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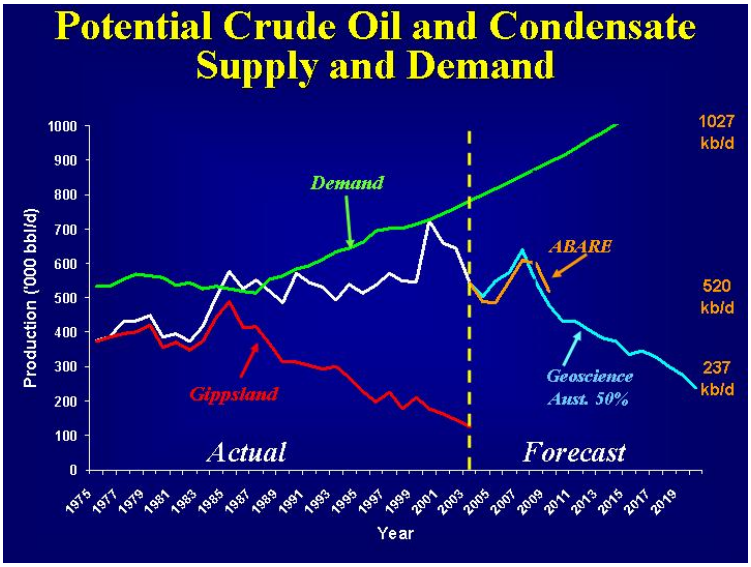
The Secretary
Senate Rural and Regional Affairs and Transport
Parliament House
Canberra ACT 2600

**Re: Inquiry into Australia's future oil supply and alternative transport fuels**

Dear Sir: This is a personal submission for subject Senate inquiry.

## Oil Production / Demand: Australia & Global Context

Government and industry groups such as Geoscience Australia, APPEA, AIP and oil experts share a common view that Australia's oil output is in decline with no tangible likelihood of returning to pre-decline rates, which peaked over 700,000 bbls/day (700 kbd). Since early nineties when the nation was largely self-sufficient, the demand-supply gap has widened significantly. Current self-sufficiency ratio is around 60%. APPEA chart below says it all.




To shed light on supply security, crude oil and oil products ought to be differentiated and examined. While oil supply in the context of this inquiry is most appropriately about products there is a dynamic interplay with crude oil, against a background of unique issues that each is faced with.

Australia imports as much crude oil as it produces. Crude imports averaged 442 kbd (2004) whilst oil and condensate production averaged 441 kbd. This means 62% — and not 40% as implied by self-sufficiency ratio — of refinery crude oil runs are met by imported crude, as shown in the table below. Dependence on imported crude is projected to rise as domestic production declines further. Several reasons: Nearly all condensate - an increasingly growing component of Australian crude oil production, comprising half in 2004, and much domestic crude, are exported rather than refined domestically. Australian refineries import most of their feedstock requirements rather than use more expensive superior grade crude i.e. light sweets produced domestically. Gippsland is an exception given dedicated oil processing infrastructure. Another reason is the rapid decline of Gippsland oil output[1] as shown in the chart. Domestic demand for condensate is minimal as there is no large-scale petrochemical plant unlike Asia where integrated oil refining centres (with condensate splitters) want such a feedstock for producing ethylene, an intermediate in the manufacture of other chemicals especially plastics.

Australia's seven refineries are geared towards gasoline production given it is the largest petroleum product market segment[2], with diesel as by-product; so are other products such as jet fuel. This has significant implications for what is called "crude diet". Australia's oil refinery configuration is such that crude oil imports have a higher proportion of heavier grades than

