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

Australia: What to do, what to do about our energy situation?

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Introduction

In my last post I suggested that over the next 5 years Australia's ability to import oil will be severely constrained. We won't be able to just switch suppliers, because that is what everybody will be trying to do – we need smarter solutions and they need to start now. In this post I look for the responses that we need to make.

There is no better group of people to answer this question than the TOD community. The calamity that we had warned of seems to be occurring, and the words "Peak Oil" now appear in mainstream media news articles on a regular basis. Our warning was heard late - probably too late for some - but it is being heard.

It is now time to turn our minds to defining solutions. This area has been approached by several TOD contributors (with valuable insights ranging from specific technical approaches to the more general ELP approach). I propose that we now need to organise and categorize the full range of actions needed. If we are going to call on politicians and business leaders to act, we need to define what actions are required. It is not enough to scare people - we need to provide a call to arms, not a call to panic.

Obviously solutions will need to address political, social and economic issues. In addition solutions need to be framed within the context of the environmental problems that we face. Clearly the

scope of this question is immense. But a start must be made, so here are some thought-starters:

The First Effects

If oil is constrained, what will be the effect in Australia?

In 2005 the US Department of Energy commissioned a study by the Oak Ridge National Laboratory to look specifically at the impact of high oil prices. In the conclusion this study finds that:

This analysis also confirms that the three components of oil dependence costs (wealth transfer, potential GDP loss, and macroeconomic adjustment costs) are approximately equal in size. Thus, focusing on the costs of oil price shocks alone and ignoring wealth transfer and the persisting effects of high oil prices on potential GDP losses would underestimate the true costs of oil dependence by about a factor of 3.

Constrained oil leads to higher oil prices, and high oil costs have three economic consequences:
1. Impact on GDP
2. Transfer of wealth from importing nations to exporting nations
3. Macroeconomic costs

The first pain that we feel will be economic pain, and it will be felt in those three areas.

The Next Effects

What comes after the economic impacts?

If the economic impact of high oil prices includes a transfer of wealth to the oil producing nations, then there will come a time when large, powerful importing nations will conclude that this transfer of wealth is not in their national interest – and that a military solution is a better option.

Although we are not an oil exporter, we are an energy exporter. Australia exports coal, natural gas and uranium. We have one of the highest ratios of energy resources per capita, (also arable land per capita, mineral resources, etc), so it might be wise for us to watch what happens to oil exporters, as our own situation may have some similarities at a later date.

What Are The Solutions Here in Australia?

There are those who tell me that we are doomed by the fact that, with a population rapidly approaching 7 billion, the Earth has already exceeded its carrying capacity. I have this answer: The population of Australia is only 21 million. Yes, we have a shortage of water and oil, but these shortages will only lead to certain disaster if we do nothing.

There are multiple areas where solutions must be found. Below is a list of broad areas that must be addressed and a few points about how to address them. I suspect that the list is far from complete and I have no doubt that the TOD readership is well equipped to add to this list.

Solutions: Technical.

Like it or not, we cannot transition to a renewable energy base in a day. Both non-renewable and renewable energy sources will be required for decades to come.

Environmental issues must be addressed. Power solutions that require large amounts of fresh water are just as crazy as water solutions that use large amounts of high-quality power (such as desalination), and neither can be entertained.

Overcoming the Constraint in Liquid Fuels

Above all, we must remember that this is a liquid fuel emergency. Liquid fuels such as petrol, and diesel are easily transported (no wires required) and very energy dense (45 kg of petrol will take a car about 500 km, while 45 kg of lithium batteries will only take it a fraction of that distance). These capabilities make liquid fuels hard to replace.

However technological solutions are already practicable:

- Battery/electric cars. Removing the requirement for liquid fuel by developing battery-powered cars is a partial answer as it gives us the capacity to move people and goods on short journeys to destinations outside of public transport routes. Some battery cars are already in limited production, and GM claims that it will be bringing out a large-production car (the Chevrolet Volt) in 2010. Hybrid cars and PHEVs also provide a partial solution. Although electric cars offer part of the solution, we will still need the capacity to move large loads for long distances.

- CNG vehicles. Australia has significant gas deposits. LNG and CNG are likely to be part of the Australian solution.

- Synthetic fuels. Producing liquid fuels from our gas and coal deposits (CTL and GTL) is another part of the likely solution, but there will be an environmental cost. We will need to find a way to soak up the CO_2, and ways to address the other environmental issues.

