



Australian Academy of Technological Sciences and Engineering

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Ms M Weeks
Committee Secretary
Senate Rural and Regional Affairs and Transport Committee
Department of the Senate
Parliament House
Canberra ACT 2600

Australia's Future Oil Supply and Alternative Transport Fuels Senate Inquiry

Dear Ms Weeks

Please find attached a submission to the Senate Inquiry into Australia's Future Oil Supply and Alternative Transport Fuels by the Australian Academy of Technological Sciences and Engineering.

Should you have any queries in relation to the submission, please do not hesitate to contact the author below.

Yours sincerely

Dr Vaughan Beck FTSE FEA FAIB
Technical Director

INQUIRY INTO AUSTRALIA'S OIL SUPPLY AND ALTERNATIVE TRANSPORT FUELS

Senate Rural and Regional Affairs and Transport Committee

Submission by

AUSTRALIAN ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING

The Australian Academy of Technological Sciences and Engineering (ATSE) has some 700 elected Fellows, consisting of the leading applied scientists and engineers in the country. The Academy, is one of four established learned Academies in Australia (the others being Science, Social Sciences and Humanities). The mission of ATSE is to promote the application of scientific and engineering knowledge to the future benefit of Australia.

This submission addresses the first two Terms of Reference of the Inquiry; namely:

1. projections of oil production and demand in Australia and globally and the implications for availability and pricing of transport fuels in Australia;
2. 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.

Given the key strategic role of oil for the Australian society, ATSE believes that Australia must encourage exploration of oil deposits, encourage development of alternative sources of oil and facilitate the more efficient use of transport fuels.

SUMMARY

World oil production is at, or close to, current capacity. There is considerable uncertainty as to whether capacity can be expanded to meet burgeoning demand at current prices or even whether current production levels can be sustained in the longer term.

Australia continues to be exposed to the international oil market simply because the composition of Australian oils does not allow the full range of petroleum products to be produced

Australia's oil production is falling due to depletion of reserves with the rate of discovery of new oil reserves not keeping up with production

Australia must adopt a number of strategies: industry must be encouraged to explore for remaining Australian oil deposits particularly in new frontier areas), diversify sources of liquid fuel supply as a buffer to the uncertainties of the international oil trade and /or attempt to mitigate demand.

These strategies are fundamentally driven by price and the market to some extent will provide a response. The development of alternative sources requires very long lead times, at least the order of a decade or more for hydrocarbon fuels and much longer for alternative sources of transportation power. This is where government can play a significant role.

RECOMMENDATIONS

The Australian Academy of Technological Sciences and Engineering recommends:

- Industry must be encouraged to explore for Australian oil deposits, particularly in new frontier areas
- Australia must encourage research, development and demonstration projects applicable to alternative sources of oil, including:
 - Use of shale oil to produce crude oil
 - Biofuels
 - Gas to liquid conversion to produce synthetic liquid fuels
 - Production of synthetic fuels from coal
- Policies need to be adopted to facilitate more efficient use of transport fuels, including
 - the development/importation of the latest vehicle technologies to reduce the average hydrocarbon fuel consumption of the vehicle fleet.
 - development of a transport policy that recognises likely future constraints on availability and price increases of liquid hydrocarbon fuels
 - development of a transport policy, in consideration of the oil supply scenario, and implement long-term strategies to optimise the role of rail (in its various forms) which are not dependent on hydrocarbon fuel sources.

FACTORS AFFECTING ABILITY TO FORECAST OIL SUPPLY

In recent years there has been considerable debate as to how long the world's oil supplies will last. This issue has been prominent in the popular media given the recent surge in the price of crude oil and its key role in the world economy. Several estimates suggest world production has peaked or will peak in the next 10 years (see www.peakoil.org and associated links). Other estimates push the date out to beyond 2020 or even to the mid-century, depending on the certainty of the resource estimates and the assumed demand (e.g. Energy Information Administration, 2000 www.eiado.gov/pub/oil_gas/petroleum/presentations/2000).

It is important to focus on when production will peak rather than how long reserves will last because it is the point at which the supply-demand pressure commences, prices begin to surge, conservation and substitution become economically attractive. Similarly at the national scale, the point at which local production peaks is the point at which petroleum imports begin to affect the trade balance and security of supply issues become increasingly important particularly if global supply is under pressure.

Australia's ability to predict local production is much more certain because through long standing policies at Commonwealth and State level, geological and petroleum resources

information is freely available - nationally through Geoscience Australia and through the state resource departments. Geoscience Australia publishes annually the national reserves and for each producing area and provides forecasts of future production. (e.g. Oil and Gas Resources of Australia 2003 (2005)) This commentary is based on these published figures. However it must be emphasised that any decision making relating to petroleum supply and transport fuels is being made in an increasingly uncertain environment as to the ongoing availability of crude oil.

Australia's oil production comes from two types of petroleum fields. Crude oil fields where the hydrocarbons exist in a liquid phase. Then there are gas fields where 'liquid' hydrocarbons exist in the gaseous phase in the reservoir and condense out of the gas stream as condensate or 'light oil' in the surface facilities upon production. Both contribute to Australia's oil production.

During the last 30 years Australia has enjoyed a high level of oil self-sufficiency. However it should be noted that a large proportion of Australia's oil production, particularly from the northwest, is light in character – feedstock for gasoline - and is exported whilst heavier crude oil suitable for the production of the full range of petroleum products is imported. Oil self sufficiency in this case is on a net basis. Australia therefore has been, and continues to be, exposed to the international oil market simply because the composition of Australian oils does not allow the full range of petroleum products to be produced and substantial amounts of oil must be imported to meet this need.