[1] In 2005, Gippsland oil output averaged 78 kbd, well down on its peak in the 1980s of 500 kbd. 2004 production was 99kbd.
[2] Out of 780 kbd products consumed, gasoline share 42%, diesel 31%, kero/jet 10%, fuel oil/other 9%, LPG 8%

light sweet. Crude oil is classified as light, medium or heavy, according to its measured API gravity[3]. Light crude oil is defined as having an API gravity more than 31.1 °API; medium oil between 22.3 °API and 31.1 °API; heavy oil below 22.3 °API. Sour/sweet refers to sulphur content, expressed as % sulphur by weight and varies from < 0.1% to > 5%. There is no sharp dividing line between sour and sweet but 0.5% sulphur content is frequently used as a criterion. Low sulphur, i.e. sweet crudes require less treating than sour crudes. Australia's refineries have conversion plant to handle medium/heavy sour crudes[4,5]. Asia supplies 78% of Australia's crude imports, with Vietnam, Malaysia and Indonesia being the largest suppliers. Middle East supplies account for 20%, mostly from Saudi Arabia and the United Arab Emirates. A feature of refining feedstocks is that light crudes, which is mostly what is produced in Australia[3], do not yield significant "bottom of the barrel" products like fuel oil and asphalt. For "yield balancing" purposes, refineries require heavier crude imports such as Minas (Indonesia; 35°API, 0.08% sulphur) and Arab Light (Saudi; 34°API, 1.78% sulphur).

Refinery runs have targeted "product mix" that also have to meet tightened road transport fuel standards following 2001 passing of Federal Government legislation. Beginning this year, the fuel standards limit gasoline to 0.015% sulphur level with 1% maximum benzene content, and diesel to 0.005% sulphur, the latter reducing to 0.001% (known in industry as ULSD, ultra low sulphur diesel) in 2009. Australia has close to A$1 billion of refinery "clean fuels" projects to meet the 2006 fuel standards. Domestic refineries currently supply 90% of petroleum product demand with 10% met by products imports from Asia.

| **AUSTRALIA (2004)** | **Kbd** | |
|---|---|---|
| Domestic crude production | 441 | 441/780 = 57% |
| Domestic petroleum products demand | 780 | Approx 90kbd or 10-11% met by imports |
| Crude imports | 442 | 442/708 = 62% |
| Total domestic refinery runs | 708 | [708–442]/780 = 34% |
| Total domestic refinery capacity | 748 | 708/748 = 95% refinery utilization rate |

Given the foregoing points, it would not be unreasonable to say that 60% self-sufficiency ratio is *not* an accurate reflection of domestic crudes that can cater for oil refining into transport fuels and other petroleum products. However an alternate ratio of 30% which disregards 200 kbd condensate production mainly unused domestically will be erroneous given the necessity of importing heavier crudes to supplement refineries' crude diet in any case. Arguably, such import is *not* a supply security issue. Composition of world crudes has trended towards heavier sour grades with growing mismatch between these grades of production[5] and rising world demand for lighter sweeter grades, reflected in hefty price discount of heavy sour crudes to light sweet as the latter prices are bid up[4] by a greater extent. The answer realistically lies somewhere between 34% (domestic crude to products) and 57%, the latter effectively a macro-economic measure of the nation's output regardless of domestic usage.

Analysing this ratio to greater depth will however miss the bigger picture of projected deterioration in Australia's crude oil supply security. Other than a short-lived oil production spurt in 2007-09 (small oil fields coming onstream; deplete quickly) Australia's downward crude production trend is unabated whereas consumption rises slowly but steadily. By beginning of the next decade, condensate share of domestic crude output is forecast to be over 60% which means much lower self-sufficiency ratio in 22-27% range, notwithstanding the relative abundance of global supplies of heavier/sour crudes for import increasingly in the

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[3] Developed by American Petroleum Institute: $^{O}$API = 141.5/spec gravity – 131.5 API gravity always refers to a liquid sample at 60$^{O}$F (15.6$^{O}$C). Generally speaking higher API gravity degree oil values have a greater commercial value and lower degree values have lower commercial value. Wandoo is perhaps the only heavy crude produced in Australia, with 19 $^{O}$API; two major crudes Gippsland and Cossack are 47-48 $^{O}$API, and Laminaria has 58.5 $^{O}$API which is typical of condensate API.

