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IMPLICATIONS OF GLOBAL ENERGY SECURITY CONCERNS FOR THE CANADIAN FORCES: A RISK MANAGEMENT APPROACH

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ABSTRACT

Energy security is causing growing concern as global demand increases and confidence in oil and natural gas supplies wanes. There is a significant nexus between energy security and the more traditional concepts of security itself: conflict jeopardizes energy security and the pursuit of energy can cause or exacerbate conflict. This presents a challenge for the Canadian Forces as it looks forward to see where its limited resources could be employed in the future. This paper will review the current energy security situation, propose a risk management framework based on Canadian national interests, and analyse the risks and concomitant proposed responses to global energy security challenges. The risk management framework enables the Canadian Forces to focus its attention on the most critical of domestic and international threats, namely the defence of Canadian energy infrastructure and Arctic sovereignty and oil and gas production and transportation in West Africa and the Persian Gulf. Although future research is required to create a more robust model through increased quantification of the effects and probabilities, the framework used in this paper demonstrates the viability of using risk management principles to assess diverse and uncertain threats.

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Mastery itself [of oil] was the prize of the venture" [1]

1. INTRODUCTION

From the 1930's through to the oil crisis of the 1970's and continuing to the present day, the availability of energy has been critical to the global economy. What is now commonly referred to as global energy security remains a frequent topic in both the popular press[2] and academia[3]. It resonates particularly strongly in Canada. With its unique geography, dependence on foreign trade, and extensive reliance on oil and natural gas for both its economic and social survival, Canada presents an ideal case study of the future impact of the changing nature of energy security.

Energy security has been defined by Bryne Purchase of Queens University as "a reasonable degree of assurance that a prolonged and large scale energy disruption will not occur and that, if it does occur, its impact will be tolerable."[4] While energy security remains largely an economic issue, there has been focus on factors and impacts beyond economic considerations. For example, in the recent annual United States (US) Intelligence summary there was increased attention on the impact of energy security on

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[1] Sir Winston Churchill, *The World Crisis,* Vol 1, (New York: Scriberners, 1928), 130.

[2] An informal survey of the internet is illustrative. A search of the www.cbc.ca site alone shows 107 articles on "energy security" from 2001 to 2009. Examples include "In-depth: Energy," CBC News, 13 April 2006; http://www.cbc.ca/news/background/energy/; Internet; accessed 20 April 2009, "Nova Scotia energy supply at risk: report, "CBC News, 7 June 2007; http://www.cbc.ca/canada/novascotia/story/2007/06/07/energy-security.html; Internet; accessed 20 April 2009, and "Summit has formal agenda, and Cuba," CBC News, 17 April 2009; http://www.cbc.ca/money/story/2009/04/17/summit-americas.html; Internet; accessed 20 April 2009.

[3] A similar survey using www.JSTOR.org shows over 100 articles related to "energy security" in academic journals or publications from 2001 to 2009.

[4] Bryne Purchase, *Canadian Energy Security and Policy,* A Presentation to Joint Command and Staff Program 35, 15 October 2008, 7.

America's security in general.[5] Furthermore, the US military is becoming ever more engaged in locations across the globe where its role, whether openly stated or not, is to provide a security environment supportive of energy security.[6]

Despite this increased focus on vulnerabilities arising from energy security, there are minimal studies on their implications for Canada, and more specifically, for the Canadian Forces (CF). While one can imagine that the role of the CF would be similar to that of US forces, that of providing the fundamental stability required to support energy security, it is not feasible or desirable for Canada to have such global ambitions. To address this dilemma, this paper contends that a risk management approach, more typically applied to business or management dilemmas, provides an appropriate framework to determine the areas of engagement for the CF that best support Canada's national interests.

This paper begins by establishing a risk management framework to determine the appropriate responses to energy security related risks. Next, to provide the basis for the risk assessments, the paper reviews the global energy security situation with a particular focus on the implications for Canada. The analysis from this review is combined with the risk management framework to demonstrate how the framework can be used to determine potential CF areas of interest in response to global energy security issues.

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[5] Dennis Blair, Annual *Threat Assessment of the Intelligence Community for the Senate Select Committee on Intelligence*, Washington: Director of National Intelligence, 12 February 2009, 3; http://intelligence.senate.gov/090212/blair.pdf; Internet; accessed 26 February 2009.

[6] There is considerable writings on this topic; however, one of the better overall discussions on the "securitization" of US energy security is: Richard Youngs, *Energy Security* (New York: Routledge, 2009), 41-42.

The analysis shows that there will be an increasing requirement for the employment of the CF in support of energy security related issues both domestically and internationally. Although these deployments could take the CF to a variety of locations, the highest priority international missions would be to West Africa and the Middle East. The analysis also demonstrates that a strong Canadian naval capability will be required if Canada wishes to influence energy security issues abroad, since significant volumes of energy production and transport occurs on or near the sea.

The extraction, processing, and distribution of oil and natural gas are critical to the global economy. Most countries, whether they are net importers or exporters, are economically reliant upon the production and/or consumption of oil and gas. For exporters, the oil and gas and industry contributes significantly to the nation's gross domestic product (GDP). For importers, oil and gas are often required to sustain industry and to look after the population's needs. Increases in energy prices result in threats to the economic growth of importing countries.[7] An "oil-price shock" caused by disruptions of the energy supplies impacts the economy of both developed countries and heavily indebted poor countries.[8] Since the International Energy Agency (IEA) predicts that fossil energy will remain dominant until at least 2030, these commodities are the focus of this paper.[9] As will be discussed in the body of this paper, of the various forms of energy resources the primary stress points in energy security are oil and natural gas due to their

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[7] International Energy Agency, *World Energy Outlook 2006* (Paris: International Energy Agency, 2006), 39; http://www.iea.org/textbase/nppdf/free/2006/weo2006.pdf; Internet; accessed 6 February 2009.

[8] *Ibid*., 39.

[9] *Ibid*., 37.

potential scarcity and extensive inter-region exportation. Therefore, this paper will exclusively focus on oil and natural gas.

"Our values will count … for very little if we fail to prosper."[10]

2 FRAMEWORK

INTRODUCTION

Before exploring energy security and its potential implications for the CF, it is first necessary to establish the risk management philosophy that will underlie this paper's analysis. This chapter will explain the concept of risk management and develop the framework for the analysis of the potential impact of energy security on the CF.

RISK MANAGEMENT

Risk management provides a systematic and structured methodology for determining priorities and responses in situations with uncertainty.[11] It is a flexible tool that is used widely in diverse fields such as finance[12], engineering[13], military operations[14] and project management.[15] There is also precedent for the application of risk management to international security studies.[16]

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[10] J.L. Granatstein, *The Importance of Being Less Earnest: Promoting Canada's Interests Through Tighter Ties with the U.S.*, C.D. Howe Institute Benefactor's Lecture 2003, 8; http://www.cdhowe.org/pdf/benefactors_lecture_2003.pdf; Internet; accessed 15 February 2009.

[11] UK Institute of Risk Management, *A Risk Management Standard* (London: Institute of Risk Management, 2002), 2; http://www.theirm.org/publications/documents/Risk_Management_Standard_030820.pdf; Internet, accessed 8 February 2009.

[12] Examples include Glen Holton, "Defining Risk," *Financial Analysts Journal* 60, no.6 (2004).

[13] Examples include Department of National Defence, 1 Canadian Air Division Order 1-623, *Airworthiness Risk Management* (Winnipeg: 1 Canadian Air Division Headquarters, 2009).

[14] Examples include Department of National Defence, B-GJ 005-502 FP-000, *Risk Management for CF Operations* (Ottawa: Public Works and Government Services Canada, 2003).

[15] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, 2000 Edition (Newtown Square, Pennsylvania: Project Management Institute, 2000).

[16] Recent examples include Peter Truscott, *The Ascendancy of Political Risk Management and its Implications for Global Security and Business Investment*,(London: Royal United Services Institute, 2006)

Heng, a lecturer at the School of International Relations at Saint Andrew's University, notes that even though the "imperfect knowledge" of international relations possibly makes the application of risk management less "scientific" than in other fields, it still provides a method to handle incertitude.[17] Others recommend caution in the application of strict scientific principles to such complex environments. Ulrich Beck, one of the most influential European writers of social analysis during the late twentieth century, warns that beyond the physical and measureable realm, risk assessments must also consider the social systems. He argues that the "systemic assumption of realism in science" can lead to invalid conclusions if the "sociological aspects" are not incorporated.[18] Ortwin Renn and Andreas Kinke, of the University of Stuttgart, conducted an extensive study of risk management across a diverse variety of fields including climate change, medicine and security.[19] Their findings were that despite incertitude in the determination of effect and probability in complex systems, it could be concluded that science-based and precautionary approaches to risk management were effective in determining strategies for reducing disaster potential and implementing precautionary plans.[20] The energy security environment is dominated by uncertainty and

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and Yee-Kuang Heng, *War as Risk Management: Strategy and Conflict in an Age of Globalised Risks* (New York: Routledge, 2006).

[17] Yee-Kuang Heng, *War as Risk Management: Strategy and Conflict in an Age of Globalised Risks*, 55-57.

[18] Ulrich Beck, translated by Mark Ritter, *Risk Society* (London: Sage, 2005), 4-5.

[19] Ortwin Renn and Andreas Kinke, "Systemic Risks: A New Challenge for Risk Management," *EMBO Report*, no. 5 (October 2004); http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1299208; Internet; accessed 21 April 2009.

[20] *Ibid.*, Table 1. They also developed "classes of risk" to measure not only the effect and probability but also the degree of uncertainty. The classes were named after mythological creatures: "*Damocles:* high catastrophic potential, probabilities (widely) known, *Cyclops:* no reliable estimate on probabilities, high catastrophic potential at stake, *Pythia:* causal connection confirmed, damage potential

a wide variety of dissimilar risks as it comprises a combination of environmental, security and economic factors. Therefore, despite some limitation in addressing the sociological aspects of security studies, risk management is an appropriate tool to investigate the implications of energy security.

The Project Management Institute, as with many organisations, defines risk as "an uncertain event or condition that, if it occurs, has a positive or negative effect."[21] This paper will use the classical understanding of risk as being composed of three fundamental elements: the event, the probability[22] of event and the severity or effect of the event.[23] The risk, then, is the product of the probability and the severity. Heng argues that the probability and severity of the consequences in international relations are analogous to what he calls the "Old Security Paradigm" of a potential threat's intentions and capabilities.[24]

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and probabilities unknown or indeterminable, *Pandora:* causal connection unclear or challenged, high persistency and ubiquity , *Cassandra:* intolerable risk of high probability and great damage but long delay between causal stimulus and negative effect, *Medusa*: perception of high risk among individuals and large potential for social mobilization without clear scientific evidence for serious harm." See figure X to see how the classes were plotted on the risk matrix.

[21] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, 207.

[22] David Mandel, *Towards a Concept of Risk for Effective Military Decision Making* (Toronto: DRDC Toronto 2007). In David Mandel's paper he argues that "uncertainty" should be used in lieu of probability.

[23] Carl Pritchard, *Risk Management: Concepts and Guidance*, 2nd edition (Arlington: ESI International, 2001), 9.

[24] Yee-Kuang Heng, *War as Risk Management: Strategy and Conflict in an Age of Globalised Risks*, 49.

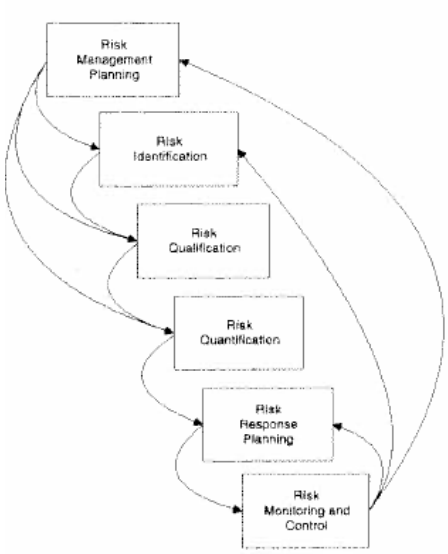

Figure 1 - Risk Management Process
Source: Carl Pritchard, *Risk Management: Concepts and Guidance* 25.

As shown in Figure 1, risk management has six fundamental stages: risk management planning, risk identification, risk qualification and quantification, risk response planning, and risk monitoring and control.[25] During risk management planning, the assessor develops a plan to manage the risk. The identification stage determines the sources of risk. At this stage, the risks are usually simply described. In the qualification and quantification stages, the risks are assessed to determine their potential effect or severity and probability. They can then be plotted on a risk matrix. One can see in figure 2 that the further one moves towards the bottom-right quadrant, the higher the risk. In fields such as engineering, the effects and probabilities are often quantified scientifically; however, in other fields such as project management and security it is typical that only a qualitative assessment is practical. Although the assessment may only be qualitative, it does not preclude the use of this methodology as it is relative rather than

[25] Carl Pritchard, *Risk Management: Concepts and Guidance,* 25.

absolute values that are of primary importance in determining the apportionment of resources.

Probability / Impact	Low probability (1)	Moderate probability (2)	High probability (3)
Low impact (1)	Low probability, low impact (1x1=1)	Moderate probability, low impact (2x1=2)	High probability, low impact (3x1=3)
Moderate impact (3)	Low probability, moderate impact (1x3=3)	Moderate probability, moderate impact (2x3=6)	High probability, moderate impact (3x3=9)
High impact (6)	Low probability, high impact (1x6=6)	Moderate probability, high impact (2x6=12)	High probability, high impact (3x6=18)

Figure 2 - Risk Matrix
Source: Carl Pritchard*, Risk Management: Concepts and Guidance,* 32.

During the risk response planning stage, appropriate responses to the identified risks are selected based on the analysis of the risk. Ortwin Renn and Andreas Kinke concluded in their studies, as shown in figure 3, that across all fields, the degree of risk that can be tolerated increases with the perception of potential extent of damage and probability of occurrence and therefore the requirement for "precautionary" action increases with risk.[26]

[26] Ortwin Renn and Andreas Kinke, "Systemic Risks: A New Challenge for Risk Management," 4.

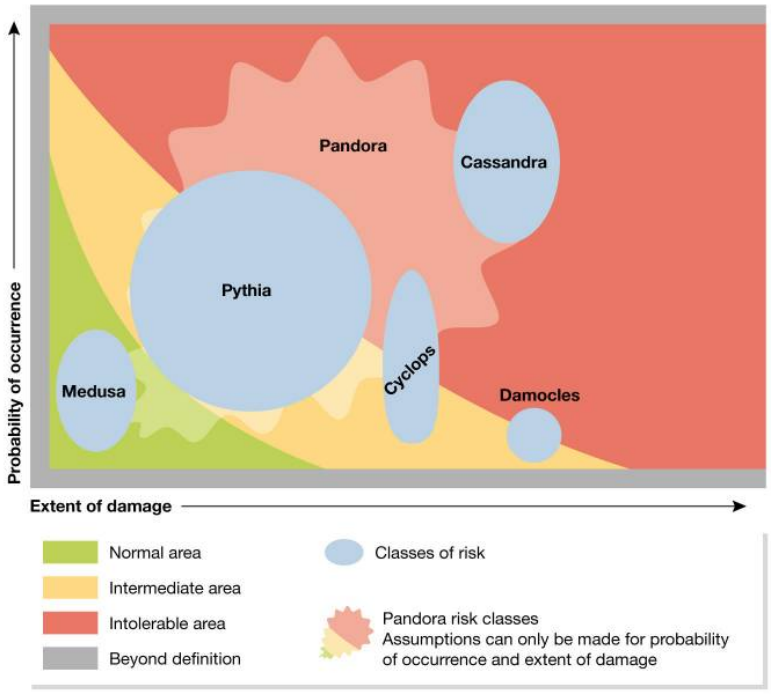

Figure 3 - Risk Classes
Source: Ortwin Renn and Andreas Kinke, "Systemic Risks: A New Challenge for Risk Management," 4.

In risk management terms, risk response fall into four forms: avoidance, transference, mitigation and acceptance.[27] In risk avoidance, the risk is avoided in its entirety, generally by choosing a different course of action. Transference means passing the responsibility or consequence for a given risk to a third party. In risk mitigation, specific courses of action are taken, or contingency plans are prepared, to reduce the probability and/or the impact of the risks. Finally, with risk acceptance, a decision is taken to acknowledge or accept the risk and "endure" the potential impact.[28] Generally, the greater the risk, the more important it is to avoid or mitigate it. At the other extreme, in cases of low risk, measures such as risk acceptance may be more appropriate.

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[27] Carl Pritchard, *Risk Management: Concepts and Guidance*, 41.

[28] *Ibid.*, 41-44.

This chapter will develop the risk management planning stage. Chapters three to five will provide background information that will be used in chapter six to conduct the risk assessment. As risk monitoring and control are continuous rather than discrete activities, this paper will not cover them.[29]

GOVERNMENT POLICIES

The risk management methodology described above is generic. In order to develop a more robust and specific framework, this paper will also review current government policy to determine what elements, if any, can be incorporated. There is a paucity of published government policy describing how the CF would be used to support energy security. Therefore, one must look at overall government policy to see what implications energy security may have for the CF.

The current Conservative government has not published an overall international policy statement, but the previous Liberal government's 2005 International Policy Statement (IPS) described Canada's overarching approach to foreign policy in terms that appear to be fairly consistent with the views of the current regime. The IPS describes the government as having three core responsibilities: prosperity, security and responsibility.[30] The first two are what the IPS describes as "fundamental interests," while responsibilities as a member of the global community are both in Canada's interest and part of a more

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[29] *Ibid*., 44-46. Risk monitoring and control refers to the continuous process where the risk assessment itself is periodically reviewed to determine if the assumptions and analysis remain valid and if triggers have been exceeded that would require the implementation of contingency plans. Additional information on project control is available at Jeffrey Pinto and Jeffrey Trailer, *Essentials of Project Control* (Newton Square: Project Management Institute, 1999).

[30] Department of Foreign Affairs and International Trade, *Canada's International Policy Statement: A Role of Pride and Influence in the World – Overview*, (Ottawa: Public Works and Government Services Canada, 2005), 5.

altruistic contribution of Canadian values globally.[31] The IPS also identifies the strong link between Canada's dependency on global markets and a requirement for "a stable world order."[32]

The current administration of the Department of Foreign Affairs and International Trade (DFAIT) has listed its top priorities on its website:

1. A safer, more secure and prosperous Canada within a strengthened North American partnership.
2. Greater economic competitiveness for Canada through enhanced commercial engagement, secure market access and targeted support for Canadian business.
3. Greater international support for freedom and security, democracy, rule of law, human rights and environmental stewardship.[33]

DFAIT also published its specific policy on Canada and energy security in 2008. It states that although Canada is a "secure, stable, democratic country that produces and exports energy" it needs to be "an active player in international efforts to address the cross-cutting challenges faced by energy producers and consumers alike, and to enhance global energy security writ large."[34] However, rather than prescribe active government intervention in the global energy market, DFAIT states that Canada is "a trade-dependent economy strongly supportive of open, transparent and rules-based international markets,"

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[31] *Ibid.*, 4.

[32] *Ibid.*, ix and 5,

[33] Department of Foreign Affairs and International Trade, "Our Priorities," 25 October 2008; http://www.international.gc.ca/about-a_propos/priorities-priorites.aspx?menu_id=18&menu=L; Internet; accessed 7 February 2009.

[34] Department of Foreign Affairs and International Trade, "Energy Security," 2 July 2008; http://www.international.gc.ca/enviro/energy-energie/energy_security-securite_energitique.aspx?lang=eng; Internet; accessed 7 February 2009.

and that this is "particularly true for the international energy market."[35] DFAIT summarises the key challenges as follows:

> Steadily rising demand, coupled with under-investment in energy infrastructure; disruption of supply due to political intervention, armed conflicts or natural disasters; an absence of transparency and predictability in regulatory, judicial and/or taxation frameworks; and increasingly unsustainable production and consumption of energy resources.[36]

In response to global energy security challenges, DFAIT states that the "appropriate role for governments, whether of a developed or developing country, is primarily to establish an enabling business environment."[37] That environment includes "regulatory, judicial and taxation regimes."[38] Although this is not DFAIT's stated intent, one might infer that the CF's contributions to stability and security can also enable national and international business and commerce. It follows that an effective overseas role for the CF might produce a climate more supportive of global energy security.

The DFAIT website neglects to emphasize that although Canada is mostly energy self-sufficient, Canada's economy is very much linked with that of the US and other trading partners.[39] Therefore, in support of the requirement for "prosperity for Canadians," it would appear to be in Canada's best interest to work with the US and other

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[35] Department of Foreign Affairs and International Trade, "Energy Security: A Canadian Perspective," 2 July 2008; http://www.international.gc.ca/enviro/energy-energie/overview-appercu.aspx?menu_id=20&menu=R; Internet; accessed 7 February 2009

[36] *Ibid.*

[37] *Ibid.*

[38] *Ibid.*

[39] National Energy Board, *Canadian Energy Overview* (Ottawa: National Energy Board, 2008), 1. http://www.neb.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/nrgyvrvw/cndnnrgyvrvw2007/cndnnrgyvrvw2007-eng.pdf; Internet; accessed 13 February 2009. Although Canada is a net-exporter of oil and gas presently it still requires oil imports for eastern Canada and is forecast to become a net importer of natural gas by 2028.

allies to contribute to global energy security. Further, as the US is the "anchor for [Canada's] international reach,"[40] it is important for Canada to pay particular attention to American energy security.

