The Oil Drum: Australia & New Zealand
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Australia's Oil-Based Energy Security

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This is the first in a series of posts co-authored with Phoenix and Matt Mushalik. In my previous post I took a high-level look at solutions for Australia. This post starts the process of iterating down from the high-level view. It assumes that we will not be able to instantly convert to sustainable solutions - we need to get there in steps. This article is co-authored with Phoenix, a qualified mechanical engineer who has been working in the infrastructure construction industry for over 28 years. He has held senior manangement positions with a number of organisations delivering projects to key energy providers. These projects have included oil refineries, power stations, LNG plants and gas processing facilities. He currently works as the National Manager – Power Generation for a major Australian construction group.

Action Plan

1.0 INTRODUCTION: THE IMPORTANCE OF TRANSPORT

Transport is critical to the functioning of our society. If Australia's transportation stopped tomorrow, then most of us would be starving in the dark a few weeks later.

Yet this is exactly the scenario that is emerging. The vast majority of transport in Australia is fuelled by oil. Without oil, transport stops. And we are being warned from every direction that our oil supplies are no longer secure.

This scenario will be the most serious threat experienced by our society since the Second World War. This is the first in a series of discussions that look at ways to secure Australia's oil based energy security into the future. Over the next few weeks we will look at short and long term goals for personal and industrial transport.

2.0 TARGETS

The papers have been full of warnings from ABARE that Australia's oil reserves will rise slightly this year, and then follow a depleting pattern through to 2013. Within 5 years we will be dependant on foreign oil for more than 50% of our needs.

However the ability of our traditional trading partners to deliver the oil we need is rapidly disappearing. Within 3-5 years, most of them will be exporting much less oil (http://www.theoildrum.com/node/3657). The oil we need for our transport will not be available.

Quantifying the degree of the problem is difficult, as it depends on two factors:
1. How much can we pay for oil without crippling our GDP and disrupting our macro-economic system?
2. To what degree can we compete with other nations, when these nations attempt to lock-in supply by exerting economic, political and military pressure?

This problem is not unique to Australia; our situation is simply a little more acute and immediate than the situation in the US or Asia. The CIBC has observed that oil exports are expected to fall world-wide (http://research.cibcwm.com/economic_public/download/occrept62.pdf) and the IEA is scheduled to release a report in November that, according to early news releases, (http://www.washingtonpost.com/wp-dyn/content/article/2007/07/09/AR200707...) supports this assertion. According to their press releases, the IEA is predicting a "Supply Crunch" by 2010-2012.

In 2012 we will be competing for new trading partners to replace the shortfall from our traditional suppliers. We will be competing against larger countries that can exert economic, political or military pressure, so we might need to accept that we will pay extremely high costs for a constrained supply that will only meet a portion of our requirements.

Although difficult to quantify, one thing can be stated with certainty: The only oil that we can count on is the oil we produce ourselves. In 5 years, this oil is likely to represent **less than 50% of our projected needs**.
This post will therefore focus on solutions that enable the country to establish complete oil independence within a 5 year period. Subsequent posts in the upcoming weeks will examine other issues, including the subsequent transition to more sustainable modes of transport.

3.0 PUBLIC AWARENESS

We have had warnings about an imminent energy crisis from:

- The peak international energy organisation, the International Energy Agency (IEA).
- Commercial analysts such as the CIBC.
- Governmental groups, such as the Energy Watch Group (EWG) in Germany
- The major oil exporters. The two biggest, Russia and Saudi Arabia have both warned that expectations of major increases in production will not be met. Malaysia (one of Australia's largest suppliers) has warned that it might not be able to meet even internal needs for oil in 2011! (http://www.bernama.com.my/bernama/v3/news.php?id=339506)
- The US Dept of Energy. Starting in 2005, with the Hirsch Reports, the US DOE has turned out a string of studies on this subject.

Despite this, the magnitude and timescale of the crisis is difficult to accept. It is likely that, in order to avoid catastrophic economic impacts, we will need to find a path to energy self-reliance within only 5 years!

The impending crisis will involve serious consequences for the current lifestyle experienced by most Australians. This will be a difficult for many average citizens to accept and even more difficult for them to act on.

Many of problems posed do not lend themselves to mandated solutions. Governments cannot tell people where to live or what job to take (at least not in the Australia we currently enjoy). The solutions must instead come from the general public, making decisions based on their individual circumstances. However, the public cannot make these decisions without a clear understanding of the problem and the Government's proposed solutions.

Action: The federal government must make the public fully aware of oil depletion and it's implication for future fuel prices.

