Queensland Government

Towards Oil Resilience Community Information Paper

An information paper to inform the development of the Oil Vulnerability Mitigation Strategy and Action Plan

Prepared by the **Environmental Protection Agency**

Toward Q2 Tomorrow's Queensland

Queensland Government

Minister's foreword

Australia is finding it difficult to access the quantities of oil that it needs at an affordable price. Demand for oil is not just coming from motorists. Farmers, miners and manufacturers are also competing for the same liquid gold that literally fuels our world.

The problem is the world is demanding more oil than it can produce. Additionally, many believe that the production of oil has—or is about to—peak.

Our State is experiencing the impacts of oil scarcity, along with our fellow Australians, our trading partners, our military allies, our regional neighbours and our friends and relations across the globe.

There is legitimate concern in many Queensland communities about the effects of an oil scarce future.

Queensland has a choice. We can either plan for an oil-restricted world or we can become victims of the global market.

With an oil-resilience strategy, Queensland has the opportunity to set its own future. We must get ahead of the game by designing how we live and move around in an oil-constrained world.

The Queensland Government does not want high oil prices to impact on the Queensland community's capacity to travel, nor do we want our farms, mines and manufacturers to lose their competitive edge because they cannot get the necessary energy inputs.

This information paper considers what alternatives we can adopt, what other energy sources we can use, and what substitutes we can develop—so we can still have a happy and prosperous Queensland population.

By expanding our options, we are spreading the risk and limiting the negative effects of oil scarcity and cost. More options will reduce our dependence on large oil companies that demand even higher prices.

This information paper outlines how we can make lifestyle choices that can improve our quality of life.

So please have a read and consider what changes you and the Queensland Government can make to prepare for an oil-resilient future.

Hon Andrew McNamara MP

Minister for Sustainability, Climate Change and Innovation

Executive summary

In a modern industrialised society such as Queensland, oil is essential. Our societies and livelihoods are firmly structured around an abundant supply of low cost oil, which makes Queensland—along with the rest of the world—highly vulnerable to volatile supplies.

Globally and nationally, the demand for oil is outstripping supply.

Future oil shortages and sustained high fuel prices are a reality that Queenslanders must now face.

As the price of petrol and the price of groceries rise, all Queenslanders feel the impact. Subsidies and tax breaks offer some temporary relief. However, oil is a finite resource and strategies to address the broader issue of declining supplies will help secure Queensland's long-term future.

The Queensland Government is preparing for an oil-resilient future. An oil-resilient Queensland is one where impacts of changing oil supplies and prices have minimal effect on the Queensland economy and lifestyle.

Given the vulnerability of Queensland industry and community to sustained high oil prices, the Queensland Government is taking a risk management approach and beginning to prepare now.

This information paper outlines some of the ways that Queensland can prepare for future oil shortages and volatile prices, while ensuring we maintain a prosperous, secure and high quality lifestyle.

This paper provides a background to the global oil issue and identifies challenges and opportunities for Queensland. Three key areas for action are proposed:

1. Creating oil-resilient transport networks
2. Promoting a sustainable fuel supply
3. Planning for oil-resilient towns and cities

The discussion in these areas looks at ways to avoid and reduce oil use and to develop a more diverse fuel base. In combination, these actions could have a number of benefits including reducing Queensland's reliance on oil, reducing greenhouse gas emissions, improving congestion and helping improve the liveability of Queensland communities.

Purpose of the information paper

This paper is part of an ongoing process to develop an Oil Vulnerability Mitigation Strategy and Action Plan for Queensland, anticipated to be finalised by mid next year. The paper is an information document that is not government policy. This paper is the first step in developing policy options for inclusion in the Oil Vulnerability Mitigation Strategy and Action Plan.

Your input to this process is welcomed. The process for making a submission is outlined at the back of this document.

Introduction

Queensland's oil vulnerability

The more dependent we are on oil, the more vulnerable we are to increases in the price of and declines in oil supply.

Queenslanders in general, like the rest of the world, are heavily dependent on oil to drive our economy and shape our lifestyles.

Oil is essential to the most basic functions of Queensland society. Oil is the key raw material for petrol, diesel, jet fuel, industrial oils, numerous chemicals and most plastics. Many industries are dependent on oil in ways that are not immediately apparent. For example, our systems for producing and distributing food rely on oil, not only for fuel for farming machinery and transport, but also as a raw ingredient for agrichemicals, fertilisers, packaging plastics and so on.

Queensland faces a high risk to volatile oil supplies. The size and regionally dispersed nature of Queensland's population and regionally distributed industry base creates a heavy reliance on oil, particularly oil-based transport and freight. The effects of increasing production costs in these key sectors will, in turn, result in higher food and commodity costs for all Queenslanders.

Opportunities for Queensland

There is great scope for strengthening Queensland's economic and environmental performance by adopting a comprehensive response to declining oil supplies.

Queensland is already in a strong position to mitigate the effects of future oil shortages. Queensland has a strong economy, a well educated workforce and an effective and fiscally sound government. These elements provide an important foundation and will equip Queensland to take a lead role in future technological innovation and planning for future oil shortages.

Queensland's diverse and high quality natural resource base will be a key element in Queensland's continued prosperity and may provide a significant advantage to explore alternative fuel and energy options. Queensland has the opportunity to draw on:

- an abundant supply of coal and gas (that will likely benefit from rising oil prices)
- renewable energy potential (notably wind, solar and geothermal energy)
- important areas of productive agricultural land as potential supply for second generation biofuels.

Initial analysis provided in the Heuris Report[1] suggests that Queensland's abundant gas resources in the form of coal-seam methane (generated as a by-product of coal formation) may provide an economically viable source of liquid fuel, via compressed natural gas and gas-to-liquids technology. Additionally, renewable energy potential, in the form of wind, solar and geothermal energy, is another significant attribute that will help Queensland become less reliant on oil.

Queensland, given its position of strength and stability, is also well placed to simultaneously address the challenge of climate change. By considering oil and climate change together, the Queensland Government can plan for action that takes care of our environment, while maintaining a strong economy.

1 ***The Oil Vulnerability Strategy/Action Plan for Queensland: Research Paper,*** **prepared by Heuris Partners Ltd , 2008.**

What is an emissions trading scheme?