The 2008 Canada First Defence Strategy (CFDS) lists three roles for the CF: "to defend Canada, to defend North America and to contribute to international peace and security."[41] To fulfil these requirements the government has determined that the CF must be able to "deliver […] excellence at home, be a strong and reliable partner in the defence of North America, and project leadership abroad by making meaningful contributions to international security."[42]

Even though contributing to energy security is not mentioned specifically, the CFDS is directly applicable to energy security issues. Within Canada, the CFDS directs that Canada "provide surveillance of Canadian territory and air and maritime approaches" and "assist other government departments in addressing … security concerns."[43] These functions are important in the protection of Canada's energy infrastructure and in assisting with sovereignty in the potentially resource rich Arctic. The CFDS emphasises Canada's traditional partnership with the US, recognizing that Canada needs to be a "strong and reliable partner."[44] Finally, the CFDS reminds the reader that "as [Canada is]

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[40] Department of Foreign Affairs and International Trade, *Canada's International Policy Statement: A Role of Pride and Influence in the World – Diplomacy*, (Ottawa: Public Works and Government Services Canada, 2005), 1.

[41] Department of National Defence, "Canada First Defence Strategy," (Ottawa, Public Works and Government Services Canada, 2008); 3; http://www.forces.gc.ca/site/focus/first-premier/June18_0910_CFDS_english_low-res.pdf; Internet; accessed 7 February 2009.

[42] *Ibid.*, 7.

[43] *Ibid.*, 7.

[44] *Ibid.*, 8.

a trading nation in a highly globalized world, Canada's prosperity and security rely on stability abroad" and therefore that Canada "must do its part to address such [international] security threats as they arise as an important element in protecting Canada."[45]

Although Canadian government policy has little in the way of direct mention of energy security and even less on the CF's role in energy security, it provides the broad policy parameters that indicate how the government wishes to apportion its efforts. This general guidance will be taken into account in the development of the framework for this paper.

NATIONAL INTEREST FRAMEWORK

While the government policies discussed in the preceding sections broadly describe Canadian and CF priorities and roles, they do not provide much in the way of a rigorous framework. In this section, the categorisation of national interests will be explored and a national interest framework will be developed for use in the subsequent chapters of this paper.

Michael Roskin, of the US Army War College, investigates the concept of national interest from an American perspective in "National Interest: From Abstraction to Strategy." [46] He states that national interests come from two philosophical approaches: either the "ethical and normative approach" commonly referred to as "Wilsonian idealism" or a power-based or "realist" approach based largely on the writings of one the

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[45] *Ibid.*

[46] Michael Roskin, *National Interest: From Abstraction to Strategy*, (Carlisle Barracks: US Army War College, 1994); http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB356.pdf, Internet; accessed 15 February 2009.

early founders of the realist school, Hans Mortenthau.[47] Mortenthau based his writings on the concept of a "struggle for power": governments should make decisions based on whether the state's power would be "preserved or improved."[48]

Canadian academics and bureaucrats have made similar arguments. Some, such as Paul Heinbecker, at the time an Assistant Deputy Minister in DFAIT, argued that as Canadians are "moved by humanitarian impulse … principles are often more important than power."[49] Noted academics Denis Stairs and J.L. Granatstein retort vigorously that Canada's foreign policy should be what Stairs describes as a "practical, utilitarian activity."[50] Granatstein argues that a government's responsibility is to "protect the nation's interests first and foremost, carefully weighing the hard-headed achievement of them with the more idealistic promotion of Canadians' values."[51] The reasoning behind this stance is his argument that a nation's primary obligation is to look after its interests and that "values will count for nothing if the nation does not survive and for very little [if the nation] fails to prosper."[52] While values cannot be discounted, it is clear that national interests need to be the primary determinant of foreign policy.

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[47] *Ibid*., 2-3.

[48] Hans J. Morgenthau, *Politics Within Nations*, 6th ed. (New York: Knopf, 1985), 31.

[49] Paul Heinbecker, "Human Security: The Hard Edge," *Canadian Military Journal* (Spring 2000): 12.

[50] Denis Stairs, "The Menace of General Ideas in the Making and Conduct of Canadian Foreign Policy," *Skelton Memorial Lecture 2006*, 2; http://www.international.gc.ca/odskelton/stairs.aspx?lang=eng; Internet; accessed 18 April 2009.

[51] J.L. Granatstein, *The Importance of Being Less Earnest: Promoting Canada's Interests Through Tighter Ties with the U.S.,* 9.

[52] *Ibid., 8.*

Beyond a determination that national interests should have a higher priority on the national agenda than values, a practical framework requires a schema to prioritize interests. Donald Nuechterlein, a notable writer on American foreign policy, categorises a state's national interests as being, in decreasing order of criticality: survival, vital, important or peripheral."[53]

Table 1 - Nuechterlein's National Interest Matrix

Intensity of Interest / Basic National Interest	Survival Level (Critical)	Vital Level (Dangerous)	Major Level (Serious)	Peripheral Level (Bothersome)
Defense of Homeland				
Economic Well-Being				
Favourable World Order				
Promotion of Values				

Source: Donald Nuechterlein, *America Overcommitted: United States National Interests in the 1980's*, 15.

W.D. Macnamara and Ann Fitz-Gerald, of Queen's University and Cranfield University respectively, have further developed Nuechterlein's ideas in a Canadian context.[54] Following a review of the processes used in the US and UK, they propose a national security policy framework for Canada based on both Nuechterlein's concepts and historical Canadian national interests.[55] Directly applicable to this paper, their framework highlights domestic and international interests against which assessments can

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[53] Donald Nuechterlein, *America Overcommitted: United States National Interests in the 1980s* (Lexington: University of Kentucky Press, 1985), 15.

[54] W.D. Macnamara and Ann Fitz-Gerald, "A National Security Framework for Canada," *Policy Matters* 3, no. 10 (October 2002).

[55] *Ibid.*, 25.

be made to identify the risk events that may impact upon Canada's interests.[56] Table 2 shows their proposed national interest matrix.

Table 2 - Neuchterlein's National Interest Matrix Modified For Canada

Intensity of Interest / Basic National Interest	Survival Level (Critical)	Vital Level (Dangerous)	Human Level (Serious)	Periheral Level (Bothersome)
Defense of Canada/N.A.				
Economic Well-Being				
Stable World Order/Int'l Security				
Promotion of Cdn Values				

Source: W.D. Macnamara and Ann Fitz-Gerald, "A National Security Framework for Canada," 25.

The application of the matrix is relatively straightforward. It shows a hierarchy of intensity of interest depending on the priority of the national interest. For example, the highest priority interest, "defence of Canada," can have intensities of interest up to "critical" while "Promotion of Canadian Values" can have a maximum intensity of "serious." This matrix, with its clear prioritisation of interests, will form the basis of the framework for this paper.

NATIONAL INTEREST FRAMEWORK FOR ENERGY SECURITY

To develop a framework to determine potential implications for the CF from energy security, the Macnamara/Fitz-Gerald's matrix was modified to focus on the issues arising from energy security.

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[56] *Ibid.*, 20.

Table 3 uses Macnamara and Fitz-Gerald's y-axis of "national interest" and x-axis of "intensity of interest"; however, it then provides an energy security (model/column/axis) based upon Macnamara and Fitz-Gerald's broader national interests.

Table 3 - Energy National Interest Framework

1. **Basic National Interest**[57]	**2. Intensity of Interest**[58]	**3. Energy Security Factors**[59]	**4. Energy National Interests**[60]
Defence of Canada/NA	Survival (Critical)	- Defence of Energy Infrastructure - Sovereignty	Defence of Canada/NA
Economic Well-Being	Vital (Dangerous)	- Ability to export oil and gas - Ability to import oil and gas - Economic Well-Being of US	Economic Well-Being
Stable World Order/Int'l Security	Human (Serious)	- Stability of allies not adversely affected by poor energy stability - Absence of significant conflict due to energy conflict	Stable World Order/Int'l Security
Promotion of Cdn Values	Peripheral (Bothersome)	- Adverse impact on human security due to energy security reduced	Human Security

These tasks provide a potential nexus between national interests and energy security. Rather than categorising risks as was done in Macnamara and Fitz-Gerald's work, this paper will translate the risks into the following potential effects as shown in Table 3: impact on Canada's sovereignty or security, impact on Canada's economic well-being, impact on a stable world order and impact on human security. While these impacts are somewhat interdependent, they represent decreasing levels of criticality to

[57] This column is from W.D. Macnamara and Ann Fitz-Gerald, "A National Security Framework for Canada," 25.

[58] This column is adapted from *Ibid.*, 25.

[59] This column shows the factors relavent to energy security that pertain to W.D. Macnamara and Ann Fitz-Gerald's categorisation of national interests.

[60] This column refers to a national interest from an energy security perspective derived from the overall national interest in the preceding column.

Canadian national interests. For example, the defence of Canada is always in Canada's national interest while human security, is not necessarily a national interest unless it impacts upon economic well-being or a stable world order, even though it is representative of Canada's values. These categories are reasonably broad but this not unusual in such a complex system, nor are they incongruent with the reality of strategic decision making (where it is often not the actual risks that drive the decision process but the "decision maker's perception of them."[61]) The categories in column four then become the "impacts" on the x-axis of the risk matrix as shown at Table 3. To assist with clarity, the matrix will only show higher order impacts. For example, economic well-being would also likely impact a stable world order and human security in the country in question; however, the risk will only be documented in the higher priority effect. In this case, a risk to economic well-being would only be listed under that column, and would not appear under stable world order and human security.

Table 4 - Risk Matrix

Prob\Impact	Sovereignty or Defence of Canada	Economic Well-Being	A Stable World Order	Human Security
H				
M				
L				

Probabilities will be categorised as high, medium and low. Although the determination of probability will be qualitative, it will be based upon the likelihood of the potential risk coming to fruition, as indicated in the available literature. Again, it is not the absolute value of the probability that is relevant but the relative probability as

[61] Richard Wilson and Edmund Crouch, *Risk-Benefit Analysis* (Newton, MA: Harvard University Press, 2001), 7.

compared to the other risk events being evaluated. Heng refers to this as "probabilistic thinking" and argues that the probability does not need to be quantifiable.[62]

Once the types of impacts and the range of probabilities have been assessed, the risk matrix can be populated. This will then form the basis of the model for determining the priorities and concomitant risk responses. Based upon the concept that the robustness of the risk response should increase with the perception of the risk, the generic risk response framework can be developed as shown in Table 5.

Table 5 - Risk Response Framework

	Sovereignty or Defence of Canada	Economic Well-Being	A Stable World Order	Human Security
H	Must Mitigate	Must Mitigate	Must Mitigate /Transfer	Should Mitigate/ Transfer
M	Must Mitigate	Should Mitigate/Transfer	Should Mitigate/ Transfer	Transfer /Accept
L	Should Mitigate	Transfer/Accept	Transfer /Accept	Transfer /Accept

The application of this framework now becomes more obvious. For example, in the case of energy security, the risk event may be something that happens overseas that would adversely affect Canada's economy. Based on the severity of the effect on Canada and the probability of the event happening, the risk could be qualitatively identified. From this point, the possible risk response can be selected based on the potential rewards, the criticality of the risk, and the feasibility of implementing a risk response measure. For example, if there is a terrorist threat to oil infrastructure in Canada and the probability was assessed as high and the effect of a successful attack on the Canadian economy or safety was assessed as very significant, the overall risk would be assessed as high. The recommended risk response to a high risk would be to mitigate the risk through reducing

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[62] Yee-Kuang Heng, *War as Risk Management: Strategy and Conflict in an Age of Globalised Risks*, 49.

its probability. However, at the other end of the spectrum, if there is a slight probability that political unrest in a distant part of the world may interfere with local (but not international) energy security, the risk may be assessed as low and the appropriate risk response may be to simply accept the risk. In the medium risk scenarios, the selected risk response may depend on the actual feasibility of implementation. For example, mitigation may be appropriate when it is feasible. However, if the geopolitical situation or the location diminishes the feasibility of mitigation, risk acceptance or risk transference may be required. Unfortunately, risk avoidance of energy security risks is unlikely in the foreseeable future unless Canada and its trade partners wean themselves from a reliance on oil and natural gas.

In risk management, it is important that the risk plan define the system in order to ensure logical comparisons between scenarios. The system boundary defines which "parts of the system will be included and which excluded."[63] In this case, the system boundary will contain those risk responses that may involve the CF.

CONCLUSION

While there is little in the way of published policy that explicitly supports CF involvement in energy matters, government policy documents identify that a secure and stable source of energy is an important national interest. As the spectrum of energy security effects is wide-ranging, Canada, and especially the CF, cannot be expected to become involved in every potential energy security related problem, and a framework that can reliably identify critical centres of gravity is required. Therefore, taking national

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[63] Richard Wilson and Edmund Crouch, *Risk-Benefit Analysis*, 18.

interests into account, this chapter has developed a risk management framework to determine appropriate risk responses to risks to, or posed by, energy security.

"Energy Security is … National Security" [64]

3 GLOBAL ENERGY SECURITY

INTRODUCTION

This chapter will summarise the present understanding of the global energy security situation to provide a basis for the analysis in the later chapters. It will consider current and forecasted future oil and gas sources, methods of distribution, and worldwide demand. It will conclude by summarizing anticipated future trends in oil and gas energy security.

FORECASTS

Despite the criticality of oil and gas to the global economy, there are forecasts of troubles ahead. The IEA, an intergovernmental organization founded by the Organisation for Economic Co-operation and Development (OECD), has looked ahead 25 years and concluded that the global energy supply "is too vulnerable to failure arising from under-investment, environmental catastrophe, or sudden supply interruption" to meet the needs of the global economy.[65] Others such as Nader Elhefnawy, a professor at the University of Miami, predict that the "beginning of oil age may be just around the corner … we will find ourselves in a truly post-industrial world, where new technology is effectively substituted for depleted natural resources, or in a Malthusian catastrophe and a new dark age."[66] Both perspectives will be reviewed and compared to provide an input into the overall review of global energy security.

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[64] United States, Government Accountability Office, *Major Management Challenges and Program Risks- Department of Energy*, (Washington, DC: US Government Printing Office, 2003), 24; http://www.gao.gov/pas/2003/d03100.pdf; Internet; accessed 20 April 2009.

[65] International Energy Agency, *World Energy Outlook 2006*, 3.

OIL

The IEA predicts that the world's proven oil reserves, including non-conventional sources, will be able to sustain current production levels until at least 2048.[67] However, the IEA notes that the reserves-to-production ratio (r-to-p) is not improving, and that the estimates of increased reserves have come primarily from revised forecasts of existing developments as opposed to new discoveries.[68] The r-to-p ratio is used as an indicator of how long a present oil field or area could remain in operation if energy companies could not find new reserves and if production remained constant.[69] In fact, the discoveries of new oilfields have fallen sharply over the last forty years due to decreased exploration and a reduced average size of new fields.[70] Figure 4 shows the reduced average size of the new fields.

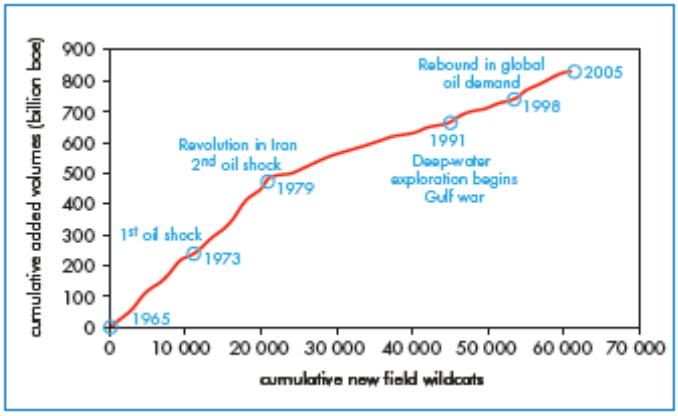

Figure 4 - Cumulative Oil and Gas Discoveries
Source: International Energy Agency, *World Energy Outlook 2006*, Figure 3.4

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[66] Nader Elhefnawy, "The Impending Oil Shock," *Survival* 50; no. 2 (April 2005): 37.

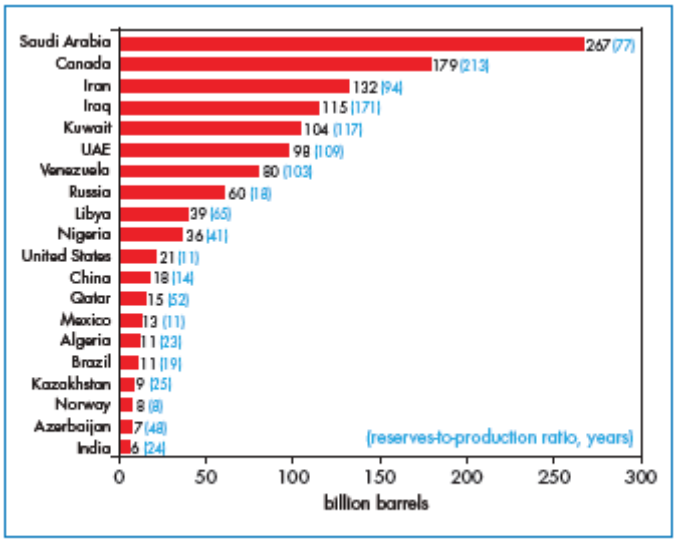
[67] International Energy Agency, *World Energy Outlook 2006*, 88.

[68] Ibid., 89.

[69] Therefore an oil field with a higher r-to-p can be expected to last longer than an oil field with a smaller r-to-p if all other factors remain constant.

[70] International Energy Agency, *World Energy Outlook 2006*, 89.

The reserves of conventional oil are concentrated primarily in the Middle East and North Africa and accounted for 62% of the world total in 2005.[71] Figure 5 shows the IEA 2005 status of proven oil reserves (but includes Canada's non-conventional reserves).



Note: Canada includes proven non-conventional reserves.
Source: *Oil and Gas Journal* (19 December 2005).

Figure 5 - Proven Oil Reserves - end 2005
Source: International Energy Agency, *World Energy Outlook 2006*, 89

Of note in Figure 5, the r-to-p varies significantly. For example, while many of the OPEC nations have an r-to-p ratio of over 100 years, the United States (US) and China only have ratios of 11 and 14 respectively. Therefore, American and Chinese production of oil is expected to outstrip their reserves in short order.

The IEA predicts that by 2030 only Russia, Central Asia, Latin America, and sub-Saharan Africa will achieve significant increases in conventional oil production.[72] While the IEA expects that production by members of the Organization of Petroleum

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[71] *Ibid*., 88.

[72] *Ibid*., 94.

Exporting Countries (OPEC) will increase based on their existing proven reserves, the future of OPEC developing new reserves is "extremely uncertain".[73] Outside of OPEC, the IEA believes that conventional oil production will to peak by 2015 and then start to decline.[74] As shown in Figure 6, according to the IEA, conventional oil production from North America and the North Sea will significantly diminish.[75]

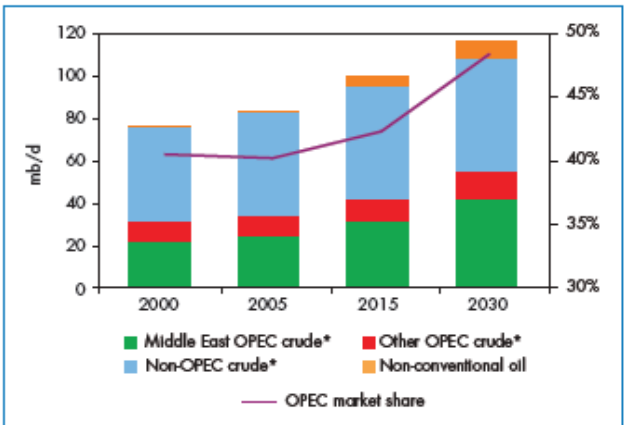

Figure 6 - World Oil Supply by Source
Source: International Energy Agency, *World Energy Outlook 2006*, Figure 3.5.

The IEA anticipates that the net effect of the concentration of oil producers with large reserves such as Russia and the OPEC states will increase these countries' market dominance.[76]

The IEA expects that the energy demands will continue to grow by 53% between 2004 and 2030 and that 70% of this increase will still come from the developing

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[73] *Ibid*., 94.

