

Kokoda Paper No. 10

August 2009

SECURING AUSTRALIA'S ENERGY FOR THE FUTURE

Erin Hurley

The Kokoda Foundation

www.kokodafoundation.org

Researching Australia's Security Challenges

Published in Australia by the Kokoda Foundation, August 2009

© The Kokoda Foundation

This book is copyright. Apart from any fair dealing for the purposes of private study, research, criticism or review as permitted under the Copyright Act, no part may be reproduced by any process without written permission. Inquiries should be made to the publisher. This book must not be circulated in any other binding or cover.

National Library of Australia
Cataloguing-in-Publications entry

Hurley, Erin Elizabeth, 1978- .

Securing Australia's energy for the future / Erin Hurley.

ISBN 9780975821886 (pbk.)

1. Energy policy—Australia. 2. Power resources—Australia. 3. National security—Australia. 4. Australia—Foreign relations. I. Kokoda Foundation. II. Title. (Series : Kokoda Papers ; no. 10).

333.790994

Series Editor: David Schmidtchen

Cover and design: Qote Canberra (02) 6162 1258

Printed by: Bluestar Print Group

Published and distributed by:

Kokoda Foundation,
First Floor, 182-200 City Walk,
Canberra City, ACT 2600
(Ph) +61 2-6204-1822

Email: manager@kokodafoundation.org

Web: www.kokodafoundation.org

Additional copies are available from the Foundation at
A\$22.00 (including postage and GST) per copy.

SECURING AUSTRALIA'S ENERGY FOR THE FUTURE

EXECUTIVE SUMMARY

A nation's ability to access and/or exploit the resources necessary to sustain and support political sovereignty, the necessities of daily life and economic growth will define our Energy Security in the remainder of the 21st century. On 4 December 2008 within the First National Security Statement Address to the Australian Parliament, Prime Minister Rudd, cited this 'master resource' as a critical national security interest. Energy security as a national security priority has two components:

- the adequacy of domestic resources and import arrangements to meet domestic energy consumption and
- the demand for and safe transport of Australia's energy exports to regional and international markets

To provide context for the discussion of what will influence Australia's energy security for the future, one that frames alternatives, requires consideration of both components of energy security. It includes an explanation of Australia's resources and trade and consideration of her energy infrastructure, technology and environmental priorities as internal issues that will shape Australia's policymaking. Two interrelated external influences on Australia's energy security: the Global Energy Market and Geopolitics also bear on the problem. An explanation of the significance for Australia follows each issue. Finally, the paper concludes with five recommendations. The recommendations consider the internal and external influences covered and seek to provide a path to strengthening Australia's energy security. An overview of the recommendations is provided below,

Recommendation 1: Elevate and incorporate energy security issues into Australia's national security community.

A complex issue that demands nuanced policymaking reflecting an understanding of the intersection among security, geopolitics, economics, infrastructure, technology and environment, Energy Security requires the fulfilment of the Prime Minister's whole-of-government approach to national security. Practical approaches to meeting the aims of this recommendation include strengthening coordination among relevant government departments, establishing a section responsible for 'Resource Security', within the Homeland and Border Security Division at the Department of Prime Minister and Cabinet and recruiting and training public administrators to focus on energy as a national security issue.

Recommendation 2: Communicate the current and future state of Australia's energy security to the Australian public.

The energy decisions made today will impact Australians for decades to come. Communication on energy issues that provides transparency and translates the immediacy of Australia's energy challenges has the capacity to mitigate 'gut economic nationalism' and provide context for a greater understanding by the public. The unpredictable nature of the energy market makes it likely that in Australia's national security interest, government may need to ask for action and/or sacrifice on behalf of the public. The Australian Government should prioritise the communication of the level of Australia's dependence on foreign oil, explain Australia's move from a trade surplus to a trade deficit in transport fuels and explain why Australia both imports and exports crude oil.

Recommendation 3: Determine that the projected level of reliance on imported oil is unacceptable and actively pursue its avoidance.

As a producing nation, until recently Australia has avoided a high level of dependency on energy imports. The international energy market is unpredictable and unreliable and intensifying worldwide competition for resources makes the market less

reliable. Avoiding increased dependence on energy imports best serves Australia's national interests. Approaches to lessening Australia's dependence may occur at the local, state and/or Commonwealth level and include demand-side initiatives, increased public investment in research and development for fuel substitutes and increased investment in domestic refining capacity.

Recommendation 4: Focus on optimising low emission energy sources for domestic consumption and export revenue generation.

At a time when environmental concerns about the burning of fossil fuels and uncertainty about the commercial viability of carbon capture and storage threatens the long term viability of coal, Australia relies on that commodity for domestic electricity generation and for the majority of energy export revenues. Australia's future energy security is best served by preparing to diversify sources for electricity generation and to optimise revenues from low emission exports. Practical approaches to meeting the goal of this recommendation include the implementation of the Emissions Trading Scheme and the funding to support the renewable energy targets and maximising the potential for Australia's uranium.

Recommendation 5: Enhance regional energy cooperation

The developing nations of the Asia Pacific region are most responsible for the increasing worldwide demand for energy. Increased demand threatens regional stability while also representing a shared interest that will create further opportunities for the nations of the Asia Pacific to work together. For example, increased activity in the region's seas presents a risk to energy transport but also an opportunity to tackle security challenges collectively. Australia must do what it can to foster collaborative approaches to alleviating the negative effects on increasing competition for energy supplies

Australia can play a pivotal role in the stability of the Asia Pacific region. That role is enhanced through the adoption of the first four recommendations. An integrated national

security community committed to reduced dependency on imports, transparent policymaking for an informed public, and the optimisation low emission energy sources will position Australia to be an 'Island of Calm' in the inevitably chaotic energy markets of the decades ahead.

This report is not intended to be the last word on the subject. Readers who wish to discuss and debate aspects are encouraged to do so by preparing either a short commentary or a longer article for the Kokoda Foundation's professional journal, *Security Challenges*. For details on how this can be done, please visit:

<http://www.kokodafoundation.org/journal/New%20Site/author.html>

ACKNOWLEDGEMENTS

The Kokoda Foundation wishes, in particular, to express its thanks to the Australian Department of Defence and Jacobs Australia for their generous support of this and other projects.

This paper benefits from the extensive research conducted by Kate Delaney in 2007 and 2008. Thanks are also due to the experts in energy security and national security that were engaged through the Kokoda Foundation.

I would like to thank Noetic Principal Andrew Balmaks for this opportunity to dedicate significant time and effort to the analysis of this important topic. Finally, I would like to thank my husband, Major Dan Küffer, who reviewed countless earlier drafts, tested my ideas and enabled me to strengthen this paper.



Australian Government

Department of Defence

JACOBS™

ABOUT THE AUTHOR

ERIN HURLEY

Erin Hurley is a Consultant with Noetic Solutions, where her work is focused on business planning, the resources sector and sustainability issues. Erin joined Noetic after nearly two years advancing the legislative priorities of the Joint IED Defeats Organization within the US Department of Defence. Prior to working within Defence, Erin worked in various legislative and non-profit advocacy positions in Upstate New York and Washington, DC. Erin graduated from Canisius College in Buffalo, NY, with a Bachelor of Arts (Hons). Erin earned a Masters Degree in Public Administration with a policy focus on National and International Security at the Maxwell School of Citizenship and Public Affairs in Syracuse, NY.

CONTENTS

	Page
Executive Summary	i
Acknowledgements	vi
About the Author	vii
Contents	viii
Introduction	1
Australia's Current Energy Position	3
Australia's Energy Infrastructure, Technology and Environmental Priorities	9
The Global Energy Market	19
Geopolitics	28
Recommendations to Support Australia's Energy Security	37
Conclusion	43
About the Kokoda Foundation	44

SECURING AUSTRALIA'S ENERGY FOR THE FUTURE

INTRODUCTION

AIM

Critical to powering a nation's industrial, residential, and transport sectors as well as its defence assets, energy has been called the 'master resource'. In his first National Security Statement to the Australian Parliament, Prime Minister Kevin Rudd articulated Australia's long-term security challenges, noting the integral role of energy security to national security. Energy security is not a new strategic issue for Australia or for that matter any other industrialised nation. Operating in an environment characterised as 'a complex and dynamic mix of continuing emerging challenges and opportunities', the critical task of securing Australia's energy security for the future offers great challenges¹ The aim of this paper is to describe Australia's energy environment and to identify opportunities and policy options to strengthen Australia's position in the future.

In the National Energy Security Assessment released in March 2009, the Department of Resources, Energy and Tourism defined energy security as the 'adequate, reliable and affordable supply of energy to support the functioning of the economy and social development'.² Two of the five national security interests outlined in the Prime Minister's National Security Statement are directly related to Australia maintaining an appropriate level of energy security. 'Preserving Australia's

¹ Address by the Prime Minister of Australia to the Australian Parliament, The Hon. Kevin Rudd MP, 'The First National Security Statement', 4 December 2008, <http://www.pm.gov.au/docs/20081204_national_security_statement.pdf>.

