



**Global Energy Security:
The Strategic Implications
for China and Australia**

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Executive Summary

Energy security is about security of energy supply – it is not about energy prices, energy efficiency, energy conservation, clean energy or sustainable development.

Energy security is strategically important for all energy-importing countries.

Energy security is even more important for rapidly developing countries like China, because energy is such an important enabler of economic development.

The principal cause of the global energy security problem is growth in energy demand. This is driven by population growth, economic growth, industrialisation and urbanisation.

There is no international organisation that can supply energy. Each importing nation must accept the responsibility of managing its own energy affairs.

For every country, the key strategic solution to the energy security problem is diversification of fuels and supply sources. This should be coupled with vertical integration to better manage the costs and risks of supply disruptions. There is also a need for investment in new energy technologies, including low-carbon technologies.

Both China and Australia are importers of oil and are equally vulnerable to oil supply disruptions. In the transportation sector, both China and Australia must find short and long-term alternatives to oil. Electric vehicles are an obvious long-term priority, as are mass transit systems.

In the case of fuels other than oil, China and Australia are 'natural' trade and investment partners in developing Australia's coal, LNG and uranium resources and in researching new energy technologies.

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1. THE STRATEGIC RELEVANCE OF GLOBAL ENERGY SECURITY

Energy security is about security of energy supply – it is not about energy prices, energy efficiency, energy conservation, clean energy or sustainable development. We believe that, without security of energy supply, sustainable development can never be achieved.

Energy security is a global problem but it is strategically important for all energy-importing countries:

"Energy is the important material basis for the development of the entire mankind. The rational exploitation and sustainable development of energy are most significant to the growth of world economy and the progress of human society. The energy issue is a global concern. To strike a balance between world energy demand and supply and to maintain world energy security is an urgent common task for all the nations on the globe."¹

Energy security is even more important for rapidly developing countries like China, because energy is such an important enabler of economic development.²

Although China's energy consumption is still very low on a per-capita basis, it has been reported by the International Energy Agency that China may have overtaken the United States in 2009 as the world's largest energy user.³ If it did not do so in 2009, it may do so in 2010.

The most prominent and entrenched feature of the international energy landscape is national sovereignty. There is no international organisation that can supply energy. Furthermore, no amount of international dialogue is going to significantly alter the need for energy or its availability – each importing nation must accept the responsibility of managing its own energy affairs and securing its own energy supply.

However, it takes a long time for the implications of international problems like energy security to be fully appreciated at national level and for policies to change. For example, until very recently, the US Army, one of the largest consumers of energy in the world, with an annual energy bill exceeding US\$4 billion, had a false sense of security about its energy supplies:

"Historically, the Army operated with the assumption that low-cost energy would be readily available when and where it is needed. Now, however, reliable access to

¹ Zhou Xinbao, Secretary-General, Council for Security Cooperation in the Asia Pacific, China, "Change in China's Energy Situation and Its Strategy for Energy Security", China International Studies, November/December 2009.

² "... energy is one of the most important drivers of economic development and is a key determinant for the quality of our daily lives ... it is probably the biggest business in the world economy, with a turnover of at least US\$1.7 – 2 trillion a year ...", "Analysis of Ways to Enhance the Contribution of Specific Services Sectors to the Development Perspectives of Developing Countries: Energy Services in International Trade: Development Implications", Note by the UNCTAD Secretariat, TD/B/COM.1/46, 10 December 2001.

³ International Energy Agency, Preliminary Energy Data for 2009, July 2010.



affordable, stable energy supplies is a significant challenge for the Army and the nation."⁴

Although energy security is a global problem, the solutions to it are overwhelmingly a national, not international, responsibility.

2. THE CAUSES OF THE GLOBAL ENERGY SECURITY PROBLEM

The energy security problem mainly relates to oil, although it is not confined to oil. Because the production of oil continues to decline in China and Australia, both countries are increasingly vulnerable to any global oil supply disruption (China became a net oil importer in 1993; Australia in 2003).

The most disruptive global energy crisis occurred in 1973, an "oil shock", a global supply disruption caused by an Arab embargo on oil supply to the United States. In almost 40 years since that disruption, most international efforts to reduce energy supply risk have focussed on emergency or short-term responses and on producer-consumer dialogue.

The International Energy Agency (IEA) was established by the OECD economies in 1974 as a response to the 1973 energy crisis. The IEA's core mission was energy security and its main focus was on short-term measures.⁵ Oil importing economies have found longer-term solutions much more difficult.