An emissions trading scheme is a market-based approach to reducing greenhouse gas emissions.

In July 2008, the Australian Government released a Green Paper indicating that an overall limit (or 'cap') on the quantity of carbon pollution released in Australia will be introduced. Once a cap is set, a trading scheme will be developed to allow companies and industries to buy and sell permits for emission releases and to gain credits from undertaking pollution mitigation actions to reduce their emissions.

A trading scheme is a cost - effective way of letting the market find the 'quick wins'. The initial and inexpensive actions that can immediately help reduce emission levels are identified and undertaken by businesses looking to gain credits to sell-on in a carbon market. Businesses exceeding their permit limits would have to buy these credits at a price set by the market.

Additional policy measures which are complementary to a national trading scheme will still be required to address other market failures such as lack of energy efficiency, as well as provide education, stimulate research and development, and restrain emissions in sectors not included under a future national trading scheme.

An emissions trading scheme may also encourage the take up of measures which reduce reliance on oil.

Changes that the Queensland Government makes in preparation for reducing our reliance on oil also provide a great opportunity for local and regional communities to embrace a more sustainable way of living. By adapting our lifestyles to reduce reliance on oil and oil-based products, communities will face less financial pressure, while maintaining a high quality lifestyle.

All of these factors will help secure a long-term fuel supply for Queensland and address critical risks and exposures that may come with declining oil availability. The challenge for the Queensland Government is how to make use of the benefits to the Queensland economy in a way that will ease pressure on individuals and communities who may be impacted by changes in oil supply.

Queensland Government response

The Queensland Government recognises that combating oil vulnerability is a challenge that cannot be viewed in isolation. This is a global issue with national and state implications.

A transition to a more sustainable future will be driven not only by declining availability of oil and other non-renewable fossil fuels, but also by important population growth, environment and climate change considerations. Actions to address these issues are being driven at both a national and state level.

Australian Government decisions to introduce a national emissions trading scheme, set future energy directions, and undertake other measures such as reviewing excise and taxation arrangements will all have direct implications for Queensland industry and community. In developing a Queensland oil vulnerability mitigation strategy and action plan, policies at a national level will need to be taken into account.

At a state level, the Queensland Government response to oil availability and related issues is wide-ranging. Many of the actions required to address these issues already exist as an important part of the government's core business, including significant improvements in public transport and congestion management, investment in infrastructure, research and development of alternative fuels, growth management, regional planning and climate change initiatives. Work in these areas will continue and important gains are anticipated which will further protect Queensland against reduced availability of oil.

In addition, the government has demonstrated a commitment to identifying and addressing Queensland's vulnerability to declining oil supplies by producing two key reports:

1. The Queensland's Vulnerability to Rising Oil Prices Taskforce Report (the Taskforce Report) was finalised by the Premier's Queensland Oil Vulnerability Taskforce in April 2007 and tabled in Parliament on 11 October 2007.
2. The Oil Vulnerability Strategy/Action Plan for Queensland: Research Paper (the Heuris Report) outlines effects and opportunities for Queensland in relation to increased oil prices. This report was commissioned by the Environmental Protection Agency in February 2008, and produced by consultants Heuris Partners Ltd.

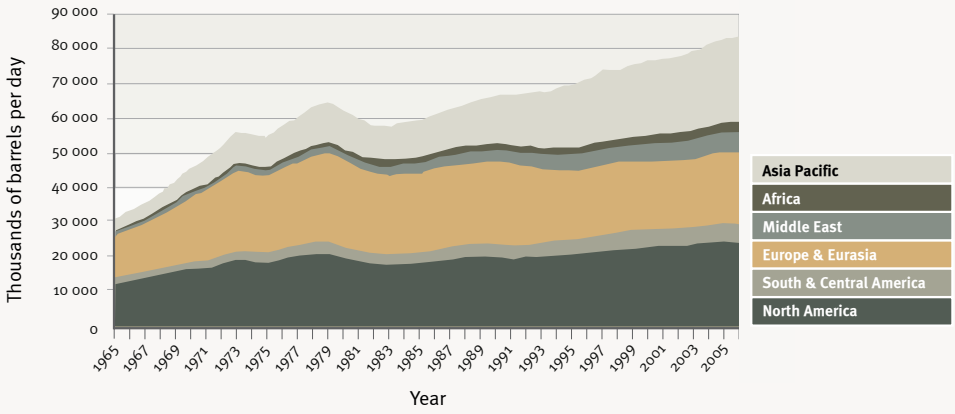
The Taskforce Report and an interim draft version of the Heuris Report can be viewed at www.epa.qld.gov.au.

Facts about Queensland's oil-based economy

Demand for oil

Global demand for oil-based fuels is growing strongly (Figure 1). According to the International Energy Agency, demand will continue to rise sharply to 2030. In recent years, rising demands for oil in developing economies with large populations, like China and India, has placed greater strain on global supply.

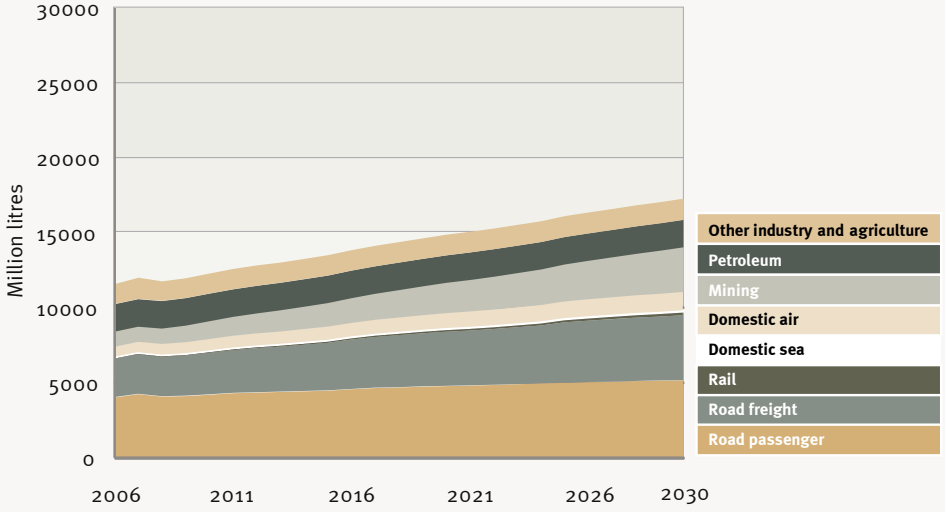
Figure 1: World oil consumption, 1965–2005 (thousand barrels daily)



Source: BP Statistical Review of World Energy, June 2008

Analysts also predict that Queensland will require significantly more oil into the future. If Queensland's pattern of oil use continues, the demand for oil by all industry sectors will continue to rise (Figure 2).