² 'National Energy Security Assessment, *Department of Resources Energy and Tourism*', 2009, p.5.

cohesive and resilient society and the long-term strengths of our economy' is the first. 'Promoting an international environment, particularly in the Asia-Pacific region, that is stable, peaceful and prosperous, together with a global rules-based order' is the second.³ Therefore, energy security as a national security interests has two priorities: meeting domestic energy demand and successfully moving exports to market. The description and analysis within this paper address both priorities.

To provide context for the description of what will influence Australia's energy security for the future, one must start with an assessment of our current energy position. This assessment includes an explanation of Australia's resources and trade and consideration of energy infrastructure, technology and environmental priorities as internal issues that will shape Australia's policymaking. Two interrelated external influences on Australia's energy security: the Global Energy Market and Geopolitics make an impact. Finally, the paper concludes with five recommendations.

METHODOLOGY

The methodology used to gain an understanding of Australia's energy security issues and subsequently to develop recommendations for future energy security included a review of the literature, interviews and consultations. Specifically:

- Reviewing diverse state-of-research works, which set out areas of science, including climate sciences, energy developments and technology.
- Drawing on the results of three closed workshops that brought together leaders in the fields of energy research, energy industry and energy policy.

³ Address by the Prime Minister of Australia to the Australian Parliament, The Hon. Kevin Rudd MP, 'The First National Security Statement', 4 December 2008, <http://www.pm.gov.au/docs/20081204_national_security_statement.pdf>.

- Interviewing people 'living in the energy sector'.
- Surveying more speculative opinion pieces and documents that provided a flavour of emerging debates and theories associated with energy security.
- Reviewing government and non-governmental publications to gather projections on energy supply and demand, often returning to the source for updates.
- Consulting with energy experts with an understanding of the Asia-Pacific region and the global energy market.

Australia's Current Energy Position

The annual 'Energy in Australia' Report produced by the Australian Bureau of Agricultural and Resource Economics (ABARE) provides a detailed overview of Australia as an energy producer and indicates that while maintaining domestic energy supply, 'Australia is well positioned to continue to supply a significant proportion of the world's energy needs.'⁴ Australia's future energy security depends on her ability to maintain that position. The first section below provides a breakdown of Australia's energy resources for consumption and export and, where available, provides broad projections for the future related to the adequacy of supply and position within the energy market. The second section outlines the influence of Australia's energy infrastructure, technology and environmental priorities on meeting the energy challenges of the future.

Although experiencing nowhere near the rate of growth in developing nations such as China and India, domestic consumption in Australia is increasing at a rate of 2.3 percent.⁵ However, the greatest shift in Australia's energy position in recent times comes from a shift from a trade surplus in liquid fuels to a trade deficit.

⁴ 'Energy in Australia 2009', ABARE, 2009, p. 1.

⁵ 'Energy in Australia 2009', ABARE, 2009, p. 4.

RESOURCES AND TRADE

Australia is the world's eighth largest energy producer. 66 percent of the energy produced in Australia is exported; the remaining 34 percent is retained for domestic consumption.⁶ Globally there are five sources for energy: coal, natural gas, nuclear, renewables and liquids (which includes oil).⁷ Energy production in Australia focuses on coal, uranium and natural gas and to a lesser extent liquids.

The Australian energy industry is critical to the Australian economy. Since the late 19th century, fossil fuels have represented a significant percentage of Australia's export revenues, continuing today with Australia's coal exports to China.⁸ Today Australia exports coal, liquefied natural gas (LNG), uranium, and to a lesser extent crude oil and other refined products. Coal is Australia's largest export earner, with a value of \$24B in 2007-08, followed by crude oil and LNG.⁹ Since 1987-88 the value of energy source exports has increased by an average of 7 percent and they currently account for 18 percent of total exports (2007-08).¹⁰

Australia's primary sources of domestic consumption are liquids and coal with the breakdown as follows: black/brown coal (40%), petroleum (34%), natural gas (20%) and

⁶ 'Energy in Australia 2009', *ABARE*, 2009, p. 4.

⁷ The reference to liquids refers to liquids as categorised by the US Department of Energy's Energy Information Agency: liquid fuels includes a full array of liquid product supplies, both conventional and unconventional. Conventional liquids include crude oil and lease condensate, natural gas plant liquids, and refinery gain; unconventional liquids include biofuels, gas-to-liquids, coal-to-liquids, and unconventional petroleum products (extra-heavy oils, oil shale, and bitumen).

⁸ M. Stutchbury, 'Up in Smoke', *Australian Literary Review*, December 2008, p. 14.

⁹ Note that there is distinction made between the amount of energy in a particular source and the earning capacity of that source.

¹⁰ 'Energy in Australia 2009', p. 2.

renewables (5%).¹¹ Broadly speaking, these sources support either the electricity or transportation sector.¹²

Coal

Electricity sector energy sources differ from country to country and in Australia's case, coal fuels 84 percent of electricity production.¹³ Australia possesses a significant percentage of the world's coal resources and currently possesses enough brown and black coal to power the electricity sector for hundreds of years. Further, coal is the energy source that is most likely to increase Australia's export earnings in 2008-09.¹⁴

Natural Gas

Although brown and black coal historically represented the primary energy sources in Australia, the contribution of natural gas to Australia's electricity and its contribution to Australia's export revenues is increasing. Fifty percent of the gas produced in Australia is exported, and gas exports are expected to increase by 15 percent in 2008-09.¹⁵

Nuclear

Nuclear power is not currently employed in Australia though uranium represents one of Australia's key exports. Australia's uranium is 38 percent of the total amount of uranium in the world.¹⁶

¹¹ 'Energy in Australia 2009', p. 12.

¹² Potentially, some energy sources may support both sectors in the future as research and development efforts focus on opportunities such as transforming coal to liquids, though most of these efforts are fairly immature.

¹³ 'Energy in Australia 2009', p. 22.

¹⁴ 'Energy in Australia 2009', p. 3.

¹⁵ 'Energy in Australia 2009', p. 49.

¹⁶ 'Energy in Australia 2009', p. 5.

Renewables

Renewables represent a small contribution of Australia's electricity generation (5%) and that contribution is dominated by hydro and wind sources with a small contribution from biomass and solar. Potential energy sources include geothermal and ocean or wave and large scale solar. At different stages of development renewables, addressed in more detail later in this paper, are expected to increase their role in electricity generation.

Liquids

The transportation sector worldwide depends on liquids.¹⁷ In Australia, commercial crude oil production began in 1964, with rapid expansion following discoveries in the Bass Strait and the Northwest Shelf.¹⁸ The oil discoveries since then have been relatively small. Australia has seven operational refineries, with six on the east coast and one on the west coast.¹⁹ As a result of declining domestic sources Australia currently imports crude oil and other refined products to meet domestic demand for transport fuels.

It is important to note that Australia exports crude oil despite the fact that domestic production is not meeting demand inside the country. This is due to the high cost of refining local crude oil. Further, a significant proportion of Australia's oil production occurs in the northwest where production centres are closer to the Asian refineries built as integrated refining centres capable of maximising Australia's crude oil at a lower price per unit. There is no spare refining capacity in Australia. This represents a serious risk, which must be managed.

¹⁷ In Australia liquids refer to crude oil, condensate, and liquid petroleum gas.

¹⁸ 'Australia's Future Oil Supply and Alternative Transport Fuels—Final Report', *The Senate Standing Committee on Rural and Regional Affairs and Transport*, 2007.

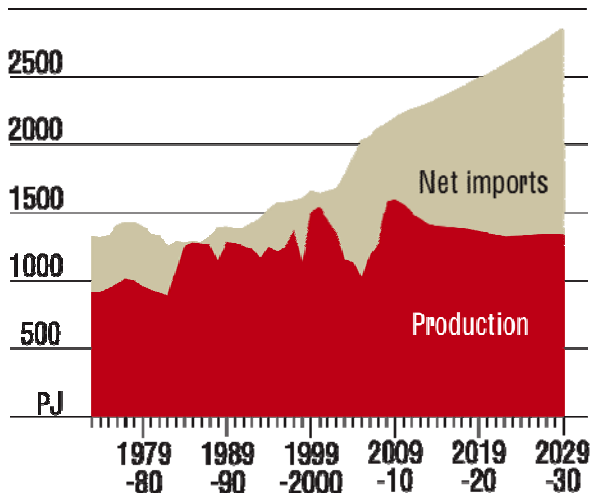
¹⁹ 'Maintaining Supply Reliability in Australia', *Australian Institute of Petroleum*, April 2008, p. 2.

Australia is less dependent on imports than most other developed countries resulting in an 'understandable tendency for Australian governments and society to be more sanguine about energy security than many of the other countries of the Asia-Pacific'.²⁰ However, Australia's exposure to market instability is increasing, particularly as the reliance on oil imports grows.