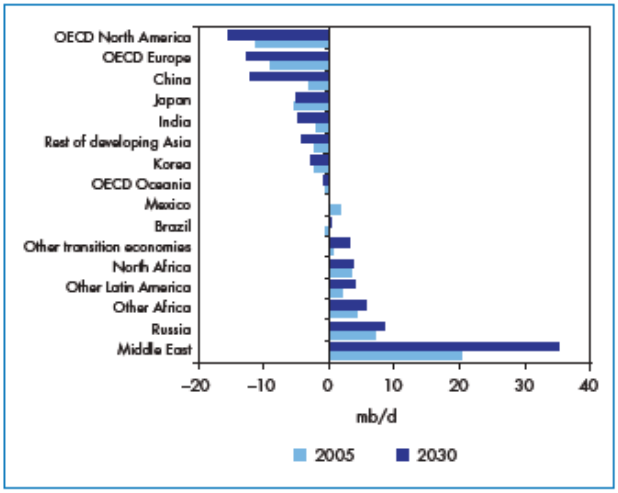
[74] *Ibid*., 94.

[75] *Ibid*., 94.

[76] *Ibid*., 39.

countries.[77] Despite the relative growth within the developing countries, the IEA expects that the biggest absolute demand increase will come from North America.[78]

One of the most relevant aspects of the IEA report for this paper is not so much the total production or demand in a particular country or region but the expected trends in trade. As shown below in Figure 7, in general, the countries that are presently net oil importers will become even more dependent on countries that are presently net exporters.



Note: Takes account of trade between *WEO* regions only. Negative figures indicate net imports.

Figure 7 - Net Oil Exports
Source: International Energy Agency, *World Energy Outlook 2006*, Figure 3.9.

NATURAL GAS

According to the IEA, the situation for global outlook for gas is similar, only more extreme. While the IEA forecasts that there are sufficient gas reserves to meet the demands to 2030, the r-to-p ratio is significantly smaller: just 64 years at present rates

[77] *Ibid*., 65.

[78] *Ibid*., 87.

and 40 years considering the projected demand rate.[79] Figure 8 shows the projected production and r-to-p ratios by region.

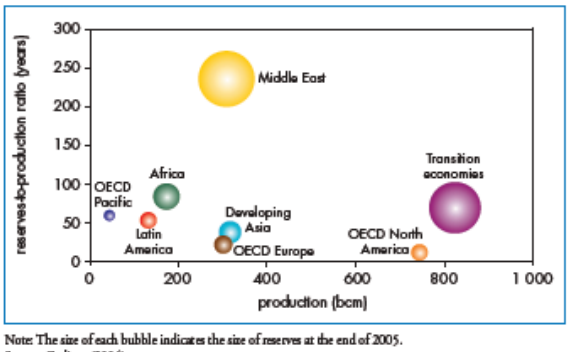


Figure 8 - Proven Gas Reserves and Production – 2005
Source: International Energy Agency, *World Energy Outlook*, Figure 4.2.

The distribution of gas reserves is less diverse than oil. For example, Russia and Iran hold almost half of the world's gas reserves.[80] The forecasted production is based not just on reserves remaining but also on the ability to produce the gas. As shown in Figure 9, the IEA expects that the areas of largest production growth in natural gas will be in Latin America, the Middle East, and Africa.[81]

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[79] *Ibid*., 114.

[80] *Ibid*., 114.

[81] *Ibid*., 116.

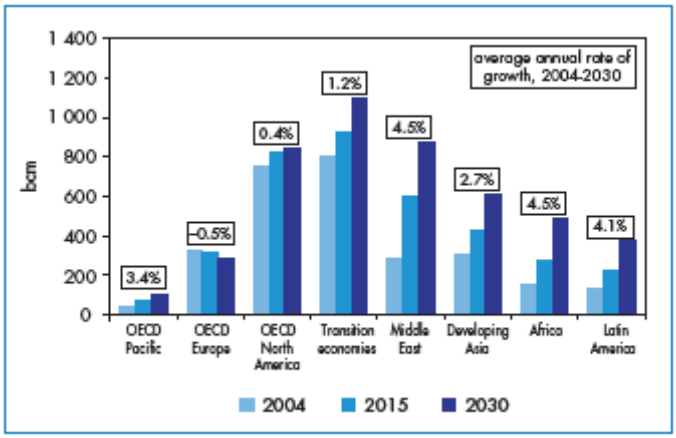

Figure 9 - Natural Gas Production
International Energy Agency, *World Energy Outlook*, Figure 4.3.

The demand for gas is expected to increase even more than for oil, with the biggest increases in Africa, the Middle East and developing Asia.[82] Despite these large increases, North America and Europe will still remain the largest users of gas.[83]

Table 6 - World Natural Gas Demand

	1980	2004	2010	2015	2030	2004-2030*
OECD	**959**	**1 453**	**1 593**	**1 731**	**1 994**	**1.2%**
North America	659	772	830	897	998	1.0%
United States	*581*	*626*	*660*	*704*	*728*	*0.6%*
Canada	*56*	*94*	*109*	*120*	*151*	*1.8%*
Mexico	*23*	*51*	*62*	*74*	*118*	*3.3%*
Europe	265	534	592	645	774	1.4%
Pacific	35	148	171	188	223	1.6%
Transition economies	**432**	**651**	**720**	**770**	**906**	**1.3%**
Russia	n.a.	420	469	503	582	1.3%
Developing countries	**121**	**680**	**932**	**1 143**	**1 763**	**3.7%**
Developing Asia	36	245	337	411	622	3.7%
China	*13*	*47*	*69*	*96*	*169*	*5.1%*
India	*1*	*31*	*43*	*53*	*90*	*4.2%*
Indonesia	*6*	*39*	*56*	*65*	*87*	*3.2%*
Middle East	36	244	321	411	636	3.7%
Africa	14	76	117	140	215	4.1%
North Africa	*13*	*63*	*88*	*104*	*146*	*3.3%*
Latin America	36	115	157	180	289	3.6%
Brazil	*1*	*19*	*28*	*31*	*50*	*3.8%*
World	**1 512**	**2 784**	**3 245**	**3 643**	**4 663**	**2.0%**
European Union	*n.a.*	*508*	*560*	*609*	*726*	*1.4%*

* Average annual growth rate.

Source: International Energy Agency, *World Energy Outlook*, Table 4.1.

[82] *Ibid*., 112.

[83] *Ibid*., 112.

The result of the "geographical mismatch between resource endowment and demands" means that the primary users of gas will become increasingly reliant on imports.[84] The resultant increases in required imports are significant over the period to 2030: North America goes from being self-sufficient to a net importer and Chinese gas imports increase 56 times.[85]

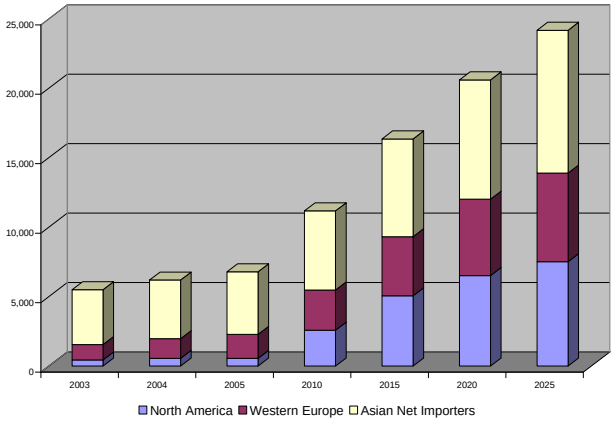

Figure 10 - Importation Trends – LNG

Source: United States, Department of Energy, *Gas Supply and Demand in an Uncertain Environment U.S. and Canada Gas Market Overview, January 2007;* http://www.eia.doe.gov/oiaf/aeo/conf/petak/petak.ppt#256; Internet; accessed 9 February 2009.

[84] *Ibid*., 117.

[85] *Ibid*., 117.

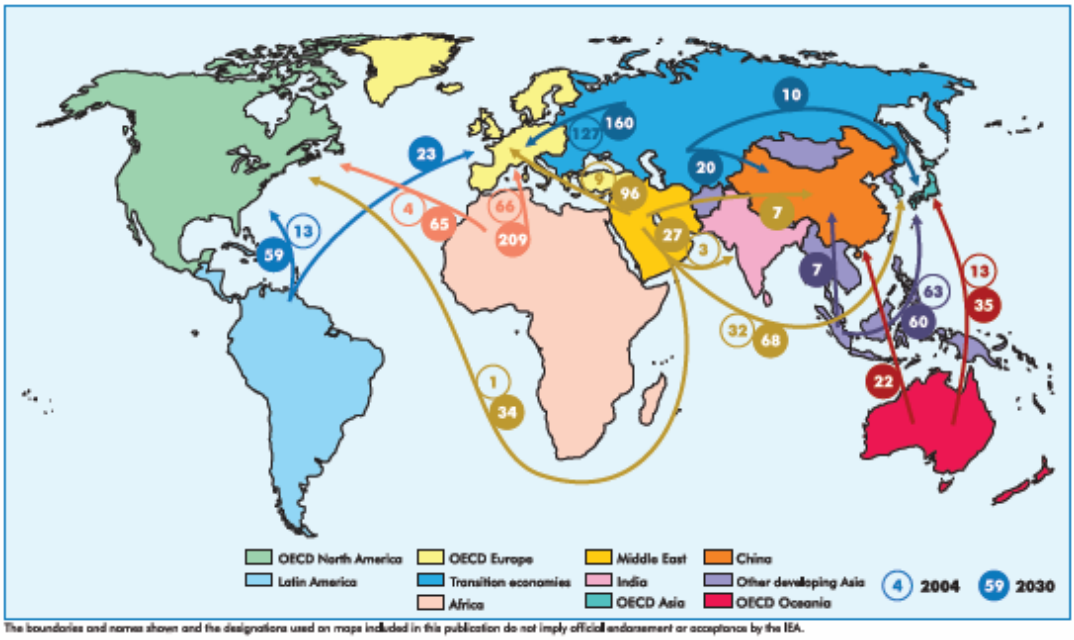

Figure 11 - Net Natural Gas Flow
Source: International Energy Agency, *World Energy Outlook*, Figure 4.4.

As can be seen at Figure 11, the IEA forecasts that Africa will overtake Russia as the largest supplier to Europe while Russia, Central Asia, Australia, and the Middle East become significant suppliers to China.[86] While much of the gas trade presently travels by pipeline, the demand for increased trade has stimulated development of trade in liquid natural gas (LNG) as shown at Figure 12.

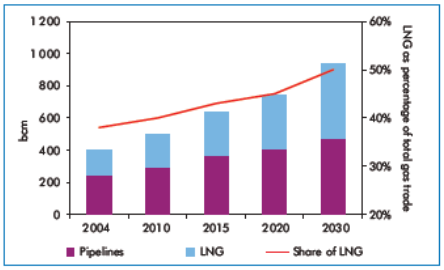

Figure 12 - Natural Gas Trade by Type
Source: International Energy Agency, *World Energy Outlook*, Figure 4.5.

[86] *Ibid*., 117.

This increased use of LNG requires significant amounts of infrastructure and shipping but facilitates trade beyond a regional basis. By 2030, the largest importer of LNG is expected to be North America.[87] As the gaps between importers and exporters grow, it is clear that there will be increased inter-region trade.

INVESTMENT

One of the key commonalities between the oil and gas situation is the requirement for significant investment to ensure that production meets the projected demands. The IEA is concerned "whether these resources will actually be developed quickly enough and at what cost." [88] Although the IEA projections show that there is enough oil and gas to meet the requirements up to the 2030 period, "more oil would need to be found were conventional production not to peak before [2030]."[89] For the non-conventional sources of oil to compensate for a lack of new oil supplies, significant investment will be required.[90] The situation for gas is similar, especially for LNG, where significant investment is required to ensure that the energy industry can distribute sufficient gas. As of 2006, the IEA was "far from certain" that all the investment needed for gas beyond 2010 will be available and as such becomes a major source of uncertainty.[91]

The IEA sees "a worsening investment climate, changes in government attitudes to foreign investment and capacity expansions, the adaptation of more stringent

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[87] *Ibid*., 117.

[88] *Ibid*., 73.

[89] *Ibid*., 73.

[90] *Ibid*., 73.

[91] *Ibid*., 121.

environmental regulations, and less favourable licensing and fiscal conditions" as potential threats to this investment.[92] Unrest or the threat of unrest could of course also have a disruptive effect on investment. Of particular concern, the IEA notes that much of the energy investment required is for developing countries that are more prone to these unfavourable conditions.[93] Later chapters will discuss these issues and their subsequent risks.

PEAK OIL

While the IEA is confident in the quantity of reserves remaining, it is concerned about the ability to extract the oil considering the lack of new oil field development and the significant investment required. Others, such as Elhefnawy, express greater concern. Elhefnawy states that not only is the world's ability to extract the remaining reserves of oil concerning, but also that the estimates of the proven reserves are understated. He is sceptical of the IEA's estimates of proven reserves, arguing that they "cannot be blithely accepted" as there is "plenty of room for over-optimism, wishful thinking and outright lying."[94] He states that up to 40 percent of the reserves reported by OPEC countries may be suspect.[95] Coupled with this is his observation that there has been relatively little investment in finding and exploiting new sources of oil since the 1980's and that new

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[92] *Ibid*., 73.

[93] *Ibid*., 40.

[94] Nader Elhefnawy, "The Impending Oil Shock," 38.

[95] *Ibid*., 38.

production can take at least ten years after the discovery of new oil.[96] On this point, the IEA agrees that investment to ensure production does not peak before 2030.[97]

Elhefnawy is not as confident as the IEA that unconventional oil reserves will satisfy the global energy challenges. He argues that the extraction of unconventional oil is extremely energy intensive and, considering the remaining stocks of natural gas, may not "do much to ameliorate a dwindling oil supply."[98] As the IEA predictions assume unconventional oil will be accessible, if Elhefnawy is correct about unconventional oil then the IEA's predictions would be less positive with significant global energy security implications. As will be seen in the later chapters, these energy concerns then have the potential to become security concerns.

Moreover, problems arise with the supply of oil or gas before the reserves actually run out. Marion Hubbert, a geoscientist who worked for Shell Oil, introduced the concept of peak oil or "Date of Culmination" in 1956.[99] Hubbert argued that oil production is not constant in any particular area but rises and then falls along what roughly could be described as a bell curve. As shown in Figure 13, his predictions of peak oil in the continental US between 1965 and 1970 were remarkably close to the actual peak oil in 1971.[100]

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[96] *Ibid*., 39.

[97] International Energy Agency, *World Energy Outlook*, 91.

[98] Nader Elhefnawy, "The Impending Oil Shock," 43.

[99] Marion Hubbert, *Nuclear Energy and Fossil Fuels* (Houston: Shell Development Company, 1956), 25; http://www.hubbertpeak.com/hubbert/1956/1956.pdf; Internet; accessed 8 February 2009.

[100] Nader Elhefnawy, "The Impending Oil Shock," 40.

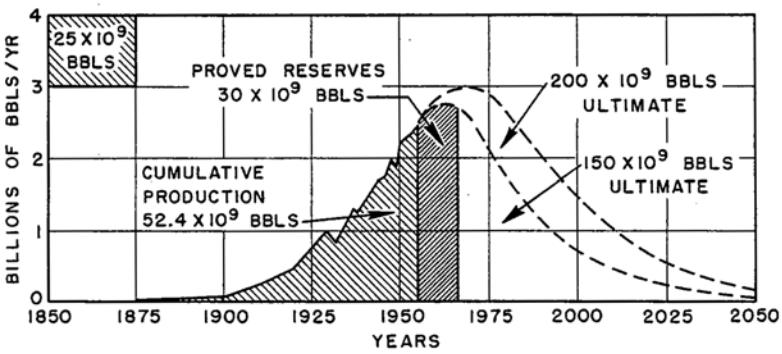

Figure 13 - Hubbert's Forecast of US Oil Production
Source: Marion Hubbert, *Nuclear Energy and Fossil Fuels,* Figure 21.

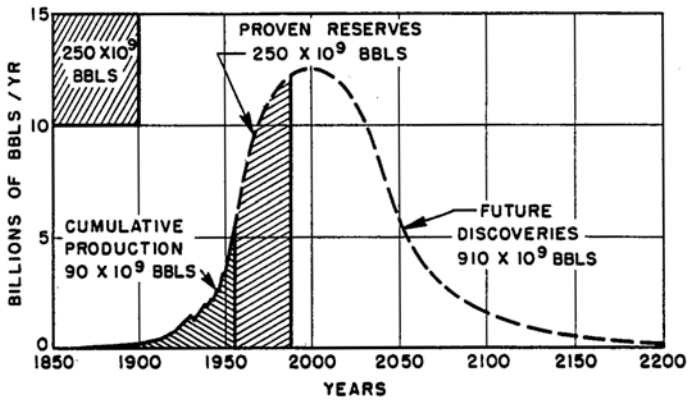

Figure 14 - Hubbert's Oil Production Forecast
Source: Marion Hubbert, *Nuclear Energy and Fossil Fuels,* Figure 20.

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While Hubbert's predictions, shown in Figure 14, of world peak oil in 2000 were not accurate, the concept remains relevant. Based on his survey of various studies, Elhefnawy predicts that peak oil will occur between 2010 and 2020.[101]

Robert Hirsch of the US Department of Energy (DOE) has conducted some of the more recent studies.[102] He focuses not so much on the precise date of peak oil due to the

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[101] *Ibid*., 40.

[102] Robert L. Hirsch, *Peaking Of World Oil Production: Impacts, Mitigation, & Risk Management*, (Washington DC, US Government Printing Office, February 2005); http://www.netl.doe.gov/publications/others/pdf/Oil_Peaking_NETL.pdf; Internet, accessed 14 February 2009 and Robert L. Hirsch, *Peaking of World Oil Production: Recent Forecasts*, (Washington DC, US Government Printing Office, February 2005); http://www.netl.doe.gov/energy-analyses/pubs/Peaking%20of%20World%20Oil%20Production%20-%20Recent%20Forecasts%20-%20NETL%20Re.pdf; Internet, accessed 14 February 2009.

"poor quality of possible political biases in world oil reserves data" but on the inevitability of peak oil and that it will not be temporary.[103] Figure 15 shows the outcomes of several of Hirsch's models forecasting the potential for peak oil in 2016 or 2027 depending on the data used.

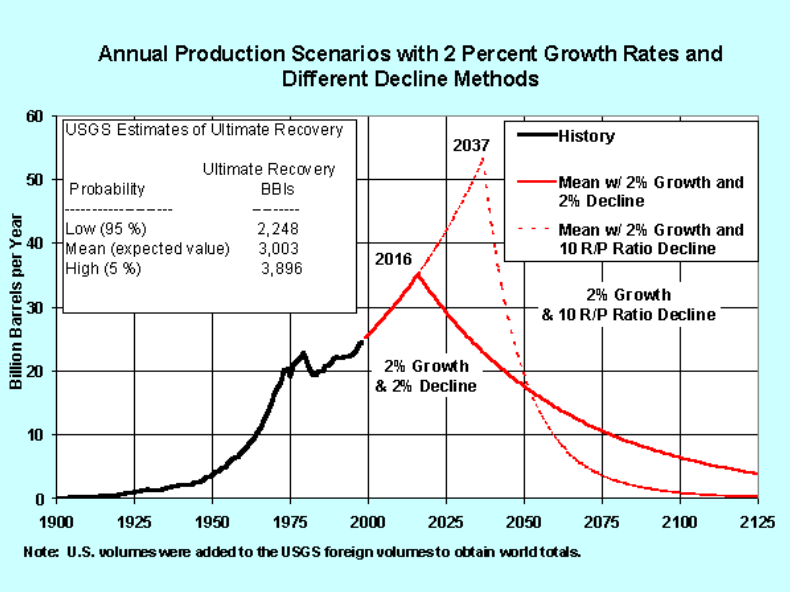

Figure 15 - Hirsch's 2005 Forecast of Peak Oil
Source: Robert L. Hirsch, *Peaking Of World Oil Production: Impacts, Mitigation, & Risk Management,* Figure A-1.

As the date of peak oil is inconclusive, and the potential mitigation measures are expensive and possibly dramatic, Hirsch concludes that it is difficult for policy makers to commence any mitigation measures. However, if governments wait "until world oil production peaks before taking crash program action [it] would leave the world with a significant liquid fuel deficit for more than two decades."[104] This would of course have a significant impact on worldwide energy security.

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[103] Robert L. Hirsch, *Peaking Of World Oil Production: Impacts, Mitigation, & Risk Management,* 5.

[104] Robert L. Hirsch, *Peaking of World Oil Production: Recent Forecasts,* 20.

