Nuclear energy security:
A critical analysis of the North-South diplomatic discourse on the nuclear fuel cycle, 2004-2011

by

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ABSTRACT

The diplomatic discourse on nuclear energy security has intensified since former United States (US) President GW Bush on 11 February 2004 announced a number of initiatives aimed at preventing the proliferation of nuclear weapons, including a proposed ban on new enrichment and re-processing facilities in countries that do not already possess such facilities. Although there is a high level of diplomatic activity characterised by various proposals on the nuclear fuel cycle at different international fora, the debate seems to have stagnated.

Firstly, this study examines the North-South diplomatic discourse on the future of the nuclear fuel cycle and, in particular, the extent to which the choice of diplomatic modes by the major actors has contributed to a stagnated debate. For this purpose, North-South perspectives on nuclear energy security are explored to determine the degree to which the dominant state-centric, national security approach as opposed to the wider conception of security found in the more recent and evolving human security paradigm has prevented consensus. While the global South prefers to pursue its interests predominantly through the multilateral mode, the North prefers a more selective approach or what is sometimes referred to as “à la carte diplomacy”. These approaches, in both form and substance, have curtailed North-South dialogue, thereby limiting the search for solutions to address the continuing dilemma and recurring tension posed by nuclear energy with negative consequences for both security and development.

Secondly, an assessment is made of the diplomatic institutional arrangements and norms governing the peaceful uses of nuclear energy to determine whether they remain able to respond to the risks associated with the expected “nuclear renaissance”. These institutions and norms reflect the global power configurations of the immediate post-WWII era and have been discredited due to their inability to deliver on the promise of increased participation in the peaceful uses of nuclear energy and a world free of nuclear weapons.

This study argues that the prevailing state-centred approach to nuclear energy security and the choice of diplomatic modes have rendered the existing diplomatic institutions and norms governing the peaceful uses of nuclear energy ineffective in responding to the challenges posed by the predicted increase in the development and use of nuclear energy in the twenty-first century.

I declare that the thesis, which I hereby submit for the Master of Diplomatic Studies degree at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

TABLE OF CONTENTS

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Above all, to my Creator, for life.

ANNEXURES

A. IAEA Conventions and Agreements (number of State Parties)

Tables:

Maps:

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ABBREVIATIONS/ACRONYMS

ABACC	Argentine-Brazil Agency for Accounting and Control of Nuclear Materials
AFCONE	African Commission on Nuclear Energy
AU	African Union
BATNA	Best Alternative To a Negotiated Agreement
BCE	Before the Common Era
BRICS	Brazil, Russia, India, China and South Africa
CAS	Committee on Assurances of Supply
CD	Conference on Disarmament
CHS	Commission on Human Security
CIT	Commodity Identification Training
CSD	Commission on Sustainable Development
CSI	Container Security Initiative
CTBT	Comprehensive Nuclear Test-Ban Treaty
DOE	Department of Energy (of the US)
DPRK	Democratic People's Republic of Korea
ECA	Economic Commission for Africa
EDP	Especially Designed or Prepared
EIA	Energy Information Administration (of the US)
EU	European Union
G8	Group of 8 (industrialised countries)
G20	Group of 21
G77	Group of 77 and China (developing countries)
GATS	General Agreement on Trade and Services
GDP	Gross Domestic Product

GHG	Greenhouse gasses
GICNT	Global Initiative to Combat Nuclear Terrorism
GIF	Generation IV International Forum
GNEP	Global Nuclear Energy Partnership
GTRI	Global Threat Reduction Initiative
HDI	Human Development Index
HEU	Highly Enriched Uranium
IAEA	International Atomic Energy Agency
IBSA	India, Brazil and South Africa Dialogue Forum
ICAN	International Campaign to Abolish Nuclear Weapons
ICCND	International Commission on Nuclear Non-proliferation and Disarmament
IEA	International Energy Agency (under the OECD)
IFNEC	International Framework for Nuclear Energy Cooperation
IGO	Inter-governmental organisation
INPRO	International Project on Innovative Nuclear Reactors and Fuel Cycles
IPE	International Political Economy
IPS	International Plutonium Storage
IR	International Relations
ISAB	International Security Advisory Board (to the Department of State, US)
ITER	International Thermonuclear Experimental Reactor
IUEC	International Uranium Enrichment Centre
JPOI	Johannesburg Plan of Implementation
LDC	Least Developed Country
LEU	Low Enriched Uranium
LWR	Light Water Reactor
MIT	Massachusetts Institute of Technology

NAM	Non-Aligned Movement
NATO	North Atlantic Treaty Organisation
NEA	Nuclear Energy Agency (of the OECD)
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organisation
NNSA	National Nuclear Security Administration
NNWS	Non-Nuclear-Weapon States
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NSG	Nuclear Suppliers Group
NTI	Nuclear Threat Initiative
NWFZ	Nuclear-weapon-free zone
NWS	Nuclear-Weapon States
OECD	Organisation for Economic Cooperation and Development
PCRD	Post-Conflict Reconstruction and Development
PHWR	Pressurised Heavy Water Reactor
PSI	Proliferation Security Initiative
RAR	Reasonably Assured Resources
RFCC	Regional Nuclear Fuel Cycle Centres
SIPRI	Stockholm International Peace Research Institute
SSOD	Special Session on Disarmament (of the UNGA)
TC	Technical Co-operation programme (of the IAEA)
TENEX	Tekhsnabexport
UAE	United Arab Emirates
UK	United Kingdom of Great Britain and Northern Ireland
UN	United Nations
UNAEC	United Nations Atomic Energy Commission

UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UN-EA	UN-Energy/Africa
UNGA	United Nations General Assembly
UNIDO	United Nations Industrial Development Organisation
UNSC	United Nations Security Council
UNSG	United Nations Secretary-General
URENCO	Uranium Enrichment Company
US	United States of America
USEC	United States Enrichment Corporation
VCDR	Vienna Convention on Diplomatic Relations
WINS	World Institute for Nuclear Security
WMD	Weapons of Mass Destruction
WNA	World Nuclear Association
WSSD	World Summit on Sustainable Development
WTO	World Trade Organisation
WWI	World War One
WWII	World War Two
ZC	Zangger Committee

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Chapter 1

INTRODUCTION

"Through the release of atomic energy, our generation has brought into the world the most revolutionary force since prehistoric man's discovery of fire. This basic force of the universe cannot be fitted into the outmoded concept of narrow nationalisms. For there is no secret and there is no defense; there is no possibility of control except through the aroused understanding and insistence of the peoples of the world. We scientists recognise our inescapable responsibility to carry to our fellow citizens an understanding of atomic energy and its implication for society. In this lies our only security and our only hope – we believe that an informed citizenry will act for life and not for death."

Albert Einstein, 1947

1.1 Introductory overview of the diplomatic discourse on the nuclear fuel cycle

On 11 February 2004, former United States (US) President GW Bush announced a number of initiatives aimed at preventing the further proliferation[1] of nuclear weapons (Boese:2004). This included a proposal to impose a global ban on the development of new uranium enrichment and reprocessing facilities in countries that do not currently operate such facilities. Against the backdrop of a renewed interest in nuclear energy as alternative form of energy for electricity generation, this proposal by President Bush sparked an intensified diplomatic debate on the future of the peaceful application of nuclear energy and, in particular, the most sensitive parts of the nuclear fuel cycle (enrichment and reprocessing[2]).

The debate on the nuclear fuel cycle is certainly not a new one. Since the first and, hitherto, only use of nuclear weapons in 1945 by the US in Hiroshima and Nagasaki, various proposals have been made and initiatives launched aimed at limiting the spread (or proliferation) of material, equipment and technology that can either be used for electricity generation and other peaceful applications or for the production of nuclear weapons.

[1] The term "proliferation" has at least two distinct meanings. In a general sense it means "to spread" or "to expand". However, in disarmament, non-proliferation and arms control literature, it could refer to either "vertical" or "horizontal" proliferation. "Horizontal" proliferation involves the transfer of nuclear weapons to other states, while "vertical" proliferation refers to the development of new types of nuclear weapons or the quantitative increase of the nuclear weapons arsenal of a state in possession of nuclear weapons. To date, only horizontal proliferation has been treated as illegal under the NPT, despite contrary arguments advanced by some NNWS. The use of the concept "proliferation" in relation to the transfer or development of nuclear material, equipment and technology for peaceful purposes is therefore value-laden and could implicitly create a negative perception of such activities.

[2] For an explanation of the nuclear fuel cycle, see Chapter 3.

The first comprehensive attempt in 1946 by the United Nations Atomic Energy Commission (UNAEC) failed after proposals by the US (Baruch:1946; US:1946; UNGA:1946) to the UNAEC were rejected by the Soviet Union (Bernstein:1974). By 1951, the first small nuclear reactor for electricity generation started operating in Idaho in the US and the potential of nuclear energy for a variety of other peaceful applications beyond electricity generation became more widely recognised.

This was followed by a second initiative in 1953 through US President Eisenhower's "Atoms for Peace" address to the United Nations (UN), which eventually led to the establishment of the International Atomic Energy Agency (IAEA) in 1957. Significantly, the IAEA's aim was not aimed at limiting the spread of material, equipment and technology, but rather to facilitate increased co-operation through safeguarding the peaceful use of the atom and preventing its diversion for non-peaceful activities.

The establishment of the IAEA was followed by negotiations during the mid-1960s that culminated in the adoption of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) (Bourantonis:1997). The NPT, which entered into force in 1970, created two categories of states, namely nuclear-weapon States (NWS)[3] and non-nuclear-weapon States (NNWS). The underlying "grand bargain" of the NPT created distinct obligations between these two categories of states. This included an undertaking by the NWS "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control" (Article VI of the NPT:1968). Based on this undertaking, the NNWS undertook to forego the nuclear weapons option in return for increased co-operation and a guarantee that the Treaty would not infringe on their right to develop and use nuclear energy for peaceful purposes.

By the mid-1980s, nuclear energy accounted for 16% of global electricity consumption. Other peaceful nuclear applications also expanded considerably, including in the field of human and animal health, food and agriculture, water resource management and the

[3] A NWS as defined by Article IX(4) the NPT is any state that had manufactured and exploded a nuclear weapon or nuclear explosive device prior to 1 January 1967 (NPT:1968), i.e. China, France, Russia, the UK and the US. While not defined in the Treaty, all other States Party to the NPT are regarded as NNWS.

environment. Since then, nuclear energy's relative contribution to global electricity production has not increased. Negative perceptions regarding the safety and security of this form of energy, brought about by the proliferation of nuclear weapons and the nuclear accidents at Three Mile Island in 1979 and Chernobyl in 1986, have to some degree curtailed the expansion of nuclear energy as an alternative source for electric power generation.

With the rising cost of hydrocarbon fuels, the rapid depletion of fossil fuels, an increasing global awareness of the impact of carbon monoxide (CO^2) emissions on the environment, as well as the growing shortage of electricity generating capacity in both the developing and developed worlds, the last decade has witnessed a resurgence of interest in nuclear energy, as part of the future energy mix (EIA 2009). Although alternative forms of renewable energy have become a priority for many countries driven by environmental and security of supply considerations (Kruger:2006), the cost factor continues to be inhibitive, especially for developing countries, who suffer from energy poverty that restrain their growth trajectory (Energy Tribune: 2006; IEA:2009).

The IAEA expects an annual global growth in the use of nuclear energy of between 1.5% and 3.3% per annum until 2030 (IAEA 2009:53), with Africa's nuclear energy capacity set to increase by between 5.7% and 10.8% annually. While nuclear energy is expected to expand gradually during the next 20 years, estimates indicate that it is unlikely to increase dramatically its share of global electricity generation. In addition, the partial meltdown of the Fukushima nuclear power station in Japan during 2011 has once again elevated concerns about the safety of nuclear energy. Although the Fukushima event may have impacted on some expansion plans, several states nevertheless seem committed to increasing the overall contribution of nuclear energy to domestic electricity generation programmes (Areva:2011). Until more cost-effective, reliable and clean alternatives are available, the use of nuclear energy is likely to continue to play a central role in the diplomatic discourse and efforts aimed at the diversification of energy sources in search of energy security, including nuclear energy security that is the central object of enquiry of this mini-dissertation.

In an International Relations (IR) context, the evolution of the diplomatic discourse on nuclear energy serves to illustrate an important dilemma and recurring tension between security and development (SIPRI 1974:1-2). Since 2004, the debate has intensified due

to a number of new arrangements advanced by the major (nuclear) powers and their allies (broadly coinciding with the industrialised countries, or "global North") to limit access to sensitive nuclear technologies to existing nuclear suppliers by, among others, offering nuclear fuel supply assurances (IAEA:2005). Despite the recent adoption of two resolutions by the IAEA Board of Governors, these proposals have not yet induced consensus, primarily due to concerns by developing countries (broadly defined as the "global South") relating to the monopolisation of the nuclear fuel cycle by the "haves" (the possessors of critical nuclear fuel cycle technologies, i.e. enrichment and reprocessing). The arguments advanced by the North are predominantly based on the increasing proliferation risks associated with the anticipated expansion of nuclear energy, while the South's approach has focussed on the developmental imperatives that underpin the search for alternative sources of energy (ISAB 2008; NAM 2009).

With a few exceptions, most states in the South, particularly in Africa, have not been able to exploit and/or develop nuclear energy for either electricity generation or other peaceful use applications despite the significant natural uranium deposits at their disposal. While some of these states are benefiting from the use of some nuclear applications, particularly in the area of human and animal health, agriculture and water management, the global South and Africa in particular remain marginalised in terms of access to relevant technologies.

While the NPT has been largely successful in limiting the number of States with nuclear arms, there is a lack of confidence in its ability to deliver on the promise of increased access to nuclear material, equipment and especially technology. Countries in the South therefore see the lack of progress towards fulfilling one of the core bargains of the NPT as exacerbating the inequalities created under the Treaty.

US President Bush's 2004 proposals provided evidence of an intention to permanently deprive non-technology holders of the right to access or develop "sensitive" technologies (Bush 2004). Under the Obama Administration, the rhetoric on the future of the nuclear fuel cycle has changed (Obama:2009), however, there is no evidence to suggest any significant shift in the US' general policy orientation regarding access to sensitive elements of the nuclear fuel cycle, i.e. enrichment and reprocessing technologies. The position of consecutive US governments on the development of enrichment capabilities by Iran on the one hand, and its nuclear co-operation deal with India on the other hand,

may have reinforced perceptions in the global South regarding the lack of commitment by the US and its allies in the North to the NPT and its core bargains.

A stagnated diplomatic discourse and persisting dilemma related to one of the most innovative (but also most destructive) scientific inventions of the last century, may present significant risks. Given the expected growth of nuclear energy, failure to address this issue may impact on nuclear energy security and by extension on the developmental priorities of the global South. Conversely, it may also have far-reaching implications for international peace and security in terms of the potential (horizontal) proliferation of nuclear weapons.

Given the focus in the diplomatic discourse on nuclear weapons and proliferation threats, the peaceful uses of nuclear energy have remained of secondary concern. Although energy security is fundamental to development, limited attention has been given to the subject of nuclear energy security as a diplomatic issue. Likewise, while much has been written on diplomatic bargaining and negotiation, including on the military application of the atom (see the various publications on the negotiations with the Democratic People's Republic of Korea (DPRK) and the Islamic Republic of Iran), there is a lack of attention to the diplomatic discourse on the peaceful uses of nuclear energy. Moreover, the structural impact of the North-South divide on the nuclear energy debate has not been fully explored. While this study aims to contribute towards filling these gaps, it is recognised that the peaceful application of nuclear energy cannot be dealt with in isolation of its military dimension due to the inherent dual-use nature of nuclear energy.

1.2 Literature Review

For the purposes of this study, a preliminary literature review has focused on three key areas that constitute a broad analytical framework: nuclear energy security; the diplomatic institutions and global norms governing nuclear energy; and the North-South divide and diplomatic discourse on nuclear energy.

1.2.1 Nuclear energy security

The literature review yielded various definitions for the concept "energy security", whereas the concept "nuclear energy security" lacks definitional clarity. As a result, the

literature review first focused on the concept of security in an IR context, then moved on to energy security and lastly added the nuclear dimension.

In IR literature, three basic levels of security are discernible, namely security at the international, national and individual levels (Barston:1997; Herz:1950). Most academic text books in the IR field, such as Jackson & Sørensen (2010) deal extensively with the various notions of security, ranging from the more traditional conceptions found in the realist and liberalist schools of thought to modern and post-modern theoretical approaches.

Scholars such as Zacarias (1999:121) note that since the end of the Cold War, the dominant state-centric security paradigm has increasingly been challenged by the gradual diminishing of national boundaries and the proliferation of new actors in the international arena, as well as phenomena such as transnational crime, terrorism and environmental crises. In a similar vein, Tarry (1999:1-13) notes that this requires a "broadening" and "deepening" of the IR agenda, where the actors and issues that were marginalised under the Westphalian paradigm now have to be considered. This broader agenda has to contend with, among others, political, military, economic and environmental issues.

As a result of the multiplicity of challenges resulting from globalisation and the realisation that security could no longer be pursued in a narrow national and international context, different approaches gained prominence during the 1990s, such as the evolving "human security" approach (UNDP:1994). With its focus on the individual, the "human security" concept has been subject to significant criticism as Newman (2001:240) and Oberleitner (2002:2-3) contend. It does, however, represent an important departure from the state-centric approaches of the past. Some states have, at least partially, embraced this concept and incorporated elements into their domestic and foreign policies. At an international level, it has also found expression in a number of UN documents such as the report of the 2004 UN High-Level Panel on Threats, Challenges and Change (UN 2004:6), which highlighted the growing "interconnection among threats and of mutual vulnerability between weak and strong" and recognised the need for a different approach to dealing with security issues.

Despite predictions that the national security concept will become obsolete in a globalised world, most commentators agree that the state is set to remain a critical actor. In a globalised world, however, the state can no longer achieve or maintain security on its own. As Langhorne (2005:331-339) explains, the transnational nature of threats, be they arms proliferation, terrorism, crime, economic/financial crises, migration, diseases or natural disasters, requires a transnational response, which means increasing co-operation within and among states, but also with non-state actors whose actions transcend national boundaries. In this context, Al-Rodhan (2009:2-3) argues that in a globalised world, "security can no longer be thought of as a zero-sum game involving states alone" and that global security "cannot be achieved without good governance at all levels that guarantees security through justice for all individuals, states and cultures".

In the absence of a global legal authority capable of enforcing decisions, the state nevertheless remains the only authority that can give concrete expression to the notion of security. However, as Ullman (1983) notes, the relegation of issues of security and justice to exclusively the domestic domain, could lead to a continued preponderance of zero-sum security paradigms that undermine global and human security. Old approaches to the concept of security are therefore in need of revision and have to be broadened to effectively deal with threats, not only to the state, but also to global and individual security. This may also necessitate a restructuring of the existing diplomatic institutions and norms that reflect outdated security approaches.

Literature on "energy security" follows mostly a functional approach and few endeavour to provide conceptual clarity. The International Energy Agency (IEA 2007:12) notes that standard definitions for "energy security" generally focus on the secure or reasonably guaranteed flow of energy to consumers at reasonable prices. Such a simplified definition is questioned by authors such as Isbell (2008:2) who notes the different meanings that this concept has for consumers and producers and the inherent tension that exists between supply and demand. While most studies on energy security tend to focus on fossil fuels, Isbell (2008:3) points out that reliable access to other forms of energy, including renewable energy and nuclear energy, require increased attention.

In reflecting on the general approaches towards energy security, Daniel Yergin (1988:11) notes that traditional thinking is state-centric and focused on energy independence. In contrast, Barton *et al* (2004:5) adopt a somewhat broader definition that deals with the

internal distributive elements of energy security by including, beyond the state, also its citizens and businesses.

Several sources explain the link between energy security and the environment. A publication by the IEA (2007) entitled "Energy Security and Climate Policy" argues for a holistic approach in dealing the various elements related to energy security, including climate change. In this context, the 1980 Report of the Brandt Commission warns about the threat posed by "the prospects of cumulative and irreversible degradation of the biosphere on which human life depends" (Brandt:1980). Isbell (2008:3) observes a paradox of energy security in the context of fossil fuels, by noting that reliable access to such fuels would lead to a more rapid depletion of these resources and increase CO^2 emissions.

In the context of nuclear energy, the concept energy security acquires further complexity as a result of the inherent dual-use (peaceful and non-peaceful) nature of nuclear energy and its potential diversion towards the development of nuclear weapons. Deutch (2004:2) in a report to the Massachusetts Institute of Technology (MIT) Joint Programme on the Science and Policy of Global Change offers an explanation for the linkage between "energy" and "security" based on three elements, namely "dependence" that refers to energy as the locomotive for economic growth, "vulnerability" that refers to the uneven distribution of resources, and "proliferation" that refers to the potential use of nuclear energy for non-peaceful purposes.

While the literature review for this study revealed a clear lack of attention to the concept "nuclear energy security", "nuclear security" has been a central feature in the diplomatic discourse on nuclear energy and subject of several IAEA General Conference resolutions and guidance documents on nuclear security, as well as the Convention on the Physical Protection of Nuclear Material (CPPNM:1987) and its amendment (2005), the International Convention for the Suppression of Acts of Nuclear Terrorism (2005) and UN Security Council Resolution 1540 (UNSC:2004a).

In literature, it is widely acknowledged that the military use of nuclear energy has significantly impacted on diplomacy (see Lauren 1979:183-203 on "deterrence" and "coercive diplomacy") inasmuch as the destructive power, speed and reach of nuclear weapons threaten state sovereignty and by implication the foundation of the modern

diplomatic system. Cohen (1987) and Jönsson & Aggestam (1999) note that during the Cold War, this threat resulted in an expansion of the diplomatic repertoire that led to the development of a "nuclear diplomacy" marked, *inter alia*, by new signalling instruments. Until the end of the Cold War, nuclear diplomacy continued to be dominated by nuclear weapons as balancing instruments in managing East-West relations. This focus is reflected in the large volume of literature published during the Cold War period on nuclear (weapons) diplomacy (see for example Quester:1973).

A limited number of academic publications in the field of diplomacy focus on the peaceful use dimension of nuclear energy. Under the title "Nuclear Non-Proliferation Diplomacy", Kapur (1993) provides an overview of nuclear power programmes in the developing world and endeavours to illustrate how the nuclear non-proliferation regime has constrained the development of nuclear power programmes in the "Third World". In his evaluation of nuclear energy in developing countries, Kapur (1993:14-15) approaches the concept "energy security" almost entirely from a national perspective by arguing that the best way to achieve energy security is by substituting imported fuels with indigenous energy and through energy diversification.

1.2.2 Diplomatic institutions and global norms governing nuclear energy

Since World War II (WWII), the international community has been struggling with the predicament of how to expand the peaceful uses of nuclear energy, while preventing the proliferation of nuclear weapons. In this context, a number of diplomatic institutions and instruments have been established, notably the IAEA, the NPT and several plurilateral control arrangements such as, *inter alia*, the Nuclear Suppliers Group (NSG). Fischer (1985) provides a comprehensive overview of the institutional framework for safeguarding the diversion of peaceful nuclear activities that addresses most of the institutions and norms relevant to this study.

While these instruments and norms have limited the proliferation of nuclear weapons, they have come under increasing pressure since the beginning of the twenty-first century, raising questions about their continued effectiveness and relevance. This has given rise to a renewed scholarly debate dominated by western authors on ways and means of improving existing institutions and norms to respond more effectively to the

perceived proliferation risks associated with the expected increase in the number of new actors involved in the use and production of nuclear energy.

In contrast, statements by states and diplomatic formations of the global South, such as the Non-Aligned Movement (NAM), seem to indicate a loss of confidence in the ability of the existing institutions and global norms to secure access to materials, equipment and technologies required for peaceful uses of the atom, including the provision of a reliable supply of energy to sustain economic development. Likewise, questions have also been raised about the ability of existing institutions and norms to secure progress towards a nuclear-weapons-free world.

1.2.3 The North-South divide and diplomatic discourse on nuclear energy security

Within the field of IR, and specifically from a structuralist perspective, much has been written on the post-colonial era division of the world into a global North and global South. Most writers, such as Kapur (1993:13), contend that the North-South divide on access to technology has its roots in the industrial revolution of the 18th and 19th century that widened the gap between rich and poor states. The diplomatic discourse on nuclear energy security only assumed a North-South dimension after the formation of the NAM in 1961 following the Asian-African Conference in Bandung during 1955. The Bandung Conference, among others, emphasised the importance of the development of nuclear energy for peaceful purposes and the need for adequate Asian-African representation on the to-be-established IAEA (Alden *et al* 2010:227). While diplomatic negotiations on nuclear energy had its nemesis in the super-power rivalry of the post-WWII era, the negotiations in the Eighteen-Nation Disarmament Conference during the mid-1960s on the NPT (Bourantonis 1997:1-11) added to what was originally an East-West diplomatic discourse, a North-South dimension.

Goldemberg (2009:73) explains that access to nuclear technology, including enrichment and reprocessing technologies has remained subject to continuing North-South tension. This has also been evident in the diplomatic discourse (discussions, statements and negotiations on resolutions) since 2004 on the future of the nuclear fuel cycle, as discussed in Chapter 5. Beyond the nuclear weapon capacities of three countries of the South (India, Pakistan and DPRK), at least half of all states that have enrichment facilities today belong to the global South, including Brazil, China, India, Iran and

Pakistan. Although access by some developing countries to these technologies has brought about new dynamics to an ongoing debate, significant disparities between the North and South remain.

Central to this study is the diplomatic discourse between the North and South on the nuclear fuel cycle. In terms of the setting, this study will examine the multiple modes in which the discourse is located, with an emphasis on the multilateral mode as the primary setting. To contextualise the multilateral setting, selected references will also be made to the bilateral, summitry (Dunn:1996), third party and polylateral (or catalytic) diplomatic modes (Hocking 1999).

What is evident from the literature review is that diplomatic theory has been dominated by North perspectives. It is generally accepted that due to its vulnerabilities and lack of diplomatic capacity, the global South prefers pursuing negotiations in the multilateral mode instead of the traditional bilateral mode of diplomacy. The North, on the other hand, prefers ordering its relations with the South on a bilateral and/or selective basis in favour of what is sometimes referred to as “anchor states”. But, as Leigh-Phippard (1996:3) explains, neither the North nor the South are monolithic groups, which opens up opportunities for group formations (such as coalitions and alliances) across the North-South divide that adds to the complexity of any diplomatic discourse, especially in the multilateral mode (Zartman 1994:xi).

For the purposes of this study, the multilateral mode will be distinguished from plurilateral activities (see Chapter 2). It will be argued that the crisis in the multilateral nuclear non-proliferation system derives from security approaches that have resulted in the development of a typology of selective diplomacy that Haass (2008) refers to as “à la carte diplomacy”. This involves the pursuance of foreign policy objectives through a mixture of diplomatic modes and a selective emphasis on certain preferred elements/issues. Besides the pursuance of a selective agenda, it also encompasses more restricted engagements with so-called key actors (smart partnerships) in plurilateral settings aimed at reinterpreting existing norms or devising new ones, which are frequently not achievable within inclusive multilateral structures or likely to be universally accepted.

While Hamilton & Langhorne (2011:80-81) note that the advent of multilateralism during the twentieth century has changed the excessive secretiveness of the "old diplomacy" of earlier years, negotiations on nuclear energy since the 1950s have continued to be characterised by secrecy, particularly, though not exclusively, in the bilateral mode. Moreover, nuclear energy's inevitable link with hard power considerations limits the amount of open source information on negotiations on nuclear energy, especially in the bilateral mode, which will necessarily restrict any analysis.

1.3 Identification and demarcation of the research problem

Although the large number of proposals on the nuclear fuel cycle at various international fora implies a high level of diplomatic activity, the global debate on the future of the nuclear fuel cycle has seemingly stagnated. Various proposals by the North that seek to introduce additional restrictions to nuclear fuel cycle technologies, including measures to fill perceived gaps in the existing nuclear non-proliferation regime, have not been accepted by the South due to their perceived impact on the inalienable right of States to pursue nuclear energy for peaceful purposes, as recognised in Article IV of the NPT (NAM:2009).

The research problem contextualised by the aforesaid can be encapsulated by the following primary research question: What are the reasons for the continuing stalemate in the North-South diplomatic discourse on the nuclear fuel cycle? The study will interrogate this research question by examining two secondary research questions related to the following key areas, namely: the modal impact of the North-South diplomatic discourse on the nuclear fuel cycle; and the diplomatic institutions and norms governing the peaceful uses of nuclear energy.

This study will firstly, examine the North-South diplomatic discourse on the future of the nuclear fuel cycle and, in particular, the extent to which the choice of diplomatic modes by the major actors in the debate has contributed to a stagnated debate. For this purpose, North-South perspectives on nuclear energy security will be examined to determine the extent to which the dominant state-centric, national security approach in nuclear fuel cycle negotiations, as opposed to a broader human security approach, has prevented consensus.

The assumption is that the powerful North prefers to pursue their interests mainly through the bilateral and plurilateral diplomatic modes, whilst the weaker South prefers the multilateral mode, where alliances and coalition formation provide a more effective means to achieve their goals. The nuclear energy debate has therefore remained locked in a security trap, *inter alia*, based on the state-centric, national security approach in which the debate has been framed that has limited the choice of solutions and brought about a continuing stalemate. This approach and by extension the choice of diplomatic modes has curtailed the North-South diplomatic discourse and the search for sustainable solutions.

Secondly, the study will assess the current diplomatic institutional arrangements and global norms governing the peaceful uses of nuclear energy and their ability to respond to the proliferation risks posed by the envisaged expansion of nuclear energy. The assumption is that the existing institutions and norms reflect the immediate post-WWII global power configurations and have been discredited due to their inability to deliver on the promise of "the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy" (Article IV of the NPT) and a world free of nuclear weapons. Some changes may therefore be required to enable these institutions to effectively address nuclear energy security in an era marked by increasing interconnectedness and mutual vulnerability.

In response to these research assumptions, the overarching assumption is that the prevailing state-centred approach to nuclear energy security and choice of diplomatic modes have rendered the existing diplomatic institutions and norms governing the peaceful uses of nuclear energy ineffective in responding to the challenges posed by the expected increase in the development and use of nuclear energy (referred to by some as the "nuclear renaissance") in the twenty-first century.

1.4 Methodological approach

This is a literature-based study that draws, *inter alia*, on the researcher's own participation and personal experience in the substantive processes under review. No additional fieldwork or interviews have therefore been undertaken. This study provides a qualitative critique of the diplomatic processes associated with the North-South discourse on nuclear energy security. An extensive literature review has been undertaken drawing

on primary and secondary sources. Primary sources include treaties, agreements, national and group statements within a multilateral context, final declarations of conferences and meetings, as well as diverse open source documentation generated by conferences. Secondary sources comprise diplomatic textbooks, articles in academic journals, the media and NGO commentary.

A selective analysis of the distribution of nuclear capabilities based on existing data has also been undertaken in order to support the qualitative and normative assessment, as well as to facilitate the identification of the major actors and their relative "bargaining power", which Schelling (1966:2) describes as "the power to hurt". This is followed by a qualitative and normative critique of the diplomatic institutions and international legal framework and norms governing nuclear energy. Based on this, a critical analysis is provided on the North-South diplomatic discourse on the future of the nuclear fuel cycle since 2004 in the multilateral mode.

One of the aims of this study is to contribute a perspective of the South to what is essentially a western-dominated field of study. Despite the researcher's personal involvement as a representative of a government from the South in this field, this study endeavours to critically reflect on the perspectives of both the North and South in the diplomatic processes under review.

1.5 Structure of the Research

This introductory Chapter provided a brief overview of the background to the renewed interest in nuclear energy, including the search for alternative forms of energy given the increasing energy demands and the need to reduce reliance on fossil fuels. It endeavoured to identify the issues that need to be resolved and introduced the complexities and dual-use nature of nuclear energy, as well as the risks associated with the lack of an adequate diplomatic response. In this regard, the North-South dimension of the diplomatic discourse on the peaceful uses of nuclear energy and in particular the debate on the nuclear fuel cycle since 2004 has been contextualised. This Chapter, furthermore, provided clarity regarding the aims and objectives of the study and the research methodology.

While this introduction provided a brief overview of the setting of the diplomatic discourse on nuclear energy, Chapters 2 and 3 will further elaborate on the various diplomatic modes and the diplomatic institutions and norms that provide the broad parameters for interaction.

Chapter 2 will provide the theoretical underpinnings of the study. It will examine the concept "nuclear energy security" within the evolving human security paradigm of IR theory. The various modes of diplomacy, as the settings or arenas in which diplomatic discourse on the peaceful application of nuclear energy is taking place, will then be explored. Thereafter, the North-South dimension of the diplomatic discourse will be contextualised.

Chapter 3 will examine the "North-South" divide and diplomatic discourse on nuclear energy. It will endeavour to identify the major state and non-state actors engaged in the nuclear fuel cycle debate and provide a brief overview of the distribution of nuclear capabilities. It will furthermore analyse the inequalities and continued marginalisation of the South, especially Africa, in the field of nuclear energy.

