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Committee Secretary
Senate Rural and Regional Affairs and Transport Committee
Department of the Senate
Parliament House, Canberra ACT 2600
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February 24, 2006.

Dear Secretary

INQUIRY INTO AUSTRALIA'S FUTURE OIL SUPPLY AND ALTERNATIVE TRANSPORT FUELS

Please find attached the submission by Sustainable Population Australia inc. into the above Inquiry. While it may seem unusual that an environmental organisation primarily concerned with population has an interest in this resource issue, we believe the impending shortages in global oil supply have significant implications for Australia and its ability to support the current, let alone a larger, population.

There is an emerging consensus that global conventional oil production (extraction) will peak soon if it has not done so already. However, there is difference of opinion, even within our own organisation, about the extent to which alternative fuels can be provided in time to pick up the shortfall in supply, or even whether they can *ever* be provided in significant amounts to sustain anything like our current material standard of living.

The ease, or lack of, with which we move into a new future characterised by increasingly expensive conventional oil will depend on how quickly governments invest in alternative technologies and adopt conservation strategies. We believe that a concomitant strategy must be to quickly stabilise and then reduce population numbers, since oil production and agricultural productivity are closely linked. We have only been able to feed 6.5 billion people because of the ready availability of cheap oil.

Yours sincerely

Jenny Goldie
National president

SUBMISSION TO SENATE INQUIRY INTO AUSTRALIA'S FUTURE OIL SUPPLY AND ALTERNATIVE TRANSPORT FUELS

by Sustainable Population Australia inc
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This submission will address the terms of reference in turn.

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

In 1956, J King Hubbert, a geologist from Shell Oil, predicted that oil production (extraction) in the lower 48 states of the US would peak in 1969. It peaked, in fact, in 1970. He drew bell-shaped graphs for global oil production and predicted that, on the basis that the total amount of oil ever available was 2.1 trillion barrels, global oil production would peak around 2000. The top of the graph where demand begins to exceed supply became known as 'Hubbert's Peak'.

Colin C Campbell and Jean H Laherrere, who had each worked in the oil industry for 40 years, argued in the March 1998 *Scientific American* that global Hubbert's Peak would occur within the decade (Campbell and Laherrere, 1998). In his book *The Coming Oil Crisis,* Campbell had noted that oil and gas *discovery* peaked in the 1960s (Campbell 1997). The oil shocks of the 1970s, he wrote, were short-lived because there were then plenty of new oil and gas finds to bring on-stream. He warned of a coming oil crisis, however, in which there were virtually no new prolific basins to yield a crop of giant fields sufficient to have a global impact. He predicted significant increases in the price of oil.

The oil industry, meanwhile, has repeatedly argued that peak production will not occur for another three decades or more. Unfortunately, oil-producing nations do not always tell the truth about their reserves. Recently it was discovered, for instance, that OPEC producer Kuwait's oil reserves are only half those officially stated (Reuters 2006). Energy investment banker Matthew Simmons, in his well-researched book *Twilight in the Desert,* revealed that Saudi oil production could soon approach a serious, irreversible decline (Simmons 2005). He verified shortfalls in his field-by-field assessment of 12 key Saudi oil fields in their production and potential. It was in stark contrast to the official Saudi version of their reserves. Given that Saudi Arabia produces a quarter of the world's supply, this is significant.

In his most recent book *Oil Crisis,* Colin Campbell argues that the oil crisis has come and that oil production is now set to decline. We are using more than we are finding, he says, because, as he predicted, there is not really any significant amount still to be found. Petroleum geologist, Professor Kenneth Deffeyes in his book *Beyond Oil* believes that on the basis that total oil – already extracted and still to be extracted - available is 2.013 trillion barrels, the peak of oil production was Thanksgiving Day in 2005 (chosen with a certain irony, no doubt) or the early months of 2006, in other words, about now (Deffeyes 2005). It signals the end of the age of cheap oil.

So what does this mean for Australia? In August 2004, Dr Ali Samsam Bakhtiari, a senior executive of the National Iranian Oil Company with 30 years' experience, spoke at a conference in Perth. He warned that petrol prices in Australia would be $3/litre by 2007 and $10/litre by 2010 (Environment Victoria 2004).

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.

It cannot be stressed strongly enough that any new sources of fuel must have an EROEI (Energy Returned Over Energy Invested) of greater than one if it is to be cost effective.