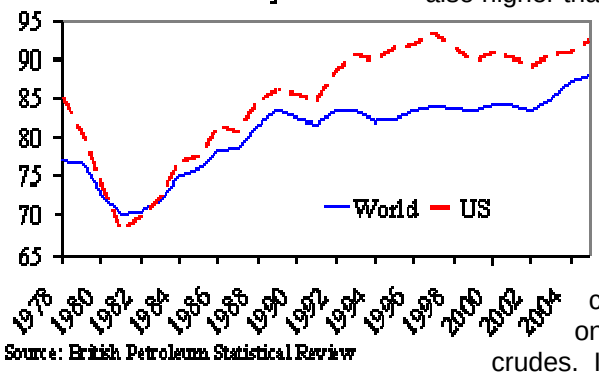
[4] To be covered in later sections, it should be noted that high oil prices in past two years and foreseeable future is attributed among other reasons to relative shortage in the oil market of light sweet crudes vs. heavy sour as (i) tightening specifications for gasoline and diesel come into effect worldwide, and (ii) lack of refining capacity; to be precise those in "complex" category that convert/upgrade simple refinery distillation outputs into light/medium products viz gasoline, diesel, jet/kerosene. Many refineries in Asia, not counting Australia/NZ/Japan, are "simple" with little or no conversion capability to enhance light products output and minimize heavy fuel oil output, which means their crude diet is mainly light sweets thereby resulting in increased demand and record increases in price premiums to heavy/medium sour crudes. Additionally, world oil production is of lesser light sweet grades due to oil field depletion e.g. Brent in UK, and fewer discoveries of large oil fields of such grades.

[5] Asia mainly produces heavy sweet crudes; 74% of 7.4 MMb/d produced in 2005. Supplemental supplies come from Middle East (ME) the main external source of the region's crude imports and are of the heavy sour grade. Japan and South Korea have the heaviest dependence on ME crudes at 90% & 80% respectively; 75% in Singapore a major products exporter.

future. The corresponding outlook for refineries and oil products supply is also one of structural industry tightness, but with unique characteristics in a global context.

Globally, complex conversion[4,8] refineries are limited for the handling of particular heavier crude grades and specific regions require demand-supply imbalances to be resolved through imports of petroleum products. Australia imports mainly gasoline from Asian refineries which are geared towards diesel production with gasoline as surplus by-product. US gasoline shortage is comfortably met by imports from Western Europe which (like Asia) has surplus production although for a different reason: road diesel market penetration[6]. There is much media coverage on the need for refinery upgrades and new complex refineries but such investment is likely to be constrained in developed countries due to environmental concerns. It is lesser developed countries, including Middle East, that global refining is expected to be boosted, in particular India which may overtake Singapore as Asia's biggest oil products exporter by the end of this decade. Statistics can however cloud the global petroleum products supply security picture. The chart below, from Sept-2005 IMF oil market study, shows global refinery utilization is close to 90% in contrast to 80-85% range in 1990s and early 2000s. The 1990s low rate was due to refinery boom[7] amid oil demand decline in the 1980s and 1997-98 Asian crises. The near-90% utilization rate is a statistical average of *all* refineries worldwide, whereas utilization rates for complex conversion refineries exceed 90% as in Australia (95% - refer table) and USA – i.e. running flat out.

Figure 6. The World and United State's Refinery Utilization




Source: British Petroleum Statistical Review

Simple (non-conversion[4]) refinery utilization is also higher than in the past decade especially in Asia – mainly China - where demand growth for light products is highest globally and where refinery complexity is low. Overall, global refining-capacity tightness is regarded as the key bottleneck in the oil supply chain. It is a complicated situation of too many simple refineries – lacking conversion capability – that run only on light sweet crudes, and too few complex conversion refineries[8] with capability to run on (abundantly available) heavier sour crudes. In this oil jig-saw set, light sweet crude supplies are tight whilst plentiful heavier sour crudes are unsuitable for most refineries outside of USA and few other countries including Australia, being simple (non-conversion). Australia's refineries are in the complex category, upgraded with clean fuels capability to meet this year's new fuel standards. Except Japan, Asia has mainly simple refinery configuration weak in sour crude handling ability despite increases in conversion capabilities geared to process sour crudes by 2008-09 e.g. India, China. On conversion capacity alone, the increase in Asia is 1.2 MMb/d over 2005-2010. Some experts think this is may be inadequate for Asia given (a) existing and older refineries still lack conversion capacity, (b) surge in demand growth for light products exceeds complex refinery capacity, (c) next higher level of product specification – 2009 for Australia – will necessitate another round of refinery upgrades. A$1 billion further investment is estimated to be required to meet Australia's post-2006 road fuel standards. The concern is Asian exports of surplus refined products, particularly gasoline and diesel, might disappear in longer term beyond 2010 turning into net shortages for the whole Asia-Pacific.