In looking at the potential world situation with respect to both conventional and unconventional reserves, Elhefnawy concludes that:

> It seems more probable that exaggerated reserves (proven and unproven), a declining rate of oil discovery and peaking production in mature fields will combine to tighten supplies, perhaps more rapidly than can be fully compensated for by unconventional oil supplies.[105]

Further, Elhefnawy states that "the evidence for a significant, prolonged and continuing contraction in production (or alternatively, of significantly raised prices) beginning by the 2020's is considerable."[106] At this point Elhefnawy reaches similar conclusions as the IEA: the trend of diversification of oil producers will reverse and oil exporters will "enjoy higher revenues and greater political leverage" while oil importers will have "an increasing risk of economic stagnation."[107]

Some writers, such as Amy Jaffe from Rice University, believe Elhefnawy's assessments are exaggerated as cyclical market forces and the US economy's "resilience" and "diverse energy geography" will make a Malthusian-like scenario less likely.[108] Elhefnawy points out, however, that while the US and rest of the developed world has recovered from oil supply issues in the past that there are limits to the "market's elasticity" and that there are numerous indicators pointing to a trend of "diminishing marginal returns on investment in oil production."[109]

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[105] *Ibid*., 42.

[106] Nader Elhefnawy, "The Impending Oil Shock," 44.

[107] *Ibid*., 43-46.

[108] Amy Jaffe, Michael Klare and Nader Elhefnawy, "The Impending Oil Shock: An Exchange," *Survival* 50, no. 1 (1 August 2008): 61-68; http://pdfserve.informaworld.com/609901_731255110_901427237.pdf; Internet; accessed 28 March 2009.

[109] *Ibid*., 75-77.

CONCLUSION

While the degree of the scarcity of oil is debatable, assuming there are no significant technological advances to relieve global dependence on oil and gas, it is clear from the literature that the demands will continue to increase while new sources of supply appear to be diminishing. Much of the existing oil and gas extraction sites are becoming less productive, therefore increased production requires either advanced techniques or the discovery and exploitation of new sites. Further, the OECD countries and China are becoming ever more dependant on the importation of oil and gas. This will result in increased levels of oil and gas been transported between regions and require significant investment in developing countries if the potential reserves are to be capitalised upon. This all adds a degree of fragility to the energy security situation. As will be reviewed in later chapters, this fragility has potential security implications.

4 CANADA-US ENERGY SECURITY

INTRODUCTION

This chapter reviews the oil and natural gas situation from a Canadian and American perspective. Specifically, it will review Canada's oil and gas reserves, distribution, and future challenges and opportunities. It will then review the US-Canada oil and gas situation to show that the US energy security is important to Canada despite Canada's status as a net-exporter of oil and gas.

CANADA'S SITUATION

Energy, much of it coming from oil and gas, continues to be an important factor in the Canadian economy. Energy in general is critical to large, northern countries with significant transport and resource industries like Canada.[110] For example, in 2007 the energy industry accounted for 5.6 percent of Canada's gross domestic product (GDP) and 19.7 percent ($90.0 billion) of Canadian exports.[111] Further, Canada's National Energy Board (NEB) studies show that Canada's "economic growth is linked to energy consumption," especially in the energy intensive industries in the goods producing sector.[112]

Due to its vast geography, the relatively concentrated location of oil and gas and the location of markets, Canada, although a net exporter of oil and gas, is also an

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[110] National Energy Board, *Canada's Energy Future* (Ottawa: National Energy Board, 2007), x. http://www.neb.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/nrgyftr/2007/nrgyftr2007-eng.pdf; Internet; accessed 13 February 2009.

[111] National Energy Board, *Canadian Energy Overview* (Ottawa: National Energy Board, 2008), 1. http://www.neb.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/nrgyvrvw/cndnnrgyvrvw2007/cndnnrgyvrvw2007-eng.pdf; Internet; accessed 13 February 2009.

[112] National Energy Board, *Canada's Energy Future*, xv.

importer. The majority of the oil production is from Alberta but as, shown at Figure 16 and 17, while much of the crude oil from western Canada in exported, eastern Canada relies on imports. Securing a supply of oil for eastern Canada therefore remains an issue regardless of the ability to export from western Canada to the US and other locations.[113]

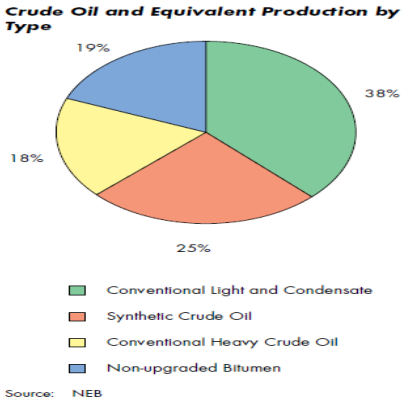

Figure 16 - Types of Oil Production in 2007
Source: National Energy Board, *Canada's Energy Future*, Figure 4.3.

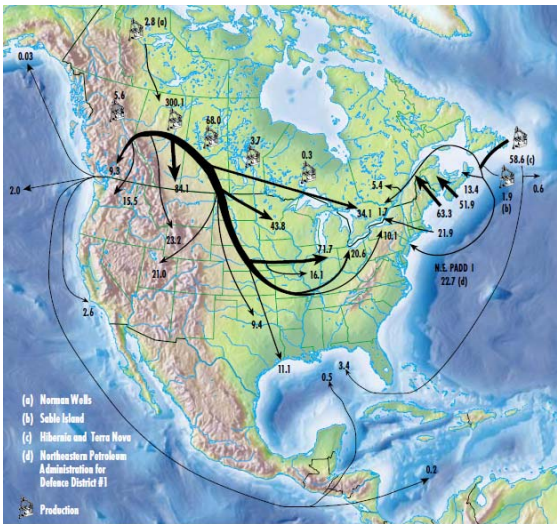

Figure 17 - Crude Oil Supply and Disposition – 2007
Source: National Energy Board, *Canada's Energy Future*, 17.

[113] Pierre Lavoie, "Asleep at the Wheel: Canada Needs an Oil and Gas Policy," (Toronto, Canadian Forces College National Strategic Studies Program Paper, 2007), 35.

Similarly, despite being a net exporter of natural gas, Canada both imports and exports natural gas. Figure 18 shows the supply and disposition of natural gas in 2007.

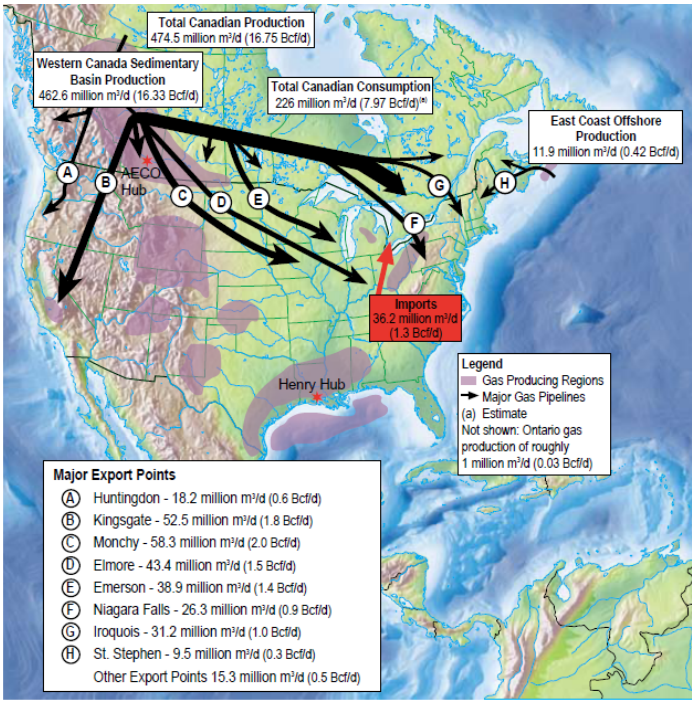

Figure 18 - Natural Gas Supply and Disposition – 2007
Source: National Energy Board, *Canada's Energy Future*, 29.

While the majority of oil production in Canada is presently conventional, the NEB forecasts that non-conventional oil, primarily from the western oil sands, will "increasingly dominate" Canada's oil production by 2030.[114] As can be seen in Figure 19, while Canada does not have large amount of the world's conventional oil reserves, the inclusion of non-conventional oil places Canada second behind Saudi Arabia in terms of proven oil reserves remaining.[115] Other potential sources of oil and gas include the Arctic where some studies report that "up to 50 per cent of the earth's

[114] National Energy Board, *Canada's Energy Future*, xiii.

[115] *Ibid.*, 12.

remaining undiscovered reserves of hydrocarbons" may be located.[116] However, access to these undiscovered reserves will be difficult and expensive and Industry is unlikely to be able to extract the energy in the near term.

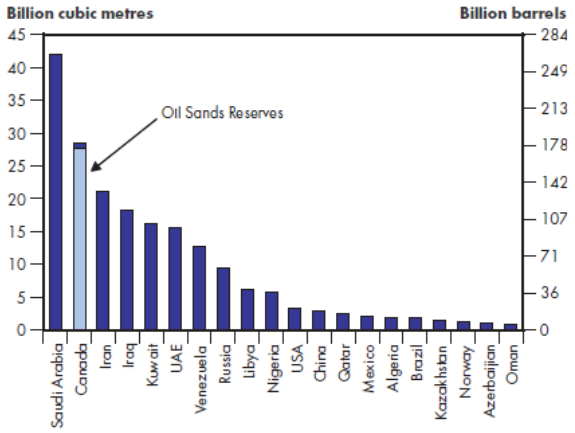

Figure 19 - Estimated Oil Reserves – 2005
Source: National Energy Board, *Canada's Energy Future*, Figure 2.3.

Access to non-conventional oil is not without significant challenges. Only 20 percent of the oil sands reserve can be extracted through surface extraction. Consequently, Canadians would have to rely on the more expensive, natural gas and water intensive *in situ* extraction methods.[117] Further, the extraction of this oil assumes that industry will be able to meet emerging environmental standards.[118] These assumptions are not guaranteed as the environmental aspects of the western oil

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[116] Matthew Carnaghan and Allison Goody, *Canadian Arctic Sovereignty* (Ottawa, Library of Parliament, 2006), 6.

[117] Annette Hester, "Canada as the "Emerging Energy Superpower": Testing the Case," 7; http://www.wilsoncenter.org/index.cfm?event_id=276298&fuseaction=events.event_summary; Internet; accessed 15 February 2009. In *situ refers to u*sing drilling technology to injected steam into the deposit to heat the oil sand lowering the viscosity of the bitumen. The hot bitumen migrates then towards producing wells, bringing it to the surface, while the sand is left in place. Government of Alberta, "The Oil Sands Story – In Situ"; http://www.oilsandsdiscovery.com/oil_sands_story/insitu.html; Internet; accessed 20 April 2009.

[118] National Energy Board, *Canada's Energy Future*, xvii.

production are increasingly being targeted by US environmental organisations.[119] Assuming these challenges can be overcome, the NEB forecasts that oil exports will "increase or remain at current levels."[120]

The forecast for natural gas is less positive. Canada's gas reserves have reduced from an r-to-p ratio of 20 in 1999 to 8 in 2007.[121] The NEB predicts that Canada by approximately 2028 will become a net gas importer.[122] To accommodate this issue, it is expected that there will be increased importation and usage of LNG. Figure 20 shows the proposed LNG importation sites in Canada.

Location	Terminal	Proponent(s)	Capacity	Proponents' Estimated On-Stream Date
1. Placentia Bay, Newfoundland	Grassy Point LNG	Newfoundland LNG Ltd.	LNG Storage & Trans-shipment	2010
2. Point Tupper, Nova Scotia	Statia LNG	Statia Terminals Canada Partnership	0.5	n/a
3. Goldboro, Nova Scotia	Maple LNG	4Gas and Suntera Canada Ltd.	1.0	2010
4. Saint John, New Brunswick	Canaport LNG	Repsol YPF and Irving Oil	0.8	2008
5. Rivière-du-Loup, Quebec	Gros Cacouna LNG	Petro-Canada and TransCanada Pipelines Ltd.	0.5	2012
6. Québec City, Quebec	Rabaska	Gaz Métro, Enbridge and Gaz de France	0.5	2011
7. Saguenay, Quebec	Énergie Grande-Anse	Saguenay Port Authority and Énergie Grande-Anse Inc.	1.0	2012
8. Bish Cove, British Columbia	Kitimat LNG	Galveston LNG	1.0	2010/11
9. Texada Island, British Columbia	Texada Island LNG	Westfac LNG Corporation	0.5	n/a

Figure 20 - Proposed LNG Sites
Source: National Energy Board, *Canada's Energy Future*, Figure 5.10.

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[119] David Hunter, "The Future of US Climate Change Policy," *A Globally Integrated Climate Change Policy for Canada* (Toronto: University of Toronto, 2008), 98.

[120] National Energy Board, *Canada's Energy Future*, xviii.

[121] *Ibid.*, 12.

[122] *Ibid.*, xx.

With its critical link to non-conventional oil production and use across Canada, access to natural gas will remain important. The importation of LNG to Canada will increase Canada's dependence on international trade.

IMPORTANCE TO CANADA

The "Fortified Islands" scenario developed by the NEB is particularly relevant to this paper. The NEB has developed this scenario "characterized by geopolitical unrest, a lack of international cooperation and trust, and protectionist government policies."[123] In this scenario, the NEB assumes that geopolitical tensions threaten world energy supplies.[124] The result on the energy market is the increased costs of security drive up oil and gas prices and the oil markets become more unpredictable and global economic growth is "restrained."[125] As with the global economy, the NEB predicts that Canada would experience "slow overall growth" in this scenario due to the loss of manufacturing growth. [126] This is despite the fact that the Canadian energy industry would fare well due to the higher oil prices, but the increased growth in this sector would not offset the losses in the other parts of the Canadian economy.[127]

Therefore, while higher oil prices may be good for the oil industry, overall, such increases and unpredictability would not be beneficial for the Canadian economy. As

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[123] *Ibid.*, 87.

[124] *Ibid*., 87.

[125] *Ibid*., 87.

[126] *Ibid*., 89.

[127] *Ibid*., 89.

shown in the NEB "Fortified Islands" scenario, a potential cause for the higher oil prices could be a world characterised by geopolitical unrest.

US-CANADIAN PERSPECTIVE

According to Bryne Purchase, a professor from Queen's University specializing in Canadian energy security research, Canadian energy security cannot be considered separately from North American Energy Security due to the North America Free Trade Agreement (NAFTA) and the reality that Canada requires the US as a market.[128] Canada relies on the US economy both as a customer and as a critical investor in the energy industry.[129] Further, the North American economy is for the large part the American economy and as the US is Canada's largest trading partner, that which affects the US will also affect Canada. In the words of the American private intelligence company, Stratfor, based on the recent 2009 Harper/Obama talks:

> It is pretty clear what the two states want from each other. The United States wants energy security and a renewed military commitment from Ottawa in Afghanistan, while Canada wants investment of money and technology in its energy sector and cooperation on dealing with related environmental issues.[130]

The Canadian and US energy industries, and to a large extent, the Canadian and US economies, are interdependent and therefore need to be assessed together.

The other major potential challenge to Canadian self-sufficiency is Canada's bilateral energy agreements with the US. NAFTA states that it recognizes "the

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[128] Bryne Purchase, *Canadian Energy Security and Policy*, 8.

[129] Laura Coates, "Canada's Energy Paradox: Why Canada's 180 Billion Barrels of Recoverable Oil Reserves are Fool's Gold," *Global Perspectives on Oil and Security* (Halifax: Dalhousie University, 2006), 256.

[130] Stratfor, "U.S., Canada: Drawing the Outlines of an Oil Sands Deal," Stratfor, 19 February 2009, 1; www.stratfor.com/analysis/20090219_u_s_canada_drawing_outlines_oil_sands_deal; Internet; accessed 28 February 2009.

importance of having viable and internationally competitive energy and petrochemical sectors to further their individual national interests."[131] Further, NAFTA prohibits the restriction of energy exports unless it is on the grounds of national security and meets the proportionality provisions.[132] Even if Canada imposes export restrictions, it must continue to provide a prorated historical share of supply to the US.[133] Therefore, if there was an energy shortage in Canada, Canada would be able to reduce the level of exports but there would be a limit to how much the Canadian government could limit the supply.

The US is concerned with its energy security and its dependence on imports to the extent that the Energy Secretary Abraham stated in 2002 that "Energy security is … national security."[134] This theme was continued by the then Senator Barak Obama in 2006 with the speech titled "Energy Security is National Security."[135] American government policy on energy security has most recently been addressed in the 2001 US National Energy Policy (NEP).[136] The NEP addresses the US's growing dependence on "foreign" oil as shown at Figure 21.[137]

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[131] North American Free Trade Agreement, 1992, Article 601; http://www.nafta-sec-alena.org/en/view.aspx?x=343&mtpiID=130; Internet; accessed 15 February 2009.

[132] North American Free Trade Agreement, 1992, Article 607; http://www.nafta-sec-alena.org/en/view.aspx?x=343&mtpiID=130; Internet; accessed 15 February 2009.

[133] Laura Coates, "Canada's Energy Paradox: Why Canada's 180 Billion Barrels of Recoverable Oil Reserves are Fool's Gold," 259.

[134] United States, General Accounting Office, *Major Management Challenges and Program Risks-Department of Energy* (Washington, DC: U.S. Government Printing Office, 2003), 24; http://www.gao.gov/pas/2003/d03100.pdf; Internet; accessed 20 April 2009.

[135] Barak Obama, speech February 28, 2006 , cited at "Energy Security is National Security - Complete Text" *Best Speeches of President Obama's;* http://obamaspeeches.com/054-Energy-Security-is-National-Security-Governors-Ethanol-Coalition-Obama-Speech.htm; Internet; accessed 20 April 2009.

[136] United States, Office of the Vice President, *National Energy Policy* (Washington: U.S. Government Printing Office, 200); http://www.energy.gov/about/nationalenergypolicy.htm; Internet; accessed 14 February 2009.

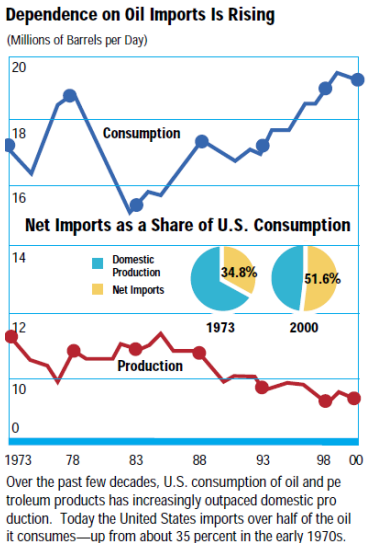

Figure 21 - US Dependence on Oil Imports
Source: United States, Office of the Vice President, *National Energy Policy*, Figure 2-6.

Michael Klare, a prolific American writer on security issues, states that cheap and abundant oil is central to the "vigour and growth of the American economy and to the preservation of a distinctly American way of life."[138] Although Klare was discussing the American economy, his comments on the requirement for "cheap and abundant oil" are applicable to most developed nations. While the oil prices have dropped dramatically over the last few months, most forecasts predict that high oil prices will return.[139] This recent drop in prices may also further reduce much needed investment in oil and gas exploration and exploitation therefore adding to the problems of future supply crunches.[140] Finally, not only does the United States need stable and affordable oil, Klare

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[137] *Ibid.*, 2-9.

[138] Michael Klare, *Blood And Oil: The Dangers And Consequences Of America's Growing Petroleum Dependency* (New York: Metropolitan Books, 2004), xiii.

[139] Dennis Blair, Annual *Threat Assessment of the Intelligence Community for the Senate Select Committee on Intelligence*, 41.

[140] *Ibid.*, 3.

argues that "the US has an interest in ensuring that *all* major consuming countries have an adequate of petroleum, lest shortages elsewhere lead to panic buying that supply boost prices everywhere."[141] Therefore, even if, as shown below in Figure 22, a significant portion of the US's oil requirements can be met by what is a relatively stable source of oil, namely Canada, the US still needs to be aware that the other nations with which it trades need a reliable source of oil for the stability of the global economy.

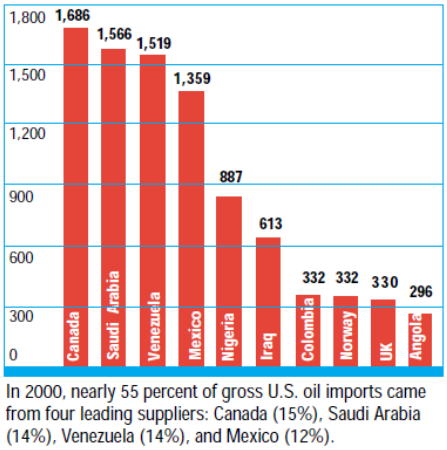

Figure 22 - Top Ten Suppliers of US Oil Imports – 2000
Source: United States, Office of the Vice President, *National Energy Policy*, Figure 8-4.

Moreover, as pointed out by Peter Archambault, an academic with the Canadian Department of National Defence, "threats to North America have to be understood in the broad context of American pre-eminence in the international system today and the foreseeable future." [142] Canadian policy makers need to consider America's threats and challenges as the threats to the US can be seen as possible threats to Canada.

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[141] Michael Klare, *Blood And Oil: The Dangers And Consequences Of America's Growing Petroleum Dependency*, 78.