Chapter 4 will provide an overview of the major diplomatic institutions and international norms governing nuclear energy that embody the broad parameters for engagement among the various actors and further contextualises the setting for the diplomatic discourse on the nuclear fuel cycle. It will also identify gaps, inadequacies and actions that weaken the non-proliferation regime.

Chapter 5 will provide a critical analysis of the North-South debate on nuclear energy security by examining the various initiatives and proposals on the peaceful uses of nuclear energy with specific reference to the diplomatic discourse in the relevant multilateral fora on the nuclear fuel cycle from 2004 to 2011, including the UN and other multilateral bodies (NPT, IAEA, UNSC) and plurilateral initiatives (such as the G8, IBSA, NSG).

In order to verify the research assumptions set out in this introduction, Chapter 6 will critically evaluate the findings of the preceding chapters. In this manner, conclusions will be drawn as to the extent to which the current diplomatic institutional architecture and global norms need to be adapted and a new diplomatic modal approach to nuclear

energy security adopted. Finally, it will also identify specific recommendations and proposals concerning additional sub-themes that could be explored by way of further research into the subject.

CHAPTER 2

CONCEPTUAL FRAMEWORK: NUCLEAR ENERGY SECURITY AND THE NORTH-SOUTH DIPLOMATIC DISCOURSE

2.1 Introduction

This Chapter aims to provide the broad conceptual framework underpinning this study on the diplomatic discourse between the "North" and the "South" on "nuclear energy security". As discussed in Chapter 1, one of the primary research questions that this study endeavours to address is the extent to which the choice of diplomatic modes by the major actors has contributed to a stagnated debate on the future of the nuclear fuel cycle.

For the sake of conceptual clarity, this Chapter begins by examining the concept of "nuclear energy security" in an IR context. It will, however, not endeavour to provide an exhaustive analysis of the security concept in IR theory. Instead, to examine the approaches to security adopted by key participants in the diplomatic discourse on the future of the nuclear fuel cycle, the different perspectives on security at the international, national and individual levels, as well as between some of the major traditional theoretical perspectives in IR and the more recent and evolving human security paradigm, are distinguished.

Another research question that will be addressed by this study is the North-South perspectives on nuclear energy security and the extent to which the dominant state-centric and national security approach, as opposed to broader approaches to security such as the human security approach, in the diplomatic discourse on the nuclear fuel cycle, has contributed to the stalemate. For this purpose, an overview is provided of the North-South dimension of the diplomatic discourse on nuclear energy security informed by the North-South divide and unequal distribution of nuclear resources and capabilities.

Lastly, the modal dimensions of the diplomatic discourse are explained. While the multilateral mode presents the primary setting for the diplomatic discourse on the nuclear fuel cycle, selected references to the bilateral, summitry, third party and polylateral

diplomatic modes will also be made to further contextualise the multilateral setting and interplay between the different modes.

2.2 Nuclear energy security in an IR context

The literature review did not yield a comprehensive definition for the concept "nuclear energy security". In the interest of conceptual clarity, it is consequently necessary to disaggregate this term. This section will therefore firstly examine the concept of "security" as applied in an IR context, then move on to focus on "energy security", and finally add the nuclear dimension.

2.2.1 The concept of security

Security is an elusive concept, even though few would dispute that it constitutes one of the most basic elements of human existence, variously at the individual, national/state and international/global level. According to Mesjasz (2004:5) a standard definition for security in IR theory can be framed as follows:

"Security, in an objective sense, measures the absence of threats to acquired values, in a subjective sense, the absence of fear that such values will be attacked".

In IR literature, three levels of security are discernable, namely security at the international, national and individual levels. At the international/global level, the concept of security has traditionally been associated with the notion of stability, which is central to the balance-of-power theory of the IR realist tradition (Deutsch & Singer 1964:390-406; Zoppo 1996:579-606). Barston (1997:200) defines international stability as "the level of tension or violence and the corresponding extent to which actor interests can be accommodated through diplomacy, without recourse to violence, on the basis of mediation, rule and norm setting". Intrinsically, the concept of stability seems to emphasise the maintenance of the *status quo* rather than progress and change. Barston's definition also, crucially, introduces the notion that diplomacy is an imperative for maintaining international security.

At the national/state level, the concept of security has principally, especially in the realist tradition, focussed on efforts to curb threats to the state, predominantly external, military ones. Paradoxically, national security remains one of the primary predicaments of state

systems. While states acquire military capabilities to provide security against threats, the existence of such capabilities in themselves constitutes a security threat. In IR, this paradox is generally referred to as the "security dilemma" of the state system, where the actualisation of individual and national security through the formation of the state is accompanied by the condition of national and international insecurity that is entrenched in the anarchical state system (Herz 1950:157-180). With more states gaining independence during the twentieth century, the concept of national security has gradually evolved to also cover a variety of internal security threats (Barston 1997:200).

At an individual level, the concept of security could have a wide range of meanings. Barston (1997: 201) argues that the degree of protection enjoyed by individuals depends on both "state capabilities" and "conceptions" of the different elements that constitute national security. In an IR context, security at the level of the individual has traditionally received peripheral attention, although this has become increasingly pertinent with the advent of broader security paradigms.

Security is not only an elusive concept, but also highly contested. Bearing in mind the growing number of transnational issues that impact on security at the three levels, at least two schools of thought in post-Cold War literature are discernible. Firstly, those that argue against the broadening or deepening of the definition of security. Generally, this school of thought represents the realist tradition of IR with its state-centric, national and military security focus (Ayoob:1997). The second group, which represents both the liberal and critical traditions of IR, argue that the security concept should be broadened and widened to incorporate new issues that impact on security and the new actors that play a role in addressing security threats (Buzan:1991; Buzan *et al*:1998; Stern:1999). There is, however, no uniform view among the second group of how this concept should be broadened or deepened.

2.2.1.1 Traditional IR assumptions about security

Most of the traditional definitions of security focus on the absence of threats to the state, especially military ones (Zacarias 1999:121). Security is therefore perceived as an "external" issue that can only be curbed by augmenting the military capabilities of the state. As such, the state remains the primary unit of analysis and international security a mere extension of national security.

Most realists contend that the normative core of realism is national security and state survival, and that security beyond the state is impossible (Jackson & Sørensen 2010:59). In the realist and neo-realist tradition, conflict and violence are therefore considered constant characteristics of the international system. As the sole security provider in an anarchical international system, the state acts rationally to promote and protect national interest. Security and power, which derive from the military capabilities of the state, are consequently regarded as core values and the driving forces in the international system (Gilpin:1986; Morgenthau:1993; Schmidt:2002).

In contrast, most liberal and neo-liberal theorists[4] maintain that the international system is primarily driven by common interests with the result that co-operation between and among states will ultimately prevail. As the entity that establishes and enforces the rule of law, the state respects other states in accordance with the norms of mutual toleration and the principles of international law (Jackson & Sørensen 2010:97; Haas:1958).

Liberalism shares the focus of realism on "interest-based" interaction (Buzan *et al*:1998; Fearon & Wendt 2002:52-72). But liberalism emphasises the positive outcome of interdependence and interconnectedness, rather than the increasing vulnerability and insecurity that ensue from this. Conflict can thus be overcome by peaceful means, especially through international institution and norm-building.

Most liberals emphasise the multiplicity of international actors, the role of international institutions in establishing norms governing the behaviour of state actors, and an expanded agenda that includes a broader set of issues beyond the security of the state. "High politics" (security and survival) have no priority over "low politics" (economic and social issues) and power resources other than military ones gain increasing prominence (Keohane & Nye 1977:23-25).

While liberals agree on the centrality of the state, they recognise that states are not the only actors in international relations. Rosenau and Czempiel (1992:282) call this "transnational" relations, consisting of individual transactions, where a state's ability to control and regulate is debilitated in a more complex reality and where "sovereignty-free"

[4] See for example the "security community" theory (Deutch et al. 1957:5), the "complex interdependence" theory (Keohane & Nye:1977, 2001), the "democratic peace" theory (Russett & Antholis:1993), the "bureaucratic politics" approach (Allison & Zelikow:1999) and "domestic politics" approaches (Snyder:1991).

collectivities compete with a state-centric world. As such, the development of international relations is increasingly complex and fragmenting the sovereignty of the nation-state.

Traditional realist assumptions about the nature of the international system and the pre-eminence of power politics in the conduct and management of international relations came under attack after the outbreak of WWI. This was accompanied by a criticism of the "old" diplomacy and its excessive secrecy. The end of WWI coincided with the proclamation of a "new" diplomacy based on Woodrow Wilson's "open covenants, openly arrived at". This victory for liberalism informed the underlying philosophy of the League of Nations of "collective security", thereby imposing a collective responsibility on the international community to intervene in international conflicts (Evans and Newnham 1992:176).

The liberal belief that the principle of "collective security" would produce peaceful co-operation between states was shattered with the outbreak of WWII. To many scholars it was clear that the power politics of earlier years continued to dominate international relations and academic writings during that period again began to use the classical realist narrative of Thucydides, Machiavelli and Hobbes (Jackson & Sorensen 2010:35). This approach was strengthened by the advent and development of the Cold War era.

2.2.1.2 Broadening and deepening the concept of security

There is broad agreement that the end of the Cold War, which saw a rapid acceleration of the process of globalisation and economic interdependence, brought renewed challenges to the study of international relations, including the dominant Westphalian paradigm with its state-centric focus. Traditional definitions of security that viewed the world exclusively through state-centric lenses and where international security became a mere extension of national security were increasingly called into question.

Such narrow interpretations of security were challenged not only by the proliferation of new actors in the international arena, but also by phenomena that transcend national boundaries, such as transnational crime, terrorism and environmental crises. Tarry (1999:1-13) notes that this required both a "broadening" and a "deepening" of the IR agenda. Both the actors that were marginalized and the issues that were not considered

relevant to security under the Westphalian paradigm now had to be considered. This broader agenda had to contend with, among others, political, military, economic and environmental issues, as well as various issues associated with human security (CHS:2003). It also raised questions about the state's ability to manage such a broad range of issues and actors over which it often has very limited or no authority and control.

One of the central issues underlying the IR debate on security is the question "whose security is being threatened?" This allows for a focus not only on the state, but also on the individual and other non-state actors as subjects of inquiry.

"Human security"[5] suggests that there is much more to security than the traditional conceptions that focused merely on the absence of threats to the state, particularly those of a military kind. Human security embraces a much broader agenda and significantly enlarges the scope and substance of the security concept (CHS:2003).

In some activities of the UN and within civil society, this broader agenda has become evident. Although limited, it has found expression in the arms control and disarmament arena through the adoption of the Anti-Personnel Mine-Ban Convention (MBT:1997) and the Convention on Cluster Munitions (CCM:2008), both of which were the result of close co-operation between and active participation by states and members of civil society in a joint effort to respond to the humanitarian concerns related to the use of these weapons. Some commentators argue that the Ottawa process that led to the adoption of the MBT has introduced a "new multilateralism" that questioned the *a priori* assumption about the state as the foundation of the multilateral system (De Larrinaga & Sjolander 1998:367).

Despite these practical examples, human security remains a highly contested concept. In addition, the practical application of the notion of human security and the accompanying doctrine of the international community's "responsibility to protect" (R2P) in recent conflict situations, such as the NATO military intervention in Libya, has raised concern about the potential abuse of such a notion as a smokescreen for military intervention and regime change (Rieff:2011). What is obvious is that there are significant

[5] A few reports of global commissions in the 1970s and 1980s, notably the Brandt Commission, the Brundtland Commission and the Commission on Global Governance, laid down concepts similar to "human security" (Oberleitner 2002:1). However, this term only made its first appearance as a distinctive concept in the United Nations Development Programme (UNDP) Report of 1994 (UNDP:1994).

normative differences between the narrow national security and broader human security approaches. It is also clear that individual or human security does not necessarily flow from the security of the state as political entity. Whereas national security predicates the necessity of preserving the state in its own right, human security accords priority to the security of the individual.

Some critics of the human security approach have suggested that it is neither a coherent concept nor a school of thought, but rather different and sometimes competing conceptions of human security (Newman 2001:240; Oberleitner 2002:2-3). Although proponents of human security have significantly different ideas, they at least seem to agree that human security is a more appropriate way of addressing the complexities brought about by a changing world — one in which human security is challenged less by interstate threats than by threats that emanate from within states or those that transcend national boundaries. In this context, the 2005 report of the UN High-Level Panel on Threats, Challenges and Change depicts the current international reality as "an age of unparalleled interconnection among threats" and of "mutual vulnerability between weak and strong" (UN 2004:6).

For the purpose of this study, the concept "human security" will be used to refer to the approach that prioritises the security of the individual as opposed to the state. The "security" element of the concept will be used to mean "freedom from fear", "freedom from want" and "freedom to live in dignity" as elaborated upon in the 2005 Report of the UN Secretary-General to the UN General Assembly (UNGA) entitled "In larger freedom: towards development, security and human rights for all" (UN:2005).

2.2.2 Security in an energy context

"Energy security", or rather the lack thereof, constitutes the backdrop for the continuous transformation of the energy sector, which entails the further diversification of energy sources, including through the predicted expansion of nuclear energy as part of the future energy mix in an increasing number of states around the world.

What then are the constituent elements of "energy security"? Despite the considerable attention that has been devoted in literature to energy security and in diplomatic practice (through "energy diplomacy"), the concept remains largely undefined. In most cases, no

effort is made to define the concept and some implicit meaning is presumed. Although energy, as one of the key drivers of economic development, has played a major role in shaping the international landscape during the twentieth century, it has remained closely associated with national security. In this context, energy security emphasises the connection between energy policy and national security.

The focus in a national security context has been on energy independence. Daniel Yergin (1988:11) argues that, at the national level, the objective "to assure adequate, reliable supplies of energy at reasonable prices" should be achieved "in ways that do not jeopardize major national values and objectives". The latter includes sovereignty and the normal functioning of the economy. He adds that traditional thinking on energy security is "state-centric, supply-side biased, overwhelmingly focused on oil and tends to equate security with self-sufficiency".

Barton *et al* (2004:5) take a broader view and define energy security as "the condition in which a nation and all, or most, of its citizens and businesses have access to sufficient energy resources at reasonable prices for the foreseeable future free from serious risk of major disruption of service". Significantly, this definition also deals with the internal distributive elements of energy security, which are relevant to the concept energy security at the level of the individual. In addition, Barton *et al* (2004:5) quotes the 1996 Report to the Trilateral Commission entitled "Maintaining Energy Security in a Global Context", which emphasises the "three faces" of energy security: "The first involves limiting vulnerabilities to disruption... The second, ... the provision of adequate supply for rising demand at reasonable prices... The third... is the energy-related environmental challenge. The international energy system needs to operate within the constraints of 'sustainable development'...".

As the beginning of modern energy history, the 1973/4 oil crisis shifted the balance from energy as an almost exclusive national issue to the international domain. The end of the last century also saw a shift from the "age of petroleum" to the age of a more diversified energy package, with natural gas and renewable energies playing a more prominent role (Barton *et al* 2004:3-4). The first decade of the twenty-first century has witnessed a renewed interest in the issue of energy security, primarily as a result of rapid economic growth in China and India, but also in other parts of the developing world. If such levels

of economic growth are to be sustained, a reliable supply of affordable energy will be essential.

Broadly speaking, a standard definition for energy security is a state of affairs that provides for adequate and secure, or reasonably guaranteed, flows of energy to consumers at reasonable prices. Isbell (2008:2) notes the inadequacies of such a definition and explains that "energy security" has different meanings for consumers and producers. For consumers it is about the "security of supply" (where price matters), while producers and suppliers focus on the "security of demand" (where income matters). As a consequence of this tension between supply and demand, the debate on energy among consumers has largely focused on energy independence, either in terms of the development of domestic resources and/or the diversification of energy resources or suppliers.

Likewise, the producers, especially in single-commodity economies (such as some of the major oil producing countries), are highly dependent on the income from energy supplies and have therefore focused on reliable markets. Despite the different perspectives of producers or suppliers and consumers on energy security, it is evident that they share, at least, the goals of stability and predictability (Bahgat 2006:961-975).

There are also different perspectives between the developed and developing world. More than a quarter of the world's population, mostly in Sub-Saharan Africa and South Asia, still suffer from energy poverty (see Chapter 3). In a developing world context, access to energy (primarily for electricity, cooking and heating) is therefore a critical component of energy security. For developed countries, on the other hand, energy security primarily revolves around the reliability of the supply of sufficient amounts of energy and the issue of cost/affordability.

While much of the international debate and empirical studies regarding energy security has focused on electricity generation, reliable access to fuel for transportation, heating and cooking is also a primary concern. In addition, fossil fuels (coal, oil, and natural gas) account for approximately 80% of the world's primary energy mix and have therefore been a major preoccupation. Isbell (2008:3) observes a paradox of energy security in the context of reliable access to fossil fuels for electricity generation and explains that should this goal be achieved on a global scale, a direct consequence would be the increased

use of fossil fuels that will lead to a more rapid depletion of such resources, add to CO^2 emissions and global warming, and consequently increase global instability and insecurity. This illustrates the direct link between energy security and the environment, which adds a further dimension to the energy security debate. A publication by the IEA entitled "Energy Security and Climate Policy" (IEA 2007) provides evidence of the importance of a holistic approach to dealing with the various elements related to energy security. In this context, the landmark 1980 Report of the Brandt Commission (Brandt:1980) warned that:

"Few threats to peace and survival of the human community are greater than those posed by the prospects of cumulative and irreversible degradation of the biosphere on which human life depends. In a global context, true security cannot be achieved by mounting buildup of weapons (defence in a narrow sense), but only by providing basic conditions for solving non-military problems which threaten them. Our survival depends not only on military balance, but on global cooperation to ensure a sustainable biological environment."

It is recognised that reliable access to other forms of energy, including renewable energy and nuclear energy, is critical to the discourse on energy security and require increased attention (Isbell 2008:3). Other elements of energy security include the reliability of supply routes, physical infrastructure, effective and efficient planning and management systems and access to technology (IEA:2007). Given the current global economic situation, investment in energy, especially alternative forms of energy is also of increasing importance. Added to these is the fear about the (potential) use of energy as a political tool, as witnessed during the 1973/4 oil crisis. Another area of contention regarding energy security is the realist-liberal debate concerning trade liberalisation and state intervention. All of these interrelated elements can either enhance or diminish energy security.

2.2.3 Security in a nuclear energy context

While the elements discussed in 2.2.2 *supra* apply equally to all forms of energy, the concept "energy security" gains additional complexity in a nuclear energy context. Nuclear energy adds a dimension that is not present in other forms of energy, which

primarily revolves around the inherent dual-use feature of nuclear energy and the consequent potential for its diversion towards nuclear weapons proliferation.

In this regard, Deutch (2004:2) points out that there are three broad reasons for the interlinkage between energy and security, namely dependence, vulnerability and proliferation. Dependence refers to energy as the locomotive for economic growth, vulnerability to the uneven global distribution of energy resources, and proliferation to the potential misuse of one energy technology, nuclear energy, for military purposes.

The elements of dependency and vulnerability have already been dealt with in some detail in the previous section. It is the proliferation dimension that brings the issue of nuclear energy security back into the realm of traditional conceptions of security, at both a national and international level. In literature, the proliferation element has been dealt with extensively since the dawn of the atomic age and it is not the intention of this study to focus on this issue. It does, nevertheless, form an integral part of the diplomatic discourse on the future of the nuclear fuel cycle and cannot be ignored in any analysis of the subject.

While the literature review for this study revealed a clear lack of attention to the concept "nuclear energy security", it is evident that "nuclear security" has been a central feature in the diplomatic discourse on nuclear energy and the subject of a number of international agreements and policy instruments that deal primarily with the physical protection of nuclear facilities, material and equipment. Since 2002, nuclear security has been incorporated into the IAEA's programmes together with the other related areas of nuclear safety[6] and safeguards[7]. In this regard, the IAEA Director General's Advisory Group on Nuclear Security in December 2003 formulated the following working definition for nuclear security:

"*The prevention and detection of and response to theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities.*"

[6] Nuclear safety is related to measures aimed at protecting health and minimizing dangers to life and property in the utilization of nuclear energy for peaceful purposes (IAEA:2011a).
[7] Safeguards are non-proliferation measures designed to ensure that special fissionable and other nuclear materials, services, equipment, facilities and information made available for verification by the IAEA are not used in such a way as to further any military purpose (IAEA:2011a).

Nuclear security therefore includes measures to prevent access by non-state actors to nuclear materials, equipment and technologies. Since 2004, nuclear security has gained more prominence on the international agenda and became a central theme of the Obama Administration's non-proliferation policies and activities. This included, for example, the hosting by the US of the Nuclear Security Summit in Washington on April 2010, attended by 47 states of which 38 were represented by Heads of States or Government — the largest gathering of Heads of State called for by any US President since the 1945 UN Conference on International Organisation (Sanger & Broad:2010).

While a comprehensive definition for nuclear energy security would have to incorporate the elements associated with energy security together with the non-proliferation dimension, a wider approach is required from a human security perspective. Building upon the standard definition for energy security and considering the wider agenda envisaged under a human security approach, a working definition for nuclear energy security could be formulated as follows:

"*Nuclear energy security" is a state of affairs that provides for reliable access, by all who choose this form of energy, to safe, secure, affordable and sufficient amounts of nuclear energy to sustain economic activity and development in a manner that contributes to a sustainable biological environment and prevents nuclear weapons proliferation.*

Nuclear energy is certainly not a new diplomatic issue, however, unlike nuclear weapons that have dominated the international discourse and diplomatic activity, among others, through "nuclear diplomacy", the peaceful application of the atom has not received the same level of attention.

2.3 The North-South divide

Though widely used in diplomatic literature, the "North" and the "South" remain ill-defined concepts. In general, the "North" refers to a group of developed, industrialised countries primarily[8] located in the northern hemisphere. Compared to the "North", the "South" is more loosely defined and consists of developing countries that occupy most of the

[8] Although located in the southern hemisphere, Australia and New Zealand are, for example, regarded as developed countries of the global North.

southern hemisphere, but that range from the Least Developed Countries (LDCs) to middle income, relatively developed states compared to some LDCs in the South (Eban 1998:46). Various terms are used to describe the "South", including, among others, "pre-modern states", "the third world", "underdeveloped countries", "world periphery", etc. Most of these terms are used interchangeably, although it is argued that some are value-laden (Korany 1986:2).

The three world classification[9] of the First, Second and Third World[10], has its origin in the Cold War and depicts the capitalist states aligned with the United States, the communist states aligned with the Soviet Union, including those with centrally-planned economies, and those not aligned to the first two groups, respectively. With the end of the Cold War and the demise of the Soviet Union, the Second World concept gradually disappeared, while the First and Third World concepts continue to be used in IR as substitutes for the developed and developing worlds. The range of terms used for the "South" illustrates the complexity of finding a clear definition for a group of states with significant disparities both within and among its members (Korany 1986:3).

Despite the lack of a universally accepted definition, the countries of the "South" share, to some degree, geographical, political and economic characteristics. Geographically, most states of the "South" are located in the southern hemisphere (see Map 1). When seen in isolation from the other broadly shared characteristics of countries of the "South", the term could be misleading, since a large number of states are not located South of the equator (Calvert & Calvert 1999:5). Politically, most countries of the "South" share a history of colonisation and a sense of marginalisation (Korany 1986:6). The majority of states in the "South" also share relative levels of political instability compared to those in the "North", where boundaries, state institutions and structures are generally stronger. However, a significant number of states that are regarded as part of the "South" do not share these characteristics (Calvert and Calvert 1999:6). Economically, it is generally accepted that the peripheral status of most developing countries in the "South" is the consequence of economic dependency on the developed states in the "North" in terms of market access, investment and technology. Rothgeb (1995:39-44) introduces the concept of two "parallel universes" to depict the economic disparities between the North

[9] This reference should not be confused with the "Three Worlds Theory" of Mao Zedong, which distinguished between the superpowers as the First World, the allies of the superpowers as the Second World and the states of the NAM, the Third World.
[10] The term "Third World" was invented by the French demographer Sauvy in 1952 and has evolved as a development concept (Calvert & Calvert 1999:5).

and South. Beyond the obvious disparities in Gross Domestic Product (GDP) per capita between these two "universes", the differences are particularly evident in the Human Development Index[11] (UNDP 2010:143-147).

While the divisions between "North" and "South" have developed over centuries, the technology gap between the North and the South has its roots in the nineteenth century, when the poor countries missed out on the industrial revolution. During the period of colonisation, many of the poor countries became the object of exploitation and colonial rule, which over a protracted period perpetuated inequalities and resulted in a further widening of the technology gap between rich and poor (Kapur 1993:13). These divisions became more accentuated since the end of WWII, with the decolonisation process that led to the independence of a large number of states with a shared history of exploitation and deprivation. The solidarity among these states has become increasingly regionalised, institutionalised and vocal as a result of the deepening socio-economic and political schism between the most advanced and poorest countries (Spies 2005:150).

Despite considerable differences in historical experience and levels of political development and stability, the "South" generally maintains collective diplomatic positions *vis-à-vis* the "North". The establishment of the NAM and the Group of 77 and China (G77) in 1961 and 1964, respectively, marked a major diplomatic alignment of the developing states of the South. The organisations continue to act as the primary diplomatic formations through which collective interests are protected and promoted.

Since the end of the Cold War, significant changes have taken place within the global South due to the growing role played by a number of key countries. This has also led to new diplomatic formations such as the India, Brazil, South Africa Dialogue Forum (IBSA) and BRICS. Hansen (1975:922) notes that these changes in the global political economy of the post-Cold War era have impacted on the analytical demarcation of the North and South in world politics. While the "North" generally perceived to be a more homogenous group of developed, industrialised countries, growing political and economic disparities among countries of the South, but also in the North, raise questions about the extent to which simplistic generalisations about these two "entities" remain useful as a tool for analysis.

[11] The HDI combines three dimensions, namely life expectancy at birth (a long and healthy life), mean years of schooling and expected years of schooling (access to knowledge) and Gross National Income (GNI) at Purchasing Power Parity (PPP) per capita (a decent standard of living).

Ontologically, the concepts North and South are social constructs to which meaning has been assigned. In this context, Doty (1996:1-4) notes that while the interaction between these broad entities revolves around a large range of topics, the issues themselves provide the context within which North-South identities are constructed. In addition, the asymmetrical nature of interaction between the North and South has meant that the South has been discursively presented by the North in a manner that has enabled it to construct certain realities based on unquestioned presumptions about the South. These constructed realities have made certain policies and practices possible. At the same time, the constructed realities and dominant diplomatic discourse introduced by the North may also have discounted or disallowed other alternative solutions to the nuclear energy security dilemma.

In a critique of the "North-South" compound, Eckl & Weber (2007:3) observe that what Jacques Derrida calls the "logocentric" tradition of the western narrative, could be seen as a binary opposition. They warn about the use of such "privileged discursive points" that may fix "reified antagonistic poles" (Eckl & Weber 2007:5) and, as such, could work against the very objective that this term aims to achieve. Further, it may also allow differences within the North or the South to be overlooked. Due to the implicit or explicit differentiated roles that may be apportioned to states from the North and the South, respectively, this could also lead to a paternalistic conclusion that states from the South should be taken care of, which may lead to interference by states of the North that could entail military, political or economic interference.

Whereas the North and South concepts are based on the more statist approach to the theory and practice of international relations, the "global North, global South" descriptions endeavour to depict a broader concept that encompasses, beyond states, also individuals, members of civil society and other entities, including those that are transnational in character and less sovereignty bound. It also endeavours to de-centre the geographical notion that has framed the South and the North. Alden *et al* (2010:221) observes that this also reflects the changing realities in both the North and the South and involves "sowing the seeds for a class-based transnational alliance", which "enables its proponents to explain the new-found power wielded by Brasilia and Beijing".

Taking into consideration the pitfalls of the North-South dichotomy, the "global South" concept will be used in this dissertation in reference to individuals, groups, entities and

states, mostly located in the southern hemisphere, that share a history of colonisation and marginalisation, as well as a common identity and solidarity informed by a shared notion of vulnerability compared to the developed, industrialised "global North".

2.4 North-South diplomatic discourse: the modal options

Diplomacy can be conceptualised according to various definitions and perspectives. Du Plessis (2006:124-125) suggests a useful approach to disaggregate the various definitions by examining the contexts in which the concept is explained. He notes that in a global political context, diplomacy represents "a pacific approach to the management of international relations in pursuit of order and justice" and what Wight (1978:113) termed the "master institution" of international relations. In a foreign policy context, diplomacy is the "master instrument" within the foreign policy process and represents the "most direct, traditional and peaceful instrument for the conduct of IR" (Du Plessis 2006:124). Lastly, and of specific relevance to this study, Du Plessis refers to diplomacy as a "master process" of international relations in the context of "the dialogue or communications process between international actors".

Although diplomacy as a foreign policy instrument has traditionally been regarded as an exclusively state-centric activity, there is increasing recognition for the multiplicity of actors that play influential roles in today's international environment. In this study, the concept of diplomacy will therefore be used to refer not only to the conduct of relations between state actors, but also between states and non-state actors. In addition, it needs to be recognised that diplomacy lies on a continuum between the peaceful, reciprocal as opposed to the unilateral, coercive tools of foreign policy. In this context, Cohen (1999:4) acknowledges that the "juxtaposition of diplomacy and war as polar opposites appears as a peculiarly Western notion not necessarily found in other traditions". A number of terms used by scholars and practitioners especially during the Cold War era, such as "coercive diplomacy" and "nuclear diplomacy" also brings into question the notion of diplomacy as an exclusively "pacific approach". Barston (1997:200) illustrates this point by referring to situations where diplomacy is used to justify the use of force and in reality becomes, what he calls, "the statecraft of force".

The use of intermediaries is a central theme of many traditional definitions of diplomacy, however, it is evident that the "information age" of the twentieth century had witnessed a

acceleration in the development of communication and transport technologies that has made direct communication between principals a regular feature of modern diplomacy (Henrikson 2006:7-10; Eban 1983:361-362).

Taking into consideration the different meanings associated with the concept of diplomacy, the following sections aim to explain the typologies or modes of diplomacy through which international relations are conducted.

2.4.1 Bilateral mode

Bilateral diplomacy is the most traditional mode for conducting relations between sovereign entities. The basis for the conduct of bilateral diplomatic relations is reciprocal recognition between two sovereign states that usually entails an exchange of official representatives through the establishment of resident diplomatic missions (Leguey-Feilleux 2009:185-216). Where resident missions are not established, various other means can be used to conduct bilateral relations. These include the accreditation of non-resident representatives or ambassadors, the appointment of honorary representatives/consuls, bilateral visits by authorised representatives, as well as meetings or negotiations on the margins of multilateral meetings or other venues in third states (Berridge 2005:108; Kaufmann 1998:13; Marshall 1997:142, 149).

Berridge (2005:105-145) distinguishes between conventional and unconventional forms of bilateral diplomacy. While the conventional mode relates to the conduct of reciprocal relations between two sovereign states, the unconventional bilateral diplomatic mode applies to situations where no official diplomatic relations are maintained or in dealings with international entities that are not officially recognised as sovereign international actors. In the unconventional mode, direct contact can be maintained through a variety of more direct means (including interests offices, consulates, representative offices or front missions) or indirect contact could be facilitated through intermediaries (Berridge 2010:207, 209-221; Dembinski 1988:10).

2.4.2 Multilateral mode

Multilateral diplomacy is generally regarded as the conduct of diplomatic negotiations among more than two parties. Based on this general conception, the origins of

multilateral diplomacy can be traced back to the relations between allies in ancient India (Watson 1982:91). Multilateral peace conferences and congresses in Europe during the seventeenth and eighteenth centuries were sporadic in nature and the multilateral diplomatic mode only established itself as a more permanent feature after the Napoleonic Wars of the nineteenth century (Hamilton & Langhorne 2011: 83-90, 93).

From the Congress of Vienna in 1814 until the outbreak of the First World War (WWI), the multilateral mode was marked by Great Power conferences in Europe (Jönsson & Langhorne 2004:318). With the establishment of the UN in 1945, the nature of multilateral diplomacy evolved from the more exclusive setting of Great Powers to a universal, inclusive setting where all states can, at least in principle, participate as equal partners. As a result of more states gaining independence during the twentieth century, the number of international state actors increased exponentially. The last century also witnessed a significant rise in the number of issues that cut across traditional national boundaries and a more prominent role of an increasing number of non-sovereign and non-state actors. There has also been an exponential rise in the number of inter-governmental organisations (IGOs) involved in an expanded system of global governance.

Multilateral diplomacy can take the form of *ad hoc* conferences on specific issues (known as "conference diplomacy") or permanent institutions such as the League of Nations, the UN and the IAEA that were established to deal with more permanent issues and problems (termed "parliamentary diplomacy") (Berridge 2010:146). Consensus decision-making is regarded as a distinguishing feature of conference diplomacy, while parliamentary diplomacy produces decisions mostly, though not exclusively[12], by majority vote. Due to the significant increase in the number of independent states from the developing world following decolonisation, and the possibilities for coalition formation offered by multilateral diplomacy, this mode is generally preferred by developing countries (Barston 1997:6; Sofer 1988:202).

