# OIL VULNERABILITY STRATEGY/ACTION PLAN FOR QUEENSLAND: RESEARCH PAPER

**Report to the Minister for Sustainability, Climate Change and Innovation.**

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**ABBREVIATIONS**

ABARE - Australian Bureau of Agricultural and Resource Economics

BAU - Business as usual

CCD - Census Collectors District

CNG - compressed natural gas

CSG - coal seam gas

CSIRO - Commonwealth Scientific and Industrial Research Organisation

ESM - energy sector model

ETS - emissions trading scheme

GDP - Gross Domestic Product

GE - General Equilibrium

GSP - Gross State Product

GTL - gas to liquids

IC - internal combustion

IEA - International Energy Agency

LNG - liquefied natural gas

LPG - liquid petroleum gas

NESA - National Energy Security Assessment

NETT - National Emissions Trading Taskforce

OESR - Office of Economic and Statistical Research

PHEV - plug-in hybrid electric vehicle

PT - public transport

VAMPIRE - Vulnerability Assessment for Mortgage, Petrol and Inflation Risks and Expenditure

**Executive Summary**

In October 2007 a report from the Queensland Oil Vulnerability Taskforce was tabled in Parliament[1] (The Report). In the light of this Report, the Government has commissioned the development of an oil vulnerability mitigation strategy and action plan.

This research paper provides an overview of a range of critical issues relevant to the development of such a strategy, including: possible broad principles and approaches to manage the inherent risks and uncertainties surrounding the timing and net impacts of peak oil on Queensland; projections of Queensland's vulnerability to the potential impacts of peak oil, drawing on currently available data and modelling; and suggesting the further work required to evaluate and refine possible initiatives to reduce Queensland's vulnerability to rising/more volatile oil prices and to the potential supply disruptions.

Analysis to date of the possible impacts of oil demand outstripping supply suggests that:

- At a broad macroeconomic level, Queensland's rich resource endowments of gas and coal provide a natural hedge against the oil price outlook that would be consistent with a nearer term plateauing of global oil production. Absent a major global recession, the general upward movement in energy prices would be reflected in improved terms of trade, economic activity and higher government revenue for Queensland;

- Higher prices would likely generate adverse sectoral impacts for industry sectors unable to pass on these higher input prices to downstream markets and/or exposed to end markets that are particularly sensitive to higher oil prices (such as air transport).

For households, there is some evidence that such a high oil price environment could combine with other proximate factors (location and low household income) to generate adverse equity impacts that would require consideration in terms of offsetting policy measures.

Detailed modelling of the road transport impacts of high oil price scenarios indicate a major response in terms of reduced oil-based liquid fuel use, delivered primarily via sharply increased fuel efficiency and fuel switching. Further work is required:

- To test and validate these assumptions, particularly those that involve large scale capital investments under conditions of significant uncertainty about future oil and carbon prices;

- To develop and test policy packages in the transport sector for robustness, cost effectiveness and coherence in relation to reducing liquid fuel demand and CO2 emissions and meeting other policy objectives for the sectors.

[1] *Queensland's Vulnerability to Rising Oil Prices Taskforce Report* (April 2007)

Physical supply risks, impacts and mitigation options have not been evaluated via either economic modelling or detailed interaction with critically exposed sectors.

Initial analysis suggests that Queensland's coal seam gas (CSG) resource provides a significant source of liquid fuel diversification away from conventional oil, both via compressed natural gas (CNG) and gas to liquids (GTL). Further work is required to validate/evaluate options in this area compared with a range of other supply side options.

Most of the work to date has been drawn on existing sources of data without the benefit of input from agencies with detailed knowledge of key sectors outside the transport sector and with broader oversight of economic issues/expertise. Interaction with these agencies would:

- Assist in generating deeper understanding of sectoral exposures to oil risk and approaches to oil risk mitigation.
- Clarify possible risk management objectives in relation to oil price and/or supply risk.

Clarifying and delineating an oil risk mitigation strategy for Queensland requires an extension and deepening of analysis and evaluation of risks and potential mitigation measures involving:

- Macroeconomic and sectoral modelling to understand future risks/impacts with and without policy interventions;
- Consultation and joint working between the Environmental Protection Agency (EPA) and key agencies (Department of the Premier and Cabinet, Department of Tourism Regional Development and Industry, Treasury /OESR, Department of Mines and Energy, Department of Primary Industry and Fisheries, Department of Planning & Infrastructure); and
- Finalisation of a strategy and action plan.

## 1. Context and Purpose

In October 2007 a report from the Queensland Oil Vulnerability Taskforce was tabled in Parliament[2] (The Report). In the light of this Report, the Government has commissioned the development of an oil vulnerability mitigation strategy and action plan.

This research paper provides an overview of a range of critical issues relevant to the development of such a strategy. It does not purport to be an exhaustive model based analysis of the risks to Queensland arising from a peak oil environment, nor the full range of appropriate policy responses. As such it draws primarily on a range of existing data sources as a basis for:

- Briefly setting out the evidence base supporting concerns about peak oil, including developments since the Taskforce Report was completed, drawing on pre-existing modelling work undertaken by the Queensland Treasury;
- Suggesting some broad principles and approaches to manage the inherent risks and uncertainties in understanding the timing and net impacts of peak oil on Queensland;
- Presenting illustrative projections of Queensland's vulnerability to the potential impacts of peak oil, with a focus on the possible direct impacts on the road transport sector, on key macroeconomic variables and social/equity impacts; and

## 2. The Nature of the Peak Oil Challenge

The Taskforce Report found that most published estimates consider that conventional oil production is likely to peak between 2005 and 2010. Given continuing strong and largely inelastic demand growth, this implies upward pressure on oil prices, with the potential for steep increases and increased price volatility.