[142] Peter Archambault, "Thinking About Strategic Threats," *Journal of Military and Strategic Studies* 9, no. 2, (Winter 2006/2007), 1; http://www.jmss.org/2007/2007winter/articles/archambault_cont-defence.pdf; Internet; accessed 25 January 2009.

CONCLUSION

Canada is in an unusual position of being a net exporter of energy resources, and forecast to remain as such, yet poor energy security in North America and globally is not in Canada's best interest. Although the energy industry is an important part of Canada's economy, Canada is dependant on trade with the US and the US economy is dependant on an affordable, stable supply of oil and gas. Further, Canada is not completely self-sufficient for oil and gas. Canada still imports some oil for the eastern Canada and will soon become a net importer of natural gas. Therefore, global energy security is a concern for Canada and, as will be seen in the next chapter, creates security implications.

"Energy crisis is not merely the moral equivalent of war; it is the extension of war by other means."[143]

5. THE SECURITY – ENERGY SECURITY NEXUS

INTRODUCTION

This chapter reviews the connection between energy security and the more traditional aspects of security. First, it reviews how states have used conflict to gain access to energy resources. Next, examples are provided that show how energy security is adversely affected by conflict. Finally, there is a discussion of the idea that energy resource exploitation and distribution can cause or exacerbate conflict.

FACTORS

To say that there are a number of interdependencies between energy security and traditional concepts of security would be an understatement. Ann Griffiths, a researcher at Dalhousie University, states "it would be impossible to untangle the complex knitted web of concerns, perceptions, misperceptions, policies, actions, counter actions and domestic politics that characterize the nexus between oil and security."[144]

Authors and researchers have categorised the relationships in different ways. A recent study for the Australian government used four categories: coercive manipulation of energy supplies, energy competition as a trigger for conflict, supply disruptions due to political instability, and attacks on supply infrastructure by transnational actors.[145]

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[143] Donald Goldstein cited in Sean Kay, *Global Security in the 21st Century* (Toronto: Rowan and Littlefield Publishers, 2006), 311.

[144] Ann Griffiths, "Introduction," *Global Perspectives on Oil and Security* (Halifax: Dalhousie University, 2006), 2.

[145] Michael Wesley, *Power Plays: Energy and Australia's Security* (Barton: The Australian Strategic Policy Institute, 2007), 12 to 19;

Similarly, Klare sees the potential conflict stemming from three interrelated factors: the relentless expansion in worldwide demand, the emergence of significant resource shortages, and the proliferation of ownerships contests.[146] Hanns Maull, the Chair of Foreign Policy and International Relations at the University of Trier, separates the scenarios for future oil crises into two categories: "diffuse and unintended" and "specific and directed."[147] While the diffuse, unintended threats include natural disasters and conflict not directly tied to energy, the specific, directed threats involve a "clearly definable objective" whether kinetic such as terrorism or non-kinetic such as an oil embargo or a deliberate withholding of exports.[148] Regardless of how the factors are divided or categorised, they all can adversely affect energy security, and, possibly, security itself.

CONFLICT DUE TO THE PURSUIT OF OIL

Daniel Yergin, the American author and economic researcher who won the Pulitzer Prize in 1992 for his writings on energy security, argues that oil, while it is important to the functioning to the world economy, also brings conflict:

> Oil has helped make possible mastery over the physical world. It has given us our daily life and, literally, through agriculture chemicals and transportation, our daily bread. It has also fuelled the global struggles for political and economic primacy. Much blood has been spilled in its name. The fierce and sometimes violent quest

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http://www.aspi.org.au/publications/publication_details.aspx?ContentID=142; Internet; accessed 17 February 2009.

[146] Michael Klare, *Resource Wars: The New Landscape Of Global Conflict* (New York: Metropolitan Books, 2001), 23.

[147] Hanns Maull, *Energy, Minerals and Western Security* (Baltimore: John Hopkins University Press, 1984), 139.

[148] *Ibid.*, 139-145.

> for oil – and for the riches and power it conveys –will surely continue so long as oil holds a central place.[149]

While his statements may be overly dramatic considering that most researchers do not foresee any major inter-state conflict in the near future, oil has had a strong role in conflict since modern militaries became more dependant on it during World War I. In World War II it was "central to the course" of the war.[150] For example, the Japanese attacked Pearl Harbor to defend their flank in their pursuit of the oil resources of the East Indies, and one of the strategic objectives for Hitler's invasion of the Soviet Union was to gain control of the oil fields of the Caucasus. Much later, oil was a motivating factor in the 1991 Iraqi invasion of Kuwait.

The Australian study predicts "international conflict triggered by energy competition, while likely having serious consequences, is probably less likely to occur than a risk in market competition or terrorist attacks on infrastructure."[151] However, the study does remind the reader that the risk factors do not necessarily occur in isolation and that one "may precipitate one or more others."[152]

THREATS TO ENERGY SECURITY DUE TO CONFLICT

A major conflict is not required to create an oil supply disruption. Even intra-state conflict can impact oil supplies. As Table 7 shows, there have been numerous oil supply disruptions since 1951. Not all of these disruptions were due to conflicts to seize

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[149] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (Toronto: Free Press, 2003), 788.

[150] *Ibid.*, 13.

[151] Michael Wesley, *Power Plays: Energy and Australia's Security*, 19.

[152] *Ibid.*, 19.

access to oil, but cases such as the Six Day War and Iranian Revolution were examples of where oil was not the object of the war but the oil supply was still disrupted.

Table 7 - Oil Supply Disruptions since 1951

Global oil supply disruptions since 1951

Disruption*	Duration**	Average gross supply shortfall+	Reason for disruption
3/51–10/54	44	0.7	Iran nationalizes oil fields
11/56–3/57	4	2.0	Suez War
6/67–8/67	2	2.0	Six Day War
5/70–1/71	9	1.3	Libyan price controversy
4/71–8/71	5	0.6	Algerian-French nationalization struggle
3/73–5/73	2	0.5	Lebanon unrest
10/73–3/74	6	2.6	1973 War/Arab oil embargo
4/76–5/76	2	0.3	Lebanon civil war/ Iraq exports disrupted
5/77	1	0.7	Damage to Saudi oil field
11/78–4/79	6	3.5	Iranian Revolution
10/80–12/80	3	3.3	Iran-Iraq War erupts
8/90–10/90	3	4.6	Iraq invades Kuwait
4/99–3/00	12	3.3	OPEC (excl. Iraq) cuts production to raise prices
1/02–1/03	12	3.5	Venezuelan and Nigerian crises
3/03–3/-	—	2.6	Iraq War

Source: Adapted from various EIA/DOE analyses, Interagency Database and Projections Working Group. Author's estimates.
* Net oil supply
** Months of net supply disruption
\+ Millions of barrels per day

Source: Steve Yetiv, *Crude Awakenings: Global Oil Security and American Foreign Policy* (Ithaca: Cornell University Press, 2004), 11.

Robert Ebel, a senior adviser in the Center for Strategic and International Studies (CSIS) Energy Program in the US, states that there is a "significant risk that a crisis in one or

more of these key energy-producing countries [the Middle East, Venezuela, West Africa, and Russia] could occur during the span of 20 years at the beginning of the century."[153]

Further, Kaplan warns from an American perspective, not only does conflict in potentially unstable areas impact the US's ability to import oil, but the US will also become increasingly drawn into such conflict itself.[154] He contends that the probability of conflict will grow as America's demand and dependency on foreign oil increases. In his view, "more and more of [America's] oil will be coming to [America] from countries that are unstable, unfriendly, or located in the middle of dangerous areas (or some combination of all three)."[155] He goes onto argue that that America's foreign oil dependency "exposes [America] to a host of perils, including supply disruptions, unsavoury alliances and entanglements in deadly oil wars."[156]

The instability of key oil producing areas such as the Middle East, West Africa and Venezuela has the potential to disrupt the supply of oil, either due to the lack of an environment conducive to the necessary investment over the long term or due to the shorter-term difficulties in extracting and transporting oil in an area of conflict. Further, the instability has the potential to draw the US, and therefore likely its allies, into areas of instability to facilitate the exploitation of oil and gas.

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[153] Robert Ebel, *The Geopolitics Of Energy Into The 21st Century, An Overview And Policy Considerations*, Vol 1, (Washington: Center for Strategic and International Studies, 2000), 11.

[154] Michael Klare, *Blood and Oil*, 18.

[155] *Ibid.*, 18. It appears that Klare has discounted the large proportion of imported oil from the relatively stable and friendly Canada.

[156] *Ibid.*, 13.

THE RESOURCE CURSE

Although any conflict in an oil-producing or transporting area has the potential to adversely affect energy security, oil production can also increase the probability of conflict. Klare states that oil production can increase the risk by "exacerbating local schisms" and "disable the local economies."[157] Researchers such as Michael Ross, an Associate Professor in the UCLA Department of Political Science, [158] and Scott Pegg, a professor at the Department of Political Science at Indiana University-Purdue University Indianapolis,[159] show the correlation between economies that rely on primary commodities exports, including oil, and intrastate conflict. Others detail the concept of the "resource curse," or the "paradox of the plenty,"[160] where countries that come to rely predominantly on "rent" from commodities such as oil develop less rigorous or stable social or government structures.

Canada has a history of involvement in peacekeeping and other human security activities internationally even when no Canadian national interests are directly involved. Therefore, it is likely that the Canadian government may decide again in the future to deploy the CF to assist in supporting human security. The "resource curse" represents one possible source for future human security emergencies.

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[157] *Ibid.*, 21-22.

[158] Michael Ross, "Oil, Drugs, and Diamonds: The Varying Roles of Natural Resources in Civil war," *The Political Economy of Armed Conflict: Beyond Greed & Grievance*, edited by Karen Ballentine and Jake Sherman (Boulder: Lynne Rienner Publishers, 2003), 47-70.

[159] Scott Pegg, "Globalization and Natural-Resource Conflicts," *Naval War College Review* 56, no. 4 (Autumn 2003): 82-96.

[160] Terry Lynne Karl, *The Paradox of the Plenty: Oil Booms and Petro States* (Berkeley: University of California, 1997).

NATURAL GAS

While natural gas does not have the same history of being impacted by or of impacting conflict, it is not immune to disruptions either. Russia has been accused of using its natural gas supply to the Ukraine as a coercive tool in recent years.[161] With the increasing dependency of the developed nations on importing natural gas and the concentrations of the known reserves in countries with stability issues, the potential for future natural gas disruptions due to instability are increasing in a manner similar to oil.

CONCLUSIONS

The previous chapter showed that energy security in Canada, the US, and globally is an important Canadian national interest. This chapter shows that there is a significant nexus between energy and security and that this relationship between the two is interdependent. There is a history of security or conflict negatively impacting energy security. Further, there is a history of the pursuit of energy security impacting security or causing conflict. In the next chapter, the implications of this nexus for the CF will be determined.

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[161] "A Bear at the Throat: Europe's risky dependence on Russian gas," *The Economist*, 12 April 2007, http://www.economist.com/world/europe/displaystory.cfm?story_id=E1_JDDJDQT; Internet; accessed 18 April 2009.

"You may have splendid moral goals but without sufficient power and willingness to use it you will accomplish nothing …."[162]

6. RISK ASSESSMENT AND RESPONSES

INTRODUCTION

The previous chapters described the global and Canadian energy security situation and the nexus between energy and security. The framework developed in chapter two will now be used to analyse the global energy security situation to determine possible CF risk responses. This will be done by identifying the areas in each geographic region or state that pose a risk to Canada. Each risk will then be assessed in turn to determine its potential effect and probability. Finally, the chapter will review risk responses and possible implications for the CF. The timeframe considered will be from the present to 2030 to correspond to the dates used in the NEB studies.[163]

EFFECT CATEGORIES

Potential effects will be categorised by their impact on the defence of Canada, economic well-being, global security and human security as described previously in the framework development.

One of the most important roles of the state is the provision of defence and sovereignty.[164] This category reviews the defence of Canada's domestic energy infrastructure as well as the maintenance of sovereignty in areas related to energy security.

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[162] Niccolo Machiavelli, *The Prince and the Discourses* (New York: Random House, 1940).

[163] National Energy Board, *Canada's Energy Future*.

[164] Public Safety Canada, "Securing an Open Society: Canada's National Security Policy," 6 October 2008; http://www.publicsafety.gc.ca/pol/ns/secpol04-eng.aspx; Internet; accessed 18 February 2009.

Energy security is fundamental to Canada's economic well-being. This category has two main aspects: the direct perspective of Canada's abilities to import and export oil or gas for its own use, and the indirect perspective, of economic impacts to Canada due to energy security issues that affect the US. As discussed earlier, energy issues which impact the US have a significant effect on Canada's economic well-being.

The final category accounts for the effect of energy security upon human security.[165] In countries where oil and gas are the primary exports, studies have found that internal conflict is more likely and human security more at risk. [166] In cases where energy-related conflict impacts Canada's interests, there is also an adverse impact on human security. However, in many other cases Canada has a limited national interest from a security, economic well-being or stability perspective, but rather becomes engaged because of Canada's "values." Canada has historically become involved in what is now often referred to a "responsibility to protect" or R2P. This is reflected in current Canadian government policy as discussed in chapter two.

DOMESTIC

This section assesses the defence of Canada's domestic energy infrastructure as well as the maintenance of sovereignty in areas related to energy. Public Safety Canada has assessed that critical infrastructure for the oil and gas industry presents "appealing

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[165] There are various definitions of human security but this explanation from the University of BC provides a clear distinction between national security and human security: "While national security focuses on the defence of the state from external attack, human security is about protecting individuals and communities from *any* form of political violence." The Human Security Centre, "What is Human Security?" University of British Columbia, http://www.humansecurityreport.info/index.php?option=content&task=view&id=24&Itemid=59; Internet; accessed 20 April 2009.

[166] Michael Ross, "Oil, Drugs, and Diamonds: The Varying Roles of Natural Resources in Civil War" and Scott Pegg, "Globalization and Natural-Resource Conflicts."

targets for vandals, criminals and terrorists" as a small attack has the potential to ripple through the larger energy system.[167] Furthermore, as argued by researchers including Aaron Shull, a graduate student at the Norman Paterson School of International Affairs, Canadian energy sectors are vulnerable to this type of attack due to exposed critical infrastructure in very remote locations.[168] There are both Canadian and world-wide examples of terrorist attacks on energy infrastructure.[169] Even more worrisome, in 2007 Al-Qaeda posted an on-line message stating that "we should strike petroleum interests in all areas which supply the United States ... like Canada."[170] At the Canadian Centre of Intelligence and Security Studies, Martin Rudner has reviewed much of the Al-Qaeda proclamations and concluded that the Al-Qaeda position is that: "Targeting oil interests is legitimate economic jihad. In this era, economic jihad is one of the best ways to spite non-believers."[171]

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[167] Office of Critical Infrastructure Protection and Emergency Preparedness, *Threats to Canada's Critical Infrastructure* (Ottawa: Public Works and Government Services Canada, March 2003), 34; http://www.publicsafety.gc.ca/prg/em/ccirc/_fl/ta03-001-eng.pdf; Internet; accessed 1 March 2009.

[168] Aaron Shull, *Assessment of Terrorist Threats to the Canadian Energy Sector* (Ottawa: Canadian Centre of Intelligence and Security Studies, 2006), 5; http://www.carleton.ca/cciss/res_docs/ceip/shull.pdf; Internet; accessed 1 March 2009. 5

[169] Martin Rudner, *Protecting Canada's Energy Infrastructure Against Terrorism: Mapping A Proactive Strategy* (Ottawa: The Canadian Centre Of Intelligence And Security Studies, 2008), 4; http://www.carleton.ca/cciss/ceipprs_publications/rudner_01_2008.pdf; Internet; accessed 18 April 2009. North American energy infrastructure has been targeted and attacked by various terrorist groups, ideological in Mexico, ecological in Canada and the United States, aboriginal in Canada, or even criminal profiteering: in March, 2008, a Canadian pleaded guilty in US court for plotting an attack on the Trans-Alaska Pipeline in 2000 in order to profit from the expected rise in oil and gas futures.

[170] "Canadian oil: Target of terror," *Ottawa Citizen*, 14 February 2007; http://www.canada.com/cityguides/winnipeg/story.html?id=ec295386-d4c0-426c-b4d3-b734ae6a48c0&k=73284&p=1; Internet; accessed 18 April 2009.

[171] Martin Rudner, *Protecting Canada's Energy Infrastructure Against Terrorism: Mapping A Proactive Strategy*, 5.

Exposure combined with a credible terrorist threat makes it clear that the energy sector is vulnerable.[172] According to the Public Safety Canada, there is no specific unclassified information that would lead Canadian law enforcement agencies to conclude that the level of threat for potential malicious physical attacks to critical infrastructure is greater than low.[173] Using the components of the framework, the effect is a threat to the "defence of Canada" while the probability is "medium" or "may occur in the timeframe."

Beyond the defence of Canada task, the CF is an element of the government that can contribute to the maintenance of Canada's sovereignty. As discussed previously, the Arctic holds great promise for future oil and gas production. Contested access to natural resources could be a potential catalyst for sovereignty conflict, and disagreements exist between Canada and a number of its neighbours as to the boundaries of its sovereign territory. At present, there are disputes with Russia and Denmark over the determination of the continental extension of the undersea Lomonosov Ridge. An estimated ten billion tons of gas and oil deposits are in the disputed area.[174] Canada also has a dispute with the US in the Beaufort Sea. The US disputes the dividing line between the territorial waters extending beyond the Yukon/Alaska border. The disputed region includes 16,187 km^2 of

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[172] Aaron Shull, *Assessment of Terrorist Threats to the Canadian Energy Sector*, 5.

[173] Office of Critical Infrastructure Protection and Emergency Preparedness, *Threats to Canada's Critical Infrastructure*, 5. Further information such as the National Counter Terrorism Plan is not available as it is classified.

[174]"Putin's Arctic Invasion: Russia Lays Claim to the North Pole - and All Its Gas, Oil, and Diamonds," *Daily Mail*, 29 June 2007, http://www.dailymail.co.uk/pages/live/articles/news/worldnews.html?in_article_id=464921&in_page_id=1811 ; Internet; accessed 4 April 2009.

area and an estimated 12 billion barrels of oil and between 13 and 63 trillion cubic feet of natural gas. [175]

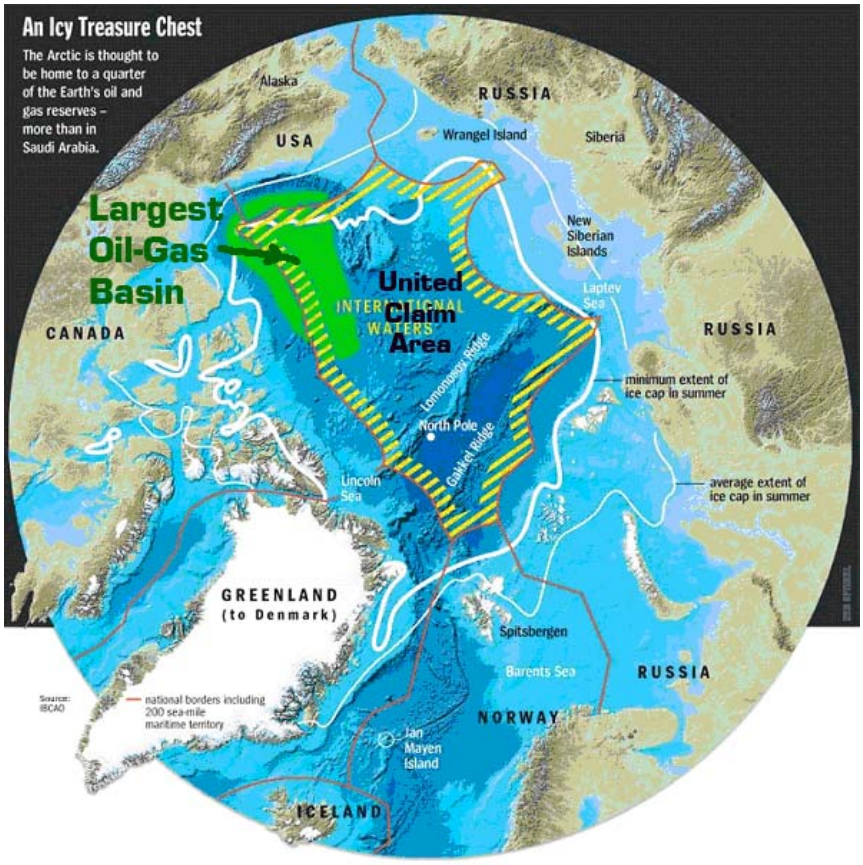

Figure 23 - Disputed Arctic Ocean Areas
Source: United Oil and Gas Consortium Management Group, www.unoilgas.com/arctic-claim-map-07.jpg ; Internet; accessed 4 April 2009.

