



THE HON MARTIN FERGUSON AM MP

**MINISTER FOR RESOURCES AND ENERGY
MINISTER FOR TOURISM**

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C09/1827

22 JUL 2009

Dr Geoffrey Chia

KANGAROO POINT QLD 4169

Dear Dr Chia

Your local member the Prime Minister, the Hon Kevin Rudd MP, has written to me on your behalf concerning high fuel prices, the adequacy of world oil reserves and development of alternate transport fuels.

The Australian Government takes energy security very seriously and is responding to the key challenges raised by current market conditions. The Government is closely monitoring assessments of global oil reserves and is independently evaluating the risks to Australia's energy security over the next fifteen years. Consideration is given to assessments from a wide variety of reputable sources, including Australian industry, the Australian Bureau of Agricultural and Resource Economics, GeoScience Australia and the International Energy Agency (IEA). These help to inform the Government's own assessments and policies relating to energy security.

The IEA suggests that sluggish crude oil supply growth since 2004 reflects a lack of investment in oil production capacity rather than a lack of oil reserves. In the *World Energy Outlook 2008* released in November 2008, the IEA stated that "global oil production in total is not expected to peak before 2030". Further, the IEA reported that "estimates of remaining proven reserves of oil and natural gas liquids range from 1.2 to 1.3 trillion barrels. They have almost doubled since 1980. This is enough to supply the world with oil for over 40 years at current rates of consumption".

While the IEA argues that peak oil is not likely to occur before 2030, a lack of timely investment, especially in the upstream oil sector, could create very tight supply-demand balances by the middle of the next decade. High and volatile oil prices are likely to remain a feature of global oil markets unless timely investment occurs. To ensure that Australia does its bit to help, the Government is encouraging exploration and development of Australian offshore oil and gas reserves through a range of measures, including improved acreage release and tax arrangements.

The Government has investigated issues surrounding liquid fuel security in Australia through the National Energy Security Assessment (NESA), which was released in March 2009. The NESA examines the key strategic risks to adequate, reliable and affordable supplies of liquid fuels, gas and electricity in Australia to 2023. The NESA found that governments face a number of key challenges if Australia's energy security position is to be improved or at least maintained. These challenges include:

- the need for further market (supply and demand-side) reforms to maximise appropriate investment and improve the flexibility and resilience of energy markets in the face of disruptions or structural change;
- the impact of tightening supply/demand balances and infrastructure reliability on supply chain resilience;
- an increase in energy costs, including those from policies to address climate change, notably the Carbon Pollution Reduction Scheme and the expanded national Renewable Energy Target;
- the sharply increasing cost of investment capital, global demand for energy infrastructure components and skilled labour; and
- threats to well functioning international energy markets such as reduced availability of capital from the current global financial crisis and growing resources nationalism.

Further information on the NESA can be found at www.ret.gov.au/energy/energy_security.

NESA findings will provide a key input into the development of the Government's national Energy White Paper. The Energy White Paper will address the dual challenges of energy security and climate change. It aims to provide a comprehensive, long-term framework to ensure cleaner, adequate, reliable and affordable energy through to 2030. More information about the Energy White Paper can be found at www.ret.gov.au/energy/facts/white_paper.

Thank you for writing to the Government on these issues. I trust this information is of assistance to you. A copy of my reply has been provided to the Prime Minister for his information.

Yours sincerely

A handwritten signature in black ink, appearing to read 'M. Ferguson', with a long horizontal flourish extending to the right.

Martin Ferguson

Dr. Geoffrey Chia
MBBS, MRCP, FRACP
Cardiologist

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From: Geoffrey Chia

August 2009

To: The Hon Mr. Kevin Rudd, PM of Australia

The Hon Martin Ferguson, Federal Minister for Resources, Energy & Tourism

Re: Peak Oil Issues

Dear Mr Rudd and Mr. Ferguson,

I was deeply dismayed to read Minister Ferguson's letter dated 22/7/09 in reply to my concerns about Peak Oil. It confirmed my view of the completely wrongheaded thinking that is going on in the highest circles of government; thinking that has been captured by the interests of the petroleum industry, the economic rationalists and the outright fraudsters. Not to put too fine a point on it, **you are wrong, wrong, wrong** on just about every point you mentioned in your letter.