Figure 2: Queensland total oil demand, 2006–2030 (by sector)



Source: CSIRO & Heuris projections, 2008

Reduced production of oil combined with an increase in global demand leads to increases in prices.

In June 2008 the President of the Organisation of Petroleum Exporting Countries (OPEC)—which produces about half of the world's crude oil exports—said:

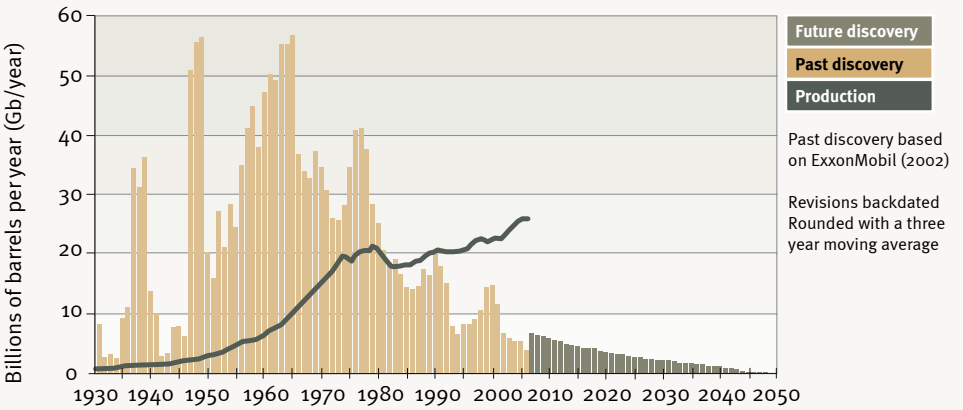
"OPEC has already done what OPEC can do and prices will not come down."

Available oil supply

Queensland's future oil supplies need to be considered in an overall national and global context.

Most of the world is now dependent on a diminishing number of oil-producing countries to supply their oil needs. The amount of new oil discovered each year peaked in the mid-1960s at around 55 billion barrels per year (Gb/year), and has been falling steadily since.[2] See Figure 3. Oil production has been essentially flat since 2005, and current rates of production are predicted to decline within the next five years.[3]

Figure 3: Discovery and production of oil

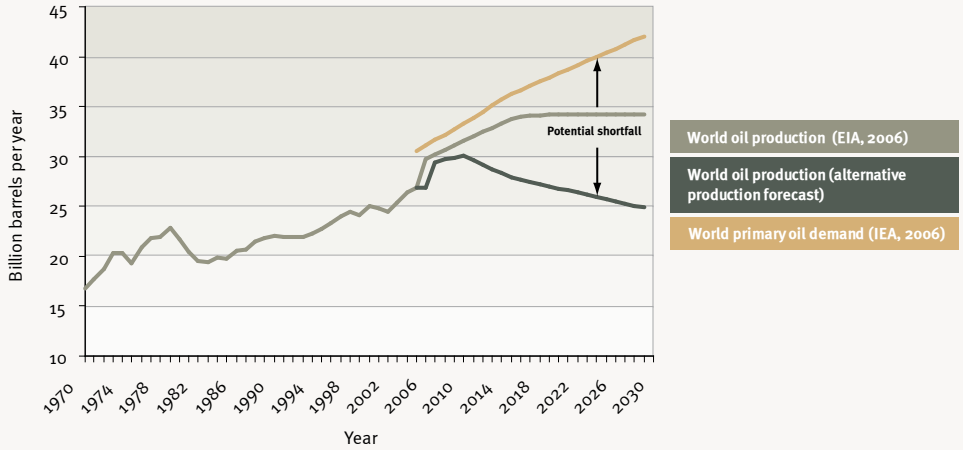


Source: ExxonMobile data, 2002

Even with significant advances in oil discovery and production technology, discovery of new oil fields have been in decline since the 1960s. This means that the global demand for oil is likely to continue to outstrip supply.

The following diagram illustrates the difference between the predicted global demand and supply of oil into the future, highlighting the shortfall in production.

Figure 4: World oil production and demand



World Oil Production (EIA, 2008): EIA, 2008, 'International Energy Outlook 2008', US Department of Energy, Energy Information Administration, Washington D.C, September

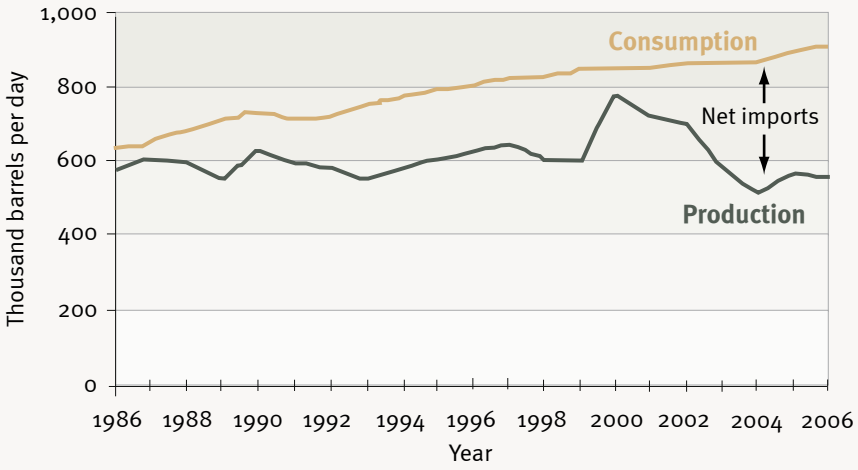
World Oil Production (Alternative Production Forecast): World oil production (EIA Monthly) for crude oil + NGL. The median forecast is calculated from 14 models that are predicting a peak before 2020 (Bakhtiari, Smith, Staniford, Loglets, Shock model, GBM, ASPO-[70,58,45], Robelius Low/High, HSM).