The other significant ongoing sovereignty debate is between Denmark and Canada over Hans Island. While no oil or natural gas is believed to be involved, Rob Huebert, the Associate Director Centre for Military and Strategic Studies at the

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[175] "The Legal Opinion on the Northwest Passage, Appendix XVII," in *Managing Turmoil, 2006 An Interim Report of the Standing Senate Committee on National Security and Defence*, http://www.parl.gc.ca/39/1/parlbus/commbus/senate/com-e/defe-e/rep-e/RepOct06-e.pdf ; Internet; accessed 4 April 2009, 226. and Todd Wilkinson, "Alaskan Oil Battle May Shift Offshore," *Christian Science Monitor* 6 May 2003, http://www.csmonitor.com/2003/0506/p01s01-ussc.html; Internet; accessed 4 April 2009.

University of Calgary, argues that if Canada loses its claim to the island, it would establish a "dangerous precedent" with the potential to affect other disputes.[176]

Despite these ongoing disputes, the probability of sovereignty issues escalating to open conflict is minimal as the legal mechanisms appear to be place to resolve the disputes. The Standing Senate Committee on National Security and Defence stated in 2006 that "there is not a major military threat to Canada through the Arctic, and that Canada's sovereignty can in the main best be asserted there through an array of government departments … including DND."[177] Although the CF is not the primary force of government in the Arctic, it is an essential component of the government's sovereignty effort. Considering the on-going disputes in the region, it is assessed that the probability of a requirement for CF support is assessed as "high."

INTERNATIONAL

This section will focus on the Persian Gulf, the Caspian Sea, China, the South China Sea, Latin America, Russia, and Africa. Even though China is not an oil exporting country, it is included because it, like the US, is a significant importer of oil and is therefore a possible source of conflict. Finally, the potential chokepoints for the distribution of oil and gas will be reviewed.

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[176] Rob Huebert, "Northern Interests and Canadian Foreign Policy" (Calgary: University of Calgary Centre for Military and Strategic Studies, 2002), http://www.cdfai.org/PDF/Northern%20Interests%20and%20Canadian%20Foreign%20Policy.pdf; Internet; accessed 4 April 2009, 12.

[177] Standing Senate Committee on National Security and Defence, "Managing Turmoil The Need To Upgrade Canadian Foreign Aid And Military Strength To Deal With Massive Change," (Ottawa: Senate, 2006), 93-94; Http://Www.Parl.Gc.Ca/39/1/Parlbus/Commbus/Senate/Com-E/Defe-E/Rep-E/Repoct06-E.Pdf; Internet; accessed 4 April 2009.

Michael Klare states that the determinants of the likelihood and location of future conflict over oil are the politics of oil security, the dynamics of supply and demand, and the constraints of geography.[178] Looking at the locations of most of the oil-producing countries and the areas of greatest competitive interests between the US and other major powers, one can draw what Klare calls the "strategic triangle" from the Persian Gulf in the west, to the Caspian Sea in the north, and to the South China Sea in the east.[179]

The Persian Gulf is one of the most studied areas in Klare's "strategic triangle." It holds the largest reserve of conventional oil and has a history of unrest and conflict, especially since World War II.[180] Of the countries in the region, Saudi Arabia has the largest reserves and is the largest non-North American supplier to the US. While it has been relatively free of conflict in the recent past, there are significant concerns over the stability of the Saud regime.[181] Saudi Arabia has been the target of a significant number of domestic direct terrorist attacks, and American and other western involvement in the region has become the inspiration for terrorist groups such as Al-Qaeda.[182] Daniel Hobson, a Fellow at the Centre for Foreign Policy at Dalhousie University, points out that although attacks on oil infrastructure are not unusual in the world, Saudi Arabia is a concerning potential target due "its critical role as supplier of last resort with excess capacity to smooth market disruptions elsewhere" and "its concentration of target-rich

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[178] Michael Klare, *Resource Wars,* 49.

[179] *Ibid.*, 49.

[180] *Ibid.*, 51.

[181] *Ibid., 76.*

[182] Daniel Hobson, "Oil and Security: The Saudi-US Nexus," *Global Perspectives on Oil and Security* (Halifax: Dalhousie University, 2006), 182.

facilities on or near the Gulf coast."[183] Although Saudi Arabia, at a government level, is generally friendly to the US and its allies and contains significant reserves, it has vulnerabilities that make it a potential risk to energy security.

Figure 24 - Persian Gulf
Source: Wikipedia, "Persian Gulf," http://en.wikipedia.org/wiki/File:Persian_Gulf_map.png; Internet; accessed 10 March 2009.

Other large producers in the Persian Gulf region include the United Arab Emirates (UAE), Kuwait, Iraq, and Iran. While the UAE and Kuwait are reasonably stable and friendly to the west, they are in a volatile region. Kuwait was invaded by Iraq in 1991. Iraq has significant oil producing potential but has suffered much damage to its infrastructure during and after the 2003 invasion by the US and the subsequent intrastate conflict.[184]

Iran has the third largest proven oil reserves and the second largest proven natural gas reserves in the world; however, its oil production has been decreasing since 1979 due

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[183] *Ibid.*, 178.

[184] Michael Klare, *Blood and Oil*, 104.

to conflict, minimal investment, sanctions, and the maturity of Iran's oil fields.[185] Much of the natural gas production is consumed domestically.[186] Iran's present regime appears quite stable but is not friendly to the West.[187] Further, it has the potential to use its oil as leverage against American or western coercion.[188]

RISK ASSESSMENT – PERSIAN GULF

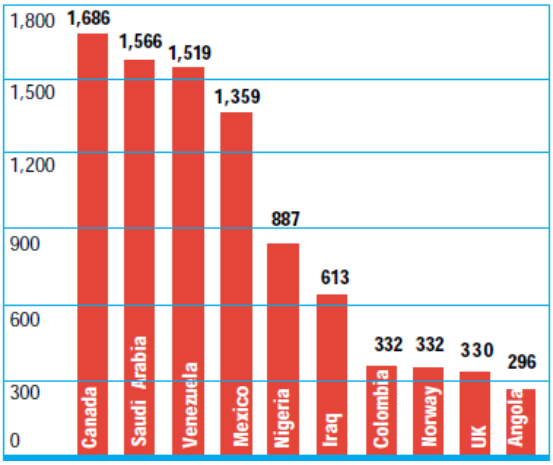

Figure 25 - Top Ten Sources of US Oil – 2000
Source: United States, Office of the Vice President, *National Energy Policy*, Fig 8-4.

The Persian Gulf region and especially Saudi Arabia provides a significant portion of the US's oil imports (see Figure 25). Therefore, events that negatively impact

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[185] United States, Department of Energy, "Country Analysis Briefs: Iran," February 2009, 3 and 7; http://www.eia.doe.gov/cabs/Iran/pdf.pdf; Internet; accessed 3 March 2009. Iran's fields have a natural annual decline rate estimated at 8 percent onshore and 11 percent offshore.

[186] *Ibid.*, 7.

[187] *Ibid.*, 6.

[188] Ariel Cohen, James Phillips and William Schirano, *Countering Iran's Oil Weapon*, Backgrounder #1982, The Heritage Foundation, 13 November 2006; http://www.heritage.org/Research/Iran/bg1982.cfm; Internet; accessed 5 April 2009.

the flow of oil and, eventually gas, from the region can be considered as risks to Canada's economic well-being.[189]

As discussed earlier in this section, the most significant impact on Saudi Arabia's ability to continue to export oil would be the replacement of the Saud regime with a regime either hostile to the US or unable to continue to provide oil exports effectively.[190] While there are varying assessments of the stability of the Saud regime, most current assessments indicate that the regime will remain stable[191] or at least continue to operate.[192] The probability of an economic well-being impact occurring due to the collapse of Saudi Arabia is therefore assessed as "low."

The risk that terrorist attacks will disrupt oil and gas flows in the region is more significant. In 2004, Bin Laden issued a decree to attack oil installations in order to impact the flow of oil to the US.[193] At the Canadian Centre Of Intelligence and Security Studies, Jack Williams has analyzed messages such as this one and tried to determine the

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[189] As discussed previously, risks to the US's economic well-being was determined to also be a risk to Canada's economic well-being due to the interdependent nature of the two country's economies. The US's economic well-being is due to both first and second order effects. The first order effect can be considered as an impact to the actual oil supply to the US while the second order effect is the price volatility of oil and gas prices due to disruptions in any part of the oil and gas producing system.

[190] For example, one can draw a parallel with the loss of Iranian productivity since the fall of the Shah. Details on Iranian productivity can be found at United States, Department of Energy, "Country Analysis Briefs: Iran," 6.

[191] Daryl Champion, "The Kingdom Of Saudi Arabia: Elements Of Instability Within Stability," *Middle East Journal of International Affairs* 3, no. 4 (December 1999), http://meria.idc.ac.il/journal/1999/issue4/jv3n4a4.html; Internet; accessed 11 March 2009.

[192] Nawaf E. Obaid, "In Al-Saud We Trust," *Foreign Policy*, no. 128 (January. - February, 2002), 72-74; http://www.jstor.org/stable/3183359; Internet; accessed 11 March 2009. Also, the following discusses the pressures on the Al-Saud government but concludes that despite the challenges the regime will likely survive intact:

[193] Anthony L. Kimery , "Us Oil Complex Vulnerable To Attack," *Homeland Security Today*, 27 November 2007; http://www.hstoday.us/content/view/13/150/ ; Internet; accessed 18 April 2009.

capability and intent of Al-Qaeda to attack oil and gas infrastructure.[194] His conclusion is that based on Al-Qaeda's already demonstrated history of attacking oil facilities in the Persian Gulf, and their clear capability and intent, it is likely oil facilities will be attacked again. While much of the present analysis is based on the oil infrastructure, it is logical that natural gas infrastructure will also become increasingly targeted as North America becomes more dependent on natural gas. Based on this analysis and the sensitivity of oil and gas imports from the Persian Gulf to North America, the probability of impacts to economic well-being due to terrorist attacks in the Persian Gulf is assessed as "high."

Although Iran does not export significant amounts of oil to North America, there are concerns over the potential of Iran to use its substantial energy resources as an "oil weapon" to allow it to influence the west or to at least afford itself some protection from western attempts to undermine its nuclear weapons program. This has the potential to negatively impact global stability. The Washington Post goes as far as to state that "Iran's oil weapon could prove more useful than any nuclear weapon it might develop" and that this has tempered the West's attempts to thwart Iran's nuclear program.[195] Some however have assessed the practicality of the oil weapon as being an "implausible threat."[196] Further, as Iran's economy is dominated by the oil industry, which is facing

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[194] Jack Williams, *Al-Qaida Threats And Strategies: The Religious Justification For Targeting The International Energy Economy*, (Ottawa: The Canadian Centre Of Intelligence And Security Studies, 2008); http://www.carleton.ca/cciss/ceipprs_publications/williams_03_2008.pdf ; Internet; accessed 18 April 2009.

[195] Steven Mufson, "The Weapon Iran May Not Want to Use," *The Washington Post*, 19 May 2006; http://www.washingtonpost.com/wp-dyn/content/article/2006/05/18/AR2006051802089.html; Internet; accessed 5 April 2009.

[196] Roger Stern, "Oil Market Power and United States National Security," *Proceedings of the National Academy of Sciences of the United States of America* 103, no. 5 (Jan. 31, 2006): 1655; www.jstor.org/stable/30048427; Internet; accessed 5 April 2009.

increased challenges in meeting its internal oil demands and is exporting its oil more and more to China and India, this approach is considered impractical and a weapon of last resort: as described by the Persian Journal, it would be an “Iranian Kamikaze."[197] Therefore, from an energy perspective, the probability of Iran affecting global energy security is assessed as “low.”

CASPIAN SEA

The Caspian Sea region is an area that has significant oil and gas reserves and is an area of potential energy security conflict. The estimates of the Caspian Sea region's proven crude oil reserves vary widely by source and range between 17 and 49 billion barrels.[198] The DOE expects that it has “potential to become a major oil and natural gas exporter over the next decade” and that its natural gas potential will be even more significant. The relative importance of the Caspian Sea natural gas reserves is shown at Figure 26.

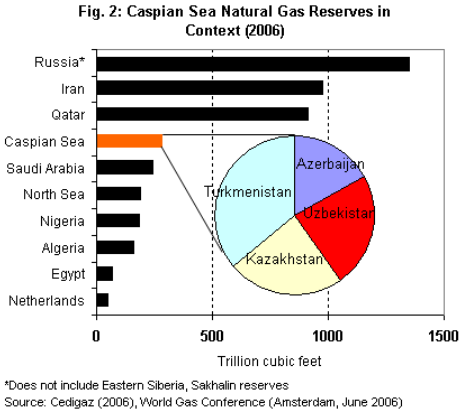

Figure 26 - Caspian Sea Natural Gas Reserves – 2006
Source: United States, Department of Energy, “Country Analysis Briefs: Caspian Sea Region,” 7.

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[197] Bahman Aghai Diba, “Iran and oil weapon,” *Persian Journal*, 11 July 2006; http://www.iranian.ws/cgi-bin/iran_news/exec/view.cgi/14/16643; Internet; accessed 5 April 2009.

[198] United States, Department of Energy, *Country Analysis Briefs: Caspian Sea Region* (Washington DC: U.S. Government Printing Office, 2007), 2; http://www.eia.doe.gov/emeu/cabs/Caspian/pdf.pdf; Internet; accessed 17 February 2009.

The largest investor in the region is Russia due to its historical involvement in the area, its pipeline infrastructure connotatively referred to as its "steel umbilical cord"[199], and the relative simplicity of access in the Caspian Sea region as compared with its northern reserves.[200] Western and Asian countries are also becoming increasingly involved in the region now that exportation is more feasible due to the increased pipeline infrastructure and stronger markets for LNG.[201] The EU is particularly interested in this region due to the possibility of reducing its dependency on Russian gas.[202] Similarly, China is engaged in developing a pipeline to allow exports to help feed its growing energy demands. [203] A pipeline is being developed between the oil and gas producing regions and the Black Sea so that oil and, especially, LNG can be shipped by sea through the Bosporus Straits.[204] The US's involvement in the region is part of its policy of diversification of energy sources; however, its interests are interrelated with concerns over security, terrorism and democracy in the region.[205]

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[199] Robert Ebel, *Energy Choices in the Near Abroad* (Washington: The Centre for Strategic and International Studies, 1997), 5.

[200] Dr Vladimir Paramonov and Dr Aleksey Stokov, *Russian Oil and Gas Projects and Investments in Central Asia* (Shrivenham: Defence Academy of the United Kingdom, 2008), 2.

[201] *Ibid.*, 11 and 14.

[202] United States, Department of Energy, *Country Analysis Briefs: Caspian Sea Region*, 6.

[203] *Ibid.*, 6.

[204] *Ibid.*, 6.

[205] Ariel Cohen, "US Interests and Central Asia Energy Security," 15 November 2006, The Heritage Foundation, www.edgeweb.heritage.org/research/russiaandeurasia/gb/1984.cfm; Internet; accessed 12 January 2009.

Figure 27 - Caspian Sea Pipelines
Source: United States, Department of Energy, *Country Analysis Briefs: Caspian Sea Region,* 4.)

Significant infrastructure investment is required before the Caspian Sea reserves can be fully capitalized.[206] The DOE has assessed that "regional conflicts, political instability, and a lack of regional cooperation" is hampering the much-needed investment.[207] While some see this as the "Great Game II"[208] as the US, Iran, Russia and China scramble for control of the region in what Jeremy Davis, the Research Chair for Oil and Natural Gas Policy at Dalhousie, sees as "a heady mix of big money, petty despots, poverty, intrigue, corruption and regional power interests," the future energy potential of the region is uncertain as is the potential of conflict in the region due to the

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[206] Dr Vladimir Paramonov and Dr Aleksey Stokov, *Russian Oil and Gas Projects and Investments in Central Asia*, 14.

[207] United States, Department of Energy, *Caspian Sea Region: Regional Conflicts,* (Washington DC: U.S. Government Printing Office, 2002); http://www.eia.doe.gov/cabs/caspconf.html; Internet; accessed 12 January 2009.

[208] Michael Klare, *Resource Wars,* 81. The Great Game refers back to strategic rivalry between Britain and the Russia for dominance in Central Asia in the time period of 1813 to 1907. For more details see N. Burns and H.A. Sadri, "The Caspian Sea Region & The Clash of Civilizations," *Paper presented at the annual meeting of the International Studies Association 48th Annual Convention,* 28 February 2007; www.allacademic.com/meta/p180254_index.html; Internet; accessed 1 April 2009.

exploitation of the oil and gas.[209] As indicated by Sean Kay, the Chair of International Studies at Ohio Wesleyan University, there is significant posturing on who should have influence in the area as the pipelines can provide oil and natural gas west (benefitting the US and Europe), north (benefitting Russia), east (benefitting China), or south (benefitting Iran).[210]

RISK ASSESSMENT – CASPIAN SEA REGION

As this region is not a large supplier of oil and natural gas to North America, the tensions in the Caspian Sea region do not pose a direct threat to Canadian economic well-being.[211] However, some authors argue that the tensions pose a threat to global stability. There is significant posturing between the major or regional powers of the US and Europe, Russia, China and Iran in influencing the direction of future pipelines.[212] With the large number of powers involved and the considerable resources at stake there is potential for some degree of conflict in the region. Based on these factors, the probability of a disruption to a stable world order is considered "medium."

SOUTH CHINA SEA AND CHINA

The last area in Klare's "strategic triangle" is the South China Sea. According to the DOE, it is rich in natural resources such as oil and natural gas but almost the entire

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[209] Jerome Davis, "Caspian Sea: The Political Economy of Bottlenecks," *Global Perspectives on Oil and Security* (Halifax: Dalhousie University, 2006), 313.

[210] Sean Kay, *Global Security In The Twenty-First Century: The Quest For Power And The Search For Peace* (Lanham, Md.: Rowman & Littlefield, 2006), 314.

[211] However, considering the inelasticity of the oil market it could be argued that an oil disruption anywhere will have knock-on effects globally; however, considering the volumes presently being produced this risk is less than in the other areas that were investigated.

[212] Lutz Kleveman, *The New Great Game: Blood and Oil in Central Asia* (New York: Atlantic Monthly Press, 2003).

region's ownership is contested.[213] The oil reserve estimates vary but one Chinese estimate suggests potential oil resources as high as 213 billion barrels of oil (bbl) while an estimate by the U.S. Geological Survey estimated the sum total of discovered reserves and undiscovered resources in the offshore basins of the South China Sea at 28 bbl."[214] Natural gas appears to be even more abundant and the estimates vary from 900 trillion to 2 quadrillion cubic feet. [215]

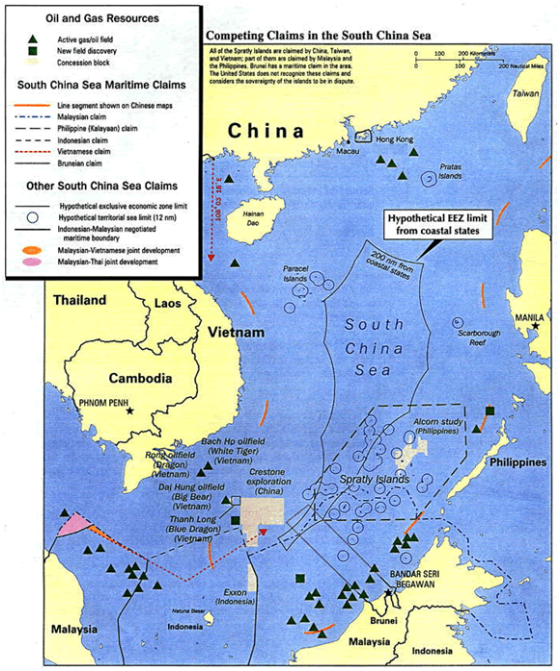

Figure 28 - South China Sea
Source: United States, Department of Energy, *Country Analysis Brief: South China Sea*, 7)

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[213] United States, Department of Energy, *Country Analysis Brief: South China Sea*, (Washington DC: U.S. Government Printing Office, 2008), 1 http://www.eia.doe.gov/emeu/cabs/South_China_Sea/pdf.pdf; Internet; accessed 16 February 2009.

[214] *Ibid.*, 4.

[215] *Ibid.*, 4. "One Chinese estimate for the entire South China Sea estimates natural gas reserves to be 2 quadrillion cubic feet. Another Chinese report estimates 225 billion barrels of oil equivalent in the Spratly Islands alone. If 70 percent of these hydrocarbons are gas as some studies suggest, total gas resources (as opposed to proved reserves) would be almost 900 trillion cubic feet (Tcf). In April 2006, Husky Energy working with the Chinese National Offshore Oil Corporation announced a find of proven natural gas reserves of nearly 4 to 6 Tcf near the Spratly Islands."

Not only do the states involved have overlapping claims for the oil and gas, Klare points out that these countries have demonstrated the resolve to use their military forces to enhance their claim.[216] China's recent increased assertiveness in the area as well as the area's criticality to shipping exacerbates the potential for conflict. From this review, it is apparent that, regardless of its motives, China's energy security situation has the potential to increase the probability of energy related conflict in the region.