The current import percentages look favourable with 40 percent from domestic sources, 40 percent from regional sources (Singapore), and 20 percent from international sources (Middle East). However, as Australia's domestic oil production declines in coming years, that mix is expected to change with an anticipated increase in the percentage of imports from the Middle East to 40 percent, to meet increasing demand. In recent years Australia has been able to offset domestic decline through increasing the imports from the region, but this trend will unlikely provide a long term solution due to the fact that most of the oil reserves in the world are concentrated in the Middle East. The figure below demonstrates the projections of a dramatic shift to imported sources of oil and liquid petroleum gas (LPG).

²⁰ M. Wesley, 'Executive Summary: Energy in Australia's Foreign and Defence Policy', *ASPI*, 2007, p. 2.

Australian oil and LPG production and net imports



Source: *Energy in Australia 2008* DRET

There are serious economic consequences to this shift to imported sources. In a recent section of *The Australian* dedicated to oil and alternative fuels, Keith Orchison explained the impact of this shift on Australia's export revenues:

In 2000, with oil production at its peak, the production-to-consumption ratio was 100 per cent. National trade in oil, condensate and refinery feedstocks was \$300 million in surplus. Then the wheels started coming off, with a decline in domestic production from more than 800,000 barrels a day fewer than 600,000 barrels a day. On top of that, there was a reduction in refining capacity and a failure to develop liquefied natural gas fields more rapidly, allowing greater output of condensate, coproduced with natural gas. Trade slumped to a deficit of \$6.4 billion by 2006. Throw in liquefied petroleum gas and refined oil products and a \$900 million surplus in 2000 had turned into a \$13.7 billion deficit six years later. Since then, the trade imbalance has risen by half in the past three years and is

predicted to rise by more than another 40 per cent in the next five years.²¹

The continuing tightening of the energy market, described next, provides ample reason to reduce Australia's dependency on imported oil and prevent massive trade deficits.

AUSTRALIA'S ENERGY INFRASTRUCTURE, TECHNOLOGY AND ENVIRONMENTAL PRIORITIES

Energy infrastructure, technology and environmental priorities represent internal factors that influence Australia's future energy security. These factors are also linked because Australia's capacity to develop and adopt clean energy technology, decrease GHG emissions and diversify supply is tied to domestic infrastructure. In 2008 the IEA's World Energy Outlook described the gap between future demand and future supply, and indicated that the only way to fill that gap lies in an energy revolution that includes a technology revolution. This technology revolution comprises four key aspects: 'improved energy efficiency, increased deployment of renewable energy, widespread introduction of carbon capture and storage, and continued fuel switching [increased use of nuclear].'²² The IEA posits that these four aspects are critical to the world meeting demand, acknowledging that on a state-by-state basis, nations will choose a 'least cost approach' that will favour certain aspects over others'.²³

The Australian Government's participation in this energy revolution began with the ratification of the Kyoto Protocol in 2007 and commitment to the international climate change frameworks that will follow. This commitment demands a significant reduction in GHG emissions from a nation with the highest level of emissions per capita (while representing less than 2 percent of the world's GHG emissions). Australia plans to meet this commitment through the establishment of an

²¹ K. Orchison, 'The Energy Challenge', Oil and Alternative Fuels, The Australian, June 2009, Section 3, p. 1.

²² 'Ensuring Green Growth in a Time of Economic Crisis: The Role of Energy Technology', *International Energy Agency*, April 2009, pp. 5-6.

²³ *ibid.*, p. 6.

emissions trading market,²⁴ which will set a price for carbon, limit GHG emissions and generate revenues that can both fund research in renewable technologies and subsidise increased energy prices for some socioeconomic groups. The increase of the mandatory Renewable Energy Targets (RET) further encourages and incentivises specific multi-year funding arrangements and international engagement.

One of the benefits of the Australian Government's decision to address climate change is that the technological investment in the development of alternative sources advances Australia's energy security. The Australian Government's current funding commitments lean heavily toward clean coal and solar energy projects to meeting energy security priorities. Efficiency programs and activities are underway at the local, state and Commonwealth level in Australia. Additionally, energy efficiency represents one of the key objectives of the APEC Energy Working Group, where Australia dedicates significant diplomatic efforts.

Domestic Infrastructure

As a nation with a large land mass and a population density that is among the lowest in the world, Australia's domestic challenge in regard to infrastructure lies in determining the correct level of investment to service a sparse and unevenly spread population, a situation in which capital investment to provide service to each customer is higher than in other countries. In the case of infrastructure for electricity generation, criticisms articulated in October 2008 by Engineers Australia reflected the enormity of these challenges. They indicated that the system suffers from 'persistent transmission limitations'; the level of investment in additional capacity for peak generation far outweighs investment in sustainment; and the National Electricity Market (NEM) fails to

²⁴ Noting that the current Emissions Trading Scheme legislation would price carbon at \$10/tonne in 2010, with the price set to increase in 2011.

function as a national market and successfully coordinate the regional markets.²⁵

The effective management of a large infrastructure legacy is critical to ensuring Australia's energy security.²⁶ Australia invested heavily in domestic infrastructure in the 1970s and is now assessing the functionality of energy infrastructure that is reaching the end of its projected economic life. However, 30 year projections on infrastructure, like power grids and facilities, do not necessarily account for technological advances over this period that may extend that life span.

Notably, China possesses a distinct advantage over nations with ageing infrastructure because much of its infrastructure is relatively young or only now under construction. Though China's policymakers have chosen to build coal-fired power stations in large numbers, they are able to build-in technological advances that will likely lower GHG emissions and increase overall efficiencies, thus lowering the unit cost of production.

Australia's oil refineries were built in the 1950s and 1960s; modifications and improvements took place in 2005-2006. Increased competition for energy has led to a rapid expansion

²⁵ 'Response to Infrastructure Australia Discussion Paper #1: Australia's Future Infrastructure Requirements', *Engineers Australia*, 15 October 2008, p. 3.

²⁶ Infrastructure Australia, an infrastructure coordination office established in 2008 within the Department of Infrastructure, Transport, Regional Development and Local Government received \$20 million in funding over a four year period to develop a strategic blueprint to guide Australia's future domestic infrastructure. Infrastructure Australia's December 2008 report to the Council of Australian Governments (COAG) addressed energy infrastructure (electricity and gas) directly, highlighting the need to develop a national energy market to address inefficiencies and the inflexibility that arises from poor market design. This report asserts that the 'adequacy of interstate interconnection' is essential to the market's ability to respond to increased demand and to incorporate renewable sources. Additionally, the report noted that a National Transmission Planner will be appointed and be responsible for the preparation of an annual transmission network plan. This role will be increasingly important as Australia shifts to a greater reliance on renewable sources, many of which reside in areas that are not currently connected to the transmission network such as the wind generation opportunities in western Victoria and South Australia.

in refining capacity in the Asia-Pacific region, and as a result, Australia's refining industry will be forced to compete with newer, mostly larger refineries. An increased investment in refining capacity would improve the overall state of the liquid supply side as Australia's net self sufficiency in oil declines.

Almost all domestic infrastructure requires significant investment in the near term to support long-term energy security.

Renewable Energy

The Australian Government committed \$500 million to the development of renewable energy sources over the next seven years. The efficient use of these resources will be critical to realising the renewable energy targets outlined in the Carbon Pollution Reduction Scheme²⁷, which require an increase in renewable sources from 4 percent in 2009 to 20 percent by 2020. The raising of the mandatory Renewable Energy Targets has been enacted to stimulate the research, development, and commercialisation of renewable energy sources. Meeting this commitment requires upgrades to existing transmission infrastructure, with the particular challenge that renewable energy sources may be located great distances from existing powerlines.

The leading alternative energy sources support stationary electricity. In the area of transport, the opportunities to fuel switch are limited. Hydrogen fuel cells represent one option. Notably the Council of Australian Governments (COAG) announced in 2007 the development of a roadmap for 'effectively exploiting the emerging hydrogen and fuel cells market and supply chain opportunities, locally and globally'.²⁸ For electricity, the opportunities available to diversify supply

²⁷ Note that as of this writing the CPRS existed as Government policy that was not yet passed by the Senate. The policy is scheduled to be debated in August 2009.

²⁸ See, http://www.ret.gov.au/energy/clean_energy_technologies/energy_technology_framework_and_roadmaps/hydrogen_technology_roadmap/Pages/HydrogenTechnologyRoadmap.aspx.

and reduce GHG include natural gas technologies, clean coal technologies such as coal gasification and carbon capture and storage, nuclear energy and renewable sources.

Although most renewable energy sources have been well-developed for decades, higher prices for fossil fuels, market-based emissions trading and commercialisation of carbon sinks are likely to encourage rapid growth in the next twenty years. Renewable energy sources include solar, hydro and ocean, wind, biofuels and geothermal.²⁹ The promise of growth in the renewable industry has led to an array of innovative approaches to capturing and commercialising renewable energy.