Berridge (2005:148-150) notes that multilateral diplomacy has a better chance of success than its bilateral counterpart, especially when issues are complex and involve multiple interests. Another advantage is that multilateral diplomacy allows political

[12] For example, the Conference on Disarmament (CD) that was mandated by the UN First Special Session on Disarmament in 1978 as the "single multilateral disarmament negotiation forum" operates on the basis of a consensus-rule.

opponents and states that do not have diplomatic relations, to work together without direct confrontation. In addition, multilateral diplomacy offers an opportunity for smaller and less developed states to simultaneously conduct bilateral relations with states that they would usually not be able to maintain regular interaction with. In addition to presenting the prospect of coalition formation, this is yet another reason why many developing states with limited resources prefer pursuing relations through the multilateral mode (Dembinski 1988:253).

While not explicitly recognised in literature as a distinct diplomatic mode[13], it is necessary for the purposes of this study, to distinguish between inclusive and exclusive multilateral settings. This study argues that the crisis in the multilateral nuclear non-proliferation system derives from security approaches that have resulted in the development of a new typology of selective multilateral diplomacy that is sometimes referred to as "à la carte" diplomacy (Haass:2008) – also referred to as "minilateralism" or "club diplomacy". This usually involves the pursuance of foreign policy objectives, in what is generally referred to by most western authors as the multilateral mode, through a mixture of a selection of preferred elements or issues reflected in international instruments. Besides pursuing a selective agenda, this also involves a more restrictive engagement with a select number of actors aimed at devising new norms, which are usually unlikely of receiving global recognition or wider voluntary adherence. These more selective methods will be referred to in this study as the "plurilateral diplomatic mode" as opposed to the multilateral mode that will be used strictly in reference to inclusive multilateral methods open for universal (such as the UN and the IAEA), or regional participation (such as the African Union or the European Union). An example of a plurilateral institution is the NSG that consists of 45 states and where membership is open only to a select group of nuclear supplier states. In diplomatic practice, "plurilateral" settings or initiatives are sometimes also referred to as "multinational" organisations or activities.

2.4.3 Summitry

Meetings between sovereigns at the highest political level date back to the earliest documented diplomatic encounters, though the term "summitry" was only coined as such by Winston Churchill during the 1950s (Berridge 2010:161). Summitry can be conducted

[13] For example, Kaufmann (1988:1-2) states that plurilateral diplomacy, parliamentary diplomacy or conference diplomacy are merely new terms to describe multilateral diplomacy.

in the bilateral or multilateral modes, be of an *ad hoc* or serial nature and has through the years remained one of the most important diplomatic methods (Eban 1998:90-94; Hamilton and Langhorne 2011:221-228).

Besides their symbolic value, summits also provide a platform for gathering information or to exchange views, to discuss side issues, to define strategic policy and to resolve disputes or diffuse crises (Barston 1997:108). Summits can, however, also be risky in case of a potential failure of a negotiation process or where direct pressure could be exerted on political leaders that may lead to unwanted results. In finalising negotiations and ratifying agreements, summits provide the highest level of recognition for a successful negotiation process or they can be used to revitalise and create new momentum to revive stalled negotiation processes (Bull 1977:173; Sofer 1988:204).

The distinction made between inclusive and exclusive settings in the multilateral mode (see 2.4.2 *supra*) apply equally to summitry. An example of Summitry in an exclusive setting is the Nuclear Security Summit convened by US President Obama in 2010 to which only a select group of countries were invited. Such meetings would be dealt with in this study as a plurilateral rather than a multilateral event.

2.4.4 Third Party diplomacy

Third party diplomacy most often entails mediation, which is a mode of diplomacy conducted by a third party, usually aimed at promoting the peaceful resolution of a dispute (Berridge 2010:235-250). Track One mediation refers to situations where states act as mediators, while Track Two[14] refers to the engagement of private individuals or non-governmental actors as third parties. Mediation can be undertaken by either a single party or by multiple parties or through a combination between mediation parties in both Track One and Two. An example of Track One diplomacy is the role played by three European countries, the so-called EU3 (France, Germany and the UK), that acted as a bridge between the US and Iran in the negotiations over Iran's nuclear programme.

Mediation is distinguished from facilitation or the use of good offices, which usually involves a more limited role. A mediator is either directly or indirectly involved in seeking

[14] Joseph V. Montville coined the term "Track Two Diplomacy" in 1981 in recognition of unofficial conflict resolution efforts by non-governmental actors.

a solution to a specific problem that is likely to be accepted by the parties to a dispute (Barston 1997:215-216). A facilitator's role is more limited in, for example, establishing dialogue between political entities that do not enjoy mutual diplomatic recognition, often aimed at preparing the ground for eventual direct negotiations. In a global South context, third party diplomacy has taken on a more long-term developmental profile through the increasing diplomatic attention that is given to Post-Conflict Reconstruction and Development (PCRD), after mediation of conflicts in weak states.

2.4.5 Polylateral diplomacy

Polylateral diplomacy remains a contested concept due to the narrow conceptions traditionally adopted by scholars on the essence of diplomacy in general and more specifically regarding the respective roles of governmental representatives and non-governmental actors in the conduct of international relations. What is evident though, is the growing involvement in diplomacy by non-sovereign actors, including members of civil society, transnational corporations and influential personalities that play an important role in the conduct of relations through what is referred to as "catalytic", "private", "para", "track two" or "unofficial" diplomacy (Hocking 1999:24; Riordan 2003:82).

Polylateral diplomacy therefore refers to the development of relations between traditional sovereign diplomatic actors and non-sovereign actors in pursuit of shared objectives. Although it is not a new phenomenon, it is acknowledged that the increasing involvement of non-sovereign actors in international relations has added to the complexity of contemporary diplomatic practice and challenges the traditional, state-centric features of diplomatic relations (Barston 1997:85).

2.5 Conclusion

This Chapter endeavoured to provide the broad theoretical underpinnings to this study by examining the concept "nuclear energy security" in an IR context. In the absence of a clear definition for nuclear energy security, an effort was made to disaggregate this concept. For this purpose, it distinguished between the different perspectives on security at the international, national and individual levels, as well as between some of the major traditional theoretical perspectives in IR and the more recent and evolving human security paradigm.

The concept energy security was then examined and a wide range of elements were identified that could have an impact on energy security, including reliable and predictable supply of energy and the availability of alternative energy sources, affordability, physical infrastructure, planning and management systems, investment and environmental impact. In this regard, it noted that economic activity is dependent on access to affordable, reliable and sufficient amounts of energy and that conceptions of energy security are influenced by geographic location, the availability of energy sources and capabilities, international relations, political systems and level of economic development. It then explored energy security in the context of nuclear energy and identified additional elements, including nuclear safety, physical security of material and the nuclear weapons proliferation threat inherent to nuclear energy. Based on the wider agenda envisaged under a human security approach and taking into consideration the elements associated with energy security and nuclear energy, a working definition for "nuclear energy security" was then formulated that can be applied throughout this study.

In addition, the Chapter endeavoured to explain the North-South dimension of this study. It provided some insight into the North-South divide, which will be further explored in Chapter 3 specifically in relation to nuclear energy, as well as the diplomatic alignment of the developing South through the formation of the NAM and the G77. In exploring the North-South dichotomy, it identified the growing political and economic disparities among countries of the South that raise questions about the use of simplistic generalisations in explaining diplomatic processes. It also argued that the "North-South" concept represents the more statist approach, while the "global North-global South" descriptions depict a broader concept that includes actors beyond the state and are less geographically confined.

Lastly, the modal dimensions of diplomacy that are of relevance to this study were identified, including the bilateral, multilateral, summitry, third party and polylateral diplomatic modes. Due to the focus of this study on the multilateral diplomatic mode, it was argued that a distinction needs to be made between inclusive and exclusive multilateral approaches. In this context, it claimed that the crisis in the multilateral nuclear non-proliferation system derives from security approaches that have resulted in the development of a new typology of selective multilateral diplomacy that is sometimes referred to as "à la carte" diplomacy, "minilateralism" or "club diplomacy".

CHAPTER 3

THE NORTH-SOUTH DIVIDE ON NUCLEAR ENERGY SECURITY: ACTORS, CAPABILITIES AND BARGAINING POWER

3.1 Introduction

This Chapter provides a brief overview of the historical development and status of the North-South divide on nuclear energy. The global distribution of nuclear resources and capabilities (material, equipment and technology) is then examined in order to support of the qualitative and normative assessment of the diplomatic discourse on the future of the nuclear fuel cycle[15]. This is done through a selective analysis of the global distribution of resources and capabilities related to the core elements of the nuclear fuel cycle, including uranium mining, nuclear power plants, research reactors, enrichment and reprocessing plants and fuel fabrication facilities. In this manner an effort is made to identify the major state actors engaged in the nuclear energy field. Considering existing capabilities, an effort is also made to analyse inequalities and the continued marginalisation of the global South, especially Africa, in the nuclear arena. Lastly, this Chapter endeavours to illustrate if and how these resources and/or capabilities strengthen or weaken the "bargaining power" of actors in the diplomatic discourse on the future of the nuclear fuel cycle.

To contextualise the North-South divide on nuclear energy security, this Chapter starts with a brief overview of the current status of nuclear energy, its growth prospects and contribution to global electricity generation and other peaceful use applications.

3.2 World energy outlook

According to the World Energy Outlook (IEA:2010a), primary energy demand around the world is set to increase by around 1.2 percent per annum – an increase of around 36

[15] The core elements of the nuclear fuel cycle include the following: mining and milling of uranium ore; the refinement and conversion of the solid uranium oxide (U_3O_8) into gas in the form of uranium hexafluoride (UF_6); enrichment of UF_6 through isotopic separation to increase the U-235 content of natural uranium (that contains 0.7% of the U-235 isotope and 99.3% U-238; reprocessing is a process whereby the uranium and plutonium discharged from the reactor core is separated from the other "fission products" by chemical means; fuel fabrication involves the production of uranium dioxide pellets from the enriched UF_6, which are then encased in fuel rods; short or long-term storage of spent fuel to allow radioactivity to decay (WNA: 2011a)

percent between 2008 and 2035. While energy demand until 2035 in OECD countries is projected to be almost negligible, non-OECD countries account for 93 percent of the projected increase in global energy demand as a result of economic and population growth. China, who overtook the US in 2009 as the largest energy user in the world, is expected to contribute around 36 percent of the projected global energy use by 2035.

A joint study by the IEA, UNDP and UNIDO (IEA 2010b:7) notes that around 1.4 billion people around the world still lack access to electricity. It identifies Sub-Sahara Africa, with an electrification rate of 31%, as the greatest challenge towards addressing energy poverty. As illustrated in Map 2, 465 million people in Sub-Saharan Africa do not have access to electricity. If the goal of achieving universal access to modern energy services in support of poverty eradication and to sustain economic development in developing countries is to be reached, an additional investment of around US$756 billion would be required.

3.3 Current status and prospects for nuclear energy expansion

From 1950, when construction started on the first nuclear power plant for electricity generation, until the 1970s, global nuclear power capacity grew at a rate of around 30% per annum. This steady growth continued until the mid-1980s, when nuclear power accounted for around 16% of global electricity consumption. Since the 1986 Chernobyl nuclear accident, only three countries (China, Mexico and Romania) have connected their first nuclear power plants to the grid and nuclear energy's overall contribution has largely stagnated. While nuclear power generation continues to expand moderately, its relative contribution to electricity production has declined to around 14% (IAEA 2010a:3).

Growth projections by the IAEA and the NEA indicate a considerable increase in nuclear energy generation to satisfy growing demand driven by vast expansion plans specifically in Asia. However, its relative contribution to electricity production worldwide is set to remain at around the current levels with only a moderate increase. The IAEA predicts (according to its low projection) an installed nuclear power capacity of 511 GW(e)[16] by 2030, which constitutes a 40% increase over the 370 GW(e) installed in 2009 (IAEA 2010b:29). As of August 2010, 29 countries operated 441 nuclear power plants, with a

[16] The high projection was 807 GW(e) by 2030, which would amount to almost double the currently installed nuclear power capacity (IAEA 2010b:29).

total capacity of 375 GW(e), and a further 60 units, totalling 58.6 GW(e), were under construction (IAEA 2010a:3).

While most of the new nuclear power plants are expected to be constructed in countries that already use nuclear power for electricity generation, another 65, mostly developing states, have expressed an interest in or are actively planning to launch new programmes (IAEA 2010a:10). This includes 21 countries in Asia and the Pacific, 21 in Africa, 12 in mostly Eastern Europe and 11 in Latin America. This interest is also reflected in the significant increase in the number of IAEA Technical Co-operation (TC) projects related to nuclear power – from 13 in 2007-2008 cycle to 35 in the 2009-2011 cycle. As of 2009, 58 countries were participating in national and/or regional projects related to the introduction of nuclear power through the IAEA's TC programme.

Among the countries expressing an interest in their first nuclear power plant, 25 have set target dates for commissioning before 2030 (IAEA 2010a:11). If achieved, this would result in the greatest number of new countries entering nuclear energy production that has ever occurred over such a short period. Given the financial and human resource requirements for launching nuclear programmes, and since the IAEA reports that only 17 of these countries were actively preparing national programmes at the end of 2009 (IAEA 2010b:19), it remains to be seen how many plans will eventually materialise. The prediction that the relative contribution of nuclear energy to global electricity production[17] will only marginally increase over the next two decades also brings into question the notion of a so-called "nuclear renaissance" that is widely used by proponents of nuclear energy.

Projections for the growth of nuclear power pose considerable challenges. The global financial and economic crisis since 2008 has yet to be overcome and the potential impact of the Fukushima disaster is difficult to predict. While some countries announced that they would review their programmes and plans, others confirmed their determination to proceed with their original plans. Even in cases where decisions have been made on the eventual phasing out of nuclear power (such as in Germany and Switzerland), it is

[17] See World Energy Outlook, 2010 for a comprehensive overview of trends in the global energy system and growth scenarios covering various elements of "energy security", including energy policy, climate change and CO^2 emissions, supply and demand issues, infrastructure investment, transportation, industry development, infrastructure and technology (IEA:2010a).

uncertain whether these decisions would hold firm by the time of decommissioning of existing nuclear power plants.

Despite ongoing concerns, the primary driving forces behind the expansion of energy, including nuclear energy, have not changed (WNA:2011b). Energy and electricity demand continues to be driven by population and economic growth. Concerns about the security of energy supply, stability in energy generating costs and the high and volatile prices of fossil fuels continue to inform the search for alternative sources of energy. In addition, nuclear power is projected to be consistently cheaper than gas-fired and coal-fired power and the public perception of nuclear power has improved due to the overall performance and the safety record of nuclear power plants (IAEA 2011b:7).

Another significant long-term driver of nuclear energy is the growing concern about environmental protection and climate change. A new international agreement on the regulation of greenhouse gasses (GHG) to replace the Kyoto Protocol that could make the climate benefits of nuclear energy more visible has not yet been realised. In countries that place restrictions or taxes on greenhouse gas emissions, low emissions have direct economic value. As such, the economic competitiveness of nuclear power could be further improved if nuclear energy were to become eligible for worldwide carbon trading schemes associated with the reduction of GHG emissions (IAEA 2010a:14-15). It is axiomatic though that the long-term environmental impact of the storage of radioactive nuclear waste derived from power plants has yet to be determined.

The contribution of nuclear energy to total electricity generation varies considerably between countries and regions. Among countries that use nuclear energy for electricity generation, its contribution ranges from more than 70 percent in France to only around 2 percent in India and China. Regionally there are also significant differences. In Western Europe, for example, nuclear generated electricity accounts for almost 27 percent of the total electricity generation. In North America and Eastern Europe, it accounts for approximately 18 percent, whereas in Latin America and Africa it contributes only around 2.4 and 2.1 percent, respectively. In the Far East, it contributes around 10 percent, while only around 1 percent of the total electricity generated in the Middle East and South Asia is derived from nuclear power (IAEA 2010a:1-22). When considering these regional differences, there seems to be a positive correlation between level of economic development and the use of nuclear energy.

3.4 Origins of the North-South divide on nuclear energy

As noted in Chapter 2, the technology gap between the North and the South has its roots in the nineteenth century industrial revolution, but widened further during the period of colonisation (Kapur 1993:13). While the origins of the diplomatic discourse on the future of the nuclear fuel cycle can be traced back to the East-West conflict in the aftermath of WWII, the issue of access by developing countries to advanced nuclear technologies only appeared on the international agenda during the Asian-African Conference in 1955 that led to the establishment of the NAM in 1961. Although the development and testing of nuclear weapons during the 1970s by two prominent members of the NAM, India and Pakistan, created divisions within the Movement, it had no negative impact on the collective positions related to the peaceful uses of nuclear energy, as reflected in consecutive NAM Summit outcomes. In this context, Morphet (2004:517-537) explains the evolution and status of the NAM's multilateral policy, including in relation to disarmament and international security.

Another important diplomatic formation of the South is the G77 that was established on 15 June 1964 by a group of seventy-seven developing countries after adopting a joint declaration at the end of the first session of the UN Conference on Trade and Development (UNCTAD) in Geneva. The G77, which now has 132 members including China, was established for the purpose of enhancing the negotiating capacity of developing countries on international economic issues within the UN system. The G77 serves as a platform for the countries of the South to articulate and promote their collective economic interests (G77). For this purpose, it has established G77 Chapters in Geneva, Nairobi, Paris, Rome and Vienna. The major difference between the NAM and the G77 is the latter's exclusive focus on economic issues. Of specific interest to this study is the role played by both the NAM and the G77 & China in the nuclear fuel cycle debate.

The end of the Cold War changed the complexion of the North-South debate on nuclear energy. Within the global South, a number of key developing countries with relatively advanced nuclear industries (China and India) emerged as global players. Whilst political cohesion in relation to the principles underpinning the nuclear fuel cycle debate continue to inform the approach of the South, growing disparities between countries in the South have weakened unified positions. Simultaneously, new smaller formations of

countries of the South (such as IBSA and BRICS) have started exerting more influence in the international area (Taylor 2009).

3.5 North-South nuclear energy divide

The global distribution of nuclear resources and capabilities related to the core elements of the nuclear fuel cycle, including uranium mining, nuclear power plants, research reactors, enrichment and reprocessing plants, as well as fuel fabrication facilities by country and geographical region can be summarised as follows:

3.5.1 Uranium mining

The global distribution of identified uranium resources amongst 13 countries that are either major uranium producers or have significant plans for growth of nuclear generating capacity illustrates the widespread distribution of these resources (see Table 1). Together, these 13 countries (Australia 23%, Kazakhstan 19%, Russia 10%, Canada 8%, South Africa 8%, United States 6%, Brazil 5%, Niger 5%, Namibia 5%, Ukraine 4%, Uzbekistan 2%, India 1.3% and China 1.2%) are endowed with more than 90 percent of the identified global uranium resource base. This includes all known reasonably assured resources (RAR) and inferred resources that are recoverable at a cost of less than US$ 130 per kilogramme uranium. The remaining 7 percent are distributed among another 30 countries. In view of the importance of the security of energy supply, the widespread distribution of uranium resources is an important geographic aspect of nuclear energy security (OECD 2008:15).

Active exploration of uranium through mining activities (see Table 2) now takes place in 19 countries, with eight countries (Australia, Canada, Kazakhstan, Namibia, Niger, Russia, Uzbekistan and the US) accounting for more than 90 percent of world uranium mining capacity (IAEA 2010a:8). As such, there are no significant disparities between the North and South in relation to either uranium resources or uranium mining activities.

3.5.2 Nuclear power reactors

Schneider *et al* (2009) provide an overview of the status of nuclear power programmes around the world. As illustrated by Map 2, there are only two operating nuclear power

reactors in Africa, both of which are located in South Africa. These two reactors provide around 5.2 percent of South Africa's total electricity supply, while significant expansion plans are in the pipeline (Schneider *et al* 2009:3-4).

In Latin America and the Caribbean, there are a total of 6 nuclear power reactors. Argentina operates two nuclear reactors that provide around 6 percent of its electricity. Brazil has two that generate 3.1 percent of its electricity and Mexico operates another two reactors that contribute 4 percent of its electricity (Schneider *et al* 2009:4-5).

In North America (excluding Mexico), there are 122 nuclear power reactors. Canada operates 18 reactors that produce 14.8 percent of its electricity. In addition, Canada is a supplier of nuclear power reactors (Candu) and has already delivered four units to South Korea, two to Romania, two to India, two to China, and one each to Pakistan and Argentina. The United States operates the largest number of nuclear power plants in the world with 104 commercial reactors that produce 19.7 percent of its electricity (Schneider *et al* 2009:4-7).

Asia hosts a total of 115 nuclear reactors of which China operates 13 that generate 1.8 percent of its electricity. China, however, has plans for a fivefold increase in its installed nuclear capacity by 2020. Chinese Taipei operates six reactors that produce 19 percent of its electricity, with a further two reactors under construction. India has 19 reactors that generate 2.9 percent of its electricity with further units under construction. Prior to the Fukushima incident, Japan operated 54 reactors (almost half of the total number of reactors in Asia) that supplied nearly 30 percent of its electricity. Pakistan has two reactors that provide 2.6 percent of its electricity, with one additional unit, supplied by China, under construction. South Korea operates 21 reactors that provide 32.2 percent of its electricity and has plans to build another 12 new reactors by 2022, raising domestic installed nuclear capacity to 48 percent of the country's electricity generation (Schneider *et al* 2009:7-10).

Western Europe has the largest number of countries that operate nuclear power, with a total of 129 nuclear reactors. Belgium has seven reactors that supply about 51.2 percent of its electricity. The UK's 19 reactors provide 15.7 percent of its electricity, while Finland operates four that supply 28.4 percent of its electricity. France, who is the world leader in nuclear energy, operates 58 reactors that produce 74.1 percent of its electricity. France

is also the largest supplier of nuclear power plants and has such a domestic oversupply of nuclear energy that it dumps electricity on neighbouring countries such as Switzerland and Italy. Although Germany decided in 2002 to phase out nuclear power, its 17 reactors contribute 28.4 percent of its electricity supplies. The remaining reactors will need to be shut down before 2022. The Netherlands has one reactor that provides nearly 4 percent of its electricity, while Spain has eight that generate 20.1 percent of its total electricity. Sweden operates 10 reactors that produce 38.1 percent of its electricity, while Switzerland has five nuclear reactors that supply 38 percent of its electricity (Schneider *et al* 2009:10-14).

Central and Eastern Europe hosts almost half the number of nuclear reactors compared to North America and Western Europe with a total of 67 reactors among 9 countries in the region. Armenia operates one reactor that generates 39.4 percent of its electricity. Bulgaria's two reactors produce 33.1 percent of its electricity, while the Czech Republic operates six reactors generating 33.3 percent of its electricity. Hungary has four reactors that contribute 42.1 percent to its grid, while Romania has two reactors that supply 19.5 percent of its electricity. Russia operates the largest number of reactors in Central and Eastern Europe with 32 reactors that produce 17.1 percent of its electricity. Russia is building more reactors for export than for its domestic market, having sold designs to Bulgaria, China and India. Slovenia operates one reactor that produces 37.3 percent of its electricity. Slovenia's nuclear power plant that is located at Krsko is owned jointly by Slovenia and Croatia, who both share the output. Slovakia has 4 reactors that contribute 51.8 percent. Ukraine has the second largest number of reactors in its region and operates 15 reactors that supply 45.1 percent of its electricity (Schneider *et al* 2009:15-19).

3.5.3 Research reactors

Research reactors are the most widely dispersed of all nuclear installations. Because of the high cost of these scientific facilities, research reactors tend to be used for multiple purposes, including radioisotope production. In terms of global distribution, Russia has the highest number of research reactors (47), followed by the US (42), China (15), Japan (12), France (9) and Germany (8). Many research reactors were built in the 1960s and 1970s and the highest number of operating facilities was around 1975 when there were 373 research reactors in 55 countries (WNA 2011c).

About 16 new research reactors are planned or under construction, and 382 have already been shut down or decommissioned. There are currently 232 operational research reactors worldwide, with 145 situated in developed and 87 in developing countries. Among these, 49 are in North America, 17 in Latin America, 38 in Western Europe, 67 in Eastern Europe, 8 in Africa, 15 in the Middle East and South Asia, 6 in South East Asia and the Pacific, and 32 in the Far East (WNA 2011c).

While research reactors are widely spread among all the regions of the world, less that 4 percent of the these reactors are located in Africa.

3.5.4 Conversion, enrichment and reprocessing

Most nuclear power reactors that are in operation today require enriched uranium for the production of nuclear fuel. Prior to enrichment, uranium oxide must be converted to a fluoride so that it can be processed as a gas (uranium hexaflouride). Today, uranium conversion plants are known to be operating in Russia, the US, France, Canada, the UK, China, Brazil and Iran (WNA 2011d). As illustrated by Table 3, Canada, the UK, France and the US combined contribute around 63 percent of the total global conversion capacity, while Russia contributes another 32 percent. The remaining countries therefore only contribute around 5 percent to worldwide capacity.

From a proliferation perspective, uranium enrichment and reprocessing technologies are regarded as the most sensitive parts of the nuclear fuel cycle. While uranium enrichment technologies are essential for the production of nuclear fuel for most nuclear power reactors, the same technologies can also be used for the production of fissile material used in nuclear warheads. Likewise, reprocessing technologies are required for the recovery of fissile material from spent fuel in order to produce fresh fuel, but can also be utilised for the production of plutonium for use in nuclear weapons.

Currently, only 11 countries are known to have operational uranium enrichment facilities. These include Russia, the United States, Germany-Netherlands-UK (through URENCO), France, China, Japan, Pakistan, Brazil and Iran (see Table 4). In terms of reprocessing facilities, an even smaller number of countries have commercial facilities, namely France, the UK, Russia, Japan and India. Brazil and Iran are the latest additions to the list of countries involved in enrichment activities. In 1990, Brazil abandoned its secret nuclear

weapons programme that it had developed in the 1970s and 1980s under military rule. Iran, on the other hand, had for a period of 18 years failed to declare research on enrichment technology when its programme was revealed in 2002. Since then, there has been ongoing allegations that Iran might be developing a nuclear weapons programme, although Iran has consistently denied this and the IAEA has not been able to confirm the existence of such a programme.

With the notable exception of Japan, all the other known possessors of enrichment and reprocessing technologies are either NWS under the NPT, NNWS that host nuclear weapons on their territories (Germany and the Netherlands) or states with nuclear weapons outside the NPT (India and Pakistan).

3.5.5 Nuclear fuel manufacturing

According to the IAEA (2010a:8), nuclear fuel manufacturing capacity is largely concentrated in France, Japan, Russia and the US. In terms of Light Water Reactor (LWR) fuel production, manufacturing facilities are found in Belgium, Brazil, China, France, Germany, India, Japan, Kazakhstan, South Korea, Russia, Spain, Sweden, UK and the US (see Table 5). Fabrication facilities for Pressurised Heavy Water Reactor (PHWR) fuel are operating in Argentina, Canada, China, India, Pakistan, South Korea and Romania, with more than half of the total PHWR fuel being produced in Canada (see Table 6).

3.6 Marginalisation of the global South

The global distribution of capacities related to some of the key components of the nuclear fuel cycle has clearly illustrated the continued lack of capabilities in most of the developing world, particularly Africa. While most of Western Europe, Central and Eastern Europe, North America and a small number of countries in Asia benefit from the use of nuclear energy for electricity generation, the vast majority of Latin America and the Caribbean, South East Asia and virtually the whole African Continent have remained marginalised. A correlation between Maps 1 and 2 illustrate that with a few exceptions (such as China, India and Brazil), the nuclear energy divide has assumed a distinct global North, global South dimension.

While Africa has access to around 20 percent of the world's known uranium deposits, it has not been able to maximise this strategic resource through the beneficiation and use of its own raw materials. Beyond significant uranium mining activities, two nuclear power reactors and eight research reactors, Africa does not have any advanced production facilities for nuclear energy. Only 31 percent of Sub-Saharan Africa's population has direct access to electricity, which is the lowest in the world (IEA 2010b:11). Without access to sufficient energy resources, efforts aimed at the eradication of poverty through sustained and sustainable economic growth cannot be achieved. Given the relatively high cost of renewable energies and general lack of other energy sources beyond traditional fossil fuels, the question is whether Africa's lack of capabilities in the nuclear sphere is the result of its colonial heritage or perhaps also the result of continued efforts by the global North, the major holders of sensitive technologies, to prevent the "have-nots" from exercising their inalienable right to develop and use nuclear energy for peaceful purposes.

While proliferation concerns are used as the basis for technology denials and has limited the number of nuclear technology holders (who also represent the key participants in the nuclear fuel cycle debate), this has also negatively impacted on development efforts in the South. It furthermore perpetuates the structural imbalances between the global North and global South.

3.7 Capabilities and bargaining power

Given the unequal distribution of capabilities evident from this analysis, the question is whether and how these asymmetries affect the bargaining power of participants in the debate on the nuclear fuel cycle. Schelling (1966:2) describes bargaining power as "the power to hurt" and notes that with enough military force a country may not need to bargain. Schelling distinguishes between force and coercion, where the difference is between taking what you want and making somebody give it to you. He observes that brute force may succeed when used, but the power to hurt is most successful when it is held in reserve. For him, coercion is a method of bringing an adversary into a bargaining relationship. Although the power to hurt is integral to war, modern technology enhances the salience of war and threats of war as techniques of influence, coercion, deterrence, bargaining and intimidation. According to Schelling the threat of war has always been an

inconspicuous element of diplomacy and modern military strategy has become the art of coercion, intimidation and deterrence – the diplomacy of violence (Schelling 1966:1-34).

But what is the relevance of all this for the debate on nuclear energy security and in particular the future of the nuclear fuel cycle? It can be argued that due to the inherent dual-use characteristics of enrichment and reprocessing technologies, access to such technologies constitutes at least a latent threat of physical force. But is possession of such capabilities in and of itself a source of bargaining power?

According to Fisher (1991:128), negotiation is a process of communication in which the parties aim to "send a message" and influence each other. Therefore, negotiating power has to do with the ability to favourably influence a decision. Some, like Schelling, assume that because threats of physical force exert influence, the ability to make such threats is what constitutes negotiating power. For others, the ability to exert influence depends also on other factors. In this context, Fisher *et al* (1991) argue that having an alternative to negotiation (what they call BATNA – best alternative to a negotiated agreement) contributes substantially to a negotiator's power. In addition, they emphasise the importance of the skills of a negotiator, including the ability to communicate persuasively, access to information and expertise, the amount of control over resources, and the negotiator's own legitimate power.

Johnson (2006:66-68) observes that in negotiations conducted in accordance with distributive assumptions, the traditional concept of power, which derives from a state's military and economic capabilities, continues to be a major factor. However, in multilateral negotiations, "attributive power" is less important. She notes that it is not only what negotiators are or have that matter, but also what they do. In determining outcomes, structural or relational power may be more important than attributive power.

While traditional theory holds that structural or relational power is determined by the distributive pattern of economic or military power, authors like William Habeeb (1988) illustrate how weaker actors can successfully negotiate with stronger ones through "issue-based" power. According to Habeeb, issue-based power relates to the alternatives that are available to an actor, as well as its commitment and control. Johnson (2006:67) acknowledges that attributive and relational power may be elements of issue-based power, but argues that the ability to influence other actors and the ability

to frame the interaction are equally important. In this sense, bargaining power relates to the success of an actor to use resources and capabilities to change perceptions of what would constitute acceptable gains or to change the scope of possible agreements to integrative options. Issue-based power is distinguished from behavioural power that involves the tactics used to change the issue power balance, which could include coalition formation (Dupont 1994:148-177; Leigh-Phippard 1996:3).

It can therefore be assumed that the capabilities (or the lack thereof) of the North and South in relation to nuclear energy could have an impact on their relative bargaining power particularly in zero-sum distributive negotiations. However, this discussion has identified many additional elements that can influence bargaining power especially in multilateral negotiations, including coalition formation that has been central to the success of the South in negotiations.

3.8 Conclusion

This Chapter set out to examine the historical development and status of the North-South divide on nuclear energy. It noted that the expected growth in global energy demand is driven by a significant increase in energy demand among developing counties. In this context, the backlog among Sub-Saharan African countries in terms of access to electricity was identified as a continuing concern. While nuclear energy was expected to continue to contribute towards energy security, it was noted that its contribution to global electricity generation varies considerably between regions in the North and South.

Although the origins of the technology gap between North and South derives from the industrial revolution of the nineteenth century, this has continued to widen during and after the period of colonisation. Two diplomatic formations of the South emerged during the 1960s that provide a platform for the formulation and promotion of the collective interests of the South. It also noted that the end of the Cold War changed the complexion of the South due to the growing power and global influence of key developing countries, which has led to the establishment of smaller diplomatic formations such as IBSA and BRICS. Despite differences between states of the South, it was noted that the South continues to maintain cohesive, principled positions on the peaceful uses of nuclear energy.