The increase in the cost of conventional fuels is likely to have the greatest impact on discretionary motor vehicle travel. However it is important that the public is not shielded from taking full responsibility for cutting usage. It will be very easy for governments to resort to popularist policy decisions to reduce excise or in other ways encourage the continued high levels of personal use. The current tax and excise regime must be either maintained or enhanced to discourage the unnecessary discretionary use of personal vehicles.

The approach by government to the issue of excise and tax on oil based fuels will be the most powerful message they can send to the general public concerning the gravity and impact of oil depletion. The general public do not have the knowledge or skills necessary to interpret the likely price effect of the future oil demand/supply imbalance. They will need simple guidelines concerning future price in order to make sensible personal decisions.

Action: Federal government to set up an Oil Excise Commission whose specific task is to maintain a forecast of future oil prices for a period of 20 years out. The oil excise will be set at a level that produces a linear increase in prices up to the forecast. The commission will act independent of government and be charged to decrease excise in the event of spikes in the international oil price and increase it when the international price falls. The net tax take over time to be maintained at current levels.

4.0 SUPPLY

The achievement of self sufficiency can be tackled by addressing both sides of the supply – demand equation. The supply side can be influenced by a number of factors that affect not only the supply of indigenous crude oil but also alternative and substitute fuels such as Natural Gas, Coal to Oil, Biofuels and Electricity

4.1 Indigenous Crude Oil

The bulk of Australia's crude oil production comes from Bass Strait fields and fields located off the west coast of Western Australia. The current government policy provides for oil field developers to sell oil extracted from these fields into the Australian market at world parity prices. There is no obvious need to change this policy as it should provide explorers and developers with the incentive they require to develop new fields and maintain production as high as is possible within the physical constraints. Governments should ensure however, that the requirement to give first preference to local supply be incorporated in all new permits issued.

Considering the timeframes that are required to find, test and develop new fields, it is unlikely that new finds will have any significant effect on our oil energy dependency within the 5-year period that we are currently examining.

4.2 Gas

Australia has an abundance of gas supplies both in the form of natural gas and CSM (Coal Seam Methane). As will be discussed later, it is likely that natural gas will provide the country with the most effective bridging fuel for the next 20 years.

Proved and probable reserves of natural gas are in the order of 140 tcf (trillion cubic feet) and the CSIRO has estimated CSM reserves to be in excess of 250 tcf. If the entire country's oil demand were converted to gas we would consume around 1.6 tcf per year in addition to the current gas consumption of around 0.7 tcf per year. We therefore have over 100 years supply of this valuable fuel at current usage levels – enough to provide us with a transition fuel and still leave some stocks of this valuable resource for future Australian generations.

However Australia currently exports close to 1 tcf per year with plans to increase this number to

more than 4 tcf per year.

This creates an insurmountable technical problem – it is not possible to increase local production to the level required to meet increased exports and ensure oil substitution within a five year time frame. All increased production must service domestic demand first, so the intended export targets will not be met. This makes economic sense – the income we receive from the LNG is only a fraction of the cost of the oil it will replace, so it makes more sense to keep it in Australia.

Action: Federal government to set in place a moratorium over the development of any new export contracts or facilities for the export of LNG.

For CNG to be an effective replacement for liquid fuels it needs to be provided with a widespread piping network to support refuelling points. This and the substantial increase in demand will mean that the natural gas pipe network that exists on the eastern seaboard of the country will need to be extended and reinforced. This network is privately owned. Government encouragement and facilitation will be required to ensure the private owners put in place the required enhancements.

4.3 Coal to Oil

Australia has vast reserves of coal and one possible solution for oil dependence is to convert some of this coal supply to liquid fuel. The technology for the conversion is well established using high temperature gasification of the coal and conversion of the resulting syngas to liquids in a Fischer Tropes reaction.

However:
- The process is wasteful of energy and produces a large amount of CO2.
- The infrastructure required for the conversion is large, complex and capital intensive.
- Developers of this infrastructure need to consider the impact of carbon tax on the price of the production.

For these reasons, it is unlikely that major developments will occur until there are clear price directions from both the carbon trade and the oil price. By the time these price signals are received there is no chance that any substantial production could be achieved within a 5-year timeframe.

4.4 Biofuels

Ultimately these may be the only energy efficient liquid fuels that will be available to us. The work on progressively transferring all of our liquid fuel demands to biofuels needs to progress at a rate that will have these fuels carry the entire liquid fuel demand within about 30 years.

Because of our very large growing areas, Australia is ideally placed for the generation of biofuels. We are however faced with a number of physical and moral difficulties. Climate change and resulting drought will impact on our capacity to grow sufficient feed stock for the production of biofuels in the quantities required. We also have to face the fact that feedstocks used for production of fuel directly impacts on the world capacity to feed an ever growing population.