- Solar photovoltaic and solar water technologies are successful in the global market and in use in homes throughout Australia. However, the significant upfront costs deter widespread use of solar water and, under the current regulation, the generation of solar PV electricity that returns to the power grid is not adequately subsidised. Australia's high levels of exposure to the sun suggest that solar should be both affordable and the primary means of heating hot water. Further, solar power is harnessed in a variety of ways and provides significant opportunities for innovation. The Australian company Solar Systems is planning to build a \$420 million photovoltaic plant in north western Victoria with the capacity to meet the energy needs of 45,000 homes. This plant will utilise space satellite technology and is capable of connecting to the existing electricity grid. The projected output from this plant will make this plant the biggest in the world.

In addition to projects such as these, solar power can also be captured through relatively inexpensive approaches such as refining concentrating solar

²⁹ Background information on the relative maturity of sources and Australian application provided through the Clean Energy Council Fact Sheets: <http://www.cleanenergycouncil.org.au/info/index.php>.

thermal (CST). ESolar, a Google funded start-up company, reduces the comparatively high costs of solar power through an innovative approach: 'unlike most of its competitors, which use large custom built parabolic mirrors to capture sunlight from all angles, ESolar uses small, flat mirrors, each about the size of a big screen television. The mirrors are easy to manufacture, and it takes just two workers to attach them to relatively light scaffolding on-site'.³⁰ ESolar's CEO projects that that solar power has the capacity to become cost-competitive with coal in the near future.

- Commercialised over one-hundred years ago, hydroelectricity represents a well-developed source with historical access to centralised electricity grids. The drought in Australia has impacted the use of hydro power (although no water is actually 'used' in the production of hydroelectricity). The innovation required for further development in Australia generally relates to the building of small hydroelectricity generators that could provide local power. Ocean energy sources including tides, current and waves remain under development. There is currently one wave power unit in New South Wales and others under development. There is potential that the future of hydro and ocean energy lies in a hybrid application called hydrokinetic power (that also incorporates elements associated with capturing wind power). Hydrokinetic power, currently being trialled in the US, functions 'like an underwater wind turbine' and produces energy by using the 'high velocity current gushing out of an existing hydroelectric dam to turn a 3.7 metre, three blade fan'.³¹

³⁰ 'The Future of Energy', *Popular Science*, July 2009, p. 45.

³¹ 'The Future of Energy', p. 46.

- Wind power is also a well-developed source benefiting from technological innovation. Wind power serves as a significant source of energy throughout Europe and is a major growth industry in the US and China. Wind power advocates cite the lack of tax subsidies for the industry as an impediment to widespread use in Australia though the increase of the mandatory renewable energy targets should encourage investment. A new approach to harnessing powerful wind energy—seabourne wind farms—is being applied in Norway: ...the turbine will be mounted 65 metres above the water on a floating platform, or spar...The steel spar, which is filled with ballast and extends 100 metres below the sea surface, will be tethered to the ocean floor by three cables; these will stabilise the platform and prevent the turbine from bobbing excessively in the waves.³²
- Biofuels generate power from agriculture crop, plantation wood, urban garden, food waste and algae and because of the accessibility of these materials represent a source with significant growth potential. Improvements are required in Australia's sugar mills and their associated power plants to optimise the output from this material. Biofuels are experimented with throughout the world as potential substitutes for both stationary electricity and transport.
- Geothermal remains under development. Similar to hydrogen, geothermal energy was an area of interest for the COAG in 2007 and DRET has been tasked with the roadmap for the development of this source. The Department is actively engaged in the development of the geothermal industry along with the technology. Geothermal energy is currently accessed through one power station in Queensland though many companies are exploring additional opportunities. Proponents highlight the fact that the

³² 'The Future of Energy', p. 49.

heat within and beneath Australia's surface has the capacity to provide 2.6 million years of Australia's energy supply.

The implementation of the Carbon Pollution Reduction Scheme should help drive investment in renewables to a greater percentage of Australia's supply. However, there are critical issues associated with the upgrades required to improve efficiency within the existing electricity supply system. This competition for investment dollars presents serious challenges to the development of renewables, as the future source. The fact that many renewable sources lack access to the National Electricity Market represents a significant impediment to the development of renewables though the examples above highlight the renewable industry's effort to develop solutions that leverage the existing system.

Proponents of renewable energy investment point to the fact that Australia's current centralised electricity infrastructure results in significant energy losses in transmission, estimated to be 8 percent of total generation. These losses equate to 18,000 gigawatts or 16 million tonnes of GHG emissions.³³ In addition to the potential reduction in transmission energy losses, increased uptake of distributed energy options lessens the pressure on existing grids and may negate the requirement for additional infrastructure investment in traditional generation and transmission.³⁴ Proponents of the existing electricity supply system point out that the only way to reduce line losses, and therein achieve a higher level of efficiency, is to invest in network upgrades.

³³ 'Response to Infrastructure Australia Discussion Paper #1: Australia's Future Energy Requirements', *CSIRO*, 15 October 2008, p. 11.

³⁴ 'Response to Infrastructure Australia Discussion Paper #1: Australia's Future Energy Requirements', *Engineers Australia*, 15 October 2008, p. 3.

Clean Coal

The Australian Government has also identified the development of 'clean coal' as one of the ways to maintain economic prosperity and address environmental concerns over the long-term. Over a seven year period, the Australian Government has allocated \$500 million to the Clean Coal Initiative, with the focus on carbon sequestration for coal-fired plants as the key to meeting energy demand in a carbon-constrained economy. This technology, often referred to as carbon capture and storage, is unlikely to be commercially available for more than a decade but represents a possible solution to coal-dependent nations such as Australia and the US.

The infrastructure implications of realising the potential of clean coal technologies are immense and expensive. For example, commercialising carbon capture and storage requires 'transforming 80 percent of Australia's current electricity generation capacity through investment in new generation facilities capable of capturing GHG emissions'.³⁵ Further, older power plants will need to be retrofitted with the technology and hundreds of kilometres of pipelines will need to be built to transport the captured GHG emissions from power plants to storage sites, which also must be built.

Building demonstration plants; despite their cost of between \$2-3 billion per plant can advance geosequestration technology.³⁶ The expenses associated with the construction and ultimate commercialisation of carbon capture and storage may result in increased interest in nuclear power, despite of its own significant upfront capital costs.

³⁵ 'Infrastructure Australia: Report to the Council of Australian Governments', *Infrastructure Australia*, December 2008, p. 36.

³⁶ 'Infrastructure Australia: Report to the Council of Australian Governments', p. 36.

Overview of the Influence of Infrastructure, Technological and Environmental Priorities

One of the most difficult challenges facing Australia's policymakers involves setting the conditions for the appropriate level of investment to support existing infrastructure and technology and environmental priorities. Adopting large scale renewable projects for electricity generation has environmental and long term security benefits. Fortunately, Australia possesses some of the best renewable energy sources in the world. Unfortunately realising a significant increase in renewable energy will require massive investment. The widespread adoption of renewables will reduce the economic efficiency of the existing electricity supply system. The industry and infrastructure that is currently providing electricity will naturally receive priority over that requirement.

Significant effort and attention has been dedicated to the development of renewables energy source for decades and yet since 1970 the renewables share of the electricity market has not changed. The adoption of the Carbon Pollution Reduction which will set a price for carbon, limit GHG emissions and generate revenues that fund research in renewable technologies and subsidise increased energy prices for some socioeconomic groups is required to appropriately incentivise the energy revolution.

The Global Energy Market

During the last decade, oil prices have risen dramatically, reaching a high of \$US142 per barrel in July 2008. Oil is a global commodity, priced according to global shifts in supply and demand. 'Insofar as oil is a globalised commodity, a disruption anywhere is a price spike everywhere'.³⁷ This most recent price spike occurred in response to several factors including galloping demand in developing Asia, a lack of investment in supply side infrastructure, political instability in Iraq and Nigeria and resource nationalism in Russia. These disparate events and realities led to what Australian newscasters referred to as 'pain at the pump', which not only impacted decisions about 'essential' uses of the family car, but also significantly increased costs for energy-intensive industries and increased debt levels among the poorest countries.

The ability of any nation to guarantee energy security in the short-term through bilateral or exclusive arrangements with other countries is limited and in the long-term is probably impossible. The global energy system is complex and intrinsically interdependent and demand grows apace.

DEMAND

Although demand for energy has been tempered by the current economic crisis, it is expected to rebound in 2010. Worldwide energy consumption is likely to increase by 50 percent between 2005 and 2030.³⁸ This demand projection factors in the likelihood of longer-term high prices for oil and natural gas being driven, in part, by sustained, increased consumption in developing countries. The 2008 World Energy Outlook agreed with this assessment. This report was released within the context of the global economic crisis and

³⁷ M. Wesley, 'Energy in Australia's Foreign and Defence Policy', *ASPI Strategy*, October 2007, p. 46.