World Primary Oil Demand (IEA, 2006): IEA, 2006, 'World Energy Outlook 2006', International Energy Agency and Organisation of Economic Co-operation and Development, Paris

2 Cambell, C.J. (2000), Presentation at the Technical University of Clausthal
3 Australian Association for the Study of Peak Oil and Gas, 2008

On a national level, Australia does not produce enough oil to meet the nation's needs. Australia and Queensland are therefore becoming more dependent on imported oil and oil-based fuels, and thus the oil used by Queensland is strongly linked to global supply and demand. Figure 5 indicates Australia's growing import needs.

Figure 5: Australia's oil production and consumption, 1986–2006



Source: EIA International Energy Annual 2004; Short Term Outlook December 2006

Nationally and globally, demand for oil far exceeds availability. Accordingly, oil prices have increased significantly in recent times, well beyond predicted levels. At the beginning of 2007, oil cost US$50 per barrel. By July 2008, oil prices have nearly tripled at US$140 per barrel. The price of oil continues to rise, with the possibility of US$200 per barrel becoming increasingly likely in the immediate future.[4] Figure 6 shows a steady increase in real oil prices since 2004.

Figure 6: Real oil prices, 2004–2008

4 The Goldman Sachs Group, Inc., 5 May 2008

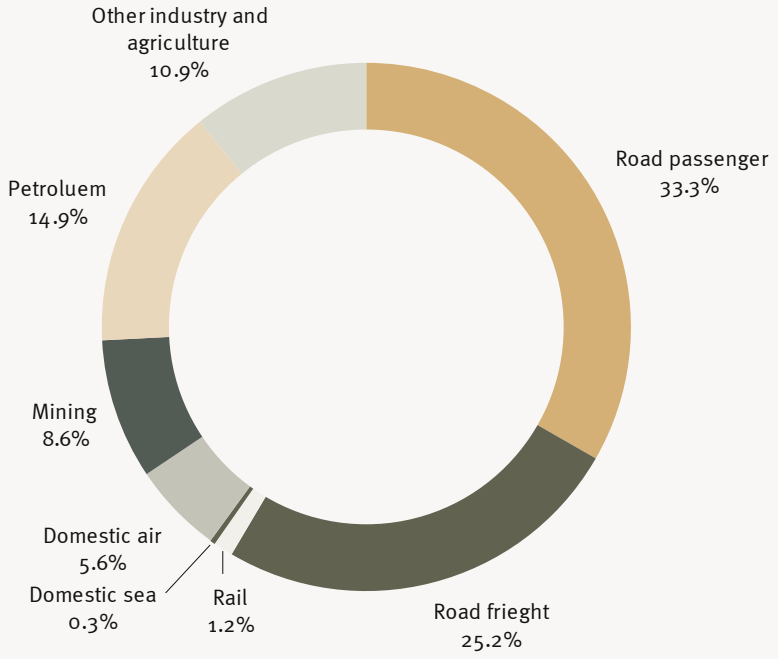
Implications for Queensland

Queensland industry and the economy

Increasing oil costs and instability in supply have serious consequences for all sectors of the economy—particularly the transport industry which is the largest consumer of petroleum products, accounting for almost three quarters of all fuel used. In addition, mining, agriculture, manufacturing and construction sectors are also heavy users of oil-based fuels. The Queensland economy is significantly influenced by the viability of these key industries.

Figure 7 illustrates oil consumption by industry sector.

Figure 7: Queensland oil use by sector, 2006



Source: Heuris Partners Ltd, 2008

For mining, agriculture and road freight sectors, fuelling heavy vehicles with petroleum or diesel represents a large proportion of industry fuel use. For example, on a mine site, the large trucks that haul ore are large consumers of diesel. A Caterpillar 777D, capable of hauling 95 tonnes, consumes 77 litres of diesel per hour according to its specifications. This type of vehicle typically consumes about 1.5 million litres of diesel per year. On-farm vehicles used in primary industry also use significant quantities of diesel.

Additionally, Queensland's agriculture and fibre (such as wool and cotton) industries rely heavily on fertilisers and pesticides that are petrochemical, oil-based products. When oil prices increase, so do production costs.

It is also worth noting that inbound tourism in Queensland has been fostered by low cost domestic and international air travel. Air transport is highly fuel-intensive and is therefore highly vulnerable to volatile fuel prices, creating flow-on effects for Queensland's tourism sector.

Queensland community

As with industry sectors, increasing oil costs and instability in supply will have social consequences. Queensland is currently experiencing the highest fuel prices on record. Communities are feeling financial pressure directly through increasing petrol prices to fuel private vehicles, and indirectly as increased business production and transport costs are incorporated into the price of goods and services.

More serious impacts of declining oil availability on Queenslanders may include:

- decline of personal mobility, recreational and social opportunities
- changes in employment
- decreased availability of a range of goods.

All Queenslanders are affected by high oil prices. However, rural, regional and outer urban communities are likely to be the most affected in the short term, due to:

- high dependence on personal vehicles, road freight and air travel to cover the significant distances between townships and economic centres
- high dependence on diesel for remote area power needs
- generally poor public transport to service outer suburban and fringe areas
- the widely dispersed nature of Queensland cities with lower-income earners commonly on the outer edges of cities.

Why does oil production have a peak?

Most of the oil wells in the world that have ceased production still have oil in them; it is simply either not economically viable or technically possible to extract the oil. The pressure in the oil reserve means extracting the first half of the oil is easy, as the pressure in the reserve forces the oil out. As more oil is extracted, the pressure begins to drop, and it becomes harder and more expensive to extract the remaining oil. At this point, the oil well has reached its peak.

What is peak oil?

The term 'peak oil' is used to refer to the point when production of oil is at its highest. Whether it is an individual oil well, a country's oil fields or global oil reserves, at some stage production passes the halfway mark of the amount of oil that is technically possible and affordable to extract. That half way point is called the peak oil production point for that reserve. From the peak, oil production will begin to decline because cheap, easy to access oil is not available. The peak oil phenomenon is the cumulative global peak of oil production worldwide.

