Senate Rural and Regional Affairs and Transport Committee: Inquiry into Australia's Future Oil Supply.

A Submission from Eriks Velins.

Australia's future oil supply, with particular reference to:

a. projections of oil production and demand in Australia and globally and the implications for availability and pricing of transport fuels in Australia:

Response:

1.0. The Committee is to be congratulated on embarking on this complex Inquiry which is of great strategic and economic importance. As will be demonstrated later, uncertainty surrounds the estimates of reserves and demand and hence price and economic impacts. Furthermore, there are risks in terms of costs and technology associated with any proposed measures for their management. A time frame of some 20-30 years should be chosen to examine all possible implications. Clearly a simple, single line forecast will most certainly turn out to be wrong, as will an aggregation of inputs from a variety of no doubt well meaning submissions. The methodology used in this Inquiry will therefore have a great influence upon its outcome and value.

Recommendation: The Committee should examine and determine the appropriate methodology to be used for analysing and understanding the uncertainty and risks in the subject of this Inquiry.

1.1. Before considering oil production and demand, it is essential to establish some fundamental definitions and an understanding of reserves of this vital commodity. Firstly, what is crude oil? There does not appear to be an accepted single definition of the complex and variable hydrocarbon mixtures which constitute crude oil, though all definitions recognise the importance of viscosity, ie its flow characteristics and of specific gravity ie is it 'light' or 'heavy'. At the heavy end crude oil turns to bitumen and ultimately to coal whilst at the light end, to condensate and natural gas, thus completing the range of naturally occurring hydrocarbons. Secondly, what are reserves (proven and commercial) and resources (non-commercial)? Thirdly, how accurate is the estimate of reserves and resources? These could be P90 (ie 90% probability), P50 or P10, or Proven, Probable and Possible (3P). Statutory reports are usually based on the P90 figure, whilst the P50 figure would be used for internal corporate planning purposes and should be used for development of public policy. However, application of the definitions is neither uniformly agreed nor applied and there is ongoing work at the UN to improve these definitions. The Society of Petroleum Engineers is a recognized authority on this subject.

Recommendation: The Committee should set out appropriate definitions for all statistical data.

2.0. In 2004 BP ('2004 BP Statistical Review of World Energy') estimated that the global P90 reserves were some 1189 billion barrels, of which some 78% were in countries belonging to OPEC ('OPEC Annual Statistical Bulletin 2004') and managed by their State Oil companies. This represented a reserves/production ratio of 41 years, a figure which has been around for a

number of years. However, whilst all companies with operations in the USA must submit their reserves estimate to the Securities and Exchange Commission (SEC) annually, no independent audit has been carried out of OPEC's reserves. Such figures have been arbitrary increased and used for political purposes, particularly by Iraq, Iran and UAE, and to increase their share of OPEC production quotas, the basis for production constraints. In addition, condensate and liquid petroleum gas (LPG) are sometimes included in crude oil reserves.
Conclusion: Published global crude oil reserves should be treated with considerable caution and there are variations between estimates prepared by different authorities.

2.1. A bituminous type material can be produced from the heavy oils in Venezuela and from the mined tar sands in Canada and upgraded to syncrude, these resources being roughly equivalent to those of crude oil, though potential recovery is at present uncertain. Oil shale can be processed to produce kerogen, a feedstock which can be converted to petroleum fuels and these resources are also roughly equivalent to those of crude oil, though potential recovery is at present uncertain. However, large scale shale processing technology is not proven. Finally, petroleum fuels can be manufactured from natural gas (a number of plants are being currently evaluated for Qatar), from coal bed methane and from brown or black coal (three black coal plants have been operating in South Africa for many years). In the long run there will be technology to exploit the huge deposits of methane hydrates eg DOE Announces $2 million for Methane Hydrate Projects, Nov 2005. Thus the world will be amply supplied with fossil fuels for a very long time, the challenge being that costs will increase as production of conventional oil moves towards its peak and is gradually replaced by these other naturally occurring hydrocarbon feedstocks. However, long before fossil fuels are exhausted, new forms of engines will have been developed which do not require fossil fuels at all, as there will be a very strong price, and possibly environmental, incentives to do so.
Recommendation: Consideration of future supplies of crude oil must include all other hydrocarbons which can be converted into transport fuels.