The "peak oil" theory (the theory that oil fields are depleting at a rate in excess of global consumption) does not explain the current global energy security problem.

The principal cause of the global energy security problem is growth in energy demand. This is driven by population growth, economic growth, industrialisation and urbanisation. Year after year, growth in energy demand has further increased the vulnerability of importing countries to oil supply disruptions and price volatility.

A second major cause of the global energy security problem is the growing mismatch between the points of demand and the sources of production, as well as the need for more transportation capacity.

In 2002, ResourcesLaw International emphasised these factors to Asia-Pacific Economic Cooperation (APEC) Energy Ministers:

⁴ US Department of the Army, "Army Energy Security Implementation Strategy", Washington DC, USA, 13 January 2009, p(i).

⁵ IEA members that are net oil importers have a legal obligation to hold emergency oil reserves of 90 days of net imports of the previous year. About two thirds of reserves are held by industry and one third by governments and special agencies. These must be allocated among IEA members in the event of a severe supply disruption. The IEA maintains a set of measures known as the Coordinated Emergency Response Measures (CERM) which have been invoked once, during the 1991 Gulf War, when 2.5 million barrels per day were made available to the market from stocks.



"We should all now be asking ourselves: what on earth have we been doing about global energy security for the last 30 years? The broad answer seems to be that we have been focusing, through institutions such as OPEC and the IEA, on short-term measures, without fully appreciating that growth in global energy demand, and shifts in the centers of energy demand, may have been increasing our vulnerability to supply disruptions and price shocks at a greater rate than any short-term measures could ever hope to control."⁶

In the case of oil, a major difficulty is that much global production comes from the Middle East and has to be transported very long distances to the points of energy demand.

In the case of natural gas, the transportation difficulty is even greater because it can only be transported by pipelines or, if it is converted into LNG for shipment, by bulk carriers. With either option (pipelines or LNG), the investment needs are huge.

3. INTERNATIONAL ENERGY TRADE

In the context of energy security, cross-border energy trade provides risk-spreading and risk reduction benefits.⁷

It is important not to lose sight of the fact that, despite a doubling of global energy demand over the last 25 years, increased competition in global and domestic energy markets over the same period has counterbalanced the supply vulnerabilities of energy importing economies, and most of the world has continued to prosper from available and affordable energy supplies. The promotion of an open global energy market should therefore continue.

Cross-border power interconnection and cross-border natural gas trade can provide favourable economic, social and environmental outcomes for the participating economies.

Interconnection of power systems enables neighbouring economies to overcome the mismatch of power supply and demand. For example, if the Greater Mekong Subregion economies were able to exploit 50% of their hydropower potential, this would create additional generating capacity of five times the present total generating capacity in the subregion.⁸ Interconnection also reduces the vulnerability of power systems to most events of force majeure which fall outside the control of transmission system operators, such as storms, sabotage and terrorist activity.

⁶ ResourcesLaw International, address to Meeting of APEC Energy Ministers, Mexico City, Mexico, 2002.

⁷ See the two studies carried out for the APEC Energy Working Group by ResourcesLaw International, "Cross-Border Power", APEC Secretariat, Singapore, 2002; "Great Expectations: Cross-Border Natural Gas Trade in APEC Economies", APEC Secretariat, Singapore, 2004.

⁸ Chonglertvanichkul, P, "The Electricity Interconnection of the Greater Mekong Subregion", APERC Annual Conference, Tokyo, Japan, 2000. The GMS interconnection project is also described in ResourcesLaw International, "Cross-Border Power", footnote 7.



In a study for APEC in 2002, we identified 14 commonly encountered barriers to power system interconnection and recommended a strategy to overcome each of them.⁹ Our main policy recommendation was to remove all regulatory restraints.

In another study for APEC in 2004, we identified the main barriers to cross-border natural gas trade, drawing attention to the commercial as well as regulatory bottlenecks. With natural gas, there are almost unlimited resources of “stranded gas” around the world. Natural gas remains stranded unless pipelines are developed to transport it across national borders or unless it is liquefied for shipment overseas as LNG. Long-term contracts are vital for bringing gas to market.¹⁰ In addition, from the perspective of an importing country, long-term contracts are likely to increase security of supply.¹¹

Nonetheless, freely operating international energy markets are not enough by themselves to negate the risk of disruption to energy supply. As we discuss in section 6, responses at the national level are imperative.