If there is one thing I learned from the invasion of Iraq, it is this: policy cannot be left to politicians. I realise Labor was against that invasion, which is why I at least to try to communicate with you, as you do seem halfway reasonable. The Coalition on the other hand lack any semblance of decency or honesty, are not worth talking to and I was vehemently opposed to them when they were in power.

You may question my qualifications to dispute the opinions of your oil and industry "experts". I am certainly not a petroleum geophysicist, however I do source my information from petroleum geophysicists. I am a physician who has been trained to analyse evidence, make objective diagnoses and shape management plans to ensure the best chance of good outcomes for patients. I am trained to select correct and truthful evidence and discard false and misleading artefacts or "noise". I practice this every working day of my life to a high degree of success, not because of any great genius on my part, but because I have inherited the most effective and the most powerful tool in the history of Mankind to determine truth and to make good decisions. It is called the Scientific Method, which I assert should also be adopted by all politicians, journalists, judges and just about everyone in the way they work and live¹.

If I diagnose a life threatening heart problem such as severe aortic valve stenosis or severe coronary artery disease, it is my duty to objectively outline the dire nature of the situation to the patient and to offer the best means of treatment. Denialism is not acceptable and can be fatal. Promptly addressed, utilising modern medical and surgical strategies, we can dramatically improve outcomes, even enable patients to cheat death. Some patients may choose to deny the facts or may fail to appreciate proportional risks, despite repeated explanation. For example a patient with severe aortic stenosis may face a 50% risk of death in the next couple of years without valve surgery but would face only a 5% risk of death if they undergo aortic

valve replacement soon (with a normal subsequent lifespan), hence the choice is clear to most sensible people. If that patient only wishes to focus on the 5% risk of surgery and refuses to appreciate the benefit of intervention, I have to respect their wishes and leave well enough alone. They will only have themselves to blame for their premature demise, but at least they will not drag anyone else down with them².

With Peak Oil however, failure of the government to act will drag down the whole of society and will affect everyone.

The economic collapse, job losses, hyperinflation, mortgage foreclosures and homelessness, food insecurity and turmoil which will result from Peak Oil **can** be mitigated, but only by the supreme efforts of exceptionally good governance. The Swedish and Norwegian governments have grasped the nettle and take heed from ASPO to shape policy (I am sure you know that ASPO stands for the Association for the Study of Peak Oil – whose membership boasts a multitude of eminent scientists from around the world³). Sweden and Norway are positioning themselves properly for the future. What about Australia?

I have no pecuniary interests in promoting one view or other regarding petroleum issues. My goals are to minimise disruptions to society, to ensure Australia's energy security and to prevent illegitimate warfare (invading Iraq was **undoubtedly** about oil, not about WMDs or any other bogus claim). I wish to prevent Australia's descent into a Mad Max type chaotic society, which is what Professor Peter Newman of Curtin University has warned will happen sooner rather than later if Peak Oil issues are not addressed. You could say my motives are self serving – I want to live in a stable society.

Ever since obtaining my fixed wing pilot's licence more than twelve years ago I have been fascinated by the geology, history, politics, economics and science of this tremendously useful substance called petroleum and the more I learned, the clearer the picture became.

There may be any number of Peak Oil deniers you wish to quote, all with very impressive official titles, just as there seem to be plenty of Global Warming deniers crawling out of the woodwork, most of them sponsored by the fossil fuel industry. For example the Cambridge Energy Research Associates are nothing more than a public relations firm for the oil companies and even the USGS (United States Geological Survey) grossly exaggerate world reserves contrary to the facts, to suit political purposes. Exxon Mobil have been particularly vocal with their Peak Oil denial and fraudulent overestimations of world oil reserves and yet recently they have quietly and suddenly injected massive investment into developing biofuels from algae (Economist magazine July 18-24, 2009). In 2004 Shell was exposed by a whistleblower and was shown to have overstated their West African reserves by 20% and were forced to write down their numbers, resulting in a sudden drop of their share prices, to the detriment of their profit. **They are all liars.**

