

FUTURE MASS TRANSPORT OPTIONS
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I do not intend to cover what others are probably covering much better than I could. I assume you have or will read US Congressman Bartlett's recent address to congress which can be found at:
<http://www.xecu.net/thorn/PO/PO-Feb08-2006.html>.

My short submission is an attempt to step right back and look at the complete "big picture" in brief summary. In some cases entire books are available about themes I refer to in less than one paragraph.

WORLD OIL SUPPLY

Among petroleum geologists and energy experts there is now almost complete agreement that there will be a peak in the world's ability to produce oil in the first half of this century. The only dispute appears to be what year. The recent news Kuwait about oil reserves supports those who conclude the peak will be sooner rather than later. In any case, the time to prepare for a peak is now. The cost of being ready too early is small compared to the cost of not being ready on time. (1) In all considerations about liquid fuel transport, it is important to consider the immense volume of the petroleum business. Solutions need to be capable of producing economically viable transport for 10 million Australian travellers on a daily basis. Kenneth Dyffeyes has published on Feb 11th that we passed the global oil peak in December, 2005. Time will tell if he is right.
<http://www.princeton.edu/hubbert/current-events.html>

Rigzone.com report this week that for the second month in a row OPEC extracted less than 30 million barrels per day in January, 2006. OPEC shipments were above 30 million barrels per day from may to November, 2005.
http://www.rigzone.com/news/article.asp?a_id=29432
If this marks the peak of OPEC capacity then the world is definitely looking down the barrel of Peak Oil right now.

The US Environmental Protection Agency are now suggesting that they believe the peak of global supplies will happen in 2010. Peak Oil is becoming a mainstream topic for the US government.

BALANCE OF PAYMENTS

The use of oil as an energy source for liquid transport fuels is already seriously affecting Australia's balance of payments. Even if world oil supplies can meet demand it is clear from ABARE data that Australia is a net oil importer from now on. There is no prospect of this changing, and is reason enough alone to embark on a process to remove our dependence on imported oil, regardless of it's source and any political implications of that source. Currently, it seems we are exporting our gas and coal to pay for our imports of oil. As the cost of shipping bunkers rises, the cost of all this increases. We are better off using our own resources in our own country.

TRANSPORT AND WELFARE

In our market based economy it is the parts of the community with the lowest income that find most difficulty in affording private motorised transport. As the cost of private motoring rises there will be an ever increasing demand for public transport from this sector of the community. This will place a greater strain on the welfare system with low income families needing greater government support. As oil supply peaks in the near future there will be an increase in the need for welfare payments to disadvantaged sections of the community.

ENERGY

According to ABARE Australia is very well endowed with fossil fuel energy resources. Coal and gas are abundant, even though much of our gas is situated a long way from our major consumption centres. It seems that electricity generation from these sources, if we choose to use them, will not present any supply constraints in the near future. The political question is whether we are satisfied to export this resource to others or prefer to save it for our country's future generations. The supply issue facing Australia is liquid fuel; and the fact that 90% of our daily transport needs are satisfied by that liquid fuel.

At the most basic level when we fill up our petrol tank at the pump we are purchasing energy to use to propel our vehicle. Altering the source of this energy is the key to escaping the worst effects of peak oil. From a purely scientific viewpoint, all energy on our planet comes from the Sun, it's just the route and speed that changes. Fossil fuels are the result of centuries of stored sunlight being buried underground. "Renewable" energy is the use of sunlight generated energy consumed at the same speed as it is created. I call these natural sources.

FUTURE SOURCES

Fossil Fuels

Coal and gas are Australia's obvious energy sources. However a return to the days of steam trains, whilst romantic, would be a disaster from both an efficiency and environmental standing. Thermodynamics dictates that there will be efficiency losses when converting from one energy type to another, so the most efficient method will be to use the energy with minimal conversions. Using gas directly poses transport problems that will be impossible to overcome in this country where the gas is so remote from the major cities. Due to the increasing cost of the conductor metals involved, we need to build power stations and the transmission lines to utilise our gas resources to generate electricity immediately. In a society with electric transport, these transmission lines will be fully utilised to power our trains and trams.

Natural Sources

Whilst wind power is going to be able to supply vast amounts of electrical energy, particularly along Southern coastlines, the best natural energy resource that Australia has is ocean wave energy. By good fortune our major populations are spread around our coastline, and based on the ability of the pilot plant in Port Kembla being able to generate 300kW from 50 metres of coastline, it will take less than 200 km of our coast to generate 100% of Australia's energy needs. That less than 2% of our coastline. Obviously such generators would be spread all around our coastline as demanded by population densities, with greater concentrations near our capital cities. The point is we have ample capacity to generate electricity from natural sources. The greenhouse gas implications of this are obvious.