The person most associated with the term 'peak oil' is geologist M.K. Hubbert who correctly predicted that United States oil production would peak in the early 1970s.

When will global oil production peak?

It is difficult to determine when the global peak might occur. Researchers have predicted that oil production will peak between 2005 and 2040, with the majority of published estimates between 2005 and 2010. It is unlikely that the peak will be recognised until after it has occurred.

Additionally, there is a question of how sudden a decline in the production of oil will be. If the decline is slow, Queensland will have more time to adjust. If decline is more rapid (the 'oil shock' scenario), the impacts will be more severe.

Some industry analysts argue that the increasing price of oil will make more expensive forms of extraction financially viable and new technologies and replacement fuels will become available so that oil production will not decrease rapidly. However, this view still accepts that 'cheap oil' will no longer be available and that oil prices will continue to increase. It is certain that the demand for oil continues to rise and a peak in global oil production will be reached—when it is reached remains to be seen.

Given the vulnerability of Queensland to peak oil effects, the Queensland Government is not gambling on a date. The government is preparing now.

Preparing to reduce Queensland's reliance on oil

The Queensland Government has identified three key areas to minimise the impact of oil vulnerability on Queenslanders and take advantage of the opportunities.

- Creating oil-resilient transport networks
- Promoting a sustainable fuel supply
- Planning for oil-resilient towns and cities

Creating oil-resilient transport networks

A key aspect to managing our response to oil vulnerability is facilitating a shift to more sustainable and energy-efficient transport modes.

Moving people

One of the biggest challenges for Queensland in reducing reliance on oil will be making critical adjustments to the passenger transport sector. The passenger transport sector accounts for approximately 40 per cent of Queensland's fuel demand.[5]

The transport sector's increasing demand for oil is likely to continue given Queensland's strong economic and population growth. Encouraging a modal shift towards public transport and other more fuel-efficient transport modes carries huge potential for oil savings.

Strategies could include encouraging people to walk or cycle for short and medium length journeys, providing accessible and relatively inexpensive public transport as a viable alternative to car travel, and providing incentives that promote a change in behaviour around transport use.

More walking and cycling

Walking and cycling have a critical role to play in moving toward sustainable transport. Increased bicycle use and walking journeys would reduce reliance on fossil fuels and reduce our vulnerability to more costly, less secure oil supplies. In addition, walking and bicycle transport are low-cost, non-polluting and healthy modes of travel. Transport and land-use planning can promote increased bicycle use and greater use of designated safe walking corridors to make walking and cycling more attractive. Walking and cycling opportunities will be further enhanced by improving connections, including facilities, between public and non-motorised transport modes.

Better public transport

Improving public transport is an integral part of reducing reliance on oil. When public transport services are frequent and reliable, they are also well used. Since 2004, better and more frequent services for bus, rail and ferry have resulted in an increase in patronage of over 30 per cent—representing an additional 39.6 million trips being taken on buses, trains and ferries across south-east Queensland.[6]

Delivering better transport for Queensland

The Queensland Government is committed to improving public transport options and tackling urban congestion by investing in infrastructure, providing more trains and more bus services, and addressing supply and demand issues to shape traffic and transport solutions into the future. Over the next four years, the Queensland Government will invest:

- *more than $7.7 billion in transport and roads infrastructure*
- *$168.4 million to improve customer services across the TransLink network, including funding for 90 new buses for Brisbane in 2008–09.*

Funding will also be directed at more immediate measures to manage urban congestion including:

- *off-peak freight efficiency trials*
- *TravelSmart initiatives to encourage alternative travel*
- *end of trip cycling facilities.*

5 ***The Oil Vulnerability Strategy/Action Plan for Queensland: Research Paper,*** **prepared by Heuris Partners Ltd, 2008**
6 Queensland Transport *2006–07 Annual Report*

Discounts on public transport

The Queensland Government has recently announced a new fee structure for trips taken on public transport in south-east Queensland. The Government is discounting go card trips by as much as 67.5 per cent from August 4, 2008.

This provides Queenslanders with a cheaper alternative when deciding whether to use a car or public transport. For example, the new discounts have the potential to reduce the fare from Gympie to Brisbane for frequent users from $18.80 to just $6.11.

By introducing cheaper travel on buses, trains and ferries, there will be more incentive for Queenslanders to shift away from car use. The flow-on effects of more people choosing public transport for journeys will lessen congestion pressures on Queensland roads, particularly during peak traffic times, and reduce greenhouse gas emissions.

The Queensland Government's Transport 2007: *An Action Plan for South East Queensland* has a number of initiatives aimed at improving public transport systems and services. Initiatives include ways to make the current system more efficient and appealing, as well as plans to increase the capacity of the public transport network by purchasing new buses, trains, ferries and rail stock.

Incentives to reduce use of cars

In addition to providing reliable, accessible and frequent public transport, other incentives could be introduced to influence a shift away from using cars for all journeys. For example, making public transport more affordable is a key way to encourage higher uptake.

Further, finding new ways of sharing cars and car pooling will offer opportunities to not only use less oil but also create sustainable environment awareness and reduce car traffic—thereby easing congestion, car parking and reducing green house emissions.

Efficient private transport

Even with various improvements and incentives to encourage public transport use, it is likely that a large percentage of travel will still be undertaken by private car. A significant reduction in oil use can be achieved by switching to fuel-efficient cars that use less oil, including smaller cars and hybrid vehicles. Providing incentives for people to make the switch towards fuel-efficient vehicles will help establish a more efficient private vehicle fleet.

Moving goods

As for passenger transport, there will be significant social, economic and environmental advantages derived through increasing the efficiency of Queensland's freight network.

Like passenger transport, Queensland's freight system is heavily reliant on road-based transport. For south-east Queensland, less than 5 per cent of freight tonnage moved is by rail and water, while 90 per cent of the movement is by road. For freight movements outside of south-east Queensland, 13 per cent is by rail, 23 per cent by sea and 63 per cent by road.[7]

Under high oil prices, pressures on the State's road freight sector are likely to intensify, with cascading effects on costs for industry and consumers. For rural and mining areas in particular, where freight rail access is absent or inefficient and industries are heavily dependent on road freight, the cost of freighting goods (in and out) will be considerably higher.