³⁸ Energy Information Administration, *International Energy Outlook 2008*, US Department of Energy, June 2008, p. 7.

the authors acknowledged that energy use grew more slowly than was anticipated in 2007 'but the overall trends are broadly unchanged'.³⁹

A comparison of the projected growth of demand in developed countries illustrates the changing face of the energy market. Demand for energy in developed countries, specifically those who belong to the Organisation for Economic Co-operation and Development (OECD), will grow at a rate of 0.7 percent annually while non-OECD (developing) nations demand growth is projected to be 2.5 percent annually.⁴⁰ Despite significant populations, the Chinese and Indian economies accounted for less than 8 percent of the world's energy demand in the 1980s. By 2005 that percentage had increased to 18 percent and projections indicate that their share of the world's energy consumption will be 25 percent by 2030. In contrast, the US percentage of energy consumption is expected to decrease from 22 percent in 2005 to 17 percent in 2030.⁴¹

Increased worldwide competition for energy directly affects Asia's demand for significant amounts of energy sources to ensure rapid economic growth. The Asia-Pacific region accounts for a majority of the growth in the developing world with an average gross domestic product growth of 7 percent annually, contributing to both an increase in population and standard of living. Increased competition means that previously regional markets, such as natural gas, will now become international ones. Additionally, Asia is likely to replace North America and Europe as the largest consumer of Middle East petroleum.⁴²

³⁹ Ibid., p. 1.

⁴⁰ Ibid., p. 7.

⁴¹ Ibid., pp. 7-8.

⁴² J. MacDonald, 'Overview of Global and Asian Security Trends', *Asian Energy Security: Regional Cooperation in the Malacca Strait*, Papers in Australian Maritime Affairs, No 23, p. 6.

Meeting worldwide energy demand requires a diversification of fuel types and a diversification of supply source. However, the capacity to diversify within the current supply market is limited. The 2008 World Energy Outlook released by the International Energy Association (IEA) links the capacity to meet long term energy demand to the development of a 'low-carbon, efficient, and environmentally benign energy system'.⁴³ The IEA indicates that the current energy system must change in order to meet future demand, and refers to that necessary change as an energy revolution because of the enormity of the systemic change required. The IEA Factsheet posited that 'achieving a more secure, low-carbon energy system calls for radical action by governments and national and local levels, and through participation in co-ordinated international mechanisms'.⁴⁴ The current level of demand translates into a very tight global energy market, a factor exacerbated by diminishing supply.

SUPPLY

Although coal, liquids and natural gas are likely to remain the main sources of consumption worldwide through 2030, all sources of energy consumption are growing. Renewables and coal represent the two fastest rising sources.⁴⁵ The use of coal for electricity continues to increase because it is cheap and abundant and not concentrated in one or two regions. Natural gas is also growing as an alternative to coal, providing relatively efficient energy while producing fewer greenhouse gases (GHG).

Worldwide, electricity generation from nuclear power will also increase due to a combination of: increasing utilisation rates of current plants, the obsolescence of existing plants in

⁴³ World Energy Outlook 2008 Fact Sheet: Global Energy Trends', International Energy Agency, p. 1, <http://www.iea.org/weo/docs/weo2008/fact_sheets_08.pdf>

⁴⁴ World Energy Outlook 2008 Fact Sheet: Global Energy Trends', International Energy Agency, p. 1, <http://www.iea.org/weo/docs/weo2008/fact_sheets_08.pdf>

⁴⁵ Department of Resources Energy and Tourism, 'Strategic Directions Paper', March 2009, p. 4.

OECD countries and the former Soviet bloc countries. The increased energy costs associated with traditional carbon-intensive sources will lead to the building of new nuclear power plants mainly in Russia, China, and India.⁴⁶[Am not sure how this last sentence fits in here.]

Because of increasing concerns about the environmental impact of burning coal and the response to government incentives, interest in renewables is growing. The majority of the increase in renewable energy sources is expected to come from hydro sources that are currently connected to power grids. China's recently completed Three Gorges Dam Project is the largest hydro-electric power station in the world. Governments continue to fund massive hydro projects such as those underway in India and Central and South America. In contrast, increased uptake in renewable energy sources in OECD countries can take the form of wind, solar, geothermal, municipal solid waste, and biomass.

Worldwide demand for oil remains relatively inelastic.⁴⁷ The 2008 World Energy Outlook forecasted oil at \$US100/barrel between 2008 and 2015, and then increasing to \$US200/barrel post-2015. Scarcity of liquid fuel supply intensifies the ongoing debate around whether the world has reached or is about to reach a peak in oil production. A 2008 working paper by the Center for a New American Security (CNAS) indicated that the 'long running feud over peak oil remains heated and unsettled, with whole armies of geologists, oil executives and statisticians blasting away from either side'.⁴⁸

⁴⁶ 'International Energy Outlook 2008', *Energy Information Administration*, US Department of Energy, pp. 9-10.

⁴⁷ Demand elasticity, according to the *Dictionary of Business* published by *The Economist* (2003), is measured by 'the percentage change in quantity demanded for an item divided by the corresponding percentage change in price that generated the change in demand. In general, price elasticity will be negative (a higher price leads to a lower demand)'.

⁴⁸ 'Peak Oil: A Survey of Security Concerns: Energy Visionary Series Working Paper', Center for New American Progress, September 2008, p. 5.

The 2008 World Energy Outlook (WEO) indicated that peak oil is not expected prior to 2030, concluding that 'the world's endowment of oil is large enough to support the projected rise in output' and that in fact there is evidence that proven reserves in the ground have been increasing.⁴⁹ However, other sources argue that we have already reached the 'peak' at which annual consumption is now greater than our ability to replace the inventory consumed. The paramount concern in the CNAS working paper is echoed in the WEO: worldwide investment in exploitation is not at a level that would ensure that the projected demand will be met as the productivity of existing oil fields declines. The WEO report highlights that 'even if oil demand was to remain flat to 2030, 45 million barrels per day (mb/d) of gross capacity—roughly four times the current capacity of Saudi Arabia—would need to be built by 2030 just to offset oil decline'.⁵⁰

The willingness of the private sector to invest in certain aspects of the energy sector relies on the level of market confidence and intensity of need. The fact that worldwide demand dramatically outpaced supply side investment in recent times adversely impacts market confidence. Uncertainty associated with the global economic crisis and the development of climate change policies may further discourage investment in the energy sector.

MARKET RELIABILITY

Neoclassical economic theory argues that persistent demand should drive supply side investment and production. However, a complicated array of factors that diminish market reliability impacts the global energy market. A functioning market seeks equilibrium,⁵¹ a state that the global energy

⁴⁹ 'World Energy Outlook 2008 Fact Sheet: Global Energy Trends', International Energy Agency, p. 3, <http://www.iea.org/weo/docs/weo2008/fact_sheets_08.pdf>.

⁵⁰ *ibid.*, p. 3.

⁵¹ The Dictionary of Business (Bannock et al) published by *The Economist* defines equilibrium as 'a situation in which the forces that determine the behaviour of a variable are in balance and thus exert no pressure on that variable to change. In business economics, equilibrium is most commonly

market cannot currently maintain, given the strength of various disruptive forces, such as political instability and nationalistic energy policies. One of the few reliable aspects of the current market is that oil prices will continue to rise.

The oil market has undergone significant price hikes in the past, such as the record high levels following the Arab Oil Embargo in 1973. The effects of this action lingered beyond the lifting of the embargo in 1974, with Western nations seeking to lessen their vulnerability through domestic exploitation and demand side policies such as the US's lower speed limit on federal highways. In the Asia-Pacific region, Japan focused on developing non-oil intensive industries and citizens in most nations, including Australia, chose to switch from oil to gas for heating. However, with the decrease in oil prices, energy security concerns faded from public debate until the next price spike in the mid-1980s.

Oil price

World average trade weighted prices, quarterly, ended December 2008



Source: ABARE, Australian commodity statistics.

The graph above depicts the relationship between world events and oil prices, both real and nominal.⁵² The difference between previous price spikes and the latest price spike of July 2008 is that response options have been more limited.

applied to the price that prevails in the market, when the forces of supply and demand are matched. The opposite is disequilibrium.'

⁵² The nominal value of a good is its value in terms of money. The real value is its value in terms of some other good, service or bundle of good.

The opportunities for fuel switching, available in the 1970s and 1980s, are no longer possible, the world's oil fields are ageing, and the capacity for further production may be diminished. The price increases over the past decade have led many leaders in the oil industry to agree that '...the world is now entering a new era of high energy costs and constrained supply'.⁵³ The era of cheap and abundant oil is unlikely to return.

The majority of the world's oil reserves are controlled by national oil companies that do not respond predictably to market incentives. International oil companies such as Exxon Mobil and BP focus on shareholder returns and are more likely competitively to develop, produce and sell their products. National oil companies with a high level of autonomy such as Petrobras in Brazil, factor national concerns into their corporate planning alongside the profit motive. Some national oil companies such as Saudi Arabia's Saudi Aramco and Mexico's Pemex are not as receptive to market pressures and their domestic practices distort the market price of oil. Saudi Aramco and Pemex use oil revenues to support domestic spending programs and sell their petroleum products to their citizens at a lower price than they will sell to the world.⁵⁴

National oil companies perpetuate an environment that rewards internally focused energy policies. These policies often take the form of resource nationalism, which limits the global supply and stimulates anxiety between nations. This practice pertains especially to Russia where the current government has increased energy prices for neighbouring states Belarus, Ukraine, and Georgia. This type of behaviour further damages market confidence that supply will be available to meet increased demand.