Currently Iran are attempting to generate electrical power by other means so they can export their fossil fuel resource for cash. Australia should apply this principle to our coal resource, and to our wind and wave generation capacity. We should save our coal for export to the highest bidder and use our vast ocean wave resources to generate electrical power for domestic consumption. It's very difficult to export the energy proceeds of ocean wave energy; perhaps Hydrogen is the only way to do this.

Hydrogen

This is only a method of transporting energy, and is currently only of limited commercial value. Truly sustainable Hydrogen, produced by hydrolysis from natural electricity sources could cost around 20 times the current cost of petrol on a per kilometre travelled basis. A "Hydrogen economy" will not be an answer in the next 20 years. There is sufficient platinum in the Earth's crust to replace each existing vehicle engine with a hydrogen fuel cell only once, so a 'fuel cell' economy would last around 25 years at best. Current cost to build a fuel cell vehicle exceeds one million dollars.

Nuclear

In 1956 M.King Hubbert wrote in his ground breaking Peak Oil article that America should begin the move to fast-breeder nuclear reactors for its increasing energy needs. Nuclear power offers Australia an excellent source of electrical power generation capacity. It does not offer a source of liquid fuel.

METHODS OF ENERGY USE FOR TRANSPORT

The seemingly indestructible link between motorised transport and liquid fuel needs to be severed. There are no liquids that can be produced in sufficient volume to meet the demands of the whole market. Biofuels may be of limited use to the trucking industry to recycle wastes, ethanol provides a marginal net energy recovery, coal to liquid and gas to liquid technologies are yet to be proven commercially in viable volumes and will result in ever increasing greenhouse emissions. Hydrogen is only an energy carrier, currently best produced from natural gas. Why convert hard won electrical power to Hydrogen when the energy can be used as it is as electric power.

MASS TRANSPORT

It is well known that trains are at around 100 times more energy efficient than cars. Electric trains will allow us to convert our electricity generation capabilities to transport. Electric trams and buses allow this as well. At least one lane of our existing motorways will need to be converted to electric rail. Our existing rail lines will need to be doubled. However as commuters come to terms with the need to 'ride' to the station the stations can be further apart, and trains can have fewer stops as people become prepared to ride up to 10 kilometres to catch a train.

COPPER AND ALUMINIUM IN ELECTRIC TRANSPORT

By far the best conductor of electricity for a given monetary value is Copper, followed closely by Aluminium. Both metals are traded routinely on world commodity markets similar to oil. In the last 6 months the world price of Copper has increased by 40%, and Aluminium by almost 50%. Whilst the world is discussing when peak oil might happen, peak copper and peak aluminium may well also be upon us. A drastic move to electric transport would only see the cost of the metals needed to create an electricity based transport system would see the cost of these metals rising to the point where electric transport is no longer viable economically. We must build our electric public transport system before the rest of the world starts and drives up the price of the necessary resources.

Aluminium is the conductor of choice for long distance transmission lines due to being one third the weight of copper. It requires vast amounts of electricity to produce. Fortunately in Australia we have good supplies of both aluminium ore (bauxite) and the electricity need to refine it.

PERSONAL TRANSPORT

There is no doubt that unbridled use of the family car for private transport must be dramatically reduced. Transport must be reduced to much more economical means, not just in the fuel used, but in the energy used to create the vehicle. In the first decade after the global oil supply peak the use of motor cycles will increase to unprecedented levels. Traffic flows will contain in excess of 50% cycles, of ever diminishing capacity and weight, and ever decreasing fuel consumption. Whilst electric cars are possible the consumption of raw materials such as copper to build them will make the purchase quite prohibitive to most wage earners. Electric bikes and scooters are the most likely successor of the motor bike.

FLEET CONVERSION

In 1984 the sale of new cars using leaded petrol was banned by governments. Data shows it took 20 years for the national vehicle fleet to become 99% converted. Gradual conversion by market forces to hybrid cars will not achieve the necessary demand reduction in anything like sufficient time. Unless governments drive changes by increasing fuel taxes we will be left with a country littered with valueless motor cars that no one can afford to drive and no one wants to buy. If the price of petrol doubles, the used car market will collapse as everyone at the bottom end of the car market drops out to other forms of transport.