Improving freight networks

A freight system that is less reliant on oil-based fuels will keep freight costs low and ensure that freight services to rural and regional communities remain viable.

Measures to improve the efficiency of the freight network may include using larger vehicles (that make fewer trips) combined with better logistical planning, increased investment in rail freight infrastructure and increased fuel efficiency standards for all freight vehicles.

7 **Queensland Transport *2006–07 Annual Report***

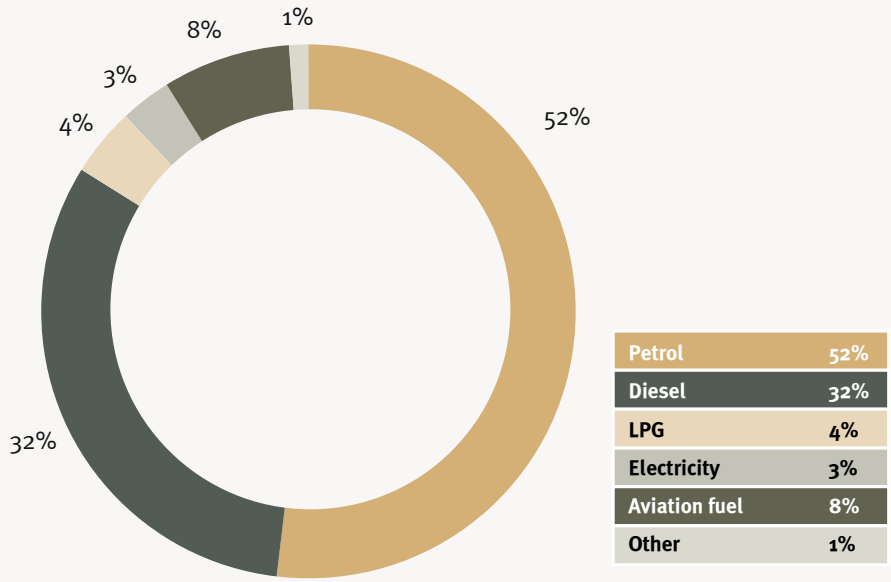
Promoting a sustainable fuel supply: alternative fuels and technologies

In addition to sustainable transport options, a more diverse fuel supply and alternative fuel options will be necessary to further Queensland's resilience to reducing oil supplies and increasing oil prices.

Diversifying fuel supply

The demand for liquid fuels is continuing to increase. There are huge gains to be made by reducing our reliance on oil-based fuels in favour of a more diverse fuel supply. This is particularly relevant to the transport sector, as Queensland transportation is 95 per cent reliant on liquid oil-based fuels, namely petrol and diesel (Figure 8).

Figure 8: Queensland transport fuels mix



Source: Adapted from Apelbaum Consulting Group Pty Ltd, 2005, *Queensland Transport Facts 2005*.

Considering alternative fuels

The Queensland Government recognises that ensuring a reliable source of fuel is critical to Queensland's economic development. However, there is no easy substitute to oil. All other present energy sources combined cannot replace the volume of energy we derive from oil. Measures to help secure a reliable and affordable source of fuel include improving energy efficiency, diversifying energy sources and providing low energy or renewable alternatives.

In addition to securing supply, the Queensland Government is committed to addressing the challenge of climate change and reducing greenhouse gas emissions. Many of the actions we take to reduce our reliance on oil will also combat climate change by reducing our greenhouse gas emissions, for example, by encouraging public transport use. Whereas some other solutions— developing liquid fuel from coal for example—have significant greenhouse gas emissions and need to be carefully assessed as viable alternatives. Queensland will therefore need to make wise decisions in relation to future fuel alternatives that are both economically and environmentally viable.

Brisbane buses fueled by CNG

More than one third of Brisbane Transport's buses now run on compressed natural gas (CNG), with plans to gradually replace the remaining older diesel buses with CNG, or alternative cleaner fuel buses.

Compared to most diesel buses, gas buses produce 99 per cent less carbon monoxide, 82 per cent less hydrocarbons, 94 per cent less nitrogen oxide, 15 per cent less carbon dioxide and greenhouse gases and 60 per cent less noise.

The business case for using CNG buses is also appealing. The cost of operating CNG buses is about half the price of diesel buses.

Exploring fuel alternatives requires consideration of technical feasibility, economic viability and ecological sustainability. It also requires Queensland to choose alternatives that will support the structural reform required to adjust the economy to a more sustainable future. As a general rule, new fuels should contribute positively to the following twin goals:

- Reduce vulnerability to oil supply
- Reduce greenhouse gas emissions that accelerate climate change.

Introduction to alternative fuels

Natural gas

Queensland has extensive natural gas reserves primarily in the form of coal seam methane. Natural gas is a versatile fuel that can be converted to compressed natural gas and liquid natural gas—both suitable transport fuel substitutes. Recent analysis undertaken by Heuris Partners suggests production of natural gas as an alternative to oil may be a competitive option for Queensland.

However, like oil, natural gas is a finite fossil fuel. The Commonwealth estimates that Australian gas reserves are equivalent to 100 years of supply at current rates of production[8]. Further, while Australia and Queensland have large natural gas reserves, a large proportion of this gas is located in remote offshore areas and is difficult to access and transport. Natural gas from renewable methane sources, such as biogas generated from organic matter in landfill, may provide an important fuel substitute in the future.

Gas to liquids (GTL)

This process converts natural gas, such as coal seam methane, to a diesel replacement. Queensland has large reserves of coal seam methane and GTL offers substantial opportunities for Queensland. GTL technology is an energy-intensive process and produces greenhouse gas emissions of a similar magnitude to conventional oil refining. However, this is in part offset by lower greenhouse gas emissions from the combustion of the fuel (as carbon dioxide) than would be released by methane, which is a more damaging greenhouse gas.

Propane or liquid petroleum gas (LPG)

LPG is manufactured during the refining of crude oil and natural gas. LPG is currently the primary alternative for transport fuels in Australia. LPG has fewer emissions than petrol, and the technology and infrastructure are reasonably well established.

There are constraints to the industry developing further in Queensland including Queensland's limited resources of LPG (as a by-product of crude oil and natural gas) and a market that currently delivers petrol at comparatively competitive prices.