The other factor is global climate change. A recent visitor to Canberra, Professor John Schellnhuber of Potsdam Institute, Germany, and Oxford University, UK, said that in order to avoid dangerous climate change, that is, over 2^{o}C, carbon dioxide levels in the atmosphere must be kept below 450ppm (pre-Industrial Revolution level was 280ppm and current level is 380ppm). In defining dangerous, he meant a level of global warming that would set of positive feedback and runaway warming with catastrophic effects for life on Earth. Some of the alternative sources of fuel listed below may well provide fuel alternatives but at unacceptable cost to the environment.

Both Kenneth Deffeyes and Richard Heinberg give serious attention to new sources of oil and to alternative fuels (Deffeyes 2005, Heinberg 2005). They include:

Natural gas: Liquefied natural gas (LNG) has the potential to fill some of the gap created by future shortages of conventional oil. Indeed, it is commonly believed that Australia has sufficient natural gas to allow a smooth transition to a post-conventional oil world. Much of the gas, however, is located in Western Australia and a great deal of that is being exported to China and elsewhere. As far as eastern Australia's natural gas is concerned, however, an ABARE study found that the principal constraint to balancing its demand and supplies over the longer term is not the availability of commercial reserves, but rather deliverability from the eastern Australian gas basins. Consequently the eastern Australian market will be increasingly dependent on new sources of supply in the future, if not within the decade (Dickson and Noble 2006).

Kenneth Deffeyes says in his earlier book *Hubbert's Peak* he was overly optimistic about natural gas supplies in North America, expecting that it would take 70 years to develop their full potential. Instead, he now says, between 1980 and 2002, the best of the natural gas targets were drilled and now they are "being served leftovers" (Deffeyes 2005). This should be a cautionary tale for Australian supplies.

Richard Heinberg warns that an expanded global trade in LNG may be even worse for the US than that of oil, threatening the planet with an even greater likelihood of 'endless war, covert disruption and forced regime change' (Heinberg 2005).

Coal: On the positive side, worldwide coal reserves are large enough to continue present rates of production for a few hundred years. On the negative side, coal use is responsible for a litany of environmental damage including acid rain, atmospheric

carbon dioxide, killer smog, hazardous mining and so on (Deffeyes 2005). Coal can, of course, be turned into gasoline as the Germans did in World War II and the South Africans did through the apartheid era. Deffeyes suggests, on the other hand, coal could replace natural gas for electricity generation; natural gas could be used to power cars and trucks; and the remaining oil used for aviation. But, as he notes, this does not solve coal's essential environment problems. Deffeyes concludes that the unfortunate choice we will have to make is between increased pollution from coal or doing without a significant proportion of our energy supply.

Professor Schellnhuber, mentioned above, felt that geo-sequestration of carbon dioxide emissions from coal-fired power stations, combined with greater biomass, may be the only way to avoid damaging climate change. While SPA remains sceptical about geo-sequestration and resentful of the excess amount of research funding it receives at the expense of renewable energy, for instance, it clearly must be seen as one means of limiting atmospheric carbon dioxide levels.

Heavy oil (tar sands): While tar sands have been found in 30 countries around the world, they are chiefly found in two locations: Alberta, Canada and in Venezuela. Heavy oil already amounts to eight per cent of the world total and the resource is very large. Its extraction, however, is very energy intensive and demands a great deal of natural gas for upgrading. Natural gas, however, is becoming increasingly expensive. The deposits are not being brought into production as fast as Middle Eastern conventional oil is declining, partly because of the huge financial investment and construction capability needed (Deffeyes 2005).

Methane hydrates: There are a variety of gases, including methane, that freeze with water and become crystalline. There are extensive deposits of methane hydrates under the Arctic permafrost and under the outer continental shelves. So far there has been no successful means of capturing the methane for commercial energy purposes and releasing other energy sources for transportation. Utter care is required because methane is a far stronger greenhouse gas than carbon dioxide and if it escapes in large quantities can exacerbate global warming.

Oil shale: There are also extensive deposits of oil shale worldwide, 60 per cent of which are in the Green River region where Colorado, Utah and Wyoming meet. One ton of rock, heated sufficiently, will release one barrel of oil. But it needs hydrogen in some form for upgrading eg from methane, and it demands a lot of water. Estonia has a history of extracting oil from oil shale rocks successfully but it has been difficult for any modern US company to do it successfully.