As the Report makes clear, there are very large uncertainties about when and how the impacts of peak oil might play out. Among other things, these uncertainties include:

- The resulting level of oil and other energy prices globally and domestically out into the future; and
- The implications for physical supply.

There is a wide range of views on the medium to long term outlook for oil and energy prices.

One view is that there will be an initial retreat from current levels and from there a gradual upward trend in oil prices as flat or declining supply intersects with strongly increased demand. Another places more emphasis on the short run elasticity of supply and demand with sharp upward movements in prices, accompanied by high volatility and, possibly, by absolute physical shortages of

[2] *Queensland's Vulnerability to Rising Oil Prices Taskforce Report* (April 2007)

fuel.[3] These different perspectives reflect differing underlying critical assumptions, for example the size and productivity of remaining conventional oil, the availability of substitutes for liquid fuels and the behavioural response to rising oil prices.

### *a. The impact of these changes on the global economy*

Analysis by a range of international agencies, together with the experience with previous global oil shocks, suggests the general impact of a long term higher oil price would be to reduce economic growth. A price increase transfers income from oil-consuming to oil-producing nations. The net economic effect is negative. Industries in which oil and gas are a higher proportion of input costs will be relatively more affected. These include transport (particularly road and air transport), mining and metals, explosives and agriculture, unless they can pass the higher input prices on to final consumers.

For consumers, higher fuel prices are likely to have most effect on those who are highly reliant on car transport and lack alternatives. These people tend to be outer suburban residents and rural and regional communities on average or below average incomes.

For both industry and consumers generally, there is an added danger of the higher interest rates from monetary authorities' attempts to control the inflationary impact of the higher prices.

Partly driven by the differing views about oil price and availability over the medium term, there are also widely divergent opinions on the likely onset and intensity of these impacts. This will be a factor of:

- how soon the world oil supply plateaus;
- how steep the decline in oil supply is afterwards;
- what the price effect is of a shortfall in supply (which depends on the elasticity of demand - consumer response to changes in the oil price);
- how much support governments give to encouraging alternatives to oil;
- the response from global financial institutions to the massive income transfers created by higher oil prices; and
- most importantly, whether market signals are sufficiently clear and timely for the necessary investments in new technologies or other adaptations.

One view is that an unexpected rapid onset of much higher oil prices and physical shortages would result in major geo-political disruption, akin to but much more sustained and severe than those

[3] See, e.g., Shares Rally as Oil Continues to Fall; http://www.nytimes.com/2008/08/09/business/worldbusiness/09markets.html?_r=1&oref=slogin; Crude Oil Retreat, Sunrise or a Lull Before a Storm; http://energybulletin.net/node/46199; August 2008.

experienced following the 1967 and 1973 oil shocks.[4] Another is that the world would adjust relatively smoothly to changing relative prices of fuels, reflecting more informed economic management, the declining energy intensity per unit of gross domestic product (GDP) of many developed economies and the ability of markets to provide solutions.[5]

The implications of peaking conventional oil production will also interact with a broad range of political, technical, environmental and social change drivers. These include other macroeconomic factors (e.g. the evolving implications of the sub-prime debt problems), population growth, environmental stressors (such as climate change), urbanisation, geo-political shifts and continued technological developments (for example, the convergence of IT and biological and physical sciences). These will combine in highly uncertain and probably surprising ways and the overall net impact will also be heavily influenced by government policies and programs here and overseas.

### *b. Australia's vulnerability to oil shocks*

Queensland's vulnerability to oil shocks is mediated through its position as a major component in the Australian economy. How a major oil shock would ramify through the Queensland economy will depend on both the underlying resilience of the Australian economy which in turn is a function of both the country's resource endowments and the strength of its political and social institutions. Reaching an informed view on Australia's vulnerability is not easy.

Recent published work evaluating the relative oil vulnerability of 26 net oil-importing countries places Australia at the low end of oil vulnerability risk. [6]

This analysis uses seven indicators to assess relative oil vulnerability[7]. Using the principal component technique the analysis combines these individual indicators into a composite index of oil vulnerability. The index is intended to capture the relative sensitivity of the selected economies towards developments of the international oil market, with a higher index indicating higher vulnerability (Figure 1).

Australia ranks lowest of the 26 countries. This reflects the combination of large domestic energy resources, low population and underlying strength of its economy and political stability. This assessment is based on 2004 data and will clearly change over time. For example, Australia's oil import ratio has risen over the past four years. Also it may not take fully into account Australia's

[4] See, e.g., Geopolitical Disruptions #1, Theory of Disruptions to Oil and Resource Supplies, August 2008; http://www.theoildrum.com/node/4373#more.

[5] See, e.g., Lovins, A .et al., *Winning the Oil Endgame*, Earthscan, London, 2004.

[6] "Oil vulnerability index of oil-importing countries": Eshita Gupta, The Energy and Resources Institute, India (Energy Policy 36, March 2008).

[7] These are the ratio of value of oil imports to gross domestic product (GDP), oil consumption per unit of GDP, GDP per capita and oil share in total energy supply, ratio of domestic reserves to oil consumption, exposure to geo-political oil market concentration risks as measured by net oil import dependence, diversification of supply sources, political risk in oil-supplying countries, and market liquidity.

potential exposure to stochastic supply shocks, particularly in relation to diesel where Australia is very dependent on Asian refinery capacity. On the other hand, recognised gas resources are likely to have increased over the same period.

**Figure 1: oil vulnerability index of all 26 countries (2004)**