The different biofuels can be effectively categorised into the feedstocks used to produce them as it is the feedstocks not the fuels themselves that are critical to the fuel's financial viability.

Sugar based ethanol

Australia has a substantial sugar growing industry and some of this capacity could easily be diverted into ethanol production. The planning and development of additional ethanol production facilities could occur within a 5 year timeframe. The only impediment is economics and certainty of a market.

Action: Federal government to mandate a progressive increase in ethanol content of all petrol in line with an aggressive build program for ethanol production.

Biodiesel based on animal or vegetable oils

Australia had a developed a large momentum behind this industry up till about 3 years ago. At that point the federal government decided to introduce the 50% ie. 19c/litre excise regime on all biofuels. This tax killed off many new proposals and forced some producers to close down facilities. Currently producers are only focused on plants where the feedstock is a waste product. This severely limits the capacity of the industry.

Ultimately the price of oil may make biofuels such as palm oil and algae based oil possible. Ethically responsible biofuel programs may grow out of these beginnings, but these industries will require years to develop and will be unlikely to be of any benefit within a 5 year timeframe. Nevertheless government needs to provide a lot more encouragement to this aspect of the solution.

Action: Federal government to repeal all excise on domestically produced biofuels.

4.5 Electricity

With the increase in oil price there will inevitably be a transfer of energy demand on to the electricity generation system. In the initial phase this will consist of increased load from public transport systems. Over a 3 year timeframe increases in load will result form electrification of rail and increased use of conveyor systems in lieu of haul trucks in mining. The major change however will be as a result of the take up by the public of plug in hybrid vehicles for commuter transport. Plugin vehicle should not present severe difficulty for the electricity system to manage if they are confined to drawing power in off-peak times. The large uptake of off peak power will necessitate a rapid roll out of timed metering.

Action: State governments to legislate that distributors are to provide access to timed metering to all consumers upon request.

Normal changes in the load profile for the electricity system are managed by the system control organisation. These changes however will be relatively rapid and will come at a time when the generation industry already faces massive upheaval due to the implications of carbon taxes and uncertainty over future fuel pricing. Power stations take 3-5 years to plan and build, cost up to a $Billion and have a life of more than 30 years. Developers need certainty over future operating conditions to free them to commit to such investments.

Action: Federal government to quickly resolve the carbon tax regime that is to be applied.

At present developers are intending a major switch to gas fired generation based on the lower carbon emissions of this fuel. The aggression with which this switch is pursued will depend on the treatment of existing coal fired generators under the new tax regime. This switch to gas however is being considered in isolation of the requirement of gas to provide an interim substitute for oil. In combination with proposed LNG export facilities the gas industry is in real danger of an over commitment, a resulting price hike and a failure to deliver.

Action: Federal government to immediately establish a national body for the management of the eastern seaboard gas network. The body to be responsible to forecast and manage future gas demand in a way similar to the way the NEM is managed.

5.0 DEMAND

Australia currently consumes around 880,000 barrels of oil a day. We currently produce around

570,000 barrels a day or 65%. As discussed previously the production of indigenous crude is likely to fall to around 50% by 2013. Add to this the small increases from production in alternative fuels and small amounts we will be able to extract from world markets, it is likely that we will have an overall oil availability in 5 years of around 60% of current consumption. We must therefore target a reduction in overall demand of 40% or 352,000 bpd. Following is a table of the approximate usage by sector of Australia's total consumption. The targeted reductions will be discussed under each sectors analysis.

Sector	2007 Usage (bpd)	Proportion of Total	Target Reduction
Agriculture	45,239	5.2%	5%
Mining	43,521	5.0%	15%
Industry/Commerce	80,171	9.1%	25%
Road Transport (Personal)	388,829	44.3%	60%
Road Transport (Goods)	133,427	15.2%	25%
Public transport	12,598	1.4%	0%
Rail goods	11,453	1.3%	40%
Air transport	98,496	11.2%	50%
Water transport	24,624	2.8%	0%
Products	36,650	4.2%	0%
Heating	2,291	0.3%	50%
Total	**877,300**	**100%**	**40%**

5.1 Personal Transport
Australia currently utilizes approximately 44 % or 390,000 barrels of oil a day on personal transport.

While personal transport directly contributes very little to wealth and gross domestic product it is the one area likely to have the greatest impact on our society and our economy. Our housing stock has been configured to be heavily reliant on personal transport to get people to and from their place of work. A disruption to fuel availability would trigger a major disruption to the workforce, that would make the difficulties that we currently face seem paltry.