4. A DECADE OF INTERNATIONAL DIALOGUE

Before analysing the contemporary global energy security challenge and how to respond to it, it is helpful to review the last decade of international dialogue.

2000

In 2000, the Asia-Pacific Economic Cooperation (APEC) organisation¹² was one of the first to acknowledge what APEC Leaders described as “*the risks to the world economy posed by volatility in the oil market*”.¹³ APEC Leaders then called for measures to promote stability.

⁹ ResourcesLaw International, "Cross-Border Power", footnote 7.

¹⁰ "For a successful cross-border natural gas project to eventuate, a gas demand profile, matched to a similar supply profile, has to be achieved. In the private sector, this has to translate into a bankable project, with adequate risk-weighted returns to the investors over the life of the project. This same consideration is true for the gasfield developer, who will have to prove up and maintain adequate gas reserves for the project life. The major challenge for cross-border gas projects is to secure a creditworthy, long-term offtaker or capacity-taker who is able to "underpin" the project. Given the very large volumes of gas to be used, this typically requires substantial switchable base load and cannot rely on the gradual building of reticulation systems and the gradual build-up of gas demand, nor on peaking power stations. Factoring in the build-up period can be a substantial challenge for all parties to a gas project. In this regard, long-term "take-or-pay" contracts remain vital for bringing gas to market", ResourcesLaw International, "Great Expectations: Cross-Border Natural Gas Trade in APEC Economies", APEC Secretariat, Singapore, 2004.

¹¹ World Trade Organization, "World Trade Report 2010", Geneva, 2010, p 61.

¹² China and Australia are both members of this 21 member intergovernmental organisation.

¹³ APEC Economic Leaders Declaration, Brunei Darussalam, 16 November 2000 page 1.



2001

In the United States, in May 2001, the US National Energy Policy Development Group recommended that energy security should become a priority of US trade and foreign policy.¹⁴

The events of September 11, 2001 changed thinking even further. After then, it was more widely appreciated that volatility in the oil market posed significant risks to the world economy, as well as to particular economies.

In late September 2001, APEC adopted the APEC Energy Security Initiative to address energy security concerns, not only by short-term measures to respond to temporary supply disruptions, but by longer-term policy responses that were “*practical in a policy context and politically acceptable*”.¹⁵

In October 2001, APEC Leaders met in Shanghai. They affirmed that a key measure would be the “*strengthening of energy security in the region through the mechanism of the APEC Energy Security Initiative, which examines measures to respond to temporary supply disruptions and longer-term challenges to the region’s energy supply*”.¹⁶

2002

Adding to the issue of price volatility, it had also become apparent by 2002:

- that world energy consumption was likely to increase by 60 percent between 1999 and 2020;¹⁷
- that near-to-market reserves would be depleted and the need for additional volumes to be transported long distances would increase;¹⁸ and
- that the risks to energy supply were serious.¹⁹

¹⁴ International Energy Agency, “Energy Policies of IEA Countries — the United States, 2002 Review”, Paris, 30 April 2002.

¹⁵ The APEC Energy Security Initiative was developed at a series of APEC Energy Working Group (EWG) workshops and adopted in Port Moresby on 27-28 September 2001.

¹⁶ Additional short-term measures recommended by APEC were:

- the need for APEC monthly oil data submissions to become a permanent initiative
- the need to enhance sea lane security (including the upgrading of navigational aids in the Straits of Sunda and Lombok as alternatives to the Strait of Malacca)
- the need to consider a real-time emergency information sharing system for APEC
- the need for all APEC economies to have fully-developed emergency response plans in place
- the need for all APEC net oil-importing economies to maintain adequate oil stockpiles.

¹⁷ US Department of Energy, “International Energy Outlook, 2002”, Washington, DC, March 2002.

¹⁸ “World Energy Outlook, 2001”, International Energy Agency, Paris, October 2001 page 13.

¹⁹ According to a professor of oil economics at the time, “*the scene is being set for a potentially serious conflict between oil producers which could lead to great instability in the oil markets*”, Paul Stevens, “Consumer Governments,



By the time that G8 Energy Ministers met in Detroit in May 2002, they were ready to make a farsighted statement about what needed to be done:

“We discussed the key role that energy plays in our economies, and how vital it is to economic and social development around the world. Access to secure, economical, and reliable supplies of energy is a lynchpin of progress.”

