister of Energy and Resources, *Fuel Supply Resilience Without a Domestic Oil Refinery*, 15 September 2021, p 1.
[xii] Refining NZ, The Marsden Point Conversion Proposal, July 2021, Appendix A, p 142. https://www.nzx.com/announcements/375073
[xiii] Bis Oxford Economics, *Improving Australia's Fuel Security*, March 2020.
[xiv] https://www.energy.gov.au/government-priorities/energy-security/australias-fuel-security-package
[xv] MBIE, spreadsheet titled "Terminal Capacities".