⁵³ 'Peak Oil: A Survey of Security Concerns', p. 5.

⁵⁴ 'Who are the major players supplying the world oil market?', *Energy Information Administration*, January 2009, <http://tonto.eia.doe.gov/energy_in_brief/world_oil_market.cfm?featureclick ed=4&>.

Finally, political unrest in producer countries—actual or potential—may physically threaten supply, causing oil futures to increase in price. Volatile political environments pose threats to energy security, causing disruptions in the local economies through local unrest and/or armed conflict or the direct targeting of energy production facilities. For instance, recent unrest in Iraq, Venezuela, Angola, Nigeria, and Kazakhstan resulted in interruptions to energy supply. These disruptions are likely to continue. The fact that the unrest is so widespread and that it continues over long periods has led some oil experts to identify a ‘geopolitical risk premium’ within current oil prices. This premium increases the current price and leads to pessimism about the potential for a stable oil price in the future.

Analysis completed last year by the International Monetary Fund (IMF) concluded that the instability in the oil market is rooted in supply and demand fundamentals, with the level of new capacity failing to meet the new level of demand:

...real oil investment has been held back by a confluence of cyclical, technological, geological, and policy constraints. Among the latter, the deterioration in the investment climate and the oil investment regime in a number of countries, as well as limits on the cooperation of national oil companies with international oil companies stand out. The perception that a meaningful supply response to high prices may be slow in coming has been one reason for increasing market pessimism and a steady increase in long-dated futures prices. Improving the stability and predictability of investment regimes and encouraging greater cooperation between national and international oil companies would strengthen the supply response.⁵⁵

This excerpt highlights the interrelated issues that destabilise the energy market, many of which are beyond the control of any one nation to influence.

⁵⁵ J. Lipsky, ‘Policies to Restore Orderly Oil Market Conditions at the Jeddah Energy Forum’, Jeddah, Saudi Arabia, June 2008, <<http://www.imf.org/external/np/speeches/2008/062208.htm>>.

SIGNIFICANCE FOR AUSTRALIA

Australia depends fundamentally on the reliability of the global energy market to ensure the export and trade of energy commodities and the import of regional and international oil.

Despite the instability of the global energy market, Australia has not suffered from a disruption of energy supply in the past, though there have been periods of relatively high oil prices. The March 2009 National Energy Security Assessment (NESA) considered the adequacy, reliability and affordability of liquid fuels through 2023 and determined that 'Australia's declining liquid fuel self-sufficiency does not necessarily imply reduced energy security', but noted that affordability is likely to decrease in the short, medium and long term.⁵⁶

However, declining domestic oil production indicates that Australia's reliance on imported oil will continue to increase and because that oil will likely come from the Middle East political instability may heighten the instability already present in the global energy market. The risks associated with this dependence cannot be easily assessed because of the inability to predict the global price of oil and the value of Australian dollar against the US dollar as the international petroleum currency.

Further, if the IEA's energy revolution represents the future of the energy market, then Australia's coal export revenues will be impacted by the success or failure of efforts to decarbonise coal.⁵⁷ In this scenario the development of large scale renewable projects becomes a paramount objective for domestic consumption.

⁵⁶ 'National Energy Security Assessment', *Department of Resources Energy and Tourism*, 2009, p. 9.

⁵⁷ Note that increased competition worldwide and increased demand for low emission sources is likely to positively impact Australia's natural gas and uranium export revenues.

Geopolitics

The power and influence of oil producing nations drives the geopolitics of energy. Increased collaboration among consuming nations to meet shared energy security aims represents the best way to counteract that power and influence. As a middle power in the Asia-Pacific, Australia has invested significant effort in regional energy dialogue, a particularly significant factor since the Asia-Pacific is most responsible for increased demand for energy globally.

A recent study of energy security and geopolitics from a European perspective examined two futures for Europe. The first involves an economically and politically integrated, multilateral world with effective institutions and markets and the second predicts a world broken up into rival political and economic blocks, competing for resources and markets via political, economic and military power. The study concludes that achieving the first (and avoiding the second) requires that energy security become an integral part of European Union external trade, foreign relations and security policy, with the European Union actively investing in dialogues with producer countries in the Persian Gulf, Africa and Russia.⁵⁸ The nations of the European Union benefit from a highly integrated European market that allows for a sophisticated level of coordination.

Although this level of integration is not an aim in the Asia-Pacific region, shared energy interests means that cooperative efforts must be enhanced to strengthen regional energy security. Australia can play a significant role in enabling this cooperation.

⁵⁸ A. Correljé and C. Linde, 'Energy Supply Security and Geopolitics: A European Perspective', *Energy Policy*, 2006, pp. 532-543.

PRODUCING NATIONS

Producing nations leverage energy supply revenues to advance national and political aims, often at the expense of multilateral institutions, and the overall stability of the energy market. The relationships that producing nations have with other nations of the world are significantly influenced by their current level of production, the presence of proven oil and gas reserves and the current price on the world market for energy.⁵⁹ Energy wealth that empowers producing nations to exercise influence over consuming nations and sometimes subvert multilateral institutions occurs too frequently.

First, the most well-known producing nation, Saudi Arabia, holds more than 20 percent of the world's petroleum resources and uses oil revenues to provide funding for a vast welfare state. Saudi Arabia is the largest exporter of petroleum and has recently begun to increase production of petrochemicals that may find a market in China and India. The abundance of Saudi Arabia's oil wealth and the persistent demand for oil means that Saudi Arabia can choose to whom they sell, depending on what best serves its strategic interests. Saudi Arabia's strategic interests are often pursued within the nation's membership of the Organisation of the Petroleum Exporting Countries (OPEC).

OPEC was formed in 1960 to coordinate oil prices among member countries. Two-thirds of the world's reserves are held by the twelve states of the OPEC: Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela. The presence of these reserves has afforded OPEC continued influence over the world market despite the opening up of new markets in oil-rich Russia and Mexico. OPEC's profit-motivated beginning devolved into a political objective when the Arab nations of OPEC plus Egypt and Syria broke off to form the Organization

⁵⁹ All sources of energy carry a level of influence but this discussion will focus on oil (and gas to a lesser extent) because of the concentrated nature of the world's supply and the relative widespread abundance of other energy sources such as coal.

of Arab Petroleum Exporting Countries (OAPEC). The nations of OAPEC expressed their dissatisfaction with US support of Israel in the Yom Kippur War through the 1973 oil embargo.

Second, Russia supplies Europe with a quarter of its gas supply and possesses the eighth largest proven reserve of petroleum in the world. The North European Gas Pipeline will allow for the transport of gas from Russia to Germany, further extending Germany's reliance on Russia for energy supply. Wealth and the promise of wealth enabled Russia to pay off over \$US50 billion in foreign debt and re-impose state control of its energy sector.⁶⁰ Russia currently has no incentive to sign multilateral agreements that would contribute to the overall security of supply. For example, Russia's leadership is unwilling to ratify the Energy Charter Treaty, which would 'guarantee transit rights for energy through Russia regardless of the owner, and preclude cutting off energy supplies as a political weapon'.⁶¹

Russia's lack of cooperation with the international community is reflected in its relationship with another producing nation, Iran. Iran's oil revenues were \$US46 billion in 2005; \$US47 billion in 2006; and were projected to reach \$US60 billion in 2008.⁶² Russia has been tacitly supportive of Iran's continued pursuit of a nuclear program in spite of several United Nations (UN) Security Council Resolutions. Russia's role in bolstering Iran introduces 'key elements of today's complex geopolitics of energy: market power to act in isolation to block multilateral instruments, and limited short-term recourse to rules-based order to control energy market power'.⁶³

Australia is impacted by the power of producing nations and any subversion of the global rules-based order has the

⁶⁰ G. Cheurin, 'Russia's Caspian Energy Policy and its Impact on the Russia-US Relationship: The Energy Dimension in Russian Global Strategy', *The James A Baker III Institute for Public Policy*, Rice University, 2004.

⁶¹ C. Pascual, 'The Geopolitics of Energy: From Security to Survival', *The Brookings Institute*, 2008, p. 8.

⁶² *ibid.*, p. 5.

⁶³ *ibid.*, p. 9.

potential to adversely impact Australia's national security. In an intensely competitive market, the energy specific capacity (and in some cases lack of capacity) of consuming nations presents Australia with another set of challenges. Any cooperation with an Australian lead fostered in the Asia-Pacific region can tend to balance factors in OPEC and Iran.