As shown in the chart below, Australia's product imports began with late-2003 closure of the Pt. Stanvac refinery. Not surprisingly, 2005's oil products import total of 76 kbd is of same

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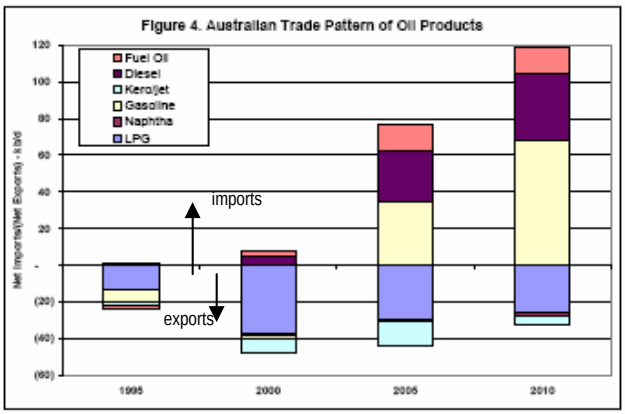
[6] Approx 50% of new vehicle registrations each year in Europe are diesel, a process called dieselization. This is attributed to host of reasons e.g. greater engine efficiency, Government policies. Only 7% of Australia's cars have diesel engines.

[7] But not in USA where no new refinery has been built for 30yrs since 1976 for several reasons, e.g. environmental and low refining margins. Lack of common fuel standards – US has 18 regional standards – is also blamed for gasoline scarcity there.

[8] Roughly, of total 82 MMb/d global refining capacity, the proportion of conversion capability (i.e. catalytic cracking & hydrocracking, catalytic reforming & alkylation) is highest in US at 70%, followed by Europe 40%, and lastly Asia 30%. It is beyond the scope of this review to examine China's crude oil imports that observers say poses a challenge to US in the oil market. However, must bear in mind China's refining configuration is mainly simple whereas US is highly sophisticated. Two opposite ends of the spectrum for *majority* of crude requirements, i.e. light sweets for China and medium/heavy sour for US, the latter mostly from Mexico & Venezuela supplemented by Middle East supplies. China imports Middle East heavy sour crudes but with limited complex refineries capable of handling such crudes, currently has a limited "appetite".




magnitude as that refinery's capacity of 78 kbd. Australia's refineries export surplus jet/kerosene; LPG exports are surplus to domestic market requirements (mainly supplied from refineries as refining by-product) but are mostly natural gas liquids production from offshore gas projects such as North West Shelf, Bayu-Undan. Projected growth in Australia's product imports reflect (i) domestic refineries' supply limitation (ii) continuing product demand growth, albeit marginal given per capita consumption is already among the world's highest. Gasoline remains the biggest import fuel item followed by diesel. However it is hard to see Australia having supply security problems given product import needs are small relative to Asia's refinery surpluses[9]. Projected Australian imports of gasoline & diesel total 80kbd in 2006, 120kbd in 2010, whereas the four major exporters Singapore, South Korea, Taiwan and India have aggregate forecast exports (both fuels) of 1250 kbd in 2006 and 1990 kbd in 2010. Whilst tightened Australian fuel specifications may prevent some products imports from meeting the standards, domestic refineries together with biofuel players[10] are responding to the clean fuels market opportunity.