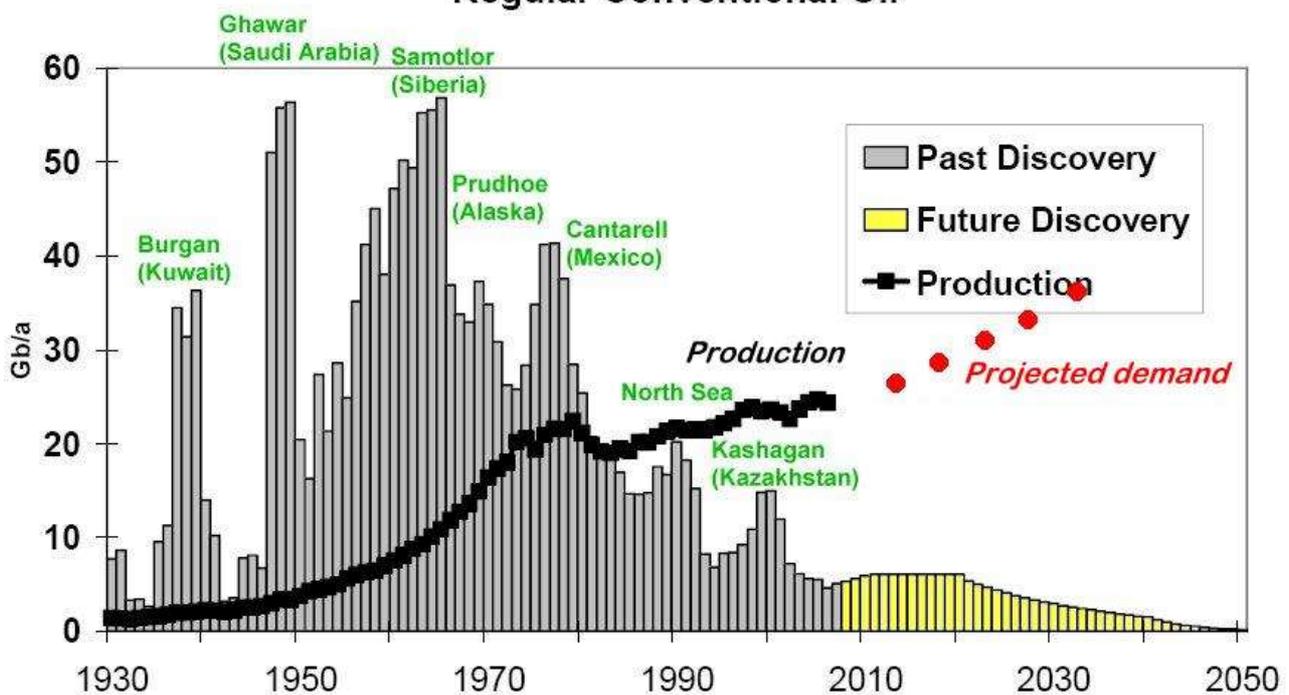
You mentioned ABARE. They are a ridiculous joke. Just a few years ago they were still formulating future plans based on the price of oil remaining at \$US30/- per barrel, a proposition patently ludicrous to even the ordinary man on the street (personal communication from Andrew McNamara, former Queensland Minister for Sustainability⁴). On page 13 of Guy Pearse's Quarterly Essay, issue 33,

2009, a senior insider described ABARE as a pro-industry “self serving group”, “guns for hire” and the idea they are independent is “unadulterated crap”. If you hire a group of flunkies who are paid to say only what the fossil fuel lobby want you to hear, that is what you will get. Glossy folders embossed with impressive logos and filled with fancy jargon and figures but containing absolutely crap information.

You say that world oil reserves have almost doubled since 1980. That is **utter rubbish, complete nonsense, pure fantasy**. This claim of increased reserves is largely based on the overinflated paper reserves of the OPEC countries. In 1985 OPEC decided they would limit annual production quota according to the stated oil reserves of each country, hence in order to continue funding their lavish lifestyles, the “leaders” of Kuwait, Saudi Arabia and many other **OPEC members magically doubled, even tripled their paper reserves over the next few years, in the absence of any new discoveries and in the absence of any proof whatsoever**. Hence if you believe those claims of increased oil reserves, you must also believe in the triple A rating of subprime mortgages/toxic assets and in the Tooth Fairy. At least there is some money to be gained from the Tooth Fairy.