This Chapter also examined the global distribution of nuclear resources and capabilities related to the core elements of the nuclear fuel cycle and identified the major actors engaged in the nuclear energy field. While no disparities between the North and the South were evident in relation to uranium deposits and mining, it was noted that the South has generally remained marginalised in terms of access to the other elements of the nuclear fuel cycle. In this regard, it also confirmed that the nuclear energy divide has assumed a distinct North-South dimension and technology denials have negatively affected development efforts in the South.

Lastly, this Chapter examined the extent to which existing asymmetries influence the "bargaining power" of actors in the diplomatic discourse. In this context, it recognised the importance of attributive power derived from military and economic capabilities especially in a distributive negotiation setting, but noted that structural or relational power as elements of issue-based power are no less important especially in a multilateral setting. It also noted that bargaining power is directly related to the successful use of resources and capabilities to change perceptions regarding the optimum outcome of a negotiation or to change the scope of a possible agreement to integrative options. The continued relevance of behavioural power and tactics, including coalition formation, was also emphasised.

CHAPTER 4

DIPLOMATIC INSTITUTIONS AND NORMS: INTERNATIONAL GOVERNANCE OF NUCLEAR ENERGY

4.1 Introduction

This Chapter aims to provide a brief overview of the major diplomatic institutions and international norms governing the peaceful uses of nuclear energy that were established prior to 2004. Based on the working definition for nuclear energy security proposed in Chapter 2, an effort is made to identify gaps, inadequacies and actions that weaken the international nuclear energy system. Of relevance to this study is the extent to which existing institutions and norms reflect current realities and the interests of the global South.

At the outset, it needs to be acknowledged that virtually all the major global governance institutions and norms in the nuclear arena have their nemesis in the East-West super power rivalry of the Cold War. While some minor adjustments have been made since the fall of the Berlin wall, none of these has achieved universality and only a limited number have legally-binding effect. The international system governing nuclear energy consists of a complex variety of international agreements, domestic laws and export regulations, administered by national and international bodies and agencies. Given the focus of this study, this Chapter will only deal with institutional and other agreements and arrangements at the international level.

Although the NPT is widely recognised as the primary element of the nuclear non-proliferation regime, the IAEA was the first international organisation established to govern the production and use of nuclear energy. Beyond the NPT and the IAEA, a number of other international arrangements related to the governance of nuclear energy have been created since the dawn of the atomic era that range from permanent diplomatic institutions, such as the Zangger Committee and the NSG, to more *ad hoc* arrangements and diplomatic initiatives of more limited duration and focus, such as the Global Threat Reduction Initiative (GTRI) and the Group of 8 (G8) Global Nuclear Energy Partnership.

4.2 Historical overview of the major diplomatic institutions and norms

To contextualise the diplomatic institutions and international norms governing nuclear energy, it is necessary to briefly examine the institutions responsible for the management of energy at a global level. Within the UN system, there is no single organisation dealing with energy matters as a whole. Following the 2002 World Summit on Sustainable Development (WSSD), UN-Energy was established to promote co-operation in the area of energy within the UN system and to engage non-UN stakeholders in implementing WSSD energy-related decisions. The work of UN-Energy primarily focuses on the implementation of the Johannesburg Plan of Implementation (JPOI), the decisions of the Commission on Sustainable Development (CSD-9) and the Programme for the Further Implementation of Agenda 21 (UN-Energy 2010:9-12).

In terms of the WSSD outcomes, the New Partnership for Africa's Development (NEPAD) serves as framework for implementation in Africa. In this regard, UN agencies in Africa have established an inter-agency co-ordination and collaborative mechanism, UN-Energy/Africa (UN-EA), to support the African Union's (AU) programme on energy through co-operation with the Economic Commission for Africa (ECA), in particular the AU/NEPAD energy initiatives. The focus of UN-EA is on the establishment of synergies with the various UN and non-UN agencies dealing with issues related to energy for development (UN-Energy 2010:10).

Despite ongoing efforts by the UN and regional organisations, such as UN-EA that contribute towards regional harmonisation and integration, existing arrangements related to energy security remain inadequate and highly fragmented. This is exacerbated by the lack of international norms related to energy. For example, although the General Agreement on Trade and Services (GATS) covers energy services and can protect investments in such services, the WTO rules do not deal with energy as such (WTO:2007).

These deficiencies have been recognised by UN Secretary-General Ban Ki-moon, who launched the "Sustainable Energy for All" initiative in 2011. This initiative aims to contribute to the International Year of Sustainable Energy for All in 2012, as called for by UNGA resolution 65/151 of 16 February 2011 (UNGA:2011). It also endeavours to bring together governments, the business community, investors, community groups and

academia in a common effort towards the goals of achieving universal access to modern energy services, improving energy efficiency and doubling the share of renewable energy to the global energy mix by 2030 (UN:2012).

International institutional arrangements and global norms governing nuclear energy are more comprehensive. Although the term "nuclear non-proliferation regime" is widely used to depict the various international institutions, instruments and arrangements governing nuclear energy at an international level, the constituent elements of the "regime" are not always seen as complementary. Many states, particularly in the global South, view some of the constituent elements of the "regime" as conflicting (for example the NPT and the export control regime that will be discussed below).

Following are some of the major efforts undertaken since the dawn of the nuclear era, which include international agreements and diplomatic institutions and norms governing the peaceful uses of nuclear energy. As noted in Chapter 1, the inherent dual nature of nuclear energy has given rise to agreements and institutions that have at least dual or multiple purposes, which has locked nuclear energy into a perpetual development-security nexus. Given the focus of this study, inclusive multilateral institutions and arrangements will be distinguished from the more selective and less inclusive plurilateral institutions and arrangements.

4.2.1 United Nations Atomic Energy Commission (UNAEC)

As noted in Chapter 1, efforts have been made since the end of WWII to deal with the predicament of how to expand the use of nuclear energy for peaceful purposes, while preventing the proliferation of nuclear weapons. During 1946, in the aftermath of nuclear weapon attacks by the US on Nagasaki and Hiroshima, attempts were made in the UN to address "problems raised by the discovery of atomic energy" through the establishment of the UNAEC by way of the very first Resolution adopted on 24 January 1946 by the then newly established UNGA (1946).

The UNAEC's work focused primarily on a plan[18] submitted by Mr Bernard Baruch, US representative on the Commission, to establish an international atomic development

[18] Baruch's plan was based on the Acheson-Lilienthal Report on the "International Control of Atomic Energy".

authority under the UN that would have had licensing and inspection powers, as well as the sole right to the mining of uranium and thorium, the refining of ores, as well as the construction and operation of nuclear power plants (Fischer 1997:18). According to the proposal, the development of nuclear weapons would have been banned and existing weapons destroyed after the establishment of such an authority. Baruch believed that this would have served as a first step towards global disarmament. Among others, Baruch's proposal included the idea of restricting the veto right of the five permanent members of the UN Security Council in the case of atomic energy violations (Baruch:1946).

The Soviet Union rejected the idea on the basis that the elimination of the US nuclear weapons arsenal should have preceded the establishment of such an authority. In response, the Soviet Union proposed that the production and use of nuclear weapons should, as the first step, be banned. The debate in the Commission reached a dead-end by 1948 and in 1949 the UNAEC was indefinitely adjourned (Fischer 1997:19-20).

4.2.2 Atoms for peace: The establishment of the International Atomic Energy Agency (IAEA)

Due to the failure of the UNAEC to produce results, the US retracted towards a policy of secrecy and denial. Despite the US denial efforts, the nuclear tests conducted by the Soviet Union and the UK, as well as the nuclear programmes launched by, among others, France and India, illustrated that the nuclear "genie was out of the bottle" (Fischer 1997:9-13). In recognising this reality, the US fundamentally altered its diplomatic strategy by promoting the idea of civilian nuclear co-operation, while increasingly gaining control over the spread of nuclear science and technology (Kessler 1995:23-24).

During his "Atoms for Peace" address to the UN on 8 December 1953, US President Dwight Eisenhower formally proposed the establishment of an international body to control and develop the use of atomic energy for peaceful purposes. This proposal eventually led to the establishment of the IAEA in 1957 after the negotiation of a draft IAEA Statute, by the "Eight-Nation Negotiating Group" (the US, UK, France, Canada, Australia, South Africa, Belgium and Portugal), which included the major producers of uranium at that time. Originally, the idea was for the eight states to reach agreement on the Statute, to establish the IAEA and only then to invite other states to join. Following

agreement by the Soviet Union in 1955 to join the statute negotiations, the negotiating group was expanded to twelve states that included Brazil, Czechoslovakia and India. After concluding these negotiations, the draft Statute was approved by a Conference on the Statute in October 1956 attended by eighty-one states. Although the original US plan with this new organisation was intended to cap the emerging arms race between the US and the Soviet Union through the creation of a uranium bank under a new international atomic energy agency, the latter idea never materialised (Scheinman & Potter 2005:24-27).

The primary purpose of the IAEA, as the only inclusive multilateral institution in the field of nuclear energy, is to promote the peaceful uses of nuclear energy, while seeking to ensure that it is not used "to further any military purpose" (Article II). Some of core functions of the IAEA, as stipulated in its Statute (IAEA:1957), include the promotion of research on, development of, and the practical applications of nuclear energy for peaceful purposes (Article III.A.1); the provision of materials, services, equipment and facilities for such research and development, and for the practical applications of atomic energy "with due consideration for the needs of the under-developed areas of the world" (Article III.A.2); the fostering of an exchange of scientific and technical information (Article III.A.3); the establishment and application of safeguards to ensure that nuclear assistance or supplies are not used for any military purposes and to apply safeguards, if so requested, to any bilateral or multilateral arrangement (Article III.A.5); and the establishment of nuclear safety standards (Article III.A.6).

In addition, the IAEA's Statute contains specific provisions dealing with the supply of nuclear material (Article IX) that are relevant to the discussion in Chapter 5 on the security of supply of nuclear material. While the Statute affirms a role for the IAEA as (potential) receiver and provider of nuclear materials, these provisions were never implemented.

In terms of the application of safeguards, the Statute also includes a provision that requires the IAEA to submit reports to the UN Security Council if, in connection with the IAEA's work, "there should arise questions that are within the competence of the Security Council...". The IAEA safeguards system evolved over the years and by 1968 it covered all fuel cycle activities except for uranium enrichment, which remained classified technology in the possession of only a few states. Although the IAEA safeguards system

covered all facilities specifically subjected to safeguards, indigenously developed facilities were originally not covered. With its adoption in 1968, the NPT extended the scope of international verification of national non-proliferation undertakings to cover all nuclear material in peaceful use, both acquired and indigenous (IAEA:1998).

In terms of the management structure, the Statute established the General Conference consisting of all members of the Agency, a Board of Governors that consists of a limited number of members (currently 35), including designated seats for the most nuclear technologically advanced states plus elected members in accordance with a system of proportional regional representation, as well as the Director General that acts as the Chief Administrative Officer of the Agency. The Statute also determined that the Board of Governors shall "have authority to carry out the functions of the Agency in accordance with its Statute" and subject to the responsibilities to the General Conference (i.e. the IAEA's annual programme and budget). In practice, this has meant that the Board has exclusive power in all safeguards matters (Kessler 1995:37-34).

Over the years, the IAEA has issued a large volume of non-legally-binding Safety Guides aimed at providing recommendations and guidance to states in achieving the highest levels of safety for protecting people and the environment from the harmful effects of ionising radiation. From 1960 to 1976, the Agency was authorised to carry out two health and safety inspections a year to ensure compliance with the approved safety measures. In 1976, this was changed to a voluntary system with no further authorised inspections. Nuclear Security Guidelines have also been published that cover issues and recommendations relating to the prevention and detection of, and response to, theft, sabotage, unauthorised access and illegal transfer or other malicious acts involving nuclear material and other radioactive substances and their associated facilities. These safety and security guides are updated on a regular basis.

Under the IAEA, various legally-binding conventions and agreements (see Annex A) have been concluded in the areas of nuclear safety and security, nuclear science and technology, as well as safeguards and verification measures.

The IAEA also conducts specific projects aimed at facilitating co-operation in technology development, such as the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) and various projects under its technical co-operation fund aimed at

strengthening national capacities (IAEA 2010a:21). These activities are funded through voluntary contributions, whereas the safeguards activities and other statutory functions are funded through the IAEA's regular budget.

Throughout the late 1970s and early 1980s, options were explored aimed at the development of a "proliferation-resistant" fuel cycle. The IAEA, for example, initiated a study in 1975 on the prospect of developing Regional Nuclear Fuel Cycle Centers (RFCC) with the aim of evaluating the advantages and disadvantages of such an approach from a safety, security, economic, safeguards, and non-proliferation perspective. Despite its positive conclusion about the advantages of regional centres, no action was taken to implement this idea (IAEA 2005:25, 68, 97).

In 1978, the IAEA also initiated a study to explore possibilities for International Plutonium Storage (IPS) to give effect to an unused provision in the IAEA statute that allows the Agency to accept the depositing of special fissionable materials until it is needed for use in a reactor (IAEA 2005:25, 64, 87). No conclusions could, however, be reached due to differences between states over what constituted "excess" plutonium and the terms for releasing stored plutonium to its owner.

During 1980, a further effort was made through the establishment of the IAEA Committee on Assurances of Supply (CAS). CAS focused on the assurance of nuclear supply, including the principles for international nuclear energy co-operation, and a long-term, predictable supply of material, technology, and fuel cycle services, as well as the role of institutional arrangements such as multinational fuel cycle centers (IAEA 2005:25). After holding 21 sessions CAS was unable to reach consensus. Most of these proposals were eventually abandoned due to competing interests driven by the dynamics of the Cold War, nationalism, economics and mistrust (Rauf & Vovchok 2009:10).

4.2.3 Treaty on the Non-Proliferation of Nuclear Weapons (NPT)

A key multilateral instrument negotiated during the mid-1960s following the Cuban Missile Crisis and after China joined the US, the Soviet Union, France and the UK in 1964 to become the fifth country to test a nuclear weapon, was the NPT. The conclusion of the Treaty was the direct consequence of increased international concern over the control of nuclear science and technology and preventing its misuse for non-peaceful

purposes. The NPT, which entered into force on 5 March 1970, is the major legal and normative barrier against the proliferation of nuclear weapons (Goldblat 2007:15-16). Although the early draft text of the NPT that was negotiated between the Soviet Union and the US focussed primarily on non-proliferation and verification, the drafters eventually included provisions on co-operation in the peaceful uses of nuclear energy and on nuclear disarmament, at the insistence of the NNWS that were later part of the negotiations (NPT:1968; Kessler 1995:34).

As a result of this "bargain", the legal obligations of the NPT rest on three core "pillars", namely nuclear disarmament, nuclear non-proliferation and the peaceful uses of nuclear energy. The inter-relationship between the three pillars is entrenched in the Treaty itself. Firstly, the nuclear-weapon State (NWS) parties undertake not to transfer nuclear weapons or other nuclear explosive devices or control over them and "not in any way to assist, encourage, or induce" a non-nuclear-weapon State (NNWS) party to acquire nuclear weapons (Article I). NNWS agree not to receive, manufacture or acquire nuclear weapons or to seek or receive any assistance in the manufacture of such weapons (Article II). In addition, the NNWS agree to accept safeguards by the IAEA on all their nuclear activities in order to verify the non-diversion of nuclear energy from peaceful to nuclear weapons purposes (Article III) (Kessler 1995:35-36). Secondly, under Article IV, the NPT guarantees "the inalienable right" of all Parties to the Treaty "to develop research, production and use of nuclear energy for peaceful purposes without discrimination", in conformity with their non-proliferation obligations. The "inalienable right" under Article VI is understood by most NPT Parties to include enrichment and reprocessing. However, Article IV is conditional upon activities being carried out "in conformity with Articles I and II of the treaty". All Parties are also obliged "to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy". Thirdly, under Article VI, the Parties undertake "to pursue negotiations in good faith on effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament".

The implementation of the Treaty is subject to regular review, as determined by Review Conferences held every five years. This process is based on one of the package of decisions made during the 1995 NPT Review and Extension Conference that decided on the indefinite extension of this instrument (Goldblat 2007:21). Today, the NPT enjoys

almost universal membership with the noticeable exception of India, Pakistan and Israel, as well as DPRK that announced its withdrawal from the Treaty in 2003.

4.2.4 Nuclear-weapon-free zones (NWFZ)

Another element of the non-proliferation regime is the nuclear-weapon-free zones. The first *de facto* nuclear-weapon-free zone (NWFZ), the Antarctica, predates the NPT and was established through the Antarctic Treaty (1959) that entered into force on 23 June 1961. This Treaty prohibits all military activities in the Antarctica, including nuclear weapons and their testing and confirms that this territory will be used for peaceful purposes only.

Further treaties aimed at restricting the proliferation of nuclear weapons in other environments include the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (1967) and the Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil Thereof (1971).

The first NWFZ covering an inhabited geographical area that also predates the NPT and entered into force on 25 April 1969, was the Tlatelolco Treaty (1967), which established such a zone in Latin America and the Caribbean. The Tlatelolco Treaty was followed by further agreements on establishing NWFZs in the South Pacific (Treaty of Rarotonga:1985), Southeast Asia (Treaty of Bangkok:1995), Africa (Treaty of Pelindaba:1996) and Central Asia (Treaty of Semipalatinsk:2006).

These NWFZ treaties either established or reinforced exiting norms regarding the control of nuclear energy by, among others, banning the testing, use, manufacture, production or acquisition of nuclear weapons by State Parties and by determining that nuclear energy shall be used in the respective regions for exclusively peaceful purposes. All these treaties make it clear that their provisions shall not prejudice the right of Parties to the use of nuclear energy for peaceful purposes, provided that such activities are undertaken in conformity with the relevant NWFZ treaty.

The Tlatelolco Treaty imposes obligations on Parties to negotiate agreements with the IAEA for the application of safeguards to their nuclear activities without specifying the nature of such agreements. The Rarotonga, Bangkok and Pelindaba treaties impose the obligation on Parties to conclude comprehensive safeguards agreements (INFCIRC/153 (Corrected)) with the IAEA. Beyond requiring a comprehensive safeguards agreement, the Treaty of Semipalatinsk imposes a further obligation on Parties to conclude an Additional Protocol (see INFCIRC/540 (Corrected)) with the IAEA. These treaties also impose similar safeguards requirements as a condition for the supply of nuclear material, equipment and technology.

Besides these general norms governing nuclear energy, the Treaty of Bangkok (1995) requires Parties, prior to embarking on peaceful nuclear energy programmes, to subject their programmes to rigorous nuclear safety assessments in conformity with the guidelines and standards recommended by the IAEA for the protection of health and minimising the danger to life and property. It also requires Parties to dispose of radioactive wastes and other radioactive material in accordance with IAEA standards and procedures. Likewise, the Pelindaba Treaty requires Parties not to take any action to assist or encourage the dumping of radioactive wastes or other radioactive matter within the Zone. Most NWFZ treaties[19] also contain provisions for the promotion of the use of nuclear science and technology for economic and social development.

4.2.5 The Zangger Committee (Nuclear Exporters Committee)

Under Article III(2) of the NPT, State Parties undertake not to provide source or special fissionable material or equipment or material especially designed or prepared (EDP) for the processing, use or production of special fissionable material to any NNWS unless such material or equipment is subjected to the safeguards required under Article III of the Treaty. Since the NPT does not provide a definition for the EDP provision, a group of 15 nuclear supplier states held a number of informal meetings between 1971 and 1974 chaired by Professor Claude Zangger of Switzerland with the aim of reaching a common understanding on the definition of EDP equipment or material and the conditions and procedures that would govern exports in accordance with the safeguards obligations

[19] See for example Article 12 of the Pelindaba Treaty that establishes the African Commission on Nuclear Energy (AFCONE) that is responsible for reviewing the application of safeguards to peaceful nuclear activities, for encouraging regional and sub-regional programmes for cooperation in the peaceful uses of nuclear science and technology and for promoting international cooperation with extra-zonal States.

under Article III (Goldblat 2007:41). This plurilateral group, which became known as the Zangger Committee, is an informal group and its decisions are not legally-binding (ZC 2011). The Committee, which now consists of 37 members, meets regularly to maintain and update a list of nuclear material and equipment, the so-called "Trigger List" that may only be exported to NNWS if safeguards are applied in the recipient state.

4.2.6 The Nuclear Suppliers Group (NSG)

A plurilateral institution closely associated with the Zangger Committee that deals with the control of nuclear material, equipment and technology is the NSG. The NSG consists of a group of 46 participating governments that include most of the major nuclear technology holders. The primary purpose of the NSG, which was established in 1974 and succeeded the so-called London Club, is to prevent the proliferation of nuclear weapons through the implementation of export control arrangements under its Guidelines for nuclear transfers (Fischer 1997:98).

The establishment of the NSG in 1974 followed India's "peaceful" nuclear explosion in 1974, using equipment and material supplied for peaceful use. This highlighted the need for alternative means to reduce the proliferation risk. The NSG Guidelines that built on the Trigger List of the Zangger Committee were published in 1978 as IAEA Document INFCIRC/254 (it later became known as Part 1 of the Guidelines). These Guidelines apply to all nuclear transfers to NNWS to ensure that such transfers are not diverted to unsafeguarded nuclear activities (IAEA 2000:3). Accordingly, exports to NNWS would be denied unless international safeguards are accepted on the transferred material and equipment, and conditions for the physical security of such material, equipment and facilities are met. Although agreement could not be reached in the NSG on ending further transfers of sensitive nuclear technologies, the suppliers agreed to exercise a policy of restraint in considering the export of enrichment, reprocessing, and heavy-water production technology and to encourage multilateral arrangements for transfers (Fischer 1997:98; Goldblat 2007:39-41).

In addition, the NSG decided to establish Guidelines (now known as Part 2) for transfers of nuclear-related dual-use equipment, material and technology that can be used in both nuclear and non-nuclear activities and that could potentially be diverted towards non-peaceful applications. In 1995, the NSG decided to make full-scope safeguards

agreements with the IAEA a condition for the future supply of Trigger List items to any NNWS. This NSG policy was later adopted by NPT State Parties at the 1995 Review and Extension Conference (IAEA 2000:4).

Except for a few developing countries (Argentina, Belarus, Brazil, China and South Africa), the 46 participating governments in the NSG consist of most of the major technology holders and developed countries in the global North.

4.2.7 Institutional arrangements and norm-setting within the United Nations

Beyond the efforts made in the context of the UNAEC, the UNGA created a number of institutions and norms relevant to the peaceful uses of nuclear energy. Perhaps the most significant effort was the First Special Session of the UNGA devoted to Disarmament (SSOD1) held in 1978. The Final Document of SSODI of 30 June 1978 notes, among others, that disarmament measures must be consistent "with the inalienable right of all States, without discrimination, to develop, acquire and use nuclear technology, equipment and material for the peaceful use of nuclear energy and to determine their peaceful nuclear programmes in accordance with their national priorities, needs and interests, bearing in mind the need to prevent the proliferation of nuclear weapons". Further, that "international co-operation in the peaceful uses of nuclear energy should be conducted under agreed and appropriate international safeguards applied on a non-discriminatory basis". In addition, the Final Document notes that non-proliferation measures "should not jeopardise the full exercise of the inalienable rights of all States to apply and develop their programmes for the peaceful uses of nuclear energy for economic and social development in conformity with their priorities, interest and needs. All States should also have access to and be free to acquire technology, equipment and materials for peaceful uses of nuclear energy, taking into account the particular needs of the developing countries. International cooperation in this field should be under agreed and appropriate international safeguards applied through the International Atomic Energy Agency on a non-discriminatory basis in order to prevent effectively the proliferation of nuclear weapons". Lastly, it decided that "each country's choices and decisions in the field of the peaceful uses of nuclear energy should be respected without jeopardising their respective fuel cycle policies or international co-operation, agreements and contracts for the peaceful uses of nuclear energy", provided that safeguard measures are applied (UNGA:1978).

The Special Session furthermore decided on the tasks and responsibilities of the respective disarmament institutions recognised or created by SSOD1. This included the First Committee of the UNGA that would subsequently deal with questions related to disarmament and international security; a UN Disarmament Commission, composed of all UN Members, that would act as deliberative body and consider and make recommendations on various problems in the field of disarmament and follow-up on the decisions and recommendations of SSOD1; a Committee on Disarmament (now known as the Conference on Disarmament), that would act as a single multilateral disarmament negotiating forum of limited size (which includes the five NWS and a selected group of other states) taking decisions on the basis of consensus; a UN Centre for Disarmament that would provide research and information functions; and an Advisory Board on Disarmament Matters that would advise the UN Secretary-General on studies to be undertaken under the auspices of the UN.

From the end of the Cold War until 2004, only one new multilateral agreement in the field of nuclear energy has been concluded in the UN, namely the Comprehensive Nuclear Test-Ban Treaty (CTBT:1996). The CTBT was adopted by the UNGA during 1996 after consensus could not be reached on the draft Treaty in the Conference on Disarmament (CD) where it was negotiated. Although 182 states have signed the CTBT by the end of 2011, several of the Annex II states whose ratification is required for entry into force has yet to do so. Parties to the CTBT have the obligation not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control.

The UN Security Council (UNSC) also adopted a number of resolutions that endeavoured to create either political or legally-binding norms in the field of nuclear energy. These can be divided between general and country-specific resolutions. In terms of general resolutions, UNSC Resolution S/RES/984 of 11 April 1995, for example, expresses the conviction of the Council that everything must be done to avoid nuclear war and prevent the spread of nuclear weapons, “as well as facilitate international cooperation in the peaceful use of nuclear energy” (UNSC:1995).

On country-specific resolutions, the Council took more decisive and legally-binding decisions, by for example imposing through Resolution S/RES/418 of 4 November 1977 a mandatory ban on all states from engaging in “any cooperation with South Africa in the

manufacture and development of nuclear weapons" (UNSC:1977). Likewise, in Resolution S/RES/1172 of 6 June 1998, the Council called upon India and Pakistan to stop their nuclear weapons programmes and to avoid the export of equipment and technology that could contribute to nuclear or missile programmes in other countries and encouraged all states to prevent the export of equipment or technology that could assist programmes in India or Pakistan (UNSC:1998).

4.2.8 Other *ad hoc* arrangements

Since 2001, nuclear energy and specifically the increasing risk of proliferation driven by the expected growth in nuclear energy, including the threat of nuclear terrorism, has become the subject of a wider international activities and a variety of *ad hoc* diplomatic initiatives.

Among others, this included the G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, initiated by the United States at the 2002 Kananaskis G8 Summit that initially focused on the legacy of the weapons of mass destruction programmes of the former Soviet Union (Goldblat 2007:57). The key focus of the Global Partnership is on securing and dismantling fissile materials and nuclear weapons around the world, promoting WMD export controls, and providing assistance for the redeployment of WMD scientists and industry engagement. Membership of the Global Partnership now includes 23 countries (mostly western, developed countries and a few from Eastern and Central Europe) and the European Union, with no members from Africa or Latin America.

Co-operation on nuclear energy is also carried out through various other organisations and programmes, including the Nuclear Energy Agency (NEA) of the OECD, the EU and programmes such as those conducted under the Generation IV International Forum (GIF) and the International Thermonuclear Experimental Reactor (ITER) project. The GIF has 13 members (Argentina, Brazil, Canada, China, France, Japan, Republic of Korea, South Africa, Switzerland, the UK, the US, Russia and Euratom) and aims to develop a new generation of nuclear energy systems that offer advantages in the areas of economics, safety, reliability, sustainability and non-proliferation (IAEA 2010a:21).

4.3 Strengths and Weaknesses

4.3.1 Multilateral institutions and agreements

As an autonomous multilateral organisation with a working relationship with the UN, the IAEA is open for participation by all States that are "able and willing" to carry out the obligations under the IAEA Statute (1957) and the UN Charter. The inclusive nature of the IAEA has accorded this institution a solid foundation as both a promotional agency for nuclear energy and an independent, objective body entrusted with the safeguarding of nuclear materials.

Despite these features, developing countries in the global South have for many years remained underrepresented (ElBaradei:2003). The last decade has seen a considerable increase in developing country membership, reflecting increased interest in the various IAEA programmes, ranging from nuclear power to programmes related to human and animal health, agriculture and water management.

Although the IAEA General Conference in 1999 adopted an amendment to the Statute (see GC(43)/RES/19/Corr.1) to improve representation in the Board of Governors, this has yet to enter into force with acceptance by two-thirds of the Member States. Given the composition of the Board of Governors, as the highest-level policy-making organ of the Agency, decisions tend to reflect the interests of the major technology holders and the developed countries of the global North. With the rotation system for elected members of the Board, around fourteen of the 35-member Board are usually members of the NAM. Since a simple majority is sufficient to approve most matters before the Board, decisions tend to favour the global North. This undermines not only the authority of the Board of Governors, but also raises questions about the credibility of the IAEA as a multilateral institution responsive to the needs of its entire membership. Another weakness is the IAEA's Technical Co-operation (TC) programme that is funded through voluntary contributions.

In addition, the safety and security guidelines issued by the Agency are all voluntary in nature and do not enjoy universal adherence. The same problem is evident in relation to the various international agreements concluded under the IAEA (see Annex A). The norms introduced under the various Conventions are therefore both incomplete and have

not achieved universality. Of particular concern is the lack of participation by some key technology holders of the North in these Conventions, including the US and other NWS.

The revelations during the 1990s that Iraq had concealed the development of a nuclear weapons programme provided evidence of the limitations of the verification system implemented by the IAEA in ensuring that the norm against the diversion of nuclear material and equipment is not undermined (Kessler 1995:41-42). This realisation led to the strengthening of the safeguards system with the adoption of the Model Additional Protocol in 1997 that expanded the IAEA's inspection capabilities beyond the verification of declared material and activities. This meant that both declared and any suspected undeclared activities could now be examined by the Agency (Goldblat 2007:18). While many states have already concluded an Additional Protocol with the IAEA, a significant number continue to reject these measures for a number of reasons. These include the fact that there is no legal obligation on states to conclude and bring into force such an instrument, as well as resistance by some states to commit to additional non-proliferation obligations, while the possessors of nuclear weapons continue to resist any restraint on their programmes or to disarm.

While the IAEA has traditionally been viewed as a technical institution, its work has become increasingly politicised (Xinhuanet:2010). The revelations about undeclared nuclear activities in Iran since 2003 exposed the Agency to significant political pressure. This was until recently resisted through the issuance of factual reports that reflected the problems related to the IAEA's verification activities in Iran, while confirming that no evidence could be found to confirm the existence of any nuclear weapons programme (IAEA:2006). The IAEA Board of Governors nevertheless adopted a number of resolutions that prompted UN Security Council action against Iran, despite the absence of conclusive evidence about the diversion of material and technology for non-peaceful purposes (IAEA:2012).

Although the NPT continues to be recognised as the foundation of the nuclear non-proliferation regime, it is a discriminatory instrument that created two distinct classes of states, the NWS and the NNWS. The NPT essentially divides the world into nuclear-weapon "haves" and "have-nots", which has direct implications for the "have-nots" in terms of the development and use of nuclear energy for peaceful purposes. While the NWS enjoy virtually unfettered access to nuclear material, equipment and technology,

beyond the general NPT norm against nuclear weapons proliferation, the NPT imposes stringent controls on the nuclear activities of NNWS[20] that create additional burdens and restrictions on these states.

Article IV of the NPT recognizes the "inalienable right" of states to the development and use of nuclear energy for peaceful purposes. Since Article IV contains no specific reference to enrichment and reprocessing, it has resulted in different interpretations in the diplomatic discourse on the types of activities covered under the NPT. Some commentators in the North argue that since Article IV does not include a reference to the sensitive elements of the nuclear fuel cycle, such activities cannot be regarded as part of the inalienable right of states recognised by the NPT. Most states in the South believe that the absence of any explicit references, sensitive nuclear fuel cycle activities are an integral part of the inalienable right referred to in Article IV of the NPT (Acheson 2010:58-61; Goldblat 2007:16).

Another issue of contention is the notion that Article IV rights are conditional upon conformation with other relevant obligations under the NPT (Johnson 2010:437). While the NPT itself recognises the link between Article IV rights and Articles I and II obligations, and the 1995 NPT Review and Extension Conference agreed to extend this link to the safeguards and verification provisions of Article III, most countries in the South, including those outside the NPT, hold the view that the inalienable right to the peaceful application of the atom pre-dates the NPT and can in fact be regarded as *jus cogens* – as an unconditional, basic and fundamental right of all states.

The diplomatic debate on the strengthening of the safeguards and verification regime applicable to NNWS stands in stark contrast to the debate on the implementation of the disarmament obligations of the NWS under Article VI. This is not solely a debate between the NWS and the NNWS, but is complicated by a sizeable number of NNWS in the global North (in NATO) that continue to fall under the "nuclear umbrella" and other nuclear-sharing arrangements (Butcher & Butler 2010:33-42). The lack of progress towards nuclear disarmament and the unfulfilled commitments made by the NWS continue to contribute to significant tensions within the NPT (Johnson 2010:439).

[20] See Article III of the NPT regarding the safeguards and verification arrangements applicable to nuclear activities in NNWS.

The main challenge to the NPT arguably comes from its discriminatory design (Johnson 2010:429-435). From its inception, the Treaty was criticised by states in the global South as introducing different norms for different states. When the text of the NPT was debated by the UNGA on 22 May 1968, Argentina, for example, explained that it would not join the treaty because it legitimised the "disarmament of the unarmed".