Uranium: Nuclear energy to provide electricity could potentially release natural gas and remaining oil for transportation. But nuclear energy is fraught with problems, not least the close nexus between nuclear weapons and nuclear power generation. Long-term storage remains problematic. And while a nuclear power station emits no greenhouse gases once built, there is considerable fossil fuel energy required for its construction and ultimately for its decommissioning. And, like oil, uranium is a finite resource. The International Atomic Energy Agency reports that world uranium production has been below uranium requirements since 1990 (Nicolet and Underhill, AIEA).

Hydrogen: Hydrogen, while not a source of energy but rather a carrier, is often held up as saviour of the cure to the world's energy problems. There is certainly potential for its use in transportation with hydrogen-powered buses and cars already in existence and Shell opening hydrogen filling stations in Iceland with other countries to follow. Production of hydrogen, however, can be energy-intensive and often fails the EROEI test. There is, however, no scientific barrier to using solar energy to produce hydrogen from water. Hydrogen can be produced from coal, as in China, but the process generates a great deal of carbon dioxide – as yet unsequestered – and is often contaminated by toxic elements such as mercury and arsenic. Nevertheless, there is some potential there if the environmental problems can be addressed. Hydrogen has other problems, not least its tendency to leak from containers and to explode with air in the presence of a flame. Nevertheless, fuel-cell cars using hydrogen may be a substantial part of the car-fleet within 20 years. The problem is in the intervening years with oil supply already having trouble keeping up with demand (Deffeyes 2005).

An article in the most recent *New Scientist* describes a miraculous new crop in the Californian desert. 'These water-filled tubes are teeming with countless microscopic algae that have been engineered to soak up the sun's rays and produce hydrogen to fuel the state's cars and other vehicles,' it says (Aldous 2006). While the tone of the article is optimistic, and no doubt hydrogen is being produced, the question remains: To what extent can it replace conventional oil? Hopefully, further studies will give the answer.

Ethanol: Ethanol appears to be the current favourite panacea though some studies find its EROEI using conventional crops is less than one while others find it is as much as two. (This is a long way short of the EROEI for conventional oil, which is 50.) Old fish and chip cooking oil is already used to supplement or replace diesel but at best this can only supply a fraction of what is needed. Globally, there is very little free land left to farm and with China buying into the world export market now and population still growing by 76 million a year, growing crops for ethanol may soon clash with growing crops for food. Recent experiments at UC Berkeley using switchgrass for ethanol, however, give some hope that it could at least partially fill the gap left by conventional oil. Its EROEI was 8.3 compared with 1.2 for corn (Peak Oil News 2006).

Solar energy (including wind): These forms of energy cannot be used directly for transportation except in the use of electric vehicles. Wind energy is expanding rapidly though it may only ever supply 20 per cent of total electricity needs. It can be used as a means of producing hydrogen when there is excess capacity.

Photovoltaics show great promise particularly with the sliver cells invented by Professor Andrew Blakers' team at ANU (http://solar.anu.edu.au). As the abstract for his upcoming colloquium at ANU on 10 March 2006 (11am Leonard Huxley Lecture Theatre) says:

> "Recent work shows that Sliver solar cell technology is capable of cost reductions of three quarters compared with current photovoltaic technology… Standard materials and techniques are used in novel ways to create thin single crystalline solar cells with superior performance and sharply

> reduced cost. Sliver technology … has an excellent chance of dominating the burgeoning worldwide photovoltaic industry. First generation Sliver technology is being commercialised in Adelaide by Origin Energy (http://sliver.com.au). ANU is developing a second-generation Sliver technology, which offers large technical and manufacturing improvements over first generation technology. With careful engineering, using well-known and established techniques, second generation Sliver solar modules allow a cost reduction of three quarters compared with current PV technology, without the need for further breakthroughs."

This is the kind of initiative that is *not* receiving adequate funding by government at the very time we are confronting an energy crisis.

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

Two books in particular: *The Long Emergency* by James Howard Kunstler and *The Party's Over* by Richard Heinberg, eloquently state what is confronting those countries still heavily dependent on oil. We commend them to the committee.

Almost all industrial societies are going to suffer from continuing rises in transport fuel. It is said that the country that will be least affected will be the least industrialised, namely Papua-New Guinea. Neither Australia nor the US nor most other countries have made adequate preparation for what can only be described as the coming crisis. The exceptions are Iceland which has large sources of geothermal and hydroelectric energy and is looking to hydrogen as a transport fuel, and perhaps Sweden that has recently announced it will end its oil dependency by 2020 (AP 2006).