Peak Oil Discovery (the maximum quantity of oil discovered in a single year) occurred way, way back in 1965. Since then discoveries have been relentlessly less and less. Around the year 2000 we were burning about 4 barrels of oil for every one barrel discovered. By around 2005 we were burning about 9 barrels of oil for every one barrel discovered (Cosmos science magazine). This growing gap between consumption and discovery will become ever wider: 20 to 1, 50 to 1, 100 to 1, as time goes by. The first year **ever** in which **no** oilfield larger than 500 million barrels was discovered was in 2004. If you think that 500 million barrels sounds like a lot, just remember that 500 million barrels will last the world only six days at our current rate of consumption.

THE GROWING GAP Regular Conventional Oil



Worldwide oil production has been flat since late 2005 despite maximal efforts at oil extraction. You state that this "sluggish crude oil supply growth since 2004" is due to underinvestment in exploration and development, not due to the fact that we have reached Peak Oil. **You are wrong, wrong, wrong.** The petroleum companies make this bogus claim because they want the government to subsidise them for useless wildcatting in the vain hope of striking it lucky, with minimal financial risk to themselves. They want free money from the taxpayers. **I personally resent my tax money being wasted for such folly, money which should go towards the encouragement of renewable energy such as establishing a gross feed-in tariff.** If there is so much more oil to be found, let the oil companies fund their own exploration. We know they had massive windfalls of profit in the leadup to oil hitting US\$147/- per barrel in July 2008, just before the economic downturn. Any prudent company would set aside such windfalls for future growth/development and exploration, if exploration was indeed a worthwhile activity. Instead, what do they use their profits for? To employ highly paid lobbyists to pester the government for more free public money. The fact of the matter is that there is no more growth to be had for the petroleum industry – they face a relentless decline in production. The last thing they should be given is taxpayer subsidies, despite their loud protestations. It is a fact however that extracting oil from a depleting oil well is much more expensive (it requires energy) than extracting oil from a fresh well (which has positive pressure). Past Peak Oil, the petroleum companies do face higher expenditures, however all of that will be passed on to the consumers.

There have been **thousands** of drilling ventures in the Gulf of Mexico in recent years, just about all of them bone dry. Massive investment has been gone into ever more desperate searches for smaller and more inaccessible oil fields. Other parts of the world are politically unstable and cannot be relied on for supply. Colin Campbell has stated that well over 90% of all conventional oil fields have been discovered to date. We know this fact due to the very sophisticated seismic technologies available these days which can locate even the tiniest oil fields in the remotest and deepest areas. We depend heavily on the giant and supergiant oilfields for most of our oil. There are around 47,500 oil fields (not oil wells) around the world. Of these, we obtain about 60% of our oil from only about 507 giant oil fields ie. just over 1% of fields

<http://www.internationaltransportforum.org/jtrc/DiscussionPapers/DiscussionPaper17.pdf>. In other words, only 40% of the oil comes from about 47,000 averaged sized oil fields. This means that even if several **thousand** more average-sized oil fields could be discovered, it will not make a darn difference to our relentlessly diminishing oil supply (giant fields are >200 times bigger than average fields).

There are no more conventional giant oil fields to be discovered. (conventional oil excludes super deep water or polar oil, the latter being purely speculative).

The news is bad from most giant oilfields worldwide. British North Sea Oil peaked in 1999 and production has fallen off a precipice. Production from Cantarell, the giant field in Mexico crashed in 2006 (they posted a 13% decline compared to the "normal" post peak decline of about 3% per year). The Kuwaiti oil minister

admitted that in 2006 the super giant Burgan oil complex had gone past peak production. And on and on. The Saudis claim they have spare capacity but do not allow any foreigners in to verify this. Their oil production fell by 8% in 2006 despite relentless demand at the time. All the evidence points to 2006 being a watershed year.

There was great hubris surrounding the discovery of the Jack 2 oil field in the Gulf of Mexico in 2006 which was estimated to contain between 3-13 billion barrels of oil. This field lies under more than nine kilometers of ocean and seabed. Nine vertical kilometers of piping and drilling, way offshore! It costs more than half a million US dollars **per day** to keep this rig running and it is vulnerable to weather disruptions, particularly during cyclone season. Even if it contains 10 billion barrels, that is only enough to supply the world for a few months.