- Solar power. Australia is richly endowed with sunlight. Solar Thermal and Photovoltaic (including thin film) technologies are both likely to be part of a solution. Solar generally delivers electricity, not a liquid fuel, but this energy can fill needs that would otherwise be provided by fossil fuels.

- Algae oil. Algae oil is one of my current crusades. In the geological past algae proved to be a great sink for CO_2. Australia has enormous potential for growing algae to offset the CO_2 produced by GTL and CTL processes. The oil can then be removed from the algae, leaving a significant amount of waste (around 70%) to be sequestered. Sequestering will probably be done by charring the waste (possibly by fast pyrolization) in a solar thermal furnace, then using the char as a soil enhancer.

Which solution do we need? None of the above solutions is a complete answer to the liquid fuel issue. We will need all of them.

Increase energy efficiency to cut energy dependence

Reducing power requirements also reduces water requirements. The quantity of water that is consumed by power generation is rarely appreciated. A single 60 watt bulb can consume nearly 1 liter of water of water per hour if left on.

Increasing energy efficiency will require more than just turning off the light switches. Whole new technologies may be required:

- Improving train infrastructure. There are existing lines that are currently unused. Restoring these lines offers a cost-effective approach to increasing transport efficiency. Unfortunately, this

process will take decades, and there will never be a train to everywhere.

- Improved sea/water transport. Water transport (River and ocean) is extremely energy-efficient.

- Air transport by dirigibles is an old technology that is making a comeback. Dirigibles that look like giant wings is an emerging technology that shows great promise.

- Improvements in sail technology make local water transport even more attractive, sail powered river ferries are a possibility wherever winds are reliable.

- Sea transport powered by giant kites is a technology already being implemented

Solutions: Changing The Economic Paradigm

The current Fractional Reserve Banking system requires growth in order to supply the extra money required to service interest on debt. If energy is constrained and growth is not possible, an intolerable strain is placed on this system. A Steady-State economic system may need to be put in place. Once again, this is a big change – it may take time, and is likely to be politically unpalatable.

Solutions: Business

Business is already feeling the pinch, making this a difficult time to be proactive. However action is required. Goldman Sachs has been consistently right with oil price predictions and are now forecasting a "Price Super-spike" of $200/barrel. The events following that are hard to predict, but that there will be effects is not really in doubt. Businesses need to address the issues now, rather than wait for them to reach full impact. Now is not the time to be running lean inventories and a just-in-time supply chain. Agility and resilience will be the key to surviving the associated effects.

- Conduct an inventory to establish vulnerability to a liquid fuel shortfall. The most likely area will be transport. Is your business dependent on transport? To what extent are your staff dependent on transport? Are your business partners dependent on transport? Your supply and distribution?

- Develop redundancies and move to alternatives.
- Increase inventory to allow for supply interruptions
- Locate any single points of failure and assess the vulnerability
- Create scenarios. Workshop if necessary.

- Plan mitigation.

Can your staff work from home? Do you have IT Infrastructure in place to support a large number of staff working from home? Has your HR signed off on working from home as an OH&S option?

Solutions: Government/political.

Links to oil producers will be required. We need to remember that we are a food exporter at a time when a food crisis is emerging across the world. Most of the oil producers are food importers.

If they want our food, then our farmers need their oil.

It might seem that we can just choose one oil importing country and offer them food in exchange for their oil, but unfortunately, many of these countries are quite unstable. For this reason, it would be wise to diversify as much as possible, so that we are not dependent on one source.

Many of our current sources of oil have no requirement for our food, but there are a few logical targets. The logical targets are:

- Iraq. We already have a history of supplying food to Iraq. It might be time to create an explicit link between food and oil, perhaps introducing the concept of a "Most Favored Trading Partner" status, with associated discount wheat in return for guaranteed oil. Sadly, this country is not stable, reinforcing the need to diversify.

- Angola. Angola is not a traditional supplier of oil to Australia. However they have relatively new fields with expanding production. And they have a food problem. Sadly, this is another country with stability problems, so the need for diversification of supply is again underlined.

- The Philippines. This country is one of our current oil suppliers, and they have a current (acute) food problem. Now might be a good time to negotiate a long-term food for oil trade relationship.