So the challenge will be to cut our reliance on oil, in a dramatically short time frame, yet maintain as much as possible of our current lifestyle.
Personal transport involves a significant proportion of discretionary use so it is reasonable that the reductions here are more severe than the overall target.

Short-term Goal: In 5 years, reduce Australia's oil consumption for personal transport to 40% of current consumption.

To achieve this goal we will need to:
1. Reduce the number of kilometers driven.
2. Increase the efficiency of vehicles.
3. Replace petrol and diesel with alternate fuels.

1. Reduce Kilometers Driven
The increase in the cost of conventional fuels is likely to have the greatest impact on discretionary motor vehicle travel. For this to be effective in reducing demand it is important that the public is not shielded from taking full responsibility for cutting usage. It will be very easy for governments to resort to popularist policy decisions to reduce excise or in other ways encourage the continued high levels of personal use. The current tax and excise regime must be either maintained or

enhanced to discourage the discretionary use of personal vehicle.

Of course the public must be provided with alternatives to the use of personal vehicles for non-discretionary travel. This will mean a substantial effort by all local authorities throughout Australia. Bus and train services will need to expand dramatically. Where appropriate, road networks may need to be reconfigured to provide serious levels of accommodation for bicycle traffic.

People are abandoning their cars and moving to Public Transport. This process is an inevitable consequence of high oil prices. We cannot simply say "please wait until we install an electric light rail in your area", people need a service now. We need to provide solutions that are immediately available. Small commuter busses bought straight off the assembly line and converted to CNG provide a "bridging service". This bridging service can provide a pathway to light rail.

Action: Local governments to dramatically increase existing fleets of busses and commuter trains. For remoter suburbs consideration to be given to the introduction battery-powered or CNG powered mini-busses for shuttle services to transfer hubs on main roads and arterials.

While it is unrealistic to expect major new infrastructure such as light and heavy rail to be put in place over 5 years the relevant governments must take immediate action to commence the planning processes for this infrastructure. Waiting until the crisis unfolds may mean the difficulties in building these projects will be insurmountable.

2. Improve Vehicle Efficiency

While there is little that governments can do directly to effect the efficiency of motor vehicles there is significant measures that can be taken to influence the acceptance and take-up of high efficiency vehicles.

Action: Increase tariffs imposed on all imported vehicles using a sliding scale based purely on fuel consumption levels.

Action: Impose increased sales tax on all locally manufactured vehicles based purely on fuel consumption levels.

3. Alternative Fuels

On the demand side there are only two alternative motor vehicle fuel sources, electric and CNG (Compressed Natural Gas). Both of these sources have their place and need to be encouraged in parallel but CNG provides the most immediate solution to disengage the existing personal car fleet from oil dependence.

The conversion to Compressed Natural Gas (CNG) requires only a minor change to the existing fleet. The conversion costs about $3,000 per vehicle. The payback for this expense is around $1800 per year at current oil prices.

The conversion from petrol to CNG is not a long-term solution – this would just be changing one problem for another. Long-term we need to be aiming for 100% renewable energy. This conversion buys us time, allowing for a gradual transition rather than a traumatic shock.

Action: Government to introduce a 50% cash rebate on costs for conversion of private vehicles

to CNG.

5.2 Other Demand
The other areas of demand reduction such as industry, goods transportation, air travel etc. will be discussed in a subsequent post.

6.0 CONCLUSION

6.1 Supply/demand balance
This will be the subject of a more detailed analysis to determine the time based results of the above measures and determine how effective each of the measures will be in achieving the targeted balance between domestic oil production and demand.

6.2 Government Budgets
There is no doubt the action items identified here will have significant budgetary effects. We have estimated the net government outlays to be in the order of $10 Billion in capital expenditure over a five year period. In addition there will be a impact on recurring revenues of around $ 7 Billion. This will come over a period during which there will be decreased economic activity and so lower tax revenue. The only way these expenditures can be responsibly accommodated is to slash government spending on the infrastructure associated with the oil-based economy.

Action: Federal and state governments to put a moratorium on all new projects involving public roads (excluding modifications for public transport) and airport facilities.

6.3 Economic Effects
The impending oil crisis will have wide ranging implications for both our domestic and the international economy. Australia along with most of the world will enter into an extended period of negative growth. This will manifest itself in the Australian context as a large increase in unemployment numbers. To a degree these effects can be countered by the high expenditure rates associated with the above measures. If prepared and managed properly by governments these actions can be used very effectively to stabilise the economy following the oil price induced crisis.

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