*“We believe **energy security and flexible emergency response are critically important** in today’s world and agreed to continue close cooperation in enhancing them.”*

“Significant investments will be needed in energy development, production and infrastructure, as well as an improved energy efficiency, to meet growth in demand for energy services in an environmentally sound way. To meet growing energy needs, countries must foster a favorable investment climate by ensuring open markets with transparent business practices and stable regulatory frameworks.”²⁰

The 2002 G8 Ministerial statement continues to be an accurate summary of the challenges facing the energy industry today.

2006

In January 2006, China and Australia became two of the six founding members of the Asia-Pacific Partnership on Clean Development and Climate, a public-private partnership to facilitate investment in clean technology, goods and services.

At their July 2006 Summit in St Petersburg, G8 Leaders agreed that energy security had become *“a challenge for our countries and for mankind as a whole”*. They then committed themselves to a seven-point plan of action known as the St Petersburg Global Energy Security Principles.

The St Petersburg Principles will be reviewed in the next section of this paper.

2007

At their 2007 Summit in Heiligendamm, G8 leaders strongly reaffirmed their commitment to the St Petersburg Principles and declared that *“the challenge of energy security will require unprecedented international cooperation.”*

In our opinion, energy security requires much more than international cooperation. Energy security requires national policy responses. We will return to this in section 6 of this paper.

In 2007, APEC Energy Ministers met in Darwin, Australia and determined that *“addressing the challenges of energy security and sustainable development should be based on well-functioning markets that are progressively characterized by free and open trade, secure and transparent*

Energy Security of Supply and the Aftermath of the 11th September”, Middle East Economic Survey, Vol 44 No 48, 26 November 2001.

²⁰ G8 Energy Ministerial: Statement from the Co-Chairs, US Secretary of Energy, Spencer Abraham, and Canadian Minister of Natural Resources, Herb Dhaliwal, May 2002 (emphasis contained in original).



frameworks for investment, market-based price signals, market transparency, good governance and effective competition."

APEC Ministers then issued instructions to their officials to implement a range of measures, starting with facilitation of investment and trade in downstream and upstream markets. They particularly emphasised the need to remove investment barriers.²¹

APEC Energy Ministers, like their G8 counterparts five years earlier, correctly identified investment facilitation as a top priority.

By then, it was already apparent that the world was building up to another global energy crisis. Because of continuing growth in demand and shifts in the centres of demand, the vulnerability of many oil importing economies was intensifying to an unprecedented level.²² ResourcesLaw was not alone in saying:

"It is too late for the world to ward off a damaging era of oil supply disruptions and price volatility. This will carry significant economic costs for many importing economies. The costs for some developing economies may exacerbate their balance of payments problems."²³

2008

By July 2008, oil prices had soared to record levels of \$147 per barrel.²⁴ They then collapsed as the entire world plunged into what is now commonly called the GFC, a global financial crisis of historic severity.

2009

In March 2009, the Major Economies Forum on Energy and Climate Change (MEF) was established on the initiative of the United States. China and Australia were amongst its 17 members. The MEF was established to facilitate dialogue among major developed and developing economies, to help generate the political leadership necessary to achieve a successful outcome at the December 2009 UN climate change conference in Copenhagen, and to advance the exploration of concrete initiatives and joint ventures that would increase the supply of clean energy while cutting greenhouse gas emissions.

²¹ The full text of the Darwin Declaration of APEC Energy Ministers is downloadable from the APEC website <www.apec.org>.

²² "The APEC region – like the world in general – is facing serious energy security and sustainability challenges", Claude Mandil, Executive Director, International Energy Agency, Address to APEC Energy Ministers, Darwin, Australia, 29 May 2007.

²³ ResourcesLaw International, "The Energy Crisis We're In", Sydney, Australia, July 2007, <www.resourceslaw.net>.

²⁴ From the mid-1980s to September 2003, the inflation-adjusted price of crude oil on the New York Mercantile Exchange was generally below \$25 / barrel. Driven principally by a steady build-up of demand pressures from 2003, the price peaked at \$147 / barrel in July 2008. In 2009, the oil price bottomed at \$35 / barrel. By June 2010, it had recovered to trade within a range of \$71-79 / barrel.



2010

In 2010, the 12th International Energy Forum (of which China and Australia are two of 98 members) met in Cancun, Mexico, when it dedicated itself to an expanded programme of international cooperation on energy security.

In 2010, APEC Energy Ministers met in Fukui, Japan when they committed to further strengthen the APEC Energy Security Initiative that was first endorsed by APEC Leaders in 2001.²⁵

In summary, the last decade of international dialogue has not been greatly productive because, after the discussants have returned home, they have run into domestic investment barriers.