- UAE. Another of our usual oil suppliers, UAE currently imports over $145 million/year worth of Australian wheat, meat, fruit, dairy and grains. Once again, it would be relatively easy to link oil with food.

There is one potential flaw in this plan. Several of the oil exporting nations know that food is a significant vulnerability, and they are seeking to address this problem by buying farmland in foreign nations. If this trend becomes widespread, then Australia's leverage as a food producer would be significantly reduced. The amount of wealth available to Middle Eastern nations is significant. They could certainly buy enough farmland to guarantee food security if they prioritized this as a goal.

This makes negotiations with nations such as Angola and the Philippines even more important.

We also need to form alliances in order to minimize our profile as a resource-rich, sparsely-populated target. In a time when the world is recognizing the emergence of several new super-powers, it is hard to know how to achieve this, and it will undoubtedly require a delicate touch.

Military planning and procurement needs to be considered. If a price of $225/barrel for oil is assumed, what impact will this have?

The current trend towards large, heavy vehicles and the profligate use of fuel to support troops must be reversed. In some cases this may be as simple as replacing steel armour with composites (eg. replacing the steel in the Bushmaster armoured car with Kevlar composites), but in other cases it will require new strategies and tactics (more use of "light fighter" troops, more emphasis

on air defense, rather than air support, etc).

Solutions: Environmental

The most pressing environmental problems in Australia include climate change, greenhouse Gas emissions and water scarcity.

Greenhouse gasses

Reducing emissions will not be enough. We need to remove CO_2 from the atmosphere and we need to start now. Algae has already been mentioned as a promising way to achieve this goal.

Saving Water

Water is a problem here in Australia. The latest solution is desalination plants. However desalination uses so much power that it has been likened to "bottling electricity".

If reducing our energy requirements and CO_2 footprints is a priority, then we may have to face the reality of recycled water.

Desalination is one of the most glaring examples of solving a problem by making another problem worse, but it is certainly not the only one. The fact that we flush our sewage out into the ocean is another example that will leave future generations speechless in disbelief.

Solutions: Localization

Cheap oil made it possible to move goods immense distances at minimal cost. This allowed economies of scale to outcompete the advantages enjoyed by local producers. This trend will need to be unwound in some areas. In some cases localization of production may even devolve down to individual families.

Localization: A worked example.

"Victory Gardens" is a concept that emerged in response to the resource constraints that the government faced during WWII. Significant resources were freed up simply by removing the necessity to produce and distribute some of the more difficult-to-handle vegetables.

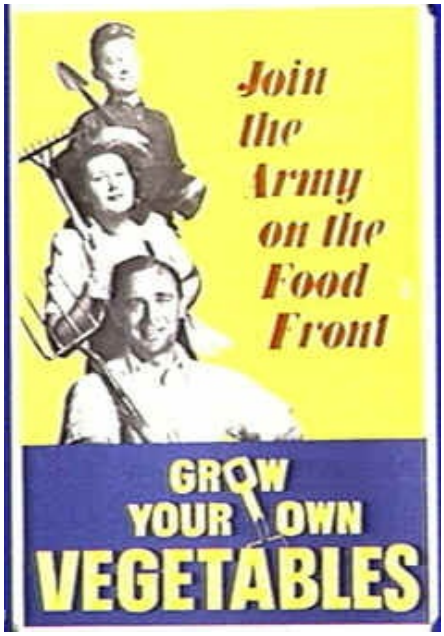
The key to success is to identify which vegetables save the most energy if grown at home, and which benefit more from the economies of scale offered by industrial agriculture. As a simple illustration of the difference, consider grains and leafy vegetables. Should we localize wheat growing? Or lettuce growing? Or both?

Harvesting a home-grown lettuce and preparing it for consumption consists of going out to the back yard, picking it, bringing it in, and washing it. A farm-grown lettuce, on the other hand, requires sophisticated and very energy-intensive processes just to transport it intact. The head of lettuce must be carefully packaged to minimize damage to leaves and then it must be transported rapidly, in temperature-controlled vehicles. Encouraging people to grow lettuce at home offers clear advantages. It is easy to grow, harvest and prepare.

However the reverse is true for grains such as wheat, rice or oats.

It is not very practical to grow your own wheat in an average backyard garden. The amount of land needed to grow enough wheat for a family will usually exceed the amount of land the family has available. In addition, wheat is hard to process. Harvesting, separating wheat from chaff, and grinding are all processes that benefit from economies of scale. But, unlike lettuce, once wheat has been grown and processed it is very easy to transport and store.