Bush and Cheney wanted to open up the pristine ANWR which, even if as vast as projected, would also only last the world a few months.

What is your claim that there is *“enough to supply the world with oil for over 40 years at current rates of consumption”* based on? I would say it is based on nothing more than wishful thinking and downright fraud.

What is my claim that the world has now gone past the peak production of conventional oil based on? Those who say Peak Oil is just a “theory” do not know what the hell⁵ they are taking about. Peak Oil is a FACT. Peak Oil is an OBSERVATION. Peak Oil is not something hypothetical. It is the best, indisputably proven way to estimate our remaining reserves. Way back in 1956, the scientist M. King Hubbert summed up the bell shaped production and depletion curves of oil fields all around the lower continental US states and predicted that they would reach peak production by 1970, beyond which there would be a relentless decline. He was vilified and ridiculed at the time, but guess what? The continental US passed Peak Oil production in December 1970 and production has gone down inexorably ever since, despite the slight blip from Alaskan oil discovery. The US now has less than 3% of world reserves and imports more than 2/3rds of their oil. This is despite ever more investment in exploration and advances in extraction technology. There is only a finite amount of oil in each well. Technology allows faster and more thorough extraction but you cannot throw money at it and magically create more oil or find more oil where there is none, despite what the economic rationalists say. We can thank all those economic rationalists for the global economic meltdown. Anyone who continues to listen to those economic ideologues must be off their rocker.

Where do I get my information from? The scientists of ASPO are probably the best experts in the world (who are not tainted by pecuniary interests). Colin Campbell, the founder, has a professional background as a petroleum geophysicist and with personal on-site experience surveying hundreds oil fields all around the world. There have been many books and documentaries on Peak Oil. Professor Kenneth Deffeyes, a veteran petroleum geophysicist of Hubbert's generation, reckoned the world reached Peak Oil in December 2005. The German Energy Watch group stated the world reached Peak Oil production in 2006. Jeremy Leggett, a younger generation petroleum geologist, used to work for the oil companies until he quit in disgust at the lies, fraud and deceit being perpetrated by them, not to mention

the harm they were causing in the world and he set up a solar energy company. The legendary American oil man T. Boone Pickens acknowledges we have reached Peak Oil and advocates a transport revolution in America. The oil financier Matthew Simmons wrote the book “Twilight in the desert” and states that Saudi Arabia has gone past peak oil (despite Saudi denials) because they have been using extraordinary energy intensive measures to suck out petroleum, methods reserved for depleting oil wells. Even Chevron, god bless their oily souls, have repeatedly published advertisements admitting that the world has reached Peak Oil.

We now sit on a plateau of Peak Oil production of uncertain duration which will be characterised by volatile oil prices. The recent economic downturn has in a way been a blessing in disguise, as it reduced global oil demand and thus reduced oil prices. This relatively low oil price at present is merely a temporary respite, the calm before a neverending furious economic storm which will hit us very soon. When oil availability inevitably declines, unless global demand similarly falls, oil prices will again shoot up. Inflation will skyrocket, truckies will be out of work and will blockade the highways, the airline industry will collapse – followed immediately by collapses of the hospitality and tourism industries, among many other dire consequences.

Increased production of non-conventional oil may prolong this Peak Oil plateau for a little while, but not for long. The largest source of non-conventional oil is the oil sands of Alberta (mainly around the Athabasca river) which are purported to contain around 2 trillion barrels equivalent, however this seemingly large number is misleading. There is more gold in the oceans of the world than is stored in Fort Knox, but it is uneconomic to extract. The same situation applies to the oil sands of Athabasca or any other shale oil or tar sands scheme. The University of Upsala of Sweden conducted a study showing that even if Canada pulled out all stops and went gangbusters, the fastest they could produce oil from the sands would be 5 million barrels per day which hardly makes a dent in the 85 million barrels per day we now consume. Not only that, it would deplete Canada's natural gas reserves and double or triple the amount of greenhouse gases emitted. Colin Campbell called it “*a way to turn gold into lead*”. Al Gore called it “*the subprime mortgage scheme of energy*”.