## Alternative Transport Fuel: Gas-to-Liquids (GTL)

Another potential significant source of clean fuels is GTL which convert natural gas to liquid fuels, principally diesel. Australia has huge gas reserves offshore north-western Australia where much of the discovered resource are still not firmly slated for development despite several new export LNG (liquefied natural gas) projects. Unlike biofuel projects which have scale-up limitations, the magnitude of GTL plants, of 34-140 kbd can make a material difference to Australia's diesel supply security. Biofuel projects do play a useful role as niche fuels[10] but are limited by the sheer scale of biomass feed requirements; indeed biodiesel proponents look to imports of palm oil from Malaysia as feedstock fallback. Because GTL uses natural gas as feedstock, product output is limited only by gas feed/offshore production rates. Going by current offshore gas production for LNG of about 1.8 billion cu.ft./day (for 12 million tonnes p.a. LNG) at North West Shelf Project, GTL can upsize to roughly 140 kbd which will yield nearly 100 kbd diesel (remainder is naphtha) – equivalent to 40% of Australia's diesel market of 250 kbd presently. This is not to say such output is the optimal GTL project size; merely to illustrate feedstock resource and technology capabilities. Soon this year, the first truly worldscale GTL plant will be commissioned in Qatar with a capacity of 34 kbd (130 kbd scale-up possible). It is notable that Alan Greenspan as Chairman of US Federal Reserve Board, in a speech on energy at the New York Economic Club in May-2005, pointed to GTL as a potential alternative ("non-conventional") fuel; to quote from his speech : "GTL is poised to become an increasingly important component of the world's energy supply".

However, GTL and biodiesel do not produce gasoline, the main transport fuel in Australia. For that another biofuel, ethanol used as gasoline blend, is gaining popularity although the economic rationale is less clear. Huge land tracts and water are required for sugarcane plantation plus energy costs of transporting plantation output and ethanol to oil refineries for product blending. National policy makers should consider whether such costs are worthwhile given that gasoline is a surplus refining by-product available from Asia for foreseeable future (despite China/India's burgeoning demand growth) and poses little supply security even as imports are projected to rise. ABARE has longer term projections of product imports rising to nearly 30% of forecast Australian demand by 2030, a sixfold increase to 475 kbd from 76kbd presently. It is too far in the future to tell if this can not be met by Asia's products exports.

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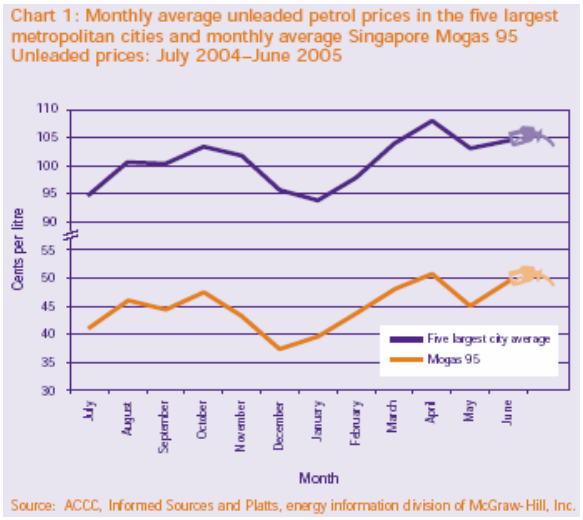
[9] This does not take into consideration what is likely available extent of Australian compliant clean fuels from foreign refineries. Moreover 2009 is next mandatory tightening of road-diesel sulphur specifications to 10ppm, i.e. 0.001%; from 50ppm (0.005%) currently. At present, no oil refinery in the region including Australia can make such quality diesel.

[10] These are small-scale producers of diesel and ethanol from biological sources like tallow and sugarcane respectively. Ethanol is blended with gasoline to form blends such as E10 i.e. 10% ethanol in gasoline. Typical biodiesel & ethanol plant size is 690 bbl/day or 40 million litres/yr plant. Currently two biodiesel projects in Australia produce 770 b/d in total; add 3500 b/d from two relatively bigger projects being built, and with other planned projects, potential aggregate output < 4% national diesel demand. Caltex Australia is reportedly to have contracted to buy 40 mill litres/yr of ethanol in Queensland.