During the Cold War, the inequality introduced by the NPT was justified on the basis of the power struggle between East and West in which nuclear weapons were used as balancing instruments in ensuring international stability. However, as Carranza (2006:490) notes, the end of the Cold War deprived the NWS of their main rationale for the possession of nuclear weapons, which has exacerbated the discriminatory nature of the NPT in the post-Cold War era. Despite strong opposition by some members of the NAM, the NPT was indefinitely extended in 1995 through a decision that was adopted without a vote. Some positive steps by the NWS before the 1995 NPT Review and Extension conference, such as US support for the CTBT and South Africa's active diplomacy resulted in a package deal according to which the NPT was indefinitely extended in exchange for a strengthened review process, the adoption of a decision on the 'Principles and Objectives for Nuclear Non-Proliferation and Disarmament', and a resolution on the establishment of a Middle East zone free of nuclear weapons, as well as other weapons of mass destruction. Another positive factor was the commitments made by the US and Russia to reduce their nuclear arms, which created the impression of a willingness by these countries to implement the nuclear disarmament side of the NPT bargain (Carranza 2006:489-525).

The nuclear non-proliferation regime came under serious duress shortly after the NPT's indefinite extension with the 1998 Indian and Pakistani nuclear weapons tests and the US Senate's rejection of the ratification of the CTBT in 1999. At the 2000 NPT Review Conference, the Parties agreed to implement "13 Practical Steps" to meet their nuclear disarmament obligations, including an unequivocal undertaking by the NWS to accomplish the elimination of their nuclear arsenals (Johnson 2010:439-440).

This renewed commitment to the nuclear disarmament goal of the NPT after the end of the Cold War was short-lived. The terrorist attacks in the US on 11 September 2001 brought about a significant shift in the dominant discourse on nuclear energy, away from nuclear disarmament towards non-proliferation and nuclear terrorism. In 2002, the US

Administration also adopted as official policy the doctrine of unilateral pre-emptive strikes against "rogue states", abandoning the previous Administration's treaty-based, multilateral approach to non-proliferation. Problems of compliance with NPT treaty obligations on the part of NNWS (Iraq, DPRK and Iran) therefore effectively relegated the nuclear disarmament commitments of the NWS to the periphery. It also illustrated that the US viewed the possible acquisition of nuclear weapons by what it called "rogue states", such as the DPRK or Iran, and the potential transfer of weapons-grade fissile material to terrorist organisations as a top priority and serious threat to US national security (Carranza 2006:491).

The GW Bush Administration's non-proliferation policy refused to acknowledge the NPT bargain and instead endeavoured to strike a new bargain by closing what it perceived to be a loophole in Article IV that could allow states to develop nuclear weapons under the guise of peaceful nuclear programmes. The US endeavoured to impose a more intrusive inspection regime in NNWS by proposing that the IAEA's Additional Protocol be made obligatory under the NPT. These ideas were rejected by many in the global South as contradictory to the NPT and undermining the NPT bargain. These efforts together with the revelations of undeclared nuclear activities in the DPRK and Iran provided the backdrop for the failure of the 2005 NPT Review Conference to produce an outcome document (Carranza 2006:489-525).

Today, as a result of the conclusion of several NWFZ treaties, the entire Southern Hemisphere is covered by the norm against the development and testing of nuclear weapons. However, the Protocols to the NWFZ treaties that are open to signature and ratification by the NWS and that were supposed to provide security assurances to Parties to these treaties have not yet been signed and/or ratified by all NWS. Some of the NWS that ratified these instruments either submitted reservations or made unilateral declarations that impose certain conditions on the provision of assurances. Likewise, while some of these treaties contain provisions related to the promotion of co-operation in the peaceful uses of nuclear energy and the safe and secure operation of nuclear activities, limited success has been achieved.

The actions and inactions of the UNSC and the various components of the UN disarmament machinery continue to reflect the realities and power configurations of the Cold War era. This is detested by the agenda of these institutions that continue to

approach security issues from a narrow military and state-centric perspective, with very limited attention to the human security dimension of current threats. Where human security considerations are brought into the equation, evidence (such as the recent imposition of a no-fly zone in Libya) suggests that they are mostly used as a pretence for actions that in fact undermine humanitarian imperatives. As such, these bodies lack the necessary credibility and legitimacy as institutions able to respond to the threats of the twenty-first century. This is reflected in the non-implementation of UNSC resolutions, whether they are politically or legally-binding, dealing with the full range of country-specific situations to thematic issues of relevance to nuclear energy[21]. The disarmament machinery that was created in 1978 has largely become dysfunctional and unable to deal effectively with such threats. For example, CD, which was recognised by SSODI as the single multilateral disarmament negotiating forum, has remained deadlocked for the last 14 years.

4.3.2 Plurilateral institutions

The realization that the structures of the NPT and the IAEA safeguards arrangements were subject to the decision of sovereign states about the type of nuclear facilities they wish to build and operate provided the background to the creation of the NSG following the Indian nuclear test in 1974 (Fischer 1997:98). One of the NSG's underlying aims was to fill the perceived proliferation gaps that existed in the multilateral system. One of these was the potential diversion of materials from peaceful facilities through exercising the right to withdrawal from the NPT (Article X) and from IAEA safeguards arrangements. In this manner, states could receive material and technology for peaceful purposes that could, after withdrawal, be diverted towards non-peaceful activities (Goldblat 2007:22). Another gap was the potential for those outside the NPT to acquire, through the transfer of civilian facilities, the necessary means that could be diverted to unsafeguarded activities, including weapons programmes. The NSG endeavoured to effectively close these gaps through a policy of material, equipment and technology denial to recipients that do not meet certain stringent criteria.

Since most of the major technology holders are members of the NSG, it is able to effectively deny access to certain material, equipment and technology by outsiders to the

[21] For example, a large number of developing countries have not yet submitted the obligatory national report on the implementation of UNSC Resolution 1540 (2004) dealing with non-state actor access to nuclear material, equipment and technology that was adopted under Chapter VII of the UN Charter.

group. In 2002, the revelations about the enrichment-related activities of Iran nevertheless demonstrated the potential to circumvent existing controls through indigenous activities and by acquiring technology from states not bound by transfer-control commitments. The NSG decisions are taken by consensus and the expansion of membership since the end of the Cold War to a relatively diverse group of countries with conflicting interests, have complicated decision-making. Another problem is that the NSG's decisions are not legally-binding, which weakens the actual implementation of decisions at a national level. Furthermore, the work of the NSG is done during closed meetings and this lack of transparency has been a source of concern to non-members (Yudin 2010:10).

The NSG has also regularly been accused of imposing unwarranted restrictions on access to nuclear material, equipment and technology and that it operates on the basis of discriminatory practices (Goldblat 2007:41). A further weakness is the exclusive nature of the NSG as a suppliers group. Since membership is limited to a select group of states, export controls are formulated without consultation with the broader international community and therefore do not necessarily reflect the interests of those not represented in the NSG. As a result, efforts to secure universal support for the NSG Guidelines have consistently been rejected by a significant number of states, predominantly from the global South, who argue for the negotiation of universal, non-discriminatory rules governing the transfer of nuclear material, equipment and technology (NAM:2005).

4.3.3 *Ad hoc* arrangements and Summit meetings

Most of the *ad hoc* initiatives and Summit meetings since the end of the Cold War have been undertaken with the stated aim of addressing some of the perceived shortcomings within the inclusive multilateral fora. As noted above, these initiatives were almost without exception driven by a select group or coalitions of the willing of mostly developed states from the global North, usually under the leadership of the US. In some instances, a select group of developing countries were also co-opted to provide legitimacy to these efforts.

While the motivation given for pursuing some of these initiatives was generally to curb the potential threat of nuclear terrorism, these initiatives focused either on curbing the further spread of sensitive technologies or imposing additional restrictions or safety and

security measures on civilian nuclear activities. The basic premise underlying all these initiatives is the notion that certain materials and technology are safe in the hands of some "responsible" international players. The question, however, is who decides on who the "responsible" possessors are? Ironically, the states that usually propose such initiatives tend to be the possessors of nuclear weapons with a proven record of having diverted nuclear materials and technology to non-peaceful activities, as well as their closest allies that are usually part of military alliances and nuclear sharing arrangements that contradict the legal norms established under Article I and II of the NPT.

There is also a significant overlap between the different initiatives that all seem to be informed by a few basic objectives that include the strengthening of export controls, the denial of sensitive material and technology transfers, the removal and disposition of sensitive material (defined as HEU and plutonium in the hands of NNWS), increasing transparency by NNWS and targeting and punishing alleged transgressors. As with the plurilateral arrangements, most *ad hoc* initiatives lack legitimacy in terms of their representational features.

4.4 Conclusion

This Chapter endeavoured to identify the core elements of what constitutes the international system governing nuclear energy. This system covers a broad range of nuclear-related activities and has evolved over time, including during successive NPT review conferences and IAEA general conferences, where issues such as the transport of nuclear waste, the safety of nuclear power stations and nuclear security gradually appeared on the agenda. Considering the working definition for nuclear energy security introduced in Chapter 2, the research confirmed that international norms have been established in relation to several of these elements, including safety, physical security and non-proliferation. However, none of these has been universally accepted and many are of a non-binding nature. What therefore seems to have been created is a highly fragmented system of unilateral, bilateral, multilateral and plurilateral international governance of nuclear energy.

This Chapter confirmed the centrality of the IAEA and the NPT that, despite their inherent weaknesses, continue to constitute the core of global nuclear governance. It was noted, however, that structurally the IAEA continues to reflect global power configurations of the

post-WWII era and that countries of the South remain underrepresented especially in the highest policy-making organ of this institution. Beyond the discriminatory nature of the NPT, which reflects its Cold War character, the continued search for balance between the nuclear disarmament and nuclear non-proliferation pillars of the treaty has negatively impacted on the peaceful use pillar of the Treaty. As a result, the peaceful uses of nuclear energy have been locked into a perpetual military/security paradigm under the NPT.

The plurilateral institutions discussed in this Chapter are dominated by technology holders from the North and their discriminatory practices undermine their standing as non-proliferation institutions. It therefore confirmed that these institutions lack the necessary credibility to act as a sustainable alternative to the multilateral institutions. In terms of other *ad hoc* initiatives, it was noted that although these initiatives were justified on the basis of the need to curb the potential threat of nuclear terrorism, their activities focussed mostly on curbing the further spread of sensitive technologies or imposing additional restrictions or safety and security measures in relation to civilian nuclear activities.

It is therefore evident that while certain narrow national and international security interests are served by the IAEA and NPT, the multilateral nuclear non-proliferation system remains ill-equipped to deal with this issue from a human security perspective. This is particularly noticeable in the limitations of the various treaties covering the safety and security of nuclear material, equipment and technology, which are essential components of the safe and sustainable use of nuclear energy. In addition, the inadequacies of the system in providing assurances against the abuse of these materials and technology for non-peaceful purposes increase insecurity. Likewise, the promise of increased access to nuclear energy in the areas of electricity generation, human and animal health and various other peaceful use applications in the global South remain unfulfilled.

CHAPTER 5

ANALYSIS OF THE 2004-2011 DIPLOMATIC DISCOURSE ON THE FUTURE OF THE NUCLEAR FUEL CYCLE

5.1 Introduction

This Chapter provides a critical analysis of the diplomatic discourse between 2004 and 2011 on the future of the nuclear fuel cycle by examining the various initiatives undertaken and proposals made in the relevant fora, including the UN and other multilateral bodies (NPT, IAEA, UNSC) and plurilateral initiatives (such as the NSG, G8, G20, IBSA).

With the estimated doubling of global nuclear power over the next 30 years, a significant percentage of the expansion is driven by nuclear programmes in countries that either do not currently have established nuclear industries or where only limited capacities exist. Such expansion is expected to increase global demand for nuclear fuel and related fuel cycle services. It is generally accepted that access to sensitive fuel cycle technologies by a wider group of states may increase the risk of their potential misuse for non-peaceful purposes. Technology holders in the global North generally share the view that further technical measures and international institutional mechanisms are required to effectively curb the proliferation threat associated with the expansion of nuclear energy. In this regard, various political, economic and diplomatic strategies for controlling access to sensitive materials, facilities or technologies are being utilised. As a result, international efforts since 2004 have increasingly focused on further restrictions and/or the denial of access to sensitive fuel cycle technologies.

Since most of the proposals have been pursued in the multilateral and plurilateral diplomatic modes, these will constitute the core focus of this Chapter. Where applicable, efforts in the bilateral, summitry and polylateral diplomatic modes will also be addressed.

5.2 Nature of the diplomatic discourse on the nuclear fuel cycle: discussion, negotiation or bargaining?

According to the online Etymology Dictionary, the noun "discourse" derives from the Latin word *discursus* meaning "process of understanding, reasoning and thought" and from the literary Latin past particle stem *discurrere*, which means "conversation" (*dis-* apart + *currere* to run). What then is the nature of the diplomatic "conversation" on the nuclear fuel cycle? Negotiation, which is defined by the Merriam Webster's Online Dictionary as "discussion for the purpose of reaching agreement", is regarded as one of the core functions of diplomacy (VCDR:1961). This raises the question whether "agreement" is not just one of the possible outcomes of "negotiation". Berridge (2010:25) notes that diplomats spend much of their time "lobbying" state agents and that the only difference with "negotiations" is "that the dialogue is configured differently and any successes are not formally registered". In many instances, the outcome of negotiations is not formalised by way of formal agreements or in the public domain. However, successful lobbying could also be formally registered, whether publicly or privately between state agencies through secret agreements, the exchange of diplomatic notes or in other forms of communication such as statements or joint declarations.

Most of the classical scholars of diplomacy recognise the centrality of negotiation in diplomatic practice. Cardinal Richelieu introduced the concept of "continuous negotiation", which he regarded as an essential condition for the well-being of the state. His conception of negotiation is not limited to the conclusion of agreements, but that it also provides an opportunity for states to keep abreast of developments and, in some situations, to gain more time (Berridge *et al* 2001:71-82).

While negotiations in the bilateral mode form an integral part of any bilateral relationship, including on bilateral co-operation in nuclear energy, it constitutes the operational focus of diplomacy in the multilateral mode, where it serves as its most important function (Berridge 2010:25; Meerts 1999:86). As will be noticed from the analysis in this Chapter, the nature of the diplomatic discourse on the nuclear fuel cycle alternates between general discussions, debate, lobbying, bargaining and around-the-table negotiations, and is linked to both the issues under consideration and the rules of engagement of the diplomatic mode in which interaction is taking place.

5.2.1 Bargaining vs. Negotiation

In IR literature, "bargaining" and "negotiation" are often used interchangeably. While bargaining can be seen as an integral component of, or tactic in, the negotiation process where proposals and counter-proposals are exchanged, it can also be used to describe the broader concept that includes both verbal (such as around-the-table negotiations) and non-verbal communications, which could include forms of diplomatic signalling (Cohen:1987; Jönsson 1990:2-3; Schelling 1980:21). Hedley Bull (1977:177) notes that the problem for diplomacy is that "states have different interests, and ... common interests have first to be identified by a process of bargaining before any question of maximization of them can arise". Therefore, even when the will or opportunity to negotiate (in a narrow sense) is absent, bargaining can fulfil an important function in identifying common interests, clarifying misconceptions, moderating differences and exploring measures to harmonise interests.

5.2.2 Stages in the negotiation process

Berridge (2010:25) notes that negotiation scholars, such as Zartman and Berman (1982), distinguish between three negotiation stages, namely pre-negotiations (reaching agreement on the need or ripeness for negotiation; the agenda; rules of engagement), formula (framework for agreement or negotiating mandate) and details. In practice, these stages are not necessarily sequential and may overlap, or the issues could become so intractable that it is necessary to return to an earlier stage. Pre-negotiations are generally more pronounced when the stakes are high and almost unnoticeable in negotiations between friendly actors (Berridge 2010:26). In the multilateral mode, the same stages are evident although they take place within a different set of circumstances that present different dynamics, possibilities and complexities (Touval:1989). The diplomatic discourse on the nuclear fuel cycle reflects the interchange between the different stages of the negotiation process, as well as between the different diplomatic modes.

5.2.3 Interests, conflict and interdependence

Any negotiation or bargaining situation necessarily involves "issues of common interest and issues of conflict" (Iklé 1964:2). According to Thomas Schelling (1980:5), "most

conflict situations are essentially bargaining situations". In his view, diplomacy is bargaining in that it seeks outcomes that are better than the alternatives, even if they are not ideal for either party. He notes that although bargaining can take many forms (be polite or rude, involve threats and/or offers, assume trust or mistrust), there must be some common interest, even if it is only to avoid mutual harm. Bargaining situations do not necessarily lead to negotiations. "Interdependence" is a third element that needs to be present and "entails the need for mutual rather than unilateral action" (Jönsson 2002:14). While common interests and issues of conflict are evident in the diplomatic discourse on the nuclear fuel cycle, it is questionable whether there is a shared view on the need for mutual action based on an acceptance that the different actors are interdependent.

5.3 An intensified diplomatic debate

Since the end of the Cold War and until 2003, a number of developments highlighted concerns over the future of the nuclear fuel cycle. These included cases of nuclear trafficking involving sensitive nuclear materials and equipment. Under a UN Security Council mandate, IAEA inspectors discovered and dismantled a secret nuclear weapons programme in Iraq, a NNWS party to the NPT. As a consequence, IAEA safeguards were reviewed and strengthened with the adoption of the Model Additional Protocol in 1997 that expanded the Agency's inspection capabilities. IAEA inspectors in the DPRK, another NPT party at the time, raised questions about the DPRK's plutonium reprocessing activities. The terrorist attacks in the US on 11 September 2001 raised further concern about possible access by non-state actors to weapons of mass destruction, including the threat of nuclear terrorism (ICNND 2010:34-35).

During 2002, revelations also emerged regarding undeclared nuclear activities in Iran in violation of its NPT safeguards agreement. This not only led to heightened tensions and diplomatic activity surrounding allegations of a possible military dimension to Iran's nuclear programme, but also raised questions about the effectiveness of the IAEA safeguards system, international co-operation and technology transfers, as well as the control of the nuclear fuel cycle (Veiluva 2010:87-110).

During an address at the Fort Lesley J. McNair National Defense University on 11 February 2004, former US President GW Bush reflected on these developments and

what he called the "new threat" of terrorists gaining access to weapons of mass destruction, including nuclear weapons. He noted that armed with such weapons, "small groups of fanatics, or failing states, could gain power to threaten great nations, threaten the world peace". In this context, Bush specifically referred to Iran, Libya and DPRK and revealed details about the AQ Khan illicit network that supplied sensitive nuclear material, equipment and technology to these countries (Bush:2004).

To respond to these threats, Bush proposed a number of steps to help combat the development and spread of weapons of mass destruction. Amongst others, this included the expansion of the US-sponsored Proliferation Security Initiative (PSI) to interdict shipments of suspected illicit nuclear materials, equipment and technology. He also called on the UN Security Council to adoption a resolution that would require states to "criminalize proliferation, enact strict export controls, and secure all sensitive materials within their borders". He said that more should be done "to keep weapons from the Cold War and other dangerous materials out of the wrong hands". Among others, he suggested that the use of weapons-grade HEU in research reactors should be stopped and that more should be done to secure and eliminate sensitive nuclear material worldwide. Bush also argued that a loophole in the NPT should be closed, namely that the world's "leading nuclear exporters should ensure that states have reliable access at reasonable cost to fuel for civilian reactors, so long as those states renounce enrichment and reprocessing". He added that enrichment and reprocessing "are not necessary for nations seeking to harness nuclear energy for peaceful purposes". He therefore called on the NSG Members to refuse to sell enrichment and reprocessing equipment and technologies to states that do not already possess full-scale, functioning enrichment and reprocessing plants. He also proposed that the IAEA Additional Protocol be made a condition of supply (Boese:2004; Bush:2004).

5.3.1 Let's ban – disarming the unarmed?

In response to the proposals made by Bush on 11 February 2004, the US engaged in a major diplomatic effort to have the NSG revise its guidelines in line with the proposal to ban any new enrichment and reprocessing facilities beyond existing technology holder countries. At the annual NSG Plenary in Göteborg, Sweden in May 2004, the US introduced the idea of an outright ban on the transfer of enrichment and reprocessing equipment and technologies to any state not already in possession of a full-scale

capability, technology and functioning plants. A number of countries including Canada, South Africa, Brazil and others rejected the US proposal mainly on the basis that such a ban would undermine and reinterpret the norm established under Article IV of the NPT on the alienable right of states to develop and use nuclear energy for peaceful purposes. Instead, Canada proposed a moratorium on transfers pending agreement within the NSG on measures to strengthen the Guidelines in relation to enrichment and reprocessing. The Canadian counter-proposal was, however, not acceptable to a number of participating states (ACT:2011a).

As a result, a proposal was made to develop strengthened criteria for the supply of enrichment and reprocessing equipment and technology. This received support from most NSG members who preferred a non-proliferation criteria-based approach over an outright ban, although some members, particularly among the few developing NSG countries, believed that the existing transfer guidelines provided adequate measures. Although the US disagreed with the criteria-based approach and continued to insist on a ban, it did not oppose negotiations on the criteria-based approach (ACT 2011a). The draft under consideration included both objective criteria (i.e. whether a state is party to the NPT; is subject to active UN Security Council sanctions; has been found by the IAEA to be in material breach of its safeguards agreement; etc.) that largely enjoyed consensus and subjective criteria (i.e. whether the state has a credible and coherent rationale for pursuing enrichment activities; whether a transfer would trigger countries in the region to seek such capabilities; whether it will affect regional instability; etc.) that were subject to significant disagreement (Ramachandran:2011).

As a result of the objection within this plurilateral institution to an outright ban and serious disagreements on some of the proposed criteria, this issue was taken up in the more exclusive plurilateral setting of the G8 (consisting of most of the key enrichment and reprocessing technology holders), who agreed on 9 June 2004 at Sea Island to implement a moratorium on the transfer of enrichment and reprocessing equipment and technology to “additional states”, pending agreement by the NSG to “appropriately” amend its Guidelines (G8:2004). Given the failure of the NSG to conclude negotiations on this issue at consecutive meetings, this commitment to a moratorium was repeated at the G8 Summits in Gleneagles, St. Petersburg and Heiligendamm (2005-2007).

Whilst the NSG continued to consider strengthening its Guidelines on the transfer of enrichment and reprocessing technologies, including the imposition of NPT membership as a condition of supply, the US submitted a proposal for the exemption of India from the NSG Guidelines that do not allow nuclear trade with NNWS that do not have comprehensive safeguards agreements with the IAEA. The US proposal followed an agreement between US President Bush and Indian Prime Minister Vajpayee in 2001 to establish a strategic partnership between the two countries (Boese:2008). This wide-ranging agreement envisaged an expansion of ties in areas such as agriculture, economic and trade co-operation, energy security and the environment, innovation and the knowledge economy, global safety and security, and on deepening democracy. By 2005 the countries reached an understanding that they would pursue civilian nuclear co-operation once a bilateral agreement could be agreed upon and other stipulated conditions, such as a NSG exemption and an agreement with the IAEA, were met (Perkovich 2010:20).

On 6 September 2008, the NSG approved a waiver for India during a Plenary meeting. Before the meeting, Austria, Ireland, the Netherlands, New Zealand, Norway and Switzerland called for additional conditions such as the termination of the exemption in case India should conduct a nuclear explosion and a prohibition on sensitive transfers (such as enrichment and reprocessing technologies). Following considerable pressure by the US and a statement by India's External Affairs Minister in which he reiterated India's unilateral moratorium on nuclear testing and committed to negotiating an additional protocol with the IAEA, the deal was approved (Boese:2008).

After 4 years of negotiation and diplomatic wrangling, the US in 2008 finally accepted the proposed criteria-based approach for enrichment and reprocessing technology transfers. However, it insisted on additional criteria such as the IAEA Additional Protocol as a condition of supply, as well as a "black-box" approach to prevent the replication of the enrichment technology by recipients. At a Consultative Group meeting of the NSG on 20 November 2008, nearly all states that had raised concerns about the subjective criteria (including Argentina and Brazil that rejected the Additional Protocol as a condition of supply) were brought on board and a "clean text" was produced. Argentina and Brazil's concerns were addressed through additional language on regional safeguards arrangements which inferred that the safeguards arrangements under the Argentine-Brazilian Agency for Accounting and Control of Nuclear Materials (ABACC) would, at

least in the interim, qualify the two states for receiving sensitive technologies under the amended Guidelines (ACT:2011b).

At the G8 Summit in Hokkaido Toyako (2008), the G8 meanwhile agreed "that transfers of enrichment equipment, facilities and technology to any additional state in the next year will be subject to conditions that, at a minimum, do not permit or enable replication of the facilities; and where technically feasible, reprocessing transfers to any additional state will be subject to those same conditions". At the L'Aquilla Summit in 2009, the G8 agreed to implement the measures agreed to in the NSG's "clean text", pending its adoption (G8:2012).

The "clean text" could, however, not achieve consensus because of the continued inclusion of certain criteria and the compulsory "black-boxing" that were not acceptable to Turkey and South Africa. At the 2010 NSG Plenary in Christchurch, Turkey proposed text to balance the "black-box" approach with a reference to the inalienable right of states under Article IV of the NPT. South Africa continued to have concerns on the basis that the Additional Protocol criterion went beyond the requirements under the NPT (ACT:2011b). At the 2010 Muskoka and 2011 Deauville Summits, the G8 leaders reiterated their commitment to implement the measures agreed to at the L'Aquilla Summit (G8:2012).

Seven years after the initial proposal by the US to ban exports to countries that do not have operational enrichment and reprocessing facilities, the NSG finally agreed to amend its Guidelines. While the previous Guidelines committed suppliers to "exercise restraint" in the transfer of sensitive technologies, the new guidelines essentially specified a list of criteria that have to be considered. Of greater significance is the provision regarding the black-boxing of technology, which is already industry practice. The effect of this provision is that recipients that meet the stringent non-proliferation criteria would be able to acquire enrichment equipment, but would not be able to become technology holders. The only possibility therefore would be for states to develop their own technology, which would only become subject to the new rules if the technology is developed by a NSG member and then only once the technology is commercialised (ACT:2011b).

The debate on criteria for the supply of enrichment and reprocessing technologies within the NSG, which consists of mostly developed countries of the global North, illustrated the approach of the North towards curbing the proliferation threat inherent in sensitive technologies. The rules agreed to within this plurllateral institution, despite staunch opposition by some countries, introduce contradictory measures to what had been agreed to in the multilateral fora, including the IAEA and the NPT. Such rules are consequently unlikely to receive support in multilateral fora where countries of the global South are well represented and could insist on non-discriminatory norms. While industry practice and technology denials by NSG members may contribute towards limiting the options for potential proliferators, these new NSG "norms" are unlikely to adequately address the perceived threat posed by the potential increased access of new actors to such technologies.

In its working paper to the 2005 NPT Review Conference (NAM:2005), the NAM noted with concern that "undue restrictions on exports to developing countries of material, equipment and technology for peaceful purposes persist". The NAM there insisted that "any undue restrictions or limitations on peaceful uses of nuclear energy, incompatible with the provisions of the Treaty, should be removed". The NAM further reiterated that "proliferation concerns are best addressed through multilaterally negotiated, universal, comprehensive and non-discriminatory agreements". It also indirectly criticised the NSH by emphasising that "non-proliferation control arrangements should be transparent and open to participation by all States and should ensure that they do not impose restrictions on access to material, equipment and technology for peaceful purposes required by developing countries for continued development". Given these clear positions that have consistently been expressed by the NAM, the amended NSG Guidelines are also likely to reinforce the perception in the global South about the discriminatory practices of the NSG and further undermine its influence.

The NSG decision to exempt India from its Guidelines for nuclear transfers also raised concern among non-NSG states particularly in the global South. In not only confirmed the discriminatory practices of the NSG, but also illustrated the lack of value that some states attach to the NPT and the virtually global norms agreed to under this multilateral instrument. Many regard this decision as the final blow to a brittle nuclear non-proliferation regime under the NPT (Lichterman & Ramana 2010:62).

The debate in the NSG on the Indian exemption illustrated a paradox in the approach adopted by the few states from the global South represented in the NSG. The India deal presented a critical dilemma for these states, who regularly caution against rules and norms governing the control of nuclear energy that may negatively affect development (Lichterman & Ramana 2010:62-70). Despite the impact of the deal from a NPT perspective and concerns that it may contribute towards further nuclear weapons proliferation in India, none of these states objected to the proposal. In fact, the Declaration issued after the 15 October 2008 IBSA Summit (IBSA:2008) welcomed the decision by the NSG "to adjust its guidelines to enable full civil nuclear cooperation between India and the international community". But it also "reiterated the importance of ensuring that any multilateral decisions related to the nuclear fuel cycle do not undermine the inalienable right of States to pursue nuclear energy for peaceful purposes in conformity with their international legal obligations". In addition, the leaders recognised the threat posed by nuclear terrorism and affirmed their commitment to contribute to "multilateral efforts" to counter such threats.

From the perspective of the US and allies in the global North, the deal bolsters geopolitical balance and security in Asia and opens up new market opportunities, whilst others view the deal as a net gain for a rising global South. While the deal between the US and India increased India's power and influence, closer relations with the US on nuclear issues, brings back India's traditional dilemma of how to reconcile its strategic foreign policy goals with the broader political agenda of global South (Alden *et al* 2010:143). Since the adoption of the NPT, India has been critical of NWS efforts to institutionalise their special nuclear status while preventing others from doing so. According to Alden *et al*, the question is whether India will maintain a nuclear policy consistent with the traditional principled stance of the NAM or endorse efforts aimed at restricting access to nuclear technologies.

The diplomatic discourse on the criteria for the supply of enrichment and reprocessing technologies and the exemption for India illustrated two contradicting approaches to negotiations. While there was an absence of shared objectives and common interest between the technology holders in the global North and the countries of the global South on the need for amending the NSG Guidelines, both sides shared a commitment to provide an exemption to India despite very different motivations. The Indian exemption therefore allowed for a process of co-operative bargaining and integrative convergence,

while the negotiation on the criteria for the supply of enrichment and reprocessing technologies serves as an example of distributive or perhaps even imposed convergence that is associated with zero-sum bargaining (see Johnsson 2006:62-63 for an explanation of integrative, distributive, imposed and managed convergence).

5.3.2 Enforcing national controls and reinterpreting norms

Between 2004 and 2011, the UN Security Council (UNSC) adopted a number of resolutions that endeavoured to create either politically or legally-binding norms in the field of nuclear energy. These can be divided between issue-specific, country-specific and general resolutions.

In terms of issue-specific resolutions, the UNSC on 28 April 2004 adopted Resolution S/RES/1540 under Chapter VII of the UN Charter (UNSC:2004a), as called for by President Bush (2004). This resolution recognises that the illicit trafficking in WMD-related material, equipment and technology and their means of delivery poses a threat to international peace and security, and requires states to establish and implement stringent national transfer controls to prevent illicit transfers, including to non-state actors. The adoption of this resolution was not without controversy and an intense diplomatic debate.

Contrary to normal practice, the UNSC came under pressure to conduct an open debate on the proposed draft resolution of which unofficial copies had been circulating outside the Council. As a result, an open debate was held on 22 April 2004 following a request by South Africa with the support of Canada, Mexico, New Zealand, Sweden and Switzerland. This request was submitted on the basis that the Council's assumption that it could enact global legislation requiring all UN Member States to modify their national legal system and policies would be unjust and unsustainable. While most participants in the debate supported the intention of the resolution to prevent the proliferation of WMD to non-state actors, serious doubts were expressed about its contents and implications. Several states including those who requested the debate, as well as Brazil, India, Iran, Pakistan and other NAM countries, questioned the UNSC's increasing tendency to assume new and wider powers of legislating on behalf of the international community. Many also noted that the text was unbalanced and that there was no reference to the threat posed by nuclear weapons and "state proliferation". Others warned that the

UNSC's actions should not weaken existing international agreements. In a similar vein, the NAM specifically highlighted the need for a comprehensive, multilaterally negotiated legal instrument to address the threat posed by non-state actor access to WMD (UNSC:2004b).

Regarding country-specific issues, the Security Council engaged in another matter related to the international control of the nuclear fuel cycle through the adoption of measures to address concerns regarding Iran's nuclear activities. In the first of six resolutions[22] adopted (as of December 2011) under Chapter VII of the UN Charter, the Security Council recalled in the preambular section of Resolution 1696 (2006) "the right of States Party [to the NPT], in conformity with Articles I and II of that Treaty, to develop research, production and use of nuclear energy for peaceful purposes without discrimination". At the same time, it demanded in the operative part of the resolution "that Iran shall suspend all enrichment-related and reprocessing activities, including research and development, to be verified by the IAEA". It furthermore called upon all States, "to exercise vigilance and prevent the transfer of any items, materials, goods and technology that could contribute to Iran's enrichment-related and reprocessing activities..." (UNSC:2006b).