RAILWAYS

Given the current state of railways in Sydney, I expect that the rail system could begin to collapse under the strain of a doubling of patronage almost overnight. In the context of the time it takes to increase capacity on heavy rail lines the changes will appear to be overnight. In an era when trains will routinely run late and be cancelled, and patrons having to queue for services such as for buses during train strikes, just arriving at your destination will be a feat, arriving on time may well become impossible. Those that can arrive at work on time will become valuable and attractive employees.

CYCLES

Initially while petrol is still somewhat available at a high price the most effective means of individual travel will be the motor cycle. Finally when all fuel is rationed by governments the fastest means of personal travel will become the bicycle. Even for longer suburban journeys this may prove quicker and more reliable than a troubled and overloaded rail system. I sincerely hope governments are able to maintain a quality rail service as our city life will become hell without it. Lengthy travel of hundreds of kilometres will become almost impossible and these types of journeys will be for very special occasions indeed, take long periods, and be very expensive, much like travel in the 19th Century.

Clearly in the era of motor cycles many families will suffer. However as children grow up seeing medium distance pushbike travel as normal they will become accustomed and fit for longer journeys. My 3 year old son can ride 1 km. My 7 year old can ride 8 km. My 9 year old can ride at 25 km/h for short periods and I would expect him to be capable of completing a 20 km journey. Once the transition to non-motorised travel is complete some three decades after the oil peak all families will no longer be disadvantaged.

CYCLEWAYS OR ROADS?

Our cities and towns already have a complete set of sealed pathways that lead to and from all possible destinations. We refer to them as roads. General commuting by bicycle cannot rely on 'cyclepaths'. A 2.5 metre wide path carries, at best, 1000 cyclists per hour. In a 3 hour peak only 3000 commuters. Three full trains can propel this number in perhaps 10 minutes. So called 'shared path' cycleways will only ever be short term method of encouraging non-cyclist to change their travel patterns. To have a sustainable transport future Australia as a whole must embrace the use of cycles on our existing roads. All major roads will need to have one lane totally set aside for bicycle use. In the meantime an extensive network of 'cyclepaths' needs to be constructed to allow bicycle users to experience the freedom relative speed of suburban bicycle travel. Only when people actually experience arriving at work on time by using the bicycle will they become convinced of its merit as a method of travel to work. Cyclepaths are needed to achieve this in a safe environment. On a properly built cyclepath with grade separation from arterial road crossings it is possible to match current car travel times with a bicycle for distances up to 15 km.

MY VISION

My vision of major cities is one where people commute to work by a combination of cycle and electric train. Transition from one mode to another will need to be seamless, with secure cycle parking on and near platforms, rolling stock capable of carrying pushbikes easily on racks or stands, and a society that accepts this type of travel as normal. In the early days of fuel shortages commuters may choose to travel to major stations by motor bike, but as the price of fuel skyrockets the choices will be electric bikes and pushbikes. Small capacity motor bikes and motor scooters should be affordable well into the future, perhaps for two decades after the peak.

MARKET FORCES

Western society has a history of allowing free market forces to shape demand. It is clear that as the cost of liquid fuel rises inexorably as global oil supply peaks and declines that individuals will make some difficult choices based on the personal financial circumstances. However, they will expect governments at both state and federal level to have been prepared for those choices. First comes the choice to sell have only one family car, then a much smaller car, finally comes the big step to no family car. If the car industry doesn't change it's products it will fail. At the end of the day, it's the market that will drive the changes in travel methods based on the cost of the fuel.

As families have a single car, commuters will need to leave that car for the children and care giver to use throughout the day and commute by other means. Increasingly, families during the day will make local journeys by other means, notably cycling and walking.

ECONOMIC DOWNTURN

Robert Hirsch (2) has concluded that it will take the USA 20 years to prepare properly for peak oil with a crash program. If the global oil peak happens before the USA is ready then the probable outcome is an economic downturn of a severity not seen since the Great Depression. Given our economic links to the US economy it seems clear that we will suffer many of the effects of this. In addition, if we are not ready then our economy will be similarly affected. Deep recession is almost guaranteed, depression both here and in the USA is possible. Immediate efforts to mitigate the economic effects of the global oil peak are warranted based on the level of risk, our exposure to that risk, and the consequences of the risk becoming reality.