3.0. Sufficient oil has always been produced to meet demand and there have been very few interruptions to supply. There is no reason to suspect that production would not continue in the future in 'normal circumstances'. Oil production does require, however, substantial input of new capital (and technology) for the maintenance of existing production, which declines as reservoirs become depleted and for meeting future growth in demand. Likewise, refineries need ongoing investment as well as new investment. Present cash flows are adequate for such purposes, should the State Oil companies wish to, or be allowed to, invest in oil production. That decision would be influenced by other needs of the State and its willingness to invest any surplus cash in the USA. Non-OPEC production has been at its optimum for many years and is now in decline. There are a diminishing number of opportunities for new investment outside OPEC in oil production and a number of the major oil companies have returned cash to their shareholders. There is some need for additional refining capacity and upgrading.
Conclusion: Ongoing capital investment is essential for maintenance of production and refining capacity as well as for ongoing growth.

3.1. Investment in production has been confined to an absolute minimum by OPEC and there has been little recent investment in refineries by consumers due to surplus capacity and poor profitability. That spare capacity has now been used up. At present time the whole production,

shipping and refining system is running at capacity ie there is spare capacity of around 1-2% for production of crude oils of a quality for which there is actually limited market. An incident anywhere in the world can create a perceived or actual shortage, with resultant volatile prices.
Recommendation: A national oil policy should recognize that this tight supply position is structural and will be in place until additional capacity has been constructed and in operation.

3.2. A new uncertainty has also become evident in the recent years, that of the geopolitics of oil. There are currently three major games being played out, firstly for the control of Central Asia by Russia, USA and China, (including China gaining access to Central Asian oil reserves among its other objectives), secondly, the struggle between the secular Islam of Turkey, Egypt and Iraq with the fundamentalist ones in Iran and Saudi Arabia as well as between the Shiites and Sunnis (complicated by the coming generational change in the ruling Saudi family) and thirdly, the ongoing war in Iraq which could suddenly involve its neighbours and thus destabilize the whole Middle East. That part of the world has not been so fragile for a number of decades. Iraq has the greatest potential for rapidly increasing its oil production but that will not happen until the war is over because it will require massive inflow of foreign capital and technology.
Recommendation: A national oil policy should include appropriate measures for managing short/medium term interruptions to supply.

4.0. Primary energy demand (oil, gas, coal, nuclear and renewables) is very closely correlated with economic growth. Since the first OPEC crisis in 1973, that elasticity of demand has declined to less than half for the developed countries, as they have restructured their economies into less energy intensive ones but has remained at former levels for the developing countries. Hence the overall impact of recent price increases, similar to those in 1973, has been much more muted than in 1973. A pattern of continuing to reduce the energy intensity of the economy in the future (but not loose sight of Australia's competitive advantage in energy) would continue to minimise the impact of future increases in price. Most future growth in energy demand will come from the developing countries, however, particularly from China and India.

4.1. Demand for petroleum products does not have such a close correlation though a global figure in the 1.5-3.0% pa range would seem reasonable. However, in addition to the uncertainties of predicting economic growth, there is an even bigger uncertainty, that of the impact of massive technological change in vehicle, particularly engine, efficiency. The hybrid petrol or, in the future, the hybrid diesel vehicle is one indication of possible trends. Present and perceived future fuel costs should already have started to accelerate the research into even more efficient drive trains and should that research be successful, unit consumption could decline by 30-50% by mid century. This would match more closely forecast availability of crude oil, offset by the transport needs of a larger economy. In any case, both the present oil industry and the vehicle industry face a paradigm shift in their operations if they were to survive and prosper in the longer term.
Conclusion: There is great uncertainty in estimating longer term demand for transport fuels.

Recommendation: A national oil policy should identify the role of Government in the transition from present low efficiency fossil fuel vehicles to future high efficiency manufactured and non-fossil fuel vehicles.

4.2. In addition to conventional petroleum fuels, other fuels have or are becoming available, such as liquid natural gas (LNG), compressed natural gas (CNG) and LPG (mainly propane), hydrogen and fuel blending components such as, methanol, ethanol, methyl tertiary butyl ether (MTBE, now banned in the USA), dimethyl ether (DME) and bio-diesel. Yet their contribution has remained small and is unlikely ever to play a significant part due to unfavourable economics of manufacture, usage or production. It would be irresponsible if a government were to mandate the use of any non-commercial fuels or blending components based on some belief or assertion rather than on economics.

5.0. Australia is fortunate in that, whilst it has diminishing reserves of crude oil, there are large volumes of uncommitted natural gas, coal bed methane, oil shale, brown and black coal and even methane hydrates. Geoscience Australia is the best source of actual and forecast resource data.
Conclusion: Australian resource statistics are believed to be of a very high standard and appropriate for policy formulation.