Resolution 1696 (2006) was adopted after the IAEA Board adopted a resolution on 4 February 2006 (IAEA:2006) by an affirmative vote of 27, with 3 votes against (Cuba, Syria and Venezuela) and 5 abstentions (Algeria, Belarus, Indonesia, Libya and South Africa). Most of the latter states regarded the call in the IAEA Board resolutions on Iran to suspend its enrichment and reprocessing activities as strictly a confidence building measure, since any obligation to suspend peaceful nuclear activities would contradict Article IV of the NPT. In defying its obligations under the Security Council resolutions, Iran argued that the resolutions are illegal since they infringe on its fundamental and inalienable rights (IBT:2012; NYT:2010). The IAEA Board resolutions on Iran also altered the negotiating dynamics in Vienna. Although the rules of procedure allow for the adoption of decisions by voting, this was not a regular practice of the Board, where almost all decisions had until then been adopted by consensus. This politicised the work of the Board and resulted in many subsequent resolutions being adopted by means of a vote.

[22] Other resolutions adopted by the Security Council on Iran include resolution 1737 of 27 December 2006 (UNSC:2006d), 1747 of 24 March 2007 (UNSC:2007), 1803 of 3 March 2008 (UNSC:2008a), 1835 of 27 September 2008 (UNSC:2008b) and 1929 of 9 June 2010 (UNSC:2010).

In another country-specific resolution, the UNSC adopted Resolution 1695 (UNSC:2006a) on 15 July 2006 on the DPRK, which urged the country "to abandon all nuclear weapons and existing nuclear programmes, and to return at an early date to the Treaty on Non-Proliferation of Nuclear Weapons and International Atomic Energy Agency safeguards". In a follow-up Resolution (1718) on 14 October 2006, the UNSC decided that the DPRK "shall abandon all nuclear weapons and existing nuclear programmes in a complete, verifiable and irreversible manner" (UNSC:2006c). In an unprecedented move, it furthermore decided in coded language that all UN Member States "shall prevent the direct or indirect supply, sale or transfer to the DPRK" of "all items, materials, equipment, goods and technology" as set out in the NSG control list which could contribute to DPRK's nuclear programme.

On 24 September 2009, under the Chairmanship of US President Obama, the UNSC adopted a general resolution. This was the first time that a US President presided over the Council. Resolution 1887 (2009) was adopted without a reference to any chapter of the UN Charter, which leaves the binding nature of the resolution open to interpretation. Resolution 1887 (2009), *inter alia*, encouraged "efforts to ensure development of peaceful uses of nuclear energy by countries seeking to maintain or develop their capacities in this field in a framework that reduces proliferation risk and adheres to the highest international standards for safeguards, security and safety". While reconfirming the inalienable right of states to the peaceful uses of nuclear energy, Resolution 1887 (2009) also called upon States to adopt stricter national controls for the export of sensitive goods and technologies of the nuclear fuel cycle. It further encouraged work in the IAEA on "multilateral approaches to the nuclear fuel cycle, including assurances of nuclear fuel supply and related measures, as effective means of addressing the expanding need for nuclear fuel and nuclear fuel services and minimizing the risk of proliferation, and *urges* the IAEA Board of Governors to agree upon measures to this end as soon as possible". In addition, the Resolution called on all States "to manage responsibly and minimize to the greatest extent that is technically and economically feasible the use of highly enriched uranium for civilian purposes, including by working to convert research reactors and radioisotope production processes to the use of low enriched uranium fuels and targets".

In terms of general, legally-binding resolutions adopted under Chapter VII of the UN Charter, Resolution 1540 (2004), for example, compels states to report on implementation measures. It is noteworthy that several states, many from Africa, have yet to submit the required national implementation reports. While some of the provisions under the Chapter VII resolutions against Iran have been implemented, the core demand of the Council for Iran to suspend its enrichment and reprocessing activities has been ignored.

The lack of ability of the UNSC to enforce its own decisions illustrate the continuing credibility problems affecting the primary organ of the UN responsible for the maintenance of international peace and security. The presumption that concerns regarding the inadequacies of the nuclear non-proliferation regime can be effectively addressed through a new legislative role for the Security Council had been questioned. In this regard, the NAM in its statement during the open debate of the Security Council in April 2004 reiterated its view that sustainable solutions can be achieved through comprehensive, (inclusive) multilaterally negotiated agreements (UNSC:2004b).

5.3.3 IAEA: To multilateralise or multinationalise the nuclear fuel cycle?

In March 2004, the IAEA Director General announced the establishment of an international Expert Group with participants from 26 countries to consider possible multilateral approaches to the front and back ends[23] of the nuclear fuel cycle. In February 2005, the IAEA released the Expert Group report (INFCIRC/640) entitled "Multilateral Approaches to the Nuclear Fuel Cycle" (IAEA:2005). The report outlined a set of five gradually introduced "multilateral nuclear approaches" (MNA's) aimed at "increasing non-proliferation assurances associated with the civilian nuclear fuel cycle, while preserving assurances of supply and services around the world"[24].

[23] The front end of the nuclear fuel cycle refers to uranium supply, enrichment and the fabrication of nuclear fuel. The back end refers to activities related to the management and containment of spent fuel, including reprocessing, disposition and storage.

[24] 1. Reinforcing existing commercial market mechanisms on a case-by-case basis through long- term contracts and transparent suppliers' arrangements with government backing. Examples would be: fuel leasing and fuel take-back, commercial offers to store and dispose of spent fuel and commercial fuel banks; 2. Developing and implementing international supply guarantees with IAEA participation. Different models should be investigated, notably with the IAEA as guarantor of service supplies, e.g. as administrator of a fuel bank; 3. Promoting voluntary conversion of existing facilities to MNAs, and pursuing them as confidence-building measures, with the participation of NPT NNWS, NWS, and non-NPT states; 4. Creating, through voluntary agreements and contracts, multinational, and in particular regional, MNAs for new facilities based on joint ownership, drawing rights or co- management for front-end and back-end nuclear facilities, such as uranium enrichment; fuel reprocessing; disposal and storage of spent fuel (and

When the report was introduced at the March 2005 session of the IAEA Board of Governors, several speakers from the North welcomed the report, while the NAM merely stated that it was not in a position to offer detailed comments. In a subsequent statement by the G77 and China to the Board during June 2006 (G77), the group associated itself with the NAM and reminded the Board that the Expert Group had consisted of individuals who participated in their personal capacities and that the report did not necessarily reflect agreement by all the experts on the desirability or feasibility of multilateral nuclear approaches.

One of the concerns frequently raised in informal discussions is that the report conflates the boundaries between "real multilateral approaches" and what is acknowledged in the report as "multinational arrangements". Multilateral approaches require some form of multilateral oversight and control, presumably by the IAEA itself, whilst multinational approaches would simply involve oversight by more than two states. This issue goes to the heart of the concerns being raised by some of the NAM countries fearful that a new system may emerge that would either perpetuate or worsen the asymmetries of the nuclear non-proliferation regime under the NPT. Extending the "haves, have-nots" system beyond the possession of nuclear weapons to the sensitive elements of the nuclear fuel cycle would simply not be an acceptable arrangement for these states. While most scholars of diplomacy in the global North tend not to distinguish between multilateral and plurilateral (or multinational) diplomatic modes, such a distinction is vital if an accurate analysis of the diplomatic discourse is to be provided.

5.3.3.1 Nuclear fuel cycle proposals

During September 2006, a special event was organised by the IAEA Director General in the margins of the fiftieth IAEA General Conference to explore a "New Framework for the Utilization of Nuclear Energy in the 21st Century: Assurances of Supply and Non-Proliferation." The event was intended to facilitate discussions on the proposals on assurance of supply mechanisms. More than 300 participants from 61 IAEA Member States and various members of industry and other organisations attended. Since then, a number of proposals have been made that essentially built upon the report of the IAEA

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combinations thereof). Integrated nuclear power parks would also serve this objective; 5. The scenario of a further expansion of nuclear energy around the world might call for the development of a nuclear fuel cycle with stronger multilateral arrangements - by region or by continent - and for broader cooperation, involving the IAEA and the international community (IAEA:2005).

Expert Group on Multilateral Nuclear Approaches. Yudin (2009, 2010 & 2011) provides a comprehensive overview of the vision, scope, goals and timelines for the implementation of the different proposals submitted by a number of states, nuclear industry, civil society and regional organisations.

Most of the proposals focus on assurances for nuclear fuel supply aimed at providing states with alternatives to the development of domestic enrichment capabilities. The proposed modalities are not geared towards replacing the existing nuclear fuel market, but rather aim at providing a fall-back option in case of supply disruptions.

5.3.3.2 Assurance of supply proposals

In what can be regarded as an example of polylateral diplomacy, the World Nuclear Association (WNA) Working Group on Security, composed of representatives from the four leading world uranium enrichment services suppliers Areva, TENEX, URENCO, and USEC, proposed a three-level mechanism to assure the supply of uranium enrichment services: a basic supply assurance provided by the existing nuclear fuel market mechanisms; collective guarantees by enrichment companies supported by commitments from governments and the IAEA; and government stocks of enriched uranium product. The second level would be triggered if a disruption of normal fuel supplies occur. A guarantee will be given to all contracting non-supplier states to obtain enrichment services from any contracting suppliers to the agreement. If this fails government stocks of enriched uranium (level three) could be used (ICNND 2010:137; Yudin 2009:27).

The so-called Six-Country Concept introduced by enrichment supplier states (France, Germany, the Netherlands, Russia, the United Kingdom and the United States) proposed a modified version of the WNA idea that would offer two levels of enrichment assurance. At the basic level, enrichment suppliers would agree to substitute for each other in the case of supply interruptions to customer states that have chosen “not to pursue sensitive fuel cycle activities”. At the reserves level, suppliers could provide reserves of LEU that would be made available if the basic assurances fail. It also suggested that the rights to the LEU reserves could be transferred to the IAEA to provide greater assurances of supply (ICNND 2010:137; Yudin 2009:29).

A third proposal made by Japan suggested the establishment of a database to complement the Six-Country Concept. The system would be administered by the IAEA who would disseminate information contributed voluntarily by IAEA member states on their national capacities for uranium ore, uranium reserves, uranium conversion, uranium enrichment and fuel fabrication. If a disruption occurs, the IAEA would act as intermediary between non-supplier states and states that could provide the required services or materials (ICNND 2010:138; Yudin 2009:30).

A fourth proposal made by the UK introduced so-called “enrichment bonds” that would, in the event that the IAEA determines that specified conditions have been met, guarantee that enrichment providers would not be prevented from supplying enrichment services and provide prior consent for export assurances. A formal agreement between governments, to be overseen by the IAEA, would ensure that suppliers are not unduly withheld for non-commercial reasons from fulfilling their contractual obligations (ICNND 2010:138; Yudin 2009:33).

5.3.3.3 Fuel bank proposals

The US had originally, in September 2005, announced that it would commit up to 17 tons of HEU declared as excess to military needs for down-blending to LEU and offered the LEU as a reserve to support assurances of supply “for states that forego enrichment and reprocessing” (ICNND 2010:139; Yudin 2009:21). This idea seems to have been overtaken by other proposals presumably due to the conditions it sought to impose.

Another proposal was submitted by Russia for the creation of a reserve of 120 tons of LEU as part of its initiative to establish an international uranium enrichment centre in Angarsk (Yudin 2009:34). Russia agreed to cover all costs associated with the establishment of the LEU reserve, its storage, maintenance, the application of IAEA safeguards, and ensuring safety and security. Upon request from the IAEA Director General to withdraw material from the reserve, Russia would deliver the required amount of LEU to the IAEA. The IAEA would control and provide supply assurances to any “non-nuclear-weapon State member of the IAEA experiencing a disruption in the supply of LEU for nuclear power plants not related to technical or commercial considerations”. The Agency may refuse to grant access to the reserve if there are any issues relating to the application of IAEA safeguards under consideration by the Board of Governors. IAEA

member states will only be eligible to draw from the reserve if they have an agreement in force requiring the application of IAEA safeguards to all of their peaceful nuclear activities. The recipient would pay the normal market price for the transferred material (ICNND 2010:139). Following several rounds of informal consultations and despite strong opposition from the NAM and the G77 and China, a final proposal was tabled in November 2009 and the Board of Governors approved the establishment of the Russian guaranteed LEU reserve. In March 2010 an agreement was signed to establish the reserve.

In another example of polylateral diplomacy, a proposal was submitted by Nuclear Threat Initiative (NTI) and US billionaire Warren Buffet who offered to contribute US$50 million towards establishing an LEU stockpile controlled by the IAEA that could be made accessible on a non-discriminatory, non-political basis should supply arrangements be disrupted (Yudin 2009:31). This offer was made contingent on one or more IAEA Member States contributing an additional US$100 million in funding or an equivalent value of LEU, and IAEA approval to establish the reserve. By March 2009, the target of an additional $100 million was reached following contributions from the US ($50 million), Norway ($5million), the United Arab Emirates ($10 million), the EU (up to €25 million) and Kuwait ($10 million). These pledges have been made without any conditions other than that the funds be used exclusively for the purpose of establishing and operating an IAEA LEU bank in accordance with the relevant decisions to be made by the Board of Governors. Following further discussions and despite opposition by the NAM and the G77 and China, a proposal for an LEU reserve was tabled and approved by the Board of Governors in December 2010. To receive fuel from the LEU bank, that will be owned and operated by the IAEA, a state must be unable to purchase fuel on the commercial market and must have a comprehensive safeguards agreement with the IAEA. In addition, the IAEA must confirm that there has been no diversion of declared nuclear material and that no issue pertaining to the implementation of safeguards in that country is under consideration by the Board of Governors (ICNND 2010:139).

5.3.3.4 Infrastructure and multilateral facility proposals

Russia submitted a proposal to create “a global infrastructure that will give all interested countries equal access to nuclear energy”, while maintaining “reliable compliance with the requirements of the non-proliferation regime”. This includes the “creation of a system

of international centres providing nuclear fuel cycle services, including enrichment, on a non-discriminatory basis and under the control of the IAEA" (ICNND 2010:141). The Russian proposal, however, does not address the multilateralisation of existing facilities.

In contrast, Austria submitted a proposal for the full multilateralisation of all nuclear fuel cycle facilities through two parallel tracks (Yudin 2009:39). The first track would involve building transparency and mutual confidence through the creation of an IAEA "cradle to grave" information system. This would enable the IAEA to build a comprehensive database of each country's nuclear capabilities and activities. The second track would focus on the multilateralisation of all fuel cycle facilities through progressive steps under "a legally binding international instrument [that] would limit the production or reprocessing of all nuclear material for civilian nuclear programmes to facilities under multilateral control" (ICNND 2010:143).

During 2007, Russia also announced the establishment of an International Uranium Enrichment Centre (IUEC) in Angarsk "to provide IUEC participating organisations with guaranteed access to uranium enrichment capabilities". According to Russia, this is a first practical step towards the creation of a global nuclear power infrastructure. The Centre was formally established with the signing of an agreement between Kazakhstan and Russia in May 2007. Armenia and Ukraine subsequently joined the IUEC agreement. Russia also invited all states that comply with their commitments under the NPT and share the objectives of the IUEC, to join. The Centre will provide guaranteed supplies of uranium enrichment services and stockholders would either have guaranteed access to enriched uranium or share in the profits. Under the IUEC agreement, Russia retains full control over enrichment technology and classified information, which will not be shared with members (ICNND 2010:142).

In May 2007, Germany proposed the creation of a new multinational enrichment facility established by a group of interested states in a specially designated area, a Multilateral Enrichment Sanctuary, supervised by the IAEA (Yudin 2009:37). According to the German proposal, a group of interested states could approach their national industries to set up a joint, multinational commercial enrichment company, which would finance, construct, own and operate the enrichment plant. The yet to be determined host state would cede administrative and other rights in a part of its territory to the IAEA, similar to a host agreement with international organisations that grant certain rights over a defined

territory. The IAEA would administer the Multilateral Enrichment Sanctuary and act as nuclear regulator and supervisor for the operation of the enrichment facility. The plant would be subject to “black box” arrangements and would therefore only be accessed and maintained by the supplier of the enrichment technology (ICNND 2010:143).

The Gulf Cooperation Council in 2007 also proposed that all interested states in the Middle East be invited to participate in the establishment of an international uranium enrichment consortium, which would be based in a neutral country outside the region. All members of the consortium in the region would be able to secure reliable access to the supply of nuclear fuel for power plants, but would not have access to enrichment technology.

5.3.3.5 Comprehensive or step-by-step multilateralisation?

In a statement on 17 April 2008, former IAEA Director General, Dr Mohamed ElBaradei suggested the idea of a new framework for nuclear energy (ElBaradei:2008). In this regard, he proposed a three-stage process to craft a new multilateral framework that is equitable and accessible to all users of nuclear energy acting in accordance with agreed nuclear non-proliferation norms. The first step, according to Dr ElBaradei would be to establish a system for assuring the supply of fuel for nuclear power reactors. The second step would be to subject all new enrichment and reprocessing facilities to multilateral control. The third step would involve converting all existing enrichment and reprocessing facilities from national to multilateral control.

While the assurances of supply and fuel bank proposals addressed the first step outlined by Dr ElBaradei, the infrastructure and multilateral facility proposals deal with the second and third steps towards the establishment of a new multilateral fuel-cycle framework. The Russian IUEC project does not seem to fit into any of the categories, but instead offers shareholding to a wider group of states and enrichment services, which are already available in the nuclear fuel market. The German Multilateral Enrichment Sanctuary Project offers an alternative model for multinational fuel-cycle facilities and increased IAEA oversight, but would not fit into the notion of a truly multilateral facility. In addition, the enrichment technology will remain with the current nuclear technology holders. The Gulf Cooperation Council proposal offers a regional dimension that could be considered as part of a comprehensive multilateral approach to the nuclear fuel cycle.

These proposals have yet to be subjected to in-depth discussion in any formal setting (Yudin 2010:13, 57-59).

Throughout the debates in the IAEA Board of Governors, the NAM and the G77 and China regularly reminded Board members that the multilateralisation of the nuclear fuel cycle is a sensitive matter that require careful consideration in an open and transparent process with the full participation of all interested states (G77). These Groups also said that any decision on these proposals should be taken by consensus. For example, in a statement to the Board during June 2008, the G77 and China noted that the issue of assurances of nuclear fuel supply was a complex matter and that any proposal to establish a framework for multilateral nuclear fuel assurances under the aegis of the IAEA must be preceded by a thorough analysis of all the technical, legal, political and economic issues involved in consultation with Member States. It repeated the same sentiment on 22 September 2008, but added that such proposals "purporting to address non-proliferation and security concerns" should not impinge on the inalienable right of States to develop nuclear technologies for peaceful purposes. Despite these concerns, the co-sponsors of the two adopted Board resolutions decided to proceed. This means that there are currently two LEU fuel banks with the combined capacity of reloading three nuclear reactors, in case of a market failure. Given that the nuclear fuel supply market has been stable and reliable for many years, the question is how this new virtual mechanism will change the *status quo*.

Several key states in the global South regard these as efforts by the "haves" to further monopolise the nuclear fuel supply market and to reinforce a *de facto* cartel of nuclear fuel supplier states. Proposals that provide for multilateral ownership, management, operation, decision- making and profit- sharing could create the necessary incentives (Yudin 2010:22).

Whilst most countries in the global South could associate with Dr ElBaradei's proposals, there are different views on the sequencing of the three steps. This concern derives primarily from the belief among NNWS in the South that they have continued to implement an increasing number of non-proliferation measures, while the NWS have yet to illustrate their commitment to fulfil their side of the core NPT bargain through the elimination of their nuclear weapons arsenals. Given their experience in the NPT context, most states in the global South believe that by agreeing to the first two steps without a

broad agreement on the different steps within specified timelines, the have-nots may deprive themselves permanently from access to such technologies, while the few existing technology-holders may continue to hold onto their *de facto* monopoly over the nuclear fuel cycle. Any attempt to manage sensitive nuclear fuel cycle technologies through arrangements that could be perceived as inequitable and discriminatory, and that would perpetuate a division between "haves" and "have-nots" in terms of the peaceful use of nuclear energy, is therefore unlikely to induce consensus.

The diplomatic discourse in the IAEA Board of Governors cannot be described as around-the-table negotiations. The long-standing practice of consensus decision-making in the Board had changed as a result of the divisive Iranian issue. Whereas proposals for decisions by the Board were traditionally subjected to direct formal and informal negotiations, proposals on the fuel bank initiatives were circulated for comment, but not negotiated. Based on calculations of the level of support that the proposals enjoyed in the Board, the sponsors simply tabled these for approval. While the NAM and G77 insisted on the establishment of an open-ended working group to create a platform for negotiation, this was rejected by the sponsors from the global North. Their willingness to pursue the adoption of decisions by a vote and to impose convergence illustrated the dilemma of unequal regional representation in this policy-making organ of a multilateral institution dominated by technology-holders from the global North.

5.3.4 NPT: a shaken foundation

The NPT can at best be described as a regime under duress. As former IAEA Director General ElBaradei pointed out at the 2005 NPT Review Conference: "The Treaty has served us well for 35 years. But unless we regard it as part of a living, dynamic regime - capable of evolving to match changing realities, it will fade into irrelevance and leave us vulnerable and unprotected" (ElBaradei:2005).

Since its indefinite extension in 1995, the NPT has suffered several setbacks resulting from a few non-proliferation cases (Libya, DPRK and Iran) and the non-implementation of the commitments that were made as part of a package deal that secured the NPT's indefinite extension. As a discriminatory instrument that created different rights and obligations for two categories of states and that only contains a compliance mechanism for one of its provisions (Article III), enforcement of Treaty norms beyond Article III

remains a serious challenges. While the IAEA is mandated to verify compliance with the safeguards obligations under Article III, no mechanism exists for monitoring or verifying compliance with the other Treaty provisions. In addition, the only other institution that could intervene in cases of non-compliance with nuclear energy norms that could threaten international peace and security is the UN Security Council where each of the five NPT NWS has a veto right and could prevent any action from being taken against them or their allies.

It is in this context and in the fulfilment of the NPT bargain, that the diplomatic stand-off between the global North and global South on nuclear energy has been most visible. Accusations by the global South (represented by the NAM) regarding the non-fulfilment of nuclear disarmament obligations by the NWS and the continued reliance on nuclear weapons by NATO NNWS is accompanied by an unwillingness among some NNWS of the global South to agree to additional obligations to further strengthen the non-proliferation provisions of the NPT. The victim of this continuing stand-off remains the third pillar of the NPT, namely the peaceful uses of nuclear energy. It is for this reason that no substantive decisions on the future of the nuclear fuel cycle could be secured at the 2005 or 2010 NPT Review Conference.

Many countries in the global South have expressed concern that multilateral assurances of nuclear fuel supply are the first step towards the restriction of national nuclear energy policies in the areas of uranium enrichment and spent fuel reprocessing (McGoldrick:2010). For example, at the 2010 NPT Review Conference, the NAM Working Paper (NPT/CONF.2010/WP.46) stated that "[I]n order to reach a consensual conclusion, it is premature for this issue to be considered before extensive, comprehensive and transparent consultations are held. In this context, to reject, in principle, any attempts aimed at discouraging certain peaceful nuclear activities on the grounds of their alleged 'sensitivity'; and emphasize that any ideas or proposals pertaining to the non-proliferation of any peaceful nuclear technology that are used as a pretext to prevent the transfer of such technology are inconsistent with the objectives of the Non-Proliferation Treaty".

As a result, the Final Document of the 2010 NPT Review Conference (NPT:2010) merely called on all States Parties to act in conformity with all the provisions of the Treaty and to "respect each country's choices and decisions in the field of peaceful uses of nuclear

energy without jeopardizing its policies for international cooperation agreements and arrangements for peaceful uses of nuclear energy and its fuel cycle choices".

In addition, the Conference could only agree to "continue to discuss further, in a non-discriminatory and transparent manner under the auspices of IAEA or regional forums, the development of multilateral approaches to the nuclear fuel cycle, including the possibilities of creating mechanisms for assurance of nuclear fuel supply, as well as possible schemes dealing with the back-end of the fuel cycle without affecting rights under the Treaty and without prejudice to national fuel cycle policies, while tackling the technical, legal and economic complexities surrounding these issues, including, in this regard, the requirement of IAEA full scope safeguards".

5.3.5 United Nations disarmament machinery: a silent voice?

It is significant to note that the debate on the future of the nuclear fuel cycle has not been pursued in the context of the UNGA and the First Committee (Disarmament and International Security) beyond a resolution calling for negotiations in the Conference on Disarmament (CD) on a treaty banning the production of fissile material for nuclear weapons and other nuclear explosive devices and an African Group resolution on the "Prohibition of the dumping of radioactive wastes". The latter resolution regularly recalls the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (1997) and calls upon all States to take appropriate measures with a view to preventing any dumping of nuclear or radioactive wastes that would infringe upon the sovereignty of States.

The UN Disarmament Commission that was established in 1978 as the sole deliberative body in the field of disarmament (UNGA:1978) was unable to agree on an agenda in 2004 and 2005 and did not hold any substantive sessions. While it considered recommendations for achieving the objective of nuclear disarmament and the non-proliferation of nuclear weapons, as well as practical confidence-building measures in the field of conventional weapons during the 2006-2008 and 2009-2011 cycles, the last of which also prepared elements for a draft declaration for a Fourth Disarmament Decade, it remained unable to agree on any substantive outcome (RCW:2011).

Likewise, the CD that was established as the single multilateral disarmament negotiating forum, has for more than a decade been unable to negotiate any legally-binding

instrument. Of specific relevance to the future of the nuclear fuel cycle is the proposed treaty that would ban the production of fissile material for nuclear weapons and other nuclear devices. Despite continuous calls on the CD (including by the NPT and the UNGA) to immediately start negotiations on a treaty banning the production of fissile material for nuclear weapons and other nuclear explosive devices, negotiations have been blocked for several years by either one of the NPT NWS (the US) or a state outside the NPT (Pakistan). The argument by Pakistan for the latest blockage is that such a treaty would jeopardise its national security interests due to the impact of the NSG exemption for India, which has exacerbated existing asymmetries (in terms of the quantity of fissile material) on the sub-continent.

Within the UN Secretary General's Advisory Board on Disarmament Matters, the issue of "energy security and the environment in the field of disarmament and non-proliferation" was discussed during its 2008 session. The Board exchanged views on the rising global demand for energy and the resultant competition for energy resources that impact on international peace and security. In this regard, the issue of nuclear energy dominated discussions and there was a recognition that the simultaneity of proliferation and energy concerns had created political and economic imperatives to urgently and concretely address questions pertaining to the peaceful use of nuclear energy. Despite this shared view among members of the Board, diverse views were expressed on the need to secure the nuclear fuel cycle to ensure non-diversion and provide NPT States parties with peaceful nuclear power. Some emphasised the need to develop reliable fuel supply arrangements to achieve long-term sustainability of the production of nuclear energy, while others underlined the importance of establishing a non-discriminatory system and specifically warned against creating a divide between the haves and have-nots. While the various proposals and ongoing initiatives regarding the nuclear fuel cycle were acknowledged for their contribution to non-proliferation efforts, many members underlined the need to bring the discussion to a credible multilateral framework. Based on these discussions, the Advisory Board suggested that the Secretary-General encourage a broader dialogue on the peaceful use of nuclear energy, including the various proposals to establish national and multilateral nuclear-fuel supply arrangements under a multilateral framework (UN Disarmament Yearbook 2008:210).

Beyond discussions in the UN Secretary General's Advisory Board on Disarmament that illustrated considerable divergences, no substantive debate on the nuclear fuel cycle has

taken place within the UN framework. While there is a clear recognition of the need to address this issue, the UN's disarmament machinery has remained deadlocked.

The only area where significant progress has been achieved is on nuclear terrorism. During 2005, the International Convention on the Suppression of Acts of Nuclear Terrorism (2005) was adopted as a result of an increasing focus in the UN on measures to curb terrorism after the 11 September 2001 terrorist attack in the US. At the end of 2011, 115 states had signed the Convention and 77 had deposited instruments of ratification.

5.3.6 *Ad hoc* initiatives: among friends

Various initiatives have been launched since 2004 that seek to address some of the elements associated with the broader debate on the future of the nuclear fuel cycle. These initiative differ in scope and duration and are mostly an extension of national programmes introduced by the US. Although many other diplomatic events have taken place that are relevant to the debate on the nuclear fuel cycle, once-off meetings, conferences and events have not been included in the discussion. Given the limitations of this dissertation, only a selected number of initiatives are discussed below in an effort to illustrate their relevance in achieving broader buy-in among groups of mostly like-minded states that influence the debate elsewhere. Some of these efforts are also the result of a lack of consensus within other fora on the pursuance of certain activities.

During May 2004, the US announced the Global Threat Reduction Initiative (GTRI) aimed at securing stocks of "vulnerable" nuclear material around the world, including the repatriation of nuclear fuel and the conversion of reactors to more proliferation-resistant technology (US:2004). The GTRI initially focussed on the repatriation of Russian-origin HEU and US-origin HEU research reactor spent fuel from locations around the world. Later the focus shifted to include the conversion of civilian research reactors that use HEU to LEU fuel and the securing of other radiological materials that could be used in so-called "dirty bombs" (crude explosive devices containing radioactive material). The GTRI essentially brought pre-existing programmes run by the US Department of Energy (DOE) under a new Office of Global Threat Reduction. As a result of this programme, vast quantities of Russian and US-origin material have been repatriated and a number of research reactors have been converted from HEU to LEU fuel. Some progress has also

been made in securing radiological materials. Although the GTRI is a national initiative by the US, it has played a key role in shaping debates for example in relation to nuclear security (which will be discussed later) and conversion programmes.

Other programmes related to the GTRI include the Megaports Initiative under the US National Nuclear Security Administration (NNSA) in the US DOE and the Container Security Initiative (CSI) managed by US Customs and Border Protection (US:2003). The Megaports Initiative, which was launched in 2003, seeks to strengthen the capabilities of "partner countries" of the US to deter, detect and interdict illicit trafficking of special nuclear and other radioactive materials at international border crossings, including airports, seaports and other points of entry and exit. At the end of 2011, there were 36 operational ports that participated in the Megaports Initiative. The CSI involves the identification of high-risk containers using targeting tools based on advance information and strategic intelligence, the pre-screening of containers, including large-scale X-ray and gamma ray machines and radiation detection devices (ICNND 2010:61). Currently, 58 ports participate in the CSI covering around 85% of all container traffic to the US. Sub-programmes, such as Commodity Identification Training (CIT), are also being undertaken by the NNSA in a number of countries to strengthen the capacity of national authorities in the identification of strategic commodities. These initiatives and training programmes are of direct relevance to the implementation of national controls as required under UN Security Council resolution 1540 (2004) and provides the US with an opportunity for oversight over border controls and information regarding the flow of proliferation sensitive (and other) goods around the world.

During February 2006, the US launched the Global Nuclear Energy Partnership (GNEP), as a means of supporting "the safe, secure and sustainable expansion of nuclear energy", both within the US and internationally (ICNND 2010:142). Within the US, GNEP did not receive the necessary support due to its focus on the reprocessing of spent fuel to recover more energy and to reduce waste. Internationally it also attracted limited support as a result of the requirement for participating states that did not have operational enrichment and reprocessing facilities to forego such activities on a national basis (McGoldrick:2010). This opposition eventually led to the formation of the International Framework for Nuclear Energy Cooperation (IFNEC) in June 2010 (IAEA 2010:21). At the end of 2011, 31 states had signed the IFNEC Mission Statement that stipulates that participating states will explore mutually beneficial approaches to ensure

that the use of nuclear energy for peaceful purposes proceeds in a manner that is efficient and meets the highest standards of safety, security and non-proliferation. Unlike its predecessor, it confirms that participating states would not have to give up any rights.

Another initiative, the Global Initiative to Combat Nuclear Terrorism (GICNT) was jointly launched by former US President GW Bush and Russian President Vladimir Putin in July 2006. It is a voluntary initiative aimed at fostering international cooperation to prevent terrorists from acquiring, transporting, or using nuclear materials or radioactive substances, to deter hostile actions against nuclear facilities, and to respond to incidents involving the use of radiological or nuclear materials (ICNND 2010:120). By the end of 2011, the GICNT had 82 states and 4 observer organisations that have endorsed its Statement of Principals (US: 2011).

On 31 May 2003, US President Bush launched the Proliferation Security Initiative (PSI). The PSI was established as a new measure for interdiction co-operation outside the multilateral system (Nikitin 2011:1). During a public address in April 2009 in Prague, US President Obama said that he planned to transform the PSI into a "durable international institution". In adopting the Western Hemisphere Counterterrorism and Nonproliferation Act in 2009 (H.R. 375), the US Congress recognised the effectiveness of the PSI in preventing the proliferation of weapons of mass destruction and requested the Secretary of State to secure the "formal or informal cooperation by Western Hemisphere countries" for PSI. At the end of 2011, more than 90 countries from several regions had endorsed the PSI Statement of Interdiction Principles under which participants commit to interdict transfers to and from states and non-state actors of "proliferation concern", to develop procedures to facilitate the exchange of information between participants, to strengthen national legal authorities to facilitate interdiction and to take specific actions to support interdiction efforts (Nikitin 2011:1-11).