Australia's remaining crude oil reserves peaked in 1995 at 2 billion barrels and have declined to 1.58 billion barrels at 1 Jan 2004 (latest figures available) of which 0.8 billion barrels are in currently commercial fields. Condensate reserves are close to an all time high of 2.42 billion barrels of which 0.66 billion barrels are in currently commercial fields. The balance is largely stranded in gas fields yet to be developed off north Western Australia. Crude oil and condensate production in 2005 was 194 million barrels of which about one third was condensate. Note the unsuitability of condensate for the refining of many petroleum products. This compares with the situation in 2000 when total oil and condensate production was at a maximum of 264 million barrels of which 21% was condensate. Through time condensate is becoming a more important source for oil production in Australia. The peak in production occurred 5 years after the peak in oil reserves was recorded

The ratio of annual crude oil production to "Economically Demonstrated Resources" is currently around 6 to 7 compared with an historical figure of around 10 during the eighties and nineties. A boost to levels of crude oil production is anticipated in the next couple of years as crude oil reserves discovered earlier in this decade in the offshore Exmouth Sub-Basin Western Australia is brought into production. Production decline is anticipated to continue in the absence of the discovery of major new reserves.

POTENTIAL NEW SOURCES OF OIL AND ALTERNATIVE TRANSPORT FUELS

Exploration

Successful exploration and full development of the identified resources is a necessary part of a sustainable oil production at a national scale. Future oil production will come from remaining reserves in:

- identified and currently commercial petroleum fields
- identified but non-commercial petroleum fields which could become commercial over the forecast period;
- petroleum fields which will be discovered and made commercial in the forecast period;
- extensions to identified commercial petroleum fields (growth in reserves), and
- non-conventional sources of crude oil such oil shales, the conversion of some of our abundant natural gas and coal reserves into synthetic fuels and the conversion of biomass into ethanol.

Any forecast must therefore consider the technical issues associated with these sources as well as the assumption of an ongoing and vigorous petroleum industry in Australia capable carrying out ongoing exploration and development in frequently more challenging circumstances such as deep water and distance from land.

The anticipated decline in Australian oil production will only change for the better if substantial new sources of crude oil are found. It is worth noting that the basins (geological entities) that sustain current production (Figure 1) were all found to be hydrocarbon bearing by 1972. The history of hydrocarbon exploration in Australia over the last 30 years has been predominantly one of exploring the full potential of these basins. The latest extension to the Carnarvon oil province in the Exmouth sub-basin is considered to be one of the last major new oil opportunities in the established basins.

However there remain many Australian Basins that to date have remained substantially unexplored (Figure 1) many of them in deep water and in difficult environmental conditions. Geoscience Australia (www.ga.gov.au/oceans/og_BigNewOil.jsp) has a geological research program aimed at opening up some of these areas for petroleum exploration. Only by continuing to encourage petroleum exploration in these frontier areas can we maximise the opportunity to find a new oil province. However the lead times are considerable – a discovery today in a frontier would be unlikely to yield any production for a least 6 years. The release and preliminary exploration of new acreage has a lead time of around 4 years. A decision to commence exploration in a new area would be unlikely to yield production under the most optimistic scenario would be around a decade. This emphasises the need to facilitate exploration in frontier areas whilst fully exploring the potential of existing producing areas where lead time are much shorter because of the knowledge of the geology and the existing infrastructure. Future exploration success for oil in Australia have significant research and development issues and problems unique to Australia.

Shale Oil

There remains in Australia an unconventional source of crude oil in shale oil. Shale oil comes from oil shale, organic-rich shale that yields substantial quantities of oil by

heating or pyrolysis and distillation. One tonne of oil shale may yield over 200 litres of oil. Australia has substantial oil shale deposits of commercial interest in a series of small basins near Gladstone, Queensland representing around 20 billion barrels of oil equivalent resources while Australia's total known liquid petroleum reserves are less than 4 billion barrels.

The Stuart Deposit has been subject to pilot production through a demonstration plant with production in 2003 of over 3000 barrels per day. In order to make a significant impact on Australia's oil supply a very large industrial scale facility would have to be developed and implemented. As with all developments of this kind there are very substantial issues to be overcome; including research and development, economic and social issues.

Biofuels

The Australian biofuels industry is small and fragmented. Further investigation is needed to determine what crops or alternatively waste vegetable matter can be most effectively converted to biofuels.

Coal to Liquid

Australia has abundant reserves of coal and the conversion to liquid fuels offers some real possibilities. While research is being conducted overseas, research is needed to optimise the conversion processes to suit Australian coals. Consideration of coal as a fuel source is constrained by many of the limitations outlined for oil shale.

Gas to Liquid

Australia's large reserves of natural gas provides significant opportunities to supplement our declining oil reserves with liquid fuels sourced from gas condensate in the short term as well as gas to liquid conversion in the medium term. The conversion of natural gas to synthetic fuels is technically feasible but its application is constrained by economic considerations. Research is needed to develop enhanced and more economical gas to liquid conversion pathways.

The above processes will produce significant quantities of greenhouse gases which will require mitigation. Hydrogen as a fuel source is a possible longer term alternative as an energy source including for use in transportation. Significant issues remain and further research is required.

ATTACHMENTS

- Figure 1 Hydrocarbon Basins, Australia (attached pdf file)