8 Quoted in Taygfeld, P., Dodson, J., Burke, M. , Gleeson, B. and Sipe. N., 2006, 16 Energy Vulnerability and Long-Term Public Transport in South East Queensland (SEQ) (Unpublished) Griffith University Urban Research Program Research Monograph 11.

Biofuels

Biofuels include ethanol and biodiesel. Biofuels are produced from grains, seeds and vegetable matter. Ideally, both the ethanol and biodiesel industries should not be dependent on feed stocks or land that competes with food production. Otherwise, increased use of biofuels could link food crop prices to the global fuel market, thereby increasing food costs and raising equity concerns.

Ethanol

Australia produces ethanol primarily from grain, grain residues and sugarcane. Ethanol production involves fermentation with sugars from molasses or with starches from grain. Ethanol has a reasonably low ratio of energy returned for energy expended, which limits its potential as a competitive option. In Queensland, ethanol is a fuel extender and therefore still includes an oil component.

Biodiesel

Biodiesel is produced from feedstock such as tallow, canola and palm oil, and cooking oil waste. Biodiesel is a direct replacement for diesel. Biodiesel produces more energy than energy invested in production, fewer greenhouse gas emissions and requires lower agricultural inputs than ethanol. However, there are a variety of environmental concerns with biodiesel, including the clearing of native vegetation to grow feedstock and the extensive use of water and agricultural chemicals.

Second-generation biofuels

The Queensland Government is currently researching new biodiesel feedstocks, such as algae, that do not compete with food production. Queensland is also investigating other ethanol feedstock, such as lignocellulostic ethanol, which involves producing ethanol from plant waste by breaking down of cellulose and subsequent fermentation. However, these are still in the very early development phase.

Coal

Queensland has large reserves of high quality coal that can be used as an indirect substitute to meeting alternative fuel demands caused by declining oil availability, both through electricity generation (to power electric rail and vehicles) and through coal-to-liquid technology. However, coal is a non-renewable fossil fuel and coal production (such as coal-fired electricity) emits large amounts of greenhouse gases.

Given climate change considerations, future coal directions are largely reliant on further innovations in low emission technologies and carbon capture and storage. Queensland is actively involved in developing carbon capture and storage technology.

Coal-to-liquids (CTL)

Through a process of gasification, coal can be converted to liquid fuels. This creates high quality replacements for diesel, jet fuel and petrol. Future directions in CTL will likely require substantial infrastructure investment. In addition, the process is energy-intensive, producing significantly more greenhouse gasses than conventional oil refining.

WA: securing gas supply

The Western Australian Government has a gas reservation policy that ensures the equivalent of 15 per cent of Liquefied Natural Gas (LNG) production from export gas projects are reserved for domestic use. This is a condition of access to WA land for the location of processing facilities.

The gas reservation policy is designed to change to suit the existing circumstances. The target of 15 per cent is flexible and could change over time as it is subject to periodic review.

Additionally the policy allows for negotiations between the State and LNG project proponents to occur on a case-by-case basis regarding the method by which proponents fulfil their domestic gas commitments, including from alternative sources.

The domestic gas policy aims to balance the interests of gas producers, gas consumers and the broader Western Australian community.

Adelaide's solar electric bus

Adelaide City Council has added a solar-powered electric bus to its passenger transport fleet. The Tindo, whose name is taken from the Kaurna Aboriginal name for sun, is recharged using 100% solar energy and will be used everyday on the Adelaide City Council's free Adelaide Connector Bus service.

Tindo uses 11 Swiss-made Zebra sodium nickel chloride batteries. These batteries give Tindo a 200km range and are recharged using a unique solar photovoltaic (PV) system at the Adelaide Central Bus Station. The $550 000 solar PV system supplied by BP Solar is currently Adelaide's largest grid-connected system, generating almost 70 000 kilowatt hours of electricity each year to offset the total energy required to recharge Tindo's batteries.

The bus can carry up to 42 passengers, with 25 standard seats, two seats especially designed for disabled passengers, and room for 15 standing passengers.

Oil shale

Queensland has large reserves of oil shale. The shale can be heated to produce non-conventional oil. However, like some other alternatives, the production of shale oil is capital and energy intensive.

There are environmental concerns about the production of oil shale, notably, it is greenhouse intensive, emits toxic compounds and uses large amounts of water in the heating process. In addition, the majority of Queensland's deposits of oil shale are in the environmentally sensitive Great Barrier Reef region, between Proserpine and Bundaberg. A number of these reserves are located in the Great Barrier Reef World Heritage Area.

Hydrogen

Hydrogen can be produced from a number of renewable and non-renewable sources including solar, biomass, coal and natural gas. Combining hydrogen with oxygen in a fuel cell generates electricity and produces water as a by-product. However, the production of hydrogen from fossil fuels such as coal and natural gas is energy-intensive. Hydrogen development is rapidly expanding. As research in this area progresses, the role of hydrogen in a future economy will become more apparent.

Renewable electricity generation

Low emission electricity generation will play an important role as an indirect substitute for oil-based fuels, as future electricity demand for both transportation and energy is likely to grow. Electric rail and electric or hybrid electric vehicles are powered primarily by electricity.

In addition to conventional electricity sources such as coal, low emissions technology including solar, geothermal and wind power will be important considerations in the electricity mix. These low emission technologies need significantly more investment and do not currently contribute substantially to Queensland's electricity generation.

Planning for oil-resilient towns and cities

Regional and local land-use planning that gives careful consideration to future oil constraints is another critical step in reducing our reliance on oil. Technology alone will not be sufficient to meet the potential fuel supply gap. By designing and building resilient and self-reliant regions, Queensland can minimise the impact of future supply shortages and secure a sustainable future.

Building self-reliant cities and regions

A future without a plentiful supply of low-cost oil will mean significant changes to the way we structure our societies and our lifestyles.

Continuing high oil prices will present challenges for all Queenslanders. If the cost of oil-intensive products and processes continues to rise, rural, regional, and outer-urban communities that are most reliant on oil are likely to be most affected, notably due to greater distances for the transport of people and goods. Increased transport costs have a direct effect on household budgets and will disproportionately affect low income households.