PSI is a controversial instrument inasmuch as it raises questions regarding the legality of interdiction activities on the high seas and consistency with the UN Law of the Sea Convention (UNCLOS:1982) that allows for the boarding of vessels under certain conditions, but not the seizure of cargo. The PSI intends to expand its activities to both air and land operations. The PSI is related to some of the other programmes under the GTRI and is directly relevant to the 2005 Protocol to the Convention for the Suppression of Unlawful Acts Against the Safety of Marine Navigation, as well as the implementation

of several UN Security Council resolutions, including 1540 (2004) and the sanctions regimes against the DPRK and Iran. The US and allies have made considerable efforts to include references to the PSI and interdiction measures in various Security Council resolutions. Due to continued opposition from China and concerns by Russia, these states have not yet succeeded in securing an endorsement for PSI activities in such resolutions (ICNND 2010:105-106).

From the initiatives highlighted in this section, it is evident that virtually all initiatives derive from the US national security agenda and programmes. Through the selection of specific target/partner countries, these national security priorities are then imposed on the international agenda in a systematic manner. It also allows the US to exercise maximum oversight and control over the flow of transfers of sensitive (and other) commodities and to some degree, from a US foreign policy perspective, reduces the relevance and importance of seeking multilateral solutions to issues of international concern. While these initiatives involve significant lobbying to secure wider participation and support, the founding documents are not negotiated with external partners, but constitute a direct extension of US national security policies.

5.3.7 Summitry: nuclear security

Central elements of the diplomatic discourse on the future of the nuclear fuel cycle have also become the subject of focus at Summit meetings beyond the G8. On 12 and 13 April 2010, US President Obama hosted a Nuclear Security Summit in Washington (US:2010). The Summit focussed on the safeguarding and disposition of weapons-grade plutonium and uranium in peaceful programmes with the stated aim of preventing nuclear terrorism. The Summit was the largest gathering of Heads of State (thirty-eight) called by a US President since the 1945 UN Conference on International Organisation. Invitees included 45 Heads of States and representatives of international organisations. A number of states with significant nuclear programmes (for example Iran, DPRK) were not invited and a non-binding communique and work plan was issued at the end of the Summit. Following a number of bilateral engagements, a document was also issued containing national commitments made by participating states. This included, among others, undertakings to sign and ratify certain international conventions, to participate in the initiatives discussed above, commitments to remove and dispose of “sensitive nuclear material”, as well as undertakings to convert nuclear facilities, especially

research reactors, from HEU to LEU use. At the Washington Summit, President Obama announced that the next Nuclear Security Summit would be held in South Korea during 2012.

Activities at the IAEA related to nuclear security have been strengthened through the creation of a voluntary nuclear security fund that focus on mostly the same issues dealt with by the Summit (IAEA:2011c). Various nuclear security guides have been issued by the IAEA and many assistance programmes have been undertaken under the nuclear security fund. However, these guides remain voluntary arrangements and cannot be enforced. In the NPT context, many countries in the global South have treated the issue of nuclear security as yet another effort by the NWS to divert attention away from the core issue, namely nuclear disarmament, through efforts to impose additional restrictions on NNWS. In addition, all efforts have been focused on civilian (peaceful) nuclear activities and nothing has been done to strengthen nuclear security in relation to nuclear weapons arsenals that remain outside international oversight and multilateral verification. Nuclear security are therefore regarded as yet another measure of imposing additional restrictions and burdens on NNWS that inhibit efforts aimed at maximising the development and use of nuclear energy for peaceful purposes.

5.4 Bilateral nuclear co-operation

Efforts aimed at the control of nuclear fuel cycle activities have also been evident in the realm of bilateral nuclear co-operation agreements. It is estimated that more than two thousand bilateral nuclear co-operation agreements have been signed since the 1950s. Many of these agreements are classified and not available in the public domain and details regarding these negotiations are generally kept secret. Keely (1985 & 2003) provides an indicative list of such agreements. He notes that virtually all countries with civilian nuclear programmes today have at some point received assistance through a bilateral nuclear co-operation agreement. Iran has, for example, received assistance from the US, Germany and Russia in developing its peaceful nuclear programme. France, Brazil and Italy assisted Iraq in reactor development, nuclear fuel, and plutonium reprocessing during the 1970s. India received nuclear technology and equipment from Canada and the US before testing a nuclear device in 1974. Pakistan received reactor technology from Canada before developing its nuclear weapons programme.

In an analysis of nuclear cooperation in the atomic age, Fuhrmann (2009:181-208) illustrates that nuclear assistance can be a valuable tool in achieving strategic objectives. Paradoxically, he notes that while commitment to the NPT reduces the likelihood of a state developing nuclear weapons, this does not necessarily translate into that state receiving nuclear technology, which brings into question the core NPT bargain. According to Fuhrmann, suppliers are sometimes willing to accept risks because nuclear assistance is "a potentially effective instrument of statecraft" due to its importance for economic growth and element of national power. This may partially explain the motivation for the conclusion of the US-India civilian nuclear co-operation agreement. As discussed earlier, this agreement with India as a state outside the NPT has affected the norm introduced by the NSG and the NPT that requires comprehensive safeguards as a condition for the supply of nuclear materials and technology (Perkovich 2010:20).

Beyond the India civilian nuclear co-operation agreement, the US has in 2009 also concluded a bilateral nuclear co-operation agreement with the United Arab Emirates (UAE) that contains a commitment by the UAE not to develop a domestic enrichment and reprocessing programme. McGoldrick:2010 calls this the new "gold standard" in US bilateral nuclear co-operation. But this agreement is not the first of its kind. In 1972, when the US agreed to transfer nuclear material, equipment and technology to South Korea, it required the country to commit to a set of non-proliferation undertakings, including a ban on the development of domestic enrichment and reprocessing facilities. This issue continues to be under discussion between the two countries due to South Korea's wish to enrich uranium and to reprocess spent fuel, which is central to its goal of meeting 60 percent of its electricity needs with nuclear power by 2030. In addition, South Korea wishes to export reactor technology to other countries that it cannot do without the consent of the US.

Bilateral nuclear co-operation agreements can, in addition to the advantages discussed by Fuhrmann, also serve as important tool aimed at changing negotiating dynamics. By agreeing bilaterally to accept a ban on the development of domestic enrichment and reprocessing capabilities, states are likely to be more amenable to accept similar arrangements at an international level, which may, as illustrated by the South Korean example, eventually be detrimental to developmental imperatives.

5.5 The role of industry and civil society

The role of civil society in the debate on the future of the nuclear fuel cycle can at most be described as marginal. While specific platforms have been created in the NPT and IAEA contexts for engagement between civil society organisations and governments, there is an absence of examples of actual participation by members of civil society in any negotiating processes. Even the opportunities provided to civil society during formal meetings to register their views, are generally not well attended by governmental representatives and are largely limited to the delivery of statements with virtually no interaction.

Yudin (2011:45, 70) notes that the weakness of democratic institutions and civil society in some regions enables governments and nuclear industry to pursue their chosen policies. He also highlights the importance of coalition-building across governmental institutions, civil society and regional actors and notes that the public, academia and civil society should be involved in discussions on nuclear energy, non-proliferation and multilateral approaches to the nuclear fuel cycle. The reality though, is that civil society has not, unlike in other areas such as human rights, played any significant role in the nuclear arena.

Kissling (2008) provides an analysis of the role of civil society in the nuclear non-proliferation regime in general and the 2005 NPT Review Process in particular, which confirms the advocacy role of civil society. He notes that the attendance by civil society organisations in NPT-related meetings during the period 1995 to 2005 showed a marked decrease from the 195 organisations represented at the 1995 Review and Extension Conference to 141 at the 2000 Review Conference and 119 in 2005, although 1800 individual representatives of civil society organisations registered for 2005 NPT RevCon (Kissling 2008:51).

Beyond the so-called “green lobby”, where organisations such as Green Peace has maintained an active campaign against nuclear power in general, civil society’s engagement on nuclear issues has largely been confined to the debate on nuclear disarmament. Examples of such organisations include the Mayors for Peace (which has 1500 member cities advocating for nuclear disarmament), the Middle Powers Initiative (a coalition of 8 international advocacy groups founded in 1998), and the more recent International Campaign to Abolish Nuclear Weapons (ICAN). Beyond advocacy, the role

of civil society organisations have largely been confined to the margins of formal negotiating settings. The major question posed by Kissling (2008) is whether civil society can contribute to international decision-making and the legitimacy and democracy of global institutions in the security arena.

As discussed earlier, there is at least one example of a non-governmental organisation, the NTI, that submitted a specific proposal related to the future of the nuclear fuel cycle that was approved by the IAEA Board of Governors. NTI has a number of projects aimed at creating awareness among the business community and government about the threat of nuclear materials. It has also assisted in the establishment of the World Institute for Nuclear Security (WINS) in 2008. WINS is a dialogue forum for governments, nuclear power plant operations and academic institutions to share international best practice (WINS:2012). NTI also serves as the Secretariat for the Nuclear Security Project established by former US Secretary of State George Shultz, former US Secretary of Defence William Perry, former US Secretary of State Henry Kissinger and former US Senator Sam Nunn. Significantly, the projects launched by the NTI and the ideas promoted by the Nuclear Security Project mirror that of the current US Administration.

As Tyson (2003:2) observes, a "critical function of NGOs is to re-humanize the effects of nuclear weapons for delegations in order to move the deliberations from a dry, rationalist debate to one of conscious commitment to progress towards genuine disarmament". However, the role of civil society in global governance structures inevitably raises questions about the nature of civil society organisations themselves and the opinions that they represent. In this context, Katz (2006:333-348) notes the "Gramsci view that civil society is simultaneously the arena in which capitalist hegemony is exercised and the terrain on which the subaltern classes in modern societies forge alliances and contest that hegemony". This means that there is no assurance that enhanced civil society engagement at a global governance level would impact on or change the nature of the debate. Civil society is therefore not necessarily agents of change, but could instead also be an obstruction to achieve greater equality and justice. The same capacity constraints that affect governments of the global South also affect civil society.

Beyond the WNA proposal discussed earlier, the role of nuclear industry in the debate on the nuclear fuel cycle is unclear. Research for this study has shown that the nuclear industry continues to be dominated by a relatively small number of companies in the

global North. On the nuclear supply-side, the market is reasonably diffused between the large European, US and Japanese companies of the North holding the largest market shares. Although these companies play no direct role in the negotiations or the current diplomatic discourse, their interests continue to be represented by state agents.

5.6 Conclusion

This Chapter endeavoured to critically analyse the efforts undertaken and proposals made between 2004 and 2011 in the relevant multilateral fora and plurilateral institutions, as well as other initiatives that have undertaken aimed at addressing concerns regarding the future of the nuclear fuel cycle. While recalling that negotiation constitutes a key function of diplomacy and is the operational focus of diplomacy in the multilateral mode, it noted that the nature of the discourse on the future of the nuclear fuel cycle alternates between general discussions, debate, lobbying, bargaining and around-the-table negotiations. It furthermore noted that there is a constant interchange between the different diplomatic modes and stages in the negotiation process.

This Chapter highlighted the reasons for an intensified debate that included cases of illicit trafficking in nuclear material and technology, proliferation concerns regarding the nuclear programmes in Iraq, the DPRK and Iran, as well as the 11 September 2001 terrorist attacks in the US. These events elevated concerns about the nuclear fuel cycle especially against the background of increased demand for nuclear energy that eventually led to a number of proposals by former President Bush to strengthen non-proliferation measures.

It identified the various technical measures and international institutional arrangement that have been proposed in multilateral fora, especially the IAEA, by a number of key technology holders in the global North. These proposals focus mostly on measures to provide an alternative to the development of national capabilities by states that do not currently have enrichment and reprocessing facilities. While some proposals to establish LEU fuel banks as guarantee for the reliable supply of nuclear fuel have been approved by the IAEA Board of Governors, these have yet to be accepted by most countries in the global South who argue for a comprehensive approach to the multilateralisation of the fuel cycle.

Beyond the IAEA, it was noted that no progress could be achieved in a number of multilateral fora, including the UN, the CD and the NPT. Despite the adoption by the UNSC of a number of general and country-specific resolutions related to the nuclear fuel cycle, the research showed that the Council remained unable to enforce implementation of some of these resolutions. It also confirmed that attempts by the Council to legislate on behalf of the international community in an effort to address inadequacies in the non-proliferation system cannot be sustained and, in fact, create additional credibility problems for this body.

The plurilateral initiatives examined in this Chapter, on the other hand, have been more selective and were almost exclusively geared towards the establishment of additional measures outside the multilateral system to curb existing and future proliferation threats associated with the transfer of sensitive technologies. Some of these measures contradict multilateral norms established through international instruments such as the NPT and the Law of the Sea Convention. As a result of the exclusive membership of these plurilateral institutions, their discriminatory practices and the contradictory norms that they sometimes seek to develop, the credibility of such institutions has been questioned which limits the possibility for the wider acceptance of these norms.

The research also illustrated the significant confidence gap between technology-holders in the North and countries in the global South, including wide-ranging suspicions regarding the motivation of these states for proposing additional non-proliferation measures. Some of these plurilateral initiatives also serve to influence the debate in the multilateral fora by providing a platform for considering technical options in support of proposals.

The debate on the various proposals has illustrated the different approaches of suppliers and consumers to the notion of nuclear energy security as defined in Chapter 2. The inherent tension between supply and demand has meant that consumers have largely approached the debate from an energy independence perspective, with the specific aim of ensuring that policy space in created for the (potential) development of domestic capabilities. It is significant to note that only two non-supplier proposals (Austria and the Gulf Cooperation Council) were submitted, both of which promoted a comprehensive approach to the multilateralisation of the nuclear fuel cycle. None of these proposals has been subjected to a debate or seriously considered.

The research has confirmed a high degree of overlap and inter-linkage between the various nuclear fuel cycle proposals inasmuch as similar efforts are being pursued in different diplomatic modes, sometimes as a direct result of failure to secure agreement in one diplomatic mode or to shape and influence outcomes in another. An overriding theme among the various modes is the dominant role of the US both in terms of the establishment of institutional structures and the formulation of norms. It also provided an illustration of the extent to which US national security interests inform and shape the international agenda.

The analysis has furthermore illustrated the narrow national and international security and state-centric focus of the diplomatic discourse on nuclear energy security. Beyond the WNA proposal drafted by a working group consisting of the largest industrial suppliers of nuclear fuel cycle services in the world, there has been no room for substantive interaction with civil society. Technology-holders of the global North have generally emphasised the non-proliferation dilemma of nuclear energy and the threat to state security as motivation for restricting access to sensitive technologies to the current technology-holders. Whilst some of the reactions of countries in the global South to these proposals emphasised the need for correcting imbalances and by retaining policy space that would allow them to exercise their right to develop national capabilities, these states also emphasised the need for consistency, non-discrimination, equality and the rule of law.

The analysis of the discourse provided evidence of a debate confined to competitive, zero-sum approaches. The lack of engagement on possible comprehensive solutions, such as that proposed by Austria, indicates a reluctance on the side of the Global North to move beyond largely symbolic incremental steps, such as LEU fuel banks. The continued reliance by the US and allies on initiatives outside the inclusive multilateral processes seems to be informed by the belief that it can continue to determine and enforce norms with the assistance of a few partners. An acceptance among the different actors of the notion of interdependence that could allow for negotiations at a global level on this issue seems largely absent. The current approach to the discourse has resulted in a virtual stalemate and processes in which there can only be winners and losers.

A rapidly changing international order and increasing number of global players wishing to exert their influence and dominance present additional complications for solving this long-outstanding issue. The discourse on nuclear energy security will remain a zero-sum game as long as the reality of global interdependence is not understood and accepted.

The manner in which the discourse of the future of the nuclear fuel cycle has been framed leads to conflictual and mostly mutually exclusive solutions. If nuclear energy is indeed a matter of global concern – and there seems to be broad agreement on this – then this issue cannot be effectively addressed through a haphazard and piecemeal approach. The neo-realist/liberalist narrative to the debate provides no possibilities for "enlarging the pie" through co-operative processes and alternative solutions to a continuing stalemate/stand-off. Beyond nuclear industry, civil society has not played any significant role in the debate. There is also no evidence of a human centred approach to the issue. Such an approach could be a game changer for transforming the security-development dilemma of nuclear energy into a sustainable solution.

CHAPTER 6

CONCLUSION

6.1 Introduction

This study endeavoured to identify the reasons for the continuing stalemate in the North-South diplomatic discourse on nuclear energy security by examining the modal impact of the debate on the future of the nuclear fuel cycle and the diplomatic institutions and norms governing the peaceful uses of nuclear energy.

For this purpose it set out to determine the extent to which the dominant state-centric, national security approach in nuclear fuel cycle negotiations, as opposed to a broader human security approach, has prevented consensus. It furthermore assessed the diplomatic institutions and norms governing the peaceful uses of nuclear energy and evaluated their ability to respond to the risks posed by the envisaged expansion of nuclear energy.

The overarching research assumption was that the prevailing state-centred approach to nuclear energy security and the choice of diplomatic modes have rendered the existing diplomatic institutions and norms governing nuclear energy ineffective in responding to the challenges posed by the expected increase in the development and use of nuclear energy in the twenty-first century.

6.2 Summary of research findings

The research, firstly, contextualised the intensified debate and the renewed interest in nuclear energy, including the search for alternative forms of energy driven by increasing energy demands and environmental imperatives that inform efforts towards reducing reliance on fossil fuels. An effort was made to briefly explain the complexities and dual-use nature of nuclear energy, the risks associated with an inadequate diplomatic response and the initiatives taken since the beginning of the nuclear age aimed at addressing the dilemma of nuclear energy. In so doing, the North-South dimension of

the diplomatic discourse on the peaceful uses of nuclear energy and in particular the debate on the nuclear fuel cycle since 2004 was contextualised.

Chapter 2 provided the broad conceptual and theoretical underpinnings to this study by analysing "nuclear energy security" in an IR context. In view of the apparent lack of conceptual clarity in the literature review, an effort was made to disaggregate this term. With this objective in mind, the different perspectives on security at the international, national and individual levels, as well as between some of the major traditional theoretical perspectives in IR and the more recent and evolving human security paradigm were analysed. The concept energy security was then examined and a wide range of elements were identified that could have an impact on energy security, including the reliability of energy supplies, access to alternative sources, affordability, infrastructure, planning and management systems, investment, distribution and environment effects. Due to the impact of energy security on economic activity, it was noted that conceptions of energy security were influenced by geographic location, the availability of energy sources and capabilities, international relations, political systems and level of economic development.

By examining energy security in the context of nuclear energy, additional elements were identified, including nuclear safety, the physical protection of material and facilities, as well as nuclear energy's intrinsic proliferation potential. Given the focus of a human security approach and considering the various elements associated with energy security, including in a nuclear energy context, a comprehensive working definition for "nuclear energy security" was formulated.

The North-South dimension of this study was explored, which revealed a persisting and growing divide between developing and developed countries, including a widening technology gap that perpetuates inequalities. It was also noted that the South continues to maintain collective positions through the NAM and the G77. In examining the North-South dichotomy, growing political and economic disparities among countries of the South were evident, which raised questions about the utility of oversimplified concepts as analytical tools. It argued that the "North-South" concept represents a more statist approach, while the "global North-global South" description depicts a broader concept that includes a wider range of actors, is not state-centric and less geographically confined.

As part of the conceptual framework for the study, the relevant modal dimensions of diplomacy were identified, including the bilateral, multilateral, third party and polylateral diplomatic modes. It was argued that the crisis in the multilateral nuclear non-proliferation system derives from security approaches that have resulted in the development of a new typology of selective multilateral diplomacy that is sometimes referred to as “à la carte” diplomacy. While recognising that most western scholars and practitioners of diplomacy do not differentiate between inclusive and exclusive multilateral settings, it was argued that it is necessary for the purposes of this study to distinguish between inclusive multilateral settings and what will be referred to as the plurilateral mode.

In examining the historical development and status of the North-South divide on nuclear energy, the research confirmed that the growth in global energy demand is driven by a significant increase in energy demand among developing counties. However, it also revealed a significant backlog among Sub-Saharan African countries in terms of access to electricity. It confirmed that nuclear energy will continue to contribute towards energy security, but that its contribution to electricity generation varies considerably between the North and South.

Although the origins of the North-South technological divide dates back to the industrial revolution of the nineteenth century, the analysis suggested that the gap has continued to widen during and after colonisation. While the NAM and the G77 continue to act as the core diplomatic formations of the South, it was noted that the end of the Cold War has changed the complexion of the South with the growing influence and stature of some developing countries. Despite these difference, which also resulted in the establishment of smaller diplomatic formations such as IBSA and BRICS, research confirmed that the South continues to maintain cohesive common positions on nuclear energy.

The analysis of the global distribution of nuclear resources and capabilities related to the core elements of the nuclear fuel cycle confirmed no major disparities between the North and the South in relation to uranium deposits and mining. However, it was evident that the South and in particular Africa has remained marginalised in terms of access to the other elements of the nuclear fuel cycle, including nuclear power plants, conversion capabilities, enrichment, reprocessing and nuclear fuel production. The research also confirmed that the nuclear energy divide has a distinct North-South dimension and that development priorities in the South are being undermined by technology denials.

In evaluating the impact of the unequal distribution of capabilities on the relative "bargaining power" of the North and the South, the relevance of attributive power derived from military and economic capabilities was recognised. It noted that attributive power was particularly important in competitive bargaining situations such as the debate on the nuclear fuel cycle, but that structural or relational power as elements of issue-based power were equally important in multilateral negotiations. Similarly, it was argued that bargaining power can also be defined in terms of the ability to optimally utilise resources and capabilities to change conceptions of what would constitute the most advantageous result of a negotiation or by altering the scope of possible solutions by successfully promoting integrative bargaining processes. Importantly, behavioural power and tactics such as coalition formation were acknowledged as elements of bargaining power, that explains the relative success achieved by the weaker global South in negotiations with the North.

In terms of international institutions and norms in the field of nuclear energy, the study showed that the current system covers a broad range of nuclear-related activities that have been subjected to change over the years. This evolution has been most visible in the outcomes of NPT and IAEA conferences, where an increasing number of issues relevant to nuclear energy security have been added to the international agenda. In using the working definition for nuclear energy security introduced in Chapter 2 as point of reference, the research confirmed that international norms have gradually been introduced in relation to a number of the constituent elements of nuclear energy security, including nuclear safety, security and non-proliferation norms. However, none of these has been universally accepted and many are of a non-legally binding nature. The study therefore revealed a highly fragmented nuclear energy governance system consisting of unilateral, bilateral, multilateral and plurilateral international measures unable to respond to humanitarian imperatives.

While the primacy of the IAEA and the NPT as the core elements of the global system of governance over nuclear energy was confirmed, both institutions continue to suffer serious inherent weaknesses. In this context, evidence suggests that the IAEA structurally continues to display the power contours of the post-WWII era. This is particularly evident in the highest policy-making organ of the IAEA, the Board of Governors, where countries of the North continue to be over-represented based on selection criteria that favour technology-holders. In a similar vein, the NPT's

discriminatory design and imposition of a system of “haves” and “have-nots” reflects its anarchic character. The lack of implementation of nuclear disarmament measures and the resultant search for balance between this NPT pillar and nuclear non-proliferation pillar of the treaty have negatively impacted on the peaceful use pillar of the Treaty. As a result, it was argued that the peaceful uses of nuclear energy have been caught into a security-military trap under the NPT.

Evidence further suggested that the plurilateral institutions analysed in this study continue to be dominated by technology holders from the North and that the discriminatory practices of these institutions diminish their reputation as credible non-proliferation institutions. In terms of other *ad hoc* initiatives, it was confirmed that, although most of these were purportedly aimed at curbing the potential threat of nuclear terrorism, their actions mostly centred around further restrictions on access to sensitive technologies or imposing additional safety and security measures in relation to civilian nuclear activities.

It was therefore evident that while certain narrow national and international security interests are served by the IAEA and NPT, the multilateral nuclear non-proliferation system remains ill-equipped to deal with this issue from a human security perspective. The analysis of the various treaties covering the safety and security of nuclear material, equipment and technology, which are essential components of the safe and sustainable use of nuclear energy, has confirmed significant gaps. In addition, the inadequacies of the IAEA safeguards system in providing assurances that materials and technology are not diverted towards nuclear weapons activities pose a continued risk. Likewise, the institutions and norms created under the IAEA and NPT remain unfulfilled in particular in as far as they relate to access by the global South to nuclear energy for electricity generation, human and animal health and other peaceful nuclear applications.

This study has therefore confirmed the hypothesis that the existing institutions and norms reflect the post-WWII global power configurations and are consequently unable to deliver on the promise of “the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy” and a world free of nuclear weapons.

In the analysis of the diplomatic discourse on the nuclear fuel cycle between 2004 and 2011, it was noted that various technical measures and international institutional arrangements have been proposed in the IAEA by a number of technology holders in the global North. Evidence suggests that most of the proposals are aimed at the development of alternative modalities to discourage the expansion of national capabilities beyond the current holders of enrichment and reprocessing technologies and facilities.

The research also confirmed the inability of the other multilateral fora, including the UNGA First Committee, the CD and the NPT, to address this issue. While the UNSC adopted a number of resolutions related to elements of the fuel cycle, evidence suggests that its endeavours to address inadequacies in the nuclear non-proliferation system cannot be sustained and create additional credibility problems for this body. In this context, it also noted the inability of the Council to enforce some of its decisions in this area.

The plurilateral initiatives examined in this study were almost exclusively aimed at establishing additional controls outside the multilateral institutions to prevent existing and potential threats associated with the transfer of sensitive technologies. This study found that some of these controls and decisions were inconsistent with the norms established under multilateral instruments such as the NPT and the Law of the Sea Convention. The research also suggested that these plurilateral institutions generally lack credibility due to their discriminatory practices and exclusive membership rules. It further illustrated the general lack of confidence between technology-holders in the North and countries in the global South about the justifications that have been provided for imposing additional restrictions.

The analysis confirmed the different approaches to nuclear energy security adopted by suppliers and consumers in the debate. While suppliers focussed on consolidating their virtual monopoly over the sensitive elements of the nuclear fuel cycle, consumers have focused on energy independence and to preserve the necessary policy space for the (potential) development of domestic facilities. As such, the debate illustrated the inherent tension between supply and demand, as well as between security and development.

The research also confirmed a high degree of overlap and inter-linkage between the various nuclear fuel cycle proposals inasmuch as similar efforts are being pursued in different diplomatic modes, sometimes as a direct result of failure to secure agreement in one diplomatic mode or to shape and influence outcomes in another. The research also revealed the dominant role of the US across the various diplomatic modes, both in relation to the formation of governance structures, but also in determining and formulating international norms. This provided an illustration of the degree to which the national security agenda of the US influences and determines the international agenda.

The analysis confirmed the narrow national and international security and state-centric focus of the diplomatic discourse on nuclear energy security. It also confirmed that the global North have mostly focused on the proliferation threat inherent to nuclear energy and the consequent threats to state security as the key motivation for restricting access to sensitive technologies to the current technology-holders. While some of the reactions among countries of the global South have emphasised the need for correcting imbalances and emphasised their inalienable right to develop national capabilities, these states also stressed the need for consistency, non-discrimination, equality and the rule of law.

The research revealed no significant interaction with civil society on the future of the nuclear fuel cycle. The analysis of the discourse provided evidence of a debate confined to competitive, zero-sum approaches. It also confirmed the continued reliance by the US and allies on initiatives outside the inclusive multilateral processes and suggested that this might be informed by the belief that the US can continue to unilaterally determine and enforce norms. It was argued that an acceptance among the different actors of the notion of interdependence, which could stimulate negotiations at a global level on this issue, seems largely absent. Given the lack of agreement at the multilateral level, the analysis suggested that the current approach to the discourse has created a virtual stalemate.

The study has therefore confirmed the hypothesis that the global North prefers to pursue its interests through the bilateral and plurilateral diplomatic modes, while the global South has a general preference for the multilateral mode, where alliances and coalition formation provide a more effective means to achieve its goals.

The prevailing state-centred approach to nuclear energy security and the choice of diplomatic modes have rendered the existing diplomatic institutions and norms governing nuclear energy ineffective in responding to the challenges posed by the expected increase in the development and use of nuclear energy in the twenty-first century.

6.3 A future research agenda

A human security approach to nuclear energy highlighted the importance of not confining the debate to the disarmament and non-proliferation elements, but also to the peaceful uses dimension. The paradox of such an approach is that it also brings to the fore questions about nuclear energy itself, especially in relation to the safety of nuclear energy and its long-term impact on the environment and human health brought about by the threat of nuclear contamination, whether in the form of a meltdown of a reactor or the short or long-term storage of nuclear waste. These are issues that were not fully addressed in this dissertation. It is recognised that any comprehensive analysis of the human security dimensions of nuclear energy will necessarily also focus on these issues and could form the basis for further research.

A human-centred approach could be a potential game changer for transforming the security-development dilemma of nuclear energy into a sustainable solution. But this question is not only relevant to the subject of this research study and could form the basis of further research into the application of humanitarian approaches to other diplomatic studies.

The manner in which the discourse of the future of the nuclear fuel cycle has been framed leads to conflictual and mostly mutually exclusive solutions. If nuclear energy is indeed a matter of global concern – and there seems to be broad agreement on this – then this issue cannot be effectively addressed through a haphazard and piecemeal approach. The realist/neo-liberalist narrative to the debate provides no possibilities for "enlarging the pie" through co-operative processes and alternative solutions to a continuing stalemate. The problem is, however, that diplomats usually receive training that is confined to these two traditional approaches. The impact of a different approach to solving international dilemmas on diplomatic training could also be usefully explored.

6.4 Conclusion

A rapidly changing international order and increasing number of global players wishing to exert their influence and dominance present additional complications for solving this long-outstanding dilemma. The discourse on nuclear energy security will remain a zero-sum game as long as the reality of global interdependence is not understood and accepted. This reality was already recognised by Albert Einstein in 1947 when he reflected on the release of atomic energy as a force that "cannot be fitted into the outmoded concept of narrow nationalisms". He noted that there is no possibility of control over the force of nuclear energy "except through the aroused understanding and insistence of the peoples of the world".

This study has highlighted the continued focus in the debate on the narrow state-centric notions of security, reminiscent of realist and neo-realist conceptions. While it argued for a wider approach to security that includes a focus on the individual, it has also recognised that the elements of national security will remain a vital component of international relations. A focus on human security allows for a more comprehensive approach that considers, amongst others, developmental elements, which in the context of this study means nuclear energy security. At the same time, it needs to be borne in mind that the physical security of nuclear material, equipment and technology in the context of the contemporary understanding of nuclear security is in itself a humanitarian imperative. In fact, it can be argued that in order to give concrete effect to human security, state capacity needs to be strengthened. Without development there cannot be security and without security development will remain hampered. But given the nature of contemporary international relations the existing international institutional framework is clearly not able to respond to today's threats.

What is needed is a new integrated approach that would focus on human security to inform priority/agenda setting at both national and international level. The recurring tension between security and development is a characteristic of the international system that can be overcome through the development of a more integrated international system that regard these two areas as a package of mutually-reinforcing elements.