CONSUMING NATIONS

Consuming nations typically cannot domestically source the energy they require to meet demand and, as a result, depend on the global energy market. One of the benefits of globalisation is the ability to access goods and services through a competitively priced international market. Unfortunately for consuming nations, the energy market within this globalised system runs as much on politics as on competition. In an opinion column in *The Washington Post* last year, Henry Kissinger, former US Secretary of State and National Security Advisor, and Martin Feldstein, conservative economist and member of President Obama's Economic Recovery Advisory Board, noted that:

...the price of oil is not determined by a traditional competitive market. Major producers such as the members of OPEC can and do raise or lower the price of oil by reducing or increasing their rate of production. And since today's oil price also reflects expectations of future oil supply and demand, these monopolistic suppliers are able to compound the volatility of the market through statements about their future intentions.⁶⁴

Competition for energy resources among consuming nations is a contributing factor in the shifting power relationships in the Asia-Pacific. As China and India rise economically, Japan, South Korea and other countries are moving to adapt. Chinese and Japanese companies struggle against one another for access to Russian pipelines and

⁶⁴ H. Kissinger and M. Feldstein, 'The Power of Oil Consumers', *The Washington Post*, 18 September 2008, p. A21.

offshore gas fields.⁶⁵ The US seeks to remain a strategic influence in the region, and in the case of the China National Offshore Oil Corporation's attempt to acquire, Unocal, the US Congress expressed serious concerns about China's expanding claim over global energy resources. China's appetite for energy sources seems limitless, and the geographic spread of China's reach from Brazil to the Sudan to Iran and Australia heightens the sense of energy competition in the region.

Many of the world's multilateral bodies and international institutions that focus on energy supply and demand were organised to serve the developed world, and did not account for the introduction of powerful players in the developing world. These arrangements encourage developing nations such as China to pursue state-led energy deals focused on exclusivity rather than mutual regional dependence.

The contribution of China to worldwide demand and competition for resources points to the importance of incorporating the concerns of the developing world into the policymaking of energy-focused multilateral bodies. This inclusion will underscore the global nature of the energy market, and could reduce apprehension among developing nations that the global market is designed to limit their access to energy.

In addition to larger nations competing for influence, the weaker states are increasingly vulnerable to energy shocks and crises.⁶⁶ Most of Australia's near neighbours that have been recipients of Australian aid and intervention retain serious vulnerabilities and are heavily dependent on energy

⁶⁵ M. Herberg, 'Energy Security in the Asia-Pacific Region and Policy for the New U.S. Administration', 2008, p.132.

⁶⁶ O. Brown, A. Hammill and R. Mcleman, 'Climate Change as the 'New' Security Threat: Implications for Africa', *International Affairs*, v.83, 2007, pp. 1141-1154.

imports. Energy scarcity and increased prices might tip them into crises that could negatively affect Australia.⁶⁷

The power of consuming nations extends mainly from their buying power; however, that power could and should be enhanced through better coordination. For example, Russia's export gas industry is entirely dependent on European consumers to purchase gas. Most consuming nations are engaged at some level in maximising domestic supply where it exists, developing alternative energy sources and promoting energy efficiencies to reduce demand. A coordinated effort along these lines, combined with emergency sharing agreements, has the potential to impact the price of oil today because 'the expectation of change would reduce the price of oil'.⁶⁸

There are also physical aspects associated with the transport of energy that require increased coordination among nations. The transport infrastructure required to meet worldwide demand for energy is increasingly interdependent. For example, in 2007 the Australian rail bottlenecks affected coal shipments to Korean industry.⁶⁹ The most complex activity associated with international energy infrastructure is securing seaborne energy transport. Approximately two-thirds of the world's oil trade moves by tanker. Most of the world's oil and gas transport is reliant upon maritime transport originating in the Middle East and travelling through various sea lanes and choke points to reach its destination, another factor in the complex environment in which nations acquire their energy resources.

⁶⁷ J. Lovell, 'British Armies Must Ready for Global Warming', *Reuters UK Online*, 2007, <<http://today.reuters.co.uk/misc/PrinterFriendlyPopup.aspx?type=topNews&storyID=20...>>.

⁶⁸ 'The Power of Oil Consumers', p. A21.

⁶⁹ M. White, 'The Compelling Requirement to Energy-Proof the Australian Defence Force', *Australian Defence Force Journal*, Issue 175, 2008, p. 13.

TRANSPORTATION RISK TO CONSUMING NATIONS OF THE ASIA-PACIFIC REGION

The seas in the Asia-Pacific region are among the busiest in the world and are projected to become even busier as regional oil imports increase and the market for LNG expands. There are a number of potential threats specific to seaborne energy transport in the Asia-Pacific:

The high incidences of piracy around Indonesian waters, the unregulated and insecure nature of the maritime trade, the presence of terrorist networks, and the fact that any disruption of global trade will have a devastating impact on a globalised manufacturing system dependent on just-in-time business operations (particularly by booming Northeast Asian economies) have raised fears over security for the Malacca Strait⁷⁰

The safety of regional and international sea lanes represents an important national security priority for Australia. The role of Defence in protecting seaborne trade was reinforced in the 2009 White Paper. The Paper identified the traditional sea lanes to Australia's north in the Asia-Pacific region but also highlighted the potential for the Australian Defence Force to operate further afield: 'Due to the centrality of the Indian Ocean's maritime trade routes to the energy security of many Asian states, Defence planners will need to focus increasingly on the operating conditions and demands of this region'.⁷¹

The protection of sea lanes has long been the responsibility of the Royal Australian Navy, working in cooperation with other nations. Australia's partnership with the United States is outlined in the Radford Collins Agreement of 1951, which 'delineated national areas of responsibility for Naval Control of Shipping, local defence and anti-submarine

⁷⁰ J. MacDonald, 'Overview of Global and Asian Energy Trends', *Asian Energy Security: Regional Cooperation in the Malacca Strait*, Papers in Australian Maritime Affairs, No. 23, p. 46.

⁷¹ 'Defending Australia in the Asia Pacific Century: Force 2030', *Defence White Paper*, 2009, p. 52.

warfare in the Indian and Southern Pacific Oceans'.⁷² Australia remains committed to this agreement while also seeking opportunities for cooperation with regional navies and states.

The development of a common framework for the protection of maritime trade routes in the Asia-Pacific not only enhances Australia's ability to lead in forming East Asian cooperative institutions, it helps to foster a more rational overall environment of energy security. This represents an area that both requires better coordination and represents a shared interest between Australia and its neighbours.

SIGNIFICANCE FOR AUSTRALIA

The Australian Government commits diplomatic and technical resources to regional energy security in the form of participation in multilateral forums, specific climate change bilateral agreements and technical cooperation efforts. Australia's participation in the APEC Energy Working Group (EWG) has contributed to the Energy Security Initiative, which seeks to address cooperative efforts to tackle regional energy security issues through greater market transparency, emergency information sharing and energy emergency response. The EWG also works cooperatively to address the development of clean fossil fuel energy and renewable energy. The threats outlined above related to seaborne energy transport underscore the importance of enhanced regional cooperation.

In April 2009, the Department of Resources, Energy and Tourism solicited comment on an International Energy Discussion Paper that outlined Australia's key policy priorities related to future energy security. This comprehensive listing of priorities included:

- 'promoting the development of efficient, transparent and competitive local, regional, and global energy

⁷² A. Forbes, 'Australia's Naval Contribution to Regional Maritime Security Cooperation', *Australian Maritime Issues 2007 SPC-A Annual*, 2008, p. 56.

markets, especially emerging economies such as China and India;

- pursuing more effective engagement with major energy consumers in the Asia-Pacific region, especially emerging economies such as China and India;
- promoting effective international energy institutions where Australia can maximize its international engagement efforts;
- promoting Australia's nuclear non-proliferation objectives alongside the expected growth in global demand for uranium; and
- promoting implementation of energy policies that address the environmental impacts of fossil fuel use at least cost, minimising the economic impact while reducing carbon emissions and energy intensity, consistent with Australia's economic interests'.⁷³

Australia has articulated a commitment to common energy concerns through the key policy priorities discussed above, and is well positioned to play a leading role in the region to address future energy security issues. A key area for enhanced cooperation is the incorporation of China and India into the international dialogue on energy issues and the protection of maritime transport

⁷³ 'International Energy Discussion Paper', *Department of Resources, Energy and Tourism*, April 2009, pp. 16-17.

RECOMMENDATIONS TO SUPPORT AUSTRALIA'S ENERGY SECURITY

Despite intensifying competition for resources and the consequent impacts on the global energy market and geopolitical activity, Australia remains a net exporter of energy with supply options and the capacity to positively influence the stability of the Asia Pacific region. These recommendations focus on fortifying Australia's efforts in energy security policymaking. In many cases they build on, or suggest a renewed commitment to, existing efforts.

RECOMMENDATION 1

Elevate and incorporate energy security issues within Australia's national security community.