5.1. In order to increase crude oil equivalent supplies, fuel manufacturing facilities could be constructed. However, Australia has very high construction costs (particularly for downstream processing of natural gas) and high natural gas costs relative to its competitors such as Qatar. Thus the first of such plants will be built overseas. Were Australia to become a manufacturer of petroleum fuels rather than just a producer and refiner of crude oil, some risk sharing arrangement would need to be developed between the Government and the companies, perhaps modeled on OPEC's risk sharing contract (RSC), to recognize this financial risk.

6.0. Australian product demand tends to follow global patterns, albeit with a much higher share of transport fuels, influenced by costs and local regulations (ABARE's single line forecast is a useful starting point). Adequate supply relies on the global market and the confidence and means to be in that market. Unfortunately there are very long lead times involved in the oil industry, a good decade for a new oil province to be brought on line (if such could be found outside OPEC) and a good decade to upgrade the composition of the vehicle fleet. Plant fabricating capacity is now very limited, being largely confined to Japan, South Korea and perhaps China, and there are serious skill and labour constraints. Thus the oil industry can no longer respond quickly to a major change in the business environment.
Recommendation: A national oil policy should include an element of demand management.

6.1. Product quality is a domestic matter, but the Government has been tardy in accepting leading edge European product specifications. Some of these will be implemented in 2006 but, as a result, Australian consumers had been denied access to the latest very high efficiency petrol and diesel engines.
Recommendation: The Government should accelerate the introduction of EURO 6 specifications.

7.0. The price of transport fuels has two components, the cost of the fuel itself, where Australia is competitive with OECD members and the tax imposed by the Government. Here Australia differs from most of OECD. Australia has fourth lowest petrol price and hence little incentive to move to more fuel efficient vehicles. Whilst the price of crude oil is subject to supply/demand considerations, other blending components or feedstocks will move with global fuel prices which reflect the changing mix of their feedstocks. Current crude oil production cost curves are not public though past data would suggest that the cheapest source remains the Middle East (Iraq, Kuwait and Saudi Arabia), followed by Latin America, Russia, China, USA deepwater, North Sea and USA stripper wells. Neither are the costs known for manufacture of liquids from natural gas and coal due to the limited existence of such plants. though they are expected to be substantially higher than for crude oil. The price of crude is likely to remain volatile around the present, perhaps inflated, plateau and increase over time as manufactured fuels enter the market. There may also be periods where it declines to the level approaching the costs of major alternatives.
Recommendation: A national oil policy must include a sound fuels taxation policy.

b. potential of new sources of oil and alternative transport fuels to meet a significant share of Australia's fuel demands, taking into account technological developments and environmental and economic costs:

Response:
1.0. It is essential that Australia permits a viable upstream and downstream oil industry to operate, with all of its profitability ups and downs, as an underperforming industry is unlikely to cope with the uncertainties of a transition. Most of Australia's oil is produced by companies which operate globally, ie they rank each investment proposal on their global basis, with the final choice made to maximize the value of this investment portfolio. This may not always coincide with Government's strategic interests.
Recommendation: A national oil policy should define the Government's objectives for the oil industry.

1.1. The most obvious source of new oil is to obtain new acreage and there are some as yet unexplored provinces offshore Australia. Such search is now facilitated by the provision of preliminary public funded geological data. However, the fiscal terms must be globally competitive. APPEA has made a number of submissions on this subject. But new acreage may not necessary guarantee new oil as Australia is not geologically that prospective. So the basic corporate objective remains to increase recovery from existing fields and current prices should assist in applying secondary or tertiary recovery methods. But that potential may also be limited. Thus Australia will need to look towards mined or manufactured fuel in the longer term were it to increase self sufficiency, or, to a more unpredictable global market were it be prepared to accept that uncertainty.
Recommendation: The Government must ensure that its fiscal regime for oil and gas exploration and production is globally competitive.

2.0. There are a number of alternatives in use such as LPG, LNG, CNG and renewable bio-fuel blending components such as ethanol (though ethanol can also be made from ethylene)

and bio-diesel. These biofuels, however, do compete for land and water presently used to provide agricultural exports. Their technical properties are well known to both the oil industry and the engine manufacturers and specifications have been prepared, the only issue being that of price.

Recommendation: Taxation of alternatives and renewables should be on the same basis as of conventional petroleum fuels and they should compete with petroleum fuel blending components on a price/quality basis only.