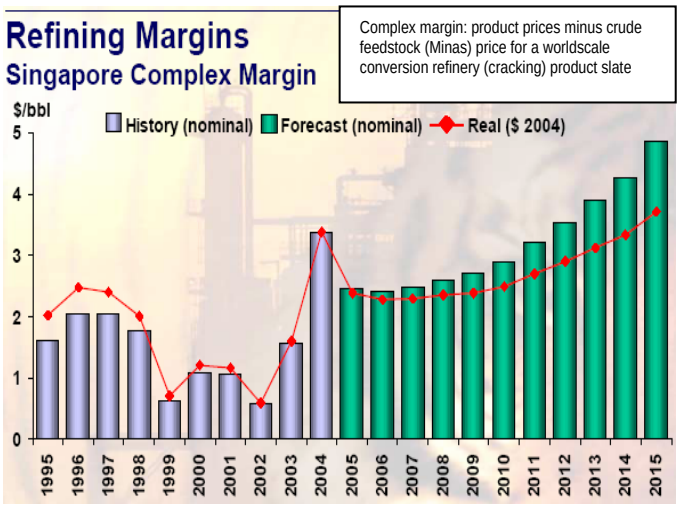
## Products Pricing: Transport Fuels, Australia & Global Context

Movements in fuel prices in Australia (also most markets in the region) follow international benchmark prices, in particular in Singapore which is a major export refining and oil trading centre. The benchmark for regular unleaded petrol (gasoline) is the spot price of Singapore Mogas 95 Unleaded which is the average daily price of gasoline from refineries traded in Singapore. Since the gasoline price is in US dollars, the price in Australia will change with movements in the A$/US$ exchange rate regardless of whether it is imported or locally produced. The chart on the left shows average monthly retail prices for the five largest Australian cities and average monthly Singapore Mogas 95 Unleaded prices in Australian cents per litre for the period July 2004 to June 2005. The chart shows movements in domestic petrol prices - up and down - are largely driven by movements in the international gasoline price and the exchange rate.




Australian refineries are price takers as their product prices are determined by market prices in the Asia-Pacific region. If the prices in Asia were to drop, Australian refiners must follow with a drop regardless of costs, or else they will lose their market share to imports. In other words, Australian refineries must price their products to be competitive with the imports. This is referred to as Import Parity Price (IPP), or simply, Singapore's product price plus freight cost to Australia. Singapore's market price is used as a reference because of its regional oil refining/trading role and being the principal source of refined products exports to Australia. The same international benchmark pricing principle applies for other petroleum products, notably diesel (ULSD grade), fuel oil, jet/kerosene and LPG. In the case of LPG, the market benchmark is Saudi Aramco monthly contract prices given it is the world's biggest producer and exporter of LPG.

Such a system is both market-based and economically efficient in that it "ensures" Australian refineries operate competitively in international context, particularly given the deregulated market allows for independent importers to access oil terminals and storage facilities. Also significant is despite Australia's small refineries by world standards they compete vigorously with overseas refineries which enjoy greater economies of scale[11] with lower operating costs. ABARE Energy in Australia 2005 notes that Australian gasoline prices *before taxes* is among the lowest in the OECD. Only UK and Germany are lower, slightly; but have very high taxes.

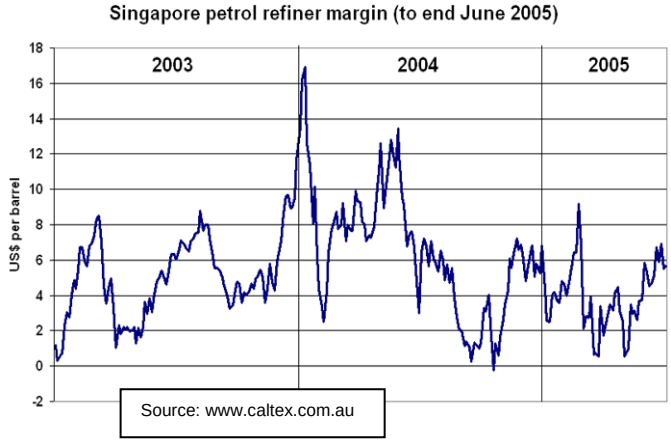



High road transport fuel prices in past two years have led to calls for the IPP methodology to be abandoned. The case against IPP rests on tight global refining situation that has nothing to do with Australia. This is shortsighted thinking as the past two decades have mostly seen refining overcapacity worldwide, especially in Singapore where refining margins (being petroleum product price less crude feedstock cost) were in the doldrums prior to 2004, as shown in Woodmac's chart on the left.