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ANNEX A:

IAEA CONVENTIONS AND AGREEMENTS (NUMBER OF STATE PARTIES)
(number of State Parties correct as of the end of 2011)

Safety and Security

- Convention on Early Notification of a Nuclear Accident, adopted in 1986 after the Chernobyl nuclear plant accident (113 State Parties)
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, adopted in 1986 after the Chernobyl nuclear plant accident (108 State Parties)
- Convention on Nuclear Safety, adopted on 17 June 1994 (74 State Parties)
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, was opened for signature on 29 September 1997 and entered into force on 18 June 2001 (63 State Parties)
- Convention on the Physical Protection of Nuclear Material, concluded on 3 March 1980 (145 State Parties)
- Amendment to the Convention on the Physical Protection of Nuclear Material, concluded in 2005 by expanding the scope to cover both nuclear material and facilities (53 State Parties)
- Vienna Convention on Civil Liability for Nuclear Damage, adopted 1963 (38 State Parties)
- Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage, adopted in 1997 (9 State Parties)
- Convention on Supplementary Compensation for Nuclear Damage, adopted in 1997, but yet to enter into force (4 State Parties)
- Optional Protocol Concerning the Compulsory Settlement of Disputes to the Vienna Convention on Civil Liability for Nuclear Damage, adopted in 1963 (2 State Parties)
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention to Nuclear Accidents, adopted on 21 September 1988 (26 State Parties
- Nordic Mutual Emergency Assistance Agreement in Connection with Radiation Accidents, concluded on 17 October 1963
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters, adopted on 10 November 1972

Science and Technology:

- African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA), adopted on 21 February 1990 (32 African State Parties)
- Co-operation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean (ARCAL), adopted on 25 September 1998 (21 Latin American and Caribbean State Parties)
- Revised Guiding Principles and General Operating Rules to Govern the Provision of Technical Assistance by the Agency, 21 February 1979 and the Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA (119 State Parties)
- Co-operative Agreement for Arab States in Asia for Research, Development and Training Related to Nuclear Science and Technology (ARASIA), adopted in 2002 (9 Arab State Parties)
- Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project, adopted on 21 November 2006 (all 7 Parties to the Agreement)

Safeguards and Verification

- Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons, June 1972
- Model Protocol Additional to the Agreement(s) Between State(s) and the Agency for the Application of Safeguards, September 1997
- Agency's Safeguards System, 16 September 1968

Table 1. Identified Uranium Resources (tonnes Uranium)

Country		Cost ranges	
	<USD 40/kgU	<USD 80/kgU	<USD 130/kgU
Algeria	NA	19 500	19 500
Argentina	7 100	11 000	12 000
Australia	1 196 000	1 216 000	1 243 000
Brazil	139 600	231 000	278 400
Canada	352 400	423 200	423 200
Central African Republic	NA	6 000	12 000
Chile	NA	NA	1 500
China	39 300	61 900	67 900
Congo, Dem. Rep. of	NA	2 700	2 700
Czech Republic	0	700	700
Denmark	0	0	32 300
Finland	0	0	1 100
France	0	0	11 700
Gabon	0	0	5 800
Germany	0	0	7 000
Greece	1 000	1 000	7 000
India	NA	NA	72 900
Indonesia	0	300	5 800
Iran, Islamic Republic of	0	0	1 600
Italy	NA	4 800	6 100
Japan	0	0	6 100
Jordan	111 800	111 800	111 800
Kazakhstan	517 300	751 000	817 300
Malawi	NA	9 600	11 600
Mexico	0	0	1 800
Mongolia	16 300	62 000	62 000
Namibia	116 400	230 300	275 000
Niger	34 200	75 200	274 000
Peru	0	2 900	7 200
Portugal	0	5 700	7 200
Romania	0	0	6 700
Russian Federation	83 600	495 400	545 600
Slovenia	0	3 300	5 500
Somalia	0	0	7 600
South Africa	234 700	343 200	435 100
Spain	0	2 500	11 300
Sweden	0	0	10 000
Turkey	0	7 300	7 300
Ukraine	34 100	184 100	199 500
United States	NA	99 000	339 000
Uzbekistan	86 200	86 200	111 000
Vietnam	NA	800	6 400
Zimbabwe	NA	1 400	1 400
Total	**2 970 000**	**4 456 400**	**5 438 800**

Source: OECD Nuclear Energy Agency (NEA), 2008

Table 2. Uranium mining (2003-2010)

Country	2003	2004	2005	2006	2007	2008	2009	2010
Kazakhstan	3300	3719	4357	5279	6637	8521	14020	17803
Canada	10457	11597	11628	9862	9476	9000	10173	9783
Australia	7572	8982	9516	7593	8611	8430	7982	5900
Namibia	2038	3038	3147	3067	2979	4366	4628	4498
Niger	3143	3282	3093	3434	3153	3032	3243	4198
Russia	3150	3200	3431	3262	3413	3521	3564	3562
Uzbekistan	1598	2016	2300	2260	2320	2338	2429	2400
USA	779	878	1039	1672	1654	1430	1453	1660
Ukraine (est)	800	800	800	800	846	800	840	850
China (est)	750	750	750	750	712	769	750	827
Malawi							104	670
South Africa	758	755	674	534	539	655	563	583
India (est)	230	230	230	177	270	271	290	400
Czech Repub.	452	412	408	359	306	263	258	254
Brazil	310	300	110	190	299	330	345	148
Romania (est)	90	90	90	90	77	77	75	77
Pakistan (est)	45	45	45	45	45	45	50	45
France	0	7	7	5	4	5	8	7
Germany	104	77	94	65	41	0	0	0
total world	**35 574**	**40 178**	**41 719**	**39 444**	**41 282**	**43 853**	**50 772**	**53 663**
tonnes U_3O_8	41 944	47 382	49 199	46 516	48 683	51 716	59 875	63 285
percentage of world demand			65%	63%	64%	68%	78%	78%

Source: World Nuclear Association, 2010

Table 3. World Primary Conversion Capacity

Company	Nameplate Capacity (tonnes U as UF6)
Cameco, Port Hope, Ont, Canada	12,500
Cameco, Springfields, UK	6000
JSC Enrichment & Conversion Co (Atomenergoprom), Irkutsk & Seversk, Russia	25,000
Comurhex (Areva), Pierrelatte, France	14,500
Converdyn, Metropolis, USA	15,000
CNNC, Lanzhou, China	3000
IPEN, Brazil	90
Total	76,090

Source: World Nuclear Association, 2009

Table 4. World Enrichment Capacity - Operational and Planned (thousand SWU/yr)

Country	Company and plant	2010	2015	2020
France	Areva, Georges Besse I & II	8500*	7000	7500
Germany-Netherlands-UK	Urenco: Gronau, Germanu; Almelo, Netherlands; Capenhurst, UK.	12,800	12,200	12,300
Japan	JNFL, Rokkaasho	150	750	1500
USA	USEC, Paducah & Piketon	11,300*	3800	3800
USA	Urenco, New Mexico	200	5800	5900
USA	Areva, Idaho Falls	0	0	3300
USA	Global Laser Enrichment	0	2000	3500
Russia	Tenex: Angarsk, Novouralsk, Zelenogorsk, Seversk	23,000	33,000	30-35,000
China	CNNC, Hanzhun & Lanzhou	1300	3000	6000-8000
Pakistan, Brazil, India, Iran	Various	100	300	300
	Total SWU approx	**57,350**	**68,000**	**74-81,000**

*Gaseous diffusion
'Various' includes Resende in Brazil, Kahutab in Pakistan, Rattehallib in India and Natanz in Iran.

Source: World Nuclear Association, 2010

Table 5. Light Water Reactor (LWR) fuel fabrication capacity (tonnes/yr)

	Fabricator	Location	Conversion	Pelletizing	Rod/assembly
Belgium	AREVA NP-FBFC	Dessel	0	700	700
Brazil	INB	Resende	160	160	280
China	CNNC	Yibin	400	400	450
		Batou			
France	AREVA NP-FBFC	Romans	1800	1400	1400
Germany	AREVA NP-ANF	Lingen	800	650	650
India	DAE Nuclear Fuel Complex	Hyderabad	48	48	48
Japan	NFI (BWR)	Kumatori	0	360	284
	NFI (PWR)	Tokai-Mura	0	250	250
	Mitsubishi Nuclear Fuel	Tokai-Mura	475	440	440
	GNF-J	Kurihama	0	750	750
Kazakhstan	Ulba	Ust Kamenogorsk	2000	2000	0
Korea	KNFC	Daejeon	600	600	600
Russia	TVEL-MSZ*	Elektrostal	1450	1200	120
	TVEL-NCCP	Novosibirsk	250	200	400
Spain	ENUSA	Juzbado	0	300	300
Sweden	Westinghouse AB	Västeras	600	600	600
UK	Westinghouse**	Springfields	950	600	860
USA	AREVA Inc	Richland	1200	1200	1200
	Global NF	Wilmington	1200	1200	750
	Westinghouse	Columbia	1500	1500	1500
Total			**13433**	**14558**	**12662**

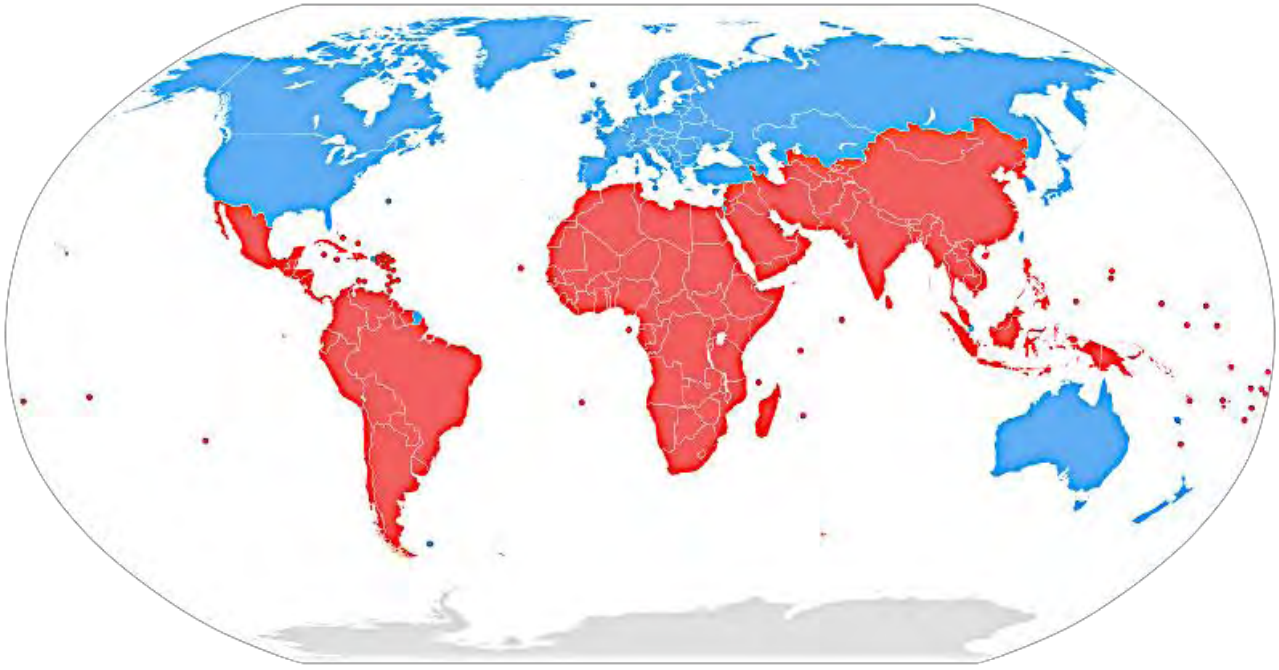
Source: World Nuclear Association, 2011

Table 6. Pressurised Heavy Water Reactor (PHWR) fuel fabrication capacity (tonnes/yr)

	Fabricator	Location	Rod/Assembly
Argentina	DIOXITEK SA & ENACE	Cordoba & Eizeiza	160
Canada	Cameco		1500
	GE		1200
China	CNNC	Baotou	200
India	DAE Nuclear Fuel Complex	Hyderabad	435
Pakistan	PAEC	Chasma	20
Korea	KEPCO	Taejon	400
Romania	SNN	Pitesti	240
Total			**4155**

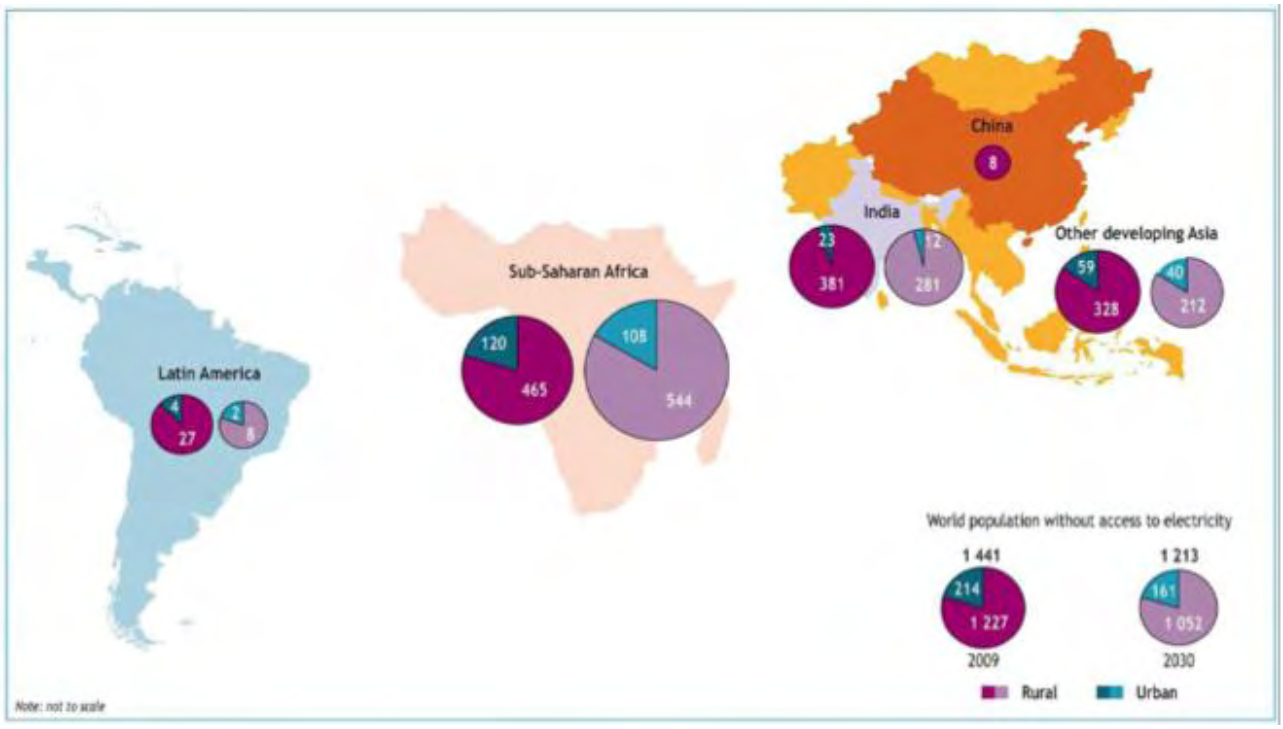
Source: World Nuclear Association, 2011

Map 1: North-South Divide



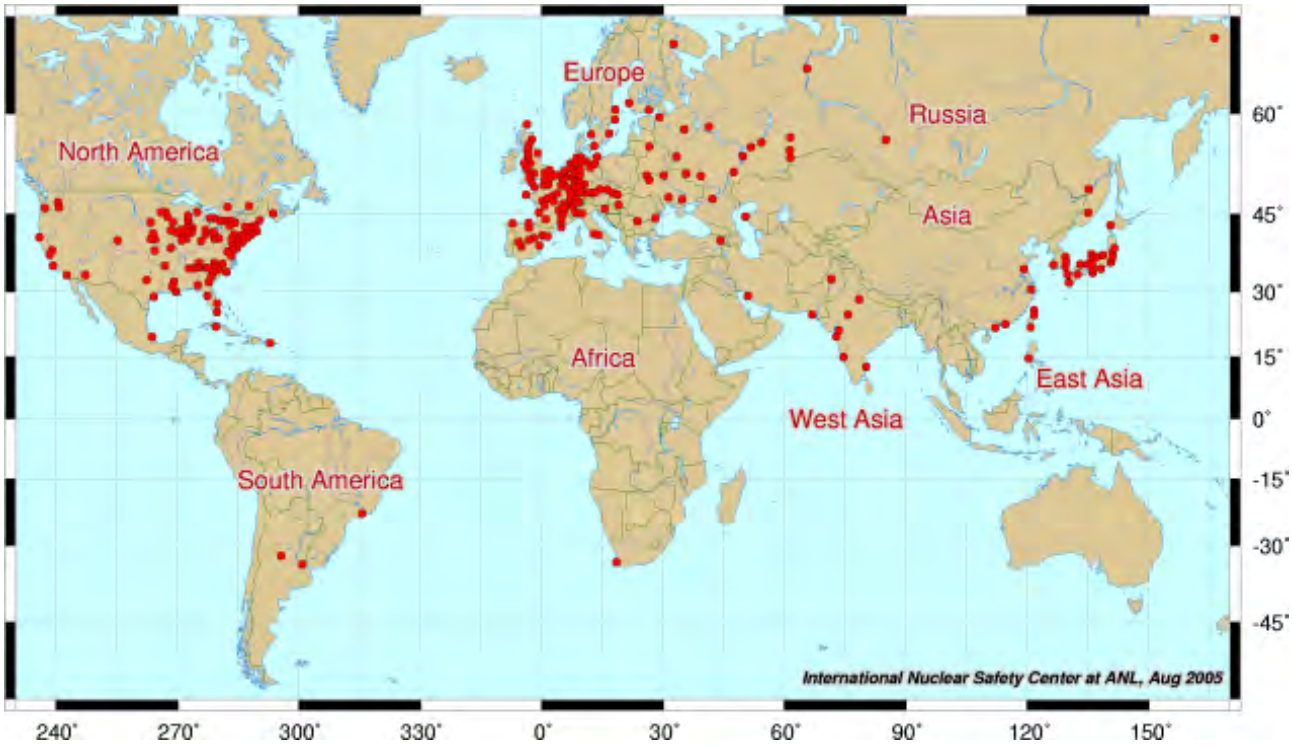
Source: Wikipedia (http://en.wikipedia.org/wiki/North-South_divide), 2011

Map 2. Number of people without access to electricity in rural and urban areas (2009-2030)



Source: International Energy Agency, 2010

Map 3. Nuclear Power Plants



Source: Nuclearstreet, 2011

ANNEX A:

IAEA CONVENTIONS AND AGREEMENTS (NUMBER OF STATE PARTIES)
(number of State Parties correct as of the end of 2011)

Safety and Security

- Convention on Early Notification of a Nuclear Accident, adopted in 1986 after the Chernobyl nuclear plant accident (113 State Parties)
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, adopted in 1986 after the Chernobyl nuclear plant accident (108 State Parties)
- Convention on Nuclear Safety, adopted on 17 June 1994 (74 State Parties)
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, was opened for signature on 29 September 1997 and entered into force on 18 June 2001 (63 State Parties)
- Convention on the Physical Protection of Nuclear Material, concluded on 3 March 1980 (145 State Parties)
- Amendment to the Convention on the Physical Protection of Nuclear Material, concluded in 2005 by expanding the scope to cover both nuclear material and facilities (53 State Parties)
- Vienna Convention on Civil Liability for Nuclear Damage, adopted 1963 (38 State Parties)
- Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage, adopted in 1997 (9 State Parties)
- Convention on Supplementary Compensation for Nuclear Damage, adopted in 1997, but yet to enter into force (4 State Parties)
- Optional Protocol Concerning the Compulsory Settlement of Disputes to the Vienna Convention on Civil Liability for Nuclear Damage, adopted in 1963 (2 State Parties)
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention to Nuclear Accidents, adopted on 21 September 1988 (26 State Parties
- Nordic Mutual Emergency Assistance Agreement in Connection with Radiation Accidents, concluded on 17 October 1963
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters, adopted on 10 November 1972

Science and Technology:

- African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA), adopted on 21 February 1990 (32 African State Parties)
- Co-operation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean (ARCAL), adopted on 25 September 1998 (21 Latin American and Caribbean State Parties)
- Revised Guiding Principles and General Operating Rules to Govern the Provision of Technical Assistance by the Agency, 21 February 1979 and the Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA (119 State Parties)
- Co-operative Agreement for Arab States in Asia for Research, Development and Training Related to Nuclear Science and Technology (ARASIA), adopted in 2002 (9 Arab State Parties)
- Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project, adopted on 21 November 2006 (all 7 Parties to the Agreement)

Safeguards and Verification

- Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons, June 1972
- Model Protocol Additional to the Agreement(s) Between State(s) and the Agency for the Application of Safeguards, September 1997
- Agency's Safeguards System, 16 September 1968

Table 1. Identified Uranium Resources (tonnes Uranium)

Country		Cost ranges	
	<USD 40/kgU	<USD 80/kgU	<USD 130/kgU
Algeria	NA	19 500	19 500
Argentina	7 100	11 000	12 000
Australia	1 196 000	1 216 000	1 243 000
Brazil	139 600	231 000	278 400
Canada	352 400	423 200	423 200
Central African Republic	NA	6 000	12 000
Chile	NA	NA	1 500
China	39 300	61 900	67 900
Congo, Dem. Rep. of	NA	2 700	2 700
Czech Republic	0	700	700
Denmark	0	0	32 300
Finland	0	0	1 100
France	0	0	11 700
Gabon	0	0	5 800
Germany	0	0	7 000
Greece	1 000	1 000	7 000
India	NA	NA	72 900
Indonesia	0	300	5 800
Iran, Islamic Republic of	0	0	1 600
Italy	NA	4 800	6 100
Japan	0	0	6 100
Jordan	111 800	111 800	111 800
Kazakhstan	517 300	751 000	817 300
Malawi	NA	9 600	11 600
Mexico	0	0	1 800
Mongolia	16 300	62 000	62 000
Namibia	116 400	230 300	275 000
Niger	34 200	75 200	274 000
Peru	0	2 900	7 200
Portugal	0	5 700	7 200
Romania	0	0	6 700
Russian Federation	83 600	495 400	545 600
Slovenia	0	3 300	5 500
Somalia	0	0	7 600
South Africa	234 700	343 200	435 100
Spain	0	2 500	11 300
Sweden	0	0	10 000
Turkey	0	7 300	7 300
Ukraine	34 100	184 100	199 500
United States	NA	99 000	339 000
Uzbekistan	86 200	86 200	111 000
Vietnam	NA	800	6 400
Zimbabwe	NA	1 400	1 400
Total	**2 970 000**	**4 456 400**	**5 438 800**

Source: OECD Nuclear Energy Agency (NEA), 2008

Table 2. Uranium mining (2003-2010)

Country	2003	2004	2005	2006	2007	2008	2009	2010
Kazakhstan	3300	3719	4357	5279	6637	8521	14020	17803
Canada	10457	11597	11628	9862	9476	9000	10173	9783
Australia	7572	8982	9516	7593	8611	8430	7982	5900
Namibia	2038	3038	3147	3067	2979	4366	4628	4498
Niger	3143	3282	3093	3434	3153	3032	3243	4198
Russia	3150	3200	3431	3262	3413	3521	3564	3562
Uzbekistan	1598	2016	2300	2260	2320	2338	2429	2400
USA	779	878	1039	1672	1654	1430	1453	1660
Ukraine (est)	800	800	800	800	846	800	840	850
China (est)	750	750	750	750	712	769	750	827
Malawi							104	670
South Africa	758	755	674	534	539	655	563	583
India (est)	230	230	230	177	270	271	290	400
Czech Repub.	452	412	408	359	306	263	258	254
Brazil	310	300	110	190	299	330	345	148
Romania (est)	90	90	90	90	77	77	75	77
Pakistan (est)	45	45	45	45	45	45	50	45
France	0	7	7	5	4	5	8	7
Germany	104	77	94	65	41	0	0	0
total world	**35 574**	**40 178**	**41 719**	**39 444**	**41 282**	**43 853**	**50 772**	**53 663**
tonnes U_3O_8	41 944	47 382	49 199	46 516	48 683	51 716	59 875	63 285
percentage of world demand			65%	63%	64%	68%	78%	78%

Source: World Nuclear Association, 2010

Table 3. World Primary Conversion Capacity

Company	Nameplate Capacity (tonnes U as UF6)
Cameco, Port Hope, Ont, Canada	12,500
Cameco, Springfields, UK	6000
JSC Enrichment & Conversion Co (Atomenergoprom), Irkutsk & Seversk, Russia	25,000
Comurhex (Areva), Pierrelatte, France	14,500
Converdyn, Metropolis, USA	15,000
CNNC, Lanzhou, China	3000
IPEN, Brazil	90
Total	76,090

Source: World Nuclear Association, 2009

Table 4. World Enrichment Capacity - Operational and Planned (thousand SWU/yr)

Country	Company and plant	2010	2015	2020
France	Areva, Georges Besse I & II	8500*	7000	7500
Germany-Netherlands-UK	Urenco: Gronau, Germanu; Almelo, Netherlands; Capenhurst, UK.	12,800	12,200	12,300
Japan	JNFL, Rokkaasho	150	750	1500
USA	USEC, Paducah & Piketon	11,300*	3800	3800
USA	Urenco, New Mexico	200	5800	5900
USA	Areva, Idaho Falls	0	0	3300
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	NFI (PWR)	Tokai-Mura	0	250	250
	Mitsubishi Nuclear Fuel	Tokai-Mura	475	440	440
	GNF-J	Kurihama	0	750	750
Kazakhstan	Ulba	Ust Kamenogorsk	2000	2000	0
Korea	KNFC	Daejeon	600	600	600
Russia	TVEL-MSZ*	Elektrostal	1450	1200	120
	TVEL-NCCP	Novosibirsk	250	200	400
Spain	ENUSA	Juzbado	0	300	300
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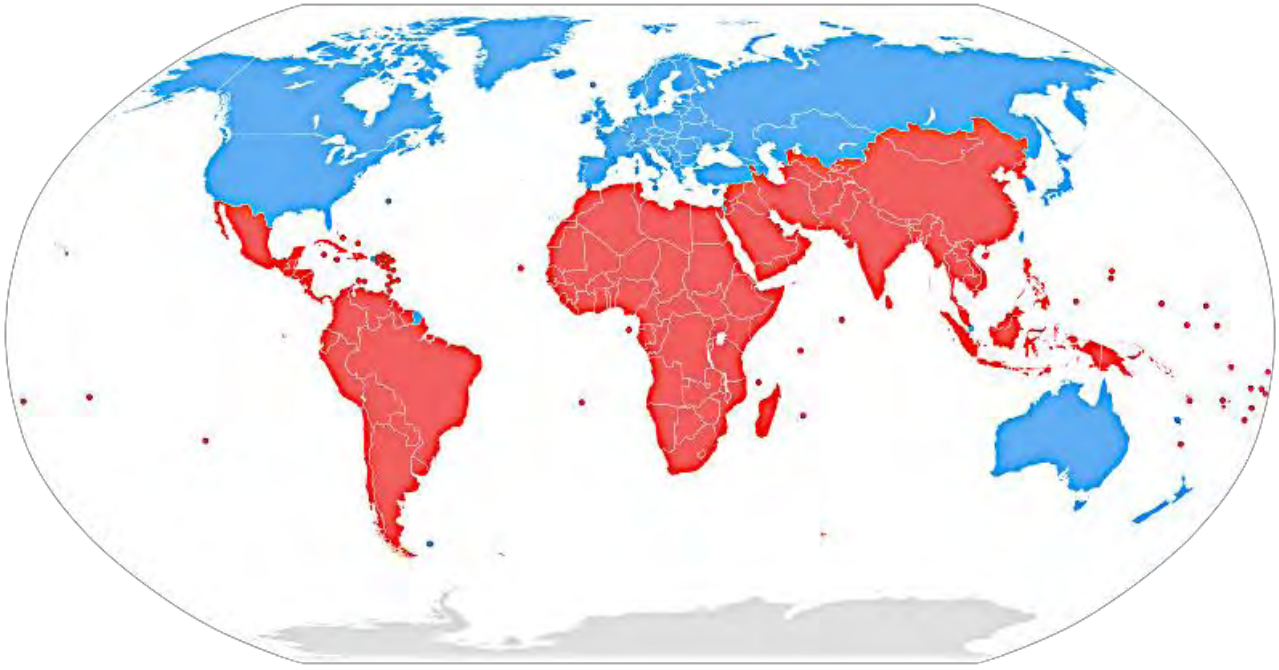
Korea	KEPCO	Taejon	400
Romania	SNN	Pitesti	240
Total			**4155**

Source: World Nuclear Association, 2011

Map 1: North-South Divide



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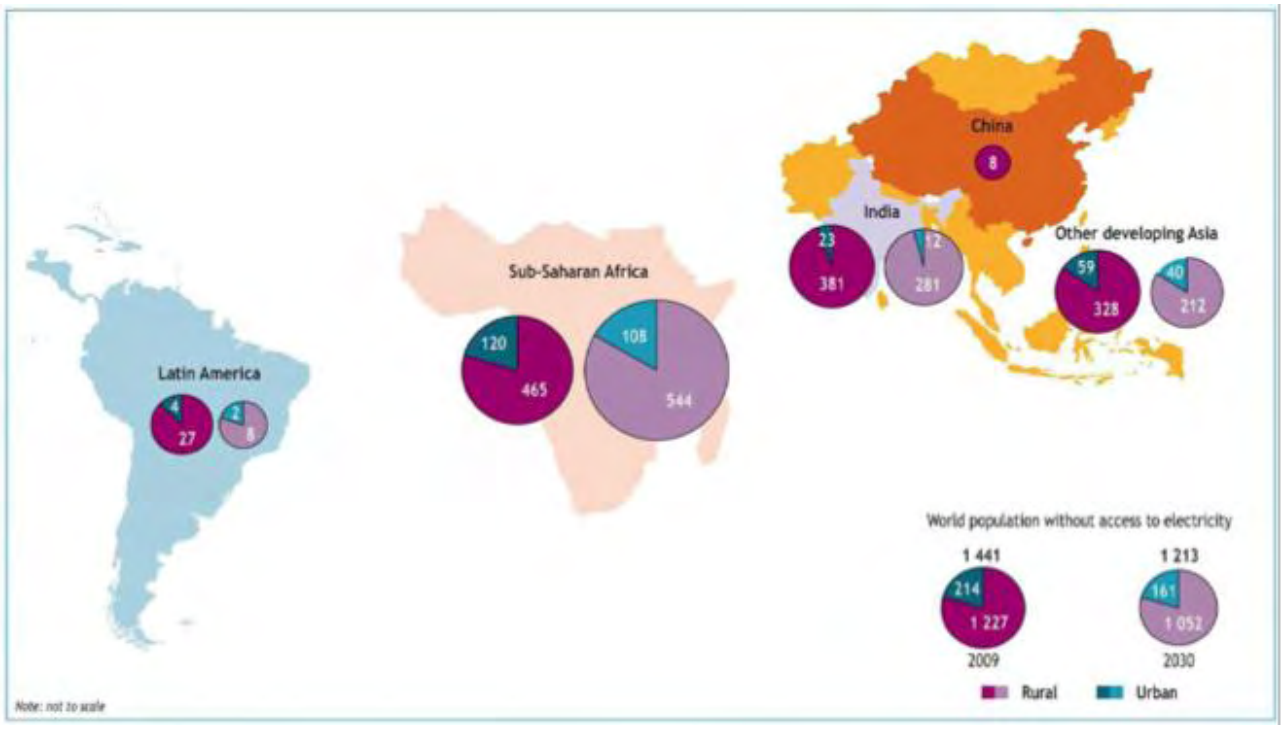
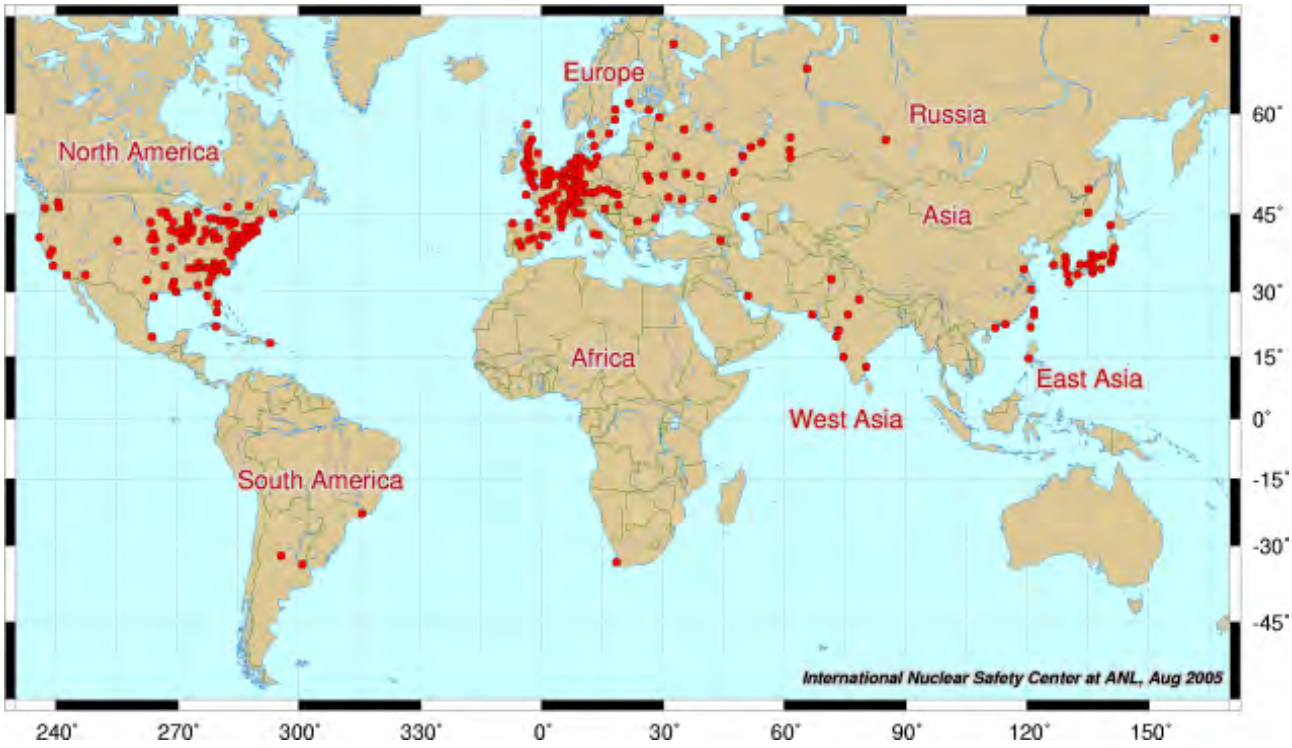


Source: International Energy Agency, 2010

Map 3. Nuclear Power Plants



Source: Nuclearstreet, 2011