3.0. The most realistic option which would make a material difference to Australia's supply of crude oil is to construct one or two gas to liquids (GTL) plants using natural gas as feedstock. Whilst their output would be a mixture of naphtha, kerosene and diesel, the logical mode would be to maximise diesel, which is of a superior quality to crude oil based diesel, thus enabling an increase in the efficiency of the diesel engine. A logical taxation system will impose a lower tax on diesel fuel than petrol, thus providing an additional incentive to move to the higher efficiency diesel engine and further reduce demand for transport fuels. Two commercial sized plants could meet all of Australia's demand for diesel or roughly one quarter of the demand for transport fuels. However, such a move would require a major adjustment by Australia's remaining seven crude oil refineries, both in term of capacity and complexity and perhaps even in numbers.

Recommendation: The economics and impact of a commercial size GTL plant and the exposure for the Government of an RSC type contract with the private sector should be examined.

3.1. Much has been written about hydrogen as the fuel of the future. At present it is probably an order of magnitude more expensive than fuels derived from crude oil. Furthermore, the fuel cell has some way to go in order to achieve the economics, reliability, distribution and safety of the present fossil fuel engines. The cheapest source of hydrogen is actually natural gas and would thus compete with the much more economic GTLs. However, some isotopes of hydrogen are the likely fuel for future fusion engines, probably the most logical long term option.

4.0. Present energy policy, due to the very large number of fossil fuel engines, continues to place emphasis on securing similar fuels to those derived from crude oil. It is a 'more of the same' strategy, for oil remains a most strategic commodity, with its central role in the economy, world trade and defence. How could one possibly replace this commodity, often extracted a long way from its consumption and used at a rate of some 12 million t/d with a manufactured or home grown product with the equivalent energy content, safety, ease of handling, global availability and favourable economics? As nations moved from wood to coal to oil, to nuclear to gas etc it was not the available fuel that drove the change but rather the invention of new engines and electricity generation processes. That pattern will follow the ultimate decline of fossil fuels also and offers the rationale for an alternative long term fuels strategy.

Recommendation: A research programme should be initiated which would look at the underlying scientific principles for development of an engine which does not use fossil fuels or fuels derived from fossil fuels.

c.flow-on economic and social impacts in Australia from continuing rises in the price of transport fuel and potential reductions in oil supply:

Response:

1.0. Australia is facing possibly a decade of change in the way it manufactures new crude oil and consumes transport fuels. Clearly a free market is the best process for adapting as well as taking advantage of that change. That would require the introduction of a rational taxation system, removal of subsidies for favoured producers and consumers and removal of anti-competitive legislation ie the removal of all distortions which affect the workings of a free market, as only that will maintain Australia's competitiveness. There is an issue, however, of whether the market could adapt in time were there a major crisis in the Middle East or a downwards revision of crude oil reserves or an externally imposed regulation on emissions of carbon dioxide or unacceptably high price rises or the removal of subsidies by a number of developing countries etc. The role taken by Government is central to Australia's ability to manage this transition: whether it continues to rely on adaptation and moderate regulation to manage change or take a more proactive role in managing the security of supply of transport fuels and rising transport costs. This, will greatly influence the choice of policy options.

Recommendation: The Committee should define the future approach by Government to the management of increasing costs of transport.

2.0. There are real limits to the price of crude oil. A floor is set by the production cost of crude oil (the finding, developing and lifting cost). This is actually very low, so in practice the OPEC producers have adopted a price which will meet the cash flow needs of their economies. The ceiling is set by the cost of producing alternatives ie the cost of manufactured or, possibly, mined, fuels. Unfortunately there is so little of that capacity actually operating that it can not act as a meaningful ceiling. That ceiling has now become the price which will slow down the global economy but not provide sufficient incentive to develop alternative fuels or engines. OPEC has controlled that price by using production constraints, with Saudi Arabia being the balancing producer within the agreed price range. Due to lack of surplus production capacity and hence an ability to 'manage' the market, there is now a more 'free' market than in recent years.

Recommendation: The Committee should prepare and examine different oil supply/demand scenarios to understand the impact of different oil prices.

3.0. Security of supply is a matter of great importance in a country so isolated from the rest of the world. Production of indigenous crude oil peaked in 2000. In 2004, Australia produced 357,000 b/d of crude oil towards a demand of 858,000 b/d of petroleum products, being roughly 42% self sufficient. (APPEA Production Statistics Calendar Year 2004.) If the 14,700 b/d condensate produced in Bass Strait is included, which is co-mingled with its crude oil, self sufficiency would rise to 43%, considerably less than ABARE's estimates of some 65%. Furthermore, this number is declining rapidly, perhaps by some 5% per annum. Why is there such a discrepancy?