The complexity of the current energy market demands nuanced policymaking that reflects an understanding of the intersection among security, geopolitics, economics, infrastructure, technology and environment. The National Security Statement began the process of 'binding the detailed and diverse work of the national security community into a coherent, coordinated whole'.⁷⁴ The energy security issue requires the fulfilment of the Prime Minister's whole-of-government approach to national security interests. This issue must be debated and the policy framework set (mainly through the Energy White Paper due at the end of 2009) in the context of this newly emerging community. Below are some practical approaches to elevating and incorporating the energy security issue:

- Strengthen the coordination on policymaking among the relevant government departments, e.g. Department of Defence, Department of Foreign Affairs

⁷⁴ Address by the Prime Minister of Australia to the Australian Parliament, The Hon. Kevin Rudd MP, 'The First National Security Statement', 4 December 2008, <http://www.pm.gov.au/docs/20081204_national_security_statement.pdf>.

and Trade, Department of Resources Energy and Tourism, Department of Climate Change and Department of Environment, Water, Heritage and Arts.

- Organise a section responsible for 'Resource Security' in the Homeland and Border Security Division within the Department of Prime Minister and Cabinet, in line with the Prime Minister's emphasis on energy, water and food security within the National Security Statement.
- Recruit and train public administrators focused on energy policy as a national security issue. Professional development in this complex policy area will contribute to the resilience of Australia's long-term efforts to develop and promote energy security in the region. This new cadre of new public servants will be able to reach across disciplines and leverage the whole-of-government approach to energy security.

RECOMMENDATION 2

Communicate the current and future state of Australia's energy security to the Australian public.

The energy decisions made today will impact Australians for decades to come. Most Australians have lived the majority of their lives in a nation they understood to be energy independent. Further, 'the challenge for Australian politicians is heightened by community puzzlement over this country simultaneously exporting large amounts of crude oil and condensate and importing crude and refined products'.⁷⁵

To people not living in the energy sector, the strengths and weaknesses of Australia's current position are crowded by warnings from different sources about peak oil and climate change and the end to the resources boom. Communication on energy issues that provides transparency and translates the immediacy of Australia's energy challenges has the

⁷⁵ K. Orchison, 'The Energy Challenge', Oil and Alternative Fuels, The Australian, June 2009, Section 3, p. 1.

capacity to mitigate 'gut economic nationalism' and provide context for a greater understanding by the public. The unpredictable nature of the energy market makes it likely that in Australia's national security interest, government may need to ask for action and/or sacrifice on behalf of the public.

The Australian Government should prioritise the communication of the level of Australia's dependence on foreign oil, explain Australia's move from a trade surplus to a trade deficit in transport fuels and explain why Australia both imports and exports crude oil.

RECOMMENDATION 3

Determine that the projected level of reliance on imported oil is unacceptable and actively pursue its avoidance.

As a producing nation, until recently Australia avoided a high level of dependence on energy imports. The international energy market is unpredictable and unreliable and intensifying worldwide competition for resources makes the market less reliable. Avoiding increased dependence on energy imports best serves Australia's national interests. This may require some understanding and sacrifice on behalf of the Australian public, which is why the Recommendation 2 is important to lay the groundwork. Noting that the effectiveness of certain policies may change over time and that some initiatives may need to occur at the state versus Commonwealth level, the following are suggested as options:

- Demand side initiatives such as the elimination of fuel subsidies
- Require new energy facilities to provide dual fuel capacities
- Increased public investment in research and development related to transport fuel substitutes such as coal to liquids and gas to liquids technology

- Increased investment in refining capacity to maximise domestic consumption of Australia's crude oil (noting that this is not currently economically efficient and could result in a higher cost to consumers)
- Establish energy independence as a national goal with a report card to be delivered to the nation in addition to, or as a part of public reporting on the effectiveness of the Carbon Pollution Reduction Scheme (see Recommendation 4).

RECOMMENDATION 4

Focus on optimising low emission energy sources for domestic consumption and export revenue generation

At a time when environmental concerns about the burning of fossil fuels and uncertainty about the commercial viability of carbon capture and storage threatens the long-term viability of coal, Australia relies on that commodity for domestic electricity generation and for our majority of export revenues. Australia's future energy security is best served by preparing to diversify sources for electricity generation and optimise revenues from low emission exports in anticipation of the IEA's energy revolution.

Australia's commitment to the energy revolution includes funding to support the commercialisation of carbon capture and storage and mandatory targets to increase the contribution of renewables to electricity generation to 20 percent and the Carbon Pollution Reduction Scheme (CPRS) under debate in Parliament. Concerns about the implementation of the Emissions Trading Scheme (ETS) challenge the implementation of the CPRS. The ETS represents a myriad of challenges for different stakeholders--introducing costs to industry and consumers and presenting difficult political decisions for elected leaders. However, the enactment of this scheme required to appropriately incentivise the energy revolution. It also represents an opportunity to

broaden understanding among the Australian public, which has the capacity to influence political leadership.

Coal will likely remain a significant revenue source but imminent measures to reduce emissions at the national and international level point to the benefit of maximising the export potential of a low emission source such as uranium. Australia is the second largest exporter of uranium at a time when there is potential to increase market share. Increasing the market share for uranium will require additional diplomatic efforts to influence the international non-proliferation community to consider export opportunities such as India. Australia's policymakers may also find opportunities to enhance the market for natural gas. Natural gas is lower in emissions and according to the natural gas industry has the capacity to expand through regulatory review. Finally, the breadth of renewable sources present in Australia provides an opportunity for Australia to develop and commercialise renewable technology to fuel electricity in the region.

RECOMMENDATION 5

Enhance regional energy cooperation

The effectiveness of the region's collective energy security arrangements in the future will determine the level of energy security and stability of the Asia-Pacific. Australia's current engagement in the Asia-Pacific region needs to focus on the promotion of a shared energy security agenda because consuming nations build power and influence through the strength of their cooperative efforts.

One area for enhancing regional energy cooperation is the development of a common framework for the protection of maritime trade routes in the Asia-Pacific. In a recent Australian Maritime Issues paper, produced by the Sea Power Centre Australia, Andrew Forbes suggested that 'there is no apparent general agreement on the common (maritime) threat assessment in Southeast Asia. Importantly, as countries recognise mutual threats and the need for greater cooperation,

it is possible to move from bilateral to multilateral exercises and cooperation'.⁷⁶ Further, Mr Forbes indicated that this agreement could be forged through the adoption of NATO Naval Control of Shipping standards for the Malacca Strait, opening up opportunities for intelligence sharing related to terrorism and other threats.⁷⁷ Adopting a common framework would allow regional players to operate from a position of shared understanding of threats and cooperatively develop ways to mitigate against those threats.

The developing nations of the Asia Pacific region are most responsible for the increasing worldwide demand for energy and the most invested in the safety of sea lanes and the overall stability of the region. Increased demand for energy represents a shared interest that will create further opportunities for the nations of the Asia Pacific to work together. Australia can play a pivotal role in this stability.

⁷⁶ 'Australia's Naval Contribution to Regional Maritime Security Cooperation', Australian Maritime Issues 2007 SPC-A Annual, p. 57.

⁷⁷ *Ibid.*, pp. 56-57.

Conclusion

During the drafting of this paper the world financial market experienced serious disruption, essentially challenging the fundamental construct on which the global energy market functions. However, within crisis there is opportunity. The attention and commitment of national leaders to restoring and improving the international financial market presents a great opportunity for energy concerns to be debated in the international sphere. As the world grapples with the appropriate balance between protectionism and free trade, energy resources emerge as an important area to achieve that balance. As the membership and authority of multilateral institutions is reviewed and reformed, energy security can be advanced by inviting developing nations to the dialogue.

Finally, and perhaps most importantly, as the world market recovers, the demand for energy is temporarily reduced. During this brief respite there is an opportunity for Australia's policymakers to focus on the long term energy security of Australia and consider alternative approaches to meeting domestic demand and ensuring export revenues. An integrated national security community committed to reduced dependency on imports, policymaking for an informed public, optimising low emission sources will position Australia to be an 'Island of Calm' in the inevitably chaotic energy markets of the decades ahead.

About the Kokoda Foundation

Purpose

The Kokoda Foundation has been established as an independent, not-for-profit think tank to research, and foster innovative thinking on, Australia's future security challenges. The foundation's priorities are:

- To conduct quality research on security issues commissioned by public and private sector organisations.
- To foster innovative thinking on Australia's future security challenges.
- To publish quality papers (*The Kokoda Papers*) on issues relevant to Australia's security challenges.
- To develop *Security Challenges* as the leading refereed journal in the field.
- To encourage and, where appropriate, mentor a new generation of advanced strategic thinkers.
- Encourage research contributions by current and retired senior officials, business people and others with relevant expertise.

Membership

The Kokoda Foundation offers corporate, full and student memberships to those with an interest in Australia's future security challenges. Membership provides first-release access to the *Kokoda Papers* and the refereed journal, *Security Challenges*, and invitations to Foundation events. Membership applications can be obtained by calling +61 2 6204 1822, and downloaded from:

<http://www.kokodafoundation.org/Joinindividual.html>