RESOURCES

At some point we have to come to terms with the fact that we are using up the resources of our planet faster than is prudent. By jumping from a society based on oil consumption, to one based on metal consumption of one type or another, we are just replacing one problem with another. We need to create a society where there is less demand and less consumption, demand for all goods, from toys to clothes to TV sets. A society where people are satisfied with the basic necessities of life like food, a small house, a walk with neighbours in the evening. A world with less, less shopping malls, less multi storey houses, less consumption; and perhaps more happiness. I have been involved with the SEPP 59 land development in Holroyd. The planning document listed a target reduction in car use for the development of 5%. Since the life of a suburb is at least 50 years, i.e. beyond even the most optimistic peak oil estimates, in my opinion the 5% reduction needed to be at least 50%, if not greater still. This is the scale of change that will be needed, and is needed right now.

FOOD PRODUCTION

In his book “The Oil We Eat – Following the food chain back to Iraq”, Richard Manning explains that every facet of food production consumes energy. Not just the tractor fuel, but construction materials, transport, and fertilizer are all consuming oil. In the second decade after the peak, food production by current methods will become more and more problematical. We need to produce food without our current intensive farming methods.

CONCLUSIONS

The world’s industrial nations have before them an unprecedented challenge. Together they may indeed fail that challenge and plunge the world into a despairing ‘winter’ of misery and starvation. Government actions need to be extreme.

We need to begin our task of removing our use of fossil fuel liquids for transport fuel and we need to begin immediately. We need to take big steps that will have significant effect on the volume of our demand for oil. Small funding of research projects will not be sufficient.

We need to utilise existing technology and make laws that discourage people from using liquid fuel for transport.

We need to make ready a system for rationing our oil supplies. We need to create a system of using our gas reserves for motorised personal transport.

We need to remove our dependence on fossil fuels and get to at least 25% use of benign energy sources for transport by the end of this decade, yes, that’s 4 years.

The world lacks sufficient resources of metal, particularly Aluminium and Copper, to convert entirely to an electric transport society. Indeed we are struggling to meet demand for these base metals at the moment. We need to jump into electric transport before the rest of the world (USA and China) catches on. **We need to start first and Australia needs to start now.** We are already behind much of western Europe.

GOVERNMENT ACTIONS

Build electric train lines, electrify all existing railways immediately.

At least double the tax on liquid fuels and use this tax to finance conversion to other energy sources

Stop buying buses, invest in electric tram system, Melbourne kept their trams and got it right, but need to expand and run trams faster in suburbs.

More dedicated tramways (off road) to increase speed.

Complete a network of suburban cycleways to allow a safe transition through the period when both cars and pushbikes are used for travel.

Convert existing busways to electric tram, and build new ones to service all suburbs without existing train lines.

Tax interstate road transport to make rail the competitive choice. This will come soon anyway due to runaway price of oil, so govt. may as well precipitate change faster.

Stop selling our gas and coal, our grandchildren will need it.

Development of new land estates to include car based transport reduction of 50% from current levels.

Apply a duty and/or quota on imported fossil fuels.

Inform the people through all levels of government, but particularly involving local govt, of the need for change and the vision for the future.

Measure and advertise the benefits of travel by cycle, both motor and pedal powered.

Prepare a system of petrol rationing to ensure emergency vehicles and services for disabled are available at reachable cost.

Build massive gas powered electricity generation capacity either:

- 1) near NW Shelf gas deposit, with electrical transmission lines to all eastern states
- 2) in eastern states with gas pipeline from NW Shelf gas deposit.

Begin the huge task of conversion to sustainable electricity generation with wind and ocean wave resources immediately, with year by year national goals on generation capacity.

Create a National Oil Independence Commission similar to Sweden's to implement oil free travel alternatives.

BIBLIOGRAPHY

- (1) Allannah McTinnernien, opening address to WA Sustainability Conference
- (2) Robert Hirsch report to US Dept of Energy
- (3) Kenneth Duffreyes, website

RESUME

Education

University of NSW.

Masters degree in Engineering Science, majoring in Industrial Management, 1991

Science Degree, majoring in Metallurgy, 1983

Represented NSW Uni in Institute of Metals seminar competition

Interest in Peak Oil

Joined Cyclist's Action Movement West (Sydney) in 2001 and was introduced to the issue of Peak Oil. Have since spent many hours researching and understanding the subject on internet.

Summary

Whilst I work in the metal industry I would describe myself as a scientist. As a science graduate with a good knowledge of Peak Oil and transport I offer an educated perspective on the issues.