China presents a special case in this paper. It is not a net exporter of oil and gas but it is an increasingly important consumer. As the world's most populous country and the second largest energy consumer behind the US, its oil imports continue to grow rapidly. Since 1993, China has gone from being largely self-sufficient to one of the largest importers of oil.[217] The EU predicts that by 2030 China and the US will be in comparable positions with respect to oil importation requirements.[218]

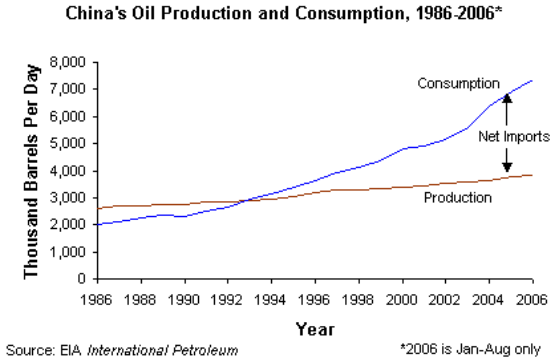

Figure 29 - China's Oil Imports
Source: United States, Department of Energy, *Country Analysis Brief: China*, 2.

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[216] Michael Klare, *Resource Wars*, 109.

[217] United States, Department of Energy, C*ountry Analysis Brief: China* (Washington DC: U.S. Government Printing Office, 2006), 1; http://www.eia.doe.gov/cabs/China/pdf.pdf, Internet; accessed 16 February 2009.

[218] Philip Andrews-Speed, *et al*, edited by Marcin Zaborowski, "Facing China's Rise: Guidelines for an EU Strategy," *Chaillot Paper* 94 (Paris: Institute for Security Studies, 2006), 91.

Some argue that China's energy requirements will lead to challenges to the US's energy security and that this could lead to confrontations between the two countries. US Senator Joseph Lieberman has been quoted as stating that "Sino-American confrontations over oil …could in the years ahead threaten our national security and global security unless each of our nations … develop and employ new technologies that will reduce our dependence on oil."[219] Others such as Owen Graham, of the Asian Studies Center at the Heritage Foundation in Washington DC, debate whether the potentially conflicting energy requirements of the US and China represent a "new type of security dilemma."[220] An EU study suggests that it is an "exaggeration that [the energy competition between China and the US] will lead to conflict" but sees two areas of concern.[221] The first is "China's willingness to ignore international opinion" in dealing with countries or regimes shunned by the western world such as Iran and Sudan.[222] China has shown that, in contrast to western nations, it invests and procures oil from countries without consideration of other political factors and that such countries may use "China's eagerness" to access sources of oil to further their own agendas.[223] The second concern is China's reliance on the United States Navy (USN) to "secure the open ocean 'public good' of security" which is an "uncomfortable situation from Beijing's position"

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[219] Joseph I. Lieberman, *China-U.S. Energy Policies: A Choice of Cooperation or Collision,* transcript from November 30, 2005 Council on Foreign Relations at Washington, DC; http://www.cfr.org/publication/9335/chinaus_energy_policies.html; Internet, accessed 12 February 2009.

[220] Owen Graham, "The 'Great Game': US Energy Security and China's Rise." *Global Perspectives on Oil and Security* (Halifax: Dalhousie University, 2006), 66 and 79.

[221] Marcin Zaborowski, "Facing China's Rise: Guidelines for an EU Strategy," 93.

[222] *Ibid.*, 79.

[223] *Ibid.*, 76.

considering the importance of Sea Lines of Communication (SLOC) to China's economy.[224] Overall, there is little consensus on the future impact of the US and China's increasing energy demands with respect to the relationships between the two significant powers; however, it is clear that the potential competition could lead to increased tensions.

RISK ASSESSMENT – SOUTH CHINA SEA AND CHINA

The risk assessment for the South China Sea and China are combined as China itself is an integral part of the tensions in the South China Sea region. There are several contributors to the tension in this region. First of all, it is thought to contain significant oil and gas reserves. There are also many overlapping claims and many of the countries involved have demonstrated the resolve to use military force to enhance their claims.[225] Based on the present situation and the capability and demonstrated intent of the powers in the region, the probability of some degree of conflict is rated as "medium."

Further, China, the largest power in the area, is expected to require the importation of ever-increasing amounts of oil and gas to keep up with its growing and modernizing economy. Much of this oil and gas will need to be move by sea through the South China Sea. With the USN presently providing much of the security on the high seas, there are concerns in China that the US could use its dominance of the SLOC as a coercive tool to influence China.[226] This is thought to be a motive for some of China's

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[224] Evelyn Goh and Sheldon Simon, *China, the United States, and Southeast Asia* (New York: Routledge, 2008), 6.

[225] Michael Klare, *Resources Wars*, 109.

[226] Evelyn Goh and Sheldon Simon, *China, the United States, and Southeast Asia*, 6.

increased emphasis on its naval power.[227] It is therefore probable that China will become more assertive in controlling the SLOC through the South China Sea. This does not necessarily mean that there will be an open conflict between China and the US. An EU study concluded that conflict between the US and China over the South China Sea SLOCs is actually unlikely as it is neither country's interest as importers of oil to create a major energy crisis.[228] Therefore, the probability of conflict between China and the US over the South China Sea SLOCs is assessed as "low."

RUSSIA

Significant oil and gas producing regions outside of Klare's "strategic triangle" are also worth considering. Russia, for instance, has the world's largest natural gas reserves, the eighth largest oil reserves, and is the world's largest exporter of natural gas.[229]

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[227] *Ibid.,* 6.

[228] Philip Andrews-Speed, Axel Berkofsky, Peter Ferdinand, Duncan Freeman, François Godement, Eberhard Sandschneider, Antonio Tanca, edited by Marcin Zaborowski, "Facing China's Rise: Guidelines for an EU Strategy."

[229] United States, Department of Energy, *Country Analysis Brief: Russia* (Washington DC: U.S. Government Printing Office, 2008), 1; http://www.eia.doe.gov/emeu/cabs/Russia/pdf.pdf; Internet; accessed 16 February 2009.

Figure 30 - Russian Oil and Natural Gas
Source: United States, Department of Energy, *Russian Oil and Natural Gas at a Glance, 2007,* http://www.eia.doe.gov/emeu/cabs/Russia/images/Russian%20Energy%20at%20a%20Glance%202007.pdf; *Internet;* accessed 16 February 2009.

Despite size of the reserves, they are dwindling. For example, in 2006 around 24 percent (or 2.3 million bbl/d) of Russia's oil production came from fields that had already produced 60 percent of their total recoverable reserves. [230] Maintaining the present growth will be unlikely as oil companies run out of easily accessible resources and lack investment and infrastructure.[231]

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[230] *Ibid.*, 3.

[231] Michael Fredholm, *The Russian Energy Strategy and Energy Policy: Pipeline Diplomacy or Mutual Dependence?* (Watchfield: Conflict Studies Research Centre, 2005), 2.

Further, there are concerns within the European Union (EU) that note that the "close links with national political leaderships, such as Gazprom,"[232] create "fear of [the] Russian energy supply position being used for leverage for unconnected political disputes."[233] The most recent example of gas as an energy weapon was on 1 January 2006 when Gazprom shut off gas supplies to Ukraine, and as a result, supplies to Europe were also affected. Gazprom resumed natural gas deliveries to Ukraine three days later. Even though Russia has used the threat of a cut-off to demand higher natural gas prices in recent years, this was the first time that a supply disruption affected flows to Europe. More recently in 2008 Gazprom cut exports by 25-35 percent after Ukraine failed to pay its debt.[234]

Russia's ability to leverage this oil and gas weapon is undetermined. So far it has only been used on former Soviet states and, potentially more importantly, Russia is largely reliant on gas for income but its increasing domestic use and the dwindling capabilities of it existing gas sites will reduce its ability to use gas as an "energy weapon." [235] With the potential development of natural gas lines to China and the investment required to capitalise on Russia's substantial gas reserves, Russia's ability to export to China has significant strategic value. Once Russia can export to China, it will

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[232] United Kingdom, House of Commons Foreign Affairs Committee, "Global Security: Russia," *Second Report of Session 2007-2008* (London: The Stationary Office, 2007), 59.

[233] *Ibid.,* 60.

[234] United States, Department of Energy, *Country Analysis Brief: Russia,* 12.

[235] United Kingdom, House of Commons Foreign Affairs Committee, "Global Security: Russia," 60, 63.

not be dependant on the EU as an export customer.[236] Mikhail Molchanov, of Saint Thomas University, concludes that this change would result in a loss of "strategic leverage for the west in Eurasia."[237]

RISK ASSESSMENT - RUSSIA

Russia is a significant player in energy issues in Europe. There is concern that Russia could use its "gas weapon" to influence EU or NATO decision making. General John Craddock, NATO Supreme Allied Commander, was quoted as saying that "Russia seems determined [to] see Euro-Atlantic security institutions weakened and has shown a readiness to use economic leverage and military force to achieve its aims."[238] If effective, this has the potential to destabilise one of the tenets of Canada's defence policy, NATO. As long as Russia remains dependent on the gas exports to the EU for much of its income, it is unlikely to present a significant threat. Both the DOE[239] and Kovykta Gas Exports[240] consider a viable pipeline between Russia and China to be unlikely in the near term due to the market dynamics and the shear magnitude of the investment required

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[236] *Ibid.*, 65.

[237] Mikhail Molchanov, "Russia's Partnership with China: Oil Politics and Security," *Global Perspectives on Oil and Security* (Halifax: Dalhousie University, 2006), 217.

[238] "NATO commander: Russia undermined national borders in Europe," *Russia Today*, 25 March 2009; http://www.russiatoday.com/Politics/2009-03-25/NATO_commander__Russia_undermined_national_borders_in_Europe.html; Internet; accessed 3 April 2009.

[239] United States, Department of Energy, *Country Analysis Brief: Russia*, 13.

[240] V. Kashirtsev, *et al*, *Independent Study Of Optimum Transportation Corridors for Kovykta Gas Exports Key Conclusions And Recommendation* (Moscow: Kovykta Gas Exports, 2007), 2; http://www.tnk-bp.com/hse/research/gas-transportation/; Internet; accessed 5 April 2009. This was a study sponsored by TNK-BP, a merger of BP's Russian oil and gas assets and the oil and gas assets of Alfa, Access/Renova group (AAR). TNK-BP, *Results of Independent Social, Environmental, and Economic Studies of Different Routes for Transportation of Gas from the Kovykta Field Are Discussed*; http://www.tnk-bp.com/press/news/2007/6/193/; Internet; accessed 5 April 2009. The report is also cited by the DOE giving the report some credence.

to establish the pipeline. Therefore, based on Russia's reliance on gas exports to the EU for income combined with the improbability of alternative gas markets, the probability of Russia being able to significantly undermine NATO though the use of the "gas weapon" is remote and therefore assessed as a "low" probability.

AFRICA

Africa holds promise as a significant source of oil and gas but, like the other regions discussed previously, it also presents significant potential for conflict. The US NEP describes Africa, or West Africa specifically, as having the potential to become the fasting growing source of oil and gas for the US.[241] Sandra Barnes, a Professor of Anthropology and the Director of the African Studies Center at the University of Pennsylvania, forecasts that by 2015 West Africa could be providing up to 25 percent of America's oil requirements.[242] Not only does West Africa have substantial reserves, the oil is especially attractive for North America as it is relatively easy to transport to the east coast of the US and it is mostly the desirable low-sulphur oil ideal for gasoline production.[243] Further, the region's substantial natural gas reserves are attracting significant investment in LNG infrastructure.[244] Klare points out however, that the region is "bedevilled by ethnic unrest, political corruption and organised crime" which

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[241] United States, Office of the Vice President, *National Energy Policy*, 8-11.

[242] Sandra Barnes, "Global Flows: Terror, Oil and Strategic Philanthropy," *Review of African Political Economy* 32, no 104/105 (June 2005), 236; www.jstor.org/stable/4007072, Internet; accessed 21 January 2009.

[243] Paul M. Lubeck, Michael J. Watts and Ronnie Lipschutz, "Convergent Interests: U.S. Energy Security And The 'Securing' Of Nigerian Democracy," *Center for International Policy*, February 2007, 3; http://www.ciponline.org/NIGERIA_FINAL.pdf; Internet; accessed 18 April 2009.

[244] *Ibid.*, 4.

are impacting oil and gas production.[245] For example, the US DOE estimates that in 2007 approximately 26 percent of Nigeria's oil production was "shut-in" or not available for export (the overall effect is shown at figure 31).[246]

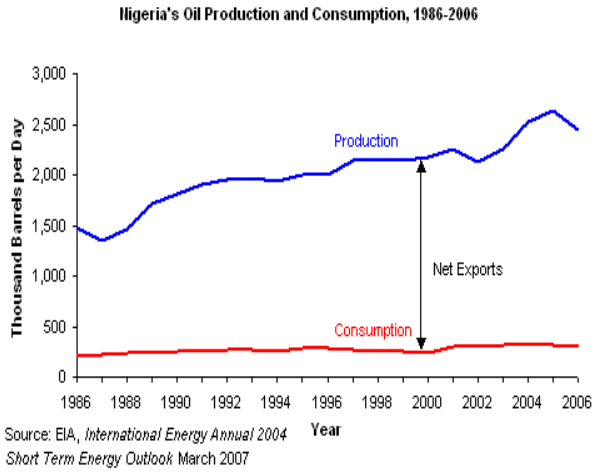

Figure 31 - Nigeria's Drop in Oil Production – 2007
Source: United States, Department of Energy, *Country Analysis Brief: Nigeria,* 3.

This unrest not only impacts upon the production of oil and gas but, due to the "resource curse" phenomena, the region's reliance on oil and gas exports exacerbates the conflict.[247] Countries like Nigeria that lack a "strong politically unifying state" to maintain some degree of cohesiveness, unlike the members of the Persian Gulf region, seem particularly affected by the resource curse.[248] In the Nigerian example, the

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[245] Michael Klare, *Blood and Oil*, 66.

[246] United States, Department of Energy, *Country Analysis Brief: Nigeria* (Washington DC: U.S. Government Printing Office, 2007), 2-3; http://www.eia.doe.gov/cabs/Nigeria/pdf.pdf; Internet; accessed 16 February 2009. The 2007 estimates are 587,000 bbl/d shut in as compared to a 2006 average of 2.28 million bbl/d.

[247] Claire Woodside, "West Africa: America's Foreign Policy Post 9/11 and the 'Resource Curse' A Head On Collision," Journal *of Military and Strategic Studies* 9 (Summer 2007), 2.

[248] Kenneth Omeje, *High Stakes and Stakeholders: Oil Conflict and Security in Nigeria* (Burlington: Ashcroft Publishing, 2006), 2.

initiation of the oil industry in the 1960's coincided with the rise in political violence.[249] Sudan is one of the most extreme examples of conflict exacerbated by oil or gas production. In Human Rights Watch's studies, it was evident that there were direct correlations between the oil industry and extreme human rights abuses such as mass expulsions.[250] Overall, Africa holds great promise as a future contributor to global energy security. Nevertheless, continental instability, some of which is exacerbated by energy issues, has the strong potential to impede Africa's contribution.

RISK ASSESSMENT – AFRICA

The symptoms of energy conflict have the potential to impact two of the risk effect categories: Economic well-being and Human Security. As discussed in previous chapters, Canada will eventually become a net importer of natural gas and North America is increasingly a net importer of both oil and gas. The conflict in West Africa has the potential to restrict what could otherwise become an important source of oil and gas for North America. There is little indication that the problem will improve in the short term. Current security efforts appear to be failing to "deliver energy security."[251] Standard & Poor's recently lowered Nigeria's ratings outlook to "negative" due to the "continued worsening of the business environment" largely caused by the unrest in the Niger

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[249] Peter Arthur, "The Problem of 'Resource Curse' and the Distribution of Oil Revenue in Nigeria," *Global Perspectives on Oil and Security* (Halifax: Dalhousie University, 2006), 352.

[250] Human Rights Watch, *Sudan, Oil and Human Rights* (New York: Human Rights Watch, 2003), 48-50

[251] Paul M. Lubeck, Michael J. Watts and Ronnie Lipschutz, "Convergent Interests: U.S. Energy Security And The 'Securing' Of Nigerian Democracy," 5.

delta.[252] Based on the extensive disruptions occurring presently in Nigeria, and lack of indicators that the situation will improve over the short term, the probability of future disruptions of oil and gas imports to North America is assessed as "likely" or "high."

As discussed previously, there are correlations between a country's dependence on exporting primary resources such as gas and oil and conflict.[253] This scenario, known commonly as the "resource curse," is evident in African countries such as Nigeria and Sudan.[254] The unrest in Nigeria is already covered under Canada's national interest of "economic well-being" in protecting a source of oil and gas for North America; however, Sudan is not expected to be a significant supplier of oil or gas to North America. The situation in Sudan, exacerbated by the energy industry, does nevertheless present an ongoing threat to human security[255]. Based on the likelihood of continued conflict in Africa exacerbated by the energy industry, the probability of continued human security threats is "high."

VENEZUELA

The last area in the review is Venezuela. The US NEP mentions Venezuela as a potential source of increased oil and gas to reduce the US's dependence on the Middle

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[252] Ayodele Aminu, "Nigeria: Standard & Poor's Downgrades Country's Credit Rating," AllAfrica.Com, 28 March 2009, http://allafrica.com/stories/200903290009.html; Internet; accessed 6 April 2009.

[253] Michael Ross, "Oil, Drugs, and Diamonds: The Varying Roles of Natural Resources in Civil War" and Scott Pegg, "Globalization and Natural-Resource Conflicts."

[254] Paul M. Lubeck, Michael J. Watts and Ronnie Lipschutz, "Convergent Interests: U.S. Energy Security And The "Securing" Of Nigerian Democracy," 6-7 and Human Rights Watch, *Sudan, Oil and Human Rights*, 48.

[255] Human Rights Watch, *Sudan, Oil and Human Rights*, 48.

East.[256] It is at present the largest oil producer in the Western Hemisphere and has the largest oil reserves in South America.[257] Like many other oil-exporting countries, its oil industry forms a high percentage of its economy.[258] While Venezuela claims that it has the "largest oil reserves in the World" there are significant challenges to actually produce this oil.[259] First of all, the majority of its existing production comes from sites that are drawing down.[260] Much of the reserves are unconventional oil and will require substantial investment to access.[261] Obtaining this investment will be challenging for Venezuela due to the extensive political unrest in the country and the Chavez government's "distribution as opposed to production mentality."[262] Figures 32 and 33 show the US Government Accountability Office's (GAO) assessment of Venezuela's oil production and exports to the US.

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[256] United States, Office of the Vice-President, *National Energy Policy*, 8-10.

[257] United States, Department of Energy, *Country Analysis Brief: Venezuela* (Washington DC: U.S. Government Printing Office, 2009), 1; http://www.eia.doe.gov/cabs/Venezuela/pdf.pdf; Internet; accessed 16 February 2009.

[258] *Ibid.*, 1.

[259] Henry Guanipa, "The Role of Venezuela in Global Energy Security," *Global Perspectives on Oil and Security* (Halifax: Dalhousie University, 2006), 273.

[260] Michael Klare, *Blood and Oil*, 121.

[261] Henry Guanipa, "The Role of Venezuela in Global Energy Security," 282.

[262] Michael Klare, *Blood and Oil*, 125, 128 and Henry Guanipa, "The Role of Venezuela in Global Energy Security," 285.

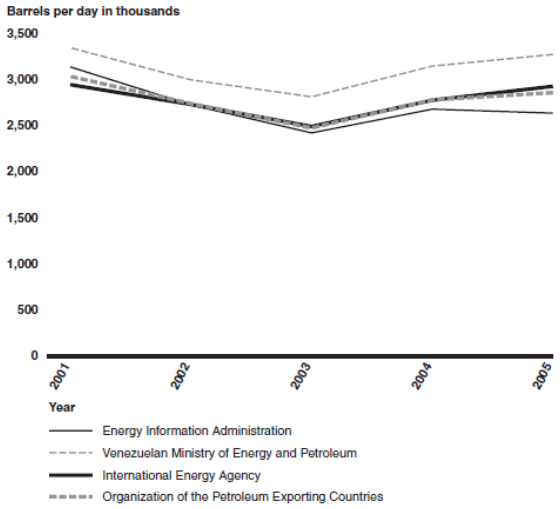

Figure 32 - Venezuelan Oil Production 2001 to 2005
Source: United States, Government Accountability Office, *Energy Security: Issues Related To Potential Reductions In Venezuelan Oil Production,* 15.