Investment barriers arise from a combination of political, technical, economic, environmental and legal issues, which are mostly domestic and are almost entirely unrelated to global markets.²⁶ Although impediments to energy investment are becoming better understood, the process of overcoming them can be long and tortuous, as has been experienced with energy market reform.

In recent years, governments have also had to accommodate the additional issues of sustainable development and climate change. These issues are often overlapping and confusing.²⁷

Governments also frequently disagree internally: finance, energy and environmental ministries have distinct responsibilities; they often have different views on what constitutes the “national interest”; they often find it difficult to articulate a “whole of government” approach to investment issues; and those with federal systems of government find it hard to win domestic political consensus.

5. THE G8 ST PETERSBURG PRINCIPLES

It is helpful to look more closely at the G8 St Petersburg Principles. Although the membership of the G8 does not include China or Australia, the seven principles represented the high point of a consensus on energy security. Our comments on each of the seven St Petersburg principles are set out in table 1 below.

²⁵ Ninth Meeting of APEC Energy Ministers, "Fukui Declaration on Low Carbon Paths to Energy Security: Cooperative Solutions for a Sustainable APEC", Fukui, Japan, 19 June 2010 <www.apec.org>.

²⁶ The various barriers to investment have been identified and discussed in the author's book: Robert Pritchard (ed), "Economic Development, Foreign Investment and the Law", International Bar Association and Kluwer Law International, London, 1996.

²⁷ The sustainability debate is often circuitous: in its submission to the 2002 World Summit on Sustainable Development in Johannesburg, the IEA listed energy security as the first of eight areas in which action is necessary for the achievement of energy sustainability.



TABLE 1: A REVIEW OF THE SEVEN ST PETERSBURG PRINCIPLES	
Principle	Our Comments
(i) Increasing Transparency, Predictability and Stability of Global Energy Markets	
<i>"Clear, stable and predictable national regulatory frameworks significantly contribute to global energy security and multilateral arrangements can further enhance these frameworks..."</i>	We absolutely agree. National regulatory frameworks are essential for the efficient functioning of markets.
<i>"We will expand the Joint Oil Data Initiative (JODI)"</i>	JODI is a valuable, short-term, data-sharing mechanism coordinated by the International Energy Forum. However, it will never increase the supply of energy by itself.
(ii) Improving the Investment Climate in the Energy Sector	
<i>"We shall take measures both nationally and internationally to facilitate investments into a sustainable global energy value chain These measures will include:</i>	We absolutely agree that an attractive investment climate is essential. A wide range of measures is required (see below). However, most of the G8's suggested measures require micro-economic reform and other domestic actions. These may take years to implement and cannot be synchronised internationally.
<ul style="list-style-type: none"> • <i>demand-side measures</i> 	Demand-side measures can produce immediate, low-cost gains and are an obvious priority.
<ul style="list-style-type: none"> • <i>energy-efficient technologies</i> • <i>cleaner, more efficient technologies and practices including carbon capture and storage</i> • <i>renewable and alternative energy sources</i> 	Technology changes will take far too long to counteract energy demand growth. Collaborative efforts are however being boosted by bilateral cooperation and by multilateral initiatives such as the Asia-Pacific Partnership on Clean Development and Climate and the Major Economies Forum on Energy and Climate.
<ul style="list-style-type: none"> • <i>expand the hydrocarbon proven reserves</i> • <i>increase the efficiency of oil and gas production</i> • <i>develop resources on the continental shelf</i> • <i>expand and improve the efficiency of oil-refining, petrochemical and gas processing industries' capacity</i> 	We agree. These are conventional measures which have been long pursued by oil and gas companies. A number of national oil companies have now joined the competition to find and develop reserves in foreign countries.