Clearly lettuce is a candidate for home-growing, but wheat benefits from the economies of scale offered by Industrial Agriculture.



The energy cost of producing and delivering food was the subject of a study that occurred after the first "oil shock" of 1973. A significant finding from this study was that massive inputs of energy are necessary to produce and deliver meat.

In addition to growing vegetables at home, if even a small percentage of the energy load associated with meat production could be avoided, the energy savings would be significant. There are obviously three strategies in approaching this goal:

1. Encourage people to eat less meat
2. Encourage people to eat less energy-intensive meat (i.e. move away from beef, to meats that require less energy, such as chicken)
3. Encourage people to go back to traditional practices such as keeping chickens, rabbits or similar animals in their back yard.

Localization: Generalizing the Principle

The example of lettuce and wheat was provided above, but this approach can be applied to all foodstuffs, and indeed all energy using activities. It is worth noting that this approach addresses two problems at once – it reduces CO_2 emissions and energy requirements.

When considering if a given activity should be localized in response to energy constraint, the questions to be asked are:

- What resources and energy does a given activity need, and can this activity be further broken down (e.g. breaking energy consumption down by food type reveals that meat and vegetables may benefit from changes, but grains probably would not).

- Is there a need for this activity to be done and is the need a priority when compared to other needs?

- Can the need be met by completely different, more effective processes (e.g. moving some percentage of protein production away from cattle and towards the localized raising of smaller animals).

- If the current process is to continue, can it be done more effectively (by using less material, less energy, reusing or recycling of components, etc)?

- If the activity is heavily centralized then, given that we face an increasingly energy and carbon constrained environment, would it make sense to decentralize the activity?

Fostering Social Solutions at the Local Level

People's behavior needs to change. In addition we need to deal with the social consequences of economic and environmental difficulties that we face.

We need to educate the public early and enlist them as part of the solution.

We need to encourage people to analyse energy usage and rationalize it. The personal use of energy must be viewed as a social issue. Activities such as walking or cycling to the train station must be viewed as a social obligation.

Local social units must be fostered at every level – for everything from carpooling to swapping seedlings and gardening tips.

Local task forces need to be encouraged. If correctly handled the costs should be minimal. Many people are almost evangelical about their hobbies, and would welcome the chance to set up localized groups that address issues such as:

- Vegetable gardening
- Bicycle building and maintenance
- Modifying your house to reduce energy needs
- Creating a no-dig garden bed
- Backyard permaculture

In general the local knowledge exists and the infrastructure exists. The only intervention needed is organizing and promoting the activities.

As part of a move to localization of production it may be necessary to encourage local councils to do an inventory of local strengths and weaknesses. Are there any goods and services that should be produced locally that are not? This will require identifying activities and deciding on an appropriate level of localization for each activity. For example, it might be appropriate to expect an electronic and computer repair capability at the local level, but it would be inappropriate to expect a computer production facility at the local level.

Local councils should also address related questions: Are there any locally produced goods or services that are vulnerable to a disruption in the supply chain? What would be the impact?

Many local areas have regular "Computer Swap Meets", or similar organized markets. It would be wise to foster these events and try to broaden the base of locally-produced goods and services available. Doing this should reduce the strain on infrastructure at the wider level, by reducing the necessity to bring in these goods and services.

Summary

Our society has evolved into a "network of systems" and it now faces a corresponding network of problems. The danger is that our tightly-coupled, mutually-dependant society could suffer from a sudden, cascading collapse. This happened, to a limited extent, in the Russian collapse of a decade ago - but Russia's systems were loosely coupled with a lot of built-in resilience. Russia did not have the lean, "just in time" inventories and single-point-of-failure systems that we now depend on.

Our ability to meet the challenge will depend on our ability to do three things:

1. Decouple the dependencies in our system and build in resilience. Resilience has fallen out of favour, we currently favour "efficiency" instead, but there is a danger inherent in this efficiency. Just-in-time inventories and single points of failure offer great economic advantages when they work, but they are not the correct model for the turbulent times ahead.
2. Remodel our society and economy in line with the new situation
3. Solve the technical challenges (probably the easiest of the three to achieve)

Achieving this is not going to be easy. The problem permeates every level of our society, so it is time to take an inventory of the solutions – at every level of our society.