Queensland must prepare for future changes and plan accordingly. There is great scope for economic gains and for building stronger and healthier communities if rural and urban townships are less dependent on oil. This way, irrespective of the severity of future oil shortages, communities are less vulnerable to resulting economic and social change.

Supporting existing cities and townships

An important strategy for reducing oil dependence is investment in compact, liveable and affordable settlements that reduce reliance on cars and provide diverse transportation options. More integrated structures of housing, working facilities, shopping, places of holiday and leisure allow people to live without having to travel long distances.

Providing affordable housing in areas that are well serviced by public transport, encouraging opportunities for local industry and providing other essential services will be critical in preparing for demographic and regional change. Furthermore, retaining green space and agricultural land in and around our major population centres is also important. This may provide an avenue for locally grown produce that does not rely on long freight distances and high oil costs.

A more localised style of living that supports local supply chains has many potential benefits including:

- renewed prosperity in local and regional areas
- opportunities for employment and innovation
- efficient and affordable transport
- diverse and unique townships with strong community identity
- protection of local biodiversity
- community health benefits.

Queensland is planning for a future where urban development is characterised by compact, well-serviced communities, connected by effective transport networks.

The South East Queensland Regional Plan and the Far North Queensland Regional Plan, as examples of new statutory planning arrangements, both describe a strategy for urban development in Queensland that aims to protect biodiversity, contain urban development, build and maintain community identity, make travel more efficient, and support a prosperous economy.

The Far North Queensland Regional Plan specifically acknowledges Peak Oil as a significant planning consideration.

Planning new urban development

All the benefits of sustainable land-use planning and more localised development that apply to renewing existing urban areas also ring true for new urban developments. New developments provide a good opportunity to get it right the first time around.

Future development that creates dense, walkable communities supported by integrated public transport will make it possible for people to live a high quality of life without complete dependence on a car for mobility.

Upholding these strong urban design principles and settlement patterns will be especially important for future development on urban fringe or greenfield lands, which are potentially at risk of isolation from essential services. In response to volatile oil prices, there is a strong need to develop future urban areas as integrated communities with appropriate connections and accessibility to surrounding townships.

Preparing now

Sustainable land-use planning and localised development is an important step in building self-reliant regions that are prepared for future oil uncertainties. However, designing better cities and towns and building self reliant regions takes time. The wide variety of urban environments often also means measures that successfully improve transport and liveability in one area will not always deliver the same outcome elsewhere.

The Queensland Government is now making a start to address the impacts of reduced oil availability for all urban, rural and regional Queensland communities.

What you can do

It is up to all of us as Queenslanders to take steps to reduce our reliance on oil. There are many things we can do right now.

Here are some ways we can all prepare:

1. **Familiarise yourself with the issues outlined in this paper.**
   Simply being aware of peak oil and oil vulnerability is the first important step to preparing and adjusting for future changes.
2. **Talk about this issue with friends, neighbours, employees and local community members.**
   If you are concerned about this issue, chances are other people around you are too.
3. **Think about how you can make a difference.**
   This may include simple actions to reduce fuel consumption such as:
   - reducing private vehicle use (by not driving so much, car pooling, taking public transport, riding a bike etc)
   - supporting local initiatives and industry that reduce food and commodity kilometres (by buying local produce, using local services, growing some of your own food etc)
   - getting involved in local and regional planning processes (by contributing submissions through government consultation processes, contacting your local member etc).
4. Visit the EPA website www.epa.qld.gov.au for more information about oil issues, sustainability and climate change.

Invitation to comment

The Queensland Government welcomes your feedback on matters raised in this information paper. Comments will contribute to the next phase in developing an Oil Vulnerability Mitigation Strategy and Action Plan for Queensland.

Submissions must be in writing and may be submitted to:

Post: Environmental Protection Agency

Oil Mitigation Strategy, File Ref: 33800
PO Box 15155
CITY EAST QLD 4002

Email: oil.mitigation@epa.qld.gov.au

Marked "Oil Mitigation Strategy"

Closing date for submissions is 5.00 pm on Friday 17 October 2008.

Further information

Further information about the development of the Oil Vulnerability Mitigation Strategy and Action Plan is available at www.epa.qld.gov.au.

Public access to submissions

Submissions may be accessible under the Freedom of Information Act 1992. Please identify any submission, or part of a submission, that needs to be treated as "commercial-in-confidence". Similarly, if a submission contains details about a person's personal affairs (his or her experiences relevant to a matter covered in this document), and it is in the public interest to protect the person's privacy, the "personal" information in that submission would not be accessible under the Freedom of Information Act 1992.

Disclaimer

This document is for information purposes only and does not commit the Queensland Government to the views expressed or to any future action. This document does not necessarily represent Government policy.

Further Reading

Australian Association for the Study of Peak Oil and Gas
http://www.aspo-australia.org.au/

CSIRO (2008) *Fuel for thought; the future of transport fuels – challenges and opportunities*.

http://www.csiro.au/files/files/plm4.pdf

Heuris Partners Ltd (2008) *The Oil Vulnerability Strategy/Action Plan for Queensland: Research Paper.*

Heinberg, R (2006) *The Oil Depletion Protocol*. New Society Publishers,Gabriola Island, Canada.

Heinberg, R (2003) *The Party's Over*. New Society Publishers, Gabriola Island, Canada.

Lerch, D (2007) *Post Carbon Cities: Planning for Energy and Climate Uncertainty*. Post Carbon Books, United States.

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

Queensland Government (2007) *Transport 2007 – An action plan for South East Queensland*.

http://www.transport.qld.gov.au/Home/Projects_and_initiatives/Plans/Integrated_transport_plans/Transport_2007/

Queensland Government (2007) *South East Queensland Regional Plan 2005–2026*.

http://www.dip.qld.gov.au/resources/plan/SEQ/SEQ_Regional_Plan_2005_2026.pdf

Queensland Government (2007) *Far North Queensland Draft Regional Plan 2025*.

http://www.dip.qld.gov.au/docs/temp/fnq/FNQRegPlan2025-DRAFT.pdf

Queensland Oil Vulnerability Taskforce (2007)
Queensland's Vulnerability to Rising Oil Prices Taskforce Report.

Sunshine Coast Energy Action Centre

http://www.seac.net.au/main/

Enquiries should be addressed to PO Box 15155 City East, Qld 4002.

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