Rising oil prices will have a flow-on effect right through the economy with higher prices for transported goods, notably food; air travel and overseas tourism will become increasingly unaffordable; a recession is possible; and a whole range of products that are made from oil or natural gas will become increasingly scarce such as plastics, medicines, synthetic fabrics, road surfaces, cosmetics, detergents, fertilisers – in fact, most modern comforts.

Rising oil prices have particular implications for agriculture. About 70 per cent of water removed from its sources is used for irrigation. Much of this energy to move water around, however, is based on oil (petrol or diesel). Thus irrigation that is not gravity-fed will be increasingly expensive, and pumping from deep aquifers may become uneconomic. A lot of land will have to be returned to dryland farming, which, of course, has lower yields than irrigated crops. Add to this the increasing cost of running machinery and fertilisers (nitrogenous fertilisers being made from natural gas), and industrial farming will become increasingly difficult.

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

It is worthwhile repeating what Richard Heinberg says is the underlying problem confronting the Earth, namely, that 'there are simply too many of us using too many

of the Earth's resources too quickly' (Heinberg 2005). He says the oil-depletion dilemma is the current mask for the timeless ecological dilemma. Technical problems may, in fact, only distract us from addressing the underlying problem. The way out is to restrict per-capita resource usage and to reduce the human population. Self-limitation is the only answer that counts.

There are clearly a number of options when it comes to limiting one's use of fuel: living near the workplace; using public transport rather than the private car; cycling instead of either private car or public transport; not flying; eating locally-grown food and, to fit with Heinberg's solution, having fewer children.

A recent study *Oil vulnerability in the Australian city* addresses various options (Dobson and Sipe, 2005).

Conclusion:

Australia is not prepared for the crisis that confronts us, namely the arrival of 'Peak Oil' and further increases in the cost of fuel. We have not developed alternatives nor have we directed adequate research dollars for the purpose. There will be inevitable economic and social dislocation. We must recognise that alternatives are unlikely to replace conventional oil completely and that it will be necessary to reduce both per capita energy and resource needs as well as population. Business as usual is not an option.

Recommendations:

That the Federal Government recognise that:

a) global peak oil production is occurring about the time of this Inquiry and that this has major implications for Australia and the world

b) as oil production progressively falls, it will lead to an inevitable increase in the price of oil and its products, not least of which is transportation fuel

c) current alternatives such as ethanol cannot replace present or future demand for transportation fuel and may create problems of their own, such as (in the case of ethanol) taking too much land out of food production

d) increasing cost of oil will be both socially and economically disruptive and, without appropriate action, may well lead to a recession in the Australian economy

e) global food production is closely tied to the availability of cheap oil and that, as supplies diminish, food production is likely to fall and its distribution impaired, including food exports from Australia

f) in developing alternatives to conventional oil, the Energy Returned over Energy Invested (EROEI) must be greater than one in order to be economically cost effective

g) the world faces the equally potentially catastrophic problem of climate change and that global levels of carbon dioxide must not be allowed to exceed 450 parts per

million if we are to avoid runaway global warming, hence any alternatives to conventional oil that are exceptionally polluting of the atmosphere must be avoided

h) continuing population growth and material per capita consumption can only worsen the situation.

It is therefore imperative that the Federal Government:

i) direct far more research and development effort into finding relatively non-polluting alternatives to conventional oil and natural gas, not only for transportation but also for the production of electricity

ii) direct more of the research effort towards renewable energy and not be as focussed on the fossil fuel industry

iii) hold a major national inquiry into the full implications of Peak Oil that goes beyond transportation

iv) deal with the issue as a matter of extreme urgency.

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Web-sites:

ACT Peak Oil Discussion List: http://act-peakoil.org/

ASPO (Association for the Study of Peak Oil and Gas): http://www.peakoil.net/

ASPO Australia: http://www.aspo-australia.org.au/

Die Off: http://dieoff.org/

End of Suburbia: http://endofsuburbia.com/

From the Wilderness (edited by Michael C Ruppert – see references) http://www.fromthewilderness.com/

Post-Carbon Institute: http://postcarbon.org/

Sydney Peak Oil: http://sydneypeakoil.com/index4.html

The Oil Depletion Analysis Centre: http://www.odac-info.org/