[11] The world's second biggest refinery, SK in Ulsan South Korea 810kbd capacity exceeds the aggregate capacity of 7 operating refineries in Australia. Singapore has three refineries, each in 300-580kbd range. Source: Oil & Gas Journal

Low refining margins reflect, among other things, low product prices which prevailed until the market tightened in early 2004 – mainly due to demand growth in China. Under IPP methodology, international product prices are automatically mirrored in Australian product pricing (including exchange rate effect). To assert IPP is no longer relevant is to say it is good so long it gives low prices, such as the situation prior to 2004. To delink from international market will cause severe economic chaos, as the refineries pay international prices for crude feedstocks, which are increasingly imported given the crude supply outlook (see earlier sections). Moreover their A$1billion investment in clean fuels based on international market pricing of light clean fuels could be jeopardized.

It should be noted refining margin referred herein pertains to the overall profit from refining a barrel of particular crude feedstock, before other operating costs such as catalysts and labor. It is a profitability measure, recognizing the range of petroleum products that a barrel of crude yields from the refining process and different products prices. Light products as jet, diesel and gasoline fetch much higher prices than "heavy ends" i.e. residual fuel oil which are in over-supply even as refineries are configured to minimize its output. Heavier crudes such as Minas (chart above) yield a significant proportion, 44%, as fuel oil; so are Middle East crudes e.g. Arab Light 40%, Arab Heavy 60%[12]. Normally refining loses money from the heavy ends side, i.e. fuel oil is worth less than crude oil. Refining profits are only from light products, which are just 40-60% of each barrel for these crudes. This is illustrated in the chart below, showing price differences between just gasoline (petrol) and Tapis crude. Tapis, produced in Malaysia, is the regional benchmark for light sweet crudes. It trades at a significant premium to Minas (being a heavy crude) so refiner petrol margins are higher if the comparison is made against Minas.




The picture is similar for jet/kerosene and diesel if prices for each product were compared to the benchmark crude price. Recognizing this is applicable only for a portion of the products yield from each barrel of crude, the graph indicates occasions when it was unprofitable or individual product margins were too low to result in positive and sound overall refining yields. With poor *overall* margins in the decade prior to 2004, in –$2/bbl to +$2.00/bbl range, refineries did not generate adequate returns. Such a prolonged period of dismal performance for downstream oil saw refinery closures, divestments and rationalizations within Australia and overseas. Indeed, even with the current refining tightness globally and sound margins, few countries expect to see new grassroots refineries for a variety of reasons which basically revolve around the low confidence of major oil players in the sustainability of high returns. Few oil majors are making such investments, which runs into billions of dollars, particularly in US where there is dire need for refining additions[13]. It is a recognized fact that the world's biggest private oil companies, supermajors as they are called, in past decade had regarded returns from refining – known as downstream – to be unsatisfactory. Naturally, 2005 has seen high oil company profitability including downstream returns but whether the supermajors expect this to be a sustained trend into the future is debatable.

[12] Contrast to much lesser fuel oil yield of 20-21% from UK North Sea Brent, Malaysia's Tapis and Australia's Gippsland crudes. All these yields are of a conversion refinery, in particular cracking mode (yield data source: Platts.com)

[13] Valero, an independent US refiner, plans to invest US$5 billion to expand refinery capacity by some 400kbd over the next five years. Although improvements will likely be made at all of the company's 18 refineries, Valero officials say the bulk of the work will occur at refineries in Texas, Aruba, Canada, Louisiana and California. Latest news is that Middle East OPEC countries plan to increase their refinery capacity by 50% in next 20 years by building new refineries domestically and in Asia, closer to their markets i.e. to secure outlets for their heavy sour crudes.