TABLE 1: A REVIEW OF THE SEVEN ST PETERSBURG PRINCIPLES	
Principle	Our Comments
<ul style="list-style-type: none"> • <i>develop global LNG market</i> • <i>establish or upgrade infrastructure for energy transport and storage</i> • <i>develop efficient power generating facilities</i> • <i>expand electricity transmission facilities and their international connectivity"</i> 	<p>We agree. However, all of these important measures require massive investments to be made. Project approval processes need to be given priority attention by host governments and development cycle times need to be reduced. In the case of LNG, the development of a global market depends on prior investment being made in liquefaction capacity and other infrastructure across the entire LNG supply chain.</p>
<p><i>"We will work to reduce barriers to energy investment and trade. It is especially important that companies from energy producing and consuming countries can invest in and acquire upstream and downstream assets internationally "</i></p>	<p>We agree. This recognises the cost savings obtainable by vertical integration in the energy industry. Almost all of the barriers to enhanced energy investment and trade are domestic, "behind the border", barriers. We reiterate that investment facilitation is absolutely essential.</p>
<p>(iii) Enhancing Energy Efficiency and Energy Saving</p>	
<p><i>"[We will take a] comprehensive approach within the international community to energy saving, energy efficiency and the extension of relevant efforts, including sharing best practices, to the entire energy value chain...."</i></p>	<p>We agree that efficiency measures are urgently required. Early and low-cost payoffs are available.</p>
<p>(iv) Diversifying Energy Mix</p>	
<p><i>"Diversification of the energy mix reduces global energy security risks. We will work to develop low-carbon and alternative energy, to make wider use of renewables and to develop and introduce innovative technologies throughout the entire energy sector.</i></p> <ul style="list-style-type: none"> • <i>alternative, cleaner low-carbon energy</i> • <i>nuclear energy</i> • <i>renewables</i> • <i>innovative energy technologies"</i> 	<p>We absolutely agree. Diversification is the key strategic solution. A diversification strategy will reduce risks, especially for developing economies. Japan possibly provides the most successful demonstration of this strategy. This will however take many years to fully implement. Concerted efforts should be maintained.</p>
<p>(v) Securing Critical Energy Infrastructure</p>	
<p><i>"We commit ourselves to address threats and vulnerability to critical energy infrastructures, and to promote international cooperation in this regard."</i></p>	<p>We agree. However, this is only a protective measure. It will not increase the supply of energy.</p>



(vi) Reducing Energy Poverty	
<i>"We confirm our commitment to the UN Millennium Development Goals, including through facilitating a better access to energy. The majority of energy investment will need to come from the private sector. Assistance programs for developing countries should work towards promoting the improved policy and regulatory structures necessary to attract that capital."</i>	This may increase the supply of energy to developing countries but will not insulate them from the effects of a global energy supply disruption that affects the entire global economy. A global energy crisis would cause balance of payments problems for some importing economies.
(vii) Addressing Climate Change and Sustainable Development	
<i>"We reaffirm our intention to deliver on commitments made in Gleneagles in order to [reduce] greenhouse gas emissions. We also affirm our commitment to the UN UNFCCC's ultimate objective of stabilizing greenhouse gas concentrations"</i>	These are not energy security measures.

Our overall conclusion is that the St Petersburg Principles point to the need for national responses.

6. LONGER-TERM NATIONAL RESPONSES TO GLOBAL ENERGY SECURITY CONCERNS

Because of the risk of major energy supply disruptions, governments must of course maintain an emergency response capability. In addition, there is a need for longer-term national responses to contain and manage the risk and, if energy disruptions actually occur, to reduce the costs of consequential damage.²⁸

The key longer term national response to the energy security problem is diversification of fuels and supply sources, coupled with vertical integration of industry to better manage the risks and costs of supply disruptions.

(a) Diversification

Diversification is the key longer-term response to energy security risk. There are four levels of diversification:

²⁸ The discussion in sections 6 and 7 of this paper draws largely on a study undertaken for the APEC Energy Working Group. See Robert Pritchard and Lindsay Hogan, "Energy Security in APEC: Assessing The Cost of Energy Supply Disruptions and the Impacts of Alternative Energy Supply Strategies – An Overview", APEC Secretariat, Singapore, 2005. The overview is based on a report of the same title presented to the APEC Energy Working Group in June 2005.. The full report is available from http://www.abare.gov.au/publications_html/energy/energy_05/nrg_security.pdf.



- diversification in energy production²⁹
- diversification in transportation
- diversification in energy consumption and
- diversification in interconnection of energy systems.

For oil importing countries, the responses should encompass both supply side and demand side aspects –on the supply side, there should be increased oil exploration and production outside the Middle East and, on the demand side, there should be reduced dependence on oil as a fuel.

The appropriate level of diversification must take into account the benefits of utilising relatively abundant energy resources, particularly in low risk geographic locations. Coal is the most abundant resource (mainly located in relatively low risk geographic regions), while oil is the least abundant resource (mainly located in higher risk geographic regions) – natural gas sits between coal and oil in terms of abundance and location risk.