Recommendation: A national oil policy should provide options to manage the risks associated with a declining production of indigenous crude oil

3.1. Australian refineries have been designed to refine indigenous crude oil as well as a range of imported crude oils from the Middle East and Far East. They are not designed to process condensate, though can process small volumes of it. Condensate contains poor quality gasoline, kerosene and diesel blending components and is usually exported as a feedstock for the production of petrochemicals. It is a byproduct from the production of natural gas and thus totally dependent upon the size of the natural gas market. Crude oil has always been produced at the maximum economic rate. Australia has negligible capacity to vary in the short term either its crude oil or natural gas production. However, ABARE adds all condensate to crude oil, some 154,000 b/d and may sometimes even add LPG, around 81,000 b/d, which results in a misleading total availability figure. The question is whether 43% is an 'actual' problem or a 'perceived' problem, in either or all of general economic, national strategic and military strategic terms. The answer to this question is a function of the expectations and acceptable cost of a short or long-term interruption to Australia's supply of crude oil.

3.2. Australia is the only member of the International Energy Agency (IEA) which does not stockpile the equivalent of 90 days net imports of oil. Even the USA, being in a similar overall self-sufficiency situation to Australia, complies with the IEA's requirement for 90 days of holdings because of the strategic value of such an asset and despite the very high cost involved.(M Taylor, 'Australia's Approach to Managing an Oil Emergency', April, 2004)
Recommendation: Australia should comply with all the obligations of being a member of the IEA.

3.3. The Australian supply chain, from oil production to final consumer, contains some 45-55 days worth of oil and petroleum products but these represent minimum operational requirements, being the largest outlay of working capital for the oil company, and include oil at sea and all blending components in the refineries. Thus, should there be a short-term interruption to supply, as was the recent case in the USA during the hurricane season, Australia has no buffer other than what is in the consumer's own tanks. So it has to accept a spike in price.

3.4. Should there be a longer-term emergency, Australia would invoke the Commonwealth Liquid Fuel Emergency Act 1984 and the National Liquid Fuel Emergency Response Plan, managed by the National Oil Supplies Emergency Committee. This is essentially a rationing process, which neither increases supply nor reduces real demand but will lead to a sub-optimal economic solution. It would be most unlikely for other members of the IEA to share their reserves with Australia on such an occasion. But how often has such an emergency arisen? Only once or twice in the post war period, brought about by war in the Middle East or destination sanctions imposed by some producers. In today's world that may not necessarily be a guide for the future. Some oil producers view oil as a political weapon and its strategic role is now well recognized, as is acceptance of the fact that there are no practical alternatives to crude oil in the short or medium term.

4.0. 'Peak oil' is a subject that has once again been reported widely in the media, based upon the argument of the industry's inability to replace for many years its consumed reserves. Clearly a time will come when production of oil will peak, a function of the actual reserves,

economics, geology, technology and demand. However, there is a range of estimates for this peaking by different authorities, from next year to two or more decades away. But does that matter? The current range of estimates is within the time frame which most oil companies would use for their long term strategic planning and such an event should therefore be included in at least one of their long term planning scenarios. One suspects that oil production will not peak but rather plateau with other hydrocarbons taking its place. Corporate plans have probably started to phase in emerging mined and manufactured fuels, in the order of expected costs and the corporation's access to such resources. Should that have been done, the problem becomes one of optimising supply costs rather than coping with possible supply shortages, a much easier problem to manage. (R Hirsch 'Peaking of World Oil Production: Impacts, Mitigation & Risk Management', Feb 2005)

d.options for reducing Australia's transport fuel demands.

Response:

1.0. There are a number of 'no regrets' measures. These include the introduction of a rational fuel taxation system (to ensure that an optimum fuel mix is used, with more emphasis on diesel), the accelerated introduction of clean fuels (so that leading edge engines could then be used), the introduction of a congestion tax in Sydney and Melbourne (as per the London model to encourage the use of public transport) and education about better driving techniques and fuel management practices.

Recommendation: The Government should implement all 'no regrets' options.

2.0. In order to make a material impact upon transport fuel demand, the existing fleet should be replaced by a more efficient one. That happens anyway over time, if there is time. Fleet fuel efficiency targets were introduced in the late 1970's and were extremely successful in reducing average consumption during the following decade. The changing mix of the vehicle fleet in recent years has increased that average consumption. Fleet fuel efficiency targets will have a profound effect upon the remaining Australian engine manufacturers. Such a policy change should be looked at in the context of optimising Australia's transport costs rather than just minimising fuel consumption. A programme would take a decade to become effective and would provide a structural change in demand.

Recommendation: The Government should implement a fleet fuel efficiency target for five successive years, say, an improvement of 10% pa for all private vehicles.

17th December, 2005