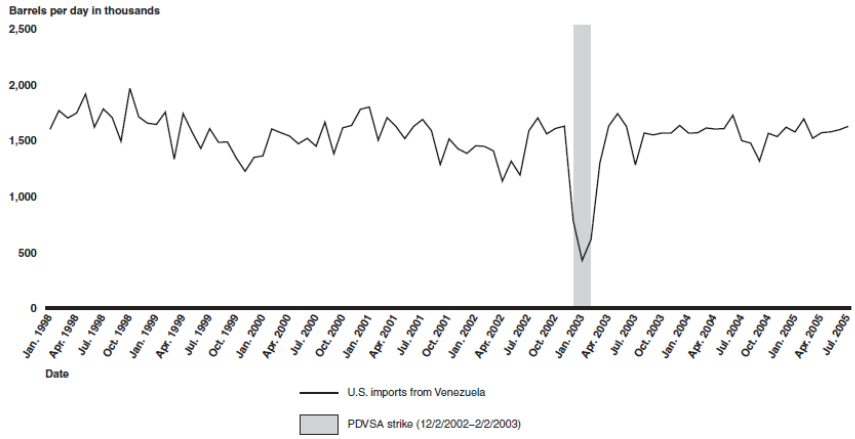

Figure 33 - Venezuelan Exports of Crude Oil and Refined Petroleum Products to the United States, Excluding the U.S. Virgin Islands, 2001–2005
Source: United States, Government Accountability Office, *Energy Security: Issues Related To Potential Reductions In Venezuelan Oil Production,* 19.

One element of the unrest is increased friction between the Chavez government and the US.[263] Chavez has threatened to use its oil exports as an "oil weapon."[264] However, as Venezuela's economy, and especially its oil industry, is so interdependent

[263] United States, Government Accountability Office, *Energy Security: Issues Related To Potential Reductions In Venezuelan Oil Production* (Washington, DC: U.S. Government Printing Office, 2006), 2; http://www.gao.gov/new.items/d06668.pdf; Internet; accessed 18 April 2009.

[264] Henry Guanipa, "The Role of Venezuela in Global Energy Security," 291.

with that of the US, the Chavez government has limited opportunities to use the "oil weapon" without devastating Venezuela's economy (unless alternate importers can be found).[265] As with the other regions, there are reports that China could become a major customer for Venezuela but there would remain significant challenges for China to transport the oil.[266] Again, as with the Africa, Venezuela's oil and gas reserves offer great potential but the geopolitical situation puts this support at risk.

RISK ASSESSMENT - VENEZUELA

Venezuela poses risks to energy security and therefore Canada's economic well-being from two perspectives. Firstly, the lack of stability in Venezuela does not provide an ideal business environment to attract the necessary investment.[267] Finally, if Venezuela were to use its "oil weapon" to cease or seriously restrict exports of oil to the US it may have an adverse affect on the US economy.[268] The GAO estimated in 2005 that a short-term disruption of Venezuela's oil exports would cause an increase in oil prices by approximately 8 to 11 percent.[269] While the increased oil prices would adversely affect the US economy, the GAO predicts that there would be a more significant negative affect on the Venezuelan economy.[270] Therefore, this paper considers it unlikely that Venezuela would use the "oil weapon" on the US for any

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[265] *Ibid.*, 291.

[266] *Ibid.*, 295.

[267] *Ibid.*, 285.

[268] United States, Government Accountability Office, *Energy Security: Issues Related To Potential Reductions In Venezuelan Oil Production*, 25.

[269] *Ibid.*, 25.

[270] *Ibid.*, 25-27.

extended period of time due to Venezuela's reliance on oil exports as a source of income. The overall risk to economic well-being is therefore assessed as "unlikely" or "low."

CHOKEPOINTS

The majority of the oil and LNG exported between regions is moved by sea.[271] Due to geography, there are only so many practical routes between the producers and importers and most of those routes travel through at least one chokepoint. Table 8 shows six potential choke points that represent 40% of the world's oil consumption.[272]

Table 8 - Chokepoints

Important World Oil Transit Chokepoints						
Name	**2006E oil flow (bbl/d)**	**Width at Narrowest Point**	**Oil Source Origin**	**Primary Destination**	**Past Disturbances**	**Alternative Routes**
The Strait of Hormuz	16.5-17 million	21 miles	Persian Gulf Nations including Saudi Arabia, Iran, and UAE	Japan, The United States, Western Europe, other Asian countries	Sea mines were installed during the Iran-Iraq War in the 1980s. Terrorists threats post September 11, 2001.	745-mile long East-West Pipeline through Saudi Arabia to the Red Sea
The Strait of Malacca	15 million	1.7 miles	Persian Gulf Nations, West Africa	All Asia/ Pacific consumers including Japan and China	Disruptions from pirates are a constant threat, including a terrorist attack in 2003. Collisions and oil spills are also a problem. Poor visibility from smoke haze.	Reroute through the Lombok or Sunda Strait in Indonesia. Possible pipeline construction between Malaysia and Thailand.
The Suez Canal/ Sumed Pipeline	4.5 million	1,000 feet	Persian Gulf Nations, especially Saudi Arabia, and Asia	Europe and The United States	Suez Canal was closed for eight years after the Six-Day War in 1967. Two large oil tankers ran aground in 2007 suspending traffic.	Reroute around the southern tip of Africa (the Cape of Good Hope); additional 6,000 miles.
Bab el-Mandab	3.3 million	18 miles	The Persian Gulf	Europe and The United States	USS Cole attack in 2000; French oil tanker in 2002, both attacks off the coast of Aden, Yemen	Northbound traffic can use the East-West oil pipeline through Saudi Arabia; Reroute around the southern tip of Africa (the Cape of Good Hope); additional 6,000 miles.
The Turkish Straits	2.4 million	0.5 mile	Caspian Sea Region	Western and Southern Europe	Numerous past shipping accidents due to the straits sinuous geography. Some terrorist threats were made after September 11, 2001.	No clear alternative; potential pipelines discussed including a 173-mile pipeline between Russia, Bulgaria, and Greece.
The Panama Canal	0.5 million	110 feet	The United States	The United States, and other Central American countries	Suspected terrorist target	Reroute around Straits of Magellan, Cape Horn and Drake Passage; additional 8,000 miles

Source: United States, Department of Energy, *World Oil Transit Chokepoints.*

[271] United States, Department of Energy, *World Oil Transit Chokepoints* (Washington DC: U.S. Government Printing Office, 2008), 1; http://www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/pdf.pdf; Internet, accessed 7 February 2009.

[272] Michael Klare, *Resource Wars*, 47.

Unfortunately, all six chokepoints have a history of tension or conflict and potential for future problems. The Strait of Hormuz sees the largest throughput of oil, and through a narrow gap of only 29 nm[273], is in a region renowned for tension and conflict. On one side of the strait is Iran which has threatened to close or restrict travel in the past. During the Iran/Iraq War of 1986, tankers were deliberately targeted and eventually were reflagged to US registration for protection by US and coalition navies.[274] The Strait of Malacca[275] and the Bab el Mandeb[276] have an extensive history of piracy. The Suez Canal has been shut during conflicts between Egypt and Israel in 1967 and 1973 and prior to that during the UK/French invasion of Egypt in 1956. Even the Bosporus Strait, which has been relatively free of conflict since World War II, is at risk due increasing congestion.[277] As an increasing amount of natural gas is being shipped as LNG[278] and with North America soon to be the largest importer of LNG[279], these chokepoints will soon become critical for LNG as well.

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[273] "Strait of Hormuz," Wikipedia; http://en.wikipedia.org/wiki/Strait_of_Hormuz; Internet; accessed 10 March 2009.

[274] Michael Klare, *Resource Wars,* 22-23.

[275] Sumathy Permal, *Piracy And Sovereignty In The Strait Of Malacca (*Malaysia: Maritime Institute Of Malaysia, 2005); http://www.mima.gov.my/mima/htmls/papers/pdf/sumathy/som-piracy.pdf, Internet; accessed 3 April 2009.

[276] John C. K. Daly, "Terrorism and Piracy: The Dual Threat to Maritime Shipping," *Terrorism Monitor Volume* 6, no. 16 (August 15, 2008); http://www.jamestown.org/programs/gta/single/?tx_ttnews%5Btt_news%5D=5112&tx_ttnews%5BbackPid%5D=167&no_cache=1; Internet; accessed 3 April 2009.

[277] United States, Department of Energy, *Country Analysis Briefs: Caspian Sea Region*, 4. The Caspian oil exports through the CPC will increase congestion in Turkey's Bosporus Straits, which connect the Black Sea to the Mediterranean. Oil flows through the Bosporus range from 2.8 - 3.1 million bbl/d. The CPC expansion could add an incremental 750,000 bbl/d of oil through the Strait.

[278] International Energy Agency, *World Energy Outlook 2006*, Figure 4.4 and 4.5.

[279] *Ibid.*, 117.

RISK ASSESSMENT – CHOKEPOINTS

Targeting chokepoints represents a relatively easy way for either states or non-state groups such as terrorist organisations or criminals to attack western interests.[280] A serious restriction on any of these chokepoints, with the exception of the Panama Canal, would seriously disrupt global energy security if the blockage lasted for any significant period of time. This would have a significant impact on economic well-being. Considering the geopolitical situation surrounding these chokepoints[281] and the ease with which they could be blocked, the probability of impact on economic well-being is assessed as "high" relative to the risks that have been reviewed.

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[280] United States, Department of Energy, *World Oil Transit Chokepoints,* 1.

[281] *Ibid.,* 1-9.

RISK MATRIX

The risks described earlier in this chapter have been applied to Table 9 using the format developed in chapter two.

Table 9 - Risks Due to Energy Security[282]

	Sovereignty or Defence of Canada	Economic Well-Being	A Stable World Order	Human Security
H	**- Arctic Sovereignty**	**-Disruption of oil or gas to North America due to unrest in west Africa - Disruption of oil or gas imports to the North America due to a terrorist attack in the Persian Gulf - Disruption to oil or gas supplies due to blockage of a critical chokepoint**		**- Impact on Human Security in Sudan or other country where oil and gas are the primary exports**
M	**- Attacks on Infrastructure**		**- South China Sea (small conflict) - Conflict in the Caspian Sea region over oil or gas resources.**	
L		**- Disruption of oil imports to the US due to the fall of the Saud regime in Saudi Arabia. - Disruption of oil imports to US due to the cessation of oil exports to the US from Venezuela**	**- South China Sea (major power conflict) - Russia – gas weapon and impact on NATO alliance - Iran – oil weapon**	

RISK RESPONSES

Now that the risks have been categorised in the risk matrix, a framework for the application of the risk responses must be applied. Table 10 shows the proposed risk response framework developed in chapter two.

Table 10 - Risk Response Framework

	Sovereignty or Defence of Canada	Economic Well-Being	A Stable World Order	Human Security
H	Must Mitigate	Must Mitigate	Must Mitigate /Transfer	Should Mitigate/ Transfer
M	Must Mitigate	Should Mitigate/Transfer	Should Mitigate/ Transfer	Transfer /Accept
L	Should Mitigate	Transfer/Accept	Transfer /Accept	Transfer /Accept

[282] To assist with the clarity in the matrix, the lower order impacts are not shown. For example, economic well-being would also likely impact global stability and human security in the country in questions; however, the risk will only be shown in the higher priority effect. In this case, a risk to economic well-being would only be listed under that column not global stability and human security.

If one then combines this risk response framework with the risks detailed in Table 9, the result is as shown in Table 11.

Table 11 - Table of Risks and Risk Response

	Sovereignty or Defence of Canada	Economic Well-Being	A Stable World Order	Human Security
H	- Arctic Sovereignty	-Disruption of oil or gas to North America due to unrest in west Africa - Disruption of oil or gas imports to the North America due to a terrorist attack in the Persian Gulf - Disruption to oil or gas supplies due to blockage of a critical chokepoint		- Impact on Human Security in Sudan or other country where oil and gas are the primary exports
M	- Attacks on Infrastructure		- South China Sea (small conflict) - Conflict in the Caspian Sea region over oil or gas resources.	
L		- Disruption of oil imports to the US due to the fall of the Saud regime in Saudi Arabia. - Disruption of oil imports to US due to the cessation of oil exports to the US from Venezuela	- South China Sea (major power conflict) - Russia – gas weapon and impact on NATO alliance - Iran – oil weapon	

(Red=mitigate risk, Yellow= mitigate or transfer risk, Green = transfer or accept risk)

The Table 11 matrix provides broad guidance on the appropriate risk response measure for each risk event. Based on the framework, the risk events fall into three broad categories: risks that must be mitigated, risks that should be mitigated or transferred, and risk that should be transferred or accepted. Further, the risk response matrix shows broadly where and why energy security concerns may lead to deployments of the CF.

In some of the cases, the forecasted deployment areas or types are congruent with existing policy. This is especially true of the domestic case. As detailed in the CFDS, the CF has the role to "provide surveillance of Canadian territory and air and maritime

approaches … and assist civil authorities in responding to a wide range of threats."[283] Further, CFDS details that the CF "must have the capacity to exercise control over and defend Canada's sovereignty in the Arctic" and that "the military will play an increasingly vital role in demonstrating a visible Canadian presence in this potentially resource-rich region."[284] Therefore, the requirement to mitigate these risks is already covered by government policy, and the CF is already working to ensure it has the capabilities to meet the requirements of the CFDS; the analysis of the energy security risk management framework reinforces the importance of these efforts.

Internationally, the risk response results are generally congruent with existing policy in the CFDS: "Lead and/or conduct a major international operation for an extended period" and "Deploy forces in response to crises elsewhere in the world for shorter periods."[285] However, the risk response matrix provides a broad indication of the probability of future deployments due to energy security concerns, which is not specified in the current policy. For example, the risk response matrix shows that the energy security risk may make it more likely that the CF would deploy to the Persian Gulf or to West Africa than to Venezuela. In a similar fashion, the risk assessment indicates that there is a greater probability of a minor conflict in the South China Sea than a direct confrontation between the US and China. Finally, as the framework included Canada's stated interest in "a projection of Canadian values abroad,"[286] the risk response matrix

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[283] Department of National Defence, *Canada First Defence Strategy*, 7.

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[284] *Ibid.*, 8.

[285] *Ibid.*, 10.

highlights that human security conflict impacted or exacerbated by energy issues could result in CF deployments. Further, analysis shows that much of the at-risk areas involve SLOC's therefore one can deduce that naval power will be an important factor.

The framework also serves as a reminder of how the application of the risk management approach must to be tempered by an assessment of feasibility. For example, the Caspian Sea region is included as an area to which the CF may be required to deploy to mitigate the risk to energy security. This region would pose a significant challenge for the CF due to its remoteness and geopolitical environment. In order to adequately address this risk, "transference" to the US may be necessary as the US is more capable of operating in that region. Finally, the results of this risk assessment must be combined with an analysis of other types of risk events in order to create a more complete assessment of potential employment areas.

CONCLUSION

This chapter combined the risk management framework developed in chapter two with the energy security situation reviewed in chapters three through five. Using that information, the potential energy security friction areas were reviewed to determine their potential impact on Canada's interests or values. Finally, each risk event was assigned a relative probability of occurrence.

The results of the risk assessment for each region were collated into a risk matrix. Overlaid onto the risk matrix was the schema for risk responses. This then provided the broad guidance for what type of risk response would be appropriate for each risk event.

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[286] Department of Foreign Affairs and International Trade, *Canada's International Policy Statement: A Role of Pride and Influence in the World – Diplomacy*, 1.

While the domestic risk events were congruent with existing policy, the international risk events provide potential, but relative, indications of future CF deployment areas not presently addressed by policy.

"The fact that the future is uncertain is no excuse for failing to make adequate preparations." [287]

7. CONCLUSION

As a middle power, Canada faces the dilemma of having the obligation and desire to engage internationally, while facing limitations as to the national power it can actually exercise. [288] The framework upon which Canada decides to apportion its national power internationally is not always clear. The Canadian government regularly publishes reports outlining its international policies yet it rarely explains the underlying calculus.[289] This paper contends that a risk management approach provides a framework to afford guidance on priorities and responses to potential threats.

There are many potential requirements or factors that drive Canada's actions domestically and internationally. This paper looked at how one of those factors, global energy security, has the potential to impact Canada and how the CF might be implicated. It demonstrated that the CF can use a risk management framework to provide guidance on how it should be prepared to respond to the challenges of global energy security.

A combination of risk management principles and existing literature on Canadian interests and values formed the basis of the analytical framework. This framework used

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[287] United States Marine Corp, *Operational Maneuver From the Sea: A Concept for the Projection of Naval Power Ashore* (Washington DC: U.S. Government Publications Office, 1996), 5.

[288] The term "middle power" has been described as deceptively ambiguous and varying depending on whether one is using a functional, behavioral or hierarchical model. In this paper, the term refers to the functional perspective. Canada expresses a desire in both policy and action to be engaged globally but is significantly more limited than a great power in what elements of national power it can bring to bear internationally. For more information see Adam Chapnick, "The Middle Power," *Canadian Foreign Policy* 7, no. 2 (Winter 1999), 73-75; http://post.queensu.ca/~nossalk/sps858/readings/chapnick_middle.pdf; Internet; accessed 7 February 2009.

[289] Examples include: Department of National Defence, *Canada First Defence Strategy* and Department of Foreign Affairs and International Trade, *Canada's International Policy Statement: A Role of Pride and Influence in the World – Overview.*

the national interests of defence and sovereignty, economic well-being, global security and human security as the areas vulnerable to fluctuations in global energy security as the basis for the risk matrix. Then, using generally accepted risk management methods, a template for risk responses was overlaid on the risk matrix to provide guidance on the risk response actions that should be executed for global energy related scenarios.

To carry out this risk assessment, it was first necessary to identify possible risk events. The paper therefore reviewed the current global context and the Canadian energy situation. The review demonstrated that a number of factors, such as the age of existing oil fields, the lack of new fields and the instability of the regions with the largest reserves, are negatively affecting global energy security. The pace at which the availability of oil and gas, or at least "cheap" oil and gas, is decreasing is inconclusive as the forecasts vary greatly depending on the source; regardless, the consensus in the literature is that the global energy security situation will deteriorate with time. Canada is fortunate in that it has abundant oil supplies and is presently a net-exporter of oil and natural gas; however, eastern Canada is already a net importer of oil and Canada will soon become a net importer of natural gas. Canada as a whole therefore remains dependant on the health of the global energy environment. Furthermore, as the Canadian and American economies are interdependent, and the US is highly reliant on imported and affordable oil and gas, energy issues that adversely affect the US will have concomitant effects on Canada's economy.

Energy security has implications for the CF domestically. While Canada has been free from attack in recent history, Canada's energy infrastructure presents a tempting target for terrorists and other criminal elements. Further, as one of the nation's

instruments of power, the CF has a significant role in preserving Canada's sovereignty in the resource-rich Arctic.

Internationally, the paper showed that the global energy security situation creates tensions in many of the oil and gas producing regions. There is the potential for some of these tensions to lead to conflict. As shown in the review, conflict can seriously impinge on the production and export of oil and gas. Beyond the potential for international conflict to affect North America's economic well-being directly due to the increased oil and gas costs attendant with more restricted supply, conflict in many of these areas has the potential to disrupt overall global security. Again, as a trading nation, impacts to global stability are not in Canada's best interests. Lastly, even in the situations where Canada's national interests are not at stake, Canada has affirmed its concern for human security worldwide. Unfortunately, in some parts of the world the tensions and temptations that come with the energy industry also bring conflict that reduces human security.

The paper then reviewed the areas where there is perceived to be a potential nexus between the energy industry and conflict. The risk assessment determined the potential risks to Canada for each area, based upon the risk effect categories developed in the framework, to produce a qualitative, relative assessment of the probabilities. Following the review of the potential conflict areas, the results of the individual risk assessments were summarised on the risk matrix. This then provided a representation of the relative risks from a Canadian perspective and the recommended risk responses for each scenario.

Not surprisingly, the results of the risk assessment showed that the highest priority risk responses should be for scenarios in support of the defence of Canada.

Outside of Canada, the risk assessment showed that the highest priority responses included the need to be ready to mitigate a disruption of oil or gas due to conflicts in West Africa or the Middle East or the blockage of one of the key shipping chokepoints. Other scenarios resulted in the assignment of a relatively lower priority and the recommended response of mitigation or transference. Some of the other risks have less direct impact on Canadian interests and are therefore candidates for risk transference to a major power such as the US. Finally, there remains a significant risk that energy exploitation will cause human security incidents for which the CF should be prepared to offer mitigation. The remaining scenarios were assessed as presenting lower risks to Canadian national interests; therefore, it was recommended that those risks be accepted or transferred to another country.

Overall, the paper demonstrated that a risk management framework could be used to prioritize potential risks and guide risk responses to challenges such as global energy security. However, the paper also confirmed that these risk assessments usually have to resort to strictly qualitative assessments and therefore the value of the assessment is not so much related to absolute values but to the relative outcomes. This paper focused exclusively on the implications for the CF of risks to global and domestic energy security. Other related areas, such as opportunities for a whole-of-government approach, increased granularity in the scenario development through a focus on a particular region or product, or the use of quantitative assessments for the potential risk severities, would all provide interesting and relevant topics for future research.

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