(b) Vertical Integration

The second important longer-term response is vertical integration to better manage the risks and costs of upstream supply disruptions.³⁰ Vertically integrated companies in a supply chain are united through a common owner. Many of the multinational oil companies, such as ExxonMobil, Chevron, ConocoPhillips, Shell, BP and Total have adopted this model. Many national oil companies, such as Petronas (Malaysia), Petrobras (Brazil), Gazprom (Russia) and PetroChina, Sinopec and CNOOC (all of China) are also pursuing this model.

(c) New Energy Technologies

Another important longer term response is research and development (R&D) and utilisation of energy technologies that may reduce the risk or cost of future disruptions, as well as lead to low-carbon energy production.

New energy technologies have potential value on both the supply side and demand side of energy markets:

²⁹ A recommendation of the 2004 World Energy Congress was "All energy options must be kept open and no technology should be idolized or demonized. These include the conventional options of coal, oil, gas, nuclear and hydro (whether large or small), and the new renewable energy sources, combined of course with increased energy efficiency. Each is subject to uncertainties, we cannot afford to jettison any one of them. Energy source diversity is the bedrock of a robust system, even if the optimum mix will vary according to local circumstances". World Energy Council, Sydney 2004 Congress Conclusions <www.worldenergy.org>.

³⁰ "... the vertical integration of various stages of the production process within one company is often the preferred mode of trade in increasingly important global production chains. This may be attributable to fluctuations in profits at different stages of the supply chain, uncertainty in access to resources, high sunk costs associated with location or site-specific investments, and consumer demands for quality and safety", World Trade Organization, "World Trade Report 2010", Geneva, 2010, p 6.



- they may facilitate energy exploration and production (for both conventional and non-conventional sources);
- they may adapt fuel types to different end uses (for example, gas to liquids plants);
- they may reduce energy consumption;
- they may increase the efficiency of energy use; and
- they may increase the speed of adjustment to supply disruptions (for example, switching technologies).

The transport sector is an area where there has been limited progress in new technology utilisation to date. For example, wider use of electric-powered vehicles will increase the diversity of the transport fuel mix and will significantly reduce the risks and costs of oil supply disruptions. Similarly, mass transit systems will be more and more essential.

In the power generation sector, there will be a steady trend towards the greater use of clean coal, natural gas, nuclear energy and renewable energy; there is also the long-term goal of a hydrogen economy.

7. WHAT IS THE 'BEST' POLICY FOR ANY COUNTRY?

The best energy security policy for any country includes a mix of emergency and longer term measures. Each country has different circumstances and different priorities.

Energy security policy options need to be prioritised within the framework of the national budget – this includes the total budget available to policymakers as well as the full range of competing priorities in the economy.

Table 2 below sets out a list of energy security risks and a choice of risk reduction strategies that are open to any country.

TABLE 2: MAIN ENERGY SECURITY RISKS AND BASIC REDUCTION STRATEGIES	
Security risk	Risk Reduction Strategies
1. Heavy dependence on oil	<ul style="list-style-type: none">• Diversify the energy mix (increase share of natural gas, coal and 'old' and 'new' renewables)• Utilise fuel switching systems
2. Heavy dependence on natural gas	<ul style="list-style-type: none">• Diversify the energy mix (increase share of oil, coal, nuclear and 'old' and 'new' renewables)• Utilise new conversion technologies such as gas to liquids (GTL), if viable• Utilise fuel switching systems



TABLE 2: MAIN ENERGY SECURITY RISKS AND BASIC REDUCTION STRATEGIES	
Security risk	Risk Reduction Strategies
3. Heavy dependence on coal	<ul style="list-style-type: none"> • Diversify the energy mix (increase share of oil, natural gas, nuclear and 'old' and 'new' renewables) • Utilise liquefaction and gasification technologies, if viable • Utilise fuel switching systems
4. Heavy dependence on hydro-electricity	<ul style="list-style-type: none"> • Diversify energy mix (increase share of oil, natural gas, coal, nuclear and 'new' renewables) • Utilise fuel switching systems
5. Heavy dependence on imports	<ul style="list-style-type: none"> • Diversify external sources of supply • Increase domestic oil and gas exploration • Build stockpiling capacity • Strengthen alliances with reliable suppliers
6. Inadequate stockpiling capacity	<ul style="list-style-type: none"> • Participate in regional and international oil stockpiling schemes for the common good • Increase domestic oil stockpiling capacity • Increase domestic gas storage above and below ground • Increase domestic coal stockpiling
7. Inadequate transport capacity	<ul style="list-style-type: none"> • Increase cross border and domestic pipeline capacity • Build and expand LNG receiving terminals
8. Poor utilisation of primary energy	<ul style="list-style-type: none"> • Utilise new vehicle technologies • Utilise new and more efficient generation technologies • Maintain high reserve generating plant margins • Increase fuel switching capacity
9. Poor efficiency of gas and electricity industries	<ul style="list-style-type: none"> • Maintain high system security • Utilise private capital and competitive markets • Reduce energy intensity • Utilise demand management systems • Compel demand restraint • Ration supplies if unavoidable