Converting natural gas to liquid fuel by the Fischer-Trope process is also akin to turning gold into lead. Converting coal to liquid fuel emits unacceptable GHGs.

There is another important reason why oil availability will become dramatically less than we think, much faster than we think. It is the land export model of petroleum, based on solid but simple mathematics and is a result of the growing populations of the petroleum exporting countries and which MUST be taken into account ⁶.

Trying to plan Australia's future, even for the short term, on an imaginary increasing or even a flat supply of petroleum is absolute folly, sheer stupidity, utter madness. The fact is that we will be facing a diminishing oil supply sooner rather than later and you MUST plan for this. Even if we were not at Peak Oil now, even if Peak Oil was 40 years in the future, we MUST wean ourselves off petroleum sooner rather than later for many other reasons, not least to mitigate global

warming and also to ensure we cannot be held to ransom by foreign regimes whose oil we depend on. Furthermore, oil revenues going to Saudi Arabia directly fund the Wahabi fundamentalist madrasses around the world who preach terrorism. Ultimately, according to the ASPO scientists, the exact date of peaking is not the important issue. The important issue is that we must wean ourselves off petroleum dependency NOW.

If NESA chooses to plan along the lines of Dick Cheney's 2001 US National Energy Development Program, then they will prove themselves to be as shortsighted, foolish and deceitful as that discredited war criminal has proven himself to be. Cheney knew and knows nothing about energy matters except to lie, steal and kill in order to obtain foreign oil. The Obama administration however gives Americans hope for the future with their initiatives to free themselves from petroleum dependency. Obama appointed the Nobel prize winning physicist Stephen Chu as his energy secretary, a man who is well aware that the future of our civilisation depends on massively ramping up renewable energy technologies and in consigning fossil fuels to the dustbin of history. Al Gore is a true visionary and must be listened to and heeded carefully. Can the Rudd administration show similar vision⁷ or are you determined to remain trapped in the obsolete thought patterns of the past, with Howard-like denialism?

I accept there may be some errors in the specifics of what I have mentioned above, no one is perfect. I expect your advisers will nitpick at some of my inadvertent errors. However the broad sweep of what I say is more than 99% likely to be true because it is based on overwhelming reliable evidence and the main points Minister Ferguson made in his letter are less than 1% likely to be true, being based on bogus claims, heresay reports, absurd hubris and utter lies from industry.

I am not an alarmist and I am not a pessimist. I am a scientifically trained realist who looks at the facts. Unfortunately the reality of our near future will be dreadfully pessimistic and alarming, unless appropriate action is taken. Those shysters who quote you fraudulently optimistic overblown figures about petroleum futures are akin to the investment bankers who repackaged subprime mortgages as triple A rated assets (no doubt employing glossy publicity brochures) – and caused worldwide economic disaster. Your falsely held ideas about petroleum will lead us into a much more serious and prolonged disaster.

I have been sending Mr. Rudd information regarding Peak Oil for several years now to no avail. Peak Oil did not even rate a mention in the 2020 summit. I am deeply disappointed with your ongoing lack of understanding, awareness and willingness to face facts and to plan properly for the future.

Yours faithfully,

Geoffrey Chia

FOOTNOTES:

1. How to find out truth: http://www.rationalist.com.au/archive/74/p39-48_chia_ar74_web.pdf
How to make good decisions: http://www.rationalist.com.au/archive/77/p40-45_AR77_web.pdf
errata for decisions essay (end of page 32): http://www.rationalist.com.au/archive/78/p25-32_AR78.pdf
2. As a physician, I make the diagnoses and I treat patients with medications, I do not operate on patients. I will refer a patient to a heart surgeon for operation if they have severe aortic stenosis. I personally have no pecuniary interest in sending patients for surgery.
3. I am not a member of ASPO but I do respect their views, as should you. They have far more credibility than any of the “reputable” sources you quoted, yet you pointedly did not include ASPO among any of your sources of information, which I consider absurd.
4. I have only met Andrew McNamara on a couple of occasions, hence I cannot claim him as a personal friend. I do however have great respect for him as the only politician (now former politician) brave enough to speak the truth about Peak Oil and about sustainability issues. If you had any sense you would immediately employ him as a senior adviser in Canberra and get rid of the many useless advisers and fossil fuel flunkies in your entourage. Better still, appoint him head of a Peak Oil Task Force, an office to be maintained in continuity, irrespective of whichever party forms the government.
5. Pardon my French. I do not wish to cause a *shit storm* with my language (but I do believe in calling a spade a spade)
6. See appendix below for explanation.
7. ASPO recommends an oil depletion protocol which can be found on their website. It is absolutely certain the price of oil will skyrocket as petroleum depletes, the only question is when. When it happens, it will be too late to prevent chaos and turmoil, hence the **only option is to act now**. The crunch may come as soon as 2010, according to the IEA which you yourself quoted as a source: <http://www.independent.co.uk/news/science/warning-oil-supplies-are-running-out-fast-1766585.html> If we can reduce our petroleum requirements by 90%, then it will not matter to us if the price of oil goes up ten times. The main sectors we will need to address will be:
 - Preserving and retrofitting cities: Professor Peter Newman has written a book on this
 - Designing new suburbs, refashioning old suburbs, changing our lifestyles: I have written a paper on the *Gaia Village project* addressing these issues. Lessons learned from this can also be used in the planning and retrofitting of cities: <http://www.d3sj.org/PDF/gaia.pdf> I believe the ideal location for such a pilot project will be land owned by the University of Queensland at Pinjarra Hills, just outside Brisbane.
 - Agricultural and land practice reform: will require input from agricultural scientists, soil experts and ecologists, among others.
 - Industrial and commercial sectors: creative solutions will have to come from each particular sector. It is inevitable and even desirable that some industries will and should collapse. For example, imported bottled water is an obscene waste of valuable fossil fuel energy and provides zero value in countries with good quality tap water such as Australia. Workers who lose their jobs in that useless sector are better retrained and redeployed elsewhere eg. solar panel installation or green car / bus production lines.

Appendix: The land export model of future petroleum availability:

The numbers used here are for illustrative purposes only. The simple mathematics is robust. Let us use an example of a group of Middle Eastern countries which now produce 20 million barrels of oil per day, of which they export 90% (18 million barrels) to the rest of the world and they consume 10% (2 million barrels) domestically to power their desalination plants, to import all their food, to drive their SUVs up and down the sand dunes on weekends and to cool their indoor snow ski resorts in the desert. What will happen in 20 years time?

Exponential growth, whether referring to GDP growth, population growth, or bank interest rates, refers to a fixed rate of increase ($x\%$) over a fixed period of time (usually one year) which is progressively compounded. It is characterised by a doubling time of 70 divided by x . For example, an annual growth rate of 3.5% represents a doubling time of 20 years ($70/3.5 = 20$).

In the situation of exponential decay (the downward slope of the Hubbert curve), the halving time is also $70/x$ where x is the rate of decrement.

As chance has it, 3.5% p.a. is also approximately the likely annual decline of petroleum availability once we are past Peak Oil.

Many Middle Eastern countries today have a very high population growth rate, which is fueled by their cheap petroleum (not to mention oppression of and lack of educational opportunities for women). For example, the average number of children per family in Saudi Arabia is six. In Iran, more than 60% of their population are under the age of 30 and this is their reproductive cohort for the near future.

Let us say the population growth rate of our hypothetical consortium of oil exporting Middle Eastern countries is 3.5%. Thus in 20 years time, their population will double, hence their oil consumption will also double (from 2 million to 4 million barrels per day) but their total oil production will drop by half (from 20 million to 10 million barrels per day) because of the 3.5% annual decrement of petroleum output. This only leaves $10 - 4 = 6$ million barrels per day for export. In other words, their oil exports in twenty years will not drop by half (halving time as calculated by $70/3.5 = 20$), but by **two thirds** (from 18 million barrels to 6 million barrels per day) due to their population growth.

The future for countries which rely on imported oil is therefore grim, unless they find alternatives to petroleum (ie. renewable energy - a permanent solution) or unless they invade the Middle East, kill as many locals as possible and steal their oil (a temporary “solution”). Oh, wait a minute, some psychopathic idiots tried invasion recently and that didn't turn out too well.

Australia obtains much of its imported oil from Vietnam, another country with a predominantly young and rapidly growing population. The future does not bode well for us unless we wean ourselves off petroleum.