There is a complicated interdependency between refining margins and oil prices (crude & product) in world oil markets that Australia is part of. Recognizing supply & demand dynamics outlined above, the interplay may be summarized as follows:

1. Nearly all the world's demand growth is concentrated in light products – essentially all products except heavy fuel oil. Gasoline and diesel comprise 50% of light products demand in Asia-Pacific region. Australia's transport fuels market is primarily gasoline.
2. High utilization of simple (non-conversion) refining capacity is needed to satisfy light product demand growth, but this leads to excess of heavy fuel oil relative to demand. Asia-Pacific refiners, except Australia, New Zealand and Japan are simple; lacking conversion capability to enhance light products output and minimize fuel oil output.
3. Complex refinery (conversion) capacity is inadequate – crude diet is primarily heavy grades (i.e. the case in Australia) which have more abundant supplies than light sweet grades. Even with future conversion refinery additions[13] the underlying structure in Asia will not change.
4. High light product margins are required to offset weak/uneconomic heavy fuel oil margins and to provide incentive to simple refiners to maintain high utilization rates. The outlook is of continued elevated light products prices given tight refining situation worldwide. Much of planned refinery additions are not simple (due to anticipated high prices of light sweet crude) but complex category aimed at reducing feedstock costs or to enhance clean fuel capability to mitigate exposure to lower-grade products markets[14].
5. Given weak/uneconomic heavy fuel oil margins and high light product margins, simple refiners bid up the price of light, sweet crudes to maximize light product output. On the other hand, weaker heavy crude oil demand means deep price discounts to light sweets which are expected to hold up complex refining margins for investors – in India and China, particularly relevant to Australia – to undertake new refinery investment[13].

## Concluding Remarks

Australia has an economically efficient market-based system for oil supply and pricing linked to global oil markets and which engenders fuel market competition domestically. Transport fuels (i.e. jet, gasoline, diesel, LPG) are priced according to domestic and international market forces. This is significant particularly as Australia's refining industry is increasingly reliant on imported crude feedstocks traded on world markets.

Reflecting complex global interdependency between refining and crude oil supply, the price implication for transport fuels in Australia is continued high prices. It is unlikely that fuel prices will fall back substantially to pre-2004 levels[15] unless global economic recession is to occur that can loosen the grip of high demand (notably China) on a tight global refining system.

On the other hand, it is hard to see Australia facing transport fuel (and also crude feedstock) supply security problems. The domestic refining industry has geared itself with significant investment in clean fuel technology to meet legislated upgrades in road transport fuel standards, in addition to having sophisticated conversion refinery plant – unique in Asia-Pacific region with the exception of Japan and New Zealand - to process mainly heavy crudes that are available abundantly[16] globally. Australia's refineries are not dependant on light sweets crudes, the main crude feedstock diet for most of Asia albeit world supplies trending to heavy sour grades. The supply of transport fuels in Australia is also supplemented by some (gasoline and to lesser extent, diesel) imports of surplus production from worldscale export refining centres in Asia in particular Singapore, which is in close proximity.

A potential new source of transport fuel, possibly the only feasible option that can go a long way to augment Australia's long-term fuel supply security with economic, technological and environmental merits, is gas-to-liquids (GTL) utilizing significant gas reserves in offshore north-western Australia.

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[14] Road diesel specification has become tighter not just in Australia but many Asian countries viz. Singapore, Hong Kong, South Korea, Japan and Taiwan. High sulfur diesel of 5000ppm (0.5%) maximum sulfur grade is no longer applicable in these other countries which have reportedly moved to 50ppm (0.005%) limit, the ULSD standard applicable in Australia from Jan-2006. In USA, road diesel specification will be tightened to 15ppm (0.0015%) limit, from June-2006.

[15] For example, petrol pump prices returning to less than A$1/litre.

[16] Compared to light sweet crudes