TABLE 2: MAIN ENERGY SECURITY RISKS AND BASIC REDUCTION STRATEGIES	
Security risk	Risk Reduction Strategies
10. Poor utilisation of electricity transmission and distribution networks	<ul style="list-style-type: none">• Decentralise generation• Upgrade and augment networks• Interconnect with other power systems by cross border transmission• Extend grid service to unserved areas

For a particular country, what might be the 'best' response strategy will depend on the make-up of the particular energy security risks that it faces. Emergency stockpiling systems have a balancing role to play as a temporary response to shortages but each country must analyse its particular circumstances and decide for itself what are its most appropriate, cost-effective and affordable longer-term response strategies.³¹

In the light of the foregoing discussion, we can attempt to draw some tentative conclusions about energy security issues for China and Australia.

8. COOPERATION BETWEEN CHINA AND AUSTRALIA

China and Australia are both increasingly dependent on imports of oil. Without new oil discoveries, the transportation sector of both countries will become increasingly vulnerable to oil supply disruptions. Substitutes for oil will therefore have to be found. Electric-powered vehicles are likely to play a key part in the transportation sector in the future, as are mass transit systems.

As well, China is becoming increasingly dependent on imports of coal, LNG and uranium.

By contrast, Australia is in the fortunate position of holding 38% of world uranium resources, 9% of world coal resources and 2% of world natural gas resources. Australia is already the world's largest exporter of coal, accounting for 85% of its total energy exports. In the 2008-09 year, the total value of Australian energy exports exceeded A\$65 billion. Plans are now under way in Australia for the development of at least six new LNG export projects.

When Vice Premier Li Keqiang of China made an official visit to Australia in October 2009, the two sides issued a joint statement on China-Australia economic relations:

"Recognising that the combined GDP of our two economies is greater than US\$5 trillion, the two sides agreed that China and Australia enjoy strong economic complementarity, and it serves the common interests of both sides to advance economic, trade and investment cooperation on the basis of reciprocity and mutual benefit. Australia is a long-term stable supplier of mineral and energy resources to China. China is a competitive supplier of goods to Australia. The Australian side stated in clear terms

³¹ In this paper, we have attempted, at the risk of over-simplification, to focus on the key strategic issues. For a comprehensive and detailed discussion of legal and regulatory issues, see Barry Barton et al (eds) "Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment," Oxford University Press, Oxford, UK, 2004.



*that it welcomes investment from China, as China welcomes investment from Australia.*³²

China has adopted six principles to guide its energy security strategy:

"Firstly, both energy exploitation and energy conservation are emphasized but priority is given to energy saving...

Secondly, China will continue to rely mainly on its domestic energy supply ...

Thirdly, diversified development of energy sources will be pursued ...

Fourthly, reliance on science and technology will be emphasized in the energy field ...

Fifthly, China will persevere in protecting the environment in its energy development...

*Sixthly, China will promote and strengthen mutually beneficial international energy cooperation".*³³

China's third strategic principle, diversified development of energy sources, is the one that will matter most for its energy security over the next decade. It has already been facilitated by the 'Go Out Policy' (going global strategy) that China initiated in 1999. China's national oil companies and their affiliates are now also investing in the development of upstream energy resources in many parts of the world, including in Australia.

China's fourth strategic principle, reliance on science and technology, will become increasingly important as time goes on, especially as the world moves towards low-carbon energy production.

For its part, Australia needs foreign capital to further develop its energy resources. Australia looks to Chinese companies to invest in new export-oriented projects as part of a process of vertical integration.

In conclusion, China and Australia are 'natural' partners in trade and investment in coal, LNG and uranium. They are also 'natural' partners in new energy technologies. The two countries should enjoy a more secure energy future by collaborating with each other.

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³² Australian Department of Foreign Affairs and Trade, Australia-China Joint Statement, 30 October 2009 <www.dfat.gov.au>.

³³ Zhou Xingbao, footnote 1.